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GIFT of LIFE MICHIGAN
ORGAN AND TISSUE DONATION

Adult Donor Management Guidelines

Adult Brain Dead Organ Donor > 45kg

Each clinical assessment is unique and dynamic. Consider these guidelines as a starting point only and adjust accordingly.

Clinical Practice Guidelines

Adult Brain Dead Organ Donor >45kg

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Central Venous Pressure (CVP)	4 – 10 mmHg during conventional ventilation 4 - 12 mmHg during inverse ratio ventilation	Page 5, 9, 13
Ejection Fraction (EF)	≥ 50%	Page 10
Pulse Pressure Variation (PPV) % or Stroke Volume Variation (SVV) %	< 13%: Unlikely to be preload responsive > 15%: Likely to be preload responsive	Page 9, 10
Vasopressors	≤ 1 vasopressor	Page 9, 10
Sodium (Na+)	135 – 155 mEq/L**	Page 17
Urine Output (UO)	0.5 - 4 ml/kg/hr**	Page 13, 23
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Hemoglobin / Hematocrit	>8.0 gm/dL / 21%	Page 25
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pH	7.35 – 7.45	Page 28, 38, 39
P/F Ratio (PaO2/ FiO2)	≥ 300 250-300 for EVLP.	Page 28, 32
SPO2	> 92%	Page 28, 32
Lab Values	Within Normal Limits (WNL)	
Creatinine	≤ 1.2 mg/dL or ≤ 1.5 mg/dL in ESRD	Page 14, 19, 20

* If donor has a history of Hypertension (HTN), MAP goals are 70 - 110 mmHg.

** Differs from Donor Management Goals (DMGs): Na+ ≤ 155 mEq/L, UO > 0.5 ml/kg/hr.

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Donor Monitoring and Interventions	
The frequency of the monitoring and interventions may be increased as needed.	
Frequency	**Monitoring/ Intervention**
Every 1 Hour	• Vital Signs (BP, MAP, HR, core temperature, CVP) • Cardiac output, cardiac index, SVR, PPV, SVV, PAP (If Swan Ganz catheter or other hemodynamic monitoring system in place) • Peak Inspiratory Pressure (PIP) • Mean Airway Pressure (MAP) • SPO2% • Ventilator Settings • Intake and Output (I&O) • Verify arterial and CVP lines are properly leveled to the phlebostatic axis (the level of the atrium of the heart).
Every 2-4 Hours	• Turn and Reposition • Check Breath Sounds • Oral Care • Chest physiotherapy (CPT) in Trendelenburg as tolerated. Suction before returning to reverse Trendelenburg. (Albuterol every 4 hours) • Suction ET tube every 4 as needed.
Every 6-8 Hours	• CBC w/ differential • Liver Function Tests (LFTs) (include direct bilirubin) • PT/INR, PTT • Cardiac Enzymes (CPK, CK/MB, Troponin I) • Basic Metabolic Panel (BMP) • Ionized Calcium (iCa++) • Phosphate (PO4-) • Magnesium (Mg++) • Lactate • Arterial Blood Gas (ABG) (ABG within 2 hours of making lung offers)
Every 12-24 Hours	• Chest X-ray (CXR) (if lung donor, last CXR w/in 3 hours prior to making lung offers.)

	• Amylase, Lipase (if recovering pancreas) • Urinalysis w/micro (UA w/micro)

Donor Monitoring and Interventions

The frequency of the monitoring and interventions may be increased as needed.

Frequency	Monitoring/ Intervention
Other Monitoring and Interventions	
General	• Measure actual height with Physical Exam • At time of serology blood draw, document admission / dry weight, if known and accurate. • If admission weight is not accurate dry weight, then measure weight at time of blood draw. Contact CLINICAL-AOC. • Head of the bed elevated > 30 in reverse Trendelenburg. • Utilize a hemodynamic monitoring system if available. • Move continuous IV infusions to a central line. • ***HLA's should be drawn prior to Solumedrol administration.***
Labs	• Hospital ABO/Rh (subtype group A if no blood product transfusions during current admission) • D-dimer, fibrinogen for intestine offers
Hemodynamics/ Cardiac	• Continuous arterial pressure monitoring. • Continuous EKG monitoring. • 12 Lead EKG with initial orders. • Before performing echocardiogram: correct electrolytes, donor should be on minimal vasopressors, normothermic, euvolemic and with cardiac enzymes trending downward. • Consider Cardiac Catheterization if indicated or requested. (Right and Left sided, leave Swan in) Discuss with CLINICAL-AOC.
Respiratory	• Bronchoscopy for all potential lung donors and as needed. • Gram stain. • Chest CT if 30 pack year or greater smoking history, or suspected COPD / emphysema. • Discuss with CLINICAL-AOC if requested by center.
Initial Donor Orders	• Transfer all care to GOLM • DC all previous orders except for vasopressors, antibiotics and insulin. • Consider Central line placement, if not done. Right IJ is preferred. • NG / OG to LIS. • Solumedrol 250 mg IV push initial bolus, followed by 50 mg/hr continuous infusion of

	1000 mg / 250cc NS (25 cc/hr). • Vasopressin 1 unit IV push bolus, followed by 0.5 units/hr to 2.4 units/hr IV continuous infusion. • T4 (Levothyroxine) 250mcg/250cc of NS in glass bottle. Administer loading dose of 20mcg IVP, then infuse at 10mcg/hr. Titrate to max dose of 30mcg/hr. • Zosyn 3.375 grams Q 6 hours. For Hospital Acquired Pneumonia / Ventilator Acquired Pneumonia: 4.5 grams IV Q 6 hours. If CrCl <40, hemodialysis or peritoneal dialysis, see medication list for dosing. • If allergic to PCN use: Clindamycin 600mg IVPB every 8 hours, and Ciprofloxacin 400mg IVPB every 12 hours. • Norcuron 10 mg IVP once at the start of case and PRN every hour for spinal reflexes. • Narcan 8 mg IVP once. • Albuterol 2.5 mg via nebulization every 4 hours or Albuterol MDI 10 puffs every 4 hours. • Free water 300cc via NG / OG every 4 hours, if Na+ >155. Clamp tube for 3 hours, then open to suction for 1 hour prior to next dose. • Initiate Insulin Protocol. • Artificial Tears 2 drops per eye every 6 hours or Lacrilube 1 application to each lower eyelid every 12 hours.
Liver Biopsy	Percutaneous needle biopsy by a physician or trained personnel. • Indications: • Serology reactive for HBcAb, HCV Ab, or NAT reactive Hepatitis B or C • BMI > 35 • History of ETOH abuse; defined as 2 or more drinks per day • As directed by the liver recovery surgeon, or accepting transplant center with the agreement of the medical director or their designee Contraindications: • INR >1.5 • Platelets <75,000/uL • The donor has received anti-platelet or therapeutic anti-coagulation Post biopsy care: • Right-side lying position for 2 hours. • H/H 30 min and 1 hour after procedure. If bleeding suspected, consult CLINICAL-AOC. • If pulse ox drops <92, consider stat CXR and consult CLINICAL-AOC. Potential complications • Bleeding • Hypotension

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	• Pneumothorax • Injury to surrounding organs
Eye Care	While donor is ventilated: • Instill ophthalmic lubricating drops (Lacrilube) every 12 hours or artificial tears every 6 hours. • If eyelids are not completely closed, tape eyelids closed with a small piece of low-adhesive tape. Use care to avoid damage to eye skin and eyelashes when removing tape. Post-Organ Recovery Care: • Instill 2 drops of sterile saline to each eye. • Tape eyes closed with paper tape. • Elevate head using a towel roll or pillow. • Cool the eyes with wet ice and / or refrigerate immediately.

