CLINICAL GUIDELINES FOR ADULT HEART TRANSPLANTATION

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1 Introduction

British Columbia’s first heart transplant was performed at Vancouver General Hospital in 1988. One hundred and eleven transplants were performed at that site until 1996. At that time, the program was moved to St Paul’s Hospital when the site was named the Provincial Heart Centre. Since 1996, over 280 heart transplants have been performed at St Paul’s.

This Clinical Guideline contains the current practices in the BC Adult Heart Transplant Program. Program members are a part of the Canadian Cardiac Transplant Network (CCTN). This network is affiliated with or works closely with Canadian Society for Transplantation (CST), Canadian Cardiovascular Society (CCS) and Canadian Blood Services (CBS). The CCTN sets policy for Heart Transplant Programs across the country.

The Adult Heart Transplant Program annually reviews its outcomes and has a mechanism to review practices weekly. An annual report is created by BC Transplant and presented to the team for discussion and planning.

The Program follows the 2001 Canadian Cardiovascular Society Consensus Conference on Cardiac Transplantation\(^1\) and the subsequent update\(^2\) (hereafter called “CCS Guidelines”) and more specifically, the document circulated by the CCTN as a basis for its protocols pre- and post-heart transplant (see hyperlink below).

Transplant Eligibility and Listing Criteria – CCTN 2012

Additional Resources

2 The Heart Transplant Core Team

The Heart Transplant Core Team is comprised of a variety of healthcare professionals including:

- Director, Heart Transplant Program / Heart Transplant Surgeon
- Heart Transplant Surgeon
- Psychologist
- Pre-Transplant Clerk
- Pre-Transplant/VAD Coordinator
- Dietitian
- Palliative Care Outreach Nurse
- Heart Transplant Cardiologist
- Post-Transplant Clinic Nurse
- Palliative Care Physician
- Post-Transplant Clerk
3 Pre-Heart Transplant

3.1 Referral for Transplant

The Adult Heart Transplant Program accepts referrals from around the province of British Columbia and Yukon Territory. From time to time the program also receives out-of-province referrals.

The program provides advanced heart failure therapies for patients who are being assessed for transplant candidacy. Early referral to the program is crucial as late referral significantly affects outcomes. In general, criteria for referral for transplantation candidacy are as follows:

- **Age** – although no absolute age cutoff, referrals over the age of 70 should have no major co-morbidities.
- **End-stage heart failure not responding to medical therapy and/or cardiogenic shock with inotrope dependence.**
- **No other medical or surgical therapies available.**
- **Absence of:**
  - Life limiting co-morbidities.
  - Life-threatening non-compliance to medical therapy.
  - Illicit substance abuse in the last 6 months.
Adult patients should be referred to the Pre Transplant Clinic.

<table>
<thead>
<tr>
<th>Contact Information:</th>
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<tbody>
<tr>
<td><strong>St. Paul’s Hospital</strong></td>
</tr>
<tr>
<td>Pre Heart Transplant Clinic 5C</td>
</tr>
<tr>
<td>1081 Burrard Street</td>
</tr>
<tr>
<td>Vancouver, BC, V6Z 1Y6</td>
</tr>
<tr>
<td><strong>Business Hours:</strong> 604-806-8602</td>
</tr>
<tr>
<td><strong>After Hours:</strong> 604-877-2240</td>
</tr>
<tr>
<td><strong>Toll Free:</strong> 1-800-663-6189</td>
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</table>

Sometimes admission is required to complete testing, depending on the patient and their condition. If the patient is a potential candidate, the Pre-Transplant clinic will monitor their progress. If the patient is not a candidate – either because they are too well or not suitable, the patient will be transferred to Heart Function Clinic or discharged back to the referring physician or clinic, clearly outlining reasons for transfer and criteria for re-referral.

**Appendix 1. Heart Function Clinic Referral Form**

### 3.2 Urgent Inpatient Referrals from other Hospitals

Urgent referrals from other centres can be made by contacting the Heart Transplant (HTx) Cardiologist or HTx Surgeon on-call through BC Transplant 604-877-2240 or St Paul’s Hospital (604) 682-2344.

### 3.3 Pediatric Referrals

Pediatric patients should be referred to the newly announced (October 2013) Pediatric Heart Transplant Program at BC Children’s Hospital.

Referrals to be made through Dr Derek Human or Dr Sanjiv Gandhi at BC Children’s Hospital until such time that formal contact information has been released.
3.4 **Indications for Adult Heart Transplant**

Indications for heart transplantation are laid out above.

The International Society for Heart and Lung Transplantation (ISHLT) has released an overview of listing criteria³ which provides further guidance in our decision-making. Our program also refers to this if more information/evidence is required.

The team also uses the “*Seattle Heart Failure Survival Score*” (SHFSS) as well as Brain Natriuretic Peptide (BNP) measurements to aid in decision making for selected patients who may require assessment for transplant⁴,⁵.

SHFSS Calculator can be found online at [http://depts.washington.edu/shfm/](http://depts.washington.edu/shfm/)

3.5 **Patient Assessment**

There are 3 levels of assessment for heart transplant candidacy – Routine, Urgent, and Emergent.

3.5.1 **Routine Heart Transplant Assessment**

Routine assessment is reserved for stable patients where there is a lower level of urgency. Normally this assessment takes 4 weeks depending on availability of the patient for specialized testing and waiting times for other specialty opinions. Refer to current Routine Heart Transplant Assessment Pre-printed Orders (PPO).

3.5.2 **Urgent Heart Transplant Assessment**

Urgent assessment is a “fast-track” version of the routine assessment and designed to be completed within 7 days. This is reserved for patients who are in hospital and NYHA class IV and requiring mechanical support assessment. All other testing is reserved for after the patient is stabilized and the clinical picture is clearer. Refer to current Urgent Heart Transplant Assessment PPO.

3.5.3 **Emergent Heart Transplant Assessment**

Emergent assessment is reserved for patients who present in cardiogenic shock and candidacy needs to be determined within 24 hours. Often, these patients will undergo assessment for Ventricular Assist Device implantation as a bridge to transplantation also. Refer to current Emergent Heart Transplant Assessment PPO.
3.5.4 High Risk Cardiac Surgery – Mechanical Support Backup

When assessing high risk cardiac surgery candidates who may require implantation of long-term mechanical support and perhaps ultimately heart transplant, careful consideration of the following should occur in order to minimize unnecessary stress to the patient and family and wastage of resources:

1. **Is the patient likely to require short-term mechanical support only?**

   If so, there is no further testing necessary and the surgeon should discuss directly with the Heart Transplant Surgeon on-call who should then meet with the patient and family to explain the possibility of short-term support.

2. **Is the patient in need of possible long-term mechanical support directly from the OR?**

   This should be determined by the HTx Surgeon and the HTx Cardiologist. If this answer is yes, then adequate time should be set aside to perform required emergent and psychosocial workup and explanations to the patient and family to ensure informed consent is obtained.
3.6 **Patient and Family Preparation for Transplant**

When first referred, the patient and caregivers are given a copy of “*Summary (Brief Overview) Booklet for Patients and Families*”. This booklet provides a short, easy to understand overview of heart transplantation and what to expect. Further information is offered once candidacy has been established.

If they would like more information, they are referred to [BC Transplant Website](#) resources and if they wish and demonstrate understanding, are given the longer, more comprehensive patient manual. Patient manuals are also available in Chinese.

The teaching plan for each patient and family member is prepared based on a number of key points:

- Clinical condition
- Where they are in the assessment process
- Ability to take in information related to low cardiac output
- Literacy
- Ability to speak and read English
- Environment
- Psychological state
- Care plan established with the patient, family and team

It must be recognized that many patients are suffering from low cardiac output and as well, are overwhelmed by the medical system.

3.7 **Psychosocial Assessment**

3.7.1 **Psychology Assessment**

The psychologist routinely assesses all patients being considered for heart transplantation using a semi-structured interview. This assessment focuses on the following: 1) social support and the ability of the social support network to cope with the stressors of heart transplant care; 2) patient understanding of the requirements, risk and benefits of transplant; 3) adherence to medical care plan; 4) psychopathology; 5) cognitive assessment.

Psychological/psychiatric contraindications are first reviewed by the psychologist and where necessary a psychiatrist is consulted for further assessment and/or a second opinion. A scoring system of psychosocial factors has been validated called the Psychosocial Assessment of Candidates for Transplantation (PACT) score\(^7\) is determined and reported. The Psychologist will also recommend referral for further neurocognitive testing if indicated.
All patients are monitored regularly for psychological distress during their regular clinic visits pre and post heart transplant. The Screening Tool for Psychological Distress (STOP-D), a screening tool validated in cardiac patients, is used for this routine screening. This tool provides severity scores for: depression, anxiety, stress, anger and low social support. Standardized cut off values are used to trigger a referral to psychology or psychiatry.

Appendix 2. The PACT Form
Appendix 3. The Stop-D Screening Tool

3.7.2 Social Work Assessment
The Social Worker collects a detailed social history, which includes assessment of:

- Social support
- Financial situation
- Relocation concerns
- Lifestyle issues
- Advance care planning
- Other relevant information

The Social Worker works with the team, the patient and family to establish a workable travel, accommodation and family support plan for presentation to the team.

Accommodation, social support and financial concerns are among the greatest burden for patients and families facing transplantation.

The Social Worker also provides counseling and assistance as required.

Appendix 4. Social Work Role Outline

3.7.3 Dietary Assessment
The heart transplant dietitian covers both inpatient and outpatient heart failure patients and works with the entire interdisciplinary team for assessment and follow up. They are involved in pre-transplant nutrition assessments to gather information regarding a patient’s weight, BMI, co-morbidities, nutrition risk/status and assessing appropriate interventions for malnutrition, weight management and cachexia, teaching fluid/salt restrictions and adherence to these restrictions and any other nutrition related teaching a patient requires (e.g. Healthy heart diet, diabetes, potassium). From this information the dietitian makes a clinical nutrition assessment of the patient’s candidacy for VAD/transplant and level of post-surgical nutrition risk. This information is then used for gridding a patient in transplant rounds for whether or not the patient is a transplant/VAD candidate.
Overall the dietitian works with the entire heart failure/transplant team to ensure that appropriate patients receive the nutrition interventions/teaching they may require and that nutrition assessments are completed for all patients being assessed for transplant.

### 3.8 How Decisions are made

Activations are determined once all necessary testing is completed and the patient fulfills listing criteria. A “Candidate Selection Form” is completed and from that, a care plan determined.

See Appendix 5. Candidate Selection Form

### 3.8.1 Team Values

Recognizing that all team members have their own personal values, the team has created and regularly reviews our group values to which we refer when difficulties arise (Refer to Figure 1).

### 3.8.2 Team Meetings

The team meets together each week. The meeting is chaired by the Clinical Nurse Specialist or designate. Currently the meeting is held every Tuesday morning in Burrard 443 from 07:30-08:30 with the option of meeting again Wednesday morning at 07:45 in 5A meeting room if the agenda cannot be completed. There is teleconference and webinar capability for those who cannot attend due to distance/logistics.

The aim is to have all members of the physician team present (2 surgeons and 4 cardiologists). This is to ensure open discussion and create a plan for each patient that is agreed upon by the medical team in order to minimize individual biases.

Decisions about transplant candidacy are often difficult. In general, the guidelines are just that, and not all patients fall neatly into the guidelines. This team decides by consensus. Where there is inability to reach consensus, the final decision rests with the Heart Transplant Surgeon and Cardiologist on-call at the time of the discussion. In the event that the Heart Transplant Surgeon and Cardiologist cannot agree, the final decision rests with the Director of the Transplant Program (currently Dr Anson Cheung).
HEART TRANSPLANT VALUES

The heart transplant program adheres to the Values outlined by Providence Health Care:

SPIRITUALITY
• Fostering holistic well-being including the patient’s spirituality

INTEGRITY
• Accountability
• Honesty
• Freedom from coercion
• Informed choices

STEWARDSHIP
• Altruism
• Transparency
• Fairness

TRUST
• Trustworthiness
• Confidentiality

EXCELLENCE
• Clinical Competence
• Knowing our limitations

RESPECT
• Patient who decides
• Allow for the patient’s perception of holistic well-being and QOL
• Compassion
• Provide empathetic understanding
• Respect for each other
• Respect for the patient and family
• Dissenting voices
• Unconditional positive regard

Figure 1. St. Paul’s Heart Transplant Team Values.
The team includes:

- Cardiologists
- Dietitian
- Ethicist
- Fellows/residents/students
- Nursing staff
- Palliative Care team
- Pastoral Care
- Social Work
- Specialists called to consult
- Surgeons
- VAD/Transplant Coordinators
- Other members as appropriate

In the case of Emergent listing out of regular hours, at least 3 members of the team are present: Surgeon, Physician and on-call VAD/Transplant Coordinator.

Regular education sessions are held each week to review relevant literature and each year, the team reviews the patient outcomes and in turn, reviews protocols.

### 3.9 Patient Listing

Patients and families are seen by the team in the clinic or in hospital and coaching and education are commenced about life on the waiting list.

Final requirements for listing are reviewed with the patient and family.

[Appendix 6. Checklist for Preactivation Teaching](#)

### 3.10 Prioritizing Patients on the Heart Transplant Wait List

Once activated, the patient is activated on the PROMIS database. This database links directly with the National Organ Waitlist which is administered by Canadian Blood Services. Urgently listed patients classified as Status 4 or 4S automatically appear on the National Organ Waitlist to initiate interprovincial organ sharing. See embedded document for latest listing algorithm and organ sharing agreement.

[CCTN Organ Sharing Agreement 2012](#)
3.11 Combined Heart and Kidney Transplantation Listing

In otherwise eligible candidates with renal failure that is considered by the nephrologist to warrant renal transplantation, a decision re candidacy will be made collaboratively with nephrology.

Two approaches to combined transplantation can be taken.

1. Combined heart/kidney transplant from the same donor
2. Staged heart transplant followed by a kidney transplant from another donor

The first approach is preferred, however it is recognized that due to long renal waitlists, it is not always possible to achieve this as these candidates “jump the queue” for a deceased donor renal transplant.

At a team meeting on July 23, 2013, Dr David Landsberg attended on behalf of Renal Tx.

