1.0 **PURPOSE AND INTENT**

To provide safe and effective management of the Prismaflex® Continuous Fluid Management (CFM) Delivery System for patients receiving Continuous Renal Replacement Therapy (CRRT). It is recommended that the user refer to this Clinical practice Guideline in conjunction with the Prismaflex® CFM.

2.0 **PRACTICE OUTCOME**

2.1 To provide continuous solute and/or fluid removal in patients with acute kidney injury and/or fluid overload over an extended period of time, aimed at being applied for 24 hours/day.

2.2 Establishment of Continuous Renal Replacement Therapy is to be performed by Registered Nurses in the Adult Critical Care Program and Cardiac Sciences Program’s Critical Care areas who have completed CRRT Level 1 and have displayed competency in performing this skill.

2.3 Registered Nurses who have demonstrated competency to the CRRT Clinical Resource Nurse (CRN), will be responsible for initiation, continuous monitoring, and discontinuation of therapy. Continued competencies (theoretical knowledge and skill demonstration) are required every 2 years.

2.4 Orders for CRRT are the responsibility of the Nephrologist. The ICU physicians may write orders to adjust fluid removal rates in collaboration with the Nephrologist. If a patient’s CRRT orders have been stopped for greater than 24 hours, new physician orders are required.

2.5 The administration of Heparin doses are for the Prismaflex® **ONLY** and require a 2 nurse independent double check and/or visual verification as per Safety Controls for High Alert Medications in WRHA Facilities (WRHA 110.000.340) A 2 nurse signature is also
required on the CRRT Medication Administration Record (MAR) or Electronic Patient record (EPR) as per facility Policy and Procedure.

2.6 Blood products and medications are not to be given via the Prismaflex® circuit.

2.7 The Prismaflex® circuit is to be changed after a maximum of 72 hours of use, or as needed.

2.8 Emergency disconnect supplies (see in-unit equipment list), are to be available in a clear plastic bag attached to or within the CRRT bedside cart.

2.9 In the case of machine malfunction it is to be removed from circulation and the Renal Technologist at the corresponding site should be notified according to hospital protocol.

3.0 BACKGROUND

CRRT is used in Critical Care primarily for patients with Acute Kidney Injury. Its main functions are fluid removal and solute clearance. The Prismaflex® CRRT Machine has four different Modes of Operation. The Winnipeg Regional Health Authority (WRHA) recommends the user set up the Prismaflex® machine in mode Continuous Veno-Venous Hemodiafiltration (CVVHDF). The WRHA also uses 3 other modes only when Nephrology orders the particular settings to be programed into the Prismaflex® machine by the CFM operator (CVVH, CVVHD, SCUF). The Prismaflex® unit automatically starts up in Setup Mode after it is powered on and initial self-tests have been completed. Setup Mode allows the operator to load the Prismaflex® CRRT filter set onto the Prismaflex® machine, prepare and connect appropriate solutions, and prime the filter set. Once the Prismaflex® machine is set up and the filter set securely connected to the patient, the operator can initiate therapy in Run Mode. Run Mode is the universal operating mode. If necessary, therapy can be delayed by putting the machine into Stand-by Mode. This allows the patient specific settings to be temporarily saved. The control unit enters End Mode when the operator presses STOP, and then chooses to change the set, end treatment or temporarily suspend therapy, disconnect the patient and use the recirculation option.
4.0 COMPONENTS

For END TREATMENT Blood Return/No Blood Return

- 1 L bag of NS with disconnection spike
- Gloves
- Sterile 4x4 (we don’t use sterile drape, we use sterile 4x4 to prepare area)
- 2 - Chlorhexidine swabs
- 2-Sterile red caps
- 2-3 mL syringes with correct amount of heparin or citrate for each catheter lumen
- 2-10 mL syringes with 10 ml NS

For RE-CIRCULATION

- 1000 mL bag of NS with primed Y line (SPS 660 Y connector/Flushing)
- Gloves and mask
- Sterile 4x4
- 2 - Alcohol swabs
- 2 - Sterile red caps
- 2-3 mL syringes with proper amount of heparin or citrate for each catheter lumen
- 2 - 10 mL syringes with 10 ml NS