Clinical Practice Guidelines

Adult Brain Dead Organ Donor >45kg

Hypotension Management

Hypotension

Definition: MAP < 65 mmHg

- Blood pressure is maintained by a series of interactive reflexes that continually link heart rate, stroke volume, total peripheral resistance, and circulating volume.

Hypotension			
Causes	**Clinical Presentation**	**Interventions**	**Reference Page**
Hypovolemia	• MAP < 65 mmHg • PPV/SVV > 13 % or significant variability visualized on arterial waveform tracing. • CVP < 4 mmHg	• Assess overall fluid balance from hospital admission; consider insensible fluid losses and the inflammatory process of brain death. • Administer 250-500 ml fluid boluses.	**See Fluid Management** **Page 13-15**
Euvolemic Hypotension	• MAPs < 65 mmHg • PPV/SVV < 13 % or minimal variability visualized on arterial waveform tracing. • CVP 4-12 during conventional ventilation or 4-15 during inverse ratio ventilation.	• Assure adequate volume resuscitation. • Begin vasopressors as directed.	**See Hypotension Pharmacological Management** **Page 10**
Cardiac Arrhythmias	• MAPs < 65 mmHg • Frequent PVCs, PACs or runs of ventricular tachycardia. • Tachycardia (HR > 120bpm) • Acid/Base Disturbances	• Obtain EKG. • Assess and treat electrolytes as directed. • Consult CLINICAL-AOC for antiarrhythmic medication administration. • Interpret ABG and make appropriate interventions.	**See Electrolytes** **Page 16 – 21** **and/or** **See ABG** **Page 38 - 39**

Clinical Practice Guidelines

Adult Brain Dead Organ Donor >45kg

Hypotension Management

Hypotension Pharmacological Management

Before initiation of "Hypotension Pharmacological Management" guidelines, the following should be considered first:

- Assure adequate volume resuscitation. (*See Fluid Management page 13*)
- For donors already on vasopressors, initiate T4 protocol and aggressively wean vasopressors maintaining MAP 65-110 mmHg. *(If donor has a history of HTN, MAP goals are 70-110 mmHg.)*
- Consult Clinical Backup for use of inotropes for poor cardiac function (cardiac output < 4 L/min, cardiac index < 2.2, EF < 50%).

Hypotension Pharmacological Management				
Use vasopressors in order of importance (A –C). **T4 is the first pharmacological choice (prior to vasopressors or inotropes) for the treatment of the hypotensive donor.**				
	Drug	**Start**	**Max**	**Comments & Precautions**
A	**T4 (levothyroxine)**	10 mcg/hr	30 mcg/hr	• Ensure administration of Solumedrol prior to beginning T4. • Ensure potassium (K+) levels are corrected and maintained. • Increase by 10mcg/hr every hour to max of 30mcg/hr as needed to wean vasopressors. • May cause tachycardia and hypertension (If HR >120 and hypertensive for 30 minutes decrease by 5 mcg/hr)
B	**Levophed (norepinephrine)**	5 mcg/min	30 mcg/min	• May begin concurrently with T4 if hypotension is acute and unresponsive to fluid boluses. • If max dose, call CLINICAL-AOC to discuss 2nd pressor.
C	**Hydrocortisone**	100mg IV	Q 8 hours	• Contact Clinical Backup • Patients with critical illness/stress may

				exhibit relative adrenal insufficiency even if they were asymptomatic prior to admission. • Indications: After declaration of brain death, if a patient's MAP remains below 65 mmHg and is already receiving thyroid hormone and near maximal doses of two Vasopressin and Levophed, empiric hydrocortisone should be considered. • This consideration is independent of the Solumedrol preparation for lung protection. The only contraindication is a known allergy to hydrocortisone preparations (extremely rare).

Hypertension Management

Hypertension

Definition: MAP > 110 mmHg

Hypertension Pharmacological Management

Before initiation of "Hypertension Pharmacological Management" guidelines, the following should be considered first:

- Wean vasopressors, then inotropes, then T4.
- Ensure the donor is not intravascularly fluid overloaded.
- If intravascularly fluid overloaded consider diuretic and consult CLINICAL-AOC.
- May consider weaning T4.

Hypertension Pharmacological Management

Begin when MAP >110 mmHg for greater than 15 minutes. Use medications in order of importance (A – C).

	Drug	Start	Max	Comments & Precautions
A	**Hydralazine**	10 mg IV slow push, may repeat PRN.	20 mg IV slow push, may repeat PRN.	• Consider "B" if hypertensive and HR >120bpm. • Direct vasodilator. • May cause tachycardia. • Allow 10 - 20 minutes between doses to assess response. • If hypertensive after 2 doses, consider "B" or "C" and consult CLINICAL-AOC.
B	**Cardene (nicardipine)**	5 mg/hr	15 mg/hr	• Begin for sustained HTN unresponsive to "A". • Calcium channel blocker causing central arterial vasodilation. • May cause tachycardia.
C	**Nipride (nitroprusside)**	0.25 mcg/kg/min	10 mcg/kg/min	• Potent vasodilator. • May cause tachycardia.

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Fluids

Fluid Management

Goal

Ensure adequate intravascular volume:

- Pulse Pressure Variability (PPV) or Stroke Volume Variation (SVV) < 13% (if hemodynamic monitoring system in place) or minimal variability visualized on arterial waveform tracing.
- CVP 4 – 10 mmHg during conventional ventilation or 4 - 12 mmHg during inverse ratio ventilation.
- Urine output (UO) 0.5 – 4 ml/kg/hr. *If UO is > 4 ml/kg/hr, evaluate intravascular volume status and treat for Diabetes Insipidus (DI).* *(See page 23)*

Recommendations

- Follow Fluid Administration Guidelines as a starting point only and adjust accordingly. *(See page 14)*
- Follow electrolyte guidelines to add to or change IV fluids as needed, considering K and Na levels.
- Monitor fluid balance closely: IVF, PPV, UO, and CVP trends. *(Hospital's EMR I & O's are the most accurate assessment of the donor's overall fluid balance since admission.)*
- Each clinical assessment is unique and dynamic; discuss management options with CLINICAL-AOC.

Precautions

- Consider the total volume of all IV drips and medications.
- Total hourly intake should not exceed 150 ml/hr, unless fluid resuscitating. If greater than 150ml/hr, consider weaning maintenance fluid.
- Give fluid boluses slowly for older donors or donors with cardiac or respiratory dysfunction.
- Hypervolemia/ fluid overload may lead to pulmonary edema. *(See page 41)*.

