Dear Colleague,

Thank you for resuming the clinical care of our shared patient who has received a kidney transplant in Auckland. By now you will have received a discharge letter and telephone call from our service detailing the progress of your patient up until the time of transfer to your care.

The following is a shared protocol explaining the requirements of care for your patient after this transfer. We will remain in close communication with you and the patient during the first 12 months and thereafter. We ask your local laboratory to send us copies of all laboratory tests undertaken on your patient. We will follow up any relevant results as soon as they come to hand and appreciate being informed promptly of any concerning result or clinical concern that you may have. The renal nurse specialist coordinates clinical care for renal transplant children and should be your first point of contact. Any changes to treatment will be communicated to you and the parents of the patient.

The patient will be scheduled for a 2-3 day review in Starship Hospital at 3 and 12 months post transplantation. The details of the review are in the Outpatient visits section of the protocol. During the first 12 months after transplantation, all diagnostic procedures (except simple blood tests) related to the care of a renal transplant patient (e.g. biopsy) will be undertaken in Auckland unless there is prior agreement.

I hope the shared cared protocol will help with your care of this renal transplant patient. We are happy to discuss any issues with you.

Kind regards

Yours sincerely

Drs William Wong, Tonya Kara, Maria Stack and Chanel Prestidge
Department of Paediatric Nephrology

Shared Care Renal Transplant Guidelines
Paediatric Nephrology Department.
July 2014
Shared Care Guidelines

Paediatric Renal Transplant Recipient
# Table of Contents

- Outpatient Visits ........................................ 4
- Routine Blood and Urine Tests ........................... 5
- Graft Dysfunction .......................................... 6
- Surveillance for Viral Infections ........................
  - CMV .................................................. 7
  - EBV .................................................... 8
- Medications .................................................. 9
- Long term Surveillance .................................... 10
- Renal Transplant Follow Up Clinic Proforma ........... 13
**Outpatient Visits**

For the first 28 days the patient will have been monitored intensively with frequent bloods and review by a Paediatric Nephrologist/ renal nurse specialist at Starship. This is a guide only for a well functioning graft in a stable post transplant patient. NB In order to preserve veins and forearm vasculature for potential haemodialysis access in the future, it is recommended that blood draws be done as microcollections.

<table>
<thead>
<tr>
<th>Time after transplant</th>
<th>Visit Interval</th>
<th>Surveillance for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month 1</td>
<td>3 days per week</td>
<td>Acute rejection, post op complications, adverse drug reactions, hypertension</td>
</tr>
<tr>
<td>Month 2</td>
<td>2 days per week</td>
<td>Acute rejection, infections, adverse drug reactions, hypertension, unexplained lymphadenopathy</td>
</tr>
<tr>
<td>Month 3&amp;4</td>
<td>1 day per week</td>
<td>Acute rejection, infections, adherence, adverse drug reactions, hypertension, unexplained lymphadenopathy</td>
</tr>
<tr>
<td>Month 5&amp;6</td>
<td>Every other week</td>
<td>Acute rejection, adverse drug reactions, infections, adherence, hypertension, unexplained lymphadenopathy, growth</td>
</tr>
<tr>
<td>Month 6-12</td>
<td>Monthly</td>
<td>Acute rejection, adverse drug reactions, infections, adherence, hypertension, unexplained lymphadenopathy, growth, vaccinations</td>
</tr>
<tr>
<td>&gt;12 months</td>
<td>1-3 monthly visit[^b^] 1 monthly labs</td>
<td>Acute rejection, adverse drug reactions, infections, adherence, hypertension, unexplained lymphadenopathy, growth, skin, vaccinations</td>
</tr>
</tbody>
</table>

[^a^] Visit requires blood test plus medical review

[^b^] Timing of visits dependant upon clinical course and interval concerns

Clinic visits should be recorded on the proforma and faxed to 09 307 8938. If a dictated letter is sent please ensure it includes all information that would be included on the proforma.

All paediatric renal transplant recipients should be seen by a Paediatric Nephrologist whenever they have outreach clinics at the patient’s local hospital.