For Repriming during Recirculation

- 1 L NS
- 1 SPC13 disconnection spike
- 1 effluent bag

For aPTT Post Filter Testing

- Red blunt needle
- 1-5cc syringe
- 1-alcohol swab
- 1-PTT blood tube (pale blue)
- 1-Chemistry/Hematopathology test requisition
5.0 GUIDELINES

5.1 Preparation of Prismaflex® Continuous Fluid Management System (CFM)

5.1.1 Plug the Prismaflex® CFM Machine and the Prismaflex® therm II warmer into the site specific ICU emergency outlets and turn on the machine. (On/off switch is at the lower right side of the Prismaflex® machine).

5.1.2 Once the Prismaflex® machine has booted up, press Continue.

5.2 Choose Patient

5.2.1 The operator follows the instructions on the display of the Prismaflex® CFM machine.

- Never Press the Custom Mode softkey. Custom Mode is only accessed by Biomed or Program Educator/Clinical Resource Nurse.
- Press Therapy Information screens to read an overview of the Prismaflex® therapies and Prismaflex® Sets.

5.2.2 Choosing New Patient

When NEW PATIENT is chosen (Only allows operator to choose this function when a new Prismaflex® machine is initiated), the control unit deletes the history data of the last treatment and advances to the CHOOSE THERAPY screen. New patient hotkey is only to be used when the CFM machine is new to the patient.

- Enter the patient’s ID Medical Record Number (MRN) into software memory.
- Enter patient weight. (either the patient’s admitting weight or ideal dry weight at the physician’s discretion).
- Verify Hematocrit default of 30.
- Confirm all entered data.

NOTE: It is recommended that the hematocrit is never to be changed by the CFM user. Only
Nephrology is to use this hot key when the physician order applies.
Rationale: The hematocrit is a number the machine uses to calculate the Filtration Fraction. The Prismaflex® will default to 30%. WRHA Nephrology uses this percentage.

### 5.2.3 Choosing Same Patient
When **SAME PATIENT** is chosen, the control unit retains the history data of the last treatment, retains the last chosen therapy and advances to the Load Set screen. The therapy can be changed by accessing the CANCEL softkey when the Load Set screen appears. The Same patient hotkey is to be used when the CFM machine is being used by the same patient.

### 5.3 Choose Therapy

#### 5.3.1 Select CVVHDF (refer to section 3)

### 5.4 Choose Anticoagulation Method

#### 5.4.1 Choose **SYSTEMIC ANTICOAGULATION**

**Rationale:** Choosing **SYSTEMIC ANTICOAGULATION** allows the Prismaflex® user to add a Heparin syringe later in CRRT therapy if Physician orders heparin at a later date. To allow for a change in anticoagulation therapy, user will load either a Heparin syringe, or a Normal Saline syringe.

#### 5.4.2 Press Confirm and Continue

### 5.5 Loading Circuit Components

#### 5.5.1 Check the expiry date of the filter.

#### 5.5.2 Remove the circuit cartridge filter from the package. Ensure all connections are tight.

#### 5.5.3 The operator follows the instructions on the display of the Prismaflex® CFM machine.

#### 5.5.4 Load filter set.
NOTE:  
- The bar code reader scans the bar code label on the filter.
- When the LOAD softkey is pressed, the control unit automatically performs a self test by running the dialysate pump at a fixed speed for approximately 7 seconds.
- If the test fails, the alarm “Warning: Wrong Set Loaded” is generated.
- Confirm the identity of the set that has been loaded.
- If the bar code reader cannot read the bar code on the filter set, the operator is required to manually enter the filter set type and confirm.
- Once the set type is confirmed, the Prismaflex® unit utilizes default settings and screens for the therapy/set selected.
- Select solution according to the Physician orders. Follow the step-bystep bullets and schematic on the display screen to connect the solutions to the filter set.

