ROYAL INFIRMARY OF EDINBURGH

ISLET CELL TRANSPLANTATION PROTOCOL

Version: 19/08/2026

Prof Shareen Forbes
Mr John Casey
Mr Andrew Sutherland
Ms Kirsty Duncan
Ms Debbie Anderson
Dr Nyo Nyo Tun
Ms Lily Roper
Ms Naomi Baker

Management of Islet Transplantation. **Pre-transplant** **Date:** **Ward:**	*Addressograph or* *Name* *Address* *Dob* *Unit no.* *CHI*

NHS Lothian- University Hospitals Division

Recipient	Donor
CMV Status	CMV Status
EBV Status	EBV Status

1. Admit under **Transplant Team** (Ward 215 Transplant, RIE)
2. Diagnosis: Type 1 diabetes for islet transplantation
3. Transplant consent form to be completed
4. Record: Height, weight, waist circumference on admission
   HR, BP lying and standing, Temp and oxygen saturations 4 hourly
   Blood glucose monitoring hourly
5. Please inform Diabetes Registrar (07870158298 between 0900 - 2000 or via switchboard) (on call up to 8pm), Islet Transplant Diabetologist, Diabetes Dietitian and Diabetes Specialist Nurse on Ext 21044 and refer via TRAK for inpatient team review.
6. **Note:** the patient should be fasted for 2 hours pre procedure and 4 hours post procedure.
7. If on Multiple Dose Insulin (MDI) regimen and procedure planned for the afternoon: long-acting insulin to be administered in the morning, usual short acting insulin with breakfast and usual short acting insulin with light lunch.
8. If on Continuous Subcutaneous Insulin Infusion (CSII; insulin pump) and procedure planned for afternoon: have bolus of insulin with breakfast and bolus of insulin with light lunch and continue usual basal rate until two hours pre-procedure.
9. Will require **TWO** Cannulas, (one for Variable Rate Insulin Infusion (VRIII), second for Hydration/IV Medicines).
10. Send blood to lab for:

    * = Urgent
    Result required prior to procedure

    Full blood count and differential*
    Platelets*
    INR*
    PT, APTT, APTT Ratio*
    HbA1c
    Electrolytes, urea, creatinine*
    Liver function tests*
    Serum pregnancy test in fertile females*
    Serum CMV IgG, EBV, HBcAb, HBsAg, Hep C, HIV
    HLA antibodies and Crossmatch (10ml EDTA and 50ml clotted sample) negative Crossmatch result must be available pre-transplant unless VXM and retrospective Crossmatch specifically agreed by the H&I team*.
    ABO* Group and X match 2 units
    Blood culture* x 2 – C&S and fungi, if pt in hospital in previous week
11. Send urine for: MSU for C&S and fungi
    Urinalysis (Inform Diabetes Team if > ++ Ketonuria)
12. MRSA screen
13. Send sputum for C&S and fungi (if clinically indicated)

14. Urgent CXR if not done in last 3 months and ECG

15. Contact and liaise with Diabetes Dietitian on Ext 21460 so appropriate catering arrangements can be made and Islet transplant carbohydrate menus can be requested. If a transplant admission occurs over the weekend or on a public holiday the catering supervisor should be contacted on Ext 27057/27052 or 27062 (pick and packers).

16. Intravenous insulin regimen to be prescribed by Diabetes Registrar - Please Contact through Switchboard.

17. **Patient should be fasted 2 hours pre-procedure.** At this time commence, intravenous insulin with intravenous fluids (VRIII).

18. For patients using CSII Insulin Pump – VRIII should commence when pump is disconnected pre-procedure – this process should be done simultaneously (patients usually do NOT use insulin pump during procedure). The patient should receive a long-acting basal insulin alongside VRIII.

Adjust insulin regimen to achieve blood glucose 4 – 7 mmol/L

50 units Human Actrapid should be added to 50 mls 0.9% Sodium Chloride (= 1 unit/ml) in a 50ml Leur-Lock syringe via syringe pump.

