مجلس الضمان الصحي
Council of Health Insurance

Renal Transplant

CHI Formulary Treatment algorithm

Treatment algorithm

Supporting treatment algorithms for the clinical management of renal transplant

The tables outline a comprehensive treatment algorithm on **the management of renal transplant,** aimed at addressing the different lines of treatment after thorough review of medical and economic evidence by CHI committees.

For further evidence, please refer to CHI **Renal Transplant** full report. You can stay updated on the upcoming changes to our formulary by visiting our website at https://chi.gov.sa/AboutCCHI/CCHIprograms/Pages/IDF.aspx

Our treatment algorithm offers a robust framework for enhancing patient care and optimizing treatment outcomes across a range of treatment options, holding great promise for improving healthcare delivery.

A- <u>Pre-Operative Medications:</u>

1- Medications for Prophylaxis

Class	Drug	dose	Note
Cephalosporin	Cefazolin	Adults: 2 g, 3 g for pts weighing ≥120 kg (1 g q8 hrs) Pediatrics:30 mg/kg	- **Recommended regimen:** Cefazolin - **Alternative Agents in Patients with b-Lactam Allergy:** Clindamycin or vancomycin + aminoglycosideg OR aztreonam OR fluoroquinolone
Glycopeptide	Vancomycin off-label use	Adults: 15 mg/kg Pediatrics::15 mg/kg	
Lincosamide	Clindamycin off-label use	Adults :900 mg Pediatrics:10 mg/kg	Total duration should be ≤24 hours
aminoglycoside	Gentamicin off-label use	Adults :5 mg/kg Pediatrics: 2.5 mg/kg	
	Tobramycin off-label use	No available dose for this indication.	
Monobactam	Aztreonam **(Not registered in SFDA list)** off-label use	Adults :2 g Pediatrics:30 mg/kg	
Fluoroquinolone	Ciprofloxacin off-label use	Adults :400 mg Pediatrics :10 mg/kg	
	Levofloxacin off-label use	Adults :500 mg Pediatrics :10 mg/kg	
	Fluconazole off-label use	Adults :400 mg Pediatrics :6 mg/kg	for patients at high risk of fungal infection

2- Medications for immunosuppression induction

Medication	Dosing	Notes
Rabbit Thymoglobulin **(Not registered in SFDA list)** **(Labeled Indication)**	**<u>Adults:</u>** - 1mg/kg IV × 4 doses - 1st dose to be started pre-reperfusion (over 6 h). - 2nd, 3rd, and 4th doses to be given on Day 1, 2 and 3 (over 4 hr). - **<u>Infant, Children, and Adolescents:</u>** <u>*Induction, prophylaxis:*</u> IV: 1.5 mg/kg/dose once daily for 4 to 10 doses initiated at time of transplant prior to reperfusion of donor kidney. <u>*Acute rejection, treatment*</u>: IV: 1.5 mg/kg/dose once daily for 7 to 14 day -Premedicate: 30 min before infusion With 500 Methylprednisolone, Acetaminophen 325 mg PO or pr × 1, Diphenhydramine 50 mg PO or IV × 1. -Administer antifungal and antibacterial prophylaxis therapy if clinically indicated. Antiviral prophylaxis is recommended in patients who are CMV-seropositive at the time of transplant and for CMV-seronegative patients scheduled to receive a kidney from a CMV-seropositive donor.	**Indicated for patients**: - High immunologic risk, for example, positive panel reactive antibody or Donor-specific antibodies (any level), re-transplantation, desensitization protocols, 3 or more mismatches) Or - At risk for delayed graft function: All the deceased donor kidney transplant.
Alemtuzumab (Campth) **This brand in not available on KSA list**	**<u>Adults:</u>** IV: 30 mg as a single dose at the time of transplant (immediately following reperfusion)	**Indicated for** recipients at higher immunological risk

(off-label)	followed by a second 30 mg dose 24 hours later (the second dose was omitted in patients >60 years of age); followed by minimized maintenance immunosuppression **<u>Pediatrics:</u>** **No available dose for pediatrics for this indication**	
Basiliximab	**<u>Adults:</u>** - 20 mg IV, 1st dose start pre-reperfusion, - 2nd on the postoperative day number 4 **<u>Children and Adolescents</u>**: IV: <u>*Patient weight <35 kg*</u>: -Initial dose: 10 mg administered within 2 hours prior to renal transplant surgery -Second dose: 10 mg administered 4 days after transplantation <u>*Patient weight ≥35 kg:*</u> -Initial dose: 20 mg administered within 2 hours prior to renal transplant surgery -Second dose: 20 mg administered 4 days after transplantation	**Indicated for patients:** 1. LKT (Living donor kidney transplant) with low immunological risk and low risk for delayed graft function. 2. Patient at high infection risk.

