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Important Contacts

Virtual Transplant p8767
Fresh Kidney p5969 Covered by APP or attending in the immediate postop period
Kidney Group Pager 11520

Providers (Kidney team in Red)

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Transplant Pharmacists

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Procurement Coordinator

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Post transplant Clinic Appts: 2-6867
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Living Donor Transplant Coordinators

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Roseann Sweda	p7655	(O)2-6820

Transplant Abbreviations

ABO = blood type	EBV = Epstein Barr virus	LFT = liver function tests
ACR = acute cellular rejection	ESRD = end stage renal disease	MFI = mean florescence intensity
ACE-I = angiotensin converting enzyme inhibitor	EVR = everolimus	MMF = mycophenolate mofetil
AKI = acute kidney injury	FCXM = flow cytometric cross match	MPA = mycophenolic acid
ANC = absolute neutrophil count	FFP = fresh frozen plasma	POD = post-operative day
AMR = antibody-mediated rejection	FK506 = tacrolimus/Prograf	PRA = panel reactive antibody
ARB = angiotensin receptor blocker	FSGS = focal segmental glomerulosclerosis	r-ATG = Thymoglobulin
ATN = acute tubular necrosis	GFR = glomerular filtration rate	RBC = red blood cell
B2M = beta-2 microglobulin	HD = hemodialysis	RRT = renal replacement therapy
BK = BK polyomavirus	HCT = hematocrit	SCr = serum creatinine
CKD = chronic kidney disease	HGB = hemoglobin	TAC = tacrolimus, FK506
CBC = complete blood count	HLA = human leukocyte antigen	TDM = therapeutic drug monitoring
CMV = cytomegalovirus	HLA = human leukocyte antigen	TPE = therapeutic plasma exchange
CNI = calcineurin inhibitor	HTN = hypertension	UTI = urinary tract infection
CrCl = creatinine clearance	IBW = ideal body weight	
CSA = cyclosporine	IVIG = intravenous immunoglobulin	
DCD = donation after cardiac death	KDPI = kidney donor profile index	
DSA = donor specific antibody	KTR/RTX = kidney transplant recipient	

Inclusion/Exclusion Criteria for Kidney Transplant

Inclusion Criteria:

- End stage renal disease requiring dialysis
- Creatinine clearance < 20cc/min not requiring dialysis

Exclusion Criteria:

ABSOLUTE CONTRAINDICATIONS
☐ Malignancy likely to significantly limit expected patient or graft survival after surgery.
☐ Known active infection or chronic infection not optimally controlled.
☐ Significant psychosocial problems or psychiatric illness that would affect the patient's ability to comply with a complex medical regimen, including but not limited to: • Issues that cannot be managed sufficiently to allow safe post-transplant care of the patient or graft • Inadequate social, housing, or environmental supports • No means of reliable transport
☐ Current drug or alcohol abuse (within 6 months).
☐ Known history of non-adherence to medical regimen or noncompliance with medical care within the last 6 months.
☐ Medical condition or combination of medical conditions deemed likely to significantly limit expected patient or graft survival after surgery or pose excessive intraoperative risk.
☐ Progression of preexisting medical conditions or combination of medical conditions (including frailty) likely to significantly limit expected patient or graft survival after surgery or pose excessive intraoperative risk.
☐ Tobacco use in all forms in association with either diabetes or other significant cardiovascular risks likely to significantly limit expected patient or graft survival after surgery.
☐ Lost to follow up as per UCM protocol.
☐ Inability to effectively collaborate with the transplant team, including inappropriate interaction with team members.
RELATIVE CONTRAINDICATIONS
☐ Active Lupus or autoimmune disease.
☐ Known chronic or active infection not optimally controlled.
☐ Morbid obesity with BMI greater than 39 dependent on body habitus..
☐ Significant aortoiliac disease.
☐ Frailty and gait instability.
☐ Inability to acquire anticipated post-transplant medications, including but not limited to immunosuppressive medications, due to insufficient financial support.

Inclusion/Exclusion Criteria for Pancreas Transplant

Inclusion Criteria:

- DM requiring insulin therapy or have pancreatic deficiency AND
- Evidence of progressive end organ damage from DM: neuropathy, retinopathy, hypoglycemic unawareness AND
- Adequate renal function with Creatinine Clearance greater than 60 cc/min for pancreas transplant alone and 40 cc/min for pancreas transplant after kidney

Exclusion Criteria:

ABSOLUTE CONTRAINDICATIONS
☐ Malignancy likely to significantly limit expected patient or graft survival after surgery.
☐ Known active infection or chronic infection not optimally controlled.
☐ Significant psychosocial problems or psychiatric illness that would affect the patient's ability to comply with a complex medical regimen, including but not limited to: • Issues that cannot be managed sufficiently to allow safe post-transplant care of the patient or graft • Inadequate social, housing, or environmental supports • No means of reliable transport
☐ Current drug or alcohol abuse (within 6 months).
☐ Known history of non-adherence to medical regimen or noncompliance with medical care within the last 6 months.
☐ Any current form of tobacco use.
☐ Medical condition or combination of medical conditions deemed likely to significantly limit expected patient or graft survival after surgery or pose excessive intraoperative risk.
☐ Progression of preexisting medical conditions or combination of medical conditions (including frailty) likely to significantly limit expected patient or graft survival after surgery or pose excessive intraoperative risk.
☐ Significant aortoiliac disease.
☐ Lost to follow up as per UCM protocol.
☐ C –peptide greater than 2ng/ml with a BMI above 30.
☐ Inability to effectively collaborate with the transplant team, including inappropriate interaction with team members.
RELATIVE CONTRAINDICATIONS
☐ Active Lupus or autoimmune disease
☐ Known chronic or active infection not optimally controlled
☐ BMI over 30 with a C –peptide under 2ng/ml
☐ Age greater than 55
☐ Inability to acquire anticipated post-transplant medications, including but not limited to immunosuppressive medications, due to insufficient financial support.
☐ Insulin dose greater than 50 units/day.
☐ Frailty and gait instability

Steps for admitting a patient for transplant

1. You will receive a page from the transplant coordinator to notify you of transplant. If liver or pancreas, coordinator will ask you to place an RFA(request for admission). To do this, go to orders only on the EPIC toolbar>enter MRN>enter RFA. If it is a kidney transplant, the coordinator will place the RFA.
2. The nurse coordinator will provide you with recipient information, ETA, OR time and if the donor is high risk. If they do not give you this information, ask. You will need to know if high risk for consenting purposes.
3. Transplant patients should be admitted to 3W, 2nd choice is 3C, and last resort in preop.
4. Once the patient arrives, place admit orders with the following order sets:
    a. 2096 Liver Transplant Recipient Admission..
    b. 2101 Kidney Transplant Recipient Admission.
    c. 2102 Kidney/Pancreas Transplant Recipient Admission.
    d. If Panc alone use 2102
5. Priority is getting labs drawn first before heading to CXR. You may need to escort the patient to and from radiology if in a time crunch. EKG done while waiting for phlebotomy.
6. If patient is a liver transplant, you will need to obtain VRE rectal swab
7. Complete transplant specific H&P using the transplant template. To access this you must be logged into PVD transplant. See next page for H&P PEARLS
8. Consent the patient. Transplant specific consents must be printed off of EPIC so the most up to date data is represented. To do this, go to EPIC tool bar>UCMC Tools>TR consent and protocol>print off 'Consent for Organ Transplant Surgery' Make sure blood consent box is checked. If donor is high risk, click the check box and ensure they initial it. If it is not high risk, cross the box off. Make sure the patient AND providers have signed, printed, dated and timed. Stickers must be on all pages of the consent.
9. Mark the patient.
10. **Follow-up all admission workup. Look at your labs, EKG, and CXR. If you have any concerns that could preclude transplant (eg severe hyponatremia, hyperkalemia, leukocytosis, arrhythmias), notify attending immediately so can be addressed or organs can be reallocated.**
11. Kidney transplants will normally go back to the floor after OR. Notify floor charge nurse so they can staff appropriately. Liver and kidney/pancs will need a transfer order for an ICU bed postop.
12. Place preop orders. Order like you normally do through the preop order reconciliation. I recommend doing this after labs are drawn and sent as to not accidently discontinue them.
    a. Use preop order set 5083 'Abdominal Transplant Preop Order Set'
    b. First part is standard preop orders
    c. Kidneys, kidney/pancs, pancs get preop HSQ
    d. Liver transplants do not get preop HSQ 2/2 coagulopathy, thrombocytopenia
    e. This is where you will choose antibiotics and immunosuppression
        i. Liver transplant-Zosyn is preferred abx. Click Zosyn and Fluconazole. If PCN allergic, Cipro+Flagyl+Vanco+Fluc. Click Solu-medrol 500mg.
        ii. Kidney Transplant-Ancef is preferred abx. Click ancef appropriate for weight. If PCN allergic, cipro+clinda. Click Solu-medrol 500mg. Then you must choose between Thymoglobulin OR Basiliximab(Simulect) induction. Ask the attending which they want. If Simulect, click Simulect 20mg. If thymo, click thymo. Calculate IBW and ABW. Then dose 1.5mg/kg IBW, rounded to the nearest 25mg. IF large discrepancy between IBW and ABW split the difference in dosing, not to exceed 150mg. Mix in 500cc bag for OR dose. If you are unsure, ask the transplant pharmacist for assistance.