Check blood glucose at least hourly but every 15 minutes if glucose <4mmol/L until glucose >4mmol/L: If glucose <4mmol/L, switch insulin off, administer 50ml 20% Glucose stat – repeat every 15 mins until BM>4mmol/L

Note: Intravenous insulin has a half-life of 2.5 minutes, so if stopped for any length of time, **hyperglycemia will occur.**

**** Usual long-acting insulin should NEVER be omitted (risk of DKA) ****

Intravenous Fluids Required

Background Fluids for VRIII

- **5% Glucose + 20mmol KCL 500ml**, Rate 50ml/hr– should be run when blood glucose less than 14.0mmols. (Consider 5% Glucose only, if K+ over 5.0)
- **0.9% Sodium Chloride 500ml**, Rate 50ml/hr – should be run if blood glucose over 14.0mmols (**Please CHECK KETONES** if glucose over 14.0mmols, if Ketones over 1.0mmols, CONTACT Diabetes team)

Hydration fluid for fasted patient

- **0.45% Sodium Chloride + 5% Glucose**, Rate 50ml/hr (runs continuously whilst patient is fasted via second peripheral venous catheter)

In Case of Hypoglycaemia

- **20% Glucose 500ml** (In case of hypoglycaemia - give stat 50ml stat bolus as above)

Note: The VRIII and Background Fluids should be administered via the same peripheral venous catheter, using an anti-syphon set with Y-Connector.

See Variable Intravenous Insulin Infusion Monitoring Chart attached below
Please prescribe on Monitoring Chart on Page 9.
If Glucose levels over 14.0mmols, please check capillary ketones. If Ketones over 1.0mmols, please contact Diabetes Team. Please recheck capillary ketones every 2 hours if capillary ketones are over 1.0mmols, further correction doses may be advised by Diabetes Team.

For ISLET ALONE

For patients having first and subsequent transplants (please prescribe on HEPMA):
Induction agent needs to be discussed with Islet Transplant Team

1. Lansoprazole 30mg PO, 4 hours before transplant

2. Piperacillin/Tazobactam4.5 gm IV 8hrly for 24 hours (3 doses). Start 1-2 hours pre-transplant.
   If allergic to penicillin give Vancomycin 1g IV in 250ml sodium chloride 0.9% over 2 hours (one dose only, adjust dose if renal impairment) and Ciprofloxacin 400mg IV over one hour (12hrly for 24 hours (2 doses)).

3. Paracetamol 1g PO, 30 mins before **induction agent**

4. Chlorpheniramine 10mg IV, 30 mins before **induction agent**

5. Hydrocortisone 100mg IV, 30 mins before **induction agent**

6. Etanercept 50mg (Enbrel; stored in transplant fridge as 25mg powder and solvent for solution for infusion) 50mg of Etanercept in 100ml of 0.9% Sodium Chloride given over 30 minutes for the first IV infusion given on ward 2 hours prior to going down to radiology for islet cell transplant.

7. **Induction agents** will be **either Alemtuzumab**(MabCampath) **or Basiliximab**

   Alemtuzumab (MabCampath)* 30mg SC (stored in transplant fridge, 30mg/1ml vial in solution – draw up 1ml into syringe) and give SC into thighs, arms or buttocks over 1-2 minutes, (Pharmacist Bleep 2294 / 5132), 1hr before transplant on ward.

   OR

   Basiliximab - 20mg IV in 50 ml of 0.9% Sodium Chloride and infuse over 30 minutes, infused 1hr before transplant on ward**. Basilixumab should also be prescribed and administered on day 4 post-transplant (see page 7- Other Medication).**

   Note: if patient <55kg and second transplant >6months after first and lymphopaenic or in patients at high risk of infection, consider induction with Basiliximab plus Etanercept.

   Basiliximab – to be given with second and subsequent islet cell transplants unless previous islet cell transplant was less than 10 weeks before.

8. Mycophenolate Mofetil 500mg BD (10.00 and 22.00) – unless other specific regimen appropriate. To discuss with transplant team.

9.Adoport (Tacrolimus) (check trough level (target 8-10ug/L) *if in target, usual dose of Adoport (Tacrolimus) BD (10.00 and 22.00) - unless alternative specific regimen appropriate. To discuss with transplant team.

Induction agent and etanercept given on ward prior to going down to radiology for islet cell transplant. Transplant Co-Ordinator will advise once final cell count has been confirmed.