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Fluids

Fluid Administration Guidelines						
Each clinical assessment is unique and dynamic. Consider these guidelines as a starting point only and adjust accordingly. ***Do NOT add KCL to maintenance fluid with renal insufficiency (oliguria and/or creatinine > 1.5 mg/dl) or if anuric.***						
	If Na+ 135 – 155 mEq/L:			**If Na+ > 155 mEq/L:**		
	IV Maintenance Fluids	**IV Fluid Bolus**	**Other**	**IV Maintenance Fluids**	**IV Fluid Bolus**	**Other**
Euvolemia	0.45% NaCl (1/2 NS) Total fluid intake of 150 ml/hr.	None	Consult CLINICAL-AOC	0.225% NaCl (¼ NS) Total fluid intake of 150 ml/hr.	None	Consult CLINICAL-AOC
Hypovolemia	0.45% NaCl (1/2 NS) Total fluid intake of 150 ml/hr.	0.45% NaCl (NS) 250-500 ml over 30 mins.		0.225% NaCl (¼ NS) Total fluid intake of 150 ml/hr.	0.45% NaCl (NS) 250-500 ml over 30 mins.	
Hypervolemia	• Consult CLINICAL-AOC. • Fluid overload may lead to pulmonary edema. *(See page 41)*					

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Fluids

IV Fluid Composition per Liter								
Fluid	**Glucose (g)**	**Na (mmol/L)**	**Cl (mmol/L)**	**K (mmol/L)**	**Ca (mmol/L)**	**HCO3 (mmol/L)**	**mOsm/L**	**Kcal/L**
Crystalloids								
D5% (D5%W)	50	0	0	0	0	0	2502	170
D10% (D10%W)	100	0	0	0	0	0	556	340
D20% (D20%W)	200	0	0	0	0	0	1112	680
D50% (D50%W)	500	0	0	0	0	0	2777	1700
0.45% NaCl (1/2 NS)	0	77	77	0	0	0	154	0
3% NaCl	0	513	513	0	0	0	1025	0
0.9% NaCl (NS)	0	154	154	0	0	0	308	0
D5% 0.225% NaCl (D5 ¼ NS)	50	38	38	0	0	0	284	170
D5% 0.45% NaCl (D5 1/2 NS)	50	77	77	0	0	0	431	170
D5% 0.9% NaCl (D5 NS)	50	154	154	0	0	0	560	170
Lactated Ringers (LR)	0	130	110	4	1.5	27	273	< 10

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Electrolytes

Acceptable Electrolyte Values for the Brain Dead Donor		
These do not represent the range of normal values but rather the range of acceptable values for the brain dead donor. Values outside of these ranges should be corrected.		
Electrolytes	**Acceptable Values**	**Reference Page**
Sodium (Na+)	135 - 155 mEq/L	Page 17
Potassium (K+)	4.0 - 5.0 mEq/L	Page 19
Ionized Calcium (ICa++)	5.2 – 5.6 mg/dL or 1.13 – 1.4 mmol/L	Page 18
Magnesium (Mg++)	>2.0 mg/dl	Page 20
Phosphate (PO4-)	3.0 – 4.0 mg/dL	Page 21

Sodium (Na+) Goal: 135 – 155 mEq/L

- Note: Severe hyperglycemia (> 250) may artificially lower serum sodium lab results.

Hypernatremia
Treat Na+ > 150 mEq/L **Causes: Hypovolemia, DI, Hypertonic Fluids** **Clinical Manifestations: Muscle twitching, spasms, seizures, coma** **Tool: www.mdcalc.com/free-water-deficit-hypernatremia (To calculate free water deficit)**
Treatment and Considerations
• Free water via NG/OG: Instill 300 ml water, and clamp tube. After 3 hours, open to suction for 1 hour. Repeat every 4 hours. • Change IVF to 0.225% NaCl (¼ NS). Consider K+ levels. *(See Fluids page 15)* • Monitor hemodynamics as hypernatremia may cause a sluggish myocardium.

Hyponatremia	
Treat Na+ < 135 mEq/L **Causes: SIADH, Cirrhosis, CHF, Neprhotic syndrome, Hypotonic fluids, Diuretic use** **Clinical Manifestations: Cerebral edema, herniation, Non-cardiogenic pulmonary edema** **Note: Hyperglycemia causes osmotic shifts of water from the intracellular to the extracellular space, causing a relative dilutional hyponatremia.** **Tool: www.mdcalc.com/sodium-correction-rate-hyponatremia (to calculate fluid infusion)**	
Serum Na+	**Treatment**
Na 125 – 134 mEq/L	• Change IVF to 0.9% NaCl (NS). Titrate fluids per

	calculation. • Wean vasopressin with CLINICAL-AOC assistance and repeat sodium in 4 hours.
Na < 125 mEq/L	• Consult Clinical Backup. • Consider 3% NaCl IV bolus 250ml x 1 over one hour.

Ionized Calcium (ICa++) Goal: 5.2 – 5.6 mg/dL or 1.2 – 1.4 mmol/L

Ionized calcium is the preferred electrolyte value to be monitored and treated rather than calcium.

- If unable to obtain ionized calcium, use Corrected Calcium Calculator
  - http://www.globalrph.com/calcium.cgi

Hypocalcemia

Causes: Chronic/Acute kidney failure, severe acute hyperphosphatemia, Rhabdomyolysis (initial stage), Alkalosis (often caused by hyperventilation).

Clinical manifestations: hypotension, myocardial dysfunction, heart block, and prolonged QT.

Note: Hypocalcemia due to magnesium depletion is refractory to calcium replacement. Often magnesium replacement will correct the Hypocalcemia without replacing calcium.

Rule: One ampule Calcium Chloride= 3 ampules Calcium Gluconate

Rule: Maximum rate of Calcium gluconate 3 Grams IV over 10 mins

Maximum rate of Calcium Chloride 1 Gram IV over 10 mins

Treat ICa++ < 4.5 mg/dL or < 1.1 mmol/L

Serum ICa++	Treatment and Considerations
ICa++ 3.2 to 4.4 mg/dL (0.8 to 1.1 mmol/L) **Or** **Corrected Ca++ 7.5 to 8.4 mg/dL (1.9 to 2.1 mmol/L) /**	• 1 gm Calcium Chloride (CaCl) or 3 gm Calcium Gluconate IVPB over 15 min • Monitor hemodynamics as hypocalcaemia may cause poor contractility of myocardial fibers, low systolic pressure, and poor response to vasopressors.

iCa^{++} < 3.2 mg/dL (0.8 mmol/L) **Or** **Corrected Ca^{++} < 7.5 mg/dL (1.9 mmol/L) /**	• 2 gm Calcium Chloride (CaCl) or 6 gm Calcium Gluconate IVPB over 15 min • Monitor hemodynamics as hypocalcaemia may cause poor contractility of myocardial fibers, low systolic pressure, and poor response to vasopressors.

- *Calcium chloride (CaCl) is the preferred calcium replacement.*
- *Calcium gluconate is metabolized by the liver.*
- *If unable to obtain CaCl, low calcium may be treated with calcium gluconate.*

Hypercalcemia
iCa ++ > 5.6 mg/dL or > 1.4 mmol/L
Treatment
Not independently treated in the organ donor. Assess phosphorus level, and treat if indicated. Page 21

Potassium (K+) Goal: 4.0 - 5.0 mmol/L

- Use caution with renal insufficiency (oliguria and/or creatinine > 1.5 mg/dl).
- Recheck potassium level one hour after completion of an intervention.

Hypokalemia
Treat K+ < 4.0 mmol/L **Causes: renal losses, steroid use, prolonged PCN use, diarrhea, prolonged beta agonist use.** **Clinical manifestations: lethal arrhythmias-note flattened t waves and ST segment changes. Especially prevalent with hx of LVH and CHF.** **Note: If magnesium is low, replace Mg+ first.** **If K+ <3.3 stop insulin infusion and stop / avoid dextrose as maintenance fluid.** **See Hypophosphatemia protocol with both Potassium and Phosphorous are low.**

Serum K+	Treatment and Considerations
3.5 to 3.9 mmol/L	• **KCl 20 mEq IV over one hour.**
3.0 to 3.4 mmol/L	• **KCl 40 mEq IV over two hours.** • Monitor for PVCs or ventricular tachycardia. • Stop insulin drip and consider stopping / holding steroid. Consult CLINICAL-AOC. • Assess Mg and treat if less than 2.0 mg/dL.
< 3.0 mmol/L	• **KCl 60 mEq IV over 3 hours.** • Consult CLINICAL-AOC. Stop insulin and hold steroid dose, if not already stopped. • Assess Mg and treat, if less than 2.0 mg/dL.

