Tacrolimus – renal transplant

<table>
<tr><th></th><th colspan="2">Recommendations</th><th>Notes/Evidence</th></tr>
<tr><td>Initiation</td><td colspan="2">Post-operative day 1</td><td rowspan="3">• Initiation of tacrolimus should start before or at the time of transplant, rather than delayed until the onset of graft function (UW Health, Very Low, Conditional)
• Capsules and suspension may be taken with or without food. Since the presence of food affects the bioavailability of tacrolimus, if taken with food, it should be taken consistently the same way each time. (UW Health, Very Low, Conditional)
• Tacrolimus may be given sublingually in patients unable to adequately absorb enteral formulations or in those unable to take oral. If a patient is being transitioned to tacrolimus sublingual from tacrolimus IR, each dose should be divided by 2 and given sublingually. (UW Health, Very Low, Conditional)
• Use of IV tacrolimus is reasonable for patients unable to adequately absorb enteral formulations, and conversion from IV to oral tacrolimus is recommended as soon as enteral therapy can be tolerated to minimize risk of anaphylactic reactions that occur with injectables containing castor oil derivatives. (UW Health, Very Low, Conditional)
• Tacrolimus ER may be utilized in patients with documented intolerable adverse effects with tacrolimus IR or who are unable to obtain a therapeutic drug concentration with the IR formulation. If a patient is being transitioned to tacrolimus ER (Envarsus®) from tacrolimus IR, the total daily dose should be multiplied by 0.8, then rounded to the nearest capsule size. (UW Health, Very Low, Conditional)</td></tr>
<tr><td>Dosing (initial)</td><td>Decreased sensitivity (African-American, >80kg)</td><td>0.1 mg/kg/day (use ABW), by mouth divided in 2 doses twice daily, rounded to nearest capsule size</td></tr>
<tr><td></td><td>Increased sensitivity (NPO, <80kg)</td><td>Fixed dose 2 mg by mouth twice daily</td></tr>
<tr><td>Drug-drug Interactions (not an all-inclusive list)</td><td>Increases tacrolimus concentration
Check Lexicomp for dose adjustments
<u>Adjust tacrolimus dose empirically:</u>
• Fluconazole
• Posaconazole
• Voriconazole
• Ritonavir
• Letermovir
<u>Monitor tacrolimus levels and adjust as needed:</u>
• Clarithromycin
• Erythromycin</td><td>Decreases tacrolimus concentration
Check Lexicomp for dose adjustments
<u>Monitor tacrolimus levels and adjust as needed:</u>
• Rifampin
• Phenytoin
• Carbamazepine
• Phenobarbital</td></tr>
<tr><td>Target levels

Dose Adjustments

Labs</td><td>Concurrent use of mycophenolate +/- prednisone

Tacrolimus goals may differ if patient is not on mycophenolate +/- prednisone regimen. Goal level should be discussed with provider.

<table><tr><th></th><th>Target TAC Trough Level</th></tr><tr><td>DGF</td><td>7-9 ng/mL</td></tr><tr><td>0-3 months:</td><td>8-11 ng/mL</td></tr><tr><td>3-6 months:</td><td>7-9 ng/mL</td></tr><tr><td>6-12 months:</td><td>6-8 ng/mL</td></tr><tr><td>>12 months:</td><td>5-7 ng/mL</td></tr></table>
<table><tr><td>Below/Above Target</td><td></td></tr><tr><td><u>≥</u>50%</td><td>Adjust dose by 25-50%</td></tr><tr><td><50%</td><td>Adjust dose by 25%</td></tr></table>*Holding doses may be necessary</td><td><u>Laboratory Monitoring:</u>
Tacrolimus (trough), potassium, and creatinine
Inpatient: Daily
Post-Discharge:<table><tr><th>Day</th><th>Frequency</th></tr><tr><td>0-90</td><td>Not less than weekly</td></tr><tr><td>91-180</td><td>Not less than twice monthly</td></tr><tr><td>181-2 years</td><td>Not less than once monthly</td></tr><tr><td>>2 years</td><td>Not less than quarterly</td></tr></table>As Needed:
• Change in medication formulation, patient status, or creatinine increase <u>≥</u>0.3 mg/dL above baseline
• 3 to 7 days (ideally 4 days) following dose adjustment</td></tr>
</table>

