# Guideline for Ordering CRRT in CCTC

## General Principles

- Determine appropriate anticoagulation (hemodilution only, heparin or citrate).
- If patient has HITT or heparin allergy, make sure the priming solution is “saline only”. The Oxiris filter if used is heparin bonded and contraindicated for all patients with HITT or heparin allergy.
- If patient has a contraindication to anticoagulation (e.g. bleeding) but does not have HITT/heparin allergy, prime filter with heparin. This bonds heparin to the filter; the heparin is rinsed out with the second litre of saline before connection so that patient does not receive a heparin bolus.
- Use standard CCTC flow rates unless patient has very high clearance needs.
- An adequate *delivered* prescription is usually 20-25 ml/kg/hr. This is calculated as the (dialysis + pre and post dilution hemofiltration solution rates + fluid removal rates) / (patient weight in kg). Most VH nephrologists suggest prescribing to an ideal body weight or a maximum of 100 kg. Our standard 2000 ml orders meet the delivered prescription target for most patients (displayed on PrisMax as prescribed and delivered).
- Solution rates that are higher than therapeutically indicated are the biggest cost driver of therapy (solutions are ~$30/5L bag). They also significantly add to nurse workload both in preparing and hanging bags and emptying effluent.
- Always setup circuit in CVVHDF mode; this allows any treatment protocol to be changed mid treatment without starting a new circuit. The actual therapy (CVVH, SCUF or CVVHDF) is determined by the flow rates.
- We no longer load a syringe (choose “no systemic anticoagulation” for all methods of anticoagulation. with a syringe in the anticoagulant pump.
- **We do not run solutions with < 2 mmol/L of K** for safety. If a patient’s K is persistently high despite a potassium of 2 mmol/L, look for non-renal causes.
- Always order the potassium titration protocol **PLUS** the Crit Care Electrolyte Power Plan.
- Discontinue bicarbonate infusions when CRRT is initiated. All stocked CRRT solutions provide 32 mmol/L of bicarbonate, which will deliver more bicarbonate than a standard bicarb infusion.
- Nurse to notify pharmacy when CRRT or IHD is started or stopped. Standard antimicrobial dosing is used for most drugs during CRRT, but changes are required if treatment is stopped/IHD initiated.
- Order the desired NET fluid removal target. The nurse will titrate fluid removal to meet this target as tolerated, starting with 0 ml/hr initially.

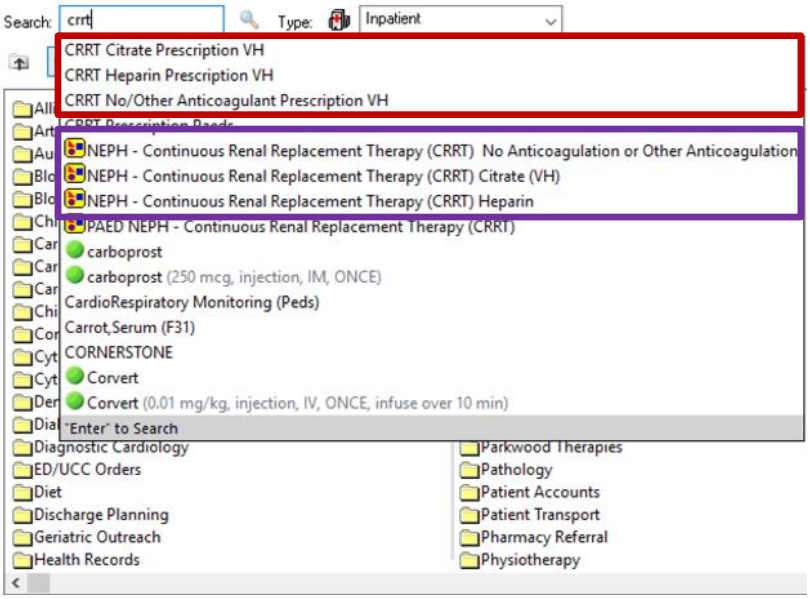
## All Therapy Orders

Currently, the orders are found as “Nephrology CRRT” in Power Chart. The orders at VH are different than UH.

There are 3 ADULT and one Paediatric CRRT Prescriptions and Order Sets. To locate, use the search term “CRRT”. The first 4 options are prescription only – these should only be used to modify a previously entered order set. The second 4 options are Power Plans (order sets). The corresponding prescription is embedded in the Power Plan, which also provides anticoagulation specific lab orders and medications. Always choose the Power Plan when initiating new orders or ordering a new method of anticoagulation.

