CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT)

TABLE OF CONTENTS
The purpose of this practice support document is to outline the procedures and guidelines related to care of the patient having continuous renal replacement therapy (CRRT) in the pediatric intensive care unit (PICU) including the following:
- Initiation of Continuous Renal Replacement Therapy
- Blood Sampling from Continuous Replacement Therapy Circuit
- Temporary Disconnection and Circulation of PrismaFlex Circuit
- Termination of Continuous Renal Replacement Therapy

PURPOSE
Continuous Renal Replacement Therapy is a continuous extracorporeal blood purification therapy whose clinical state requires the slow removal of fluid and substrates.

POLICY STATEMENTS
Prior to initiating Continuous Renal Replacement Therapy (CRRT), baseline values (weight, laboratory data) are collected and recorded.

An emergency clamping kit must be available at the bedside while a patient is receiving Continuous Renal Replacement Therapy.

Asepsis must be maintained during the procedures of preparation, initiation and maintenance of Continuous Renal Replacement Therapy.

Transfer of care of the patient receiving Continuous Renal Replacement Therapy must include a review of the items in Continuous Renal Replacement Handover Checklist.

Expected outcomes during initiation and maintenance of CRRT include:
- hemodynamic stability during initiation and maintenance of CRRT therapy;
- normalization of electrolyte and acid base abnormalities
- correction of fluid overload
- vascular access and circuit remains patent throughout the duration of therapy
- provision of adequate nutrition
- variable medication clearance, depending on molecular weight and protein binding
- fluid and electrolyte abnormalities monitored and adequately treated (hypovolemia, hypocalcemia, hypomagnesemia, hypophosphatemia)
- heat loss, especially in the neonatal population

SITE APPLICABILITY
Patients receiving Continuous Renal Replacement Therapy are cared for in Critical Care areas only where there is trained staff available to provide care.

PRACTICE LEVEL/COMPETENCIES
Continuous Renal Replacement Therapy management is considered an advanced critical care skill and is performed after the practitioner has the required critical care education, and learning has been validated at the bedside with the appropriate clinical support person. The practitioner must maintain competency through annual education and skills validation.

DEFINITIONS
Adsorption: Molecular adherence to the surface or interior of the membrane or artificial surface
Convection: The movement of solutes with a water-flow, “solvent drag”

Continuous Renal Replacement Therapy (CRRT): A general term referring to any extracorporeal blood purification therapy intended to substitute for impaired renal function over an extended period of time.
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CRRT Modalities -

**Slow Continuous Ultrafiltration (SCUF)** - This therapy is used for the removal of plasma water and electrolytes through ultrafiltration without concomitant fluid replacement. Not used with the PrismaFlex, but may be used during ECLS when a roller pump is attached to the ECLS circuit.

**Continuous Venovenous Hemofiltration (CVVH)** - CVVH removes fluid and electrolytes and corrects acid base disturbances. This therapy facilitates the convective removal of larger solutes by providing ultrafiltration rates in excess of patient fluid removal requirements.

**Continuous Venovenous Hemodialysis (CVVHD)** - CVVHD provides clearance of fluids and small solutes by diffusion. The fluid compartment of the hemofilter is perfused with a countercurrent of dialysate solution.

**Continuous Venovenous Hemodiafiltration (CVVHDF)** - Is a therapy that combines both hemofiltration and hemodialysis.

*(Note: any of the CRRT modalities can be used to remove excess fluid intake or excess total body water. Some modalities are theoretically more effective at removing the middle molecules of inflammation – clinical outcomes have not been proven to be different with the different modalities. Key message = use a modality with which the majority are familiar!)*

**Diffusion:** The movement of solutes from a higher to a lower concentration

**Filter:** Device containing the fibers of the semi-permeable membrane within it

**Ultrafiltration:** The movement of fluid through a semi-permeable membrane driven by a pressure gradient.

**PROCEDURES**

**Initiation of Continuous Renal Replacement Therapy**

1. **PLUG** PrismaFlex machine in, turn machine **ON**.  
   **NOTE:** for patient’s **less than 10 kg requiring a blood prime**, ensure cross match is drawn and contact blood bank to prepare pre-filtered packed red blood cells (PRBCs), send Alaris Blood Administration set to Blood Bank.  
   Allows machine to warm up and software check as preparation continues to occur.  
   Ensures filtered blood available for blood prime.