Hyperkalemia

Treat K+ > 5.0 mmol/L

Serum K+	Treatment and Considerations
5.0 to 6.0 mmol/L	• Consider **Lasix 20mg IVP** unless actively treating volume deficit or hypotension. • **Kayexalate 15-60 grams via NG/OG or rectally.**
> 6.0 mmol/L	• Monitor EKG for peaked T-waves and bradycardia • Repeat K level. Assess for hemolyzed specimen. • **"K Cocktail"** ▪ **1 amp D50% IVP** ▪ **10 units regular insulin IVP** ▪ **1 gram Calcium Chloride IVPB** ▪ **1 amp (50mEq) NaHCO3 (Bicarb)** • Consider **Lasix 20mg IVP** unless actively treating volume deficit or hypotension.
> 6.0 mmol/L and/or no urine output.	• Notify CLINICAL-AOC. • Consider Dialysis.

Magnesium (Mg++) Goal: 2.0 – 2.5 mg/dL

- Use caution with renal insufficiency (oliguria and/or creatinine > 1.5 mg/dL).

Hypomagnesaemia

Treat Mg++ < 2.0 mg/dL

Causes: Acute/chronic diarrhea, DM, diuretic use, nutritional deficiency. **Clinical Manifestation: Torsades de pointes, polymorphic ventricular tachycardia, widened QRS, peaked or inverted T waves.** **Note: Hypokalemia and hypocalcemia will persist if hypomagnesemia is not treated. Hypomagnesemia can cause hypophosphatemia. Replace Calcium first if also below normal.**	
Serum Mg++	**Treatment and Considerations**
1.5 to 2.0 mg/dL	• **2 grams Magnesium IVPB over one hour.** • Monitor EKG, low levels may cause PACs.
< 1.5 mg/dL	• **4 grams Magnesium IVPB over two hours.** • Monitor EKG, low levels may cause PACs.

Hypermagnesaemia
Mg++ > 2.5 mg/dL
Treatment
Not independently treated in the organ donor.

Phosphate (PO4-) Goal: 3.0 – 4.0 mg/dL

Hypophosphatemia
Treat PO4- < 3.0 mg/dL **Causes: Acute/chronic diarrhea, renal loss, diuretic use, nutritional deficiency.** **Clinical Manifestations: reduced cardiac output, hemolysis and oxyhemoglobin dissociation shift.** **Note: Replace calcium prior to phosphorous.**

Serum PO4-	Treatment and Considerations
2.3 to 3.0 mg/dL (Mild)	• **Phosphate 0.16 mmol/kg IVPB over two hours.** • Given as potassium phosphate (KPhos/KPO4-) or sodium phosphate (NaPO4-). • Potassium phosphate (KPhos/ KPO4-) is preferred; if K+ > 4.0 use sodium phosphate (NaPO4-). o Check Na+ and K+ level, and call CLINICAL-AOC if both elevated. • Be aware that 15 mmol of KPO4- gives 22 mEq of K+. • Hypophosphatemia can alter oxygen transport and cause an increased affinity of oxygen for hemoglobin. • Correction of severe hypophosphatemia may increase myocardial contractility up to 20%.
1.6 to 2.2 mg/dL (Moderate)	• **Phosphate 0.32 mmol/kg IVPB over four hours.** • Considerations as noted above.
< 1.5 mg/dl (Severe)	• **Phosphate 0.64 mmol/kg IVPB over four hours.** • Considerations as noted above.

Hyperphosphatemia
PO4- > 5.0 mg/dL
Treatment
Assess Ca++ and treat hypocalcemia, if appropriate. Page 17

Diabetes Insipidus

Definition: An endocrine dysfunction causing polyuria and hypernatremia resulting from insufficient blood levels of antidiuretic hormone (ADH, also known as vasopressin).

Tool: **www.mdcalc.com/free-water-deficit-hypernatremia**

(To calculate free water deficit)

Refer to Page 15 for IVF composition per liter

Diabetes Insipidus	
Symptoms	**Treatment**
• Tachycardia • Hypotension • Polyuria: Urine output > 4 ml/kg/hr for greater than two hours. (Look for dilute / clear urine). • Serum Sodium > 155 mEq/L (Assess if sodium is high r/t prior treatment for elevated ICPs). • Serum osmolality > 310 mmol/L • Urine Osmolality < 300 mmol/kg • Urine Specific Gravity < 1.005 • Hypocalcaemia • Hypophosphatemia • Hypokalemia • Hypomagnesaemia	• **Vasopressin 0.4 to 2.4 units/hr to target fluid management goals (see page 13)** • For Sodium >155 meq/L, start Free Water flushes 300cc per OG/NG every 4 hours. (page 17) • **Calculate free water deficit. .** • **Replace U/O 1:1 +100cc every hour until serum sodium < 150 meq/L** • **Use 0.45 NS / D5 for maintenance / replacement fluid** • **Maintain glucose < 180. Initiate insulin gtt as indicated. (See page 27)** • Maintain electrolytes within suggested limits. *(See Electrolytes pages 16-21).*

Temperature

Goal: Core temperature 35.0 – 36.0 C or 95.0 – 96.0 F

Temperature Interventions	
Hypothermia (< 35.0 C or 95.0 F)	**Hyperthermia (> 36.0 C or 96.0 F)**
• Reassess labs with significant temperature changes. • Apply external warming blankets or heating device. • Increase ventilator temperature. • May decrease GFR (glomerular filtration rate). • May cause bradycardia, wide pH swings, and hyperglycemia.	• Reassess labs with significant temperature changes. • Remove excess blankets or clothing. • Decrease room and ventilator temperature. • Apply external cooling blanket or ice packs. • Actively cool IV fluids. • If temperature remains > 39.0 C or 102.0 F after three hours of cooling, call CLINICAL-AOC • Review antibiotic coverage.

Blood Products and Hematology

Blood Products

Packed Red Blood Cells (PRBCs)

- Use leukocyte depleted blood for all transfusions of PRBCs until CMV status is known.
- If donor is CMV negative, request CMV negative PRBCs, if available.
- After every two units of PRBCs, check ionized calcium and follow the treatment table on page 18.
    - The citrate used as a preservative in PRBCs can bind with Ca++ and cause levels to decrease with repeated blood administration.
- For severe bleeding Clinical Back Up.

Blood Products		
Hematology	**Begin Treatment When:**	**Treatment**
Hemoglobin (Hgb)/ Hematocrit (Hct)	Hgb < 8 gm/dL • *If evidence of bleeding and Hgb drops > 2 gm/dL per hour treat when Hgb < 9.0 gm/dL.*	2 units PRBCs. • *Recheck Hgb/ Hct 1 hour after transfusion completed.*
International Normalized Ratio (INR) **or** **PT**	> 1.5 > 15 seconds	**Give FFP 2 units IVPB** **Vitamin K 10 mg IVPB** • *Infusion rate not to exceed 1mg/min.* • *Reevaluate INR in 4-6 hours.* • *Max dose of 40mg during case.*
Platelets (Plt)	< 60,000 m/uL and signs of bleeding	Transfuse 1 six-pack of platelets. • *Recheck CBC / platelets in 4-6 hours.*
Fibrinogen	< 100 mg/dL	One unit of cryoprecipitate (cryo).