iii. Kidney/Panc-Rocephin is preferred abx. Click Rocephin dose appropriate for weight. If PCN allergic, clinda+cipro. Click Solu-medrol 500mg. Then you must choose between Thymoglobulin OR Basiliximab(Simulect) induction. Ask the attending which they want. If Simulect, click Simulect 20mg. If thymo, click thymo. Calculate IBW and ABW. Then dose 1.5mg/kg IBW, rounded to the nearest 25mg. IF large discrepancy between IBW and ABW split the difference in dosing, not to exceed 150mg. Mix in 500cc bag for OR dose. If you are unsure, ask the transplant pharmacist for assistance.

Transplant H&P PEARLS

Prior to Transplant

- Recent hospitalizations or infections
- Recently diagnosed cancer
- Previous transplant>When, why was graft lost?
- Urine output prior to transplant
- Is intraop CVVH necessary? If so, page on call nephrology.

Common Order Sets

2101 Kidney Transplant Admit for Transplant
2104 Kidney Transplant Postop Orders
2096 Liver Transplant Admit for Transplant
2533 Liver Transplant Postop Orders
2102 Kidney/Pancreas Transplant Admit for Transplant
2116 Kidney/Pancreas Transplant Postop Orders
5083 Abdominal Transplant Preop Order Set(Includes immunosuppression and abx)
6758 Acute Liver Failure Protocol

Initial Immunosuppression

Immunosuppression for Adult Kidney Transplant Recipients					
		INDUCTION-CHOOSE ONE			
POD	**Steroids**	**Simulect (basiliximab)**	**Thymoglobulin (r-ATG)**	**Cellcept (MMF)**	**Prograf (tacrolimus immed. release)**
0	Methylprednisolone 500 mg IVPB x1 intra-op	20 mg IV x1 *Give in OR at beginning of case *No premeds needed *Infuse over 30 mins through central or peripheral line	1.5 mg/kg IV *Confirm preferred dosing weight with attending—IBW vs ABW (round to 25 mg) (max 150 mg) *Give in OR, at beginning of case *Recommend mixing first dose in 500 mL so can run either central or peripheral	Start following case completion: 1000 mg PO q12h (09:00/ 21:00) Conversion: IV:PO 1:1	Typically start POD1, initial dose depends on patient (06:00/18:00) Goal Trough: 8-10 ng/mL Conversion: SL:PO 1:1 *Avoid IV tacrolimus unless approved by transplant attending*
1	Methylprednisolone 200 mg IVPB		Assess CBC first! 1.5 mg/kg IV (round to 25 mg) (max 150 mg)		
2	Methylprednisolone 160 mg IVPB		Assess CBC first! 1.5 mg/kg IV (round to 25 mg) (max 150 mg)		
3	Methylprednisolone 125 mg IVP		Assess CBC first! 1.5 mg/kg IV (round to 25 mg) (max 150 mg)		
4	Prednisone 80 mg PO	20 mg IV x1			
5	Prednisone 40 mg PO				
6 and on	Prednisone 20 mg PO daily *Tapered to 5 mg/day over next several weeks*				

Thymoglobulin (r-ATG) Dosing Instructions			
FULL DOSE = 1.5 mg/kg IBW (round to 25 mg) (max 150 mg) *For mild infusion-related reactions, slow the infusion rate and consider repeating premeds. If concern for severe reaction-stop infusion and page 8767*	**Thymoglobulin Administration:**		
	- Premedicate doses with scheduled steroid (or at least methylprednisolone 40 mg IV), acetaminophen 650 mg PO, and diphenhydramine 25-50 mg IV/PO 30-60 minutes before starting Thymo infusion - Infuse over 6 hours through a central line using a 0.22-micron filter (max concentration 0.5 mg/mL) **- If only peripheral access, infuse over 12 hours (max concentration 0.25 mg/mL)**		
	Thymoglobulin Dose Adjustments:		
	If WBC 2,000 – 3,000	and/or platelets 50,000 – 75,000	→ consider decreasing dose by 50%
	If WBC < 2,000	and/or platelets < 50,000	→ consider holding dose

Routine Prophylaxis

Routine Prophylactic Medications for Kidney Transplant Recipients			
Indication	**Population**	**Medication & Dose (see below for renal dose adjustments)**	**Duration**
Peri-operative	All patients	Cefazolin 1-2 g IV every 8 hours (wt <60 kg=1 g, wt≥60 kg=2 g)	1st dose 60 min prior to incision through 24 hours post-op x 24 hours
	Alternative if severe B-lactam allergy *If rash w/o other systemic issues or mild B-lactam intolerance, encourage cefazolin	Clindamycin 600 mg IV every 8 hours **AND** Ciprofloxacin 400 mg IV every 12 hours	
Fungal (thrush)	All patients	Fluconazole 100 mg PO daily	1 month
PJP	Preferred (PJP and UTI protection)	Sulfamethoxazole/trimethoprim 400/80 mg 1 tab PO daily for 6 months then 1 tab PO three times weekly thereafter	Lifelong
	If sulfa allergic and NOT G6PD deficient	Dapsone 100 mg PO daily	6 months
	If sulfa allergic and G6PD deficient	Atovaquone 1500 mg PO daily OR Pentamidine 300 mg inhalation once monthly	
Viral	CMV High Risk (D+/R-)	Valganciclovir 900 mg PO daily	6 months
	CMV Mod Risk (R+)	Valganciclovir 900 mg PO daily	3 months
	CMV Low Risk (D-/R-)	Acyclovir 400 mg PO twice daily	3 months

Renal Dosing

Renal Dosing for Prophylactic Medications
(Notes: Renal function is often dynamic post-transplant and alternative estimates to CrCl may be needed,
monitor dialysis schedule as often for cause rather than scheduled)

Cefazolin (peri-op)	
CrCl (mL/min)	**Dose**
10-29	Redose x 1 at 12 hours
<10 or HD	No need to redose pending dialysis needs

Ciprofloxacin (peri-op)	
CrCl (mL/min)	**Dose**
<30	No need to redose pending dialysis needs

Fluconazole	
CrCl (mL/min)	**Dose**
<15 or HD	100 mg PO three times weekly (after HD)