2. **ENSURE** child and family understand procedure and questions are answered.  
   Evaluates and reinforces understanding of previously taught information.

3. **VERIFY** child’s identity. **COLLECT** and **RECORD** patient’s **pre-treatment baseline values** (weight, laboratory data). **CONFIRM** vascular access present and functional with the most responsible physician.  
   **Suggested catheter size and sites:**

<table>
<thead>
<tr>
<th>Patient size</th>
<th>Catheter size</th>
<th>Site of insertion</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 - 30 kg</td>
<td>Double-Lumen 6.0 - 8.0 French</td>
<td>Internal/External-Jugular, Subclavian or Femoral vein</td>
</tr>
<tr>
<td>&gt; 15 kg</td>
<td>Double-Lumen 9.0 French</td>
<td>Internal/External-Jugular, Subclavian or Femoral vein</td>
</tr>
<tr>
<td>&gt; 30 kg</td>
<td>Double-Lumen 10.0 French</td>
<td>Internal/External-Jugular, Subclavian or Femoral vein</td>
</tr>
</tbody>
</table>

4. **OBTAIN** physician treatment orders, including:  
   - Filter set required  
   - Priming solution  
   - Anticoagulant type, concentration, infusion rate, monitoring parameters  
   - Blood flow rate  
   Familiarizes nurse with the individual patient treatment and reduces the possibility of error
• Replacement fluid and rate (if used)
• Dialysate solution and rate (if used)
• Fluid removal goal for 12 hour shift
• Routine bloodwork protocol (on reverse)

5. SCAN orders to Pharmacy.

6. PREPARE prescribed solutions (prime solution, anticoagulation, replacement fluid, dialysis fluid).

   CRRT fluids are individualized to the specific patient situation; use of anticoagulants prolongs the function of the filter.

   Therapy components
   Checklist:
   1. Prismaflex® configuration: enable therapy and set
   2. Disposable set
   3. Syringe, if required
   4. Effluent bag
   5. PEP solution
   6. Dialysate or replacement 2 solution
   7. Replacement solution
   8. Access to patient’s blood

7. PREPARE Emergency Clamping Tray

   Emergency Tray Contents
   • Sterile towel
   • 50 ml bag of Normal Saline with 5 units of Heparin per ml.
   • 2 X fluid transfer set
   • Clamps X 2
   • 2 X 5 ml syringes for aspirating blood
   • 10 ml sterile Normal Saline prefilled syringes X4
   • Citrate prefilled syringe X2 (enough to fill each vascath lumen)
   • ‘dead end’ caps X 2
   • 2% Chlorhexidine swabs X 4
   • Clean gloves

   Ensures necessary supplies available to preserve vascular access in event of pump failure or complications.

8. GATHER supplies:
   o Prepared standard calcium chloride infusion (to be administered through a separate central line – not through the CRRT vascular access catheter)
   o Filter set (check expiry date)
     ▪ < 10 Kg 0 HF20 (60 ml circuit)
     ▪ < 30 Kg – ST60 (93 ml circuit)
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- > 30 Kg – ST100 (152 ml circuit)
- > 80 Kg – ST150 (189 ml circuit)

**PrismaFlex circuits must be changed every 72 hours**

- 20 millilitre (ml) syringe (if heparin anticoagulation required)
- Heparin bolus (as required) per physician prescription
- Sterile towels
- Replacement fluid solution (PrismOcal)
- Remove dialysate solution from medication refrigerator (or NS to prime dialysis line of PrismaFlex circuit if dialysis not utilized)
- Prepared anticoagulant infusion (Citrate or Heparin)
- Blue clamps X 2
- 4 X 2% chlorhexidine in 70% alcohol solution swabs
- 5 ml sterile syringes X 2
- 0.9% sterile normal saline flushes (10 ml) X 4
- Prepared priming solutions:
  - 0.9% normal saline with 5 units of heparin/ml X 1L
  - 0.9% normal saline X 1L
- Sterile dressing tray
- Emergency medications (epinephrine, calcium and bicarbonate) available for possible cardiovascular instability during initiation of therapy (especially neonatal or post cardiac surgical patients).

9. PRESS ‘THERAPY INFO’ to view PrismaFlex Therapy Info screens (theory, modes, etc.)
or PRESS ‘CONTINUE’ to proceed to ‘Choose Patient’ screen.

