Lung Transplantation

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Pre-Transplant

Criteria for Referral: Based on ISHLT guidelines. Refer via Lung Transplant Proforma available on MMUH website and sent to lungtransplantreferrals@mater.ie. Must be active undergoing pulmonary rehab. Contraindications to referral BMI >35, active smoking, vaping, nicotine patch. Transplant Physician reviews each case, not all referred undergo an assessment for transplant.

General Indications	Potential Contraindications
Advanced lung disease Unacceptable QOL >50% risk of death 2yrs >80% chance 90day survival >80% chance 5 year survival	Advanced comorbidities, Malignancy, Obesity, Severe osteoporosis, Sepsis, Steroid >20mg, Non-Adherence, Substance abuse, Active Smoker, Absence of social support, Poor rehab potential. Age >65 years higher risk

Inpatient Assessment:

1. **Patient undergoes investigations**: May include the following

Labs	FBC, Renal, Liver, Bone, CRP, TFT, Iron, Glucose, HBA1c, Lipids, SPEP, Autoimmune Panel, ENA
Respiratory	CXR, CT Thorax, VQ Scan, ABG, PFT, CT Sinus(CF)
Cardiac	Left & Right Cath, Echo
Gastro	Colonoscopy, pH manometry, FOB, Abdo US
Bone	DEXA, OPG
Vascular	Carotid Dopplers, ABPI, Femoral Artery US
Cancer	PSA, Cervical Smear, Mammogram

2. **Patient meets with MDT:** Includes medical team, nurse specialists, surgical team, transplant coordinators, dietician, physio, social work, dentist, psychiatry, relevant consults.
3. **Patient optimized:** All co-morbid conditions optimized, Respiratory status optimized, adequate O2 prescribed.

Listing: Discussion at listing MDT where decision made to actively list patient if suitable candidate.

Active List: While on the list they may be called in for potential donor offer. They must be seen regularly by referring physician who should communicate to transplant team if deterioration. They may be suspended pending certain criteria or removed from the list if no longer suitable.

Palliative Care: At referral patients have end-organ disease. Referring physicians should have advanced care directive planning discussion and introduce palliative care for symptom control.

Transplant

Perioperative: Candidate called in for potential donor offer. If offer and cross-match acceptable transplant undertaken. Complex surgery involving medical transplant, ICU and surgical teams. Many medical and surgical complications can arise with multiple teams involved in care delivery. High risk surgery. Immunosuppression given at time of surgery.

Immunosuppression: Critical to graft survival. Donors matched for blood type to prevent hyperacute rejection. Candidates evaluated for donor specific antibodies (DSA) that could cause antibody mediated rejection. Specific peri-op regimen transitioned to maintenance as renal function and absorption allows.

Peri-Op	Maintenance	
Basiliximab (IL-2 antagonist) Methylprednisolone Azathioprine	Prednisolone	Usually 10mg
	Calcineurin Inhibitor (CNI)	Tacrolimus or Cyclosporine
	Antimetabolite	Mycophenolate or Azathioprine

IVIG: CMV status (D+/R-) and cross-match risk (↑ risk) important to note as both may require additional IVIG post-op.

CNI Levels: Trough levels taken with individualized targets based on time from transplant and patient factors such as rejection, infection, comorbidities including renal failure and presence of antibodies at time of surgery.

Side Effects: Prednisolone: Osteoporosis, ↑BSL, Psychosis
Tacrolimus: Nephrotoxicity, tremor, ↑BP ↑BSL ↑Lipids, Alopecia
Mycophenolate: Leukopenia, diarrhea, ↑BP, peripheral edema

Interactions: Caution prescribing as many drug interactions. Sotalol, Clarithromycin, contraindicated. Antifungals require CNI dose reduction. **ALWAYS ASK TRANSPLANT TEAM SIGNIFICANT CONSEQUENCES FROM DRUG ERRORS**

Antimicrobials Prophylaxis: Dictated by prior sputum and donor infections. CF require two antibiotics for Pseudomonas Cover.

Post Operative Regimen	Prophylaxis	
Gram Negative Ceftazidime	CMV	Valganciclovir
Gram Positive Flucloxacillin	PCP	Septrin Dapsone Pentamidine
Anaerobe Metronidazole		
Fungal Caspofungin	HSV	Acyclovir if CMV-/-

Post-Transplant

Respiratory: Drop in Lung Function can signal many problems

- **Infection:** May present atypically, see next section.
- **Acute Rejection:** Common within first year, ↑risk for CLAD

a) **Cellular (ACR)** –TBBX graded A0-4 for vascular, B0-2 for airway rejection. ≥A2 or ≥B1 treated with steroid pulse. May treat A1 based on clinical context. Repeat TBBX post steroids

b) **Antibody Mediated (AMR)** – Asymptomatic DSA consider ↑ immunosuppression. AMR is diagnosis of exclusion. Treated with Steroids, IVIG, plasmapheresis, rituximab.

- **Chronic Lung Allograft Dysfunction (CLAD):** 20% drop in FEV1 over 3 weeks. Multiple phenotypes including BOS and RAS. Treated with Azithromycin, Total Lymphocyte Irradiation (TLI)
- **Airway Stricture:** Treated with bronchial dilations, stent
- **Aspiration:** ↑risk, evaluate pH manometry, treat PPI/H2antag

Infections: Common post transplant, typical and opportunistic

- **Bacterial:** CAP pathogens e.g. Strep pneumonia, MSSA, MRSA, Resistant Gram-negs e.g. Pseudomonas
- **Viral:** CMV, HSV, VZV, Adenovirus, RSV, Influenza, Covid

a) **CMV Viremia** – Asymptomatic with significant replication. Treated with Valganciclovir until 2 viral loads negative then prophylactic dose with CMV level monitoring.

b) **CMV Disease** – Symptomatic with Colitis, Pneumonitis, Retinitis, Encephalitis. Treated with IV Ganciclovir then Valganciclovir. Foscarnet if resistant.

- **Fungal:** Aspergillus, PCP, Mucormycosis.

a) **Aspergillus** –Probable Pulmonary IA, Tracheobronchitis, Anastomotic infection treated with Voriconazole 1st line. Prophylaxis if colonization pre-transplant.

- **Others:** M. abscessus, M.chelonae, M.tuberculosis

Non-Respiratory Complications:
Cardiology: Hypertension, Hyperlipidemia, Ischemic Heart disease
Renal : CNI nephrotoxicity; AKI, CKD, may require RRT/ transplant
Gastroenterology: Aspiration, GERD, Gastroparesis, DIOS.
Bone: Osteoporosis, Fragility fractures, Avascular Necrosis
Endocrine: Steroid induced hyperglycemia, New-Onset Diabetes post transplant. Check OGTT in CF patients as HbA1c unreliable.
Hematological : Bone marrow suppression common due to medications and infection. Neutropenia: Mycophenolate, Septrin , Valganciclovir, CMV. May need to hold meds and give GCSF.
Malignancy: Skin Cancer: Frequently SCC. Post-Transplant Lymphoproliferative Disease (PTLD):EBV associated, usually lung/abdo, diagnose tissue bx, treat with RI/R-CHOP
Psychiatry: Depression, Anxiety, PTSD.

Referrals should be sent to lungtransplantreferrals@mater.ie