Valganciclovir	
CrCl (mL/min)	**Dose**
≥ 60	900 mg daily
40 – 59	450 mg daily
25 – 39	450 mg q48 hours (may opt for three times weekly for med adherence)
10 – 24	450 mg twice weekly
< 10 or HD	100 mg three times weekly after HD (use solution)
CRRT	Use IV ganciclovir *contact clinical pharmacist for dosing*

Acyclovir	
CrCl (mL/min)	**Dose**
<15 or HD	400 mg daily (after HD)

Sulfamethoxazole/Trimethoprim 400/80 mg	
CrCl (mL/min)	**Dose**
<15 or HD	1 tab three times weekly (after HD)

Dapsone	
CrCl (mL/min)	**Dose**
<15 or HD	50 mg daily (after HD)

Other Routine Medications	
GI Prophylaxis	Famotidine 20 mg PO twice daily If on PPI prior to transplant: Pantoprazole 40 mg PO once daily, can resume PTA PPI on discharge
Bowel Regimen	Docusate 100 mg PO twice daily
DVT Prophylaxis	Heparin 5000 units subcutaneously every 8 hours

Post transplant Care Pathway

Post operative Inpatient Management					
	Day 0	**Day 1**	**Day 2**	**Day 3**	**Day 4**
Standing Weight	Daily	Daily	Daily	Daily	Daily
Vital Signs	q15 min x4. Then q30min x2. Then q1Hx12H. Then q2H x4H	Q4H^{+} *More frequent during Thymo admin	Q4H^{+}	Q4H^{+}	Q4H^{+}
Intake/Output	Q1H	Q4H	Q4H	Q4H	Q4H
Urine Replacements	Q1H	Q1H if clinical status warrants vs stopping	-	-	-
CVP	Q2H	Q4H	-	-	-
CBC, BMP, Mag, Phos	On arrival	Daily while on the floor			
Tacrolimus trough	-	Daily once started			
CXR	Upon arrival to PACU/SICU/Floor if central line placed intraoperatively				
Analgesics	IV	IV/PO	PO	PO	PO
Fluid management	Maintenance IVF@100mL/hr Replacements	Consider stopping replacements	IVF vs diuresis	Consider diuresis	Consider diuresis
Thrombosis prophylaxis	HSQ+SCDs + Mobilize OOB to chair	HSQ+SCDs + Mobilize OOB to chair+Ambulate in hallway			
Deline				Consider Foley removal	Consider Foley removal DC TLC after last dose of Thymo
JP management					Consider removing JPs
Diet	NPO except meds	Clears	ADAT		
Pharmacy	Assist with coordination of intra-operative medications, review initial post-op orders	Medication history, documentation of initial post-transplant note, order	Coordinate any prior authorizations needed, collaborate with transplant	Prompt medications for delivery Discharge medication reconciliation, discharge medication teaching, documentation of discharge teaching	

		meds for discharge	SW regarding patient assistance PRN	
Social Work	Social work initial visit/note to address coping, support plan, insurance	Collaborate with pharmacist regarding medications, anticipated cost/copay, assistance programs	Follow up on any issues as needed	SW discharge visit/note to address discharge plan, caregiver plan, transportation, clinic follow up, patient education, insurance/income, letter to donor family (if applicable), handouts and contact info provided
Nutrition	Nutrition history and initial note	Check on PO intake/nutrition status and start diet education	Complete full diet education	Touch base on any nutrition-related questions prior to discharge
Nurse Coordinator		Drop off handbook	Initiate teaching	Complete discharge education
Dispo Planning	Daily on rounds—including pharmacy, nutrition, social work, case management, and nursing Goal for discharge postoperative Day 3 or 4			

Kidney Transplant Contact Information		
Transplant Surgery p8767	Transplant Pharmacist: Brenna Kane p8807	Pre-kidney nurse on call p7657
Fresh Kidney Transplant p5969	Transplant Dietitian: Lauren Remley p8950	Post-kidney nurse 2-6338 (answering service)
Transplant Nephrology p6310	Transplant Social Workers: Katie Dowling p7333 Laura Holzinger p6611	CCD 3W unit 6-0392
Post-transplant RN office 2-6820		CCD 3E unit 6-0396
Post-transplant nurse fax 4-3745		Transplant case manager: p4080
UChicago Medicine; Revised 3/1/2018		

Kidney/Pancreas Transplant Clinical Pearls for Early Inpatient Management

- No PICCs in post kidney transplant patients without clearing with attending. May need veins for future access.
- Judicious use of blood transfusions in kidney transplants patients, especially in highly sensitized patients. Always verify with attending prior to transfusion.
- Consider darbepoetin for anemia in the early postop period.
- Foley usually stays until POD#3 or 4 depending on bladder wall. Ask surgery attending prior to removal.
- JP drains stay until at least after Foley removed.
- Central line stays in place until Thymo induction is completed.
- Permissive hypertension, usually up to SBP 180 in the POD #0-1 period. Then slowly start to add back on antihypertensives. Avoid hypotension.
- Do not use Kayexalate POD 0-1 for hyperkalemia 2/2 high risk of colonic perf
- If diabetic, especially insulin dependent, prior to transplant consult endocrine early, as their requirements will be different 2/2 steroids and functioning organs.
- Transplant is NOT under SCIP criteria.
- Daily weights are to be done on all transplant patients. Should ideally be done on standing scale.
- Change dressings POD#2, unless soiled.
- No IV tacrolimus or cyclosporine. Tacrolimus immediate release can be given SL 1:1 conversion.
- No LR for fluids

When to call Nephrology

Consult transplant nephrology (or if during the week-end, then the nephrology service on call for the week-end) for evaluation for potential dialysis for all patients with ESRD brought in for transplant.

In cases where time is limited before going to the OR …consult in the following circumstances:

- Potassium great than or equal to 5.2 mmol/L
- Sodium less than or equal to 129 mmol/L
- Shortness of breath
- Last dialysis more than 2 days previous

The Transplant Nephrology Pager is 6310

MANAGEMENT OF POST TRANSPLANT COMMON ISSUES

Electrolyte Management

Background:

Electrolyte abnormalities are common following kidney transplant. These include hyperkalemia, hypomagnesemia, and imbalances within calcium and phosphorus metabolism. They are often caused by medications and/or changes in renal function and may be an acute or chronic problem.

Medications	Electrolyte Effect
Calcineurin inhibitors (tacrolimus, cyclosporine)	Increase potassium, decrease magnesium
Bactrim (sulfamethoxazole/trimethoprim)	Increase potassium
ACE inhibitors/ARBs	Increase potassium
Potassium-sparing diuretics (spironolactone)	Increases potassium
Loop diuretics	Decrease potassium, decrease magnesium
NSAIDs	Increase potassium (would avoid in general due to risk of hemodynamic nephrotoxicity)
Heparin	Increase potassium
Fleets enema (Avoid in our pts)	Increase potassium, increase magnesium
Beta blockers	Increase potassium

Note-many of these medications can be used safely if needed post-transplant but require monitoring

Hyperkalemia:

1) Assess severity of hyperkalemia as this guides treatment and urgency of situation. Treatment path may also depend on renal function.
    a. Mild (K 5-5.5)-consider medical management (May not be needed as this level is baseline for many patients)
    b. Moderate (K 5.5-6.5)-check EKG, consider medical management/temporization versus dialysis, if outpatient and has EKG changes, consider ED and/or direct admission
    c. Severe (K>6.5)-check EKG, consider medical management/temporization versus dialysis. If outpatient, recommend patient go to ED and/or direct admission
    d. *Recommend using hyperkalemia order set for inpatient management*
2) Review current medications. Discontinue potassium supplements and/or potassium containing IV fluids. Check CNI level—consider CNI dose reduction if level is elevated. Consider alternative agents to medications which may be contributing to hyperkalemia (e.g. discontinue Bactrim and initiate alternative agent for PJP prevention).
3) Ask patient about recent dietary intake. Transplant dietitian will educate regarding low potassium diet. Consider adding potassium restriction to diet order.
4) Avoid Kayexalate early post-op due to risk of intestinal necrosis
5) Use caution with fludrocortisone—though it may help to lower K, it can also contribute to hypertension and volume retention