10. SELECT ‘NEW PATIENT’ to start a new treatment. ENTER patient identification and weight and press the ‘ENTER’ key.
or SELECT ‘SAME PATIENT’ to continue with current patient info and proceed to patient treatment screen. PRESS ‘CONFIRM’.

The patient’s weight is required to be entered for each therapy and is essential to PrismaFlex operation in the low body weight patient.

11. ENTER ‘PATIENT HEMATOCRIT’ from most recent CBC. If CBC not available utilize the default of 30.

The hematocrit will allow the machine to calculate a filtration fraction during therapy

**Do not use hematocrit from ABG – CBC Only**

12. ‘Confirm Patient Information’ and PRESS ‘CONFIRM’. Make corrections as necessary.

13. SELECT ‘CVVHDF’ in therapy options screen

Allows multiple treatment options once CRRT commenced

14. PROCEED to the ‘Choose Anticoagulation Method’ screen. CHOOSE:

‘Systemic’ for Heparin syringe anticoagulation or
‘No Anticoagulation’ for Citrate anticoagulation.

PRESS ‘CONFIRM’.

Anticoagulation therapy must be selected at the beginning of the set up.

NOTE: syringe pump on PrismaFlex is disabled during entire treatment if ‘no syringe’ option selected.

15. OPEN filter set. INSPECT set to ensure connections are secure (tighten all 10 connections).

Connections can become loose during the sterilization process.
16. PLACE filter set on PrismaFlex machine and SET UP according to step by step directions indicated on the ‘Load Set’ screen (work through each step using the touch screen).
PRESS ‘LOAD’ and, CONFIRM set loaded correctly on ‘Confirm Set Loaded’ screen.
PRESS ‘UNLOAD’ if set incorrectly loaded (this will give you the option to load set again), or ‘CONFIRM’ if filter loaded and therapy selected is correct.

17. PROCEED with step by step instructions on the ‘Prepare and Connect Solutions’ screen.
CONNECT priming solutions:

<table>
<thead>
<tr>
<th>Priming solution bag</th>
<th>= 0.9% normal saline with 5 units of Heparin per milliliter</th>
</tr>
</thead>
<tbody>
<tr>
<td>PreBlood Pump</td>
<td>= Citrate infusion or if using Heparin anticoagulation, can either prime with 0.9% normal saline or can consider splitting replacement fluid such that a percentage runs pre filter and some runs post filter.</td>
</tr>
<tr>
<td>Dialysis Pump</td>
<td>= prepared dialysis solution or prime with 0.9% normal saline</td>
</tr>
<tr>
<td>Replacement Pump</td>
<td>= prepared PrismOcal or as otherwise prescribed.</td>
</tr>
</tbody>
</table>

18. PRESS ‘CONTINUE’ to proceed to ‘Verify Setup’ Screen. ENSURE connections are correct and secure and that clamps are open on all lines. PUSH ‘PRIME’ and machine should proceed to priming mode. Once initial prime complete, ‘Priming, 1 of 1 Cycles Complete’ should appear.

*if using ST150 filter, you will need 2 priming bags (2000mls required to prime circuit)

NOTE: Can leave machine in this state until ready to initiate therapy.

19. REPRIME machine with 1 Litre of 0.9% normal saline within 30 minutes of initiating therapy.
PRESS ‘REPRIME’ and proceed to ‘Prepare to Reprime’ screen.
Follow step by step instructions on screen.

***ALWAYS Reprime with 1 Litre on 0.9% Normal Saline if primed set left for more than 30 minutes.

Correct system setup is imperative for safety and optimal functioning.

TIPS:
- Ensure filter holder is pulled all the way out
- Do not clamp a line unless the machine tells you to do so
- Do not break tape until you spike bags
- Scales must “click” in and out
- Slow down and read the machine step by step!

** when using PrismOcal solution – bag must be labelled that the Sodium Bicarbonate has been added with the date and time. Solutions containing sodium bicarbonate are stable for 24 hours

Removes air and sterilizing agent from circuit; heparin adheres to surface treated filter to prevent clotting. For ST membrane, 600 U per square meters will bind to the membrane.

TIPS:
- presence of air on the outside of the filter’s hollow fibers, top or bottom, may be seen. Additional manipulation to remove it is unnecessary and attempts at clearing may damage the hemofilter.
- Heparin primed machine can sit for up to 72 hours.