Post transplant, children will be reviewed at Starship Children’s Hospital over 2-3 days at 3 and 12 months for a surveillance biopsy and at 36 and 60 months for general review including consideration of GFR measurement, blood pressure monitoring, growth assessment, vaccination review and possible biopsy.
Post Renal Transplant **Routine Blood and Urine Tests**

Please ensure blood test forms state copy to be sent to renal team at Starship on fax number (09) 3078938.

Additional tests or change in frequency of these tests may be required for more complex patients or those with chronic kidney disease, these patients may have an individualized plan.

<table>
<thead>
<tr>
<th>Investigation</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Electrolytes</td>
<td>As per visit schedule - see above.</td>
</tr>
<tr>
<td>Sodium</td>
<td>Calcium</td>
</tr>
<tr>
<td>Potassium</td>
<td>Phosphate</td>
</tr>
<tr>
<td>Urea</td>
<td>Magnesium</td>
</tr>
<tr>
<td>Creatinine</td>
<td>Albumin</td>
</tr>
<tr>
<td>Glucose</td>
<td></td>
</tr>
<tr>
<td>Full Blood Count</td>
<td>As per visit schedule - see above.</td>
</tr>
<tr>
<td>Tacrolimus Level (trough)</td>
<td>As per visit schedule - see above.</td>
</tr>
<tr>
<td>EBV PCR</td>
<td>Monthly for first year. Monitoring thereafter dependent on antibody status.</td>
</tr>
</tbody>
</table>
| CMV PCR | Monthly for first year after taking valganciclovir prophylaxis (monitoring not required whilst on). Monitoring may resume post increased immunosuppression.  
For CMV R-/D- transplants (no valgac) q 3/12 for first year. |
| Fasting lipid profile | Annual |
| 25-OH Vitamin D | Annual |
| ALP | Annual |
| (suggest these are done at time of transplant anniversary) | |
| PTH | Annual if eGFR>60, biannual 30-60, q 3 monthly <30. |
| HBsAb | 6 and 12 months post transplant then annually (unless documented non-responder). |
| VZV and Measles IgG | Annually unless IgG neg. |
| Urine microscopy & culture, protein:creatinine ratio | Monthly – first morning urine specimen should be obtained for confirmation if proteinuria detected. |
Graft Dysfunction

Significant rejection can present with only small rises in creatinine. Other causes of graft dysfunction can include, dehydration, infection (including UTI, EBV/CMV/BKV), obstruction and nephrotoxicity secondary to high levels of calcineurin inhibitors (tacrolimus, cyclosporine).

All elevations in creatinine (>10-20% above baseline) should be reviewed/investigated to identify the underlying cause and discussed urgently with Starship. If thought to be hydration related this should be addressed with a follow-up creatinine measurement within 48 hours. Any rising or persistently elevated creatinine levels should be re-discussed with Starship. Patients may be required to return to Starship urgently for transplant biopsy.

Persistent Proteinuria and Haematuria

Urine microscopy and a protein:creatinine ratio should be evaluated monthly. Persistent proteinuria and haematuria, even in the setting of otherwise stable graft function, can signify significant pathologies including rejection, recurrence of original renal disease, de novo renal disease in allograft, BK virus nephropathy, nephrolithiasis, malignancy etc. These findings should be discussed with Starship and specific investigations, which might include a renal biopsy will be recommended.
Surveillance for Viral Infections

CMV and EBV infections are associated with significant morbidity, and the possible development of post transplant lymphoproliferative disease (PTLD). Infection may require treatment or changes in immunosuppression. Early detection may prevent the development of more serious disease.

CMV Infection

Routine CMV Quantitative PCR monitoring

- CMV PCR at monthly intervals for the first year post transplant unless whilst taking valganciclovir prophylaxis.
- IF transplant was CMV D-/R- with no valganciclovir prescribed, q 3 monthly CMV PCR for first year.
- Monthly CMV PCR for three months following IV steroids/ATG.
- Required routine frequency after one year should be documented at their 12 month review at Starship.

Additional

- CMV PCR should be checked during episodes of allograft dysfunction.
- CMV should be checked in all patients who develop unexplained fever, diarrhoea, persistent cough, unexplained lymphadenopathy, abnormal liver function tests, or persistent haematological abnormality.
- CMV should be checked in children presenting with EBV, HSV or Varicella.
- In a patient with previous CMV PCR positive results, if beyond the first year post transplant, continued monitoring can be discontinued following three consecutive months of negative test results. This should be discussed with Starship Nephrology.