Hypomagnesemia

1) Assess severity of hypomagnesemia
    a. If mild (eg. Mag 1.6-1.9)-consider oral replacement with magnesium oxide or magnesium chloride. Of note, magnesium chloride contains less elemental magnesium than magnesium oxide but may be better tolerated. Patient may require standing oral supplementation. If inpatient, can consider magnesium chloride IV.
    b. If moderate to severe (eg. Mag <1.5)-consider IV magnesium chloride, patient may also require standing oral supplementation

Hyperphosphatemia

1) If mild hyperphosphatemia (eg. phosphorus 5-6), recommend monitoring and avoiding phosphorus binders early post-op (rationale: generally expect improvement in phosphorus post-transplant, phosphate binders add to complexity of regimen and overall pill burden, may add onto GI issues like constipation)
2) If early post-transplant and patient has good renal function, consider monitoring versus starting phosphorus binder as anticipate improvement post-transplant.
3) If patient has poor renal function which isn't expected to improve quickly and is eating, consider adding phosphorus restriction to diet and resuming phosphorus binder.

Hypophosphatemia

1) Treat conservatively following transplant as acute phosphate nephropathy is described as a complication of aggressive phosphorus replacement.
2) Transplant dietitian will counsel patients with hypophosphatemia about increasing intake of foods that are rich in phosphorus.
3) If phosphorus 2-3- continue to monitor, prefer increased phosphorus dietary intake over starting supplementation but can consider oral supplementation with low potassium phosphorus supplement such as Phospha-250 Neutral
4) If phosphorus 1-2-recommend oral supplementation with low potassium phosphorus supplement such as Phospha-250 Neutral
5) If phosphorus <1-recommend IV repletion—select IV sodium or potassium phosphate depending on review of labs (eg. consider potassium phosphate if patient is also hypokalemic), patient may also require standing oral phosphorus supplementation.
6) *Recommend aggressive phosphorus supplementation if patient mechanically ventilated to support respiratory muscle function.*
7) Consider addition of calcitriol

Hypocalcemia

1) Monitor calcium closely (correct for albumin if needed or check ionized level) in patients who are anticipated to have excellent renal function post-transplant as they are likely to be hypocalcemic.
2) Consider IV repletion with calcium gluconate or chloride (chloride would preferably be given via central line) if corrected Ca <7. Patient may also need to be placed on oral calcium temporarily. To act like more of a calcium supplement than a phosphorus binder, calcium supplements should be given between meals.

Hypertension

Early Postoperative Management-First 24-48 Hours

- **Permissive Hypertension**
  Goals multifactorial, generally SBP 110-180
  Avoid hypotension as can lead to graft loss. Consider fluid challenges (avoid LR), albumin if SBP below goal and clinical status allows. Know the expectation of the allograft's function (DGF, living donor, etc).
  Recipients of en-bloc kidneys, which are two kidneys from a pediatric donor implanted together, often have lower BP goals.
  Medications such as Thymoglobulin may cause hypotension as an adverse effect, so be cautious about uptitrating BP meds in setting of Thymoglobulin administration.
- Determine goal SBP-determined by surgical and nephrology team collaboration.
- Ensure adequate pain and nausea control prior to aggressive treatment.
- Identify home BP medications; if possible, utilize agents that patient already has on hand if on BP meds prior to transplant.
- Evaluate for comorbid conditions such as atrial fibrillation or diabetes, which may influence initial agent selection.
- PRN medications include IV hydralazine and labetalol
- If unable to control on PRN medications, see below

Adding Scheduled Anti-hypertensives

- **Determine fluid status**
  Consider IV loop diuretics or dialysis if clinical status indicates. Avoid dialysis if expect graft function to improve quickly.
  Indications for dialysis include
    Volume overload unresponsive to diuresis
    Electrolyte imbalances unresponsive to treatment
    Delayed graft function with any of the above
- Consider specifying hold parameters for antihypertensives and nursing instructions for notifying service in case of significant hyper or hypotension
- Ideal medications are daily dosing, inexpensive, and have other beneficial properties. If on multiple antihypertensives prior to transplant, recommend adding back agents gradually and monitoring response.

- **Medications**
  - Dihydropyridine calcium channel blockers such as amlodipine are often first choices since they can mitigate CNI-induced hypertension and nephrotoxicity. They also do not cause electrolyte disturbances or have clinically significant interactions with CNIs.
  - Beta-blockers such as metoprolol, carvedilol, and labetalol are often utilized. Avoid longer acting forms early on to allow for dose titration and decrease the risk of overshooting BP targets. They can decrease the risk of perioperative MI and if on prior to arrival, recommend restarting, even if at lower dose (often select ½ of PTA dose as starting point).
  - If on oral clonidine PTA, consider adding back at a lower dose to avoid rebound hypertension.
  - Avoid ACE-I/ARB early after transplant due to risk of hemodynamic nephrotoxicity and risk of hyperkalemia.
  - Be mindful of non-dihydropyridineCCBs (verapamil, diltiazem) as these can increase CNI levels. Consider alternative agents if on PTA.

SBP-Systolic blood pressure
LR-Lactated ringers
DGF-Delayed graft function
PRN-As needed
CNI-Calcineurin inhibitor
MI-Myocardial infarction
ACE-Angiotensin converting enzyme inhibitors
ARB-Angiotensin II receptor blockers
CCB-Calcium channel blockers
PTA-Prior to admission

Mangray, M., Vella, J. Hypertension After Kidney Transplant. American Journal of Kidney Diseases. February 2011. Volume 57, Issue 2, Pages 331-341. Accessed May 15, 2018. https://www.ajkd.org/article/S0272-6386(10)01581-7/fulltext#tbl1

Post-Transplant Hyperglycemia

Background:

ESKD secondary to diabetes is a leading indication for kidney transplant. Diabetes management post-transplant is often dynamic and can be challenging due to a variety of factors. Patients who are on insulin at baseline may have increased insulin requirements due to influence of improving renal function and medications.

It is common for patients with type 2 diabetes to no longer require insulin and/or glucose-lowering medications while on dialysis due to reduced renal clearance of insulin. Some patients believe their diabetes is no longer an issue if they do not require medication to control it while on dialysis. It is likely that these patients will again require medications to manage blood sugar post-transplant. Patients are educated regarding this risk in the pre-transplant setting by transplant dietitian and other providers.

Transplant recipients without a history of diabetes pre-transplant may develop diabetes following transplant due to medications such as tacrolimus and steroids and exacerbation of other risk factors (e.g. weight gain). Those deemed to be at high risk for post-transplant diabetes are educated by transplant dietitian regarding risk prior to transplant.

Hyperglycemia may also be only a transient complication post-transplant due to high dose steroids used initially post-op.

Management approach:
For patients with a history of diabetes on insulin or other antihyperglycemic medications prior to transplant

1) Recommend consulting endocrinology POD0—of note, patients who require an insulin drip will need to go from PACU to SICU instead of 3W, please refer to transplant pocket card for typical steroid dosing **need to add endocrine pager**
2) Diabetic educator should meet with patient prior to discharge. Transplant dietitian will re-educate on diabetic diet. Transplant pharmacist, diabetic educator, and transplant APP will coordinate any medications and/or glucose testing supplies needed.
3) Patients should be scheduled for endocrinology follow-up prior to discharge—preferably this would be with a UCM provider but acceptable for patient to follow locally with endocrinology if they have already established care.