Prismaflex should not sit for more than 30 minutes following prime as ETO (sterilizing agent) may leach out of plastic.
20. PRESS ‘PRIME TEST’ and wait for machine to conduct a prime test. Once prime test completed, machine ought to proceed to ‘Prime Test Passed’ screen.

INSPECT set for air – if minimal priming is needed, use ‘MANUAL PRIME’.

If entire circuit requires repriming, PRESS ‘REPRIME’.

ADJUST Deaeration Chamber as per directions on screen.

21. PrismaFlex is primed. When patient is ready to commence CRRT, proceed to following steps.

<table>
<thead>
<tr>
<th>Moving the PrismaFlex following initial prime:</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ determine that you are on the PRIME TEST PASSED screen</td>
</tr>
<tr>
<td>▪ turn OFF the machine</td>
</tr>
<tr>
<td>▪ unplug the machine</td>
</tr>
<tr>
<td>▪ move PrismaFlex to bedside, plug in, and turn ON</td>
</tr>
<tr>
<td>▪ machine will re-boot into ‘Query’ screen</td>
</tr>
<tr>
<td>▪ select CONTINUE</td>
</tr>
<tr>
<td>▪ CONFIRM set loaded</td>
</tr>
</tbody>
</table>

The PrismaFlex battery only lasts for 15 seconds. Following these steps ensures the machine will not alarm when moving the machine to the bedside. Unplugging the machine will not result in loss of data.

22. SELECT ‘CONTINUE’ following prime test, to proceed to ‘Enter Treatment Setting’ screen.

In this screen, you can adjust the Patient Fluid Loss/Gain Limit.

It is recommended to not adjust below the following pre-set Patient Fluid Loss/Gain Limits:

▪ <10 kg = 60 ml
▪ 10 – 20 kg = 100ml
▪ 20 – 40 kg = 200 ml
▪ > 40 kg = 330ml

NOTE: Maximum Excess Gain/Loss Limits cannot be changed once therapy initiated.

Maximum excess gain/loss limit ensures safer limits of fluid removal/gain.

Software 7.11 includes access pressure update – no longer required to choose positive or negative access pressure.

23. PRESS ‘CONFIRM’ to proceed to the ‘Enter Flow Settings’ screen. Flow settings will be set to a default setting of 0 except the blood flow setting which is preset at a flow rate dependent on the size of the filter. PRESS ‘CONFIRM’ SELECT ‘POST’ Replacement. PRESS ‘CONFIRM ALL’.
24. **CLAMP** the Y connection, return line and effluent line

- ATTACH return line *(blue)* to Y connector.
- ATTACH effluent line *(yellow)* to effluent bag.

25. **VERIFY** child is ready for initiation of therapy. **INITIATE Calcium Chloride infusion** (via a separate central line – **not** the CRRT vascular access); consider additional correction of calcium if patient levels indicate.

   SELECT ‘**CONTINUE**’ from ‘**Connect Patient Screen**’.

   Citrate binds ionized Calcium in the circuit and filter and prevents clotting of the circuit. If citrate accumulates in the patient, systemic hypocalcemia may occur and contribute to hypotension during ongoing CRRT. Normalizing patient ionized calcium levels prior to commencement minimizes initial hypotension.

26. For Pediatric patients **less than 10 kilograms**, proceed to **Blood Priming Procedure** – unless patient on ECLS.

   For patients greater than 10 kg or on ECLS proceed to step # 30.

   **Reduces hemodilution in pediatric patients less than 10kg. If the volume of the hemofiltration circuit is greater than 10% of the child’s blood volume, the circuit is primed with blood to help prevent excessive hemodilution.**

### Blood Priming Procedure:

**NOTE:** Blood Prime is done immediately pre-therapy initiation and is done at the patient bedside. Blood prime is required for **patients weighing less than 10kg.**

27. **VERIFY** flow rates are at default settings of zero and blood flow at **10 ml/minute**.

28. **CHECK** blood as per blood checking procedure.

29. **PRIME the transfer sets with blood.**

30. **ATTACH** the Access line to the blood bag.

31. **ATTACH** the Return line to the blood bag.

32. **ENSURE** the effluent line is attached to the effluent bag.

33. **UNCLAMP** access, return, and effluent lines.