5.5.5 Confirm Set Loaded.

5.6 Prepare and Connect Solutions

5.6.1 The operator follows the instructions on the display of the Prismaflex® CFM machine.

NOTE: ALL SITES WITHIN THE WRHA USE 2 DIFFERENT SOLUTIONS:

1. Prismaflex® sol 4 (4mmols K+)
2. Prismaflex® sol 0 (0 K+)

AS PER PHYSICIAN ORDER.

5.6.2 Hang 1 litre of Heparinized Saline (2 litres total, 1st bag Heperinized, 2nd bag NS) (1000 units/mL Heparin concentration vial or equal to 5000 units in a 1 Litre bag) on the left corner hook.

When the therapy ordered is Heparin-free and the physician orders “no Heparin prime”, hang 1 liter of NS (2 litres total) (no Heparin added).

NOTE: Refer to Physician order for Heparin or Heparin free prime.
5.6.3 Heparin bolus upon initiation as per Physician orders. Instill 3000 units of Heparin as ordered by the physician into the patients vascular access port that will be connected to the access limb on the filter set.

**Rationale:** The Access limb will allow the instilled Heparin to flow into the Prismaflex® system allowing for adequate anticoagulation of the ST-150 filter fibers. This bolus is NOT intended for the patient.

5.6.4 Heparin Bolus during **RUN MODE** will be initiated **ONLY** if the Physician has indicated **tight** or **full** Heparin on the order sheet. The syringe pump on the Prismaflex® system will supply the bolus and/or continuous Heparin to the ST-150 filter fibers. This is **NOT** intended for the patient.

5.7 **Use of Prismatherm® II Blood Warmer**

5.7.1 Open and remove the Prismatherm® II blood warmer tubing keeping it coiled.

5.7.2 Start with the end of the line marked with blue & green tape (female end) and work from the front of the blood warmer to the rear of the warmer.

5.7.3 Hold the coil and position the green tape in the front of the tubing holder. Push the tubing under the front tubing holder.

**NOTE:** The green tape on the blood warmer tubing should fit directly into the tubing guide on the warmer.

5.7.4 Pass the coil around the warmer in a clockwise direction, pressing the tubing into the grooves of the heat exchanger.

5.7.5 As the blood warmer tubing leaves the last groove, pass it through the rear tubing holder and rest it around spring knobs of warming holder. Attach the male end to the female end of the Prismaflex® return line.

5.7.6 Attach the tubing end with the blue tape (female end) to the male end of the Prismaflex® return line.

5.7.7 Apply thermal sleeve.
5.7.8 **Do not** set heat on warmer at this time, wait until patient is connected and therapy is in **RUN MODE**.

**Rationale:** Bicarbonate solution produces carbon dioxide when heated, creating extra bubbles, and consequently the possibility of more air in the filter system.

5.7.9 Press Continue.

5.8 **AntiCoagulation Syringe**

5.8.1 The operator follows the instructions on the display of the Prismaflex® CFM machine.

5.8.2 Press Continue and CONFIRM.

**NOTE:** Install the anticoagulant syringe. Ensure the proper label is attached.

**Rationale:** The WRHA Critical Care Program uses both Heparin and/or Normal Saline in the syringe pump at any given time; the syringe pump is required to be functional in both cases. It is recommended that the syringe pump have a syringe attached.

5.9 **Circuit Prime**

5.9.1 Confirm the priming solution on the physician’s order sheet.

Press **Prime & Test**.

**NOTE:** This will direct the Prismaflex® flex to automatically proceed to the Prime Test sequence once the second priming sequence is completed. If **PRIME + TEST** was not selected, perform the prime test by pressing the **PRIME TEST** softkey.

5.9.2 Assess the circuit for adequacy of priming.

5.9.3 At completion of the prime, if larger amounts of air are present in the access or return line, press and hold **MANUAL PRIME** softkey until air removed. (small air bubbles are normal).

