**Protocol for Plasma Exchange and Double Filtration Plasmapheresis**

| Author: Contact Name and Job Title | Dr G McHaffie  
Consultant Nephrologist Ext. 55932 |
<table>
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<tbody>
<tr>
<td>Directorate &amp; Speciality</td>
<td>Cancer and Associated Services (Renal/Transplant)</td>
</tr>
<tr>
<td>Date of submission</td>
<td>September 2017</td>
</tr>
<tr>
<td>Explicit definition of patient group to which it applies (e.g. inclusion and exclusion criteria, diagnosis)</td>
<td>Applies to: All patients under the care of the Nottingham Renal and Transplant Unit</td>
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<tr>
<td>Version</td>
<td>V1.1</td>
</tr>
<tr>
<td>If this version supersedes another clinical guideline please be explicit about which guideline it replaces including version number.</td>
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<tr>
<td>Statement of the evidence base of the guideline – has the guideline been peer reviewed by colleagues?</td>
<td>These guidelines were developed in conjunction with medical and nursing staff within the renal unit. Evidence level ranges from 3 – 5.</td>
</tr>
<tr>
<td>Evidence base: (1-6)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>NICE Guidance, Royal College Guideline, SIGN (please state which source).</td>
</tr>
<tr>
<td>2a</td>
<td>meta analysis of randomised controlled trials</td>
</tr>
<tr>
<td>2b</td>
<td>at least one randomised controlled trial</td>
</tr>
<tr>
<td>3a</td>
<td>at least one well-designed controlled study without randomisation</td>
</tr>
<tr>
<td>3b</td>
<td>at least one other type of well-designed quasi-experimental study</td>
</tr>
<tr>
<td>4</td>
<td>well-designed non-experimental descriptive studies (ie comparative / correlation and case studies)</td>
</tr>
<tr>
<td>5</td>
<td>expert committee reports or opinions and / or clinical experiences of respected authorities</td>
</tr>
<tr>
<td>6</td>
<td>recommended best practise based on the clinical experience of the guideline developer</td>
</tr>
</tbody>
</table>

**Consultation Process**

These guidelines were developed in conjunction with medical and nursing staff within the renal unit. They have been ratified at the Renal Unit Senior Staff Meeting.

| Ratified by:                      | Renal Unit Senior Staff Meeting |
| Date:                             | September 2017                 |
### Target audience

<table>
<thead>
<tr>
<th>Renal unit medical and nursing staff.</th>
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</table>

### Review Date: (to be applied by the Integrated Governance Team)

A review date of 5 years will be applied by the Trust. Directorates can choose to apply a shorter review date; however this must be managed through Directorate Governance processes.

<table>
<thead>
<tr>
<th>September 2022</th>
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</table>

This guideline has been registered with the trust. However, clinical guidelines are guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt contact a senior colleague or expert. Caution is advised when using guidelines after the review date.
Protocol for Plasma Exchange and Double Filtration Plasmapheresis

Renal and Transplant Unit
Nottingham University Hospitals NHS Trust

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Introduction

Plasma exchange and double filtration plasmapheresis are extracorporeal blood purification techniques in which plasma is separated from rest of the blood. In most clinical circumstances the aim is to remove large molecular weight substances from plasma which include pathological auto-antibodies, immune complexes, cryoglobulins, myeloma light chains, endotoxin or cholesterol-containing lipoproteins. In HUS/TTP the aim is the replacement / replenishment of complement factors using blood plasma products.

There are 2 main methods:
   a) Filtration (the most common technique)
   b) Centrifugation (removing plasma by centrifuging the blood).

Replacement fluids is usually one of, or a combination of:

Human albumin solution (HAS) 4.5%
Sodium Chloride solution 0.9%
Fresh frozen plasma or equivalent solution (eg Octaplas®)
Plasma Exchange vs. Double filtration plasmapheresis (DFPP)

Standard plasma exchange uses a single filter to remove whole plasma and the volume is replaced with a matched volume of blood products +/- saline.