3- Medications for immunosuppression maintenance

Medication	Dosing	Notes
Methylprednisolone / Prednisolone	**- Induction** 500 mg IV (finish prior to thymoglobulin administration) **- Post induction** Methylprednisolone 100 mg IV on day 1 Methylprednisolone 80 mg IV on day 2 Methylprednisolone 60 mg IV on day 3 Methylprednisolone 40 mg IV on day 4 Prednisolone 20 mg PO on day 5 (Patient will be discharged on 20 mg daily) **- Tapering:** Prednisolone 20 mg PO Daily × 7 days Prednisolone 15 mg PO Daily × 7 days Prednisolone 10 mg PO Daily × 7 days Prednisolone 5 mg PO Daily thereafter (can stop Nystatin at this time).	**Initial steroid therapy** should be part of immunosuppression in the peri-operative and early post-transplant period. **-** Consider steroid withdrawal in standard immunological risk patients on combination therapy with calcineurin inhibitors and mycophenolic acid after the early post-transplant period. - If steroids are not withdrawn within the first month then they should be maintained at low dose (Prednisolone - 5 mg per day or less)
Tacrolimus	**<u>Adult:</u>** If renal function is immediate, tacrolimus can be started on day 0 at 1mg PO Q 12 hrs.	- Use tacrolimus as first-line calcineurin inhibitor due to its higher efficacy. <u>Adults:</u>

	Titrate dose to reach a level 6–8 ng/mL on day 5. **<u>Children and Adolescents</u>**: Initial: 0.2 to 0.3 mg/kg/day divided every 12 hours	- Monitor blood-levels to allow appropriate dose adjustment. - Target level of 10–12 ng/mL (months 0–3); 8–10 ng/mL (months 4–6); 6–8 ng/mL (months 7– 12), and 5–7 ng/mL afterward. <u>Pediatrics:</u> -Standard-dose achieving trough levels (C0) of 10 (5–15) ng/mL. -A low-dose tacrolimus has recently been introduced in the Symphony study and was defined as C0 of 5 (3–7) ng/mL (KDIGO Clinical Practice Guideline for the Care of Kidney Transplant Recipients.)
Cyclosporine	**<u>Adults:</u>** 3 mg/kg/dose q 12 h. **<u>Infants ≥6 months, Children, and Adolescents:</u>** IV: <u>*Intermittent IV infusion*</u>*: Initial:* 5 to 6 mg/kg/day or one-third (1/3) of the oral dose as a single daily dose over 2 to 6 hours; administer 4 to 12 hours prior to organ transplantation or may be given postoperatively <u>*Continuous IV infusion*</u>: Limited data available: Children and Adolescents: 2 to 4 mg/kg/day; doses as high as 4.5 mg/kg/day have been used in patients ≥6 years old	- Indication: alternative to Tacrolimus. <u>Adults:</u> Monitor blood-levels to allow appropriate dose adjustment - Targeted Levels of (C0) 200–250 ng/mL at 0–3 months, 125–200 ng/mL at 3–6 months and 100–150 ng/mL at >6 months

	Oral: Initial: 10 to 14 mg/kg/day has been used for renal transplants (the manufacturer's labeling includes dosing from initial clinical trials of 15 mg/kg/day [range: 14 to 18 mg/kg/day]); administer 4 to 12 hours prior to organ transplantation. Continue initial dose daily for 1 to 2 weeks; taper by 5% per week to a maintenance dose of 5 to 10 mg/kg/day; some renal transplant patients may be dosed as low as 3 mg/kg/day to achieve target concentrations.	
Mycophenolic Acid, derivatives, MPA MMF and EC-MPS,	**Adults:** 1000 mg PO q 12 h (starting preoperative); **Pediatrics:** *Mycophenolate mofetil*: Infants ≥3 months, Children, and Adolescents: **Oral:** Suspension: 600 mg/m2/dose twice daily; maximum daily dose: 2,000 mg/day. Tablets or capsules: BSA 1.25 m2 to 1.5 m2: 750 mg twice daily. BSA ≥1.5 m2: 1,000 mg twice daily. *Mycophenolate sodium delayed-release tablets (Myfortic):* Children ≥5 years and Adolescents: 400 mg/m2/dose twice daily; maximum daily dose: 1,440 mg/day; avoid partial tablet doses by rounding	

