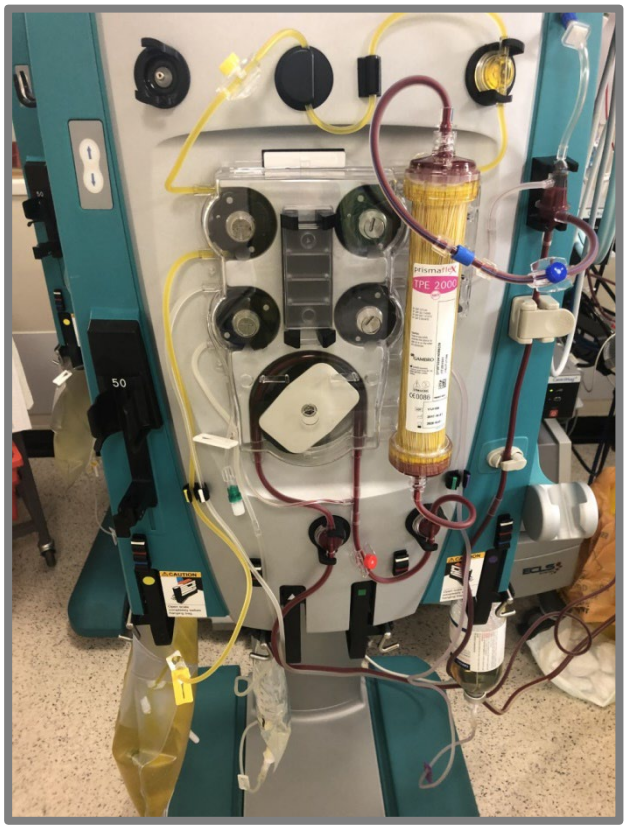
Practical guide to Therapeutic Plasma Exchange on the Prismaflex

Cardiac Paediatric Intensive Care Unit

Leicester Royal Infirmary



This guide is intended for the use of nurses and medical staff on CPICU who are delivering Therapeutic Plasma Exchange (TPE) via the Prismaflex machine. TPE can be delivered either as a stand-alone therapy or in combination with ECMO and/or CVVH/CVVHDF.

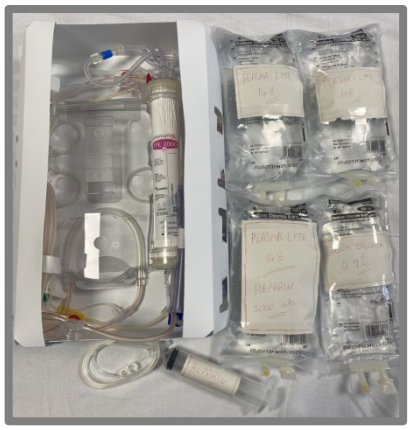
Please also refer to the following guidelines for more information:

- Therapeutic Plasma Exchange UHL Children's Intensive Care Guideline – UHL ref: C117/2016
- Paediatric Therapeutic Plasma Exchange Prescription
- CVVH/CVVHDF guideline - UHL ref: C151/2016

Title: PICU Practical guide to TPE on the Prismaflex UHL Childrens Intensive Care Guideline
V: 1 Approved by: PICU clinical practice group: September 2022 Next Review: September 2024
Trust Ref No: C26/2022

PREPARING FOR TPE

Equipment required:

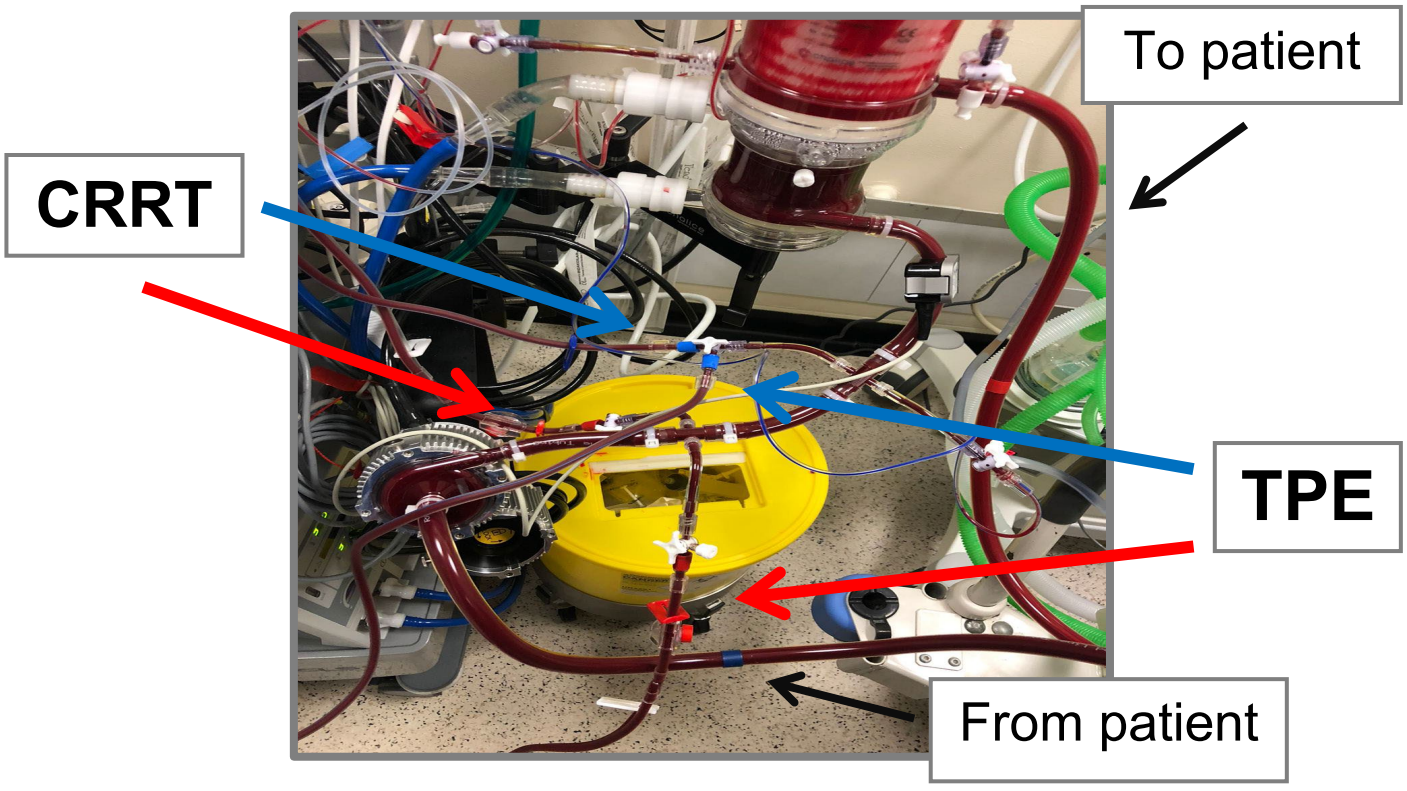


- Circuit of appropriate size
  TPE 1000 0-16kg
  TPE 2000 >16kg
- 2 litres of Plasmalyte 148 with no heparin added
  (only 1 litre required for TPE 1000 sets)
- 1 litre of Plasmalyte 148 with 2000units of added heparin
- 500ml bag of sodium chloride 0.9% for replacement scale
- Heparin syringe made up according to IV monograph
- Plasma replacement (HAS 4.5%/FFP/Octaplas) prescribed and ordered
- TPE prescription completed and printed out

Access:

If stand-alone therapy, ensure patient has an adequate sized vas cath insitu, refer to CVVH/CVVHDF guideline for more detailed information on access.

TPE can be incorporated into a patients ECMO circuit using pigtails and can be run simultaneously with ECMO and CVVH/CVVHDF if required. See below photo for how TPE and CVVH/CVVHDF circuits can be attached to an ECMO circuit:



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For patients already on ECMO no additional anticoagulation is required.

If running as a standalone therapy then heparin will be required to ensure adequate anticoagulation of the circuit. This is run as the CVVH/CVVHDF guideline with the heparin infusion running on an external pump into the heparin line on the circuit. Below taken from IV monograph, please also refer to Medusa for recent updates. This needs to be prescribed on patients prescription chart.

HEPARIN

Care: there are different strengths available – check!