Double filtration plasmapheresis (DFPP) is a variation of plasma exchange. The circuit contains two plasma filters: the first is a standard plasma filter and the second is a high molecular weight filter (fractionator) that primarily removes immunoglobulins. The depleted plasma is returned to the blood circuit and then to the patient. It has the advantage that it removes immunoglobulin with less depletion of albumin.

DFPP is the preferred method of exchanging plasma when the aim of the therapy is the removal of a pathological antibody. It is considered to be the safer because of a reduced requirement for plasma products. Importantly however it must be acknowledged that the majority of evidence that supports the use of this therapy is extrapolated from trials of plasma exchange.

Standard plasma exchange is the treatment of choice for Haemolytic Uraemic Syndrome (HUS) or Thrombotic Thrombocytopenic Purpura (TTP). It is also the preferred treatment for patients with ANCA associated vasculitis where there is evidence of benefit in a randomized clinical trial.
Indications for treatment

Adapted* from American Society of Apheresis (ASFA) guidelines 2013

*This adaptation doesn’t contain a complete list of conditions that have been reviewed by ASFA but it includes the conditions that are most commonly treated or considered for treatment within the Nottingham Renal unit. More detailed information about all conditions reviewed by ASFA is presented in the reference.

ASFA Categories

I – Disorder for which apheresis is accepted as a first-line therapy, either as a primary standalone treatment or in conjunction with other modes of treatment.

II – Disorder for which apheresis is accepted as second-line therapy, either as a standalone therapy or in conjunction with other modes of treatment.

III – Optimum role of apheresis is not established. Decision making should be individualized.

IV – Disorder in which the published evidence demonstrates or suggests apheresis to be ineffective or harmful.

The grading of evidence for the ASFA recommendation utilised the framework proposed by Guyatt and co-workers.