   **PRESS** start on PrismaFlex machine.
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**INCREASE** blood flow rate to **100 ml/minute**. **OVERRIDE** alarm, if necessary. If alarm continues, use **Roller Clamp** to provide a more negative pressure reading.

negative pressure on access line and positive pressure on return line. Pressures must be +/- 15 mmHg for alarm free operation.

Approximate time to prime blood: ~5 minutes

34. **CONTINUE** blood prime until blood has circulated through the return line. **DECREASE** blood flow rate to **10 ml/minute**. **PRESS ‘STOP’**. **REMOVE** roller clamp from access line if in use.

**NOTE**: consider **testing circuit for ionized calcium** for very hemodynamically unstable patients or speak to physician re: small calcium bolus.

*****CONTINUE** with initiation of CRRT as per procedure…

35. **ENSURE effluent line unclamped**. **ENSURE access and return lines clamped**. PLACE the access (red) and return (blue) circuit lines on clean surface near the vascular access catheter leaving attached to priming bag (or blood prime).

Preparation for initiation of CRRT therapy.

36. **REMOVE** tape, gauze or labels from vascular access catheter.

37. **OBTAIN** help of a **second nurse** and request **physician to be present during initiation**. **ENSURE emergency medications** and **fluid boluses** are available at bedside.

Maintains aseptic technique; emergent medical management is available if needed. **Suggested Emergency Medications at bedside**:

- Epinephrine
- Calcium Chloride
- Sodium Bicarbonate

38. **PREPARE and PLACE sterile field** near vascular access catheter.

Maintains sterile environment to prevent contamination of vascular access catheter.

39. **DON personal protective equipment** (gown, eye protection and mask) and **PERFORM hand hygiene**. **PROTECTS staff and reduces transmission of microorganisms; Standard/routine precautions**

40. **OPEN 4 X 2% chlorhexidine/70% alcohol solution swabs** and place on sterile field. **OPEN** sterile syringes and 0.9% normal saline flushes and place on sterile field. **DON** sterile gloves.

41. **PERFORM** a vigorous 30 second scrub of the hub of each lumen of vascular access device and allow to dry X 1 minute. Place on sterile drape. **Prevents introduction of infection**
42. VERIFY catheter clamps are closed, ACCESS red lumen of vascular access catheter, and ATTACH a sterile 5 ml syringe. Gently WITHDRAW waste greater than the filling volume of the catheter, CLAMP lumen, remove syringe and discard. ATTACH 10 ml 0.9% normal saline flush syringe and flush with 9 ml of normal saline. CLAMP lumen. REPEAT this step with blue lumen.

NOTE: Do not delay connecting the circuit and initiating therapy at this stage as these lines can clot very quickly.

43. ADMINISTER heparin bolus (if prescribed).

Remove anticoagulant and potential clots from line; flushing prevents clotting of blood until CRRT is initiated.

44. ENSURE access (red) lumen is clamped and remove syringe. DISCONNECT priming bag (or PRBC) from access line, ATTACH to access (red) lumen of vascular access device and secure connection (red to red). ATTACH return line to return (blue)lumen of vascular access device (blue to blue). SECURE connections.

NOTE: CRRT is attached to ECLS circuit for patient’s receiving ECLS therapy.

45. OPEN the clamps on the lumens of vascular access catheter.

Heparin is given to prevent clotting of blood when it comes in contact with CRRT tubing.

46. Begin with Blood Flow Pump set at 10 ml/minute. As blood moves through the circuit, increase blood flow rate to prescribed setting as patient tolerates.

NOTE: patients on high vasopressor therapy +/- hypotension – may require slow blood flow rates (20 – 30 ml/minute) for up to 5 minutes while initiating CRRT.

May be necessary to increase vasopressor drug therapy prior to initiating therapy due to some clearance of these agents across the filter.

47. START Pre Blood Pump (Citrate or pre filter replacement fluid if not using pre blood pump for anticoagulant) once full blood flow is achieved.

Slow rate prevents hypotension from rapid blood and fluid shifts

Priorities during initiation:
   i. Hemodynamic stability
   ii. Goal blood flow rate
   iii. Attach Barkey warmer tubing

48. COMMENCE Calcium Chloride infusion to patient (not to CRRT circuit) if not already commenced.

Citrate binds ionized calcium in the circuit and prevents circuit clotting (regional anticoagulation).

49. ATTACH Barkey Warmer to return line tubing. SET temperature to 37.0 degrees.

Maintaining a normal systemic ionized calcium level allows normal systemic clotting function and prevents the other complications of systemic hypocalcemia.