For patients not on insulin or other anti-hyperglycemic medications prior to transplant:

1) Assess medications which may be contributing to hyperglycemia (eg. high dose steroids, dextrose containing fluids or medications)
2) Assess timing of hyperglycemia relative to meals
3) Assess diet-transplant dietitian will educate regarding limiting concentrated sweets and being mindful of carbohydrate intake. Consider changing to diabetic diet.Consider endocrinology consult early following transplant if persistent hyperglycemia (eg. BG >250).

4) Supplies/appointments. See steps above regarding diabetic education and coordination of medications/testing

Urinary Tract Infections in Kidney Transplant Recipients

Bacteriuria in first 2 months post-transplant

- Urine cultures are drawn for cause rather than per protocol so if culture is ordered, patient likely has some symptoms though they may non-specific (eg. leukocytosis).

- Antibiotic selection:
  - First line agent: cephalexin*
  - In case of severe beta-lactam allergy (e.g. hives, angioedema, anaphylaxis): Ciprofloxacin*

    *Adjust antibiotics as needed based on sensitivities of isolate.

- Duration: 14 days
  - Given presence of ureteral stent for at least 4-6 weeks post-transplant

Urinary Tract Infections in Kidney Transplant Recipients

- Any UTI in a transplant recipient should be considered complicated in nature given altered anatomy of the urinary tract post-transplant. *Consider ID consult for patients with recurrent UTIs.*

- Antibiotic selection:
  - First line agent: cephalexin* or cefdinir*
  - In case of severe beta-lactam allergy (e.g. hives, angioedema, anaphylaxis): Ciprofloxacin*

    *Adjust antibiotics as needed based on sensitivities of isolate.

- Duration: 14 days

Transplant Pyelonephritis

- Patients should be considered to have transplant pyelonephritis if they have ANY of the following symptoms: fever, graft tenderness, and/or bacteremia. *Consider ID consult for patients with recurrent transplant pyelonephritis.*

- Antibiotic Selection:
  - First line agent: ceftriaxone (IV recommended for initial management)
    - Consider changing to oral antibiotics 72 hours after defervescence or clinical improvement.

- Duration: 4 weeks
  - If patients have recurrent transplant pyelonephritis, consider 6 weeks of antibiotics

Recurrent Transplant Pyelonephritis or UTIs, Prophylaxis:

- Methenamine hippurate may be considered for prophylaxis (dose: 500 mg every 12 hours).

- Of note, there is a clinically significant drug interaction between methenamine and sulfamethoxazole/trimethoprim so sulfamethoxazole/trimethoprim should be discontinued upon methenamine initiation due to risk of urinary crystallization.

Table 2. Antibiotic dosing recommendations

Antibiotic	Usual dose*	CrCl ≥ 75	74 – 50	49 – 30	29 – 10	< 10	HD
Amoxicillin/clavulanate (PO)	---	875mg/125mg Q8-12H			500mg/125mg Q12H	500mg/125mg Q24H	
Ampicillin/sulbactam (IV)	1.5-3g	Q6H		Q6-8H	Q12H	Q24H	
Aztreonam (IV)	1-2g	Q8H			Q12H	Q24H	
Cefepime (IV)	1g	Q6-8H		Q8-12H	Q24H		50% Q24H
Cefdinir (PO)	300mg	Q12H			Q24H		Q48H
Ceftriaxone (IV)	1-2g	Q24H					
Cephalexin (PO)	500mg-1000mg	Q8-12H			Q12H	Q12-24H	
Ciprofloxacin† (IV)	400mg	Q8-12H			Q12-24H	Q24H	
Ciprofloxacin† (PO)	500mg	Q12H			Q24H		
Fosfomycin‡ (PO)	3g	1x dose (uncomplicated), 3 doses Q48hrs (complicated)					
Nitrofurantoin§ (PO)	100mg	Q12H			Avoid		
SMX/TMP (PO)	1 DS (800mg/160mg)	Q12H			Q24H		

Abbreviations: SMX/TMP, sulfamethoxazole/trimethoprim; IV, intravenous; PO, oral

* Consider higher doses for treatment of pyelonephritis and lower doses for uncomplicated cystitis.

† WARNING: A baseline EKG should be obtained when initiating ciprofloxacin along with other QT prolonging medications; if QTc ≥440 msec, consult UCM Drug Induced QTc Prolongation Monitoring Guideline: (http://home.uchospitals.edu/pdf/uch_034345.pdf)

‡ May be a consideration for complicated and uncomplicated UTIs with multi-drug resistant organisms without suspected or confirmed systemic infection; page the antimicrobial approval pager (#5734) or discuss with ID consult service prior to admitting the patient.

§ Avoid long term/chronic use of nitrofurantoin if CrCl is 30-50ml/min

Dyslipidemia

Statin Therapy in Renal Transplant

Medication	Available Doses	Dosing Information	Side effects
Atorvastatin (Lipitor)	10, 20, 40, 80 mg tabs Moderate-intensity: 10 - 20 mg daily High-intensity: 40 mg daily	*With Tacrolimus: 10-40 mg daily* *Avoid with Cyclosporine* *With mTORi: 10-40 mg daily*	Headaches, arthralgia/arthritis, myalgia, muscle spasms, musculoskeletal pain, myopathy, rhabdomyolysis, hepatotoxicity
Pravastatin (Pravachol)	10, 20, 40, 80 mg tabs Moderate-intensity: 40 mg daily	*With Tacrolimus: 20-40 mg daily* *With Cyclosporine: 20 mg daily* *With mTORi: 20-40 mg daily*	Headaches, myalgia, rhabdomyolysis, hepatotoxicity
Rosuvastatin (Crestor)	5, 10, 20, 40 mg tabs Moderate-intensity: 5 - 10 mg daily High-intensity: 20 mg daily	*With Tacrolimus: 5-20 mg daily* *With Cyclosporine: 5 mg daily* *With mTORi: 10 mg daily*	Headaches, arthralgia, myalgia, myopathy, myopathy, rhabdomyolysis, hepatotoxicity

- **Expect ~50% LDL reduction with high-intensity statin and 30-50% LDL reduction with moderate-intensity statin**
- **Cyclosporine inhibits statin metabolism; combination with lower statin dose results in higher statin concentration**