Use 1,000units/ml for these infusions

Dose: for treatment or prevention of thrombotic episodes, after complex cardiac surgery procedures and for patients on CVVH

Loading dose:

Neonate <35weeks post-conceptional age:	50units/kg
Neonate >35weeks post-conceptional age:	75units/kg
Paediatric:	75units/kg

Initial maintenance dose:

Neonates and children <1year of age:	25units/kg/hour
Paediatric (>1 year of age):	20units/kg/hour

Usual range 10-40 units/kg adjusted according to APTT - Higher doses may be required

Method of administration:

Loading dose: IV bolus over 10 minutes (check if required with medical team)
Maintenance dose: Continuous IV infusion

Draw up 500 units/kg into a syringe and make up to 50ml with sodium chloride 0.9% or glucose 5%.

1ml/hour = 10 units/kg/hour 4ml/hour = 40 units/kg/hour

Dilution:

Sodium chloride 0.9% or glucose 5%

Change infusion every 24 hours

Adverse effects:

Haemorrhage and thrombocytopaenia
Very rarely: hyperkalaemia (via hyperaldosteronism), hypersensitivity reactions, local skin irritation or skin necrosis

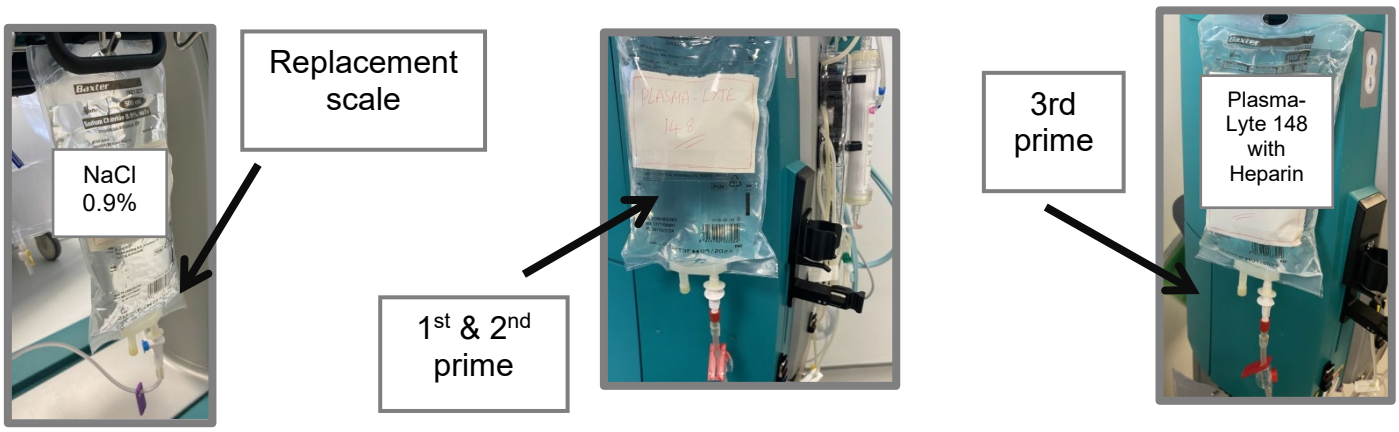
Notes:

Check clotting screen (baseline FBC, INR & APTT) prior to commencing heparin
Check APTT regularly, advise 4 hours post loading dose and 4 hours after each alteration in dose
Check APTT and FBC daily and potassium levels on alternate days
Consult the pharmacist before use in renal or hepatic impairment
Heparin has short half-life but if antidote required give protamine

This procedure is very similar to setting up the Prismaflex for CVVH/CVVHDF so please refer to that guideline for more detail. Also the machine is very user friendly and will clearly tell you what to do at each step so pay close attention to the information displayed on each screen.

Lining & Priming:

- Plug in and turn on machine, ensure nothing is resting on the scales
- Enter patient details and follow on-screen instructions
- Select **TPE** option
- At anticoagulation screen select 'no anticoagulation'
- Follow instructions to line and load the circuit



- No need to attach anything to the pre blood pump (PBP) line
- Go into prime test after all 3 primes have finished
- Adjust level in de-aeration chamber as required. Then **stop!**
- If not connecting to patient straight away **do not** go past 'Prime Test Passed' screen
- If machine has been stood for >20mins then a further re-prime with plain Plasmalyte 148 will be required before connecting to patient

