Kidney Transplant Recipient Protocol – Cadaveric and Living Donor

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Pre-Transplant CPC Visit	○ Review orders ○ Review consent ○ Perform medication reconciliation ○ Perform JCHAO RN history ○ Identify dialysis history ○ Perform history and physical ○ Summarize cardiac history and testing ○ Consult with anesthesiologist
Beta Blockers and Antihypertensive Therapy	Refer to surgical team or transplant nephrology for medication adjustments if: • Patient has severe uncontrolled hypertension (SBP>180) • Patient has relative hypotension (SBP<110) on anti-hypertensive therapy • Patient is on Coreg • Patient has cardiovascular indications for beta blockers and needs initiation of beta blocker therapy. Patients on beta blockers and vasodilators for systolic and diastolic heart failure should be referred to their managing cardiologist with a request for medication adjustments if blood pressure or HR are outside of goal ranges.
Preoperative Setup	○ Standard airway equipment and monitors ○ Central line kit – available ○ Arterial line kit ○ Vigileo transducer, monitor, and cables ○ CVP transducer with cables – available ○ IV pumps ○ Fluid Warmer with 2nd IV set up ○ Filter for thymo (available from pharmacy)
Additional Drugs to have Available	○ **SQ Heparin** ○ **Antibiotic** ○ **Lasix** ○ **Solumedrol** ○ **Induction Immunosuppressant:** Thymoglobulin, basiliximab (Simulect), or alemtuzumab (Campath) (as ordered by transplant surgery). If using thymo peripherally, make sure the surgery team has ordered the dilute concentration (mixed in 500mL instead of 250mL.) ○ **Heparin** (if surgeon requests prior to arterial clamping; ~3000 units) ○ **Sugammadex**1-4 ○ **Dopamine infusion** (discuss with surgeon and consider whether appropriate. Will be provider dependent.)
Preoperative Tasks	○ Interview and examine the patient ○ Review Epic for records. ○ Determine recent dialysis history. ○ Review day-of-surgery labs (Renal panel with particular attention to the potassium and serum bicarb; CBC; ABG if done. This is especially important on preemptive, non-dialyzed patients.) If a living donor kidney recipient was seen in CPC, the renal panel and VBG potassium should already be ordered.

	○ **Determine the need for preoperative dialysis. This should be done the evening prior to the OR if possible. If you feel a patient should be dialyzed and it has not occurred, please discuss this with the attending surgeon ASAP.** ○ Ensure patient has an active type and screen ○ For diabetics, check baseline glucose level, disconnect insulin pump if present, and note the last insulin type and dose given. ○ Obtain consent for TAP block in case surgeon does not place OnQ and you feel that your patient would benefit from a block. [5-8] ○ Order multimodal analgesia, as appropriate ○ Ensure that SDS RN gave the premeds (typically acetaminophen, diphenhydramine, an immunosuppressant, multimodal analgesia, and SQH.) If there are questions regarding medications, discuss them with the transplant fellow. The attending surgeon or transplant pharmacist are additional resources. (Transplant Pharmacist: Nicholas Parrish, office 584-8557, pager 585-9924 ext. 2365 [8:30-1700 M-F]. The after-hours clinical pharmacist on call is available at (513) 343-5412.
Fluids	**Default fluid should be Normosol or Plasmalyte** - higher incidence of hyperkalemia, acidosis, and need for dialysis when normal saline is used.[9-13] - no added benefit to albumin[14-15] For patients with severe hyponatremia, consider having pharmacy compound the following fluid: ½ NS + 1 Amp NaHCO3/L (50 meq/L) {[Na] = 127 meq/L} For patients with hyperkalemia, consider having pharmacy compound the following fluid: ¼ NS + 2 Amps NaHCO3/L (50 meq/L) {[Na] = 138.5 meq/L}
IV Access	○ Adequate PIVs (at least two) ○ CVC if indicated due to patient's comorbidities or limited venous access - Surgeons are ok with not having a central line in every patient, but this is provider dependent. - If you anticipate that the patient will be on multiple drips, please place a central line. - It is ok to give thymoglobulin through a PIV,[16,17] but it needs a dedicated line and must be given through a filter. **If you are giving thymo peripherally, pharmacy has a more dilute concentration that is mixed in 500mL instead of 250mL; it also contains heparin and hydrocortisone to prevent thrombophlebitis.** - If a CVC line is needed and placing it above the diaphragm is not possible, discuss the use of a femoral CVC on the opposite side from the surgical approach (kidney is usually placed on the right - Discuss with surgeon.)