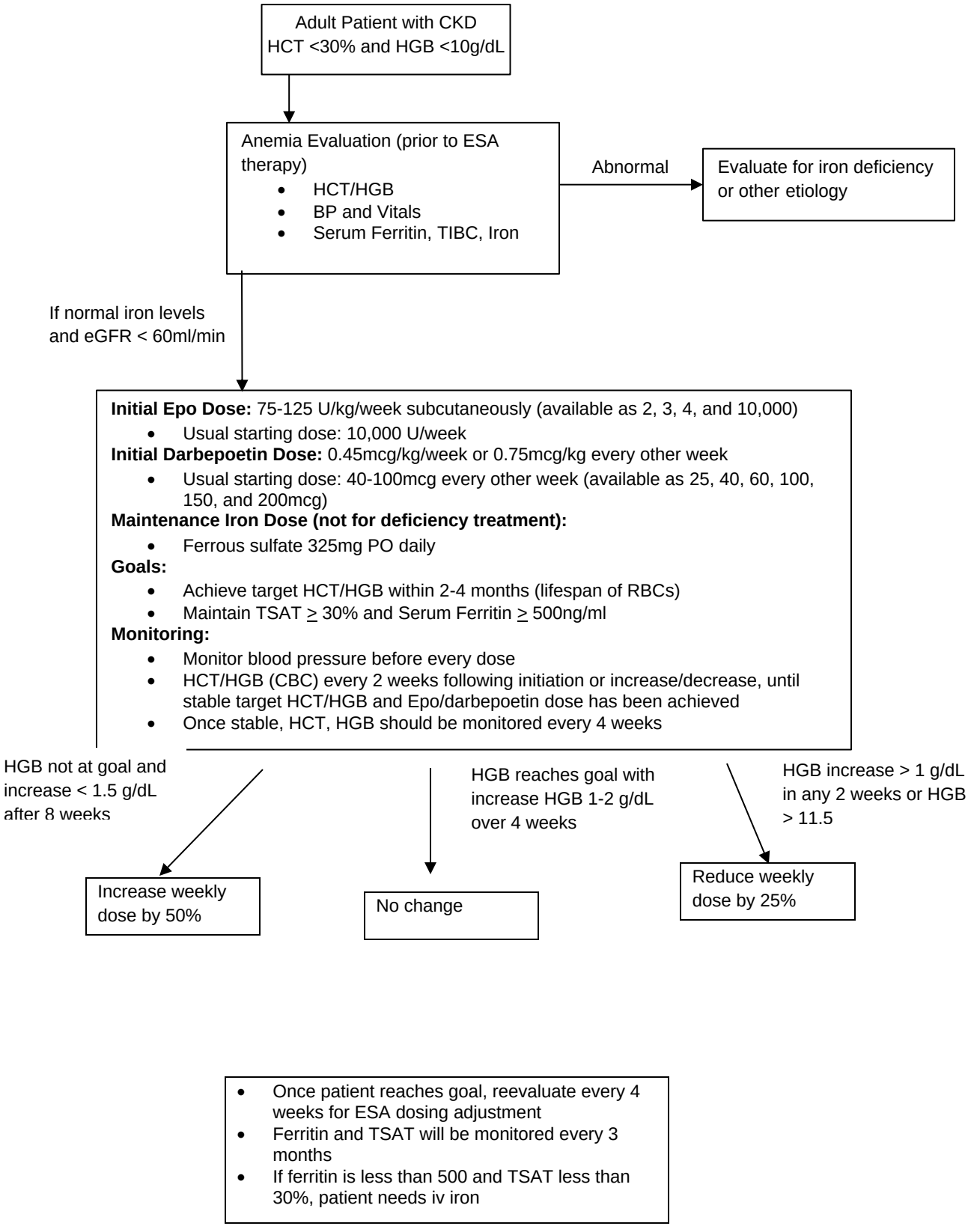
Lifestyle Recommendations:	· Maintain healthy weight · Avoid tobacco · Moderate aerobic activity for at least 30 minutes, most days of the week · Heart healthy diet (lower sodium, lower saturated/trans fats, limited sugar, less red meat)

THIS IS A GENERAL GUIDE; ALWAYS REVIEW PATIENT CHARACTERISTICS (i.e. allergies, medical history, medications)

Modified KDIGO Recommendations:	Statin therapy is recommended for patients: • Age ≥ 50 • If age < 50 and have one of the following: ✓ Hx of CVD (MI/CAD/CVA/TIA/PVD) ✓ DM ✓ ASCVD 10-year risk > 10% Consider initiation of statin at one-month post-transplant visit if graft function stable
Monitoring of Statin Therapy:	• Protocol lipid checks at one-month, six-month, and annual timeframes • Allow for adherence monitoring • Assess for myalgia • Could consider change to higher-intensity dosing if less than expected LDL response • Consider statin dose reduction if two consecutive LDL measurements are less than 40 mg/dL • Consider additional agent to address triglycerides if > 500 mg/dL or higher (use omega-3 fatty acids, niacin, or fenofibrate)
Approach to Reported Intolerance:	If mild to moderate muscle symptoms develop: • D/C statin & evaluate for other causes (hypothyroidism, vitamin D deficiency, steroid myopathy, etc.) If symptoms resolve: • Resume same statin at a lower dose OR • Start a different statin at a lower dose and slowly up titrate this new statin as tolerated If symptoms fail to resolve off statin x 2 months, consider other causes of muscle symptoms • If persistent muscle symptoms are determined to arise from a condition unrelated to statin therapy, or if the predisposing condition has been treated, resume statin therapy at the original dose If severe muscle symptoms/fatigue of unknown cause develop:

	• Hold the statin and check creatinine and urinalysis to rule-out rhabdomyolysis

Anemia



Notes

- Epo or Darbepoetin should be held if uncontrolled blood pressure (> 160/100 mm Hg)
- Epo or Darbepoetin should be held if recent thrombosis
- Response to Epo/Darbepoetin is strongly dependent on functional iron stores (TSAT > 20-30%)
- If anemia is mild and allograft function is good, may be reasonable to hold Epo or darbepoetin
- Consider hemolysis if high reticulocyte count, high LDH, low haptoglobin

Iron Deficiency:

- Ferritin < 500 ng/ml and TSAT <30%. Low Reticulocyte Hgb (< 30%) also an indicator of iron deficiency.
- If iron levels are very low, consider workup for occult GI bleeding
- Treatment: Iron sucrose injections (Venofer) 1000mg IV total dose administered over 5 weeks
    - Common dosing: iron sucrose (Venofer) 200mg IV every week x 5 doses
    - Anaphylactic reactions are rare but have been reported
- Supplementation: ~200mg/day (elemental iron)
    - Options include: Fe sulfate 325mg TID, Fe fumarate 200mg BID, or Fe gluconate 300mg BID
    - Oral iron is poorly absorbed, may cause constipation or abdominal discomfort

Neutropenia

Leukopenia Management Protocol		
Laboratory Value	**Intervention**	**Monitoring**
WBC < 3000	NONE	Check ANC
WBC <3000 and ANC >1500	No change required in immunosuppression or prophylaxis	Recheck ANC within 2 weeks
ANC 1000 – 1500	Stop Bactrim, Valcyte	Consider checking CMV PCR in high risk CMV+/- patients Monitor ANC within 5 -7 days
ANC < 1000	Stop Bactrim, ValcyteIf not on Valcyte, consider decrease MPA to ½ dose in low immunologic risk patients	Check CMV PCR in high risk CMV+/- patients Recheck ANC within 3 day
ANC <500	Stop Bactrim, Valcyte Neupogen 300 mcg SQ x 1 If not on Valcyte, decrease MPA to ½ dose	Assess for acute infection Check CMV PCR in high risk CMV+/- patients Recheck ANC within 1-3 day to assess need for repeat Neupogen dosing

Recurrent Focal Segmental Glomerulosclerosis (FSGS)

Rationale:

1. FSGS may recur in the allograft, sometimes within hours-days post-transplant. This suggests the presence of a circulating factor that causes podocyte injury resulting in proteinuria. This circulating factor is not fully identified and hard to measure, but has been detected by some researchers.
2. Consistent with the postulated circulating factor, plasmapheresis is effective in reducing proteinuria in some patients with recurrent FSGS particularly if applied very early after the diagnosis of recurrence.

Patients at risk of recurrence after transplant:

1. Biopsy proven FSGS in the native kidney
2. History of FSGS recurrence in a previous allograft even if no native diagnosis was available

Magnitude of risk for recurrence and consequences:

1. Approximately 30% of patients with biopsy proven primary FSGS will have disease recurrence in the allograft.
2. Up to 50% of recurrent FSGS in the allograft leads to graft loss

Risk Modifiers

The risk of recurrence is quite variable and several factors can be used to assess the magnitude of the risk.

Variables associated with **increased** risk of recurrence:

1. Young age at diagnosis of FSGS in native kidneys: Patients diagnosed prior to age 18 have a 55-60% incidence of recurrence. In contrast, patients diagnosed after age 45 have a ~15% incidence of recurrence.
2. Aggressive course of FSGS in native kidneys (heavy proteinuria, rapid loss of native kidney function).
3. Recurrence does not appear to be different in living related versus deceased donor transplants
4. Previous history of recurrence in an allograft (increases the risk of recurrence to ~80-90%)

Variables associated with **reduced** risk of recurrence:

1. Clinical diagnosis of “secondary” FSGS is associated with a much lower risk of recurrence (although not zero)
2. Familial FSGS has lower risk of recurrence in the allograft
3. Indolent course in native kidneys (less proteinuria, slow progression to ESRD)
4. African American race in the recipient is associated with reduced risk.