Aim to maintain normothermia. May have to adjust set temperature up or down depending on patient condition. (Barkey Warmer temperature range is 33-
### 50. START Replacement Fluid, as prescribed.

43 degrees).

### 51. START Dialysis Fluid, if ordered.

Commences hemodialysis/hemodiafiltration.

### 52. ENSURE that all monitor alarms are on and parameters are set.

Ensures safe delivery of therapy.

### 53. DISPOSE of soiled materials in the appropriate container.

Standard/routine precaution.

### 54. REMOVE gloves and PERFORM hand hygiene.

Protects staff and prevents transmission of microorganisms.

### 55. MONITOR Vital Signs every 15 minutes for the first hour of therapy, then hourly or as patient condition requires.

Some instability during initiation of therapy can be anticipated, particularly in small infants and children requiring hemodynamic support.

### 56. DOCUMENT blood flow rate, vital signs, access and return pressures, amount and colour of ultrafiltrate upon initiation. INITIATE CRRT Flow Sheet and monitor fluid balance hourly.

Accurate calculations of hourly fluid balance prevent hyper and hypovolemia and ensure that clinical goals are being met.

### 57. PRESS ‘SYSTEM TOOLS’. PRESS ‘MODIFY SETTINGS’. ‘PRESS CHART REMINDER’ – turn on using up and down arrows.

Keep audible tone on High when circuit is in an isolation room. Minimal audible tone to be set to Medium.

## Blood Sampling from Continuous Replacement Therapy Circuit

1. **GATHER** needed supplies.  
   - Sterile syringe to collect specimen (blood gas syringe for ionized calcium specimen)  
   - 2% Chlorhexidine and 70% alcohol swabs  
   - 25 gauge needle.  
   - Clean gloves  

   Ensures that all needed supplies are available and procedure completely in timely manner.

2. **PERFORM** hand hygiene.  
   **DON** clean gloves.  

   Standard/routine precautions; protects staff and reduces spread of microorganisms.

3. **IDENTIFY** sampling port to be used for specimen (generally pre-filter).  

   **NOTE:** if using syringe pump for heparin anticoagulation, use post filter sampling port as heparin is infused into the circuit proximal to the sampling port.  

   Pre filter sample is best indicator of anticoagulation status prior to blood going through circuit with citrate anticoagulation.

4. **CLEANSE** port with 2% Chlorhexidine/70% alcohol swab X 30 seconds and let dry X 1 minute.  

   Prevents contamination of system.

5. **ATTACH** needle to syringe, **INSERT** into port and **WITHDRAW** required amount of blood (~0.3 ml).
6. **DISPOSE** of supplies and used equipment; **REMOVE**
gloves and **PERFORM** hand hygiene. **Standard/routine precautions; decreases the**
transmission of microorganisms.

### Temporary Disconnection and Circulation of PrismaFlex Circuit

1. **VERIFY** temporary disconnection and circulation is
required. **Verifies decision to interrupt patient treatment**

**NOTE:** it is not recommended to interrupt treatment for long periods of time.
***Only consider if treatment will be interrupted for a short period of time.
***Anything exceeding 3 hours -- discontinue treatment and recommence treatment with a new circuit.

2. **GATHER** needed supplies:
   - 50 ml bag of 0.9% normal saline bag with 5
     units of heparin per ml
   - 2X fluid transfer sets
   - 4 X 10 ml sterile 0.9% normal saline pre-filled syringes
   - 2X prefilled syringe of Citrate solution (enough to fill both lumens of vascular access catheter)
   - 2% chlorhexidine/70% alcohol solution swabs
   - 2X sterile caps
   - Sterile glove, mask, goggles
   - Sterile towel

   Ensures that all needed supplies are available and minimizes likelihood that sterile field is contaminated.

3. **PERFORM** hand hygiene. **DON** mask and goggles. **Standard/routine precautions; protects staff and**
reduces spread of microorganisms.