1. CRRT Power Plan and Prescription (Power Form): **No anticoagulation**
   Use this when no anticoagulation is being used or if the patient is receiving anticoagulation that is being delivered systemically
2. CRRT Power Plan and Prescription (Power Form): **Heparin Anticoagulation**
   Use this when ordering heparin via the filter. For patients on systemic heparin, use the “no anticoagulation” order. The patient should be considered to be receiving systemic anticoagulation, regardless of systemic PTT.

3. CRRT Power Plan and Prescription (Power Form): **Citrate Anticoagulation**
   This is a method of providing regional anticoagulation to the filter; the citrate is reversed systemically with a titrated calcium infusion. This is used rarely in CCTC.




**Prescription only:** Use to change an existing prescription only

**Power Plan:** Use for initial orders (contains prescription). Must be initiated. Discontinue entire Power Plan to switch to a different anticoagulation type.

The sequencing for entering CRRT orders and prescriptions is provided in the CCTC Website as shown:

**Continuous Renal Replacement Therapy Ordering**

Guideline Decision-Tree for Filter Anticoagulation

Power Chart Instructions: Ordering No Anticoagulation Prescription (full slide view)
Ordering CRRT No AC (smaller slides)

Power Chart Instructions: Ordering Filter Heparin Prescription

Power Chart Instructions: Ordering Citrate Prescription (full slide view)
Ordering CRRT Citrate (smaller slides)

Sequence for Signing Orders in Power Chart (Quick Steps)

Viewing, Modifying and Discontinuing Power Chart Orders

Protocols for Titration: Potassium, Heparin, Citrate and Calcium

**POWER FORM ORDERS BY THERAPY**

**Power Form Order for "No Anticoagulation":**

1. **Mode: CVVHDF** always
2. **Blood Flow: 250-300 ml/min.** Increasing the blood flow quickly reduces clotting by reducing the duration of time that blood is in the filter.
3. **Prime with heparin** UNLESS patient has HITT
4. **Solutions:** Use the same solution on all pumps (P4 or P0)
   PrismaSol 4 is the standard solution unless K is above 5.6 at the start of treatment. If K is 4.6-5.6, nurse will recheck potassium in one hour to ensure it has responded. Nurses switch between PrismaSol 4 and 0 as needed to achieve target potassium. PrismaSol 4 also contains glucose, whereas, PrismaSol 0 contains no glucose. Monitor glucose and insulin infusions closely if solution is changed. Consider orders to allow continued PrismaSol 4 for stable potassium levels that remain below 5.2.
5. **Dialysate flow rate: 0** (P4 or P0)
6. **Pre filter hemofiltration flow rate (PBP): 2000 ml/hr** (P4 or P0)
7. **Post filter hemofiltration flow rate (Replacement): 200-500 ml/hr** (P4 or P0)
8. **Potassium Titration:** Select "add potassium chloride per potassium titration protocol"
9. Order the **Crit Care Electrolyte Replacement Power Plan**
10. If a higher prescription is needed to increase clearance or achieve prescription goals, order the additional prescription *as dialysis fluid*. Higher predilution rates may fatigue the filter (a volume of effluent that is equal to the pre AND post dilution hemofiltration fluid rates must be pulled across the filter membrane each hour).

