

Citrate Protocol for Use with CRRT Therapy (Prismaflex)

Initiation

- 1 A patient ionized calcium sample should be drawn within 2 hours BEFORE CRRT initiation. If the calcium level is <1.00 mmol/L, the treating physician should be contacted and consideration given to a calcium chloride infusion (eg. 1g CaCl IV) BEFORE CRRT initiation.
- 2 Prime Prismaflex as usual, choose the appropriate therapy per physician's order.
- 3 Attach the ACD-A Citrate 1000ml bag to pre-blood pump of the Prismaflex machine. The starting citrate infusion rate (ml/hr) should be set at 1.5 times the BFR (ml/min)- Round up to nearest 10.
Example: $BFR = 200\text{ml/min}$, then initial citrate rate is 300ml/hour
- 4 Set up the calcium chloride infusion (20mg/ml in NS) as ordered and infuse into a three-way stopcock valve placed at the venous port of the dialysis catheter (for fistula or graft, a central line is not needed). Initial calcium infusion should set at 10% of the citrate infusion rate.
Example: Citrate rate = 300ml/hr , then the calcium rate is 30 ml/hr ($300 \times 0.10 = 30$)
- 5 Input settings on the Prismaflex machine to match the physician's orders.
- 6 Connect Prismaflex circuit to the dialysis catheter per normal procedure. Set BFR and press start.

Maintenance/Monitoring

- 7 Ionized calcium samples will be checked **every 2h x4, then every 4h x4 for the first 24 hr** after initiation of citrate therapy, and then at least **every shift (every 6-8 hr) thereafter**. Additionally, the ionized calcium should be checked 2 hours after any adjustment(s) to either the ACD-A or calcium chloride infusion rates.
- 8 **The ionized calcium should be checked within 2 hours whenever there is any interruption in the system (eg. the site of the infusion is changed, tubing is changed, patient traveling, etc.).** If the ionized calcium is stable then resume the protocol schedule.
- 9 For each check, the ionized calcium needs to be drawn from two sites (and labeled as such):
"Post-filter" from the post-filter venous (blue) sample port – labeled "**circuit**" sample
"Systemic" from the patient via arterial or peripheral line – labeled "**arterial**" sample
- 10 Other labs to be checked at least daily include: Basic metabolic profile, magnesium, phosphorus.
- 11 Titrate the ACD-A (citrate) infusion according to the following table:

ACD (Citrate) Infusion Titration Guidelines	
Circuit Ionized Ca⁺⁺ (mmol/L) (drawn from post-filter venous port)	ACD Infusion Adjustment
< 0.20	Decrease rate by 10ml/hr
0.20 - 0.40 (Target Range)	No change
0.41 - 0.50	Increase rate by 10ml/hr
> 0.50	Increase rate by 10ml/hr and consult physician

12 Titrate the calcium infusion according to the calcium sliding scale below:

Calcium Infusion Titration Guidelines	
Patient Ionized Ca⁺⁺ (mmol/L) (drawn systemically from patient)	Ca⁺⁺ Infusion (20mg/ml in NS) Adjustment
< 0.90	10mg/kg CaCl bolus, increase rate by 10ml/hr, and consult physician
0.90-0.99	Increase rate by 5 ml/hr
1.00 - 1.20 (Target range)	No change
1.21-1.40	Decrease rate by 5 ml/hr
>1.40	Decrease rate by 10 ml/hr

13 *If a higher target patient ionized calcium is desired (eg. 1.10 – 1.30 mmol/l), then a higher target circuit ionized calcium should also be pursued (eg. 0.30 – 0.50 mmol/l).* In this scenario, the above titration tables can be followed by simply shifting the ionized calcium ranges upward and maintaining the same adjustment guidelines.

14 **If a change in BFR is made, then *proportional* adjustments must be made to both the citrate and calcium chloride infusion rates.** For example, if the BFR is decreased from 200mL/min to 150mL/min (ie. 25% decrease), then the citrate and calcium chloride infusion rates also need to be decreased by 25%. Call MD for clarification if needed.

15 Notify MD for the following:

- If **4 or more consecutive** ionized calcium checks require either citrate and/or calcium chloride rate changes.
- If the patient's bicarbonate rises ≥ 10 mEq/L (*Suggestion: check to be sure that the citrate is infusing in the right direction and not back into the patient through the access catheter rather than into the filter; if OK, then decrease the ACD rate by 25%, recheck bicarbonate in 2-4 hours. If the recheck is still not within acceptable range decrease ACD by another 25%.*)
- If the patient's sodium rises by 10 mEq/L or is ≥ 155 mEq/L (*Suggestion: check to be sure that the citrate is infusing in the right direction and not back into the patient through the access catheter rather than into the filter; if OK, then decrease the ACD rate by 25%, recheck the sodium in 2-4 hr; if the recheck is still not within acceptable range hang D5W.*)
- If unexpected clotting occurs in the extracorporeal system – poor access flow is likely.

16 Precautions:

- The calcium pump must be clamped (or turned off) when the blood pump stops for any period of time (more than several minutes) to avoid unneeded calcium administration to the patients.
- Basic dialysate bags contain: Na 136 mEq/l, Cl 115 mEq/L, HCO₃ 25 mEq/l, Mg 1.8 mg/dl, K 2 mEq/l; there is no calcium, phosphorus or glucose. KCl (at 1-2 mEq/L, totaling 3 or 4 mEq/l) and/or Na-phosphate (at 0.75 mmol or 1.5 mmol/L) can be added as needed per MD orders.
- If the system must be interrupted (e.g. diagnostic tests, surgery in OR, catheter change, system clotting and replacement), the citrate and calcium infusions should restart at the same parameters as when the system stopped.
- If the site or tubing for the calcium chloride infusion is changed, then the ionized calcium must be checked within 2 hrs to be sure that the infusion is running.
- Calcium chloride infusions for adjustment of low systemic ionized calcium should be infused over 30 minutes if the patient is clinically stable and asymptomatic, or over 10 minutes otherwise.