All patients to go down to radiology with 20% Glucose 500ml bag for treatment of hypoglycaemia. Administer 50ml 20% Glucose Stat Bolus – repeat every 15 mins until BM>4mmol/L.

For ISLET AFTER KIDNEY

For patients with previous transplant, still on full immunosuppression including Adoport (Tacrolimus) aim for Tacrolimus trough level 8-10 µg/L. If in target range give as per usual dose BD*

Follow steps 1-9 above.

10. Analgesia (To be prescribed on HEPMA)

Paracetamol 1g QDS
Additional analgesic requirements to be prescribed by Transplant Team
Ondansetron 4 mgs QDS/Cyclizine 50mgsTDS for nausea and vomiting.

11. Radiology

- Radiologist to prepare, prescribe and administer sedation.
- Surgeon to prepare and add heparin to islet bags prior to infusion (usually 35 units per kg body weight, (intraportal), into bag containing islets (not the rinse solutions)

FOR SIMULTANEOUS ISLET AND KIDNEY SEE SEPARATE SIK PROTOCOL

On return from radiology

1. OBSERVATIONS: Temperature, heart rate, blood pressure, oxygen saturations, respirations every 15 minutes x 1 hour; then every 30 minutes x 2 hours; then every 1hour x4 hours.

Call transplant team: (greater than OR less than)

- Temp > 38º C.
- HR > 100 or < 60.
- Systolic BP > 160 or < 100 mmHg.
- Diastolic BP > 100 or < 60 mmHg.

2. ACTIVITY: Bed rest for 4 hours lying on right side, then activity as tolerated.

3. STAT BLOODS: Full clotting screen. FBC including, WBC and differential.

4. DOPPLER USS LIVER: Ensure Doppler USS of liver has been arranged for within 24 hours post-procedure. No need to fast for this procedure.

5. DIET: Nil by Mouth for 4 hours only post-transplant, then clear fluids. If patient tolerating clear fluids they can eat – they may choose from **islet transplant carbohydrate restricted menu** which should have already been arranged by Diabetes Dietitian (Ext 21460). If there are any catering queries, contact the catering supervisor (Ext 27057) and liaise with Diabetes Dietitian.

6. INTRAVENOUS THERAPY:

Insulin Management: Please contact on-call Diabetes registrar with any concerns.

- Target glucose 4 – 7 mmol/l

- CHECK Capillary glucose on patient's return to ward, then hourly for the first 48 hours. After 48 hours, check capillary glucose pre meals, two hours post meals and at bedtime.

Post-Operative Instructions for restarting usual insulin, ONCE EATING (Target Glucose between 4 – 7 mmol/L):

Continue hourly blood glucose monitoring and intravenous insulin scale until reviewed by Diabetes Team.

- Recommence usual insulin plan.
- If patient using an insulin pump, and able to self-manage the pump post-procedure, it can be restarted provided patient can re-attach their own insulin pump (connect pump, WAIT ONE HOUR, then disconnect VRIII).
- If patient has nausea OR vomiting, continue Variable Rate Intravenous Insulin Infusion, along with long-acting insulin

- Quick-acting insulin (Mealtime) eg Novorapid, Humalog, Fiasp must be administered 10 – 15minutes before meals.
- Patient may carbohydrate count using pre-meal glucose readings and carbohydrate content of the meal.

- Patients will have a particular ratio of amount of insulin required per 10G carbohydrate (please discuss with Diabetes Dietitian or Diabetes Registrar or Diabetes Specialist Nurse).

Note: The amount of insulin required for a carbohydrate restricted meal is individualized to the patient, reflecting amount needed to cover amount of carbohydrate as well as the amount needed to correct the glucose reading to a target value of 6 mmol/L

7. OTHER MEDICATIONS: (To prescribe on HEPMA)

1.Two further doses of Piperacillin/Tazobactam 4.5 g IV (8 hours apart); If allergic to penicillin give x1 further dose of Ciprofloxacin 400mg IV over one hour (12 hours apart from first dose)

2. Lansoprazole 30mg PO OD to continue post discharge

3. Mycophenolate Mofetil (MMF) 500mg PO BD at 1000 and 2200 hours (or alternative dose / immunosuppression if appropriate). Note dose to be increased if not lymphopaenic to 1g bd typically after 6 months. Patients >65yrs may be maintained on MMF 250mg BD.