Adverse effects	Acute kidney injury	• Assess tacrolimus trough level for correlation with elevated creatinine • If trough level is above goal and creatinine has increased ≥ 0.3 mg/dL above baseline: o Decrease tacrolimus dose if trough is <4 ng/mL above goal o Hold tacrolimus if trough ≥5 ng/mL above goal and consider increasing current prednisone dose
	Neurological symptoms (tremor, headache)	• Assess tacrolimus trough level for correlation with tremors or headache • If trough level is above goal, adjust tacrolimus dose and follow up with patient • if trough level within target range, no dose adjustment is recommended, follow-up with patient in 1 week • If adverse effects are intolerable or interacting with daily activities and there is no other known cause of symptom: o Consult the transplant physician to consider converting the patient to tacrolimus ER, belatacept, cyclosporine, or refer to primary care provider for supportive therapy, such as addition of low dose beta blocker (propranolol)
	New onset diabetes after transplantation (NODAT) *Diagnosis* • Sx of DM + casual PG concentrations ≥200 mg/dL • FPG ≥126 mg/dL • 2-hr PG ≥200 mg/dL during an oral glucose tolerance test	• No tacrolimus dose adjustment is recommended • Consider consulting diabetes management & nutrition services • Diagnosis of new onset diabetes after transplant (NODAT) is defined by the World Health Organization (WHO) and American Diabetes Association (ADA) that develops for the first time after transplantation • If there is no improvement in glucose control 6 months after transplant (NODAT requiring insulin OR A1c >7% with glucose lowering agent) and there have been 3 months of minimal glucocorticoid doses o Consult transplant physician and consider converting the patient to cyclosporine

Cyclosporine – renal transplant

<table>
<tr><th></th><th colspan="2">Recommendations</th><th>Notes/Evidence</th></tr>
<tr><td>Initiation</td><td colspan="2">Post-operative day 1</td><td>• The initiation of cyclosporine should start before or at the time of transplantation, rather than delayed until the onset of graft function (UW Health, Very Low, Conditional)</td></tr>
<tr><td>Dosing (initial)</td><td>Decreased sensitivity (African-American, >80kg)</td><td>Fixed dose 150 mg by mouth twice daily</td><td rowspan="3">• Neoral/Gengraf (cyclosporine modified) and Sandimmune (cyclosporine non-modified) are not bioequivalent and cannot be used interchangeably (UW Health, Very Low, Conditional)
• Capsules and suspension may be taken with or without food. However, since the presence of food affects the bioavailability of cyclosporine, if taken with food, it should be taken consistently the same way each time. (UW Health, Very Low, Conditional)</td></tr>
<tr><td></td><td>Increased sensitivity (NPO, <80kg)</td><td>Fixed dose 100 mg by mouth twice daily</td></tr>
<tr><td>Drug-Drug Interactions (not an all-inclusive list)</td><td>Increases cyclosporine concentration
Check Lexicomp for dose adjustments
<u>Adjust cyclosporine dose empirically:</u>
• Fluconazole
• Posaconazole
• Voriconazole
• Ritonavir
• Letermovir
<u>Monitor cyclosporine levels and adjust as needed:</u>
• Clarithromycin
• Erythromycin</td><td>Decreases cyclosporine concentration
Check Lexicomp for dose adjustments
<u>Monitor cyclosporine levels and adjust as needed:</u>
• Rifampin
• Phenytoin
• Carbamazepine
• Phenobarbital</td></tr>
<tr><td>Target levels

Dose Adjustments

Labs</td><td>
<table>
<tr><th></th><th>Goal CSA Level</th></tr>
<tr><td>0-3 months:</td><td>200-300 ng/mL</td></tr>
<tr><td>3-6 months:</td><td>150-250 ng/mL</td></tr>
<tr><td>6-12 months:</td><td>100-200 ng/mL</td></tr>
<tr><td>>12 months:</td><td>50-100 ng/mL</td></tr>
</table>
<table>
<tr><td>Below/Above Target</td><td></td></tr>
<tr><td>≥50%</td><td>Adjust dose 25% to 50%</td></tr>
<tr><td>≤50%</td><td>Adjust dose by 25%</td></tr>
</table>
*Holding doses may be necessary
</td><td><u>Laboratory Monitoring:</u>
Cyclosporine (trough), potassium, and creatinine
Inpatient: Daily
Post-Discharge:
<table>
<tr><td>Day</td><td>Frequency</td></tr>
<tr><td>0-90</td><td>Not less than weekly</td></tr>
<tr><td>91-180</td><td>Not less than twice monthly</td></tr>
<tr><td>181-2 years</td><td>Not less than once monthly</td></tr>
<tr><td>>2 years</td><td>Not less than quarterly</td></tr>
</table>
As Needed:
• Change in medication formulation, patient status, or creatinine increase ≥0.3 mg/dL above baseline
• 3 to 7 days (ideally 4 days) following dose adjustment</td></tr>
</table>