<table>
<thead>
<tr>
<th>Nephrology Conditions</th>
<th>Category</th>
<th>Grade</th>
<th>Comment (target immunoglobulin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANCA-associated rapidly progressive glomerulonephritis</td>
<td>Dialysis dependence</td>
<td>I</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>Diffuse Alveolar Haemorrhage</td>
<td>I</td>
<td>1C</td>
</tr>
<tr>
<td></td>
<td>Dialysis independence</td>
<td>III</td>
<td>2C</td>
</tr>
<tr>
<td>Anti-GBM disease</td>
<td>Dialysis dependence but no alveolar haemorrhage</td>
<td>III</td>
<td>2B</td>
</tr>
<tr>
<td></td>
<td>Dialysis independence</td>
<td>I</td>
<td>1C</td>
</tr>
<tr>
<td></td>
<td>Alveolar Haemorrhage</td>
<td>I</td>
<td>1B</td>
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<tr>
<td>Cryoglobulinaemia</td>
<td>Symptomatic/severe</td>
<td>I</td>
<td>2A</td>
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<tr>
<td>FSGS post renal transplantation</td>
<td></td>
<td>I</td>
<td>1B</td>
</tr>
<tr>
<td>Haemolytic Uraemic Syndrome (HUS), Complement gene mutations</td>
<td></td>
<td>II</td>
<td>2C</td>
</tr>
<tr>
<td>Condition</td>
<td>Treatment/Therapy</td>
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<td>-------------------------------------------------------</td>
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<tr>
<td>atypical Factor H antibodies</td>
<td>I 2C and replace complete volume with Octoplas®</td>
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<tr>
<td>MCP mutations</td>
<td></td>
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<td>Haemolytic Uraemic Syndrome (HUS), infection associated</td>
<td>Shiga toxin associated III 1C</td>
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<td></td>
<td>S. Pneumonae associated III 2C</td>
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<td>Henoch Schonlein Purpura</td>
<td>Crescentric III 2C</td>
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<td>Extra-renal disease III 2C</td>
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<td></td>
<td>Use DFPP (IgA / IgG auto-antibodies)</td>
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<tr>
<td>Myeloma cast nephropathy</td>
<td>II 2B</td>
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<td></td>
<td>Use DFPP (clonal immunoglobulin)</td>
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<tr>
<td>Renal transplantation</td>
<td>Antibody mediated rejection I 1B</td>
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<td>Desensitization, living donor I 1B</td>
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<td></td>
<td>Desensitization, deceased donor, high PRA III 2C</td>
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<tr>
<td>Renal transplantation, ABO incompatible</td>
<td>Desensitization, live donor I 1B</td>
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<td></td>
<td>Humoral rejection II 1B</td>
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<td></td>
<td>Gp A2/A2B into B, deceased donor IV 1B</td>
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<td>Glycorex immunoabsorption is the preferred alternative treatment</td>
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<td>Systemic Lupus Erythematosus</td>
<td>Severe II 2C</td>
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<td></td>
<td>Nephritis IV 1B</td>
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<td>Thrombotic microangiopathy, drug induced</td>
<td>Ticloidipine I 1B</td>
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<td></td>
<td>Clopidogrel III 2B</td>
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<td></td>
<td>Cyclosporin / Tacrolimus III 2C</td>
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<tr>
<td></td>
<td>Gemcitabine IV 2C</td>
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<tr>
<td></td>
<td>Quinine IV 2C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thrombotic Thrombocytopenic Purpura (TTP)</td>
<td>I 1A</td>
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</tr>
<tr>
<td></td>
<td>Use standard plasma exchange and replace complete volume with Octoplas®</td>
<td></td>
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<tr>
<td>Miscellaneous Conditions</td>
<td>Category</td>
<td>Grade</td>
<td>Comment</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>----------</td>
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<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Acute disseminated encephalomyelitis</td>
<td>II</td>
<td>2C</td>
<td></td>
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<tr>
<td>Acute inflammatory demyelinating polyneuropathy (Guillain-Barre syndrome)</td>
<td>I, III</td>
<td>1A, 2C</td>
<td></td>
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<tr>
<td>Chronic inflammatory demyelinating polyneuropathy</td>
<td>I</td>
<td>1B</td>
<td>2-3 x / week until improvement and then taper as tolerated</td>
</tr>
<tr>
<td>Hyperviscosity with monoclonal gammopathy</td>
<td>I, I</td>
<td>1B, 1C</td>
<td>Use DFPP (monoclonal antibody)</td>
</tr>
<tr>
<td>Lambert-Eaton myasthenic syndrome</td>
<td>II</td>
<td>2C</td>
<td>Use DFPP (anti-AChR)</td>
</tr>
<tr>
<td>Multiple Sclerosis</td>
<td>II</td>
<td>1B</td>
<td></td>
</tr>
<tr>
<td>Myasthenia gravis</td>
<td>I</td>
<td>1B</td>
<td>Use DFPP (anti-NMO)</td>
</tr>
<tr>
<td>Neuromyelitis Optica (Devic's syndrome)</td>
<td>II</td>
<td>1B</td>
<td>Use DFPP (anti-AQP4, anti-MOG)</td>
</tr>
<tr>
<td>Voltage gated potassium channel antibodies</td>
<td>II</td>
<td>1C</td>
<td>Use DFPP (anti-VGKC)</td>
</tr>
</tbody>
</table>
Protocol for plasma exchange treatment

1. Volume of plasma to be exchanged

1 - 1.5 x patient's plasma volume.

The following formula can be used to estimate the plasma volume in an adult.

\[
\text{Estimated plasma volume (in litres)} = 0.07 \times \text{weight (kg)} \times (1 - \text{hematocrit})
\]

This should be rounded up to nearest 500mls to a maximum of 4000mls.

Larger, prolonged treatments can be performed where specifically prescribed by the consultant in charge however the level of additional removal beyond 1.5x plasma volumes is only marginal. It would however increase the cost and risk associated with the replacement fluid.

* NOTE – for vasculitis the exchange volume should be 60mls/kg (based on the PEXIVAS trial) *

2. Number and Frequency of treatments

Five to seven plasma exchanges should be considered standard therapy.

More prolonged courses may be recommended in individual cases (eg atypical HUS with on-going microangiopathy or the chronic treatment of post transplant FSGS).

