



London Health Sciences Centre

Critical Care Trauma Centre
**CONTINUOUS RENAL REPLACEMENT THERAPY
 USING CITRATE ANTICOAGULATION**
PREPRINTED ORDER
 Page 1 of 2

KEY: R - REQUISITIONED P - PROCESSED (KARDEX)

NON-MEDICATION ORDERS	R	P	MEDICATION ORDERS	P
<p>Reason for Exam / Clinical History and Contact # required for all Radiology / Nuclear Medicine orders.</p> <p>FILTER SET-UP:</p> <p><input type="checkbox"/> ST 150 (Note: ST 150 requires 2 litres priming solution.)</p> <p><input type="checkbox"/> Other: _____</p> <p><input type="checkbox"/> Set-up Prismaflex in CVVHDF mode.</p> <p><input type="checkbox"/> Start blood flow rate at 150 mL/min. May increase to 250 mL/min p.r.n. if needed to manage access and return pressures.</p> <p>LABORATORY / INVESTIGATIONS:</p> <p><input type="checkbox"/> Monitor ionized calcium levels that are <i>not</i> corrected to pH.</p> <p><input type="checkbox"/> POC systemic ionized calcium prior to starting treatment. See calcium chloride protocol on reverse.</p> <p><input type="checkbox"/> POC ionized calcium post-filter (blue port) 1 hour post initiation of therapy, then q 3h until 2 results obtained within range, then q 6h. Goal: post filter ionized calcium 0.25 - 0.35 mmol/L.</p> <p><input type="checkbox"/> POC systemic ionized calcium from arterial line 1 hour post initiation of treatment, then q 3h until 2 results obtained within range, then q 6h. Goal: systemic ionized calcium 1.0 - 1.3 mmol/L.</p> <p><input type="checkbox"/> Sample all other bloodwork from an arterial line, central venous line or venipuncture.</p> <p><input type="checkbox"/> Electrolytes, glucose, phosphate, magnesium q 6h and p.r.n.</p> <p><input type="checkbox"/> Liver function: Alk Phos, ALT, AST, GGT, total and direct bilirubin daily.</p> <p><input type="checkbox"/> Serum urea, creatinine, ultrafiltrate urea q 12h. Change filter if urea ultrafiltrate:serum ratio < 0.8.</p> <p><input type="checkbox"/> Systemic total calcium by lab and systemic ionized calcium by POC testing q am.</p>			<p>Initiate treatment within 10 minutes of priming.</p> <p><input type="checkbox"/> Prime system with 5,000 units heparin sodium/L 0.9% NaCl.</p> <p><input type="checkbox"/> Prime system with 0.9% NaCl (heparin contraindicated/HIT syndrome).</p> <p>DIALYSATE SOLUTION:</p> <p><input type="checkbox"/> PrismOcal <input type="checkbox"/> Other: _____ Rate: _____ mL/h. (Recommended rate: 1000 mL/hr) Add KCl to dialysate solution according to protocol on reverse. PrismOcal has 0 KCl.</p> <p>Post dilution replacement solution Administer via Replacement Pump.</p> <p><input type="checkbox"/> PrismOcal <input type="checkbox"/> Other: _____ Rate: _____ mL/h. (Recommended rate: 1000 mL/hr)</p> <p>CITRATE INFUSION (ACD-A): Administer via Pre Blood Pump (PBP).</p> <p><input type="checkbox"/> Citrate ACD-A 500 mL Rate: _____ mL/h. (Recommended rate to start at 250 mL per hour.) Adjust citrate according to protocol on reverse.</p> <p>CALCIUM CHLORIDE INFUSION:</p> <p><input type="checkbox"/> CaCl 8 g in 1 L 0.9% NaCl. Infuse via central venous catheter that is separate from dialysis line. Start the CaCl infusion 15 minutes before initiating dialysis treatment at 50 mL/h (400 mg/h). Adjust as per protocol on reverse.</p> <p><input type="checkbox"/> If systemic ionized calcium is ≤ 0.80 mmol/L, give 1 g calcium chloride in 100 mL 0.9% NaCl over 15 minutes and adjust CaCl infusion as per protocol.</p> <p><input type="checkbox"/> If systemic ionized calcium is 0.81 - 0.95 mmol/L, give 500 mg calcium chloride in 100 mL 0.9% NaCl over 15 minutes and adjust CaCl infusion as per protocol.</p>	

ORDER CONTINUED ON PAGE 2

PRESCRIBER'S PRINTED NAME / SIGNATURE / CONTACT #:		DATE (YYYYMMDD):		TIME:	
PROCESSOR INITIALS:	DATE (YYYYMMDD):	TIME:	NURSE INITIALS:	DATE (YYYYMMDD):	TIME:

1. Calcium Chloride titration protocol:

Adjust calcium chloride infusion according to protocol below to maintain SYSTEMIC ionized calcium level 1.0 - 1.3 mmol/L.