The group agreed that if a dialysis patient was a suitable candidate for combined transplant then a simultaneous deceased donor transplant would be performed. If the patient was not on dialysis and had renal dysfunction a plan would be created in conjunction with renal and cardiac teams together on an individual basis.

3.12 The Sensitized Patient

All patients undergoing transplant assessment require a Cytotoxic Antibody Screen (also called Panel Reactive Antibody – PRA). As per the Canadian Cardiovascular Society Consensus Conference on Cardiac Transplantation guidelines, 2001, the purpose of this test is to screen patients before transplant “in an effort to minimize the risk of allograft rejection after transplantation”. This test is only performed at the Vancouver General Hospital Immunology lab. The process for our testing and ongoing management is outlined in Figure 2.

For patients who are highly sensitized (cPRA >80%), our program follows the listing guidelines as per the CCTN Organ Sharing Agreement 2012. If clinically indicated, patients may undergo plasmapheresis +/- intravenous immunoglobulin G in an attempt to lower their PRA titres. If plasmapheresis is ordered, we refer to the attached protocol and pre-printed order set in addition to consulting the oncall renal team (SPH) and immunology team (Dr. Paul Keown @VGH) to determine a treatment plan individualized for the specific patient.

Refer to current protocol and PPO for Plasmapheresis.
Figure 2. Cytotoxic Antibody Screen

Cytotoxic Antibody Screen (AKA Panel Reactive Antibody) ordered
If inpatient – order via SCM. If outpatient, use pre-filled requisition. 7mls clotted specimen red top to be sent to Immunology Lab at VGH

Fax Booking Form to VGH Immunology & ask to run CAS

Results Negative

Is the pt going to be listed?

Yes – repeat yearly and...

No – No further action required

Results Positive

Is the pt going to be listed?

Yes – Order HLA Tissue Typing
If inpatient – order via SCM. If outpatient, use pre-filled requisition. Collect: ACD yellow top x3. Clotted specimen red top x 1 and EDTA purple top x 1. To be sent to VGH Immunology lab

Patient to submit monthly CAS sample 1st of each month (grace period 4 days before or after the 1st of each month)

If pt had a sensitizing event, e.g. Blood transfusions, IV abx, VAD implant - send booking form to VGH for retesting of PRA 4-6 weeks post sensitizing event. VAD pts needs PRA retesting Q3 months

No – Make note in front of chart: “Do HLA if pt may be listed in the future”

Ongoing while listed
3.13 Cross-matching

The on-call transplant cardiologist when triaging a donor call from BC Transplant will ask the coordinator for the donor’s blood group and Human Leukocyte Antigen (HLA) status. This information will then be cross-referenced with potential recipients on our local transplant list. Once a possible recipient is identified based on acuity, size, weight and time on list, the cardiologist will review each donor antibody against the list of recipient antigens provided by the BCT ODHD coordinator (virtual x-match). If this crossmatch is negative then the donor would be considered an appropriate match for the specified recipient. If the crossmatch is negative, then two options are possible:

1. The transplant cardiologist may identify a potential alternate on the transplant list that is appropriate in terms of size/weight/acuity who has a negative virtual crossmatch

2. The transplant cardiologist may confer with the immunologist on-call to determine the significance of the potential antigen-antibody mismatch or the titre of the donor specific antibody. In the case that an organ is transplanted with a positive crossmatch, there is a conversation with the cardiac surgeon on-call to discuss the clinical situation, rationale for transplanting in this scenario and for identifying pre-intra- and post-operative strategies to mitigate the risk of acute/hyper acute rejection.


3.14 Donor Criteria

Donor suitability assessment follows Health Canada's Regulations for Safety of Cells, Tissues and Organs. All pertinent donor information is reviewed with the cardiologist and surgeon on call.

Additionally, the HTx surgeon and cardiologist use the following exclusion criteria to assess donor suitability:

- Poor Ejection Fraction
- diffuse atherosclerosis
- congenital or valvular heart diseases that are not easily correctable
3.15 Exceptional Distribution - Follow-up of Recipients

It is recognized that in exceptional circumstances and compassionate reasons, a Heart may be transplanted even when there may be a contraindication during donor assessment (e.g., incomplete donor screening). If these conditions exist, an organ may be released for transplant only under exceptional distribution as per Health Canada requirements. The process is documented on an Exceptional Distribution Form by the BCT Organ Donation Coordinator. The transplantsing physician must authorize the exceptional distribution including obtaining informed consent of the recipient. Copies of the exceptional distribution form are to be included in the Recipient chart.

It is important that in all cases, appropriate follow-up of recipients is performed by the post-transplant medical care team. Each exceptional distribution is to be reviewed and assessed by the team for any follow-up treatment and diagnosis.

Risk for Viral Mediated Disease Transmission

In Exceptional Distribution cases involving risk for viral mediated disease transmission, the following will be faxed from BC Transplant Quality Assurance to St. Paul’s or outpatient location:

1) Fax Coversheet - Required Medical Follow-up for Transplant Recipient(s)
2) Copy of the Exceptional Distribution Form
3) Reference - Recommended Follow-up Testing for Recipients Transplanted under Risk for Viral Mediated Disease Transmission

The post-transplant coordinator at SPH will ensure the above documents are reviewed by the post-transplant medical care team and the recommended follow-up is performed at the required intervals.

Appendix 7. Exceptional Distribution Forms
4 The Heart Transplant

4.1 Call in for Heart Transplant

The recipient is agreed upon between the cardiologist and surgeon on call. The process for allocation is outlined previously.

The Heart Transplant Coordinator is notified (on call coordinator if after hours: 604-250-2658) by the Heart Transplant Cardiologist and informed as to who needs to be called in as well as approximate timing and any other pertinent information.

A Call in Form is used to document the process.

Appendix 8. Patient Call in Form

4.2 Admission

The patient arrives at the hospital through the ER.

All relevant departments have been notified according to the call in form.

4.3 Pre-operative Protocol

Once the patient arrives to 5A, the nursing staff initiates the Transplant RN Checklist. Heart Transplant Admission Preprinted Prescriber Order is initiated by the Cardiologist on-call. Refer to current Htx Admission PPO.

Appendix 9. Transplant RN Pre-Op Checklist

4.4 The Transplant Surgery

The surgery is performed by the Transplant Cardiac Surgeon on-call.

It is the responsibility of the Transplant Cardiac Surgeon to verify with the OR and BC Transplant teams involved in the organ retrieval, the correct blood group of the organ donor and the organ recipient before the transplant procedure commences.

4.5 Perioperative Immunosuppression

Immunosuppressive regimen immediately prior to transplant and intraoperatively can be found in the Heart Transplant Admission PPO. Refer to current orders.
4.6 Perioperative Care

As much as possible, standard procedures in the OR and Cardiac Surgery Intensive Care Units for all patients are in place for heart transplant recipients. This includes infection control practices, standard cardiac support protocols, skin and wound care and other nursing practices. Please refer to local manuals for more information.

The immediate post-operative management specific to heart transplant recipients is contained in the Heart Transplant Post-operative PPO. This includes current protocol for induction immunosuppression. Refer to current orders and the BCT Clinical Guidelines for Transplant Medications.

4.6.1 Most Responsible Physician

The most responsible physician until transfer to 5A is the Transplant Surgeon.
5 Post-Transplant

5.1 Early Post Operative Phase
The Canadian Guidelines contain information about management of patients post-
transplant (CCS Consensus Conference on Cardiac Transplantation) and the subsequent
update (CCS Consensus Conference Update). Most commonly, complications in the
immediate post-operative phase include:

- Post surgical bleeding
- Right-sided heart failure
- Infection

Close surveillance by the CSICU team and early intervention are the key. Post operative
PPO addresses prophylactic and preventative measures used to minimize complications.

Daily rounds by the Heart Transplant Surgeon, Cardiologist and Clinical Nurse Specialist
occur in collaboration with the CSICU and other relevant teams.

5.1.1 Combined Heart-Kidney Transplant
In the case of combined heart and kidney transplantation, the Renal Transplant Team
controls the immunosuppressive regimen.

5.2 Transfer to 5A (post-operative ward)
Most patients can be transferred to the ward within 2-5 days. Once hemodynamically
stable and no longer requiring critical care surveillance, Heart Transplant Transfer PPO is
completed.

The Clinical Nurse Leaders and staff nurses in both areas together with the Clinical Nurse
Specialist create a care plan for the patient using the Heart Centre Care Map available on
Chart Scan in the hospital system. The Care Map provides a day to day plan for the
patient as well as a long-term plan.

The Heart Transplant Clinical Practice Guideline is also available to guide routine patient
care planning.

5.2.1 Most Responsible Physician
The most responsible physician is now the Heart Failure/Transplant Cardiologist. The
patient is seen daily by a member of the Transplant Cardiology team.

Appendix 10. Heart Centre Care Map
Appendix 11. Heart Transplant Clinical Practice Guideline
5.2.2 Infection Control

Where possible, patients are nursed in a private room. This is primarily to enable more undisturbed time for rest and patient teaching. Standard infection control measures are used. Isolation procedures are only implemented with a specific order (eg. severe neutropenia).

5.2.3 Immunosuppression

Triple therapy primarily with Tacrolimus, Mycophenolate mofetil and steroids are initiated in the majority of patients. This is tailored according to clinical condition. The Heart Transplant Transfer PPO outlines the immunosuppressive regimen used. Also refer to current BCT Clinical Guidelines for Transplant Medications.

In the case of heart-kidney transplant recipients, the Renal Transplant Team controls the immunosuppressive regimen.

See below for the current accepted target blood levels for heart transplant recipients.
TARGET DRUG LEVELS
HEART TRANSPLANT
REVISED JULY 2013

**TACROLIMUS TROUGH**

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<th>TIME POST-Tx</th>
<th>TARGET LEVEL</th>
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<td>0-3 months</td>
<td>9-12 ug/L</td>
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<td>6-12 months</td>
<td>6-8 ug/L</td>
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<tr>
<td>&gt;12 months</td>
<td>4-8 ug/L</td>
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**SIROLIMUS LEVEL**

| All time periods | 8 – 12 ug/L |

**Mycophenolic Acid (MPA) Trough**

| All time points | >1.5mg/L |

**CYCLOSPORINE C2 (Creatinine <170)**

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**CYCLOSPORINE C2 (Creatinine >170)**

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**CYCLOSPORINE C0 (trough level for early Tx patients)**

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<tr>
<td>&gt;12 months</td>
<td>100-150 ug/L</td>
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5.2.4 Patient Education

Patient education is initiated as soon as feasible. The program uses a competency-based teaching program that can be performed by all experienced nurses and allied health team members on 5A. The post-transplant Patient Educator sees the patient and family to ensure they understand what they have learned and to provide outpatient information.

Patients learn to self-medicate while in the hospital and either the patient or a family member must show competence before discharge.

5.2.4.1 Diet

Post-transplant the dietitian is involved in the patients inpatient stay for reassessment of nutrition status/risk, consulted for tubefeed if required, and with any post surgical complications that require nutrition intervention (eg. Wound healing, failure to thrive). Before a patient goes home, they receive a nutrition consultation detailing their nutrition needs post-transplant for a successful recovery including food safety, food and medication interactions, protein requirements, fluid/salt, how to better control blood sugars on prednisone, calcium and vitamin D requirements and over all weight management/healthy heart teaching. The dietitian will liaise with the pharmacist to adjust the schedule of medications and supplements to avoid/eliminate interactions. The patient is then followed at post-transplant clinic and by consultation.

5.2.5 Discharge

Discharge from hospital occurs when the patient has completed education training and has demonstrated understanding and/or competence with self-medication, self-reporting of symptoms and self-care. Patients are usually discharged within 10-14 days of surgery. Refer to current Heart Transplant Discharge Prescription Forms.
5.3 **Follow-up**

5.3.1 **Introduction and Approach**

The heart transplant clinic aims to improve long-term survival of heart transplant recipients under their care by providing support through:

- Self-management education and counseling
- Heart Transplant related follow-up
- Providing support to primary care providers
- Providing an efficient and safe service

5.3.2 **Primary Care Involvement**

Establish a partnership with Primary Care Providers, recognizing that active involvement in patient management with clear communication is a key factor in influencing outcomes.

Appendix 12. Discharge Letter to Primary Care

5.3.3 **Readmissions to Hospital**

5.3.3.1 **Heart Transplant and Immunosuppression related issues**

Patients readmitted to hospital where possible, will be cared for directly by the Heart Transplant Cardiologist in 5A. Recognizing that there may be logistical or medical issues that prevent this, the Heart Transplant Cardiologist should be actively involved in their management plan.

5.3.3.2 **Non-heart transplant related issues**

It is the role of the Heart Transplant Cardiologist to provide advice in a consultative manner around immunosuppression and cardiac medications. Regular updates will be sought by the team members in order to provide input when necessary.

5.3.4 **Outpatient Schedule**

Once the visit is completed, the clerk reviews the document to determine what follow-up testing and referrals need to be scheduled and ensures a follow up clinic appointment is organized. The document is then faxed to the Primary Care Provider and other specialists involved in the patients’ management.
Medication changes are changed on the PROMIS database and an updated list is faxed to the pharmacy and the patient is informed of the changes either through “Snapshot of my Visit Form”, PROMIS medication list, or “My Medscheduler” – whichever suits the patient best.

A Pharmacist is available in the clinic to assist with medication reconciliation as well as patient education and support.

Further, changes in immunosuppression and transplant medications are documented in the Biopsy Summary Sheet and the CMV (cytomegalovirus) Summary Sheet.

5.4 **Immunosuppression**

5.4.1 **Blood Levels**

See Section 5.2.2 Target Blood Levels

See BCT Clinical Guidelines for Transplant Medications for detailed information.

5.4.2 **Steroid weaning**

Steroid weaning commences after the result of the first biopsy has been obtained. Steroid dose is weaned by 2.5mg after each biopsy that does not require treatment at the discretion of the Cardiologist. Points to consider include patient sensitization pre transplant, rejection history, comorbidities and clinical picture. The overall aim is to have the patient steroid-free by month 4 post-transplant.