Plasma exchange can be performed daily or on alternate days. The therapy’s indication as well as logistic considerations, such as the need for dialysis, may influence the frequency of therapy.

In HUS and TTP daily exchanges are recommended.

Note that daily treatments may result in a more rapid drop in fibrinogen and other clotting factors because there is less time between treatments to replenish plasma levels. This should be accounted for when monitoring fibrinogen levels and replacing clotting factors.

3. Filter choice and Filtration settings

Blood Flow rate 100-150mls/min

Inlet replacement fluid heater temperature 37 °C

Priming 1 L 0.9% Saline with 5000 units unfractionated heparin

4. Fluid replacement

Volume = treated plasma volume

HUS/TTP use all Fresh Frozen Plasma or equivalent eg Octaplas®.
All other situations use

1/3 volume: Sodium Chloride solution 0.9% (only use if serum Albumin > 30g/l)

plus

2/3 volume: 4.5% Human Albumin Solution

Octaplas® - 500mls if required – see below. Administer as the final replacement fluid.

5. Calcium replacement

Standard regime:

20mls 10% Calcium Gluconate diluted to 50 ml in 0.9% Sodium Chloride Solution given over the duration of the treatment into the venous limb of the plasma exchange circuit.

Calcium level to be checked using blood gas machine every 30 minutes. If ionised calcium level below 1.1mmols/Litre and the patient is asymptomatic consider oral replacement with three 1.25g calcichew tablets.

If symptoms of hypocalcaemia replace with an additional 10mls of 10% Calcium Gluconate IV.

Continue to monitor calcium level on blood gas analyser.

6. Anti-coagulation

20ml Becton-Dickinson(BD) luer lock syringe

Standard regime:

1000 units of Heparin sodium as a loading dose and then 500 units/hour thereafter.

This may require adjustment depending on the circumstances of an individual case – such as bleeding risk or the presence of pulmonary haemorrhage.

Monitor ACT readings and adjust heparin rate according the Renal Unit extracorporeal anti-coagulation protocol.

Plasma exchange and Haemodialysis:

For patients requiring plasma exchange and haemodialysis on the same day - consider omitting / reducing the heparin dose in order to avoid over coagulation.

7. Blood monitoring

A U&E, calcium, full blood count and clotting screen (including fibrinogen) should be checked daily before treatment.
8. Prescriptions

A summary of the plasma exchange treatment plan should be documented in the patient’s notes.

Heparin and calcium should be prescribed on the drug prescription chart.
Saline should be prescribed on the drug prescription chart IV fluid section.
Human Albumin solution and/or Octaplas® should be prescribed on the blood transfusion chart.

9. Clotting Factor Replacement

500mls of Octaplas® is required if :

A. The fibrinogen level falls below 1g/Litre. (By fourth treatment replacement is usually required).

or

B. The plasma exchange treatment is within 36 hours (pre or post) of an invasive intervention (eg renal biopsy, central line or dialysis catheter insertion, surgery) or any recent episodes of bleeding.

10. Complications

1) Relating to vascular access: wound infection, sepsis, venous thrombosis and bleeding.
2) Pulmonary oedema
3) Hypocalcaemia
4) Hypotension
5) Coagulopathy
6) Allergic reaction eg to blood products or the filter (consider paracetamol, hydrocortisone and/or anti-histamines)
Protocol for double filtration plasmapheresis treatment

1. Volume of plasma to be exchanged

1 - 1.5 x plasma volume.

The following formula can be used to estimate the plasma volume in an adult:\(^3\)

\[
\text{Estimated plasma volume (in litres)} = 0.07 \times \text{weight (kg)} \times (1 - \text{hematocrit})
\]

This should be rounded up to nearest 500mls to a maximum of 4000mls.

Larger, prolonged treatments can be performed where specifically prescribed by the consultant in charge however the level of additional removal beyond 1.5x plasma volumes is only marginal. It would however increase the cost and risk associated with the replacement fluid.

2. Number and Frequency of treatments

Five to seven DFPP exchanges should be considered standard therapy.

More prolonged courses may be recommended in individual cases (e.g. Goodpasture's disease where anti-GBM antibodies are still detectable after 5-7 treatments).