Systemic ionized Ca ⁺⁺ (mmol/L)	Calcium Chloride Adjustment
< 0.80	↑ by 20 mL/h (↑ by 160 mg/h)
0.80 - < 1.0	↑ by 10 mL/h (↑ by 80 mg/h)
1.0 - 1.3	No change
> 1.3	↓ by 10 mL/h (↓ by 80 mg/h)

- If ≤ 0.80 mmol/L, give CaCl 1 gram in 100 mL 0.9% NaCl over 15 minutes and adjust CaCl infusion per protocol. Repeat ionized calcium level 1 hour post bolus.
- If 0.81 - 0.95 mmol/L give CaCl 500 mg in 100 mL 0.9% NaCl over 15 minutes and adjust CaCl infusion per protocol. Repeat ionized calcium level 1 hour post bolus.

2. Citrate titration protocol:

Adjust citrate infusion according to protocol below to maintain POST-FILTER ionized calcium level 0.25 - 0.35 mmol/L.

Post-filter ionized Ca ⁺⁺ (mmol/L)	Citrate Infusion Adjustment
< 0.25	↓ by 10 mL/h
0.25 - 0.35	No change
0.36 - 0.45	↑ by 10 mL/h
> 0.45	↑ by 20 mL/h
Notify Nephrology MD if Citrate Infusion > 350 mL/h.	

3. Add KCl to dialysate according to the following protocol:

Serum K ⁺ level (mmol/L)	FINAL KCl concentration in dialysate
If < 3.0	<ul style="list-style-type: none"> • KCl bolus I.V. as per Electrolyte Replacement Preprinted Order. • Recheck serum Mg⁺⁺, and treat as per Electrolyte Replacement Preprinted Order • KCl to equal 6 mmol/L. • Notify Nephrologist if repeat potassium level is < 3.0 mmol/L.
3.0 - 3.4	KCl to equal 5 mmol/L
3.5 - 4.0	KCl to equal 4 mmol/L
4.1 - 5.0	KCl to equal 3 mmol/L
5.1 - 6.0	KCl to equal 2 mmol/L
> 6.0	Notify Nephrologist



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<p>Reason for Exam / Clinical History and Contact # required for all Radiology / Nuclear Medicine orders.</p> <p>FLUID REMOVAL GOALS:</p> <p>Set fluid removal to 0 mL/hr when initiating CRRT.</p> <p><input type="checkbox"/> Set fluid removal rate at 0 mL/hr.</p> <p><input type="checkbox"/> Aim to a NET fluid removal rate* (see reverse) of _____ mL/hr, titrate as tolerated.</p> <p><input type="checkbox"/> Goal: CVP _____ mm Hg or PWP _____ mm Hg or MAP > _____ mm Hg.</p> <p>* The NET fluid removal rate = hourly I.V. intake + hourly enteral intake + desired fluid removal. Enter this value as fluid removal rate.</p> <p>Notify Nephrology if:</p> <ul style="list-style-type: none"> • Total calcium:ionized calcium ratio > 2.5:1. • Systemic ionized calcium < 0.75 mmol/L post CaCl I.V. bolus. • Serum sodium ≥ 150 mmol/L. • Serum bicarbonate (from electrolyte panel) > 36 mmol/L. 			<p><input type="checkbox"/> Ongoing Management:</p> <ul style="list-style-type: none"> • Correct serum phosphate as per preprinted orders for electrolyte replacement. • If serum magnesium < 0.90 mmol/L, give 2 g MgSO4 I.V. in 100 mL 0.9% NaCl over 1 hour. <p>CATHETER LOCKING SOLUTION:</p> <p><input type="checkbox"/> Instill 4% sodium citrate solution into each catheter limb (total volume = limb volume + 0.1 mL).</p>	

Draft August 25, 2009

ORDERS INITIATED ON PAGE 1

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0.36 - 0.45	↑ by 10 mL/h
> 0.45	↑ by 20 mL/h

Notify Nephrology MD if Citrate Infusion > 350 mL/h.

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