5.5 **Rejection Surveillance**

Rejection monitoring is performed using the endomyocardial biopsy (EMBx). The first one is usually performed prior to discharge at around 10 – 14 days post-operatively.

The standard EMBx surveillance protocol is outlined earlier.
5.5.1 Inpatient EMBx
The Cardiologist determines when the next biopsy occurs in hospital if necessary. To order an EMBx for an inpatient, the following procedure should be followed:

Arranging Cardiac Biopsies for Heart Transplant In-patients

Background
Post-heart transplant biopsies are routinely done on Thursdays in Radiology between 0850 and 1000 hrs.

Results of Cardiac Biopsies:
Routine biopsies are read by the pathologist the following day and results are communicated to the Heart Transplant Clinic (local 68374). They will inform the Heart Transplant physician on-call with results and they will plan medical management.
For urgent cases, rapid processing of biopsies (meaning they are read by a pathologist on the same day) can be arranged. See below for extra instructions.

How to Book a routine Cardiac Biopsy

- Transplant physician must indicate the date of planned biopsy on Prescriber Orders
- The unit coordinator will print forms PHCRA089 and LA184 and ask the physician to complete.
- Physician to include on Radiology Requisition: Date of HTx, any specific instructions/infection risks/allergies (eg HIT)
- Physician to complete top of Lab Requisition (LA184):
- The unit coordinator will inform post-transplant clerk of the intended date so he/she can add to the list.
- Post transplant clerk to inform unit of proposed biopsy time.

Day before the Cardiac Biopsy

Unit Coordinator to send the following items to Tube Station 8.

1. Radiology Requisition (Form #PHCRA089)
2. Pathology requisition (Form # LA184)
3. Four Name Labels

Rapid processing
Rapid Processing means that the biopsy is processed immediately and results are available in 4 to 6 hours.
If rapid processing is required please follow the above steps, but also specify “Urgent Biopsy – Rapid Processing” on requisition and page the Histology Technician immediately:
- Histology Tech in Histology Lab pager 54461, local 62228 or 62383

Updated February 2013
5.5.2 Outpatient EMBx

The procedure for organizing EMBx as an outpatient is as follows:

The Post-transplant Patient Educator informs the Transplant Clerk of pending first biopsy. After that the schedule is determined by the steroid dose. If steroid weaning is slower than the routine outlined in the surveillance protocol due to rejection, the biopsies are more frequent. In some cases this protocol may not be possible. In which case, the biopsy schedule is determined on an individual basis in consultation with the team.

Blood work is often performed at the time of the EMBx and the following protocol is used where this is possible in order to minimize venipuncture for patients.

A summary of EMBx results and treatments is kept in the patient’s file as well as entered into PROMIS.

Appendix 15. Protocol for Bloodwork Drawn during Routine Endomyocardial biopsy
Appendix 16. Post Heart Transplant Biopsy Record
5.5.3 Rejection Treatment

An endomyocardial biopsy result of ISHLT 2R or above is considered significant enough to treat actively. In general, the following schedule is followed at the discretion of the attending Heart Transplant Cardiologist.

<table>
<thead>
<tr>
<th>ISHLT Grade of Rejection</th>
<th>&lt; 3 months post-Tx</th>
<th>&gt; 3 months post-transplant</th>
<th>Hemodynamic Compromise</th>
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<tbody>
<tr>
<td>Grade 0R</td>
<td>Nil</td>
<td>Nil</td>
<td>Assessed individually</td>
</tr>
<tr>
<td>Grade 1R</td>
<td>Nil</td>
<td>Nil</td>
<td>1g IV Solumedrol x 3 days Admit to CCU</td>
</tr>
<tr>
<td></td>
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<td>• Echo</td>
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<td>• Monitor</td>
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<td></td>
<td>• +/- inotropes</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Consider ATG</td>
</tr>
<tr>
<td>Grade 2R</td>
<td>100mg Prednisone po x 3 days</td>
<td>100mg Prednisone po x 3 days</td>
<td>1g IV Solumedrol x 3 days Admit to CCU</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Echo</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Monitor</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• +/- inotropes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Consider ATG</td>
</tr>
<tr>
<td>Grade 3R</td>
<td>1g IV Solumedrol x 3 days Admit 5a Consider ATG Optimize immunosuppression</td>
<td>1g IV Solumedrol x 3 days Admit to CCU</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Echo</td>
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<td></td>
<td>• Consider ATG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Optimize immunosuppression</td>
</tr>
</tbody>
</table>

Nursing Considerations:

- Close monitoring of hemodynamic parameters such as BP, heart rate, rhythm and symptoms of pump failure such as fluid retention and shortness of breath should be carefully monitored and reported immediately.
- Prednisone is discontinued while the patient is receiving Solumedrol.
- If the patient was a CMV mismatch, or if they required Acyclovir post transplant due to HSV prophylaxis, they will need prophylactic antiviral treatment reintitated as per infection protocol.
- Septra will need to be reinitiated as per infection protocol.
- If the patient had steroid induced Diabetes in the immediate post-transplant period, this will likely re-occur. Check with the physician to see if he wants to order any therapy.

Revised November 2013 by Dr M Toma
5.6 Infection Prophylaxis

Standard body substance isolation as per hospital policy is in place for heart transplant recipients. Isolation is enforced only when indicated (eg. Infection requiring isolation or reverse isolation in severe neutropenia). Infection prophylaxis is seen in Appendix 17.

Appendix 17. Infection Prophylaxis

The Heart Transplant Clinic keeps track of CMV virology monitoring and treatment using the Post Heart transplant Recipient CMV-PCR Record (See Appendix 18).

Appendix 18. Post Heart Transplant Recipient CMV-PCR Record

5.6.1 Graft Vasculopathy Surveillance

Appendix 19. Graft Vasculopathy Surveillance

5.6.2 Cancer Surveillance

Patients are encouraged to visit their Primary Care Provider regularly to screen for potential malignancies. Skin cancers are the most frequent cancer found in transplant recipients and therefore the following skin cancer precautions are in place:

- Patients are encouraged to visit their GP regularly for skin screening
- Referral to dermatologist for 6 monthly to annually and prn evaluation
- Linkage with Renal Program Dermatology Service

In general, patients are offered the opportunity to see a Dermatologist at St Paul’s Hospital either through the Renal Program or through the Dermatology Clinic.

If outside the Lower Mainland, they are encouraged to see their Family Doctor and obtain a referral to nearest Dermatologist if appropriate.

Colonoscopy screening is recommended for patients greater than 50 years old and patients at risk after the first year of transplant.
5.6.3 Dental care

Dental checkups are encouraged every 6 months or as indicated. A letter is sent to the dentist outlining antibiotic prophylaxis recommendations.

Appendix 20. Heart Transplant Patients - Dental Work Advice

5.6.4 Immunization

Yearly influenza vaccinations are advised by the program for heart transplant recipients. Pneumovax if needed is also recommended. Prior to travel, patients are encouraged to discuss vaccinations with the team in collaboration with vaccination clinics.

Live vaccines are not recommended for transplant recipients.

5.6.5 Pregnancy

Patients are encouraged to discuss conceiving children and pregnancy with the Heart Transplant Cardiologist when planning a family. Patients are informed that some drugs may harm the unborn child and so careful planning with Primary Care Provider, the transplant team and possible referral to the “high risk pregnancy” clinic at St Paul’s are encouraged.

Pregnancy is not recommended in the first year after heart transplant at this program.
6 Reference List


## 7 APPENDICES

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<th>Description</th>
</tr>
</thead>
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| Appendix 18. | Post Heart Transplant Recipient CMV-PCR Record |
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| Appendix 20. | Heart Transplant Patients – Dental Work Advice |
| Appendix 21 | CCTN – Cardiac Transplantation: Eligibility and Listing Criteria in Canada 2012 |
Appendix 1. Heart Function Clinic Referral Form

HEART FUNCTION CLINIC
REFFERAL FORM

Name:__________________________________________

Date of birth:________________________M / F__________

PHN:__________________________________________

Address:__________________________________________

P.C.__________________________________________

Phone:__________________________________________

Referring Doctor:________________________Billing #:________________________Date Referred:________________________

Number of pages including this one:______________________

☐ Assessment of ASYMPTOMATIC Heart Failure
☐ Chronic heart failure management
☐ Heart failure with symptoms but NOT decompensated, OR
  New diagnosis of heart failure and STABLE
☐ New diagnosis of heart failure and UNSTABLE OR
  Post MI heart failure OR
  Post hospitalization heart failure OR
  Progressively worsening heart failure
☐ Heart transplant assessment

Interpter Needed:    Yes     No     Specify language:________________________

Does patient know about; and agree to the referral?    Yes     No

Please complete the following checklist and attach all reports.

<table>
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<tr>
<th></th>
<th>DONE (Please include report)</th>
<th>NOT DONE</th>
<th>DONE</th>
<th>NOT DONE</th>
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<tbody>
<tr>
<td>CHEST XRAY</td>
<td>CAR PAC</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ECHOCARDIOGRAM</td>
<td>CAR PAC</td>
<td></td>
<td></td>
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<tr>
<td>RIGHT HEART CATH REPORT</td>
<td>CAR PAC</td>
<td></td>
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<tr>
<td>CORONARY ANGIOGRAM REPORT</td>
<td>CAR PAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(INCLUDE HEARTVIEW DIAGRAM)</td>
<td>CAR PAC</td>
<td></td>
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</tr>
</tbody>
</table>

Acknowledgement of Referral within 48 hours (to be completed by specialist clinic)
☐ Our office will make the appointment with your patient within the next __________ week(s)
☐ Your patient is booked to see a specialist on
  ☐ Please notify your patient of the above appointment
  ☑ We will notify your patient of the above appointment
☐ Attached is additional information for you to give to your patient
☒ We require additional information ☐ before we can book the patient ☐ prior to the patient’s appointment

Form No ______ (Aug 11)
Appendix 2. Psychosocial Assessment of Candidates for Transplantation (PACT)

<table>
<thead>
<tr>
<th>Initial Rating of Candidate Quality</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Unable to Rate</th>
</tr>
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<tbody>
<tr>
<td>1. FAMILY OR SUPPORT SYSTEM STABILITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No strong inter-personal bond or highly unstable relationship</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some stable relationship; some problems evident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Stable, committed relationship; strong family commitment; good mental health in supportive</td>
<td></td>
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<tr>
<td>2. FAMILY OR SUPPORT SYSTEM AVAILABILITY</td>
<td></td>
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<tr>
<td>Support unavailable</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Support availability limited by emotional or geographical factors</td>
<td></td>
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<tr>
<td>In touch with patient step process; emotionally supportive</td>
<td></td>
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</tr>
<tr>
<td>III. LIFESTYLE FACTORS</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>Unable to Rate</td>
</tr>
<tr>
<td>5. Healthy Lifestyle, Ability to sustain change in lifestyle</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Sedentary lifestyle; Major dietary problems; ongoing smoking; resistant to change</td>
<td></td>
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<tr>
<td>Some lifestyle change; May require further education to reduce correlative risk</td>
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<tr>
<td>May sustained changes in lifestyle; No major risk factors; Willing to change</td>
<td></td>
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<td></td>
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<tr>
<td>6. Drug and Alcohol Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Unable to Rate</td>
</tr>
<tr>
<td>Dependence</td>
<td></td>
<td></td>
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<tr>
<td>Resistance to change</td>
<td></td>
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<tr>
<td>Alcohol or other substance use</td>
<td></td>
<td></td>
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<tr>
<td>7. Compliance with Medication and Medical Advice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Unable to Rate</td>
</tr>
<tr>
<td>Irregular compliance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Known to be non-compliant; Does not consult physician</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Usually consults physician; Knows medication</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>IV. UNDERSTANDING OF TRANSPLANT AND FOLLOW-UP</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>Unable to Rate</td>
</tr>
<tr>
<td>8. Relevant Knowledge and Receptiveness to Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No idea of what is involved;Views transplant as a cure; No long range picture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some knowledge gaps or denial; Can explain good understanding</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Able to state risks and benefits; Realistic</td>
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</table>

Final Rating of Candidate Quality:

<table>
<thead>
<tr>
<th>Score</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-19</td>
<td>Poor candidates; surgery not recommended</td>
</tr>
<tr>
<td>20-24</td>
<td>High Risk Candidates; significant risks identified</td>
</tr>
<tr>
<td>25-29</td>
<td>Recommendations while identified risks are present</td>
</tr>
<tr>
<td>30-34</td>
<td>Minimally Acceptable Candidate</td>
</tr>
<tr>
<td>35-40</td>
<td>Recommended to fail under certain conditions</td>
</tr>
<tr>
<td></td>
<td>Good candidates</td>
</tr>
<tr>
<td></td>
<td>Recommended to fail; some monitoring may be required</td>
</tr>
<tr>
<td></td>
<td>Excellent candidates</td>
</tr>
<tr>
<td></td>
<td>Recommended to fail without reservations</td>
</tr>
</tbody>
</table>
Appendix 3. STOP-D FORM

STOP-D

NAME: ___________________________  DATE: ___________________________

Please answer the following questions so we can offer you additional services should you need them. Please answer each question by circling how you have been feeling. Be assured that your answers are CONFIDENTIAL.