4. **PREPARE** sterile field. **ADD** Citrate prefilled syringes, 0.9% normal saline flushes, and sterile caps to sterile field. **OPEN** 4X 2% chlorhexidine/70% alcohol solution swabs (maintaining asepsis) and place on the edge of sterile field. **Maintains sterile environment to prevent contamination of catheter.**

5. **SPIKE** 50 ml bag of 0.9% normal saline bag with 5
units of heparin per ml with 2X fluid transfer sets and expel air from bag and transfer sets.
**PRIME** transfer sets with fluid, **CLAMP** and **PLACE** sterile caps on ends. **Prevents introduction of air into circuit.**

6. **OBTAIN** help of a second nurse. **DON** sterile gloves. **Maintains aseptic technique; protects staff and reduces the spread of microorganisms.**

7. Vigorously **SCRUB** access lumen connection with 2% chlorhexidine/70% alcohol solution swab for 30
seconds and place on sterile field. **REPEAT** scrub with return lumen and place on sterile **Reduces the spread of microorganisms; reduces risk of vascular access contamination.**
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8. PRESS ‘FLOW RATES’.
   - SET Blood Flow Rate to 50 ml/minute and
   - SET all other flow rates to 0.

9. TURN OFF citrate or heparin infusion. Patient Calcium Chloride should be reduced or stopped as per patient condition and physician prescription. Discontinues anticoagulation for temporary termination of CRRT treatment.

10. PRESS ‘STOP’ on Prismaflex machine.

11. CLAMP access and return lines on the circuit.

   CLAMP both lumens of the vascular access catheter.

   **NOTE:** For ECLS, clamp access and return circuit lines and turn stopcock on ECLS circuit off to both lines. Ensure heparin infusion remains open to ECLS circuit.

12. Maintaining asepsis, DISCONNECT circuit access line from access lumen ATTACH 10 ml sterile 0.9% normal saline pre-filled syringe to vascular access lumen and leave on sterile towel. ATTACH access line to one of the primed fluid transfer set lumens without introducing air into the circuit. REPEAT procedure for return line.

13. VERIFY absence of air at connection sites and remove if necessary. UNCLAMP access and return lines and both transfer set clamps. PRESS RESUME.

   **CAUTION:** Do not press RECIRCULATE. This requires blood to be flushed back to the patient and a new set to be primed.

   **CONSIDERATION:**
   - For CRRT attached to ECLS circuit (operating with a positive access pressure) blood flow rate may need to be adjusted to 20 mls per minute to maintain positive pressure status.
   - May need to use roller clamp placed between connection and sampling port on access line for alarm-free operation.

14. ASPIRATE vascular access lumen slightly to ensure absence of air in lumen. FLUSH lumen with 9 mls of 0.9% saline solution X 2 until lumen cleared of blood. CLAMP lumen, FLUSH with enough Citrate solution to fill lumen (RECLAMPING lumen while flushing to generate a positive pressure in the lumen) and Clears catheter lumen of residual blood, reducing potential of clot formation; prevents clot formation when catheter is not in use.
### ATTACH sterile cap.  
#### REPEAT procedure for return lumen.

15. **REMOVE** gloves, mask, and goggles.  
   - Standard/routine precautions; no further risk of exposure to blood products

16. **LABEL** vascular access catheter lumens ‘DO NOT FLUSH, FOR DIALYSIS ONLY’, date, time and initials.  
   - Ensures catheter is used only for dialysis purposes, unless specified by PICU physician under special circumstances.

17. **PERFORM** hand hygiene.  
   - Standard/routine precautions.

18. **DOCUMENT** patency of vascular access catheter, fluid balance, patient’s tolerance of temporary termination of therapy, rationale for temporary termination, circuit assessment, amount of citrate flush.  
   - Meets legal documentation requirements.

### TO RECONNECT:  
**FOLLOW** CRRT initiation policy.

#### Termination of Continuous Renal Replacement Therapy

1. **VERIFY** treatment termination required.

2. **GATHER** needed supplies:  
   - 2 X 10 ml syringes  
   - 4 X 10 ml sterile 0.9% normal saline pre-filled syringes  
   - Citrate prefilled syringes (enough to fill both lumens of vascular access catheter)  
   - 4 X 2% chlorhexidine/70% alcohol solution swabs  
   - 2 X sterile caps  
   - Sterile glove, mask, goggles  
   - Sterile towel  
   - Ensures that all needed supplies are available and minimizes likelihood that sterile field is contaminated.

3. **PERFORM** hand hygiene.  
   - **DON** mask and goggles.  
   - Standard/routine precautions; protects staff and reduces spread of microorganisms.