Adverse effects	Acute kidney injury	• Assess cyclosporine trough level for correlation with elevated creatinine • If trough level is above goal and creatinine has increased ≥ 0.3 mg/dL above baseline: o Decrease cyclosporine dose if trough is <50 ng/mL above goal o Hold cyclosporine if trough ≥50 ng/mL above goal and consider increasing current prednisone dose
	Neurological symptoms (tremor, headache)	• Assess cyclosporine trough level for correlation with tremors or headache • If trough level is above goal, adjust cyclosporine dose and follow up with patient • if trough level within target range, no dose adjustment is recommended, follow-up with patient in 1 week • If adverse effects are intolerable or interacting with daily activities and there is no other known cause of symptom: o Consult the transplant physician to consider converting the patient to tacrolimus ER, belatacept, or refer to primary care provider for supportive therapy, such as addition of low dose beta blocker (propranolol)
	New onset diabetes after transplantation (NODAT) *Diagnosis* • Sx of DM + casual PG concentrations ≥200 mg/dL • FPG ≥126 mg/dL • 2-hr PG ≥200 mg/dL during an oral glucose tolerance test	• No cyclosporine dose adjustment is recommended • Consider consulting diabetes management & nutrition services • Diagnosis of new onset diabetes after transplant (NODAT) is defined by the World Health Organization (WHO) and American Diabetes Association (ADA) that develops for the first time after transplantation • If there is no improvement in glucose control 6 months after transplant (NODAT requiring insulin OR A1c >7% with glucose lowering agent) and there have been 3 months of minimal glucocorticoid doses: o Consult transplant physician

Belatacept – renal transplant

	Recommendation		Notes/Evidence
Dosing	Induction dosing (starting post-transplant or converting from CNI <6 months from transplant)	Day 0, day 4: 10 mg/kg/dose Ends of weeks 2, 4, 8, 12: 10 mg/kg/dose 5 mg/kg/dose every 4 weeks (±3 days) starting at week 16	• Indicated for use in patients who are EBV seropositive as a replacement for CNIs or to allow for CNI minimization (UW Health, Very Low, Conditional) • EBV serostatus should be evaluated prior to initiation of belatacept (UW Health, Very Low, Strong)
	Conversion dosing w/ CNI taper (converting from CNI to belatacept >6 months from transplant)	Initial phase: - Day 0: 5 mg/kg/dose - End of weeks 2, 4, 6, and 8: 5 mg/kg/dose Maintenance phase: - 5 mg/kg/dose every 4 weeks (±3 days) starting end of week 12 CNI taper: - 100% of previous dose on days 1-14 - 50% of previous dose on days 15-28 - 25% of previous dose on days 29-41 - Discontinue CNI on day 42	
	Conversion dosing with no CNI taper (converting from CNI to belatacept >6 months from transplant)	Initial phase: - Day 0: 10 mg/kg/dose - End of weeks 2, 4, 6, and 8: 10 mg/kg/dose Maintenance phase: - 5 mg/kg/dose every 4 weeks (±3 days) starting end of week 12	
Labs	<u>Laboratory Monitoring:</u> **Prior to initiation**: EBV serostatus		
Adverse effects	Post-transplant lymphoproliferative disorder (PTLD)	• Consult transplant provider if concerns for PTLD (weight loss, fatigue, unexplained anemia/thrombocytopenia/leukopenia, hypercalcemia)	

Mycophenolate – renal transplant

<table>
<tr><th></th><th colspan="2">Recommendation</th><th>Notes/Evidence</th></tr>
<tr><td>Initiation</td><td colspan="2">Post-operative day 1</td><td rowspan="3">• Full dose mycophenolic acid is the preferred anti-proliferative medication used for renal transplant patients (UW Health, Very Low, Conditional)
• IV mycophenolate mofetil is indicated if the patient has an acute condition that affects gastrointestinal absorption (i.e., GI bleed or obstruction, malabsorption syndromes, severe diarrhea or severe vomiting) (UW Health, Very Low, Conditional)
• Mycophenolate mofetil suspension is utilized for patients receiving medications via nasogastric or orogastric tube</td></tr>
<tr><td>Dosing (initial)</td><td>Mycophenolate sodium (Myfortic)
Mycophenolate mofetil (Cellcept)</td><td>720 mg by mouth twice daily
1000 mg by mouth twice daily</td></tr>
<tr><td>Drug-drug interactions (not an all-inclusive list)</td><td colspan="2">Decreases mycophenolate concentration
Check Lexicomp for dose adjustments
• Cyclosporine</td></tr>
<tr><td>Target levels