	doses to nearest whole tablet size as follows: BSA <1.19 m2: Use of this formulation is not recommended. BSA 1.19 to 1.58 m2: 540 mg twice daily. BSA >1.58 m2: 720 mg twice daily. **Note**: Mycophenolate sodium delayed release 720 mg twice daily was shown to be bioequivalent to mycophenolate mofetil 1,000 mg twice daily.	
Azathioprine	**<u>Adult:</u>** 100 mg PO daily. **<u>Pediatrics:</u>** Infants, Children, and Adolescents: IV, Oral: Initial: 3 to 5 mg/kg/dose once daily, beginning at the time of transplant; maintenance: 1 to 3 mg/kg/dose once daily	- Alternative to mycophenolate. - Azathioprine may be used in a low-risk population as an immunosuppressive drug, especially for patient intolerant to mycophenolate formulations.
Belatacept **(Not registered in SFDA list)**	- IV q 2 weeks × 5 doses then monthly, - Belatacept doses are 10 mg/kg if <6 months post-transplant; otherwise 5 mg/kg per dose.	- Has been used in KTRs as an alternative to ciclosporin Calcineurin inhibitors tapered to 50% of baseline dose by week 2, 25% of baseline by week 3, and discontinued by week 4. - Maximize MMF dose to 2 g/day as tolerated.

4- Recipients At-Risk for HBV

Very high risk: Donors with HBs Ag positive: Not routinely accepted.		
High risk: Recipient is HBs Ag positive: Patient should be seen by hepatology pre-transplant and cleared for transplant after viremia is negative before consideration as a transplant recipient. - Entecavir , Tenofovir (in cases of prior Lamivudine treatment or resistance), or Lamivudine for life post-transplant. - HBV DNA tested post op (initially q 1, 3, and 6 months for a year, yearly).		
Moderate risk: (A core positive donor, HBs Ag negative and HBDNA negative) to a "susceptible" recipient(HBs Ab <10): - Lamivudine for 1 year or longer while checking HBV DNA q 1, 3, 6, and 12 months for 1 year. - After transplantation, HBV vaccination is recommended for all nonimmune transplant recipients (strong; low).		
Low risk: Donor is anti-HB core positive, HBs Ag negative and/or HBDNA negative to naturally immune or vaccinated recipient (HBs Ab >10). - Recipients who have prior vaccination or have cured themselves of HBV (core and surface antibody positive, all else including HBV DNA negative) no treatment is required. - If the HBs Ab titer is low can consider Lamivudine initially for 1 year. - While checking HBVDNA 1, 3, and 6 months		
Special risk: Recipient requires Rituximab but is also HBcore positive or received HBcore positive donor - Lamivudine 100 mg per day for life (dosed per eGFR).		
For early discontinuation of prophylaxis: refer to Hepatology.		

Medication	Dose	Notes
Entecavir (off-label)	0.5 mg PO daily (adjusted for eGFR)	according to *Saudi guidelines* Lamivudine can be used in high and moderate risk patients and recipient requires rituximab but is also HBcore positive or received HBcore positive donor **BUT** according *American Gastroenterological Association Institute Guideline on the Prevention and Treatment of Hepatitis B Virus Reactivation During Immunosuppressive Drug Therapy:* suggests using entecavir or tenofovir (high barrier to resistance) over lamivudine for high to moderate reipients. Treatment should be continued for at least 6 months after discontinuation of immunosuppressive therapy (at least 12 months for B cell– depleting agents eg rituximab)
Lamivudine	100 mg PO daily	
Tenofovir	300 mg PO daily	

Conclusion: Entecavir or Tenofovir are recommended over lamivudine. Prophylaxis should be continued for at least 6 months after discontinuation of immunosuppressive therapy (at least 12 months for B cell– depleting agents. eg rituximab)

5- **Pre-medications to prevent infusion reactions**

Medication	Dosing	Notes
Diphenhydramine	50 mg	Premedication with corticosteroids, acetaminophen, and/or an antihistamine 30-60 min prior to infusion to reduce the incidence and severity of infusion-related reactions is recommended with: - Rabbit Thymoglobulin, - Alemtuzumab, - Rituximab
Acetaminophen	500-1000 mg	
Methylprednisolone	500 mg	

6-Medications Recipient At-Risk for Recurrent aHUS

Patients need to be stable and without active features of ahus (atypical hemolytic uremic syndrome) for at least 6 months before transplantation.