4. **PREPARE** sterile field. **ADD** Citrate prefilled syringes, 2% chlorhexidine/70% alcohol solution swabs, 0.9% normal saline flushes, 10 ml syringes and sterile caps to sterile field.  
   - Maintains sterile environment to prevent contamination of catheter.

5. **PRESS ‘STOP’**, then ‘END TREATMENT’. **CLAMP** the vascular access catheter lumens and the access and return line tubing.  
   - Clamping prevents blood loss and contamination.

6. **DON** sterile gloves.  
   - Protects staff and reduces the spread of microorganisms.

7. Vigorously **SCRUB** access lumen connection with 2%  
   - Reduces the spread of microorganisms; reduces contamination.
**CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT)**

<table>
<thead>
<tr>
<th>Chlorhexidine/70% alcohol solution swab for 30 seconds and place on sterile field. <strong>REPEAT</strong> scrub for return lumen connection and place on sterile field. <strong>ALLOW</strong> to dry X 1 minute.</th>
<th><strong>risk of vascular access contamination.</strong></th>
</tr>
</thead>
</table>

8. **DISCONNECT** the circuit tubing and **ATTACH** 10 milliliter 0.9% normal saline pre-filled syringe to vascular access lumen. **ASPIRATE** slightly to ensure absence of air in lumen. **FLUSH** lumen with 9 mls of 0.9% saline solution X 2 and ensure lumen is cleared of blood. **CLAMP** lumen, **FLUSH** with enough Citrate solution to fill lumen (**RECLAMPING** lumen while flushing to ensure a positive pressure lock) and **ATTACH** sterile cap. **REPEAT** procedure for return lumen.

<table>
<thead>
<tr>
<th>Clears catheter lumen of residual blood, reducing potential of clot formation; prevents clot formation when catheter is not in use.</th>
</tr>
</thead>
</table>

9. **LABEL** vascular access catheter lumens ‘DO NOT FLUSH, FOR DIALYSIS ONLY’, date, time and initials.  

<table>
<thead>
<tr>
<th>Ensures catheter is used only for dialysis purposes, unless specified by PICU physician under special circumstances.</th>
</tr>
</thead>
</table>

10. **PRESS** ‘DISCONNECT’.  
**CLAMP** all lines in set.  

<table>
<thead>
<tr>
<th>Standard/routine precautions.</th>
</tr>
</thead>
</table>

11. **PRESS** ‘UNLOAD’, and **REMOVE** circuit from Prismaflex machine. **DISCARD** circuit. **REMOVE** gloves, mask, and goggles.  

<table>
<thead>
<tr>
<th>Saves patient data for quality assurance purposes.</th>
</tr>
</thead>
</table>

12. **PERFORM** hand hygiene.  

<table>
<thead>
<tr>
<th>Performs hand hygiene.</th>
</tr>
</thead>
</table>

13. **PRESS** ‘HISTORY’.  
**PRESS** ‘TREATMENT COMPLETE’.  
Turn PrismaFlex machine OFF.  

<table>
<thead>
<tr>
<th>Meets legal documentation requirements.</th>
</tr>
</thead>
</table>

14. **DOCUMENT** patency of vascular access catheter, fluid balance, child’s tolerance of termination of therapy, rationale for termination, circuit assessment, amount and strength of heparin flush.  

| Documentation of CRRT therapy is done on the Continuous Renal Replacement Therapy flowsheet. Each flow sheet is started at 0700 and is completed at 0600 (or when therapy is terminated).  
Documentation of catheter site and size, filter size, last circuit change, weight, previous days balance, and solutions and rates of infusions are documented at the beginning of the 24 hour period (e.g. at 0700) on the CRRT flowsheet on the appropriate line. Any changes to treatment, troubleshooting issues, complications and patient response to CRRT are documented narratively on the CRRT flowsheet.  
Hourly documentation includes:  
- Set patient fluid removal |
|---|
CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT)

- Actual patient fluid removed
- Cumulative fluid removed (e.g. running total of fluid removed)
- Anticoagulant rate
- Replacement fluid rate
- Dialysate rate
- Circuit pressures
  - Access
  - Filter
  - Return
  - Transmembrane
- Ionized Calcium or Activated Clotting Time level (if drawn that hour)
- Deairation level check (to ensure fluid level in deairation chamber is adequate)

Every 12 hours a total of the cumulative fluid removed, run time and a filtration fraction is calculated and documented.

REFERENCES


PrismaFlex Operators Manual for software version 4.XX