Over the last two weeks, how much were you bothered by:

1. Feeling sad, down, or uninterested in life?
   - not at all
   - a little
   - moderately
   - severely

2. Feeling anxious or nervous?
   - not at all
   - a little
   - moderately
   - severely

3. Feeling stressed?
   - not at all
   - a little
   - moderately
   - severely

4. Feeling angry?
   - not at all
   - a little
   - moderately
   - severely

5. Not having the social support you feel you need?
   - not at all
   - a little
   - moderately
   - severely

Please provide your phone number ___________________________

For Office Use Only
- Nurse discussed responses with patient
- Referral sent to Psychology
- Handouts given to patient
- Letter sent to family doctor
- Patient declined referral

NOTES:

Young, Q-R, Ignaszewski, A, Fofonoff, D & Kaan, A. Brief Screen to Identify the Five Most Common Forms of Psychosocial Distress in Cardiac Patients: Validation of the STOP-Distress. Journal of Cardiovascular Nursing; 2007; 22-6:525-534.
Appendix 4. Social Worker Job Description

Social Worker Job Description for Heart Failure and Transplantation

Along with routine Social Work responsibilities, the Social Worker in the Heart Failure and Transplantation Program will be flexible in scheduling of working hours (to accommodate family meetings etc) and provide the following support for heart failure, VAD, pre and post-transplant patients and their caregivers:

- Compliance history
- Notification of BC Hydro re VAD implantation
- Assist with financial plans for candidates needing urgent dental work
- Explore the feasibility of innovative interventions to improve the patient and family experience

**Adult Guardianship: abuse, neglect & self-neglect:**
- Investigate all AGA concerns

**Transition and discharge planning:**
- Arrange and facilitate family meetings

**Psychosocial Assessment and Support:**
- Determine level of family/caregiver support available
- Provide ongoing emotional and psychological support for patients and families in conjunction with other team members – for eg., psychology, nursing, pastoral care,
- Assist patients and families re: financial concerns
  a. Referral to income assistance as appropriate
- Address psychosocial issues that come to light during assessment

**Accommodation and Travel:**
- Assist Travel arrangements for out of town patients needing to travel urgently for transplant
- Assist with finding accommodation if necessary
- Arrange for accommodation at Heart Home
- Develop with team a long term plan for accommodation support for out of town patients/families

**Advance Care Planning:**
- Ascertain/facilitate designation of temporary substitute decision maker guardianship
- Assist with end of life care planning/ wills/advance directives

November 14, 2012
Appendix 5. Candidate Selection Form

Providence Health Care
St. Paul’s Hospital

Heart Transplant Program
CANDIDATE SELECTION FORM

Date: ____________________ Diagnosis: ____________________

Medical/Surgical Contraindications
☐ NONE
☐ Neurological
☐ Cardiovascular
☐ Respiratory
☐ GI-hepatic
☐ Renal
☐ Urogenital
☐ Skin/Eyes
☐ Musculoskeletal
☐ Hematologic
☐ Endocrine
☐ OTHER

Lifestyle Management Contraindications
☐ NONE
☐ Smoking
☐ Substance misuse
☐ Exercise
☐ Medications
☐ Diet
☐ Weight
☐ Fluid restriction
☐ Missed appointments
☐ OTHER

Psychosocial Contraindications
☐ NONE
☐ Psychiatric disorder
☐ Personality disorder
☐ Cognitive deficits
☐ Poor coping
☐ Social support system limitations
☐ Relocation concerns
☐ Financial concerns
☐ OTHER

Decision Making Process

THIS DECISION WAS MADE WITH:
☐ Open and honest discussion amongst the team
☐ An invitation for dissenting opinions
☐ Input from all appropriate team members
☐ A holistic assessment of the patient
☐ Input from patient re personal preferences
☐ Respect for patient’s dignity and autonomy

COMMENTS:

Transplant Team Decision: Transplant Candidate [ ] YES [ ] NO V.A.D. Candidate [ ] YES [ ] NO [ ] Deferred

Decision Approved By: Cardiologist: ____________________ Surgeon: ____________________

Plan: ____________________

Living Will
☐ Power of Attorney
☐ DNR

Form No. PHC-XX000 (Sep-06)

Clinical Guidelines for Adult Heart Transplantation Page 38 of 77
Appendix 6. Pre-Activation Talk

Pre-Activation Talk

☐ Waiting on the list
  - Not everyone gets a transplant
  - <10% die on the heart waiting list
  - Discuss wishes with family while you are in control
  - Advance Care Plan
  - Pack a bag ready with things you may need post op. Put the transplant education manual in there

☐ Pager
  - Have cell phone with you and on at all time. We will call cell first. If unable to reach you at all other numbers, we will page you
  - Password locked
  - Pager testing every other Thursdays am
  - Change batteries every month

☐ While Active on list
  - If you are admitted to a hospital your status has changed, notify your Nurse during office hours or BC Transplant after hours
  - If planning travel, notify nurse
  - No surgery unless cleared by surgeon & cardiologist
  - Pre-transplant clinic appointment every 4-6 weeks

☐ Donors
  - No control over receiving donors
  - Pronounced brain dead by two doctors
  - Thank you letters important

☐ Call into Hospital
  - We will ask you: Any change in your status since last seen in clinic? Fever? Antibiotics? Signs of infection?
  - Nothing to eat by mouth
  - Stay off cell phone so we could contact you again if needed
  - Set up phone tree system
  - We arrange transportation to SPH but if dry run, you would be responsible for trip home – have a plan in place
  - Dry run 20-30%
  - May need money for cab if commercial flight
  - Travel plan as per social worker

☐ Arrival to St. Pauls
  - Go directly up to 5A
  - If after hours, go through ER
  - You will get a CXR, IV, bloodwork
  - You may get drugs/blood products to reverse your INR if you are on warfarin

☐ Surgery
  - On average 6 hrs
  - Family wait in CSICU waiting room for surgeon after surgery
  - Rest Easy gift certificate
  - Lines put in while asleep
  - There will be many tubes and machines post op
  - Goal length of stay is 2 days. May be up to 1 week

☐ Ward
  - From CSICU, will transfer to 5A more stable or when bed is available
  - Focus on education, exercise, deep breathing and coughing, learning new medication and biopsy schedule
  - Average stay 2 weeks

☐ Post transplant clinic
  - Will need to stay in Vancouver for 3 months
  - Clinic & biopsy schedule will be given to you at discharge

☐ Complications
  - All surgeries come with potential complications
  - Bleeding
  - Clots
  - Diabetes (may require insulin use in the beginning, esp if already have diabetes)
  - Rejection
  - Infection
  - Death
  - Lymphoma from drugs
  - Skin exam annually, +++ sun protection
  - Recommend annual physical – especially mammograms, Pap smears, prostate exam for men

Page Tested with patient present and provided on

Date: __________________

Pager number: __________________

RN signature __________________
Appendix 7. Exceptional Distribution – Follow-up of Recipients

FAX COVERSHEET - REQUIRED MEDICAL FOLLOW-UP FOR TRANSPLANT RECIPIENTS

BC Transplant (BCT) 3rd Floor, West Tower, 555 West 12th Ave. Vancouver, BC CANADA V5Z 3X7
Telephone (604) 877-2240 Toll Free 1-800-663-6189 FAX (604) 604-877-2111

FAX COVERSHEET
Required Medical Follow-Up FOR TRANSPLANT RECIPIENT(S)

FROM: ___________________________ Date: _____________________
Number of Pages ___________________ [Attach copy of Exceptional Distribution]
(including this one)

☐ SPH Heart Clinic Fax: 604-806-8763 Attention:
☐ SPH Kidney Clinic Fax: 604-806-8076 Attention:
☐ BCCH Fax: 604-875-2943 Attention:
☐ VGH SOT Clinic Fax: 604-875-4088 Attention:
☐ OTHER Fax: Attention:

Please note that the organ recipient listed below requires Medical follow-up as a result of Exceptional Distribution of Organs:

Date of Transplant: _____________________________

Name of Recipient: _______________________ Organ transplanted: ________________

A copy of the Exceptional Distribution is attached.

PLEASE INFORM THE RECIPIENT’S MEDICAL PHYSICIAN IMMEDIATELY. If further information is required, please do not hesitate to contact our department.

Notice of Confidentiality
This communication is intended for the individual or institution to which it is addressed. It may not be distributed, forwarded, or disclosed to other unauthorized persons. It may contain confidential or personal information subject to the Freedom of Information and Protection of Privacy Act and the Personal Information Protection and Electronic Documents Act. If you receive this communication in error, please notify the sender immediately and destroy the communication, thank you.
Appendix 7. Exceptional Distribution – Follow-up of Recipients (Cont)

BC Transplant Exceptional Distribution Form

PART A
Source Establishment:  BC Transplant □ Other (Provide Name)  
Donor ID No.: Date of Distribution of Organ: 
Receiving Program or Transplant Centre: □ VGH □ SPH □ BCCH □ Ike Barber Lab  
□ Other 
Name of Organ: □ Heart □ Lung (Dbt) □ Lung (Rt) □ Lung (Lt) □ Liver □ Pancreas □ Pancreas for Islets  
□ Kidney (Rt) □ Kidney (Lt) □ Adjunct Vessels  Other Describe (e.g. small bowel): 
Reason for Exceptional Distribution (include all tests not completed or conditions not met and risk of disease transmission. Refer to back of form):  
(Write if applicable) □ RPR not available 
Completed by: Date: 

PART B
TRANSPANTING PHYSICIAN / SURGEON
The justification for acceptance is for compassionate reasons related to the interests of the recipient, including medical emergency and an organ determined safe is not immediately available.

I (or my authorized designee) have had a conversation with the recipient and/or next of kin/substitute decision maker in which I explained the reason(s) for Exceptional Distribution as defined above, and the risks associated with this reason(s). I have obtained informed consent from the recipient and/or next of kin/substitute decision maker and I authorize the acceptance of the organ(s) described above for transplant. 

Name Signature Date Time

THIS MUST BE FULLY COMPLETED WITH DATE AND TIME

Return completed signed copy to BCT Quality Assurance. FAX 604-877-2111
Appendix 7. Exceptional Distribution – Follow-up of Recipients (Cont)

Recommended Follow-up Testing for Recipients Transplanted under Risk for Viral Mediated Disease Transmission

NOTICE TO TRANSPLANT RECIPIENT MEDICAL TEAM:

The following protocol has been approved by the BC Transplant Medical Advisory Committee (MAC) as a course of action for follow-up of recipients transplanted at risk for HIV and/or Hepatitis:

IT IS RECOMMENDED THAT RECIPIENTS ARE RETESTED FOR HIV, HEPATITIS B AND HEPATITIS C at:
- 4 weeks
- 8 weeks
- 6 months
- 1 year

Recommended Test Methods**:
- HIV - Conventional antibody testing
- HBV - HBsAg and HBcIgM
- HCV - Conventional antibody testing

**NOTE: If there is clinical or epidemiological evidence to suggest a patient may have become infected with any of these viruses and antibody tests are negative, then PCR testing should be discussed with the medical team.
Appendix 8.  Heart Transplant Recipient Call-In Progress Notes

Heart Transplant Recipient Call-In Progress Notes

<table>
<thead>
<tr>
<th>Date:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Call start time:</td>
<td>Call End time:</td>
</tr>
<tr>
<td>Estimated donor organ retrieval time:</td>
<td>Estimated recipient OR time:</td>
</tr>
<tr>
<td>Contact pt – phone 1st or if have pager (code 2468)</td>
<td></td>
</tr>
<tr>
<td>Change in condition?</td>
<td>Infection?</td>
</tr>
<tr>
<td>Remind patient:</td>
<td>INFO</td>
</tr>
<tr>
<td></td>
<td>Hold Coumadin &amp; all meds</td>
</tr>
<tr>
<td></td>
<td>Bring list of medication</td>
</tr>
<tr>
<td></td>
<td>Possibility of dry run</td>
</tr>
</tbody>
</table>

Patient is Local

Pt stable, ample time & responsible person is able to drive
- Taxi vouchers for absolute cases only – page SPH ER social worker to request for voucher

Patient is NOT local - option below as per patient's travel plan:

BC Ferries – Call 1-877-222-1949 and ask for Kim Cameron regarding Medical Assured Loading to ensure expedited and free travel. Provide pt’s name, reason for travel, address, phone number, and vehicle colour, year, make and license plate number and departure terminal.

Flight – Call Traveler Emergency Help Desk 1-888-252-4942 or 1-416-928-5432

- Arrange taxi (Yellow Cab 604-681-1111) or ground ambulance (604-875-5151) for airport to hospital transport

ETA

If Delay – Notify Cardiologist on-call
- Notify Retrieval Coordinator (page via 604-877-2240)

Does patient have infection precaution?

| No | Yes - specify: *notify departments |

Notify following departments/persos – inform of ETA & infection precaution.

SPH # 604-682-2344

SA 62204  * remind to pick up chart  CNL/CN;

Bed Booking 604-806-9271  Clerk;

CSICU  62117  CNL/CN;

OR 62330  CNL/CN;

Form completed by:  Signature:  Print name:
Appendix 8.  Heart Transplant Recipient Call-In Progress Notes (Cont)

Emergency Travel Requirements for Recipients needing Flights to Vancouver for Transplant on/or behalf of BC Transplant and as arranged/ticketed by TEH.

1. Once organ(s) are accepted by physician or surgeon from each organ group, they call the recipient coordinator to confirm the name of the proposed recipient, and identify the time frame in which the patient should be in hospital. This will determine transportation options (ferry, flight, drive, charter, air ambulance). Individual organ acceptance typically does not occur simultaneously. There can be up to 6 different recipients for each case (2 lungs, 1 liver, 2 kidneys, 1 pancreas) with a mixture of transportation needs.
2. Recipient coordinator contacts recipient and determines transportation needs, if they have oxygen, need for companion, etc.
3. It may be determined that air transportation may not be required for any recipients.
4. Recipient coordinator would then contact TEH travel specialist for each recipient needing commercial flight. Recipient coordinator has the following information on hand:
   - Recipient name
   - Contact information
   - Time parameters
   - DOB
   - Contact info
   - O2 requirements
   - Companion needs (For exceptional cases based on medical needs TO BE ADVISED AT TIME OF BOOKING)
5. TEH specialist contacts recipient coordinator with details of commercial flight.
6. Recipient coordinator advises recipient of the arrangement details and requirements.

- NB: Ask if their pilot can call a cab for the patient that gets them closest to the plane (as charted flights are on a different tarmac).

Progress Notes:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
Appendix 9. Transplant Pre-op Check list

Transplant Pre-op Check List

The goal is to have the patient prepared for the OR within 1 hour of arrival.

Assume the OR is going ahead unless you hear otherwise! The physicians will phone if they have an update in regards to time. Do not call for OR time.

The Physician key to the pre-transplant office is kept in the 5A narcotic cupboard. The BCTS are kept on the shelf marked activated.

Nursing

Prior to patient arrival prepare the patient room/lounge with the following:

☐ IV D5W TKVO – use macrodrip and extension tubing set
☐ 10 mg Vitamin K (mix in a mini-bag) Vitamin K is kept in the fridge.
☐ Containers for urine C&S and urinalysis
☐ Scale, BP cuff, and dinamap

On Most occasions the patient will arrive with a support person(s). This is usually a very emotional / stressful time for both the patient and the family. Pastoral care can be called to see. This is usually very helpful!