A- Vaccination prophylaxis before the use of Eculizumab

Medication	Dosing	Notes
Meningococcal Vaccination	For Those with Increased Risk of Infection) a dose of 0.5 mL IM as a single dose or as a 2-dose series (depending on degree of risk) given at least 8 weeks apart; give 1 additional dose every 5 years if increased risk remains	- Meningococcal vaccination 14 days before the first dose of Eculizumab - Consider antibiotic prophylaxis, if the first dose given within 2 weeks from vaccination.
Pneumococcal vaccine 13	If the recipient receives the first dose of PCV13, it should be followed by PPSV23 at about 8 weeks later. If that recipient had received PPSV23 in the past, a PCV13 dose should be administered after at least a year only. If the recipient who has received PPSV23 requires further doses of PPSV23, it should be administered at least 5 years after the last dose of PPSV23.	If not previously immunized): at least 2 weeks before the first dose of eculizumab.

Hemophilus influenza B	Single dose.	If not previously immunized: at least 2 weeks before the first dose of eculizumab.
Pneumococcal polysaccharide vaccine (Pneumovax 23)	8 weeks after Prevnar 13	If not previously immunized): at least 2 weeks before the first dose of eculizumab.

B- Antibiotic prophylaxis before the use of Eculizumab

Medication	Dosing	Notes
Ciprofloxacin	**Adults:** 400 mg IV or 500 mg PO BID × 14 days **Infants, Children, and Adolescents**: Oral: Immediate release: 20 mg/kg as a single dose, maximum dose 500 mg/dose	-----
Penicillin (off-label)	250 mg PO BID	After 14 days of ciprofloxacin, give Penicillin 250 mg PO BID or erythromycin (if penicillin allergic) while on eculizumab therapy.
Erythromycin	250 mg PO BID	After 14 days of ciprofloxacin, give Penicillin 250 mg PO BID or erythromycin (if penicillin allergic) while on eculizumab therapy.

C- The use of Eculizumab

Medication	Dosing	Notes
Eculizumab **(Not registered in SFDA list)**	**For patients 18 years of age and older:** - Induction dosing: Eculizumab 900 mg weekly for 4 doses. - Maintenance dosing: Eculizumab 1200 mg at week 5 then Eculizumab 1200 mg every 2 weeks thereafter. **For patients, <18 years of age:** 1- 2 months to 17 years; 40 kg or greater:	-----

	Initial: 900 mg by IV infusion weekly for 4 doses. Maintenance: 1200 mg for the fifth dose 1 week later, and then 1200 mg every 2 weeks thereafter. 2- 2 months to 17 years; 30 kg to less than 40 kg: Initial: 600 mg by IV infusion weekly for the first 2 weeks. Maintenance: 900 mg for the third dose 1 week later, and then 900 mg every 2 weeks thereafter. 3- 2 months to 17 years; 20 to less than 30 kg: Initial, 600 mg by IV infusion weekly for the first 2 weeks. Maintenance, 600 mg for the third dose 1 week later, and then 600 mg every 2 weeks thereafter. 4- 2 months to 17 years; 10 to less than 20 kg: Initial, 600 mg by IV infusion for the first dose. Maintenance, 300 mg for the second dose 1 week later, and then 300 mg every 2 weeks thereafter. 5- 2 months to 17 years; 5 to less than 10 kg: Initial: 300 mg by IV infusion weekly for the first week. Maintenance, 300 mg for the second dose 1 week later, and then 300 mg every 3 weeks thereafter.	