Disseminated Intravascular Coagulopathy

Disseminated Intravascular Coagulopathy (DIC)	
DIC is a serious disorder in which the proteins that control blood clotting become abnormally active.	
Causes	• DIC can result from several clinical conditions including sepsis, severe tissue and head injuries, obstetric emergencies, liver disease, pancreatitis and malignancy.
Clinical Presentation	• Spontaneous bleeding from multiple sites in the body. • Thrombus/emboli including microvascular thrombi in various organs. • Fever. • Signs of adult respiratory distress syndrome (ARDS). • Drop in blood pressure. • Sudden bruising/petechiae
Tests	• Confirmatory tests look for evidence of the simultaneous formation of thrombin and plasmin. • D-dimer- *Elevated* • Fibrin Degradation Products (FDP)- *Elevated* • Partial Thromboplastin Time (PTT)- *Elevated* • International Normalized Ratio (INR)- *Elevated* • Platelet Count (Plt)- *Low* • Fibrinogen- *Low*
Treatment	• Identify and treat the underlying cause. • Maintain hematology within suggested limits. *(See Blood*

	Products and Hematology on page 25)

Insulin Therapy

Blood Glucose (BG) Goal: 80 to 180 mg/dL

Hyperglycemia Treatment
Treat Blood Glucose > 180 mg/dL
• Correct potassium imbalances and start insulin IV drip following hospital's insulin protocol. • If a hospital insulin protocol is unavailable follow the below protocol. • Sampling site and lab analysis should remain consistent. • Arterial sampling is the preferred method for obtaining blood glucose measurements. • BG < 180 mg/dL will stay below the renal threshold for glycosuria thus preventing excessive diuresis. • Do not initiate infusion / stop current infusion if K <3.3 mEq/L and call CLINICAL-AOC.

Initial Regular Insulin Guide		
Baseline BG	**Bolus**	**Initial Infusion Rate**
180 – 200	3 units and	5 units/hour
201 – 250	5 units and	10 units/hour
251 – 300	5 units and	15 units/hour
> 300	10 units and	15 units/hour
Check blood glucose 1 hour after beginning insulin drip and follow the Insulin Titration Guide below.		

Regular Insulin Titration Guide		
Blood Glucose	**Bolus**	**Titration**
< 60	Give ½ amp D50	Stop infusion. Recheck BG in 15 mins.
61 – 79	--	Stop infusion. Check BG in 15 mins.
80-180	Target goal	No intervention.
181 – 200	2 units	Increase by 2 units/hour.
201 – 250	4 units	Increase by 5 units/hour.
251 – 299	5 units	Increase by 5 units/hour.
> 300	5 units	Increase by 5 units/hour.

Clinical Practice Guidelines

Adult Brain Dead Organ Donor >45kg

Check BG 1 hour after each insulin titration.

If no titration is required, check blood glucose every 2 hours.

After stopping infusion, restart insulin drip at ½ the previous rate when first blood glucose level is ≥ 180 mg/dL.

If infusion stopped for persistent hypokalemia, do not start until K >3.4 mEQ/L, and glucose >200mg/dL.

Lung Management

ABG Reference Range	
These do not represent the range of normal values but rather the range of acceptable values for the brain dead donor. Values outside of these ranges should be corrected.*	
ABG	**Acceptable Values**
pH	7.35 – 7.45
PaO2	80 - 100 mmHg w/ FIO2 < 25%
PaCO2	35 – 45 mmHg
HCO3	22 – 26 mEq/L
SPO2	> 92%

Ventilation Targets	
These represent the ventilation targets for lungs to be considered for transplant while on conventional ventilator settings.*	
Measures	**Target**
Tidal Volume (Vt)	6 - 8 ml/kg of IBW
Peak Inspiratory Pressure (PIP)	< 35 cmH2O
Mean Airway Pressure (MAP)	< 15 cmH2O
Plateau Pressure	< 30 cmH2O
Positive End Expiratory Pressure (PEEP)	5 cmH2O when making offers / challenge gas

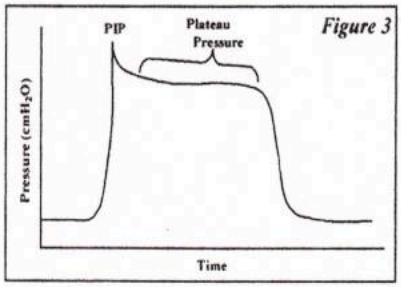
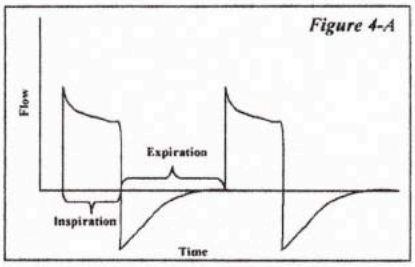
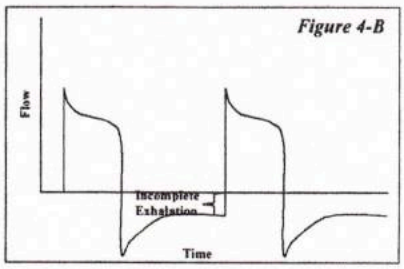
	Consider Optimal PEEP for management
P/F Ratio (PaO2/ FiO2)	≥ 300 while FiO2 100% If 250-300, consider allocation for EVLP. Consult CLINICAL-AOC.
FiO2	Wean as low as 30% for SPO2 92%

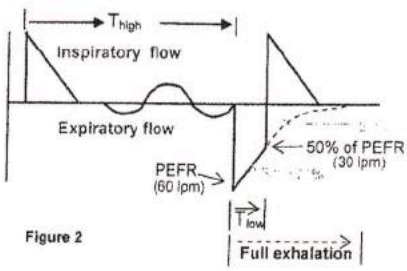
Lung Management

Terminology	
Term	**Description**
Peak Inspiratory Pressure (PIP)	• Maximal pressure generated during the inspiratory phase of the ventilator cycle. • PIP = PEEP + IP or ΔP
Inspiratory Pressure (IP) or ΔP	• Pressure above PEEP generated during the inspiratory phase of the ventilator cycle. • ΔP denotes change in pressure. • IP or ΔP = PIP – PEEP
Tidal Volume (Vt) or ΔV	• The volume of gas delivered during the inspiratory phase of the ventilator cycle. • ΔV denotes change in volume. • Target Vt: 6 - 8 ml per kg of IBW
Minute Ventilation (MV)	• The product of tidal volume times the respiratory frequency. • MV = Vt or ΔV x RR
Plateau Pressure (PP)	• The pressure applied to the small airways and alveoli. • Measured during an inspiratory pause on the ventilator. • Goal PP is < 30 cmH20 to prevent volutrauma. • An increased PIP and peak plateau pressure may indicate increased Vt or decreased pulmonary compliance.
Ideal Body Weight (IBW)	• Estimated weight based on the height of a person with a normal BMI. • To calculate the ideal body weight in kilograms, you can use the following formulas:

	Men: [(height in inches – 60) x 2.3] + 50 Women: [(height in inches – 60) x 2.3] + 45

Lung Management

Ventilator Waveforms		
Waveform	**Figure**	**Description**
Pressure/ Time Waveform		• Perform an inspiratory pause to assess plateau pressure. • Plateau pressure should be < 30 cmH2O.
Flow/ Time Waveform	 	• Monitor the ventilator waveforms to assess expiration. • Not reaching full exhalation leads to air trapping and increases the risk of developing a pneumothorax.

Expiratory Flow Waveform	 Figure 2	• During APRV, adjust T Low to cut off the expiratory flow during a release at about 50% of the peak expiratory flow rate (PERF). • Never allow the termination of expiratory flow to go < 25% of the PERF. This intentional intrinsic PEEP allows P Low to be set at 0 cmH2O without causing de-recruitment.