DFPP can be performed daily or on alternate days. The therapy's indication and logistic considerations, such as the need for dialysis, may influence the frequency of therapy.

Daily DFPP should ideally be performed in:

a) Acute humoral (antibody-mediated) transplant rejection
b) Anti-GBM disease
c) Pulmonary haemorrhage

Note that daily treatments may result in a more rapid drop in fibrinogen and other clotting factors because there is less time between treatments to replenish plasma levels. This may be less of a problem with DFPP as compared to standard plasma exchange. Never the less this should be accounted for when monitoring fibrinogen levels and replacing clotting factors.

3. Filter choice and Filtration settings

First filter : Plasmaflo OP-08W (L)  
Second filter : Cascadeflo™ EC-30W

Blood Flow rate 100-150mls/min

Standard plasma filtration percentage - 30%

Drain percentage – 20 %

Inlet and outlet replacement fluid heater temperature 37 °C
Priming 2.5 L 0.9% Saline
Priming 1 L 0.9% Saline with 5000 units unfractionated heparin

4. Fluid Replacement

Volume = Drain percentage (usually 20%) of treated plasma volume.

4.5% HAS should usually be prescribed

Octoplas® should be prescribed if clotting factor replacement is necessary (see below).

Washback volume 1-200mls 0.9% saline.

5. Calcium replacement

Calcium level to be checked using blood gas machine every 30 minutes. If ionised calcium level below 1.1mmols/Litre and the patient is asymptomatic consider oral replacement with three 1.25g calcichew tablets.

If symptoms of hypocalcaemia replace calcium with 10mls of 10% Calcium Gluconate IV. Continue to monitor calcium level on blood gas analyser.

6. Anti-coagulation

20ml Becton-Dickinson(BD) luer lock syringe

Standard regime:

1000 units of Heparin sodium as a loading dose and then 500 units/hour thereafter.
This may require adjustment depending on the circumstances of an individual case – such as bleeding risk or the presence of pulmonary haemorrhage.

Monitor ACT readings and adjust heparin rate according the Renal Unit extracorporeal anti-coagulation protocol.

DFPP and Haemodialysis:

For patients requiring DFPP and HD on the same day - consider omitting / reducing the heparin dose, in order to avoid over coagulation.

7. Blood monitoring

A U&E, full blood count, clotting profile and fibrinogen level should be checked daily.

8. Clotting Factor Replacement

500mls of
Octaplas® is required if:
A. The fibrinogen level falls below 1g/Litre. (By fourth treatment replacement is usually required).

or

B. The DFPP treatment is within 36 hours (pre or post) of an invasive intervention (eg renal biopsy, central line or dialysis catheter insertion, surgery) or any recent episodes of bleeding.

9. Complications

1) Relating to vascular access: wound infection, sepsis, venous thrombosis and bleeding.
2) Pulmonary oedema
3) Hypocalcaemia
4) Hypotension
5) Coagulopathy
6) Allergic reaction eg to blood products or the filter (consider paracetamol, hydrocortisone and/or anti-histamines)

10. Prescriptions

A summary of the plasma exchange treatment plan should be documented in the patient’s notes.

Heparin and calcium should be prescribed on the drug prescription chart. Saline should be prescribed on the drug prescription chart IV fluid section. Human Albumin solution and/or Octaplas® should be prescribed on the blood transfusion chart.
References