4. Tacrolimus (Adoport) 0.05mg/kg PO BD at 1000 and 2200 hours; or usual dose if already on drug (or alternative dose / immunosuppression if appropriate).

5. Etanercept 25mg SC to be prescribed day 3, 7 and 10. Days 7 and 10 Etanercept dose to be given subcutaneously by patient as outpatient. For first SC dose (Day 3), patient should be taught to self- administer Etanercept using the pre-filled pens.

6. Basiliximab 20mg IV (in 50 ml of 0.9% Sodium Chloride and infuse over 30 minutes) day 4 post-transplant. Patient to be re-admitted for infusion. Note this is required whether it is first, second or subsequent islet transplant.

7. Co-Trimoxazole 480mg PO OD for 6 months for PCP prophylaxis. If the patient is allergic to Co-Trimoxazole Dapsone100mg PO OD is second line treatment.

8. Unfractionated Heparin sodium (MiniHep) 5000 units SC BD. Withhold if APTR >1.5. One day before discharge convert to Enoxaparin (Inhixa) 2,000 IU (20mg) SC once daily. Continue heparin SC for total of 7 days.

9. Valganciclovir 450 mg PO OD for 6 months for CMV prophylaxis unless recipient/donor both CMV and IgG negative. If T-Cell depleting induction (Alemtuzumab/ATG) is used CMV IgG D-/R- cases will also receive 6 months.

Dose as per creatinine clearance (see table below).

Note: This includes previous transplant donor CMV status.CMV status should be rechecked one-weekpost-transplant.

Creatinine clearance (ml/min)	Prophylactic dose
>40	450mg OD
25 to 39	450mg every two days
10-24	450mg twice weekly

10. Paracetamol 1g PO QDS

11. Additional analgesic requirements to be prescribed by Transplant Team

12. Ondansetron 4mg/Cyclizine 50mg PRN for nausea and vomiting

13. Glucagon 1 mg IM PRN if blood glucose <2.8mmol/l and patient cannot be treated orally

14. TB prophylaxis only for those with a history of TB, or born in the Asian/African continent: isoniazid PO 300mg OD and pyridoxine PO 10mg OD (prophylaxis of isoniazid induced neuropathy)

8. LABORATORY / DIAGNOSTIC STUDIES:

4 hours post transplant:

FBC including WBC and differential and coagulation screen.

Routine Studies (Routine Requisition):

1. DAILY: FBC including WBC and differential, coagulation screen, glucose (fasting) and glucose.
2. ALTERNATE DAYS: trough Tacrolimus level (Monday, Wednesday, Friday)

   On discharge, patients may need to attend ambulatory care for bloods prior to the Monday clinic, depending upon day of discharge. This should be discussed with islet transplant team.

Radiology:

EARLY AM liver ultrasound scan day 1 post-procedure. **Patient does not need to be fasted.**

10. DISCHARGE

On discharge the patient will be provided with a sheet containing:

1. Subcutaneous insulin regimen

2. Medication booklet including immunosuppression schedule. See over-leaf for table of drugs. Note TOTAL duration of drug treatment is shown

3. Follow up appointments for the Monday transplant clinic and other studies (to liaise with Kirsty Duncan/ Sorcha Michie/Victoria Prior/ Mel Philips/Laura Wood)

4. Contact numbers

5. General Health Care Advice in relation to transplant and immunosuppression

TABLE OF DRUGS AND TOTAL DURATION OF TREATMENT

DRUG	DOSE	ROUTE	FREQUENCY
INSULIN		SC	
Lansoprazole	30mg	PO	OD (1000) for 6 months
MYCOPHENOLATEMOFETIL*	500mg or alternative dose	PO	BD (1000; 2200)
ADOPORT (TACROLIMUS)*	0.05mg / kg Or usual dose if on drug	PO	BD (1000; 2200)
CO-TRIMOXAZOLE	480mg	PO	OD (8am) for 6 months
VALGANCICLOVIR	450mg (adjust dose if impaired renal function)	PO	OD (8am) for 6 months
ENOXAPARIN (Inhixa)	2,000 IU (20mg)	SC	OD 7 days total on SC heparin
ETANERCEPT	25mg	SC	Days (3), 7 and 10
BASILIXIMAB	20mg in 50ml saline	IV	Day 4