☐ Ensure the chest X-ray has been done. The patient usually stops at X-ray before coming to the unit. If it is not completed call for it to be done STAT.
   Note on the requisition:
   Exam required: CXR PA-Lateral
   Relevant History: For transplant
   Tentative Diagnosis: For heart transplant

☐ Ensure the lab and IVT are called STAT.

☐ If patient has AICD – place patient on telemetry. The pacemaker clinic or EP physician will turn off AICD function.
Appendix 9. Transplant Pre-op Check list (Cont)

☐ Have the patient change into hospital gown.

☐ Inquire when the last food or drink was and if the patient is taking anticoagulation.

☐ Call the physician to inform him/her that patient has arrived. They may give verbal orders over the phone.
   Note on the orders:
   - CMV status: Donor and Recipient
   - √ CMV negative blood products if CMV recipient and donor are negative.
   - If on anticoagulation – physician may request FFP prior to OR. Ask whether patient needs a repeat INR and who to inform if INR is greater than 1.5
   - Antibiotic coverage – physician to choose Cefazolin or Clindamycin

☐ Get height, weight and vital signs. Record on clinical record. The weight must also be recorded on the admission orders.

☐ Do a mini nursing assessment. (Important areas to focus: brief medical history, medications, breath sounds, last food/drink, location of emergency contact person). If time permits complete assessment as per standards.

☐ Connect IV D5W and give vitamin K if ordered.

☐ Collect and send urine specimens to the lab.

☐ Assess patient’s anxiety. Administer ativan PRN (Ensure consent signed. This is usually done before admission – found in brown folder in the front of BCT8 chart)

☐ Give pre-medications as ordered.

☐ Assist if necessary for pre-op shower. Use Chlorhexidine scrub.

☐ Print off blood work results. Notify physician of any abnormalities.

☐ Complete pre-op checklist.
Appendix 10. Heart Centre Care Map (Cont)

HEART CENTRE CARE MAP
PAGE 2: INITIAL ASSESSMENT & SCREENING

Permanent Record – COMPLETE IN PEN

Baseline Functional Assessment

<table>
<thead>
<tr>
<th>Activities of daily living:</th>
<th>Who helps care for you at home?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is your living situation?</td>
<td>Independent ☐ Facility ☐ Assisted ☐ Residential ☐ Other:</td>
</tr>
</tbody>
</table>

Do you need help with bathing and dressing? ☐ No ☐ Yes
Do you need help with meals and eating? ☐ No ☐ Yes

Do you require home supports? ☐ No ☐ Yes
☐ Referral to OT complete
☐ TST referral when transferred to cardiac ward

Other information:

Mobility: How far can you walk? ☐ Independent ☐ Mobility aids: ☐ Walker ☐ Cane/crutches ☐ Wheelchair

FALL RISK: If YES to either question, complete Fall Risk Assessment Screen (PHC-NF250) and referral to physiotherapy

Do you have difficulty walking? ☐ No ☐ Yes

Have you had a fall in the past 6 months? ☐ No ☐ Yes

Nutrition: Special diet: ☐ Good ☐ Poor
Appetite: ☐ Good ☐ Poor
Recent unintentional weight loss/gain: ☐ No ☐ Yes
☐ Referral to Dietitian complete

Sleep problems: ☐ None ☐ Occasional ☐ Frequent
☐ Sleeping pills:
☐ Sleep apnea: ☐ Home CPAP ☐ Referral to Resp. Therapist

Screening

I need to ask you the following questions to help us care for you safely:

Dysphagia: Screen all patients before any food or drink is offered
☐ No risk factors for dysphagia ☐ OR ☐ Check all that apply if YES to any, complete Dysphagia Screening Tool (PHC-NF208)

☐ Age of 70 or older ☐ Signs/symptoms of dysphagia ☐ Neurological diagnosis
☐ History of COPD ☐ Intubation (more than 48 hrs) ☐ Head/neck surgeries or injuries (this admission)

Tobacco: Have you used any tobacco products in the past 5 months? ☐ No ☐ Yes
☐ Referral to QuitNow program complete

Drugs: Have you used any non-prescription drugs in the last month? ☐ No ☐ Yes
What and last use:

Alcohol: When was your last alcoholic drink? ☐ 7 or more days ago (No further screening required) ☐ If less than 7 days ago, complete CAGE questions (below):

CAGE:
| Have you ever felt the need to cut down on your drinking? | ☐ No ☐ Yes |
| Have people annoyed you by criticizing your drinking? | ☐ No ☐ Yes |
| Have you ever felt guilty about your drinking? | ☐ No ☐ Yes |
| Have you ever been physically hurt by someone? | ☐ No ☐ Yes |

If YES to 2 or more of CAGE questions, complete Alcohol Withdrawal Monitoring Protocol (PHC-PH214)

Delirium: Risk factors for delirium:
If 3 or more risk factors, screen patient using Confusion Assessment Method (CAM):
☐ CAM- ☐ CAM+

Other information:

Skin/wound care: ☐ Braden scale completed (PHC-EL029)

Pain: Do you have pain now or do you have an illness that gives you pain?
☐ No ☐ Yes
Pain score (0-10): ☐ 10 ☐ other
Specify:

Violence, abuse, neglect and self-neglect:

(1) Observe: for signs of violence, abuse or neglect (e.g. bruising, fear or anxiety, lack of self-care)
(2) Say: Because we know that violence and abuse affects health, at PHC we ask all our patients about their safety in relationships.
(3) Ask:

Do you feel unsafe at home? ☐ No ☐ Yes
Are you being physically hurt by someone? ☐ No ☐ Yes
Are you afraid of someone close to you? ☐ No ☐ Yes
If YES to any, ☐ Referral to Social Work

If you initial this form you must complete the Interdisciplinary Signature Sheet at the front of the patient chart.

Form No. NF219 (R. Aug-11)
Appendix 10. Heart Centre Care Map (Cont)

PAGE 3: PLAN OF CARE (Prelim - working document)  
Patient Name: ______________________

DNAR status:  
☐ Refer to completed Orders (PMC-PR254)

Neurological
Observation level:  
☐ Routine  ☐ Close  ☐ Constant
Delirium plan: ______________________
Restrains in use: ______________________
Pain management plan: ______________________
Delirium:  
☐ CAM –  ☐ CAM +

Cardiovascular
Vital signs:  
☐ Routine  ☐ Q ____________  Target weight: ____________  ☐ Daily weight
Telemetry:  
☐ No telemetry  ☐ Class II  ☐ Class I  Heart rhythms: ______________________
☐ Pre-op telemetry: ______________________
Last ischemic symptoms: Date & time: ______________________  Ischemia management: ______________________
Last arrhythmia event: Date & time: ______________________  Arrhythmia management: ______________________
☐ Pacer:  
☐ Temporary  ☐ Permanent  ☐ Epicardial wires:  
☐ Insulated  ☐ Date removed: ______________________
☐ ICD  ☐ Other cardiac device: ______________________
Goals for hemodynamic parameters: HR: ____________  P/CO/VT: ____________  MAP/BP: ____________
Inotropes: ______________________
Mechanical support parameters: ______________________
IV Infusions: ______________________  ☐ Strict fluid balance monitoring  ☐ Vascular checks: ______________________
VTE Mechanical prophylaxis:  
☐ Sequential compression device  ☐ Compression stockings
Other cardiovascular issues and plan: ______________________

Respiratory
☐ O2: if SpO2 < 92% or less  ☐ OR ☐ Other parameters
Critical care: ______________________
Intubated:  
☐ ETT size: ____________  Date intubated: ____________  Date extubated: ____________
Ventilated:  
☐ Settings and parameters: ______________________
☐ CPAP: ______________________
☐ Keep head of bed raised 30-45° at all times
Other respiratory issues and plan: ______________________

Gastrointestinal and Nutrition
☐ Swallowing assessment: Date: ____________  by:  
☐ OT  ☐ Speech & Language
Diet:  
☐ NPO  ☐ Healthy Heart  ☐ Diabetic  ☐ Other: ______________________
Calorie count: ____________  to: ____________  Glucometer: ______________________
Fluid restrictions: ____________ mL/24 hrs  ☐ Encourage fluids
☐ Feeding tube: Type: ______________________  Date inserted: ____________  Date removed: ____________
Enteral feeding – Dietitian’s orders: ______________________
☐ Keep head of bed raised 30-45° at all times
Last bowel movement: ______________________  Incontinence: ______________________
Other GI & nutrition issues and plan: ______________________

RN Initials: ______________________  Date updated: ______________________

Form No. NF379 (R. Aug-11)  
Page 3
Appendix 10. Heart Centre Care Map (Cont)

### PAGE 4: PLAN OF CARE (Pencil – working document)

<table>
<thead>
<tr>
<th>Patient Name:</th>
</tr>
</thead>
</table>

#### Genitourinary

- **Voiding:**
  - [ ] Continent
  - [ ] Incontinent
  - [ ] Urinary retention
  - [ ] Bladder scale

- In-dwelling urinary catheter:
  - Date inserted: 
  - Reason for continued use: 
  - Date removed: 

- **Dialysis:**
  - 

- Other GU/Rectal issues and plan:
  - 

#### Activity & Mobility

- Daily activity plan:
  - 
  - 
  - 

- Physiotherapy plan:
  - 

- Occupational therapy plan:
  - 

- Mobility aids:
  - 

- Fall risk:
  - [ ] Unchanged from baseline (see p. 2)
  - [ ] Increased due to change in condition
  - [ ] Fall Risk Assessment Screen updated (PHC-NP256)

- Fall prevention interventions:
  - 

- Last fall:
  - 

- Other activity and mobility issues and plan:
  - 

#### Psychosocial Issues

- Last family meeting:
  - 

- Social Work consult — Reason:
  - 

- Psychosocial issues and plan (Social Work to complete):
  - 

#### Hygiene & Personal Care

- Bathing:
  - [ ] Independent
  - [ ] Assistance required

- Mouth care:
  - 

- Dentures:
  - 

- Eye care:
  - 

- Hygiene and personal care issues and plan (including patient’s preferences):
  - 

#### Skin & Wound Care

- Skin invasion:
  - 

- Braden scale reassessment required:
  - [ ] No
  - [ ] Yes

- Skin breakdown – Assessment and interventions:
  - 

- Wound care:
  - 

- RN initials:
  - 

- Date updated:
  - 

---

Form No. NF279 (R. Aug 11)

Clinical Guidelines for Adult Heart Transplantation  Page 50 of 77
### Appendix 10. Heart Centre Care Map (Cont)

**PAGE 5: PLAN OF CARE (Pencil – working document)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Major/Significant Events During Admission</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Plan for Next 24 Hours**

**Long-Term Plan and Goals of Care**

Team goals:

Patient’s goals, likes and dislikes:

<table>
<thead>
<tr>
<th>Date</th>
<th>Cardiac Surgery/Procedures this Admission</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coronary angiogram/PCI:</td>
</tr>
<tr>
<td></td>
<td>Repeat cardiac surgery:</td>
</tr>
<tr>
<td></td>
<td>Cardiac echo:</td>
</tr>
<tr>
<td></td>
<td>Transcatheter valve procedure:</td>
</tr>
<tr>
<td></td>
<td>Cardiac device implant/explant:</td>
</tr>
<tr>
<td></td>
<td>EPS/ablation:</td>
</tr>
<tr>
<td></td>
<td>Mechanical support:</td>
</tr>
<tr>
<td></td>
<td>Other:</td>
</tr>
</tbody>
</table>

**RN Initials:**

**Date updated:**
Appendix 10. Heart Centre Care Map (Cont)

<table>
<thead>
<tr>
<th>Vascular Access Lines</th>
<th>Patient Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Site</td>
</tr>
<tr>
<td>IV central</td>
<td></td>
</tr>
<tr>
<td>Arterial line</td>
<td></td>
</tr>
<tr>
<td>IV peripheral</td>
<td></td>
</tr>
<tr>
<td>IV peripheral</td>
<td></td>
</tr>
<tr>
<td>PICC Line</td>
<td></td>
</tr>
</tbody>
</table>

Pending Diagnostic Tests

<table>
<thead>
<tr>
<th>Date:</th>
<th>Date:</th>
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</tbody>
</table>

Consults

<table>
<thead>
<tr>
<th>Date:</th>
<th>Consult service:</th>
<th>Date:</th>
<th>Consult service:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

Discharge Planning

See Condition Specific Discharge Guidelines

<table>
<thead>
<tr>
<th>Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

Target discharge date: Follow-up MD:

- Cardiac Risk Factor assessment/counselling complete (PHC-NF15)
- Cardiac rehabilitation program referral

TEACHING AND INSTRUCTION REVIEW: (Tick all that apply)

- Patient education materials
- Cardiac Surgery book
- Other: __________
- Activity:  
  - Stairs
  - Exercise
  - Sexual activity
  - Driving (MD)
  - Equipment prescription
  - Other: __________
- Medications:  
  - Pharmacist to see patient – Reason:
  - Prescription given
  - Medication information materials given
  - Instructed in managing ischemic symptoms
- Wound care
- Other self-management teaching:

- Discharge guidelines given
- Follow-up:  
  - BC Bedside and transfer plan:
  - Physiotherapy:
  - Occupational Therapy:
  - Social Work:
  - TST:

RN Initials: Date updated:

Form No. NF279 (R. Aug.11)
### Heart Transplant Clinical Practice Guideline

#### Care Category

<table>
<thead>
<tr>
<th>Ward Day 1 POD</th>
<th>Ward Day 2 POD</th>
<th>Ward Day 3 POD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment/ Treatments/ Interventions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Assessment per ward routine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Telemetry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Vital signs q4h (except 0200 if stable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• If wounds dry - remove dressing and leave to air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• If wounds draining - chlorhexadine and dry dressing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• if no swabs taken for culture, take swabs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Chemstrip bid (08-16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Daily weight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Assessment per ward routine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Telemetry</td>
<td></td>
<td></td>
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<tr>
<td>• Vital signs q4h (except 0200 if stable)</td>
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<tr>
<td>• If wound dry - leave to air</td>
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<tr>
<td>• If wound draining - continue chlorhexidine and dry dressing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Chemstrip bid (08-16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Daily weight (same scale)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Assessment per ward routine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• DIC Telemetry (if RSR x24 hr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Vital signs q4h (except 0200)</td>
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<td></td>
</tr>
<tr>
<td>• Remove saline lock once telemetry d/c (if no IVs)</td>
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<tr>
<td>• Flag chart for pacing wire removal Day 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Daily weight (same scale)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• If Chemstrip &gt; 9 continue bid (08-16)</td>
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<td></td>
</tr>
<tr>
<td>• If Chemstrip &lt; 9, once daily at 1600 hr, only</td>
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<td></td>
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<tr>
<td>• Wound care (if draining)</td>
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</tr>
</tbody>
</table>