5.9.4 Leave PRISMAFLEX® CFM in “Prime Test Passed” screen until ready to continue.
NOTE: The PRIME TEST PASSED screen indicates that the Prismaflex® is ready to be connected to the patient. The Prismaflex® machine cannot be primed any further once the user moves forward from the “PRIME TEST PASSED” screen. If the patient is not ready for CRRT connection, please keep the Prismaflex® plugged in and reprime when patient is ready. Pumps automatically turn on and off to perform various tests. If the patient cannot be connected and therapy initiated within 60 minutes, the machine must be reprimed with 1 L NS and pressing Manual Prime.

Rationale: There is a risk of Ethylene Oxide (sterilizing agent) leaching into the stagnant NS solution and infusing to the patient, with the potential for an allergic/anaphylactic reaction

- If needed, the Prismaflex® may be turned off then unplugged and moved if necessary.
- When turned back on it performs an initializing test and a Query Screen appears with the following options:
  CONTINUE TREATMENT, NEW PRIME, NEW SETUP.
  (The user can select any of these as it pertains to the situation).

5.9.5 Press Continue. After pressing continue, there is no possibility of returning to the previous screens.

5.10 Adjust the Deaeration Chamber
The level of fluid in the Daeration chamber should be level with the indicator line on the chamber itself. (See picture for reference).

Rationale: The Daeration chamber needs to have enough room above the fluid line to allow for air to escape from the filter set. Failure to keep the fluid level at optimum height may allow air and/or blood clots in the lines.
5.11 Programming Prismaflex®

5.11.1 Enter treatment settings and confirm patient fluid loss/gain
5.11.2 Press CONTINUE.
5.11.3 Enter the Blood Flow Rate (BFR) ordered.
5.11.4 Enter Pre Blood Pump (PBP) Flow Rate ordered (pre-filter replacement).
5.11.5 Enter Dialysate Flow Rate ordered.
5.11.6 Enter Replacement Flow Rate ordered (this should default to 250 ml/hr).
5.11.7 Press Pre or Post (therapy defaults to Post filter).
5.11.8 Fluid removal as per Physician order.
5.11.9 Press CONFIRM ALL.

NOTE: All treatment settings are obtained from the Physician’s order sheet.

5.12 Enter Anticoagulation Settings

5.12.1 Enter the anticoagulation settings as per Physician order. Anticoagulation order will be for bolus dose and or continuous rate.
5.12.2 Press CONFIRM ALL.

* See order sheet for full or tight Heparin

HEPARIN AND ANTICOAGULATION PROCEDURE

NOTE: Heparin is the anticoagulant of choice within the WRHA. CRRT therapy can be run with either Heparin or with Normal Saline (NS) as ordered by the prescribing Physician. Heparin will ensure the ST 150 filter set is bonded with Heparin.

Rationale: The use of Heparin as a bonding agent for the ST 150 filter set may allow for extended filter life while in therapy.

5.13 HEPARIN BOLUS UPON INITIATION OF THERAPY

5.13.1 Heparin is run in conjunction with the Prismaflex® system to add anticoagulation to the Heparin binding ST 150 filter fibers.
5.13.2 The registered nurse will administer a Heparin bolus, when ordered by the Physician, through the patient’s central venous catheter via the access limb chosen (may be either RED or BLUE) immediately prior to connection and initiation of therapy.

5.13.3 The operator follows the instructions on the display of the Prismaflex® CFM machine.

5.13.4 Review prescription.

5.13.5 Press CONTINUE.

5.14 Connect Patient/ Initiation of treatment

5.14.1 The operator follows the instructions on the display of the Prismaflex® CFM machine.

NOTE: While on CONNECT PATIENT screen, access Central Venous Access Device (CVAD) as per policy #30.30.02 – Accessing and Locking Dialysis Central Venous Catheter (Anticoagulant/Thrombolytic/Antibiotic Locking). Winnipeg Regional Health Authority, Manitoba Renal Program.

5.15 RUN MODE

NOTE: The control unit enters Run Mode after the Prismaflex® user connects the patient to the primed ST 150 filter set and presses the START softkey from the Verify Patient Connection screen. During Run Mode, all appropriate alarms are enabled and the green status light is illuminated, unless an alarm occurs if the CHANGE BAGS softkey is selected.