*In some patients reduced or alternative immunosuppression (see page 10) may be appropriate

IN SOME PATIENTS, THE FOLLOWING DRUGS MAY BE APPROPRIATE

DRUG	DOSE	ROUTE	FREQUENCY
ISONIAZID TB PROPHYLAXIS	300 mg	PO	OD 3 months
PYRIDOXINE PROPHYLAXIS OF ISONIAZID INDUCED NEUROPATHY	10 mg	PO	OD 3 months

Variable Rate Intravenous Insulin Infusion (VRIII) for ISLET CELL Transplantation MONITORING CHART

Ward: _____ Site: _____ Date: _____

Addressograph or
Name:
Address:

DOB:
Unit no. : CHI:

Notes	Capillary Blood Glucose	Scale 1 For Insulin Sensitive Patients Total Insulin Dose <25 Units per day	Scale 2 Standard Rate Total Insulin Dose 25-35 Units per day	Scale 3 For Insulin Resistant Patients Total Insulin Dose >35 Units per day	Scale 4
TREAT HYPOGLYCAEMIA SEE BELOW	**Mmol/L**	**Units/hr**	**Units/hr**	**Units/hr**	**Units/hr**
	< 4.0	0	0 ⇦	0 ⇦	
	4.1 - 8.0	0.2	0.5	1	
	8.1 - 12.0	0.5	1	2	
MEDICAL REVIEW IF GLUCOSE PERSISTENTLY ABOVE 14mmol/L	12.1 - 16.0	1	2 ⇨	4 ⇨	
	16.1 - 20.0	1.5	3	5	
	20.1 - 24.0	3	4	6	
	> 24.1	4	6	8	
Doctor Signature and Print					

Adjust insulin regimen to achieve blood glucose 4 – 7 mmol/L

50 units Human Actrapid made up to 50 mls 0.9% sodium chloride (= 1 unit/ml) in a 50ml Leur-Lock syringe via syringe pump.

Check blood glucose at least hourly but every 15 minutes if glucose <4mmol/L until glucose >4mmol/L: If glucose <4mmol/L, switch insulin off, administer 50ml 20% Glucose stat – repeat every 15 mins until BM>4mmol/L

Note: Intravenous insulin has a half-life of 2.5 minutes, so if stopped for any length of time, **hyperglycemia will occur.**

A	B	C	D	E	F	G	H	I	J
Date	Time (24hr clock)	Blood glucose (mmol/L)	Rate ml/hr	Volume (ml) remaining in syringe	Volume (ml) infused since last check (calculated from E)	Total volume (ml) infused (calculated from E)	Total volume (ml) infused – device reading	Initials (2 to set up / change rate)	Cannula check and Comments

Variable Rate Intravenous Insulin Infusion (VRIII) for ISLET Cell Transplantation
MONITORING CHART

Ward: _____ Site: _____ Date: _____

Addressograph or
Name:
Address:

DOB:
Unit no. : CHI:

Adjust insulin regimen to achieve blood glucose 4 – 7 mmol/L

50 units Human Actrapid made up to 50 mls 0.9% sodium chloride (= 1 unit/ml) in a 50ml Leur-Lock syringe via syringe pump.

Check blood glucose at least hourly but every 15 minutes if glucose <4mmol/L until glucose >4mmol/L: If glucose <4mmol/L, switch insulin off, administer 50ml 20% Glucose Stat – repeat every 15 mins until BM>4mmol/L

Note: Intravenous insulin has a half-life of 2.5 minutes, so if stopped for any length of time, **hyperglycemia will occur.**

A	B	C	D	E	F	G	H	I	J
Date	Time (24hr clock)	Blood glucose (mmol/L)	Rate ml/hr	Volume (ml) remaining in syringe	Volume (ml) infused since last check (calculated from E)	Total volume (ml) infused (calculated from E)	Total volume (ml) infused – device reading	Initials (2 to set up / change rate)	Cannula check and Comments