#### Education

*Please use patient competency checklist as an adjunct to the care plan.*

Daily plan (as per patient guideline) on white board (1 day at a time only)

- NURSING
  - Introduction to ward
  - Expected pathway understood

- PHARMACY
  - Assess for suitability for self-medication
  - Immunosuppressant teaching commenced

- NURSING
  - Explanation of sternal support and wound care
  - Acquisition of post-discharge tools

- PHARMACY AND NURSING
  - Reinforce immunosuppressant teaching

- NURSING
  - Other medication teaching commenced

- NUTRITION
  - Introduction of dietary considerations

#### D/C Planning

- Transition to ward setting
- Assess plans for accommodation
- Accuchek (if required)
- Medical Alert bracelet

#### Diagnostic Tests

- M/MF - Transplant bloodwork 2 hours post-dose if on Cyclosporine, 0830 if on Tacrolimus
- • Cyclosporine given pre-bloodwork/Tacrolimus given post-bloodwork
- • Monday - CXR
- • If wound draining - swab for C&S
- • Day 7 or closest BW - CMV Antigen (unless both patient & donor CMV negative)

#### Pain Management

- Assess post-op pain q4h
- Offer Tylenol #3 or plain regularly q4h

#### Mobilization

- Up in chair as much as possible
- Scheduled rest period
- Ambulate in hallway as tolerated.
- Up for meals
- Shower and wear own clothes (insulate pacing wires)
- Scheduled rest period
- Increase mobilization in hallway
- Exercise class
- Scheduled rest period

#### Nutrition

- Fluid balance - intake & output
- Assess for nausea q 4h
- Cardiac/NAS Diet as tolerated
- Intake & Output
- Increase diet as tolerated

#### Bowel Function

- Bowel protocol if required

#### Nursing Consults

- Pharmacy
- Transplant CNS
- Physiotherapy
- Social Work
- Dietitian
- +/- Diabetic RN if Gluc ↑
- +/- Psychologist
## Appendix 11. Heart Transplant Clinical Practice Guideline (Cont)

### Cardiac Transplant Clinical Practice Guideline

<table>
<thead>
<tr>
<th>Care Category</th>
<th>Ward Day 4 POD</th>
<th>Ward Day 5 POD</th>
</tr>
</thead>
</table>
| **Assessment/Treatments/Interventions** | • Assessment per ward routine  
• Vital Signs tid & pm 08/16/22  
• Wound care (if draining)  
• If Chemstrips > 9 continue bid (08-16)  
• If Chemstrips < 9, once daily at 1600 hr. only | • Assessment per ward routine  
• Vital Signs tid & pm 08/16/22  
• Pt demonstrates taking own vital signs - checked by RN  
• If Chemstrips > 9 continue bid (08-16)  
• If Chemstrips < 9, once daily at 1600 hr. only |
| **Education**                      | **NURSING**  
• Patient and family learning to monitor own vitals under RN supervision  
• Reinforce medication teaching  
• Effects of immunosuppression  
• Assess competency with bedside medication administration | **NURSING**  
• Increase independence with medications  
• Assess medication competency  
**PHARMACY**  
• Discussion re dietary requirements post discharge |
| **D/C Planning**                   | • Accommodation organized  
• +/- Day pass if educational milestones have been reached | |
| **Diagnostic Tests**               | • MWF - Transplant bloodwork 0630 if on Cyclosporin, 0830 if on Tacrolimus  
• Cyclosporin/Tacrolimus given post blood work  
• Monday - CXR  
• If wound draining - swab for C&S Day 7 or closest BW - CMV Antigenemia (unless both patient & donor CMV negative) | |
| **Pain Management**               | • Assess post-op pain regularly and  
• Offer regular Tylenol 3's or plain | |
| **Mobilization**                   | • Independent with ADL's  
• Progression of exercise including hallway walking, stairs & exercise class  
• Scheduled rest periods | |
| **Nutrition**                      | • Intake & output  
• Increase Cardiac/NAS diet as tolerated | |
| **Bowel Function**                 | • Ensure normal bowel habits restored  
• Bowel protocol if required | |

---

Clinical Guidelines for Adult Heart Transplantation Page 54 of 77
# Appendix 11. Heart Transplant Clinical Practice Guideline (Cont)

## Cardiac Transplant Clinical Practice Guideline

<table>
<thead>
<tr>
<th>Care Category</th>
<th>Ward Day 6 POD</th>
<th>Ward Day 7 POD</th>
</tr>
</thead>
</table>
| **Assessment/ Treatments/ Interventions** | - Assessment per ward routine  
- Vital Signs bid & pm 08/22  
- Pt able to take own vital signs- checked by RN  
- If Chemstrips > 9 continue bid (08-16)  
- If Chemstrips < 9, once daily at 1600 hr. only | - Discharge Assessment  
- Vital signs before discharge (patient to take own)  
- CT Sutures out (7 days post-CT removal)  
- If Chemstrips > 9 continue bid (08-16)  
- If Chemstrips < 9, once daily at 1600 hr. only |
| **Education** | **NURSING**  
- Review medication competency  
- Commence preparation for discharge teaching | **NURSING**  
- Reinforce sternotomy care  
- Explain details of outpatient medication management |
| **DiC Planning** | | **NURSING**  
- Plan for removal of staples (if present)  
- Review discharge instructions  
- Prescriptions for Immunosuppression filled |
| **Diagnostic Tests** | - NWF - Transplant bloodwork 0630 if on Cyclosporin, 0830 if on Tacrolimus  
- Cyclosporin/Tacrolimus given post blood work  
- Monday - CXR  
- If wound draining - swab for C&S  
Day 7 or closest BW - CMV Antigenemia (unless both patient & donor CMV negative) | |
| **Pain Management** | - Tylenol or Tylenol 3s as required | |
| **Mobilization** | - Independent with ADL’s  
- Progression of exercise including hallway walking, stairs & exercise class  
- Scheduled rest periods | |
| **Nutrition** | - Cardiac/NAS diet as tolerated | |
| **Bowel Function** | - Ensure normal bowel habits restored  
- Bowel protocol if required | |
Appendix 12. Example Discharge Letter to Primary Care

Dear Dr,

Please find attached a copy of the discharge summary for X.

Now that X has been discharged, we would like to outline what you can expect from our clinic in relation to care of your patient. We would like to enter into a partnership with you.

### Summary of Heart Transplant Clinic visit schedule

<table>
<thead>
<tr>
<th>Testing</th>
<th>1 month</th>
<th>Up to 6 months</th>
<th>6 months to 1 Year</th>
<th>Annually</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Biopsy</td>
<td>Weekly until 1 month</td>
<td>Second weekly until 5 months</td>
<td>Than month 6, 8 and 1 year</td>
<td>After 1 year; only if indicated</td>
</tr>
<tr>
<td>Renal function and</td>
<td>As above</td>
<td>As above</td>
<td>As above</td>
<td>As above</td>
</tr>
<tr>
<td>Immunosuppressive levels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest X Ray, ECG and Echo</td>
<td>As year 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coronary artery disease screening</td>
<td></td>
<td></td>
<td></td>
<td>Yearly</td>
</tr>
</tbody>
</table>

**Our commitment – We will:**

- Manage the patient’s immunosuppression for life.
- Continue to manage specific medications that we prescribe.
- Manage lipids and hypertension.
- Order cardiac diagnostic procedures
- Refer to cardiac rehab
- Send you a summary sheet of each clinic visit with our plans.
- Phone you if we have any concerns.
- Send you a discharge summary if the patient has been hospitalized here.

**We ask that you:**

- Manage other non-cardiac chronic conditions such as diabetes
- Keep the program here informed of major changes to the patient’s condition
  - Malignancies
  - Infections
  - Surgery
  - Major morbidities
  - Death
- Administer yearly flu shots
- Routine malignancy screening particularly
  - Bowel
  - Breast
  - Gyno
  - Skin (at least 6 monthly)

We look forward to managing this patient with you. We would appreciate feedback if you have any so that we can continue to provide consistent care with you.

**Who to call**

- Business hours: 604-806-8374
- After hours local: 604-877-2240
- After hours toll-free: 1-800-863-8189
Appendix 13. Post Heart Transplant Clinic Visit Summary

**POST HEART TRANSPLANT CLINIC VISIT SUMMARY**

Phone: 604-806-8374    Fax: 604-806-8763

Clinic Visit Date: ____________________ Date of Transplant: ____________________

Any recent hospitalization: [ ] Yes [ ] No    Date: ____________________

Clinic weight: ____________________ Last clinic weight: ____________________ Home weight: ____________________

<table>
<thead>
<tr>
<th>Signs &amp; Symptoms</th>
<th>Physical Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>BP:</td>
</tr>
<tr>
<td></td>
<td>HR:</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>Temp:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Edema:</td>
<td>Heart sounds:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Neuro symptoms:</td>
<td>JVP:</td>
</tr>
<tr>
<td></td>
<td>Edema:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Signs of infection:</td>
<td>Lung sounds:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>GI complaints:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Palpitations:</td>
<td></td>
</tr>
<tr>
<td>[ ] Other:</td>
<td></td>
</tr>
</tbody>
</table>

**Last diagnostics**

<table>
<thead>
<tr>
<th>Test</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHO/DSE</td>
<td></td>
</tr>
<tr>
<td>CXR</td>
<td></td>
</tr>
<tr>
<td>ECG</td>
<td></td>
</tr>
<tr>
<td>Angiogram</td>
<td></td>
</tr>
<tr>
<td>Biopsy</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

**RN Assessment**

**Education:**

[ ] Rejection
[ ] Infection
[ ] Medication
[ ] Diet
[ ] Lifestyle (smoking/alcohol)
[ ] Stop - D

**Annual Checks:**

[ ] Skin
[ ] Flu Shot
[ ] Other

Comments/Issues:

Signature:

Printed name:

Copy to: ____________________

Aug 2011

**Physician Assessment**

Plan:

Next Clinic Visit: ____________________

Signature: ____________________

Printed name: ____________________
## HEART TRANSPLANT OUTPATIENT TESTING SCHEDULE

<table>
<thead>
<tr>
<th>Test</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
<th>Month 4</th>
<th>Month 5</th>
<th>Month 6</th>
<th>Month 7</th>
<th>Monthly</th>
<th>1 Year</th>
<th>Annual Visits after 1 year</th>
<th>After 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biopsy</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
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<td>☑</td>
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</tr>
<tr>
<td>Typical Steroid dose</td>
<td>17.5mg</td>
<td>15mg</td>
<td>12.5mg</td>
<td>10mg</td>
<td>7.5mg</td>
<td>5mg</td>
<td>2.5mg</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td></td>
<td></td>
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<tr>
<td>Full Bloodwork</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
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<tr>
<td>Mini Bloodwork</td>
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<td>Chest Xray</td>
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<td>ECG</td>
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<tr>
<td>Angiogram, IVUS</td>
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<td></td>
<td></td>
<td>If DSE positive and creat &lt;200 if CA3 at one year, addition of alifimix</td>
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<td>Echo</td>
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<td>DSE</td>
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</table>

**Full bloodwork:** CBC, cTnT, platelets, INR, BUN, creat, LFTs, abo, lab pro, sodium, K, Ca, phosph, Mg, hemo Hb/C (for diabetics), TSH, lipids, Cys/Cr levels.

**Mini bloodwork:** felytes, R.B.C, Creat, Cys/Cr levels.
Appendix 15. Process for bloodwork drawn during routine endomyocardial biopsy

Process for bloodwork drawn during routine endomyocardial biopsy

Scope: For routine outpatients receiving an endomyocardial biopsy by Dr Toma

Rationale: This protocol is designed to minimize the number of blood draws that heart transplant patients receive by drawing blood when we already have access to a vein.