	- If unable to obtain IV access, dialysis catheter could be used if no other option (discuss with surgeon). **YOU MUST WITHDRAW INDWELLING HEPARIN (the amount is printed on the catheter lumens).**
Monitors	o Place arterial line. o Use Vigileo to monitor cardiac output (CO), cardiac index (CI), stroke volume (SV), and stroke volume variation (SVV). Chart values every 15 minutes in the anesthesia record.[18-20] o If using a central line, consider monitoring CVP. - No consistent demonstrated benefit to improved outcomes[21-5] o Additional option is to ask the surgeon to palpate the vein to assess volume status.
Intraoperative Tasks	
Time Out #1	o ABO Timeout – On arrival to the room by OR RN **prior to induction**
Induction	o Induction and Airway as clinically indicated - Consider RSI, remembering that diabetes is a common cause of ESRD and may cause gastroparesis. Succinylcholine is ok to use if clinically appropriate; keep in mind that the potassium will rise by ~0.5mEq/L. - Instead of cisatracurium, consider using rocuronium or vecuronium given the ability to reverse with sugammadex at the end of the case. The onset of action of sugammadex may be delayed in ESRD and the clearance of the sugammadex-paralytic complex may be delayed.[1-4] The package insert does not recommend use below a CrCl of 30ml/min, but there are articles reporting safe usage in ESRD and case reports using it in pediatric kidney transplants. - There is minimal surgical stimulation after the fascia is opened. Because of this, some high volume kidney transplant centers recommend back loading narcotics toward the end of the case to minimize hypotension.
Time Out #2	o During "Time Out" ensure that appropriate interventions have been performed or discussed: ABO, UNOS number (nursing), antibiotics, immunosuppressants, premedications, SQH, pressor/dopamine plans, fluid goals (CVP, MAP, SVV, CI), any patient specific concerns, and which ICU will be the postop destination. Kidney transplant recipients rarely require transfusion and it should always be discussed with the surgeon.

Intraop Management	Initiate appropriate infusions: o Solumedrol – immediately after induction o Send baseline ABG to assess acid base status o Thymoglobulin, basiliximab(Simulect), or alemtuzumab (Campath) 30-60 minutes after solumedrol (based on surgeon preference.) Thymo should be given through a **filter and on a pump** (regardless of central or peripheral administration). - Give thymoglobulin over 24 hrs. If SBP falls < 110 discuss pausing or reducing the infusion rate with the surgeon. Monitor labs: ABG Plus, others as appropriate. o **DO NOT** automatically chase the base deficit with fluid. (These patients often have a metabolic or hyperchloremic metabolic acidosis — bicarb may be a better answer.) Optimize Hemodynamics and Intravascular Volume Status: o Goal SBP within 20% of CPC BP (discuss with surgeon.) o Adequate preload with care to avoid hypervolemia. If monitoring CVP, goal should be ~10-12mmHg, per surgeon request. - No good evidence to support specific CVP goals. CVP monitoring unreliable.[21-25] o Utilize Vigileo to ensure adequate CI >2.2 and SVV<13%. o Give 1-2 liters of warmed fluid prior to insertion of new kidney, with total volume in the range of 2-3L for the case. - NaHCO3 and Calcium can be helpful in treating hypotension based on patient's lab values - Consider vasopressin for refractory hypotension if patient took ACE inhibitor or ARB on day of surgery. If you need an infusion, start vaso at 0.03 units/min. - Phenylephrine, ephedrine, or levo may be appropriate if CVP and SVV suggest adequate preload. (Vasodilation can occur with thymoglobulin.) **Communicate with the surgeon if you have ongoing hypotension and discuss the management plan.** o Start dopamine infusion if requested by surgeon and if clinically appropriate. - No good evidence to support renal dose dopamine and not being used frequently[26-28] - Use cautiously in patients with CAD to avoid tachycardia o May be period of minimal stimulation in living donor recipients while waiting for the donor organ to be brought into the room o Surgeon may request IV heparin (~3000 units) in certain clinical scenarios prior to arterial clamping. o From the time the surgeon starts sewing in the kidney, it will be ~20-30 minutes until reperfusion - Utilize this time to optimize the blood pressure. - The surgeons would like a SBP>~120 when the cross clamp is released. - Dr. Woodle prefers to follow the SBP because of the limited diastolic blood flow when the kidney is congested (high venous pressure).

Reperfusion	Administer Lasix ~100 mg IV when appropriate (check dose and timing with surgeon). - Usually there is minimal change in hemodynamics, but you may see a drop in BP. Occasionally, patients may have a dive reflex and develop brief bradycardia.
After Foley clamp released	o Empty the initial collection. (This is saline placed at the beginning of the operation to distend the bladder.) o Monitor UOP frequently.
Emergence	o **MAINTAIN PARALYSIS UNTIL FASCIA IS CLOSED.** - There is a high risk of vascular injury if the patient coughs prior to fascial closure. o Opioid and non-opioid analgesics as appropriate. o Anti-emetics as clinically indicated. o Unilateral TAP block vs On Q, as indicated o Attempt reversal with standard drugs first. If rocuronium or vecuronium was used and your reversal with neostigmine is insufficient or impossible, consider reversal with Sugammadex. o Extubation as clinically appropriate (based on standard criteria, fluid status, acidosis, etc.)
Postoperative Tasks	o Transfer to appropriate ICU - Most patients will go to the SICU, but if they have significant cardiac disease, the patient may go to the CVICU. o Give report to RN and ICU team. o Check "Follow Up Needed" in Epic Postop Tab

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