CMV Serology

- If the recipient is CMV IgG negative then serology should be checked annually as silent seroconversion is possible.
- If a CMV IgG negative recipient develops a positive CMV PCR then CMV IgM and IgG should be checked.
EBV Infection

Routine CMV Quantitative PCR monitoring

- Monthly EBV PCR for first year.
- Monthly EBV PCR for three months following IV steroids/ATG.
- After first year those who are seronegative should continue to have routine PCRs every 3 months. Those who are seropositive do not require routine testing. Both groups require additional testing as documented below.
- Required level of EBV testing should be documented at 12 month review at Starship.
- If the PCR is found to be positive this should be checked monthly or more frequently at the discretion of the Paediatric Nephrology team.

Additional

- EBV PCR should be checked during episodes of allograft dysfunction.
- EBV should be checked in all patients who develop unexplained fever, diarrhoea, persistent cough, unexplained lymphadenopathy, abnormal liver function tests or persistent haematological abnormality.
- EBV should be checked in children presenting with CMV, HSV or Varicella.
- In a patient with previous EBV PCR positive results, if beyond the first year post transplant, continued monitoring can be discontinued following three consecutive months of negative test results. This should be discussed with Starship Nephrology.

EBV Serology

- If the recipient is EBV negative then serology should be checked annually as silent seroconversion is possible.
- If an EBV negative recipient develops a positive EBV PCR then EBV IgM and IgG should be checked.
- A change in viral status should be discussed with a Paediatric Nephrologist.
Medications

Routine Post Transplant Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nystatin</td>
<td>Stop after 6 weeks</td>
</tr>
<tr>
<td>Ranitidine</td>
<td>Stop after 6 weeks</td>
</tr>
<tr>
<td>Cotrimoxazole</td>
<td>Stop after 6 months (protocol can change based on local risk)</td>
</tr>
<tr>
<td>Valgancyclovir (CMV prophylaxis)</td>
<td>Stop at 12 weeks</td>
</tr>
</tbody>
</table>

Maintenance Immunosuppressive Regime

Any changes in immunosuppression drugs must be discussed with a Paediatric Nephrologist first.

Prednisone

This will be weaned as per the individualised protocol and will depend on graft function and growth.

Tacrolimus

In general target levels are:
- > 30 days post RTX 6.0–8.0μg/l
- 90-180 days post RTX 5.0 – 7.0μg/l

Note: Levels of around 4.0μg/l after 6 months are acceptable if there has been no history of acute rejection. However we may aim for different levels under certain circumstances eg EBV viraemia. Any changes or concerns should be discussed with the renal team.
**Long Term Surveillance**

**Histological Surveillance of Renal Transplant by Graft Biopsy**

**Rationale**
- To detect CNI toxicity
- To detect chronic allograft nephropathy
- To detect sub-clinical rejection

**Timing**
- Time Intervals for surveillance biopsy: 3 months and 12 months and discretionary biopsies thereafter depending on GFR.
- The biopsy at 3 months will be undertaken before switching to alternate day steroids. Conversion to alternate day steroids will only take place if there is no history of acute rejection and the biopsy is satisfactory.

**Surveillance of Glomerular Filtration Rate (GFR)**
- $^{51}$Chromium EDTA GFR will be considered at 12, 36, 60 months post transplant when at Starship for review.
- To be arranged by Starship renal team with Nuclear Medicine Department of Auckland City Hospital.

**Cardiovascular Surveillance**
- Target blood pressure after the first three months post transplant is 50th-90th percentile for gender/height/age. Any patient with persistent hypertension should be discussed with Starship nephrology.
- 24 hour ambulatory blood pressure profiles recommended annually (where facility is available) to assess blood pressure control - we will do this at their routine Starship reviews when possible.
- In those patients who are on anti hypertensive medications, best practice recommendation is biannual ambulatory blood pressure profile.
- Annual serum lipid profiles measuring fasting cholesterol, triglycerides, and glucose.

**Bone Health Surveillance**
- Evaluation of serum calcium, phosphate, alkaline phosphatase, PTH, in all post transplant patients twice in the first year and at annual intervals thereafter, more frequently if CKD stage 3 or higher.
- Vitamin D level annually and more frequently based on advancing CKD.
Ultrasound Surveillance of Native Kidneys and Allograft:

Ultrasound surveillance of native kidneys and the allograft should be performed routinely at 1, 5 and 10 years post transplant.