B- Post-Operative Medications:

1- Kidney Transplant Prophylaxis Medications:

		Notes
Medication	**Dosing**	

	Adults:	
	A. High immunologic risk:	**NB.**
Sirolimus		Sirolimus concentrations are dependent on the assay method (eg, chromatographic and immunoassay) used; assay methods are not interchangeable. Determine the assay method used to assure consistency (or accommodations if changes occur) and for monitoring purposes, be aware of alterations to assay method or reference range. Refer to specific protocol for target sirolimus concentration goals.
	1- For weight less than 40 kg:	Serum trough concentration goals for renal transplantation (based on HPLC methods):
	Initial loading dose, 3 mg/m(2) ORALLY as soon as possible on day 1 post-transplantation,	

	<u>Maintenance,</u> 1 mg/m(2)/day orally once daily starting on day 2 post transplantation in combination with: cyclosporine starting at up to 7 mg/kg/day in divided doses and prednisone ORALLY starting at a minimum of 5 mg/day	**Concomitant cyclosporine**: 4 to 12 ng/mL
	<u>2- For weight 40 kg or more</u>	**Low to moderate immunologic risk (after cyclosporine withdrawal):**
	<u>Initial, loading</u> dose up to 15 mg ORALLY as soon as possible on day 1 post transplantation,	8 to 12 ng/mL

	<u>Maintenance,</u> 5 mg ORALLY once daily starting on day 2 post transplantation in combination with cyclosporine starting at up to 7 mg/kg/day in divided doses and prednisone ORALLY starting at a minimum of 5 mg/day	
		High immunologic risk (with cyclosporine):
		10 to 15 ng/Ml
	B- Low to moderate immunologic risk; Prophylaxis	
		When combined with tacrolimus and mycophenolate mofetil (MMF) without steroids: 6 to 8 ng/mL
	<u>1- For weight less than 40 kg</u>	
	<u>loading,</u> 3 mg/m(2) ORALLY, **<u>maintenance</u>**, 1 mg/m(2)/day ORALLY once daily	**As a substitute for tacrolimus (starting 4 to 8 weeks posttransplant), in combination with MMF and steroids**:

		8 to 12 ng/mL
	2- For weight 40 kg or more **loading,** 6 mg ORALLY, **maintenance**, 2 mg ORALLY once daily	
		Following conversion from tacrolimus to sirolimus >6 months posttransplant due to chronic allograft nephropathy: 4 to 6 ng/mL
	Pediatrics:	
	prophylaxis of organ rejection low to moderate immunologic risk: Oral:	
	Conversion from tacrolimus in patients with stable graft function:	

	Initial maintenance dose: 3 mg/m2/day divided every 12 hours; adjust dose to achieve target sirolimus serum trough concentration.	
	In one trial, a loading dose of 5 mg/m2 on day 1 was used, followed by maintenance doses of 3 mg/m2/day divided every 12 hours.	
	Manufacturer's recommendations: Adolescents:	
	Weight <40 kg: Loading dose:	
	3 mg/m2 on day 1; initial maintenance dose: 1 mg/m2/day divided every 12 hours or once daily; adjust dose to achieve target sirolimus trough blood concentration	

	Weight ≥40 kg: Loading dose:	
	6 mg on day 1; maintenance: 2 mg once daily; adjust dose to achieve target sirolimus trough blood concentration**.**	

	Dosage adjustment: Sirolimus dosages should be adjusted to maintain trough concentrations within desired range based on risk and concomitant therapy; maximum daily dose: 40 mg/day. Dosage should be adjusted at intervals of 7-14 days to account for the long half-life of sirolimus; in children receiving twice-daily dosing, serum concentrations should be checked earlier due to pharmacokinetic differences. In general, dose proportionality may be assumed. New sirolimus dose equals current dose multiplied by (target concentration/current concentration). Note: If large dose increase is required, consider loading dose calculated as:	

	Loading dose equals (new maintenance dose minus current maintenance dose) multiplied by 3	
	Maximum daily dose: 40 mg/day; if required dose is >40 mg (due to loading dose), divide over 2 days. Serum concentrations should not be used as the sole basis for dosage adjustment (monitor clinical signs/symptoms, tissue biopsy, and laboratory parameters).	

	Maintenance therapy after withdrawal of cyclosporine: Following 2-4 months of combined therapy, withdrawal of cyclosporine may be considered in low to moderate risk patients. Cyclosporine should be discontinued over 4-8 weeks, and a necessary increase in the dosage of sirolimus (up to fourfold) should be anticipated due to removal of metabolic inhibition by cyclosporine and to maintain adequate immunosuppressive effects.	
Co-trimoxazole (Sulfamethoxazole 400/trimethoprim 80 mg)	**Adult:** 1 tablet PO daily for 6-9 months **Pediatrics:** **Prophylaxis:**	The preferred regimen for PCP prophylaxis.