Process:

1. Patients will be sent a letter with their appointment times informing them of the new process and clarifying that the old process will stay for Biomarker study patients.
2. Biomarker Research Coordinator, Transplant Admin Assistant and Transplant Patient Educator determine which patients will have blood collected through the biopsy line.
3. HTx clerk enters request into Sunrise Clinical Manager
4. Emails Lab on Wednesday (eclairke@providencehealth.bc.ca; chlee@providencehealth.bc.ca) with a list of names of eligible patients.
5. Lab prints forms on Wednesday
6. Lab inserts the following for each patient into a specimen bag:
   a. required paperwork
   b. tubes
   c. blood transfer assembly (Product No MBC6008)
7. On Thursday morning, patient comes to accessioning between 08 and 09:00
8. Dr Toma will see that they need bloodwork as they have a bag with them
9. Dr Toma will draw blood at the beginning of the procedure, that way there will be no saline in the sheath
10. 20ml syringe of blood will be drawn – volume is dependant on tests ordered, please consider 12.5 mL extra for Research samples!
11. Using the blood transfer assembly, Dr Toma will fill each tube according to prespecified order (Link here). Keep in mind:
   a. Blood transfer assembly is sterile
   b. Nurse or assistant will have to hold the tubes
   c. Nurse will invent tubes as per instructions on above poster
   d. Labels will be in bag and must be attached to samples
12. Blood tubes will be placed in bag and the nurse will write the following on the blood requisition form (will be stamped to prompt the nurse)
   a. Date and time of collection
   b. Time of tacrolimus dose
   c. Name of collector
13. Blood to be tubed at earliest convenient time to lab
14. Any problems?
   a. Lab issues, call 62741 and ask for Calvin Lee or Jennifer Clark
   b. Other, call 62809 Carol Imai

Created July 23, 2013
Modified November 19, 2013
Appendix 16. Post Heart Transplant Biopsy Record

POST-HEART TRANSPLANT BIOPSY RECORD

<table>
<thead>
<tr>
<th>Date of Biopsy</th>
<th>Result</th>
<th>Action</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

*If you initial this form, you must complete the interdisciplinary Signature Sheet in the front of the Patient chart.*
## Appendix 17. Infection Prophylaxis

<table>
<thead>
<tr>
<th>CMYMEGALOVIRUS (CMV) PROPHYLAXIS</th>
<th>DONOR</th>
<th>RECIPIENT</th>
<th>PROPHYLAXIS</th>
<th>PRE-EMPTIVE</th>
<th>TREATMENT PROTOCOL</th>
</tr>
</thead>
</table>
| Negative                         | Negative | Negative | None        | CMV PCR Viral Load with biopsy schedule | *Valganciclovir 900mg po BID x 2 weeks then 900mg po once daily x 3 months*  
|                                  |       |           |             | *If >1000 copies/mL, follow treatment protocol for both asymptomatic and symptomatic patients* | If symptomatic or unable to tolerate oral meds, use *Ciclovir* 500mg po daily x 14 days, then *Valganciclovir 900mg po once daily x 3 months*  
|                                  |       |           |             |             | CMV PCR Viral Load weekly until documented decreased viral load, then with routine biopsies |
| Positive                         | Negative | Negative | *Valganciclovir 900mg po once daily x 3 months. Start when tolerating oral intake.* | CMV PCR Viral Load with biopsy schedule | *Valganciclovir 900mg po BID x 2 weeks then 900mg po once daily x 3 months*  
|                                  |       |           |             | *If >1000 copies/mL, follow treatment protocol* | If unable to tolerate oral meds, use *Ciclovir* 500mg po daily x 14 days, then *Valganciclovir 900mg po once daily x 6 months*  
|                                  |       |           |             | *If antibody or IV steroid positive for rejection, *Valganciclovir 900mg po daily x 2weeks* | CMV PCR Viral Load weekly until documented decreased viral load, then with routine biopsies |
| Positive or Negative             | Positive | None     | None        | CMV PCR Viral Load with biopsy schedule | *Valganciclovir 900mg po BID x 2 weeks then 900mg po once daily x 3 months*  
|                                  |       |           |             | *If 1000 - 5000 copies/mL and asymptomatic, follow treatment protocol* | If unable to tolerate oral meds, use *Ciclovir* 500mg po daily x 14 days, then *Valganciclovir 900mg po once daily x 3 months*  
|                                  |       |           |             | *If > 5000 copies/mL, follow treatment protocol* | CMV PCR Viral Load weekly until documented decreased viral load, then with routine biopsies |

- CMV PCR VIRAL LOAD = number of copies of CMV DNA Viral per millilitre
- Oral valganciclovir capsules are covered by BCTS Pharmacy Programme
- * If eGFR < 30ml/min reduce dose to 450mg
- Please consult with product literature or Pharmacist to determine exact renal dosing.
- Please consult with product literature or Pharmacist to determine paediatric dosing.

Revised March 2013
Appendix 17. Infection Prophylaxis (Cont)

### HSV PROPHYLAXIS

<table>
<thead>
<tr>
<th>HSV STATUS</th>
<th>DONOR</th>
<th>RECIPIENT</th>
<th>PROPHYLAXIS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>Any</td>
<td>Negative</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>If not available</td>
<td>Any</td>
<td></td>
<td>Acyclovir 400mg bid</td>
<td>Patients on ganciclovir or valganciclovir are covered for HSV</td>
</tr>
<tr>
<td>Positive</td>
<td>Any</td>
<td></td>
<td>Acyclovir 400mg bid</td>
<td>Patients on ganciclovir or valganciclovir are covered for HSV</td>
</tr>
<tr>
<td>Any</td>
<td>Positive</td>
<td></td>
<td>Acyclovir 400mg bid</td>
<td>Patients on ganciclovir or valganciclovir are covered for HSV</td>
</tr>
</tbody>
</table>

If any treatment for rejection is administered, re-initiate HSV prophylaxis for 2 weeks

### PCP/Toxo PROPHYLAXIS

3 months post transplant or until prednisone weaned and during any augmentation of immunosuppression (should be reinitiated for 2 weeks)

<table>
<thead>
<tr>
<th>DRUG OF CHOICE</th>
<th>ALTERNATIVES (IF SULFA ALLERGIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aerosolized Pentamidine 300mg once monthly via Respigard Nebulizer</td>
</tr>
<tr>
<td></td>
<td>Atovaquone 1500mg po daily</td>
</tr>
<tr>
<td></td>
<td>Dapsone 100mg po daily</td>
</tr>
</tbody>
</table>

If donor Toxoplasmosis positive and recipient negative consider lifelong prophylaxes

### CANDIDIASIS PROPHYLAXIS

ALL PATIENTS until discharge

- Nystatin 100,000 units/ml, swish and swallow 1 mL qid post op during hospital stay.

Revised March 2013
Appendix 18. Post Heart Transplant Recipient CMV-PCR Record

### POST-HEART TRANSPLANT
### RECIPIENT CMV-PCR RECORD

**DONOR STATUS:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Result</th>
<th>Action</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recipient Baseline:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If you initial this form, you must complete the Interdisciplinary Signature Sheet in the front of the patient chart.*
Appendix 19. Protocol for Long Term Surveillance of Cardiac Allograft Vasculopathy

PROTOCOL FOR LONG-TERM SURVEILLANCE OF CARDIAC ALLOGRAFT VASCULOPATHY

PROTOCOL

<table>
<thead>
<tr>
<th>Time Post-Tx</th>
<th>SCA</th>
<th>IVUS</th>
<th>DSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>Yes (left, right and Bx)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2 year</td>
<td>If DSE abnormal</td>
<td>Only if IMT ≥0.3mm at 1 year</td>
<td>Yes</td>
</tr>
<tr>
<td>3 to 10 years</td>
<td>If DSE abnormal</td>
<td>Only if IMT progression of ≥0.5mm at previous year</td>
<td>Yes</td>
</tr>
<tr>
<td>&gt; 10 years</td>
<td>Only if indicated</td>
<td>Only if indicated</td>
<td>Only if indicated</td>
</tr>
</tbody>
</table>

TREATMENT OPTIONS

<table>
<thead>
<tr>
<th>Abnormal SCA</th>
<th>IMT &lt;0.3mm</th>
<th>IMT ≥0.3mm</th>
<th>Subsequent IVUS - IMT unchanged</th>
<th>Subsequent IVUS – IMT progression ≥0.5mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCA and IVUS annually depending on severity</td>
<td>DSE yearly (to 10 years) Continue current therapy</td>
<td>Repeat IVUS at year 2 Tailor immunosuppression</td>
<td>Continue current therapy</td>
<td>Tailor immunosuppression</td>
</tr>
</tbody>
</table>

DSE = Dobutamine Stress Echocardiogram, SCA = selective coronary angiogram
IVUS = intravascular ultrasound
IMT = Intima/medial thickness

BIBLIOGRAPHY

Heart Transplant Patients – Dental Work Advice

Please give this sheet to your Dentist.

The Heart Transplant Program at St Paul’s advises adherence to the 2007 American Heart Association Guidelines for Prevention of Infective Endocarditis. Antibiotic regimens are listed below:

Your patient:

Name: ______________________ DOB: __________

Had a heart transplant on: ______________________

☐ Requires antibiotic prophylaxis due to post transplant valvulopathy¹ or due to:

☐ Does not currently require antibiotic prophylaxis

Signed: ______________________ Date: __________

Heart Transplant Physician

<table>
<thead>
<tr>
<th>Situation</th>
<th>Agent</th>
<th>Regimen: Single Dose 30 to 60 min Before Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>Amoxicillin</td>
<td>Adults 2 g, Children 50 mg/kg</td>
</tr>
<tr>
<td>Allergic to penicillins or ampicillin—oral</td>
<td>Cephalexin† OR Clindamycin OR Azithromycin or clarithromycin</td>
<td>Adults 2 g, Children 50 mg/kg; Clindamycin 600 mg, Children 20 mg/kg; Azithromycin 500 mg, Children 15 mg/kg</td>
</tr>
</tbody>
</table>

¹ (Circulation. 2007;116:1736-1754.)
Cardiac Transplantation: Eligibility and Listing Criteria in Canada

Anne I. Dipchand MD, Vivek Rao MD, Mustafa Toma MD, Debra Isaac MD

For the Canadian Cardiac Transplant Network
Introduction

The members of the Canadian Cardiac Transplant Network have developed Listing Status criteria to ensure consistent status listing for patients awaiting cardiac transplantation in Canada. Appropriate allocation of donor hearts across Canada is promoted by a nation-wide organ sharing agreement. The fact that this system works so well is a tribute to the members of Canada's cardiac transplantation programs, who continue to work cohesively to set standards and promote best practices for cardiac transplantation across the country.

Cardiac transplantation is the treatment of choice for patients who have 1) severe end-stage heart failure despite maximal medical therapy and/or 2) complex congenital heart disease not amenable to surgical palliation at reasonable risk. With improvements in organ preservation, anti-rejection regimes, and post-transplant management, survival rates post cardiac transplantation are very good. Unfortunately, there is a gap between the supply and the demand for transplantable organs, a gap which is made more severe by expanding indications and less conservative listing criteria for cardiac transplantation. In Canada, it is estimated that 50% of patients listed for cardiac transplantation will never receive a donor organ. Many of these patients will be removed from the active transplant list because of progressive deterioration and multi-organ failure that renders them unable to survive transplantation, and others (20-30%) will die while on the transplant list.

Indications for Cardiac Transplantation

Transplantable conditions

In general, cardiac transplantation can be considered in patients with late-stage heart disease who have received optimal medical and surgical (if appropriate) therapy, and who have an unacceptable quality of life and poor anticipated survival. Typically, this would include patients with:
- late-stage heart failure due to any cause;
- refractory life-threatening arrhythmias despite optimal medication, surgical, and device therapy;
- refractory angina not amenable to further revascularization;
- complex congenital heart disease with failed surgical palliation or not amenable to surgical palliation at acceptable risk.
Assessment of the potential cardiac transplant recipient

Cardiopulmonary exercise testing (CPX) is routinely used as an objective assessment of functional limitation and prognosis, and is valuable in determining candidacy for cardiac transplantation. CPX testing results alone, however, do not constitute candidacy for transplantation, and must be used in conjunction with a complete clinical assessment. The currently accepted indication for transplantation is a peak VO₂ <10 ml/kg/min, providing anaerobic threshold was achieved. A relative indication for transplantation, in those patients who have significant functional limitations due to heart failure, is a peak VO₂ of 10–14 ml/kg/min in patients intolerant of beta blockers, 10–12 ml/kg/min in patients on beta blockers, or those with a peak VO₂ of <50% of their maximum predicted value.

In patients with borderline VO₂ values, the Heart Failure Survival Score (HFSS) may be used to evaluate prognosis and assess candidacy for transplantation. The HFSS is a predictive model using 7 clinical characteristics, and can stratify patients into low, medium, and high risk for post-transplant survival. These variables include: (1) presence of ischemic etiology of heart failure; (2) resting heart-rate value; (3) left ventricular ejection fraction; (4) mean arterial blood pressure; (5) presence of intraventricular conduction delay; (6) peak VO₂ value; and (7) serum sodium level.

In the paediatric population, objective testing and the HFSS are generally not applicable and existing literature and clinical experience need to be utilized in a specialized centre to determine prognosis, identify patients with the greatest risk of dying and identify those who will derive the most benefit from heart transplantation.

In the setting of fetal listing for cardiac transplantation, assessment should include a detailed fetal echocardiogram for diagnosis, a detailed anatomic antenatal ultrasound for other anomalies, amniocentesis for genetic and metabolic testing, and maternal blood for viral exposure and other infectious surveillance.

Contraindications to Transplantation

In addition to assessment of patient prognosis, the evaluation of candidacy for cardiac transplantation includes careful workup for potential contraindications. It is important to note, however, that for the most part these contraindications are not absolute and decisions regarding candidacy should be made on an individual basis by the cardiac transplant program.

Pulmonary Hypertension is the only hemodynamic contraindication to transplantation. The presence of significantly increased pulmonary artery pressure is a critical issue in the determination of candidacy. The potential for right heart failure is significant in the early post-operative stages of cardiac transplantation in the presence of refractory elevation of
pulmonary artery pressure. As much as 20% of early post-cardiac transplantation deaths are attributable to right heart failure. Prior to a patient being listed for cardiac transplantation, a right heart catheterization is mandatory to assess pulmonary artery pressure, and to identify whether high pulmonary artery pressures are reversible with therapy. A vasodilator challenge should be administered when the PA systolic pressure is >50 mmHg, and when either the transpulmonary gradient (PA mean - PA wedge pressure) is >14 mmHg or the pulmonary vascular resistance is >3 Woods units (while maintaining a systolic arterial pressure of 85 mmHg). In the paediatric population, differing thresholds and criteria for acceptable levels of pulmonary hypertension exist. Assessment of candidacy with this regard should be done in an experienced paediatric cardiac transplant centre.

**Age** is not an absolute contraindication to cardiac transplantation. Although the current guidelines suggest that patients should not be considered for cardiac transplantation if they are 70 years of age or older, patients over the age of 70 have had acceptable outcomes after cardiac transplantation if they are otherwise in excellent physical condition (i.e., no other significant medical problems).

**Obesity** is associated with higher post-cardiac transplant mortality and morbidity, and it is recommended that severely obese patients not be listed for transplantation until they have achieved a BMI of <30kg/m².

**Malignancy**, specifically active neoplasm from origins other than the skin, is an absolute contraindication to transplantation. Although the general recommendation is that the patient be in remission for 5 years prior to being considered for transplantation, a pre-transplant cancer history should be assessed individually, with input from the treating oncologist regarding the risk of tumour recurrence, particularly in the setting of post-transplant immunosuppression. In the paediatric population, there is precedence for cardiac transplantation within 2 years post-malignancy in the setting of low risk malignancies with high response rates to treatment.