Labs</td><td><table><tr><th></th><th>Goal MPA Trough</th></tr><tr><td>CsA based regimens:</td><td>1.3-2.8 mg/L</td></tr><tr><td>TAC based regimens:</td><td>1.9-2.8 mg/L</td></tr></table></td><td><u>Laboratory Monitoring:</u>
• Lab monitoring of MPA levels is not recommended to assess for toxicity or efficacy
• If levels are requested, they are only appropriate for mycophenolate mofetil and should be drawn as a trough</td><td>• MPA AUC is a better predictor of clinical events than MPA trough. Trough levels are poorly correlated with AUC and are not recommended (UW Health, Very Low, Conditional)</td></tr>
<tr><td rowspan="2">Adverse effects</td><td>Diarrhea

If a patient has ≥50% increase in their frequency of daily bowel movements for ≥ 5-7 days
• 0-3 months post-transplant:
o C. difficile, C. difficile toxin B PCR
o CMV PCR
• ≥3 months post-transplant:
o CMV PCR
o Complete blood count
o Clostridium difficile toxin B PCR
o Cryptosporidium
o Giardia PCR
o Norovirus PCR
o Rotavirus AG
o Stool culture, with E. Coli (Shiga) toxin
o Stool O&P (parasitology, isospora, cyclospora, pinworm)
o Consider colonoscopy if diarrhea persists and all stool studies are negative</td><td colspan="2">• If diarrhea work-up is negative for an infectious cause of diarrhea and it is affecting activities of daily living or the patient is having limited and/or decreased oral intake:
o Decrease mycophenolate by 25% and increase dosing frequency (ex. 720 mg BID → 360 mg TID)
▪ If fails, decrease mycophenolate by 50%
o Follow up with patient in 1 week
o If dose is decreased to 180 mg twice daily (MYF) or 250 mg twice daily (MMF) consult provider to determine if other immunosuppression needs to be adjusted
o Consider adding the following:
▪ Add loperamide (Imodium®) 2 mg as needed after each loose stool (max dose: 16 mg daily)
▪ Diphenoxylate/atropine (Lomotil®) 5 mg four times daily as needed (max dose: 20 mg/day)
▪ Psyllium fiber (Metamucil®) 3.4 g daily as needed</td></tr>
<tr><td>Heartburn/nausea</td><td colspan="2">• Counsel patient on taking MYF or MMF with food if not already doing so
• Convert from MMF to MYF if only upper GI complaints (heartburn, nausea)
• Add calcium carbonate as needed, or the addition of an H2RA or PPI if not already on
• If symptoms continue following 1 week of daily therapy increase H2RA or PPI dose to twice daily, reassess in 1 week
• If symptoms persist for ≥1 week, consider EGD to rule out infection vs. ulceration</td></tr>
</table>

Azathioprine – renal transplant

<table>
<tr><th></th><th colspan="2">Recommendation</th><th>Notes/Evidence</th></tr>
<tr><td>Initiation</td><td colspan="2">Failure to tolerate mycophenolate</td><td></td></tr>
<tr><td>Dosing (initial)</td><td colspan="2">1-2 mg/kg by mouth daily</td><td rowspan="3">• Azathioprine is recommended for use in patients unable to tolerate adverse effects of mycophenolate (UW Health, Very Low, Conditional)
• Azathioprine is considered to be less effective than MPA in preventing rejection. Prior to initiating azathioprine, consider the total immunosuppression for the patient and timing out from transplant</td></tr>
<tr><td>Drug-drug interactions (not an all-inclusive list)</td><td colspan="2">Increases azathioprine concentration:
Check Lexicomp for dose adjustments
<u>Avoid concurrent use:</u>
• Febuxostat
<u>Adjust azathioprine dose empirically:</u>
• Allopurinol</td></tr>
<tr><td>Labs</td><td colspan="2"><u>Laboratory Monitoring:</u>
• There is no recommended azathioprine level for monitoring purposes. However, if toxicity is suspected, check thiopurine methyltransferase (TPMT)</td></tr>
<tr><td rowspan="2">Adverse effects</td><td>Leukopenia</td><td>• Consult transplant provider if WBC <3</td><td rowspan="2"></td></tr>
<tr><td>Gastrointestinal