Nottingham Renal and Transplant Unit

Criteria for Plasauto\textsuperscript{Σ} - Blood Purification Plasmapheresis

<table>
<thead>
<tr>
<th>No.</th>
<th>Criteria</th>
<th>Assessment</th>
</tr>
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<tbody>
<tr>
<td></td>
<td><strong>Pre-operation inspection &amp; Correct Set-Up of the Device</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Has the device been isolated for another patient?</td>
<td>Has a previous patient used this device and awaiting their virology results? If results are not recorded on NOTIS do not use this device.</td>
</tr>
</tbody>
</table>
| 2.  | How to check for damage / wear / faults?                                | Ensure that the component parts (listed below) are free from damage and are clean:  
Sensors 1 & 2 are clean, attached and free from damage  
Electrical cable is attached and free from damage.  
Screen is clean and not damaged  
All pumps are clean and free from debris.  
Air alarm sensor door is intact and the air sensor is clean.  
Heparin pump syringe holder is intact and clean.  
The device has been serviced annually. |
| 3.  | How to switch on the device?                                            | Switch on using grey button fourth from the right.                                                                                                                                                       |
| 4.  | How to be sure that all relevant accessories are available?             | Plasma separator : One set  
Tubing : One set  
Saline with anticoagulant : 950ml  
Waste bag : One set  
3 individual spikes.  
Air inlets.  
Sanicloths  
20ml Syringe for anticoagulant.  
Heparin 15mls – 5mls for saline bag – 10mls in 20ml syringe.  
Treatment solution : As prescribed  
Saline for recovery : 500ml |
| 5.  | How to check that the device is working?                                | Start-up check and self tests  
Touch [Start-up check]  
Confirm the audible alarm sound, and touch [Yes] key.  
・ Visually confirm that the status light switches red/yellow/green, and touch [Yes] key.  
After the above confirmations are made, <Self test> screen appears.  
Self tests |
Do not touch [Skip] this will move to the treatment preparation process and display <Treatment preparation > Screen, this will interrupt the self test

In <Self test> screen, perform pre-treatment self tests as follows:
Touch [Start] key.
The system automatically checks:
• Operation of the pumps
• Operation of the valves
• Check of the blood leak detector
• Check of the pressure sensors
Touch [Stop] key suspends self tests.
Touch [Start] key resumes self tests.
After the self tests are completed, the system moves to <Select therapy> screen and displays the Self test complete, Test results and No error detected messages.
Touch [Clear] key.

### Ability to Operate the Device Safely

| 6. | How to set up the Plasauto∑ for plasmaphoresis? | In order to perform PE, touch [PE] key in <Select therapy> screen, and then touch [Next] key

**Installation of the tubing**
In <Install tubing> screen, install tubing, blood filter and other devices following the guidance on the screen.

**Install tubing as shown in <Install tubing> screen.** |

| 7. | Are there any limitations or contra-indications for the use of the device? | Do not use non-specified tubing. Using non-specified tubing will not assure the flow rate control, alarm and other functions.

● Securely install tubing according to the procedure described in this manual.
● Ensure no loosening at the connections of tubing.
● Ensure no loosening at the connections of tubing and syringe.
● Ensure that tubing is not kinked or twisted.
● If the pressure port is contaminated by damage to the hydrophobic air filter, disinfect the equipment before use.
● If the hydrophobic air filter gets wet with blood or fluid, replace it immediately.
● If the arterial pressure chamber is removed, pressure may not be correctly measured. The arterial pressure chamber is disconnected from the pressure port of the equipment, take appropriate actions |

| 8. | How to prime the Plasauto∑? | In <Priming (1/2)> screen, touch [Start Priming] key to move to <Priming (2/2)> screen. Then rinse is automatically started.
During rinse, you can use the following controls:
• Touch [Stop] key pauses rinse and replacement.
• Touch [Restart] key, the rinse and replacement procedure continues.

**After priming, ensure that no air remains in the venous line.**
If additional priming is necessary, Touch [Additional priming] key to move to <Additional priming> screen and perform additional priming. |

| 9. | How to programme the | (At this point unplug, but don’t switch the power off, and move to the side of the patient to be treated) |
### Prescribed Therapy?

If additional priming is unnecessary follow the guidance and connect the prescribed treatment solution. After completing the above steps touch [Treatment] key and <Treatment> screen appears. Press flow rate/ target icon on the screen to set ratios of the Plasma/Blood and Replacement/Plasma. Press Syringe/Heater icon to set the heparin rate and bolus dose and set temperature of replacement fluid heater. Press fluid level icon to raise/ lower the level in the venous air chamber.