	Infants (at least 4 weeks of age) and Children: Oral: 5 to 10 mg TMP/kg/day or 150 mg TMP/m2/day; dose may be given as a single daily dose or in divided doses every 12 hours given 2 to 3 days per week on consecutive days or alternating days; maximum daily dose: TMP 320 mg/day	
	Adolescents: Oral: 80 to 160 mg TMP daily or alternatively, 160 mg TMP 3 times weekly	
	Treatment:	

	Infants >2 months and Children: Initial: IV: 15 to 20 mg TMP/kg/day in divided doses every 6 hours for 21 days; as acute pneumonitis subsides in patients with mild to moderate disease and no malabsorption issues nor diarrhea, may transition to oral therapy of same daily dose (15 to 20 mg/kg/day TMP) administered in divided doses 3 or 4 times daily	
	Adolescents:	
	Mild to moderate: Oral: 15 to 20 mg TMP/kg/day in 3 divided doses for 21 days or alternatively, 320 mg TMP 3 times daily for 21 days	

	Moderate to severe: **Initial: IV:** 15 to 20 mg TMP/kg/day in 3 to 4 divided doses for 21 days; may switch to oral after clinical improvement	
Dapsone	**Adults:**	Alternatives for Co-trimoxazole in case of allergy PCP prophylaxis.
(off-label)	100 mg orally daily .	
	Pediatrics:	
	Infants and Children: 2 mg/kg/dose once daily; maximum dose: 100 mg/dose	
	Adolescents: 100 mg/day in 1 or 2 divided doses.	
Pentamidine	**Adults:**	Alternatives for Co-trimoxazole in case of allergy PCP prophylaxis.
(Not registered in SFDA list)	300 mg every 3 or 4 weeks	
(off-label use)	**Children ≥5 years and Adolescents: Inhalation:** 300 mg once monthly (every 4 weeks)	
Atovaquone	**Adults:**	Alternatives for Co-trimoxazole in case of allergy PCP prophylaxis.
	750 mg (5 mL) orally twice daily.	

	Pediatrics :	
	1 to 3 months: 30 mg/kg/day once daily	
	4 to 24 months: 45 mg/kg/day once daily	
	>24 months: 30 mg/kg/day once daily; maximum daily dose: 1,500 mg/day	
	Adolescents: Oral: 1,500 mg once daily	
Nystatin	**Adults:**	For Fungal prophylaxis
	500,000 units (5 mL) swish and swallow PO 4 × daily after meals for the duration of high dose steroid (or when prednisolone is at 5 mg/day)	
	Pediatrics:	
	Infants: Oral: 200,000 to 400,000 units 4 times daily or 100,000 units to each side of mouth 4 times daily; one study of 14 patients (neonates and infants) found higher cure rates using 400,000 units/dose 4 times daily	

	Children and Adolescents: Oral:	
	400,000 to 600,000 units 4 times daily; administer half of dose to each side of mouth; swish and retain in the mouth for as long as possible before swallowing	
Clotrimazole	**<u>Adults:</u>**	For Fungal prophylaxis
	10 mg Buccal BID × 3 months then discontinue or continue BID if indicated for tacrolimus level maintenance.	
	Children ≥3 years and Adolescents: Oral:	
	10 mg troche dissolved slowly 5 times daily for 14 consecutive days	
Acyclovir (off-label)	**Herpes simplex virus prophylaxis**: (HSV-seropositive patients who do not require CMV prophylaxis): Oral: 400 to 800 mg twice daily	HSV & HZV
		Prophylaxis:
	Varicella zoster virus: (VZV-seropositive patients who do not require CMV prophylaxis): Oral: 200 mg 3 to 5 times daily.	- Most commonly, and based on the available evidence, antiviral prophylaxis is usually continued for 90–180

		days following transplantation
		and during periods of lymphodepletion associated with treatment of rejection
	Pediatrics:	
	HSV prophylaxis	
	Oral: Children ≥2 years and Adolescents: 200 mg every 4 hours while awake (5 doses daily) or 200 mg every 8 hours.	
	Varicella (chickenpox) or Herpes zoster (shingles), prophylaxis:	
	Oral: 20 mg/kg/dose 4 times daily for 7 days; maximum dose: 800 mg/dose.	
Valganciclovir	**<u>Pediatrics:</u>**	Used for CMV prophylaxis, duration of prophylaxis is dependent on type of transplant, as well as donor and recipient CMV serostatus
	Oral: Dosing based on BSA and CrCl calculation using modified Schwartz formula which bases k constant on age*:	
	Dose (mg) = 7 x BSA x CrCl* administered once daily	
	Maximum daily dose: 900 mg/day**.**	