If a patient has ≥50% increase in their frequency of daily bowel movements for ≥ 5-7 days
• 0-3 months post-transplant:
o C. difficile, C. difficile toxin B PCR
o CMV PCR
• ≥3 months post-transplant:
o CMV PCR
o Complete blood count
o Clostridium difficile toxin B PCR
o Cryptosporidium
o Giardia PCR
o Norovirus PCR
o Rotavirus AG
o Stool culture, with E. Coli (Shiga) toxin
o Stool O&P (parasitology, isospora, cyclospora, pinworm)
Consider colonoscopy if diarrhea persists and all stool studies are negative</td><td>• See diarrhea work-up algorithm</td></tr>
</table>

Sirolimus/everolimus – renal transplant

<table>
<tr><th></th><th colspan="2">Recommendations</th><th>Notes/Evidence</th></tr>
<tr><td>Initiation</td><td colspan="2">For use in patients with:
CNI toxicity
Skin cancer
Quadruple therapy</td><td>Sirolimus/everolimus may impair or delay wound healing, and should be used with caution in the peri-surgical period (UW Health, Very Low, Conditional)
Indicated for use in patients with recurrent skin cancers as a replacement for azathioprine, MPA, or CNIs (UW Health, Very Low, Conditional)</td></tr>
<tr><td rowspan="2">Dosing (initial)</td><td>Sirolimus</td><td>6 mg load on day 1, followed by 2 mg by mouth once daily</td><td rowspan="3"></td></tr>
<tr><td>Everolimus</td><td>0.75 mg by mouth twice daily</td></tr>
<tr><td>Drug-drug interactions (not an all-inclusive list)</td><td>Increase mTOR concentration (not an all-inclusive list):
Check Lexicomp for dose adjustments
<u>Avoid concurrent use:</u>
Posaconazole
Voriconazole
Ritonavir
<u>Monitor mTOR levels and adjust as needed:</u>
Fluconazole
Ritonavir
Letermovir
Clarithromycin
Erythromycin</td><td>Decrease mTOR concentration (not an all-inclusive list)
Check Lexicomp for dose adjustments
<u>Monitor mTOR levels and adjust as needed:</u>
Rifampin
Phenytoin
Carbamazepine
Phenobarbital</td></tr>
<tr><td>Target levels

Dose Adjustments

Labs</td><td colspan="2"><table><tr><th></th><th>Goal Trough Levels (SIRO/EVR+TAC)</th><th>Goal Sirolimus Level (SIRO/EVR+MPA)</th></tr><tr><td>0-3 months:</td><td>TAC: 5-7 ng/mL
SIRO/EVR: 4-7 ng/mL</td><td>SIRO/EVR: 8-10 ng/mL</td></tr><tr><td>3-6 months:</td><td>TAC: 5-7 ng/mL
SIRO/EVR: 4-7 ng/mL</td><td>SIRO/EVR: 8-10 ng/mL</td></tr><tr><td>6-12 months:</td><td>TAC: 3-5 ng/mL
SIRO/EVR: 3-5 ng/mL</td><td>SIRO/EVR: 5-8 ng/mL</td></tr><tr><td>>12 months:</td><td>TAC: 3-5 ng/mL
SIRO/EVR: 3-5 ng/mL</td><td>SIRO/EVR: 5-8 ng/mL</td></tr></table><u>Laboratory Monitoring:</u>
Recommended once weekly upon initiation and with any dose changes
When the target trough level has been attained, recommend monitoring levels once monthly</td><td></td></tr>
</table>

Adverse effects	Proteinuria	• Monitor at 6 months and then annually post-transplant per standard lab monitoring • Consider administration of angiotensin-converting enzyme (ACE)-inhibitors and angiotensin II receptor antagonists and reducing mTOR levels
	Mouth ulcers	• Development of mouth ulcers also seems to be dose-related, because they usually appear after the loading dose and often improve after a dose reduction • Addition of a high-potency topical steroid may be considered
	Hyperlipidemia	• Monitor cholesterol and lipids • If hyperlipidemia occurs, follow current guidelines for management (diet, exercise, lipid lowering agents) • Immunosuppressive strategies minimizing doses of mTORs, CNIs, or corticosteroids may help in controlling hyperlipidemia
	Thrombocytopenia	• Consider dose reduction or temporary drug suspension if appropriate