The Status screen is the main Run Mode screen and is normally displayed during the entire patient treatment. Run Mode allows the operator to perform the following actions:

- Administer treatment to the patient. The fluid pumps operate according to settings validated by the operator. Bag weights are monitored and history data is accumulated and stored.
Anticoagulation Settings - Heparin Bolus

5.16.1 The operator follows the instructions on the display of the Prismaflex® CFM machine.

5.16.2 Follow Physician orders for Anticoagulation (Tight, Full, or no Heparin).

END MODE

The Prismaflex® unit enters End Mode when the user presses STOP. Appropriate alarms are enabled and the yellow status light is illuminated. End Mode allows the operator to perform the following procedures:

- **CHANGE SET** – Remove present set with/without returning blood to the patient and load a new set.
• **END TREATMENT** – Terminate the present treatment, with or without returning blood to the patient; view/download history data if desired.

• **RECIRCULATE** – Involves returning blood to the patient; temporarily disconnecting patient and recirculating saline through the blood lines.

5.17.1 **CHANGE SET:**

5.17.1.1 The operator follows the instructions on the display of the Prismaflex® CFM machine.

5.17.2 **END TREATMENT PROCEDURE:** by either returning blood or not returning blood.

**WARNING:** Always inspect the blood flow path for signs of clotting before returning the blood in the set to the patient. If clotting is suspected, **DO NOT** return the blood to the patient. A visual inspection of the filter set lines should be done at all times while returning blood from the filter set. Clots will be visibly darker in color than the blood in the set and will usually be seen travelling through the set while the blood return is initiated. It is important to keep a keen visual view on the return line directly after Post filter and up to the patient while returning blood.

5.17.2.1 **RETURNING BLOOD**

- Treatment will be terminated and the blood returned in these situations:
  - High TMP alarms with no filter clotting
  - High TMP is variable during treatment. It is often necessary to return the blood when TMP reaches the +250-300 mmHg range.
  - Filter has been running 72 hours.
  - Patient being transported for tests.
  - Treatment discontinued by Physician.

**Rationale:** TMP range above +250-300 has been linked to higher incidence of filter clotting resulting in the loss of patient blood in the filter set.

5.17.2.2 The operator follows the instructions on the display of the Prismaflex® CFM machine.
NOTE: Ensure both Prismaflex® end and patient end are clamped prior to any disconnection and emergency disconnection supplies are ready and available. Follow Manitoba Renal Program (MRP) for care and management of vascular access catheter.

5.17.2.3Flush both lumens with NS and then flush with the appropriate volumes of anticoagulant solution.

NOTE: Anticoagulant volume = volume of lumen.

5.17.2.4Press CONTINUE and advance to PATIENT DISCONNECT screen.

5.17.2.5The operator follows the instructions on the display of the Prismaflex® CFM machine.

5.17.2.6Remove extracorporeal circuit from machine and dispose according to your site specific bio-hazardous waste policy.

5.17.2.7Press TREATMENT HISTORY and obtain information from previous hour.

5.17.2.8Document on Patient Progress Notes:

• Reason for termination
• Care of vascular access
• Condition of dressing and if changed

5.17.2.9 NOT RETURNING BLOOD

• Treatment will be terminated and the blood not returned in these situations:
  • Filter/access lines clotted
  • Suspected air embolus

5.17.2.10Press STOP and select END TREATMENT.

5.17.2.11Press CONTINUE and advance to “Patient Disconnect” screen.

5.17.2.12The operator follows the instructions on the display of the Prismaflex® CFM machine.

5.17.2.13Remove extracorporeal circuit from machine and dispose according to your site specific bio-hazardous waste policy.

5.17.2.14On Treatment Complete screen, press HISTORY and obtain fluid removal information from previous hour.
5.17.2.15 Document on CRRT flowsheet that blood has been either returned or lost due to clot.