					Adults: Dose refer to table below	
Donor's	**Recipient's**	**Duration**	**eGFR**			
CMV Ig	**CMV Ig**		**>40**	**25–39**	**10–24**	**<10**
+ve, -ve or	Positive	3 months	450 mg daily	450 mg	450 mg	100 mg
unknown				3 times	twice	3 times
				a week	weekly	a week
						after
						HD
Positive	Negative	6 months	900 mg daily	900 mg	900 mg	
				3 times	twice	
				a week	weekly	
Negative	Negative	Acyclovir for HSV only for 3 months.				

Medication	Dosing	Notes
Esomeprazole (Off-Label)	40 PO daily ×3 months	For ulcer prophylaxis
Atorvastatin	10 mg for >30 year old patients. (post transplantation),	For Hyperlipidemia
Ergocalciferol	50,000 units once/month for all post TX patients.	KTRs suffering from osteoporosis or at high potential risk should be considered for

		steroid avoiding immunosuppression
Isoniazid	**<u>Adults:</u>** 300 mg PO daily for 9 months **<u>Pediatrics</u>**: Daily regimen: Oral: 10 to 20 mg/kg/dose once daily for 6 to 9 months; maximum dose: 300 mg/dose Twice-weekly regimen: Oral: 20 to 40 mg/kg/dose twice weekly for 6 to 9 months; maximum dose: 900 mg/dose	- For selected patients, prophylaxis against mycobacterium tuberculosis - Can be administered pre-or post-transplant (preferably pre for deceased donor kidney transplant).
Pyridoxine (off-label)	**<u>Adults</u>**: 50 mg PO daily ×9 months	- Peripheral neuropathy associated with isoniazid therapy for Mycobacterium tuberculosis (prevention).

Praziquantel	60 mg/kg/day orally in 3 divided doses.	Recipient At-Risk for Schistosoma

2-**<u>Vaccination</u>**

- Prior to transplantation, each patient's vaccination and exposure history should be reviewed in detail and any indicated vaccinations should be administered.
- KTRs should be vaccinated with inactivated viruses as per the normal population**. This is discussed in details in a separate document.**
- Vaccination should probably be carried out at least 3 months and preferably 6 months after transplantation when the immunosuppression has been reduced**.**

Medication	Dosing	Notes
Inactivated vaccines		
Flu vaccine (inactivated)	Single dose	Is recommended annually to all post-transplant patients. to wait for 3-month post-transplant before vaccination in fresh transplantation
Pneumovac **23 valent polysaccharide vaccine**	- If the recipient receives the first dose of PCV13, it should be followed by PPSV23 at about 8 weeks later. - If that recipient had received PPSV23 in the past,	------

(PPSV23) and/or **13 valent conjugate vaccine (PCV13)**	a PCV13 dose should be administered after at least a year only. – If the recipient who has received PPSV23 requires further doses of PPSV23, it should be administered at least 5 years after the last dose of PPSV23.	
Meningococcal vaccine	For Those with Increased Risk of Infection) a dose of 0.5 mL IM as a single dose or as a 2-dose series (depending on degree of risk) given at least 8 weeks apart; give 1 additional dose every 5 years if increased risk remains	At least 2 weeks before Eculizumab. Maybe reasonable for those who undergo a desensitization protocol
Hepatitis B virus	Administer an additional hepatitis B dose.	Should have HBsAb levels rechecked annually and consider revaccination if

		antibody titres fall below 10mIU/ml
Live vaccinations **Contraindicated post-transplantation and/or for immunosuppressed patients**		
Varicella Virus Vaccine	Two doses of 0.5 mL separated by ≥4 weeks (4 to 8 weeks apart per ACIP) all children and adults without evidence of immunity receive 2 doses of the vaccine; those who received only 1 dose of a varicella-containing vaccine receive a second dose	- Nonimmune renal transplant candidates prior to transplantation; can be given as early as 6 months of age in children. - **A minimum of 4 weeks is recommended between vaccination with live attenuated vaccines and transplantation**