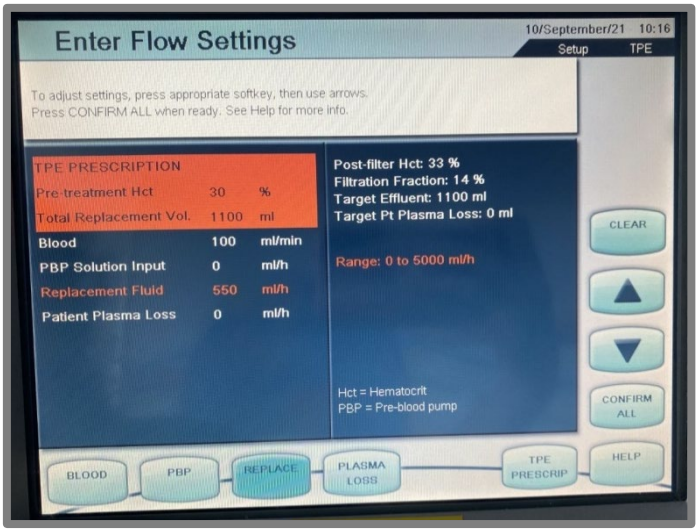
TPE prescription and flow settings:

Ensure TPE prescription is completed and printed, this can be found on the S drive (K:\1.GUIDELINES\FORMS & PAPERWORK), this prescription will calculate exchange volume and replacement rates based on the patient's weight. Please manually check these are correct using the following formula:

Plasma exchange volume: (80 x weight (kg)) x (1-HCT)

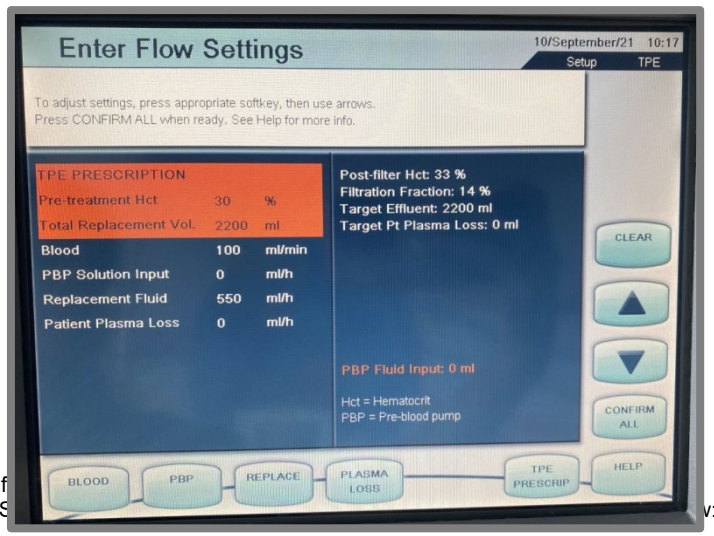
- Set Pre-treatment Hct to most recent patient result, this is used to calculate the patients plasma volume, post filter Hct and filtration fraction to optimise filter life
- Total Replacement Vol. is the patients Total Exchange Volume calculated by TPE prescription, this can only be set in 100ml aliquots
- Set the Replacement container volume – this will vary depending on which replacement solution is being used and the size of the bag/bottle. Set this 10% less than the actual volume to prevent air flowing into the circuit
- Blood flow rate (**6-9ml/kg/min**) - if patient already on ECMO or CVVH/CVVHDF then set to **100ml/min** and increase as tolerated once treatment commences. If running as stand-alone therapy then run blood flow slower initially (**3ml/kg/min**) to ensure haemodynamic stability
- Leave pre blood pump (PBP) at **0ml/hr**
- Set desired replacement rate according to prescription
- Patient plasma loss should remain at **0ml/hr**, there will almost never be a reason to have a negative plasma balance
- Set heparin rate on external pump according to prescription and connect to heparin line on circuit

Example for 20kg patient:



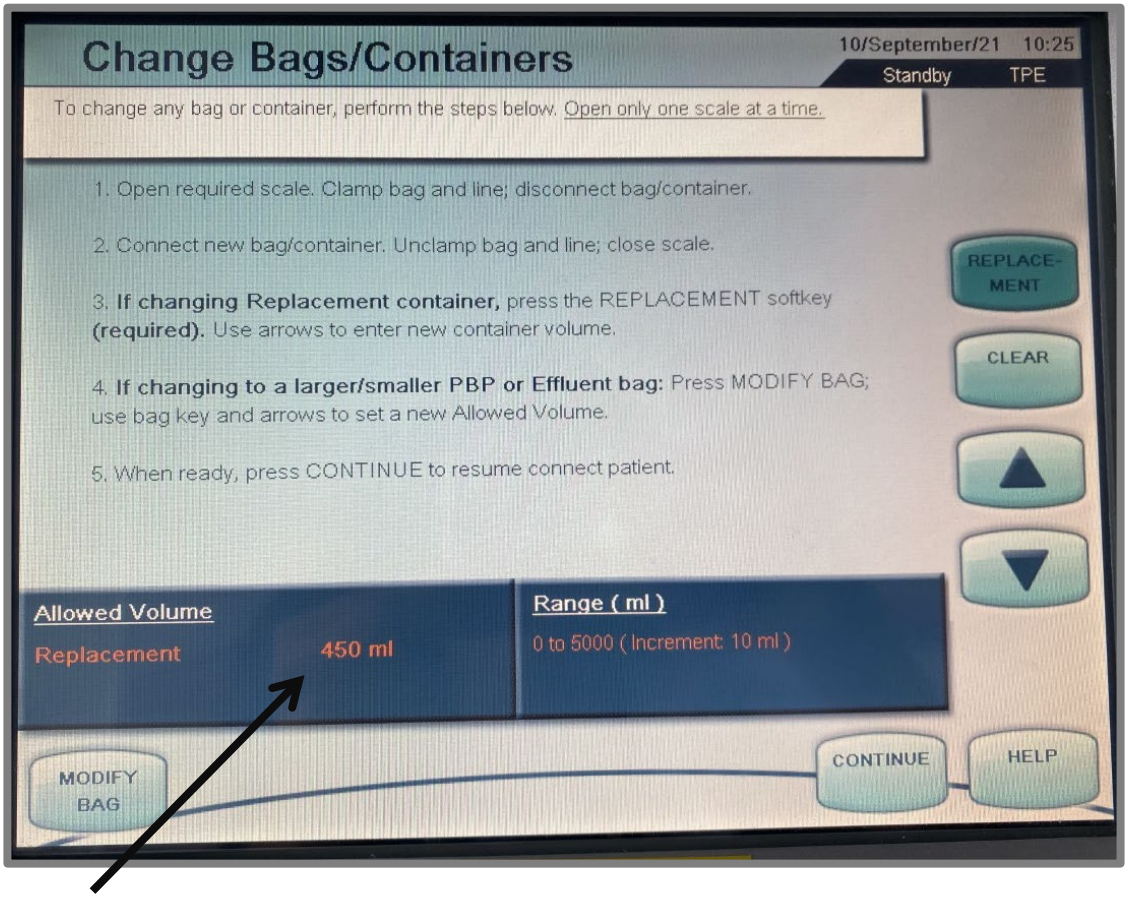
Single exchange

Double exchange



Connecting to patient:

When you get to the ‘Connect Patient’ screen press the change bags button to change the replacement bag to your first bag/bottle of plasma replacement, read all info on the screen to ensure correct procedure is followed. At this point you can also change the effluent bag for an empty one.



Ensure replacement volume is 10% less than actual volume

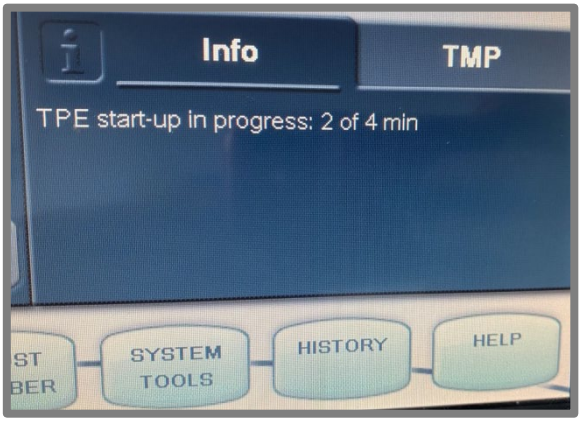
Once required bags have been changed press continue button and follow on screen instructions to connect circuit to patient either via their ECMO circuit or dedicated VasCath. If necessary also attach heater wire at this point.

As when commencing CVVH/CVVHDF ensure close observation of patient’s haemodynamic status and ensure emergency fluids and drugs are readily available if required.