Diagnosis of FSGS recurrence

1. FSGS recurrence may occur within hours of the transplant so the diagnosis of recurrence requires close monitoring during the very early post-transplant period and routinely during long term follow up, particularly during the first one year.
2. The diagnosis of disease recurrence is first made clinically, based on the presence of increasing amounts of albuminuria in urine. Thus, to make the diagnosis of recurrence promptly, during the early post-transplant period, it is essential to establish a baseline level of albumin immediately post-transplant.
3. In patients making urine before transplantation, albuminuria may be from native kidneys. Thus the trend in urinary albuminuria must be followed carefully. Native kidney proteinuria tends to decrease significantly the first month after transplantation.
4. Early post-transplant, the presence of blood in the urine may confuse the interpretation of urinary protein, so urinary albumin/creatinine ratio is a better marker than urinary protein.

5. The clinical diagnosis of recurrence should be promptly followed by a kidney biopsy to confirm the diagnosis. In that biopsy it is critical to order electron microscopy, as light microscopy may show normal glomeruli. Recurrence is associated with diffuse podocyte foot process fusion seen by electron microscopy.

Treatment of recurrent FSGS

Early FSGS recurrence (hours to first 30 days post-transplant)

1. **The clinical diagnosis of FSGS recurrence should be followed by prompt therapy that should not be delayed waiting for the results of electron microscopy. This recommendation is based on data suggesting that the effectiveness of plasmapheresis improves if started as early as possible.**
2. Immediate FSGS recurrence frequently causes delayed graft function (DGF) that can be quite severe. Thus, DGF in this setting should prompt the following actions: a) measure of urinary albumin, b) kidney biopsy and c) consideration of initiation of PP.
3. After recurrence is suspected, a kidney biopsy should be done, including immunofluorescence (IF) and electron microscopy (EM) studies. It is important to talk with the pathologist so the EM study can be done urgently because the confirmation of recurrent FSGS is based on EM findings.
4. Initiate plasmapheresis daily for 3 days and then every other day for at least 9 total treatments. Replace volume with 5% albumin. Every treatment should be followed by infusion of IVIG (100mg/kg)
5. Once the EM studies of the biopsy become available:
    a. If diffuse foot process fusion continue PP.
    b. If no diffuse foot process fusion is present and the albuminuria is not progressing plasmapheresis can be discontinued.
6. Continue to monitor albuminuria before every plasmapheresis treatment. After 2 weeks:
    a. If albuminuria is reduced by >50%:
        i. Consider reducing the interval between plasmapheresis treatments.
    b. If albuminuria is not reduced by >50% and particularly if kidney function remains impaired
        i. Consider repeat kidney biopsy to rule out additional pathology
        ii. If the FSGS lesion remains unchanged and no other pathology is present additional therapy may not be of benefit and the kidney is likely lost.
        iii. Some small case series suggest rituximab may stabilize or improve the course of recurrent FSGS

Late FSGS recurrence (beyond 30 days post-transplant)

1. Late recurrence is less likely to respond fully to plasmapheresis. In particular, patients with glomerulosclerosis on light microscopy seem to be less likely to respond.
2. These patients should never be treated with sirolimus, which can also cause podocyte injury and proteinuria.
3. Still, a significant proportion of these patients may have a partial response to plasmapheresis, which may be associated with improved prognosis. Other patients become plasmapheresis dependent (rise in proteinuria after discontinuation of plasmapheresis). Therapy in these patients is guided by the following observations
    a. Prognosis is worse with heavy proteinuria (> 1.5 g/day). Thus, it is reasonable to use any maneuver that reduces proteinuria, including plasmapheresis.
    b. Long term plasmapheresis which achieves low levels of proteinuria may be associated with histologic stabilization of the disease (based on a few case reports).
4. BP control (target systolic BP <125 mmHg) and liberal use of angiotensin receptor blockers can help reduce proteinuria by as much as 50% or more.
5. **Avoid ACE inhibitors in patients treated with plasmapheresis as these drugs may cause anaphylactic reactions during plasmapheresis.**

Prevention of recurrence

In recipients at especially high risk of recurrence, some groups have performed a course of plasmapheresis and subsequent rituximab to prevent recurrence, which may be successful. However this is based on a very small number of uncontrolled reports.

POST TRANSPLANT REJECTION (ACR/AMR) TREATMENT PROTOCOLS

Acute Cell Mediated Rejection (ACR) Treatment

1ST Line Therapy: Methylprednisolone 500 mg x 3 days IVPB *(should not be pushed, give over **30 minutes**)*
The 3 doses of steroids should be followed by an oral prednisone taper as follows:
Day 1: 200 mg
Day 2: 160 mg
Day 3: 120 mg
Day 4: 80 mg
Day 5: 40 mg
And then back to baseline

Steroid Resistant ACR: r-ATG (Thymoglobulin) 1.5 mg/kg (rounding up to 25 mg increment with maximum dosing at 150 mg) x 5 – 14 days
Central line is preferred as the drug can be given more quickly (6 hours), though if given peripherally must be given over a minimum of 12 hours

A CBC should be obtained prior to ordering dose as Thymo may require dose adjustment for thrombocytopenia and/or leukopenia

Premedications should include: (given within 1 hour of administration of thymo)

-Acetamenophen (650 mg PO)
-Diphenhydramine (25-50 mg IV or PO)

- PCP prophylaxis with daily trimethoprim–sulfamethoxazole single strength or dapsone 100 mg for at least 3 months during and after treatment for acute rejection
- CMV prophylaxis with valganciclovir (renally dosed) for 3 months
- Fluconazole 100 mg daily X 1 month (renally dosed if needed)

Antibody Mediated Rejection (AMR) Treatment –Acute Hospitalization

- TPE x 4 (ever day or every other as tolerated) w/ 100 mg/kg IBW (rounded to nearest 5 grams) IVIG after pheresis 1 through 3. 2 gram /Kg IBW after last session in divided doses
- Use only sucrose-free IVIG (eg. Gammagard, Gamunex-C)
- Maximum dose of IVIG to be given is 70 grams/dose
- Premedicate with acetaminophen (650 mg) and diphenhydramine (50 mg IV)
- If the IVIG dose will be greater than or equal to 1 gram/kg, give 40 mg IV methylprednisolone as premedication
- Consider repeat course if responding
- Rituximab 375 mg/m2 x 1 at end (round to nearest 100 mg)
- Premedicate for Rituximab with acetaminophen (500 mg) and diphenhydramine (50 mg IV)
- Premedications should be administered (?time frame before IVIG or rituxan)
- It is not necessary to restart daily PCP prophylaxis, valganciclovir or fluconazole after IVIG or rituxan, unless thymoglobulin has also been administered.
-

Check DSA 1 week after IVIG completed, then again at 6 months and 12 months

POST-OP DONOR NEPHRECTOMY PATHWAY

	Preoperative	Intraoperative	Postoperative
Diet	CHO drink 2 hrs preop (Provided in preop clinic)	NPO	Resume diet early
Multimodal Analgesia	a. Acetaminophen 975mg pox1 b. Gabapentin 600 mg pox1	a. Fentanyl boluses b. TAP Block c. Acetaminophen 1g IV towards end of case, if available. If not, Acetaminophen 650mg suppository d. Ketorolac 15mg towards end of case	a. Acetaminophen 650mg po q6h(Max 3g/24hr) b. Gabapentin po 300 mg po q8hrs c. Ketorolac 15mg IV q6hx24 hrs d. Tramadol 50-100mg q6hrs PRN
Antiemetics	a. Scopolamine Patch	a. Dexamethasone 4mg IV at start of case b. Zofran 4mg IV when closing	a. Scopolamine patch b. Zofran 4 mg IV q4h PRN c. Promethazine if needed
VTE Prophylaxis	a. Heparin 5000units SubQx1 b. SCDs	a. SCDs	a. Heparin 5000units SubQ TID b. SCDs c. OOB POD 0 d. Early ambulation
Antibiotic prophylaxis	a.Cefazolin 1-2g IVx1 b. If PCN allergic, Cipro 400mgx1+Clinda 600mgx1	a. Repeat if procedure >4hrs	Antibiotics x 24hrs None
Foley		Foley catheter removed at end of case	

Pain plan on discharge DAY 1 Tylenol+tramadol +/- gabapentin

Miscellaneous

Management of hepatitis C positive kidney transplant recipient (either receiving a HCV pos or HCV negative kidney)

After Kidney Transplantation

1. Inpatient Hepatology consult at the time of kidney transplantation
2. Patient to be seen in Hepatology clinic within one month post kidney transplantation. Further Hepatology clinic appointments to be determined by the patient's Hepatologist.