2- Treatment of Acute Rejection:

A- Cellular Mediated Rejection (acute cellular rejection)

Medication	Dosing	Notes
Methylprednisolone	500 mg, 250 IV over three days. **Then Prednisone** taper rapidly to the	Give methylprednisolone over 15–30 min, (rapid administration can result in hypotension or cardiac arrest).

	same dose the patient had been taking prior to the episode.	
Alemtuzumab	Two doses of 30 mg	If re-biopsy shows no antibody-mediated rejection but evidence of refractory cellular mediated rejection,)

B- Antibody-Mediated Rejection

Medication	Dosing	Notes
Methylprednisolone	500 mg, 250 IV over three days. **Then Prednisone** taper rapidly to the same dose the patient had been taking prior to the episode.	- Give methylprednisolone over 15–30 min, (rapid administration can result in hypotension or cardiac arrest).
Immunoglobulin (off-label)	IV, 500 mg/kg × 4 (total 1–2 g/kg	
Bortezomib (off-label)	Bortezomib IV or Sub Q 1.3 to 1.5 mg/m2 on days 1, 4, 8, and 11 for a total of 4 doses.	If refractory antibody-mediated rejection
Rituximab (off-label)	375 mg/m2 after PP/intravenous	- If refractory antibody-mediated rejection,

	immunoglobulin completion	alternative to Bortezomab - Prophylaxis with Entecavir 0.5 mg once po daily adjusted to renal function for recipients who are HBsAg positive or HBcAb positive with HBsAb titre is recommended.

C- Treatment of Cytomegalovirus Disease

Medication	Dosing	Notes
Ganciclovir **(Not registered in SFDA list)**	**<u>Adults:</u>** IV 5 mg/kg q 12 h and cautious reduction of immunosuppression × 2 weeks minimum **<u>Pediatrics:</u>**	- For Sever Cytomegalovirus Disease - Treatment duration is until resolution of clinical symptoms and virologic clearance then secondary prophylaxis for 1–3 months. - Please refer to the table below for dose adjustment for adults. (Pediatrics: There are no pediatric-specific recommendations; based on experience in adult patients,

	IV: 5 mg/kg/dose every 12 hours; individualize duration based on CMV blood concentrations; some institutions decrease frequency to every 24 hours after 2 weeks	dosage adjustment necessary.)
Valganciclovir	**<u>Adults:</u>** PO 900 mg PO BID and cautious reduction of immunosuppression ×2 weeks minimum.	- For Mild to Moderate Cytomegalovirus Disease - Treatment duration is until resolution of clinical symptoms and virologic clearance then secondary prophylaxis for 1–3 months. - Please refer to the table below for dose adjustment. Infants ≥1 month, Children, and Adolescents ≤16 years: BSA and CrCl based dosing calculation: No additional dosage adjustments required; dosing

	<u>Pediatrics:</u> **Note:** Limit CrCl value used in equation below to 150 mL/minute/1.73 m2 regardless of CrCl calculated in order to avoid overexposure**.** **Infants, Children, and Adolescents:** **Oral:** Dosing based on BSA and CrCl calculation using modified Schwartz formula which bases k constant on age*: Dose (mg) = 7 x BSA x CrCl* administered every 12 hours Maximum dose: 900 mg/dose**.**	equation adjusts for renal function using modified Schwartz equation*.
Intravenous Ganciclovir		
CrCl	Treatment dose	Maintenance dose
≥70	5 mg/kg Q12 Hr	5 mg/kg Q24 Hr

50–69	2.5 mg/kg Q12 Hr	2.5 mg/kg Q24 Hr
25–49	2.5 mg/kg Q24 Hr	1.25 mg/kg Q24 Hr
10–24	1.25 mg/kg Q24 Hr	0.625 mg/kg Q24 Hr
<10	1.25 mg/kg 3 times a week after HD	0.625 mg/kg 3 times a week after HD
Valganciclovir		
>60	900 mg Q12 Hr	450 mg daily
40–59	450 mg Q12 Hr	450 mg daily
25–39	450 mg daily	450 mg every 2 days
10–24	450 mg every 2 days	450 mg twice weekly
<10	200 mg 3 times a week after HD‡	450 mg once/week (or 100 mg 3 times a week after HD)