Lung Protocol

Initial Pulmonary Management	
Intervention	**Rationale**
• Evaluate lungs sounds, SPO2, and current ventilator settings.	• Establish a baseline assessment of the donor.
• STAT ABG on current hospital ventilator settings.	• Evaluate donor's oxygenation status on current hospital ventilator settings to plan for interventions.
• Maintain initial ventilator settings until ABG / CXR resulted. Ensure Vt 6 - 8ml/kg of IBW, and determine Optimal PEEP.	• Wait for ABG results before changing ventilator settings. See Lung Protocol on page 32.
• Early administration of Solumedrol. • *(HLA's should be drawn prior to Solumedrol administration.)*	• Decreases inflammatory process of brain death thus reducing acute lung injury and progressive lung water accumulation.
• Verify adequate ETT cuff pressure (30 cmH2O).	• Prevents aspiration and ventilator associated pneumonia.
• Early bronchoscopy for all potential lung donors and as needed. • May be done ASAP after authorization	• Donor may require a therapeutic bronchoscopy to clear secretions and facilitate lung recruitment. • Obtain sputum culture to assess for appropriate antibiotic coverage. • Decreases the need to break the ventilator circuit after recruitment measures have been

	initiated.

Lung Protocol

P / F Ratio > 300	P / F Ratio <300
• Maintain current ventilator settings. • Optimal PEEP • *Continue with CPT, ARM, and albuterol per GOLM Lung Management Protocol*	• *Optimal PEEP* • *Implement recruitment measures* • *Consider changing mode to Pressure Control 1:1 or inverse ratio (2:1). (Consider decreasing PEEP if inversing)* • *Consider APRV* • *Contact CLINICAL-AOC* • *Assess fluid balance. Target negative / neutral I/O as able* • *Obtain CXR, if not already done.* • If in Pressure Control, monitor Vt as compliance changes and adjust drive pressure to maintain desired Vt.

Pulmonary Management	
Intervention	**Rationale**
• Wean FIO2 < 50% as able while maintaining SPO2 > 92%.	• Prevents nitrogen washout/ oxygen atelectasis.
• Contact CLINICAL-AOC and consider early prone positioning if P/F ratio remains < 300 despite initial pulmonary management.	• Improves ventilation via its effect on pleural pressure and lung compression.

Clinical Practice Guidelines

Adult Brain Dead Organ Donor >45kg

• Maintain closed ventilator circuit, use in-line suctioning and spring loaded aerosol adaptors.	• Prevents losing generated pressure and recruitment.
• Patient must remain on a ventilator for all transports.	• Prevents de-recruitment.
• Use PEEP valve when bagging patient. ○ Set PEEP at 5 cmH2O greater than ventilator's set PEEP or 5 cmH2O less than MAP in APRV.	• Prevents de-recruitment.
• Monitor fluid balance closely: Total IVFs, SVV, PPV, UO, and CVP trends. ○ Hospital's EMR I & O's are the most accurate assessment of the donor's overall fluid balance since admission.	• If there is a positive fluid balance and declining oxygenation a diuretic may be considered. *(See Pulmonary Edema page 41)*
• If a lung donor, the ICU ventilator must be utilized during OR recovery.	• The recovering centers have accepted lungs based on ICU vent settings, anesthesia machines cannot mimic inverse ventilation modes, and the brain dead donor will *not* require anesthetic gases.

Ventilator Modes and Settings

Pressure Control Ventilation (PCV)		
• A pressure limited breath is delivered at a set rate. • Improves the distribution of ventilation in the lung because of its decelerating flow pattern. • Does not guarantee minute ventilation, monitor closely.		
Setting	**Description**	**Precautions**
Positive End-Expiratory Pressure (PEEP)	• The resistance to exhalation. • Prevents progressive atelectasis and intrapulmonary shunting. • Recruits collapsed alveoli and improves V/Q matching.	• Increases intrathoracic pressure. • PEEP > 12 cmH2O in euvolemic donors may lead to decreased CO and BP. o *If hypovolemic, PEEP >5 may cause a decrease in BP.* o *Fluid resuscitate as directed and increase PEEP as tolerated.* • Excessive PEEP may contribute to barotrauma and alveolar rupture.
Respiratory Rate (RR or f)	• Number of set mandatory breaths delivered each minute.	• Adjustments to the RR inversely affect CO2 levels thus influencing pH.
Peak Inspiratory Pressure (PIP)	• Maximal pressure generated during the inspiratory phase of the ventilator cycle to deliver a desired Vt or ΔV. • PIP = PEEP + IP or ΔP	• Avoid PIP > 35 cmH2O. • Closely monitor lung compliance and adjust to maintain desired Vt or ΔV. • Excessive pressures can increase the risk of barotrauma, compromise both ventilation and oxygenation effects, and significantly compromise hemodynamics.

Tidal Volume (Vt)	• Is not independently set in PC mode. • Determined by the set ΔP. • Is dependent in part on compliance of the lung and inspiratory time. • Goal Vt: 6 - 8 ml/kg of IBW	• Requires frequent adjustments to ΔP setting to maintain desired Vt or ΔV. • Calculate the ideal body weight in kilograms. *(See page 29)*
Inspiratory Time (Ti)	• The duration of the inspiratory phase. • Ti adjustments change the I: E ratio. • Increase Ti to inverse the I: E ratio.	• Longer inspiratory times may cause alveolar gas trapping and over distension, monitor closely. *(See Ventilator Waveforms page 26)* • Monitor total PEEP (intrinsic + set PEEP) by performing an expiratory hold.

Ventilator Modes and Settings

Adjusting PCV Settings	
	Adjustment
Respiratory Acidosis	• Increase RR. • Decrease Ti.
Respiratory Alkalosis	• Decrease RR. • Increase Ti if there is a need to increase P/F ratio or MAP.
To improve P/F Ratio (Oxygenation)	• Increase PIP in 2 cmH2O increments to a maximum of 35 cmH2O to obtain desired Vt or ΔV. • Increase PEEP *or* increase Ti to inverse the I: E ratio. • Increase FIO2.

Ventilator Modes and Settings

Airway Pressure Release Ventilation (APRV)

- *Also referred to as bivent, bilevel, biphasic, or extreme inverse ratio pressure control ventilation.*
- A time-triggered, pressure-limited, time-cycled mode of mechanical ventilation.
- Uses a release of airway pressure from an elevated baseline to simulate expiration.
- Advantages of APRV include the ability to increase MAP while lowering the PIP and PEEP as well as a decreased effect on cardio-circulatory function when compared to inverse ratio PCV.
- APRV is a lung protection strategy that limits lung injury associated with mechanical ventilation and helps to decrease lung water, limits shearing and decreases alveolar instability.

Setting	Description	Precautions
P High	• Upper pressure setting used to help generate the Vt or ΔV. • Inflation pressure. • Has a direct effect on oxygenation.	• Closely monitor Vt or ΔV and adjust the P High accordingly. • Monitor hemodynamics closely while making adjustments. • Avoid exceeding 35 cmH2O.
P Low	• Lower pressure setting during the release phase. • Release pressure. • Also known as the PEEP level.	• *Always* set at a pressure of zero.
T High	• The set time interval for P High (the upper pressure phase). • Inflation time. • Allows for sustained lung recruitment.	• Adjustments directly affect the PaCO2 levels. • Shorter T High means more releases per minute, which equates to a higher rate. • Monitor hemodynamics closely while making adjustments.
T Low	• Sets the time interval for P Low (the low pressure phase). • Also known as release time. • Allows for the intermittent release of airway pressure providing CO2 removal. • Set based on the expiratory flow graphics	• See expiratory flow waveform on page 26. • A longer pressure release can cause de-recruitment of unstable alveoli. • Set properly to minimize dangerous levels of auto/intrinsic PEEP.

	viewed on the ventilator. • Set to limit expiratory gas flow from falling to zero thus limiting expiratory de-recruitment.	• A shorter release time may facilitate an early disruption of expiratory flow, inducing air trapping and the development of auto-PEEP. • Monitor total PEEP (intrinsic + set PEEP) by performing an expiratory hold.

