

CRRT Orders 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 is heparin bonded and contraindicated if the patient has HITT or heparin allergy.
- If patient has a contraindication to anticoagulation but does not have HITT/heparin allergy, prime filter with heparin. This bonds heparin to the filter; the heparin is rinsed out before connection so 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 nephrologists suggest prescribing to an ideal body weight or a maximum of 100 kg. Our standard 2500 ml orders meet the delivered prescription target for most patients (displayed on PrisMax).
- 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.
- The PrisMax is always setup in CVVHDF mode with a syringe in the anticoagulant pump. 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 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, consider 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 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 options for orders:

1. CRRT No anticoagulation: use this when no anticoagulation is being used or the patient is receiving anticoagulation systemically
2. Heparin: Use this when ordering heparin via the filter. For patients on systemic heparin, use the “no anticoagulation” order
3. Citrate

All therapies require the completion of a Power Plan and embedded Power Form. The Power Plan includes all orders for labwork and medications that will appear on the MAR. The prescriptions described below are entered into the Power Form (accessed by choosing “modify” from the top option of the Power Plan). Instructions for entering order are available on CCTC Website:

At the top of each Power Plan there is an option for prescription. Modify the prescription to access the associated Power Form. The sequencing for entering orders is provided on the [CCTC Website](#) as shown:

Continuous Renal Replacement Therapy

CRRT ORDERING IN CCTC

[Ordering Guidelines for CRRT in CCTC](#)

[Decision Tree for Filter Anticoagulation](#)

[Power Chart Instructions: Ordering No Anticoagulation Prescription](#)

[Power Chart Instructions: Ordering Filter Heparin Prescription](#)

[Power Chart Instructions: Ordering Citrate Prescription](#)

[Sequence for Signing Orders in Power Chart \(Quick Steps\)](#)

[Viewing, Modifying and Discontinuing Power Chart Orders](#)

[Protocols for Titration: Potassium, Heparin, Citrate and Calcium](#)

INFORMATION AND TROUBLESHOOTING

[Antibiotic dosing adjustments and CRRT](#)

[Citrate Anticoagulation Protocol: Principles of Citrate Protocol](#)

NURSING PROCEDURES

[Procedure: Accessing Dialysis Line and Initiation of Therapy](#)

[Checklist: Accessing a Dialysis Catheter](#)

[Procedure: Ending CRRT Treatment/Blocking Dialysis Catheter](#)

[Checklist: Ending CRRT Treatment/Blocking Dialysis Catheter](#)

[Blood Lead Detector Alarm: Lab Assessment](#)

[Fluid Monitoring: How to find my 0700 and 1900 fluid balance \(PrismaFlex\)?](#)

POWER FORM ORDERS SELECTED BY METHOD OF FILTER ANTICOAGULATION

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. 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.
5. **Dialysate flow rate:** 0
6. **Pre replacement flow rate (PBP):** 2000 ml/hr
7. **Post replacement flow rate (Replacement):** 500 ml/hr
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**
4. **Solutions:** Use the same solution on all pumps 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 have an order to change between PrismaSol 4 and 0 as needed to achieve target potassium.
5. **Dialysate flow rate: 1000 ml/hr** usual starting rate
6. **Pre replacement flow rate (PBP): 1000 ml/hr** usual starting rate
7. **Post replacement flow rate (Replacement): 500 ml/hr**
8. **Potassium Titration:** Select the standing order to “adjust potassium by protocol”
9. Order the **Crit Care Electrolyte Replacement Power Plan**
10. **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, place a new order using the “CRRT Heparin”.

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 either the no anticoagulation or heparin protocol. 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).

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 and documented in the MAR. The Citrate is ordered as part of the dialysis prescription and is ordered within the associated Power Form. 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)
PrismOCal is a calcium and potassium free solution. Calcium free reduces the amount of citrate required. Nurses will add potassium to a desired final potassium concentration.
5. **Dialysate flow rate (PrismOCal): 1000 ml/hr** fixed rate
6. **Pre replacement flow rate (PBP, Citrate): 250 ml/hr** 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 replacement flow rate (Replacement, PrismOCal): 1000 ml/hr**
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 pager 19914 or one of our two Clinical Educators (Kendra Krouskos -17313; Rebecca Park - 15871).

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