DURING TREATMENT

- Once the start button has been pressed the blood and PBP pumps will start
- Press start on the heparin infusion

- The Prismaflex delays start of the plasma exchange for **4mins**

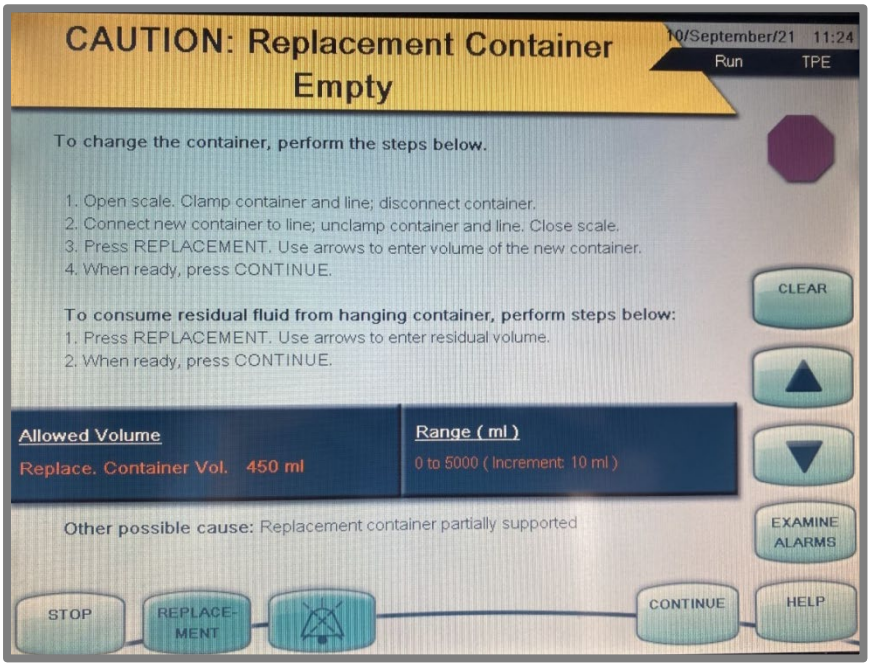


- If patient is stable and access allows increase blood pump speed

- Perform a self-test at this point as this will prevent having to delay at a later point due to multiple bag changes

- After the **4mins** is complete the plasma exchange will start. Be alert for signs of a transfusion reaction

When the 'Caution: Replacement Container Empty' screen appears press Container Volume to confirm/adjust as necessary before pressing Continue



If you are having any flow issues from the replacement container check that the air inlet is open

- Always keep a close eye on the bag or container on the replacement scale, if this
  runs out air will flow into the circuit and treatment may need to be stopped.

- Observe patient closely throughout treatment for signs of cardiovascular instability,
  bleeding, transfusion reactions and hypothermia. Record all observations on the back of the TPE prescription.

- Once prescription has been delivered press **STOP**. If therapy is incorporated into an
  ECMO circuit then do not wash back blood, just continue to disconnect from patient
  and unload the circuit as per on screen instructions.

- If TPE is running as a stand-alone therapy then returning the blood in the circuit to
  the patient can be considered. You will need a 1litre bag of 0.9%NaCL and a dispensing pin. When ready follow instructions on screen to wash back the blood.
  Using the manual return option will give you more control when washing back.

BLOOD SAMPLING

Ensure that a full set of bloods has been taken pre commencement of TPE paying close attention to electrolytes clotting.
Once TPE has commenced take a blood gas and ACT. Adjust heparin as necessary to main ACT 190-210.
Post treatment a full set of bloods including U's + E's, FBC, clotting and calcium need to be taken. Hypocalcaemia can be common during TPE as calcium binds to albumin and is removed during the exchange.

****If TPE is administered to an ECMO circuit after discussion with C Harvey, it is safe to give FFP unfiltered pre oxygenator****

If you have any questions please speak to Kate Peace (Paediatric renal critical care nurse) or Fiona Taylor (Senior Sister) :0)

3. Education and Training

None

4. Monitoring Compliance

None

5. Supporting References

Therapeutic Plasma Exchange UHL Children's Intensive Care Guideline 2020 – UHL ref: C117/2016

6. Key Words

CVVH, CVVHDF, ECMO, Heparin, Plasmalyte

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.
As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Kate Peace – Paediatric renal critical care nurse Fiona Taylor – Senior Sister	**Executive Lead** Chief Nurse
Details of Changes made during review: New guide	