Ventilator Modes and Setting

Setting Airway Pressure Release Ventilation (APRV)

1. Set P High using the peak inspiratory pressure (PIP) of the previous PC mode or at the peak plateau pressure (pPlat) of the previous VC mode.
    a. *A plateau pressure is obtained by performing an inspiratory hold.*
    b. *Set to a minimum of 20 cmH2O but avoid exceeding 35 cmH2O.*
    c. *Make adjustments in 2 cmH2O increments to maintain increases in MAP from baseline.*
2. Set P Low to 0.
3. Set T High initially between 4 - 6 seconds.
4. Set T Low initially between 0.5 - 0.8 seconds.
    a. *Set to achieve an expiratory flow rate termination that is 50% of the peak expiratory flow. (See Expiratory Flow Waveform page 26)*
    b. *Consult RT for assistance.*
5. Recheck ABG in 2 hours after initial change and then every 4 hours and make adjustments as needed to obtain optimal oxygenation and a normal pH.

The first ABG in APRV may be worse than baseline. Keep in mind full recruitment may take 4 – 6 hours.

Adjusting APRV Settings	
	Adjustment
Respiratory Acidosis	• Increase P High in 2 cmH2O increments to a maximum of 35 cmH2O. • Decrease T High to increase the release rate. *(May require an increase in P High to maintain increase in MAP).*
Respiratory Alkalosis	• Decrease P High (monitor oxygenation). • Increase T High to decrease the release rate.

To improve P/F Ratio (Oxygenation)	• Increase P High in 2 cmH2O increments to a maximum of 35 cmH2O. • Increase T High. • Decrease T Low to achieve an expiratory flow rate termination that is closer to 75% of the peak expiratory flow. *(See Expiratory Flow Waveform page 26)* • Increase FIO2.

ABG Interpretation

Uncompensated (acute)			
	pH	**PaCO2**	**HCO3**
Respiratory Acidosis	Decreased	Increased	Normal
Respiratory Alkalosis	Increased	Decreased	Normal
Metabolic Acidosis	Decreased	Normal	Decreased
Metabolic Alkalosis	Increased	Normal	Increased

Partially Compensated			
	pH	**PaCO2**	**HCO3**
Respiratory Acidosis	Decreased	Increased	Decreased
Respiratory Alkalosis	Increased	Decreased	Decreased
Metabolic Acidosis	Decreased	Decreased	Decreased
Metabolic Alkalosis	Increased	Increased	Increased

Fully Compensated (chronic)			
	pH	**PaCO2**	**HCO3**
Respiratory Acidosis	Normal	Increased	Increased
Respiratory Alkalosis	Normal	Decreased	Decreased
Metabolic Acidosis	Normal	Decreased	Decreased
Metabolic Alkalosis	Normal	Increased	Increased

Mixed Respiratory/ Metabolic			
	pH	**PaCO2**	**HCO3**

Acidosis	Decreased	Increased	Decreased
Alkalosis	Increased	Decreased	Increased

Abnormal ABG Interventions and Considerations

Abnormal ABG Interventions		
Condition	**Intervention**	**Rationale**
Respiratory Acidosis	• Increase minute ventilation (MV).	• Increasing MV will 'blow off' CO2 thus increasing the pH.
Respiratory Alkalosis	• Decrease minute ventilation (MV).	• Decreasing MV will retain more CO2 thus decreasing the pH.
Metabolic Acidosis	• Increase minute ventilation to target pH of 7.4. • Contact CLINICAL-AOC to assess underlying cause. • Calculate Anion Gap https://www.mdcalc.com/anion-gap • Consider administration of bicarbonate. *(See below)*	• Replaces depleted bicarbonate which will increase the pH.
Metabolic alkalosis	• Decrease minute ventilation to target pH of 7.4 • Contact CLINICAL-AOC to assess underlying cause.	

Considerations
Acidosis: ventilation change is first line for respiratory acidosis and restoring adequate perfusion is first line treatment in metabolic acidosis from hypoperfusion. HCO3 is temporary

solution while correcting the underlying insult. During acidotic states a decrease of CO, decreased perfusion, shift in oxyhemoglobin dissociation curve, and minimized vasoactivity of drugs occurs. Prompt and adequate treatment is necessary.

- If Ph <7.20 and base deficit -5 to -10, or anion gap >10 administer 2 amps HCO3 and repeat dose in 1 hour
- If Ph < 7.20 and base deficit >-10 or anion gap > 15 administer 4 amps HCO3 and repeat does in 1 hour
- If Ph still < 7.30 after HCO3 administration, adequate resuscitation with achievement of most endpoints and respiratory etiology corrected call CLINICAL-AOC.

- If hypercholoridemia metabolic acidosis change maintenance IVF to ½ NS

Acute Lung Conditions and Interventions

Condition	Clinical Presentation	Intervention
Acute Hypoxia	• Rapid drop in SPO2 < 90% or PaO2 < 60 mmHg.	• Increase FIO2. • Assess ventilator settings and tubing. • Auscultate lungs. • Suction. • STAT ABG. • STAT CXR to verify ETT and line placement and check for other lung conditions. • Manually ventilate donor, include PEEP valve. • Evaluate fluid status and hemodynamics.
Pulmonary Edema (non-cardiogenic)	• Decreasing SPO2/PO2. • Rales/ crackles auscultated in lungs. • Hypervolemia/ fluid overload: positive fluid balance, CVP >15.	• STAT CXR to verify diagnosis of pulmonary edema. • Consider administration of a diuretic.
Pneumothorax	• Acute hypoxia. • Decreased or absent breath sounds over the affected area. • Tracheal deviation. • Hypotension • Tachycardia	• STAT CXR. • Consult CLINICAL-AOC and critical care specialist. • If severe, may require placement of a chest tube. • If clinical status is quickly deteriorating, may require immediate needle

	• Subcutaneous emphysema.	decompression.

Atelectasis: Atelectasis is the collapse of the airspaces which also results in the visual impression of increased soft tissue density. This makes it impossible to distinguish infiltrates from Atelectasis on the basis of visual density along. Considering other factors is therefore required. Atelectasis must have volume loss by definition (collapse of airspaces must reduce lung volume), whereas infiltrate does not.

1. In cases with persistent Atelectasis by CXR consider pulmonary recruitment Maneuvers
2. Prevent interruptions in the ventilator circuit with possible.
    a. Pulmonary recruitment maneuver contraindicated perform PEEP maneuver
3. Consider repeat bronchoscopy in cases of segmental Atelectasis.

Pulmonary infiltrates: An infiltrate is the filling of airspaces with fluid (pulmonary edema), inflammatory exudates (white cells or pus, protein and immunological substances), or cells (malignant cells, red cells or hemorrhage) that fill a region of the lung and increase the visual impression of increased soft tissue density.

1. Ensure early bronchoscopy
2. Ensure heated humidification of vent circuit.
3. Ensure ETT cut inflated to 30 cmH20
4. Perform Manual CPT
5. Consider correct ABX coverage
6. Ensure HOB 30-40 degrees
7. Position "good" lung down.

Pleural Effusion: A pleural effusion is an accumulation of fluid between the layers of tissue that line the lungs and chest cavity.