5.18 **RECIRCULATION:**

- **RECIRCULATE** – The return of blood to the patient; disconnecting patient (So patient can go for various tests if needed) and recirculating Normal Saline through the prismaflex® CFM system to maintain filter integrity. The length of time spent in recirculation will be included in the filter life.

- Recirculation is ONLY performed when:
  - The filter is less than 24 hours old.
  - The filter is free of clots when inspected post return of the patient’s blood.

**NOTE:** Maximum recirculation time is 2 hours (Prismaflex® CFM will count this down).

5.18.1 **For Repriming:** the operator follows the instructions on the display of the Prismaflex® CFM machine.

- In End Treatment mode, on the STOP Screen, press the **RECIRC** softkey.
- Choose Recirculation Screen.
- Choose **SALINE RECIRC**. (follow the prompts on the screen).
- After pressing **SALINE RECIRC**, The operator follows the instructions on the display on the Prismaflex® CFM machine.

5.18.2 **Saline Recirculation**

**NOTE:** If significant clotting is noted in the filter, the operator will automatically UNLOAD the filter set and progress into the CHANGE SET procedure. This is accomplished by pressing DISCONNECT without returning the patient’s blood. (Prismaflex® CFM automatically proceeds to the “Disconnect Patient” screen.

5.18.2.1 Once the blood is returned to the patient, press **CONTINUE**.

5.18.2.2 The operator follows the instructions on the display of the Prismaflex® CFM machine.

5.18.2.3 Press **START RECIRC** softkey.

5.18.2.4 Enter the preferred **RECIRCULATION RATE** 100 ml/hr to 180 mL/hr.
5.18.2.5 When the patient is ready to be reconnected, Prime the set, with the ordered priming solution. When the prime test is successfully completed, reconnect the patient, resume treatment by pressing the START softkey on the Reconnect Patient screen.

NOTE: RECIRCULATION may be stopped and the treatment terminated. This involves unloading the set, progressing to the TREATMENT COMPLETE screen. The bags and set are then discarded after this step. The RECIRCULATION RATE can be changed at any time while recirculation is in progress. The Recirculation in Progress Screen reports Recirculation Time, Recirculation Rate, and Status of the Set (litres of patient blood/saline that have been processed through the filter). Most alarms are disabled during Recirculation. The set must be replaced if the maximum recirculation time (2 hours) is exceeded, or in the case of poor blood return.

5.19 aPTT SAMPLING

5.19.1 aPTT sampling is required for assessment of adequate aPTT values for Primaflex® circuits where heparin is ordered for anticoagulation management in Primaflex® CFM therapy.

5.19.2 Heparin is used for Anticoagulation within the Primaflex® flex CRRT unit. PTT sampling is needed to ensure proper levels of anticoagulation are adequate within the ST 150 filter set during operation.

5.19.3 The nurse will obtain the blood sample required for aPTT measurements from the patient indwelling line (Arterial, Central venous line (CVL) or by veni-puncture) when heparin has been ordered.

5.19.4 When heparin is being administered for systemic anticoagulation (eg. ACS or DVT therapy), it will be delivered via infusion pump directly to the patient and aPTT sampling will be obtained via arterial line or peripheral IV lock according to set hospital protocols.

5.19.4.1 Identify the desired patient indwelling IV line.

5.19.4.2 Wipe the site with an alcohol swab.

5.19.4.3 Withdraw the desired amount of blood.
6.0 REFERENCES:


(2) Manitoba Renal Program Accessing and Locking Dialysis Central

(3) Continuous Renal Replacement Therapy: Pittsburgh Critical care medicine, Oxford Univ. Press

(4) Regional Citrate Versus Heparin Anticoagulation for Continuous Renal Replacement Therapy: 
   A Meta-Analysis of Randomized Controlled Trials

(5) Prismaflex® Tutorial, SW 7.xx, Gambro.

(6) Ashley Pauls, RN, BScN. Acute Therapy Specialist. Personal Communication. Baxter Corporation.

(7) Continuous Renal Replacement Therapy Advance Training Presentation Handout, SW 7xx, 
    Gambro/Baxter

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