Prednisone – renal transplant

<table>
<tr><th></th><th colspan="2">Recommendations</th><th>Notes/Evidence</th></tr>
<tr><td>Initiation</td><td colspan="2">Post-operative day 4 following dexamethasone taper</td><td>• Prednisone 30 mg once daily will be started on POD 4 following dexamethasone taper and may be continued on discharge</td></tr>
<tr><td rowspan="3">Dosing (initial)</td><td>Standard steroid taper
• Prednisone taper should occur following POD4
• Factors that may influence the duration of prednisone taper:
o Current and historical CNI levels
o Current MPA dose
o Current renal function
o Episodes of rejection</td><td><table>
<tr><td rowspan="2">Dexamethasone</td><td>100 mg</td><td>POD0</td></tr>
<tr><td>50 mg</td><td>POD1</td></tr>
<tr><td rowspan="2">Dexamethasone or Prednisone</td><td>18 mg (dex) or 90 mg (pred)</td><td>POD2</td></tr>
<tr><td>12 mg (dex) or 60 mg (pred)</td><td>POD3</td></tr>
<tr><td rowspan="2">Prednisone</td><td>30 mg</td><td>POD4</td></tr>
<tr><td colspan="2">Discharge on 30 mg and decrease dose by 5 mg each week to a target dose of 10 mg daily</td></tr>
</table></td><td rowspan="3">• Steroid withdrawal can be considered for patients who receive alemtuzumab for induction (UW Health, Very Low, Conditional)
• Rapid steroid taper can be considered for patients who receive alemtuzumab or thymoglobulin for induction (UW Health, Very Low, Conditional)
• Prednisone doses should be split to twice daily dosing for patients requiring insulin for glucose control (UW Health, Very Low, Conditional)</td></tr>
<tr><td>Rapid steroid taper</td><td><table>
<tr><td rowspan="2">Dexamethasone</td><td>100 mg</td><td>POD0</td></tr>
<tr><td>50 mg</td><td>POD1</td></tr>
<tr><td rowspan="2">Dexamethasone or Prednisone</td><td>18 mg (dex) or 90 mg (pred)</td><td>POD2</td></tr>
<tr><td>12 mg (dex) or 60 mg (pred)</td><td>POD3</td></tr>
<tr><td rowspan="3">Prednisone</td><td>30 mg</td><td>POD4</td></tr>
<tr><td>10 mg</td><td>POD5</td></tr>
<tr><td colspan="2">Discharge on 10 mg and consider reduction to 5 mg at week 3 to target dose of 5 mg daily</td></tr>
</table></td></tr>
<tr><td>Early steroid withdrawal</td><td><table>
<tr><td rowspan="2">Dexamethasone</td><td>100 mg</td><td>POD0</td></tr>
<tr><td>50 mg</td><td>POD1</td></tr>
<tr><td rowspan="2">Dexamethasone or Prednisone</td><td>18 mg (dex) or 90 mg (pred)</td><td>POD2</td></tr>
<tr><td>12 mg (dex) or 60 mg (pred)</td><td>POD3</td></tr>
<tr><td rowspan="2">Prednisone</td><td>30 mg</td><td>POD4</td></tr>
<tr><td colspan="2">Steroid withdrawal on POD5</td></tr>
</table></td></tr>
<tr><td>Labs</td><td colspan="3"><u>Laboratory Monitoring:</u>
Glucose, bone mineral density</td></tr>
<tr><td rowspan="3">Adverse effects</td><td>Hyperglycemia</td><td colspan="2">• Prednisone doses should be split to twice daily dosing for patients requiring insulin for glucose control</td></tr>
<tr><td>Heartburn/reflux</td><td colspan="2">• Start a proton pump inhibitor (PPI) at time of transplant
• If a patient complains of heartburn on daily dosing of the PPI, frequency may be increased to twice daily (pending renal function)
• Discontinue PPI in patients with no history of heartburn/gastroesophageal reflux disease (GERD) prior to transplant if prednisone is discontinued</td></tr>
<tr><td>Osteoporosis</td><td colspan="2">• Recommend calcium 2000 mg daily (based on elemental calcium dosing)
• Recommend vitamin D 2000 units daily
• For patients that are on an early steroid withdrawal maintenance immunosuppression regimen, calcium and vitamin D supplementation are not required</td></tr>
</table>