Hepatitis B Prophylaxis in Kidney Transplant Recipients

(A) Managing Donor Positive/ Recipient Negative Patients

a. Recommendations from the American Journal of Transplantation (2015) for non-liver transplant recipients from anti-HBc positive, HBsAg negative donors [Figure 2]

i. Antiviral prophylaxis for up to 1 year may be considered in HBV susceptible (anti-HBc negative, anti-HBs negative) recipients (weak; low).

ii. Lamivudine is the recommended choice for prophylaxis (strong; moderate).

iii. Antiviral prophylaxis is not recommended for recipients with natural (anti-HBc positive, anti-HBs positive) or vaccine (anti-HBc negative, anti-HBs positive) immunity (strong; moderate).

iv. HBIG is not recommended (strong; moderate).

v. HBV DNA with or without HBsAg should be monitored every 3 months for 1 year (weak; low).

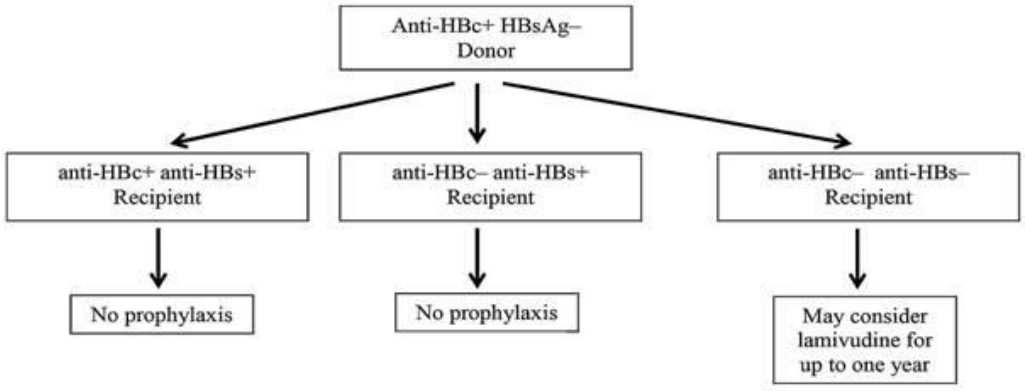


Figure 2: Algorithm for use of non-liver grafts from anti-HBc+ donors in recipients without chronic HBV.

(B) Managing HBV Positive Patients Needing Rituximab

a. Hepatitis B Virus reactivation (HBVr) risk is based on recipient HBV serologies and immunosuppressive drug class.

1. B-cell depleting agents (i.e. Rituximab) have a high risk (>10%) of HBVr

The risk increases to 30-60% in patients that are HBsAg-positive

2. Prednisone risk is dose-dependent:
    1. High dose (≥20 mg for ≥4 weeks)- HBVr risk ≥10%
    2. Moderate dose (<20 mg for ≥4 weeks)- HBVr risk= 1-10%
    3. Low dose (<20 mg for <1 week)- HBVr risk <1%
    4. The risk increases in patients who are HBsAg-positive.

b. The American Gastroenterological Association (AGA) published recommendations in 2015 for prophylaxis based on recipient serologies and drug class:
    i. <u>High-risk</u>
    1. HBsAg-positive/anti-HBc-positive or HBsAg-negative/anti-HBc-positive
        a. Receiving B cell-depleting agents (i.e. rituximab, ofatmumab)
    2. HBsAg-positive/anti-HBc-positive
        a. Receiving moderate-dose(10-20 mg prednisone/d) or high dose (>20 mg prednisone/d) corticosteroids daily for ≥ 4 weeks

Prophylaxis is recommended:

Continue 6 months after discontinuing immunosuppressive therapy or at least 12 months after B cell-depleting therapy.

Entecavir or Tenofovir (Vemlidy) preferred over Lamivudine

(C)Managing Hepatitis B surface Ag positive kidney transplant recipients

Pre-emptive therapy is indicated regardless of HBV DNA levels or fibrosis stage and should be maintained for life or as long as immunosuppression is required. Entecavir and Tenofovir (Vemlidy) are preferred over Lamivudine.

Process for Conversion to Belatacept

1) Obtain baseline EBV IgG--must be positive for patient to receive belatacept. Discuss belatacept logistics and risk versus benefit with patient in clinic.

2) If patient interested in proceeding--enroll patient in Nulojix Distribution Program and submit medical necessity form to Bristol Myers Squibb—as of 3/2017 this is a requirement for belatacept new starts. Investigate and confirm insurance coverage of medication. Confirm patient's preferred infusion site (UCM, other infusion center, home infusion).
3) Once patient approved for drug and assigned ID number by Nulojix distribution program
4) Dosing conversion from CNI (tacrolimus or cyclosporine) to belatacept—transplant pharmacist to provide patient with calendar.

- Day 1: Belatacept 5 mg/kg Continue CNI at original dose
- Day 15: Belatacept 5 mg/kg Reduce CNI to 40-60% of original dose
- Day 22: No infusion Reduce CNI to 20-30% of original dose
- Day 29: Belatacept 5 mg/kg Discontinue CNI
- Day 43: Belatacept 5 mg/kg
- Day 57: Belatacept 5 mg/kg
- Q28 days: Belatacept 5 mg/kg

Dosing conversion from sirolimus to belatacept—transplant pharmacist to provide patient with calendar

- Day 1: Belatacept 5 mg/kg Continue sirolimus at original dose
- Day 15: Belatacept 5 mg/kg Reduce sirolimus to 50% of original dose
- Day 29: Belatacept 5 mg/kg Discontinue sirolimus
- Day 43: Belatacept 5 mg/kg
- Day 57: Belatacept 5 mg/kg
- Q28 days: Belatacept 5 mg/kg

Stop checking drug levels when belatacept initiated

4): Continue belatacept 5 mg/kg every 4 weeks indefinitely. Consider dose adjustment of belatacept should patient's weight change by >/= 10%.

References:
Rostaing L, et al. *Clin J Am Soc Nephrol* 2011; 6(2): 430-9.

Post kidney transplant Expectations

1. Expect to attend clinic up to 3 x weekly for approximately 3-6 weeks, or as deemed necessary
2. Clinic visits will likely be 2-3 hours long since patient needs to wait for labs to be resulted, and will be called later with IS results/med changes
3. Have reliable transportation in place
4. Family support is necessary, as well as, possibly family member accompanying patient to and from clinic as long as necessary
5. Understand medication coverage and what will be paid by insurance and what will be paid by the patient
6. Understand they will lose Medicare coverage for medications 36 months from date of transplant if the indication for coverage was only ESRD.
7. If patient is diabetic and not on insulin while dialyzing, there is probability that they will be on insulin post-transplant