**Power Form Order for CRRT Heparin:**

1. **Mode: CVVHDF** always
2. **Blood Flow: 250-300 ml/min.** You will need to adjust default setting.
3. **Prime with heparin**
11. **Solutions:**
    5,000 mL Heparin/1 L 0.9% normal saline on PBP
    PrismaSol 4 or 0 on Dialysis and Replacement pumps (use same solution on both to reduce error)
    PrismaSol 4 is the standard solution unless K is above 5.6 at the start of treatment. If K is 4.6-5.6, nurse will recheck potassium in one hour to ensure it has responded. Nurses switch between PrismaSol 4 and 0 as needed to achieve target potassium. PrismaSol 4 also contains glucose, whereas, PrismaSol 0 contains no glucose. Monitor glucose and insulin infusions closely if solution is changed. Consider orders to allow continued PrismaSol 4 for stable potassium levels that remain below 5.2.
4. **Dialysate flow rate: 1000 ml/hr** usual starting rate (P4 or P0 solution)
5. **Pre filter hemofiltration flow rate (PBP):** heparin solution (dose titrated to post filter PTT)
6. **Post filter hemofiltration flow rate (Replacement): 500 ml/hr** (P4 or P0 solution)
7. **Potassium Titration:** Select the standing order to "adjust potassium by protocol"
8. Order the **Crit Care Electrolyte Replacement Power Plan**
9. **Heparin Order:** Bolus with 80 u/kg to a maximum of 5000 u and initiate at 1000 u/hr unless a more conservative heparin protocol is desired. Nurses titrate the heparin to achieve a post filter PTT of 60-80 seconds (default setting, can order a lower PTT if desired).
   The systemic PTT may range between normal and therapeutic levels; ***regardless of the systemic PTT, the patient should be considered systemically anticoagulated*** (e.g. before lines are inserted). CRRT heparin can be held as required or switched to no anticoagulation orders; increase the predilution hemofiltration rate (PBP) to maintain filter patency.

**Order for Patient Receiving Systemic Anticoagulation:**

Complete the orders for "No Anticoagulation". If the patient is subsequently switched from systemic anticoagulation to CRRT heparin, delete the "No Anticoagulation" Power Plan and order a new Power Plan for CRRT with Heparin Anticoagulation. If you only change the prescription, there will be no orders for PTT.

**Ordering Citrate in CCTC:**

Citrate Protocol is used infrequently and nurses may need a refresher; some may have never run it (contact CNS or Educator for support if needed). Citrate provides regional filter anticoagulation that is reversed systemically. In CCTC, citrate is generally ordered if the filter cannot be maintained at > 12 – 24 hours (with high flow or heparin), despite an adequate access site. It is not indicated if clotting is due to hypovolemia or line placement issues (identified by access and return pressure problems).

The protocol at VH is substantially different than at UH. Liver failure is a relative contraindication to citrate (most patients with liver failure do well without any anticoagulation). We do not use 3-lumen dialysis catheters as they have smaller access and return lumens and our usual practice it flow rates of 250-300 ml/min.

A calcium infusion must be ordered to reverse the citrate systemically. Calcium chloride requires a central line that is not part of the dialysis circuit. The calcium orders (bolus and infusion) are within the Power Plan portion of the Citrate Orders because they are administered outside of the CRRT circuit. These are also documented in the MAR. The Citrate is ordered as part of the dialysis prescription and is ordered within the associated Power Form (prescription). Nurses titrate the potassium concentration, citrate flow rate and calcium chloride replacement by protocol. Citrate is adjusted to achieve a target post filter ionized calcium and the calcium chloride infusion is titrated to normalize the systemic ionized calcium.

**Power Form Orders for Citrate**

1. **Mode: CVVHDF** always
2. **Blood Flow: 150-200 ml/min.** The blood flow should remain at a fixed rate to prevent swings in ionized calcium. The nurse may need to increase the blood flow rate above 150 ml/min to manage access and return alarms; 150 ml/min is the usual goal.
3. **Prime with heparin if patient does not have HITT or heparin allergy**
4. **Solutions:** Use PrismOCal for the post dilution hemofiltration solution (replacement) and dialysis fluids. Citrate will run on the pre dilution hemofiltration pump (PBP)
   **Prism0Cal** is a calcium, glucose and potassium free solution. Calcium free reduces the amount of citrate required. Nurses will add potassium to a desired final potassium concentration by protocol.
5. **Dialysate flow rate: 1000 ml/hr** fixed rate **Prism0Cal**
6. **Pre filter hemofiltration flow rate (PBP) rate: 250 ml/hr CITRATE** starting rate; nurse will titrate to post filter ionized calcium target
7. **Post Filter Ionized Calcium Target:** 0.36-0.45 (recommended starting target; nurse will titrate to target)
8. **Post filter hemofiltration flow rate (Replacement): 1000 ml/hr** of **Prism0Cal**
9. **Potassium Titration:** Select the standing order to "adjust potassium by protocol"
10. Order the **Crit Care Electrolyte Replacement Power Plan**

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If you have questions or need clinical support, please contact brenda.morgan@lhsc.on.ca extension 55683 or pager 19914 or one our Clinical Educators (Rebecca Park/Tiffany Dubrueil).