Skin Surveillance:

Patients should be given regular reminders about sunblock. If there is concern about changing moles or other new skin lesions they should be discussed with a dermatologist.

Vaccinations and Post-Exposure Prophylaxis Recommendations:

You should receive a copy of your patient's Starship CKD Vaccination Record documenting their pre-transplant vaccinations and highlighting those that are still required.

It is recommended to avoid vaccinations, except influenza vaccination (see below), in the first 6 months following kidney transplantation. All live vaccinations and BCG are contraindicated whilst immunosuppressed post renal transplantation.

Hepatitis B

- Check HBsAb titres 6 & 12 months post transplant and then annually (unless patient is known to be HBsAb <10 and a documented vaccine non-responder).
- Give Hep B booster vaccination if antibody titer falls below 20mIU/mL.
- Recheck HBsAb 1 month post vaccination to determine response.
- A single “booster” dose may be provided annually as long as patient continues to mount a response.
- To maximise response can administer vaccine intradermally.
- Booster dose recommendation:
  - HBvaxPro; <16yrs = 10ug, 16+ yrs 20ug
  - Engerix B (if above unavailable); <16 yrs =10ug, 16+ yrs 40ug
- If patient was a documented non-responder pre transplant recommend a repeat standard 3 dose series with repeat serology 1 month after completion. If continued non-response not for further vaccination. A non-responder who is exposed to blood or body fluids should be given 2 doses of HB Ig, 1 month apart.

Varicella and Measles

Check VZV IgG and Measles IgG 12 months post transplant and then annually (unless known IgG negative).

- **ALL post transplant patients should receive IVIG if Varicella or Measles exposed**
irrespective of their serological results during the first 12 months post transplant.

- Post transplant patients who are VZV/Measles IgG negative who are exposed should be given immunoglobulin, as per the national immunisation guidelines.
- Ig is not indicated in immunosuppressed contacts (>12 months post transplant) with detectable antibody as the amount of antibody provided by VZIG will not significantly increase varicella antibody titres in those who are already positive.
- Ensure household contacts are immunised/have immunity. Varicella vaccine is now funded for household contacts of immunosuppressed patients.

**Influenza**

- All kidney transplant recipients who are at least 1-month post-transplant, should receive the influenza vaccination prior to the onset of the annual influenza season, regardless of status of immunosuppression.
- Household contacts also recommended but not currently funded to receive the annual flu vaccine.
- Even while transplant recipients are receiving high levels of immunosuppression, the benefits of timely vaccination outweigh the risks of delaying vaccination.

**HPV (Gardasil)**

- Recommended and funded (from age 9) for all male and female transplant patients.
Renal Transplant Follow Up Clinic Proforma

<table>
<thead>
<tr>
<th>Renal Transplant Follow Up Clinic Proforma</th>
<th>Date seen: <em><strong>/</strong></em>/___</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Name Sticker

Date of transplant: ___/___/___

Time Since Transplant:

<table>
<thead>
<tr>
<th>Background History</th>
<th>1. ESKD secondary to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Transplanted</td>
</tr>
<tr>
<td></td>
<td>3.</td>
</tr>
</tbody>
</table>

Current Issues

Medications

1. 
2. 
3. 

Examination

<table>
<thead>
<tr>
<th>Height</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>%</td>
</tr>
<tr>
<td>BSA</td>
<td>m²</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BP:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodes:</td>
</tr>
<tr>
<td>ENT:</td>
</tr>
</tbody>
</table>

Investigations

<table>
<thead>
<tr>
<th>Creatinine</th>
<th>Hb</th>
<th>Urea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt</td>
<td>WCC</td>
<td>N</td>
</tr>
<tr>
<td>Tac</td>
<td></td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Urine PCR</th>
<th>Urine microscopy</th>
<th>EBV PCR</th>
</tr>
</thead>
</table>

Date of next clinic visit

Please ensure results are copied to fax 093078938

WHEN COMPLETED PLEASE FAX TO 093078938

If completed electronically email to: renalnurse@adhb.govt.nz

Please do bloods/urine as per protocol