### How to Commence Prescribed Plasmapheresis Treatment on the Plasauto∑?

Follow Guidelines for the commencement and termination of extra-corporeal therapies via a central venous catheter (tunneled and non-tunneled) using citrate locking solution or Guidelines for the Insertion and Removal of Fistula / Graft Needles as required.

1. Confirm that the blood pump is stopped.
2. Confirm that the syringe is attached, and set the syringe flow rate. Immediately after the treatment is started, use fast feed or bolus function as necessary to inject a required amount of anticoagulant. Set the heater as necessary.
3. Confirm that no air remains in the venous line. If air is left, remove appropriately.
4. Connect the arterial line to the patient's vascular access.
5. Connect the venous line to the patient's vascular access.
6. Start the extracorporeal circulation by starting the blood pump.
7. Gradually accelerate the blood pump flow rate observing the extracorporeal circulation, arterial and venous pressure.

When setting of the Plasma/Blood, please refer to the instructions for use of the plasma separator used.

Complete the documentation and record on RS6000 /e-med.

**Record:**

1. Pressure values
2. Cumulative values
3. Target plasma volume
4. Flow rate of plasma and replacement fluid
5. Heparin flow rate
6. Blood pump flow rate
7. Heater status
8. Treatment mode
9. Blood leak alarm sensitivity

### How to Terminate Completed Plasmapheresis Treatment on the Plasauto∑?

Process treatment solution inside the scale chamber

- Touch [Start] key. Treatment fluid recovery is automatically performed and stopped upon completion.
- During treatment solution recovery, touch [Stop] key suspends the operation in progress.
- Touch [Start] key again resumes the operation.
- When treatment solution recovery is complete, touch [Next] key displays the <2/4 Recovery> screen.

Recovery of blood upstream of the arterial line

- Connect saline according to the guidance on the screen.
- Touch any numeric key highlights the part of the guidance image relevant to the current explanation.
- Touch the same numeric key again greys out the highlighted part.
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| 19 | Touch **[Next]** key displays <3/4 Recovery> screen.  
Touch **[Back]** key returns you to <1/4 Recovery> screen.  
Recovery of blood in tubing and filter  
• Set the flow rate and start the blood pump according to the guidance on the screen.  
• When the cumulative recovery volume has been achieved, the blood pump stops automatically, and the system displays an advisory screen notifying that the target blood recovery volume has reached, touch **[Clear]** key.  
• If the blood volume returned is insufficient, start the blood pump and perform additional return as required.  
Touch **[Next]** key displays <4/4 Recovery> screen.  
Touch **[Back]** key returns you to <2/4 Recovery> screen. |
|   | Disposal of the tubing.  
• Follow the guidance on the screen and disconnect the tubing from the patient, and touch **[Release all valves]** key to dispose the tubing.  
• Touch **[Cancel]** key cancels the disposal of the tubing.  
• Touch **[Back]** key returns you to <3/4 Recovery> screen. |

**Review maintenance and take appropriate action**

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| 12 | **The limitations of this device?**  
This device can currently **ONLY** be used for plasmaphoresis, not for **Immunoabsorption** treatments. |
| 13 | **What actions to take if there is an error or failure with the device?**  
Follow all on screen alarm messages to resolve the initial alarm.  
Knows the difference between a notice function, an alarm message and a system error.  
If there is a system alarm:  
1. System failure is suspected.  
2. There may be a strong noise source near the system.  
3. Power the equipment off, and power it on again after 10 seconds.  
4. If the problem persists, discontinue use and contact the Renal Technician for assistance or report the fault to the renal technician. |
| 14 | **How to clean / decontaminate the device?**  
Clean the surface of the Plasauto∑ with a Clinell wipe.  
Store the device in an appropriate area. |
| 15 | **How to store the device safely?**  
Select a water-free area.  
• Ensure the equipment is stable and there is no tilting, vibration or impact (including transportation).  
• Avoid chemical storage locations or any location in which gas may be produced.  
• Avoid direct sunlight, and direct air from air conditioners, heaters, vents, or humidifiers.  
Ensure the Plasauto∑ is **plugged in to the mains electricity to enable the internal batteries to be fully charged.** |