**Diabetes with end-organ damage**, other than non-proliferative retinopathy, is a relative contraindication to transplantation. Of particular concern are those diabetics with autonomic dysfunction and those with hypoglycaemic unawareness. Uncontrolled diabetes despite optimal therapy (HbA1c >7.5) is also considered a relative contraindication.

**Renal dysfunction** is common in the heart failure population, and may be secondary to poor renal perfusion or related to underlying conditions such as diabetes, hypertension, or primary renal disease. In many of these cases the renal function can be expected to improve with restoration of adequate blood flow, but the use of calcineurin inhibitors post transplant may be associated with deterioration in renal function. Irreversible renal dysfunction with serum creatinine of >150 mmol/l (2 mg/dl) or creatinine clearance of <40ml/min has been considered a relative contraindication to cardiac transplantation. However, multi-organ transplantation (i.e., heart and kidney) has been performed, and may be considered in appropriate candidates.

**Peripheral vascular disease** is considered an absolute contraindication, based on the severity of lesions, and the associated symptoms. In some cases surgical intervention (particularly carotid lesions) may be performed to allow listing for transplantation however,
the progression of peripheral vascular disease may be accelerated after cardiac transplantation. Isolated lesions amenable to intervention may be considered relative contraindications.

Active **tobacco and substance abuse** is a contraindication to transplantation. Active tobacco smoking is a risk factor for adverse outcomes after transplantation, particularly when it comes to coronary artery vasculopathy and malignancy. It is recommended that tobacco abstinence be monitored for a minimum of 6 months prior to a patient being listed for transplantation, and every 1–3 months afterwards. Unfortunately, about 24% of patients who receive a cardiac transplant will return to smoking post-operatively. For those patients who abuse alcohol or other substances, a similar program of monitored abstinence is required prior to listing for transplantation. Active substance abuse is an absolute contraindication to transplantation.

Active **infection** is also an absolute contraindication to transplantation. HIV infection has been considered an absolute contraindication to transplantation in the past, but more recently patients with stable, treated HIV in the absence of significant active disease have been transplanted with reasonable results. The Canadian Cardiac Transplant Network considers HIV infection to be a relative contraindication to cardiac transplantation. With the advent of effective antiretroviral therapy, patients who are carriers of Hepatitis B and C may be considered for cardiac transplantation, providing there is no evidence of hepatic cirrhosis.

**Psychosocial issues** should be carefully evaluated by qualified personnel, so these issues can be identified and addressed if possible prior to transplantation. This assessment should focus on compliance, quality of life, rehabilitation potential, ability to understand treatment plan, and social support network. The goal is to identify those factors that would have a negative impact on post-transplant survival.

**Severe pulmonary or liver disease**, or any other significant organ dysfunction that would limit the quality of life or survival benefit to be gained from cardiac transplantation, is a contraindication to cardiac transplantation. Multi-organ transplantation may be considered in appropriate circumstances. Concomitant lung and heart transplant is the most common multi-organ (with heart) transplantation, and requires a separate discussion of indications and listing protocol.

**Immunoincompatibility** testing is mandatory prior to listing for transplantation. Although a high panel reactive antibody (PRA) is not a contraindication to transplantation, it is associated with a marked decrease in availability of suitable donors. Strategies to reduce PRA in highly sensitized patients are being developed and evaluated but are beyond the scope of this paper. High PRA is most likely to be present in multiparous females, patients who have received numerous blood transfusions, those with mechanical circulatory assist devices, and patients with complex congenital heart disease having undergone previous palliative surgery (especially with the use of autologous homograft material).

**ABO-incompatibility** in the setting of cardiac transplantation is generally an absolute contraindication except in the infant and young toddler population given the immaturity of the immune system and the delayed production of isoagglutinins. ABO-incompatible
cardiac transplantation should only be undertaken in an experienced paediatric cardiac transplant centre.

Chromosomal, neurologic or syndromic abnormalities that are severe and/or progressive with an early mortality are absolute contraindications to cardiac transplantation. Nonprogressive or slowly progressive systemic diseases and genetic syndromes with life expectancies into the 3rd or 4th decade (genetic or metabolic cardiomyopathies) are no longer considered absolute contraindications.

Fetal listing is contraindicated if the fetus has not reached an age of pulmonary maturity, is not greater than 35 weeks gestation, and has not reached an estimated fetal weight of greater than 2.5 kilograms.

**Process of Assessment for Cardiac Transplantation**

Adult cardiac transplant programs currently exist in Halifax, Montreal, Quebec City, Toronto, London, Ottawa, Edmonton/Calgary, and Vancouver. Paediatric cardiac transplant programs currently exist in Toronto, Montreal, Edmonton and Vancouver. Patients from outside of these geographic areas are referred to the nearest transplant centre for assessment. While it is often possible for a portion of the pre-transplant investigations to be performed outside of the transplant centre, the patient is usually required to undergo a significant portion of the assessment at the transplant centre.

Considerable expertise is required to determine whether a patient is a suitable transplant candidate. This requires a multi-disciplinary approach, to build a relationship between the patient and the transplant centre and to facilitate post-transplant management. Good communication between the transplant centre and the referring physicians is essential.

While some patients are referred for emergent transplantation listing, many others will be referred as they progress in their disease, to the point where it is anticipated that their functional status will imminently decline. For non-emergent candidates, the assessment process should include thorough evaluation of all of the prognostic investigations and potential contraindications. In patients for whom emergent listing is contemplated (cardiogenic shock, acute mechanical circulatory support, etc.) the assessment process is by necessity abbreviated. In these cases, the following assessments are key:

- Assessment of neurologic status. Patients must be deemed neurologically intact prior to listing for transplantation. If there is either doubt about the neurologic status or potential for significant neurologic impairment, strategies for bridge to candidacy (i.e., short-term circulatory support) may be considered, and the patient then re-evaluated over time.
- Assessment of infection and infection risk.
- Assessment of blood group for listing purposes.
- Assessment of pulmonary artery pressure, and documentation of the absence of irreversible pulmonary hypertension.
• Assessment for sensitization to HLA antigens.
• Careful consultation with patient and family. It is important that the patient and family be aware of the risks and benefits of transplantation, and of the therapeutic commitments necessary for successful management after transplantation. When a patient is not able to give informed consent, the family must be consulted about the patient’s stated or probable wishes.

Timing of Referral for Transplantation

1) Potential transplant patients should be referred to a cardiac transplant centre for evaluation in the setting of severe chronic cardiac disability ± evidence of reduced organ perfusion only after they have undergone optimization of medical, surgical, and device therapy.

2) Patients with acute severe cardiac decompensation may be referred for evaluation when there is failure to respond to conventional therapies, and where the primary process is cardiac, in the absence of irreversible failure of other organ systems. Examples would include documented dependence on IV inotropic support to maintain adequate organ perfusion, or refractory cardiogenic shock.

3) Patients being considered for acute Mechanical Circulatory Assist (MCA) device implantation should be evaluated for cardiac transplantation candidacy as part of the MCA assessment.

If referring physicians have questions about their patients’ suitability or the timing of referral for cardiac transplant assessment, the cardiac transplant program should be contacted directly for discussion and guidance.
Listing Status for Cardiac Transplantation

When patients have been listed for transplantation, they are assigned a listing status according to their disease stability and the likelihood of survival without transplantation. The following status criteria have been developed by consensus by the Canadian Cardiac Transplant Network for listing of cardiac transplant recipients across the country. The criteria below are to be applied to patients for whom a decision has already been made about the appropriateness of cardiac transplantation. It is not meant to represent criteria for listing. All patients must be proven neurologically eligible for listing.

Status Criteria: Adult Cardiac Transplantation

**Status 4**
1) Mechanically ventilated patient on high-dose single or multiple inotropes ± temporary mechanical circulatory support (eg. Intra-aortic balloon pump, extra-corporal membrane oxygenation (ECMO), abdomen BV5500, or biomedicus), excluding long-term ventricular assist devices (VAD).
2) Patient with VAD malfunction or complication, such as thromboembolism, systemic device-related infection, mechanical failure, or life-threatening arrhythmias.
3) Patient should be re-certified every 7 days as a Status 4 by a qualified physician, if still medically appropriate.

**Status 4S**
1) High PRA (>80% using the Canadian cPRA calculator)

**Status 3.5**
1) High-dose or multiple inotropes in hospital, and patients not candidates for VAD therapy or no VAD available.
2) Acute refractory ventricular arrhythmias.

**Status 3**
1) VAD not meeting Status 4 criteria.
2) Patients on inotropes in hospital, not meeting above criteria.
3) Heart/Lung recipient candidates.
4) Cyanotic congenital heart disease with resting saturation <65%.
6) Adult-sized complex congenital heart disease with increasing dysrhythmic or systemic ventricular decline.

**Status 2**
1) In-hospital patient, or patient on outpatient inotropic therapy not meeting the above criteria.
2) Patients listed for multiple organ transplantation (other than heart-lung).
Status 1

1) Adult with cyanotic CHD: resting O₂ saturation 65–75% or prolonged desaturation to less than 60% with modest activity (i.e., walking).
2) Adult with Fontan palliation with protein-losing enteropathy.
3) All other out-of-hospital patients.

Pediatric Cardiac Transplantation

General Principles for the Pediatric Age Group (fetal – 18 years):

1. The option for listing across compatible blood groups (i.e. ABO-incompatible heart transplantation), should exist in any pediatric patient in whom it is clinically appropriate. Eligibility for ABO-I listing is to be determined by a transplant physician or surgeon with the appropriate clinical expertise.

2. Organ allocation will be made preferentially to postnatal patients regardless of status. There may be circumstances where an in utero patient is deemed to have “life threatening CHD not amenable to medical or surgical temporizing therapy” and may be listed as a Status 4 at the discretion of the listing program. Allocation of a donor organ to an in utero patient ahead of any postnatal patient (regardless of listing status) will require mandatory discussion physician-to-physician. The program with the Status 4 patient should be notified as per the principles of organ sharing and initiate the discussion regarding the possibility of reallocation of the donor heart to the in utero candidate. In Utero listing: prenatal testing should confirm that the fetus is viable and medically suitable to receive a transplant; the risk of associated complications becomes appropriately low at approximately 35-36 weeks gestational age; waiting time recommences at the time of birth.

3. Hearts from donors less than 18 years of age will be first considered for recipients less than 18 years of age (pursuant to size, blood type and clinical status). However, a suitable sized pediatric donor may be better suited for a higher status older recipient and consideration for reallocation should proceed as per the principles of organ sharing (see below).

Status Criteria: Pediatric Cardiac Transplant

Status 4

1) VAD in a patient <8 kg
2) Paracorporeal VAD in a single ventricle patient
3) Mechanically ventilated on high dose single or multiple inotropes & mechanical support (eg: IABP, ECMO, abioMed BVS5000, or biomedicus), excluding VADs
4) VAD malfunction or complication such as thromboembolism, systemic device-related infection, mechanical failure, or life threatening arrhythmia
5) Patients should be recertified every 7 days as a Status 4 by a qualified physician if still medically appropriate
Status 4S
1) High PRA (≥80% using the Canadian cPRA calculator)

Status 3.5
1) Hospitalized patient with a VAD
2) Less than 6 months of age with congenital heart disease – prostaglandin dependent
3) High dose or multiple inotropes in hospital and patients not candidates for VAD therapy or no VAD available
4) Acute refractory ventricular arrhythmias

Status 3
1) VAD not meeting Status 4 criteria including outpatient VAD
2) Less than 6 months of age with congenital heart disease
3) Cyanotic congenital heart disease with resting saturation less than 65%
4) Congenital heart disease – arterial shunt dependent (i.e. Norwood)
5) Patients on inotropes in hospital, not meeting above criteria
6) Inpatient with CPAP/BIPAP support for HF management
7) Restrictive cardiomyopathy
8) Heart-Lung recipient candidates

Status 2
1) At Home with intermittent CPAP/BIPAP support for HF management
2) In Hospital for management of heart disease/HF not meeting the above criteria
3) Growth failure: <5th percentile for weight and/or height OR loss of 1.5 SD of expected growth (weight or height)
4) Cyanotic congenital heart disease with resting saturation 65-75% OR prolonged desaturation to less than 60% with modest activity (i.e. walking, feeding)
5) Fontan palliation with protein-losing enteropathy or plastic bronchitis
6) Multiple organ transplant recipient candidates

Status 1
1) All other out of hospital patients
2) In Utero (congenital heart disease or heart failure)

In the event of a dispute in organ allocation between centres, then a member of the current CCTN Executive is to serve as a mediator and can be contacted 24/7 by the physicians and surgeons participating in the organ allocation discussion.

All Status 4 and 4S patients, whether adult or pediatric, are reviewed annually at a meeting of representatives from all of the transplant centres (i.e. Canadian Cardiac Transplant Network meetings) as a means of quality assurance.
Organ Sharing: A Nation-wide Agreement to Promote Optimal Donor Heart Allocation

The Canadian Cardiac Transplant Network has endorsed and formalized a system whereby hearts are allocated nation-wide to the patients most in need of transplantation. The principle of the organ-sharing agreement, as outlined by the Canadian Cardiac Transplant Network, is as follows:

The OPO will offer the donor heart to the Canadian site with the highest status recipient in the geographic area. The OPO will also notify the Canadian program(s) with a potentially appropriate Status 4 or 4S recipient(s) nationwide of the potential donor heart. Mandatory discussion in a timely fashion, physician to physician, will ensue to allocate the organ, the principle being that the recipient with the longest current listing as Status 4 be given priority. If consensus is not reached, final allocation will be made by the center to which the heart was originally offered.

If an organ becomes available in a province without a cardiac transplant program (adult or pediatric), it will be offered to the program with the longest list patient from that province. That transplant program will then follow the established organ allocation algorithm.

All out-of-country donor hearts will be offered nationally to all programs with eligible Status 4 or 4S recipients based on the National Organ Waiting List (NOW). If there are competing Status 4 candidates, mandatory discussion is required in a timely manner, physician to physician, prior to allocation of the donor heart. If consensus is not reached, final allocation will be made by the center with the recipient with the longest current listing time as Status 4. If there are no status 4 or 4S recipients, the allocation will follow the NOW by status and date/time of listing, taking into consideration geographic considerations.