1. If severe consult CLINICAL-AOC, may request chest tube.

Clinical Practice Guidelines

Adult Brain Dead Organ Donor >45kg

Medication Quick Reference	
Drugs or doses may differ from those recommended in other guidelines. Each clinical assessment is unique and dynamic. Consider these guidelines as a reference point only and adjust accordingly.	
Medication	**Adult Dose**
Acetaminophen	650 mg suppository every 4 hours (daily max 3000 mg) for temp > 101.5 F (38 C)
Acyclovir	10 mg/kg IDW, IV Q 8 hours * requires CLINICAL-AOC approval **Requires renal adjustment if CrCl < 50 ml/min*
Albuterol	2.5 - 5 mg every 4 hours via nebulizer or MDI
Amiodarone	Life threatening arrhythmia: 150 mg IV bolus over 10 minutes. Repeat as needed in 10 and 30 min, then 1 mg/min for 6 hours; 0.5 mg/min continuous infusion for 18 hours
Amphoteracin B	Ordered by recovering transplant center
Ampicillin	1 - 2 grams IV Q 4-6 hours. Maximum of 12 grams Q day.
Ampicillin / Sulbactam (Unasyn)	1.5 - 3 grams Q 6 hours IV. Requires renal adjustment if CrCl < 30 ml/min
Argatroban	350 mcg/kg IV over 15 min, prior to cross-clamp • *For HIT and at discretion of recovering surgeons*
Artificial Tears	2 drops per eye every 6 hours
Bumetanide (Bumex)	0.5 - 1 mg IVP
Calcium Chloride	0.5 -1 mg gram IV; 1 gram = 270 mg of elemental Ca++
Calcium Gluconate	1-2 grams IV; 1 gram = 93 mg of elemental Ca++
Cefazolin (Ancef)	80 kg or less: 1 gm Q 8 hours IV 80 to 120 kg: 2 gm Q 8 hours IV >120 kg: 3 gm Q 8 hours IV * *requires renal adjustment if CrCl < 50 ml/min*
Cefepime (Maxipime)	1 - 2 grams every 8 hours IV **requires renal adjustment if CrCl < 60 ml/min*
Cefotaxime (Claforan)	2 grams every 6-8 hours IV. Meningitis: 2 grams Q 4-6 hours **requires renal adjustment if CrCl < 60 ml/min*

Clinical Practice Guidelines

Adult Brain Dead Organ Donor >45kg

Ceftazidime (Fortaz)	2 grams every 8 hours IV **requires renal adjustment for CrCl <50 ml/min*
Ceftriaxone (Rocephin)	1 – 2 grams every 12 - 24 hours IV. Meningitis 2 grams IV Q 12 hours.
Clindamycin (Cleocin)	600 mg every 8 hours IV
Ciprofloxacin (Cipro)	400 mg Q 12 hours. **requires renal adjustment if CrCl < 30 ml/min.*

Medication Quick Reference

Drugs or doses may differ from those recommended in other guidelines. Each clinical assessment is unique and dynamic. Consider these guidelines as a reference point only and adjust accordingly.

Medication	Adult Dose
Cisatracurium	Bolus: 0.15-0.2 mg/kg IVP Continuous IV: 0.5-10 mcg/kg/min
Desmopressin (DDAVP)	2-8mcg/day IV in two divided doses
Diltiazem (Cardizem)	0.25 mg/kg IV bolus(Maximum bolus 25 mg) then 5-15 mg/hr IV
Diphenhydramine	25-50 mg IV Q 6-8 hours
Dobutamine	3 – 20 mcg/kg/min continuous IV infusion ** requires medical director or their designee approval*
Dopamine	3 - 20 mcg/kg/min continuous IV infusion
Epinephrine	2 - 10 mcg/min continuous IV infusion
Erythromycin	500 - 1000 mg IV Q 6 hours
Fluconazole (Diflucan)	200 – 800 mg Q day IV **requires renal adjustment if CrCl < 50 ml/min*
Furosemide (Lasix)	20 – 120 mg IVP
Gentamicin	**Require medical director or their designee approval*
Glucose (D10)	500ml IVP
Glucose 25% (D50)	1 amp (25 grams) IVP
Hydrocortisone (Solu-Cortef)	75 mg/kg IV every 6 hours
Hydralazine	5 - 20 mg IV Q 10 – 15 min (maximum of 20 mg Q 4 – 6 hours)
Insulin-Regular	See Insulin protocol
Ipratroprium	0.5 mg via nebulazation Q 4 hours
Labetolol	10-20 mg IVP Q 20 minutes PRN
Lacrilube	1 application to each lower eyelid Q 12 hours
Levothyroxine (T4)	20 mcg IVP bolus, then 10 - 30 mcg/hour continuous IV infusion
Lidocaine	1 mg/kg IVP; then 1-4 mg/min continuous IV infusion

Magnesium Sulfate	1- 2 grams IV
Mannitol	25 – 100 grams IV
Methylprednisolone (Solu-Medrol)	250 mg IV push initial bolus, followed by 50 mg/hr continuous infusion of 1000 mg / 250cc NS (25 cc/hr).

Medication Quick Reference

Drugs or doses may differ from those recommended in other guidelines. Each clinical assessment is unique and dynamic. Consider these guidelines as a reference point only and adjust accordingly.

Medication	Adult Dose
Metronidazole (Flagyl)	500 mg IV Q 6-8 hours **requires renal adjustment if creatinine clearance less than 10 ml/min*
Milrinone	50 mcg/kg IV over 10 min, then 0.375 – 0.75 mcg/kg /min **Requires medical director or their designee approval*
Naloxone (Narcan)	8 mg IVP x 1. **Follow dose immediately with paralytic*
Nicardipine (Cardene)	5 - 15 mg/hr continuous IV infusion until target MAP is reached
Nipride (Nitroprusside)	0.3 - 10 mcg/kg/min continuous IV infusion
Norepinephrine (Levophed)	1 – 30 mcg/min continuous IV infusion
Pancuronium Bromide	1 – 3 mg/kg IVP Q 1 – 3 hours PRN
Phenylephrine (Neo-Synephrine)	40 – 200 mcg/min continuous IV infusion
Phytonadone (Vitamin K)	1-10 mg/dose x 1 **Requires medical director or their designee approval*
Piperacillin / Tazobactam (Zosyn)	3.375 grams Q 6 hours. For HAP / VAP: 4.5 grams IV Q 6 hours. HAP/VAP and renal impairment: CrCL 20-40: 3.375 grams q6hr CrCl <20 2.25 grams q8 hrs Hemodialysis: 2.25 grams q8hrs Peritoneal Dialysis: 2.25 grams q 8hrs Other indications and renal impairment: CrCl 20-40 2.25 grams q 6 hours CrCl <20 2.25 grams q8 hours HD: 2.25 grams q12 hours PD: 2.25 grams q 12 hours
Potassium Acetate	20 – 60 mEq IV
Potassium Chloride (KCl)	20 – 60 mEq IV
Potassium Phosphate	15 – 30 mmol IV
Rocuronium (Zeruron)	0.6 – 1.2 mg/kg IV push

Clinical Practice Guidelines

Adult Brain Dead Organ Donor >45kg

3% Sodium Chloride	40 ml / hour for 3 hours
Sodium Bicarbonate (NaHCO3)	1 amp (50 mEq) IVP PRN (1 mEq = 84 mg); Consult medical director or their designee regarding continuous IV infusion dosing
Sulfamethoxazole / TMP (Bactrim)	10-20 mg TMP/kg/day Q 6-12 hours **required renal adjustment if CrCl < 30 ml/min*
Tobramycin	**Requires medical director or their designee approval*
Vancomycin	15 - 20 mg/kg IV every 6 - 12 hours , pharmacy to dose **requires medical director or their designee approval*
Vasopressin	0.5 – 2.4 units/hr continuous IV infusion (0.008 – 0.04 units/min)

References

Gift of Life Adult Donor Management Guidelines, Revision 11. Effective 8/15/2016.

Lifebanc Standing Orders CL-8.0 v.3, Revision Date 4/7/11

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