

# Entering CRRT Orders in Power Chart Citrate Anticoagulation

Use these orders for regional filter anticoagulation with citrate.

Citrate is administered as the predilution hemofiltration fluid via the PBP pump. The citrate infusion is titrated to achieve a low post filter ionized calcium. The citrate is reversed with a calcium chloride infusion that is titrated to achieve a normal systemic ionized calcium. It is used when systemic anticoagulation is contraindicated and filter patency cannot be maintained with the No Anticoagulation prescription for > 12 hours after ruling out access problems.

A separate central venous line is required for the administration calcium chloride. The calcium chloride infusion is titrated to the ionized calcium level drawn from an arterial line.

Citrate is contraindicated in severe liver failure. CRRT is usually successfully delivered with No Anticoagulation in liver failure. Liver function and signs of citrate toxicity should be monitored closely during Citrate. It should be used with caution in profound shock where clearance may be impaired. Citrate should be delayed or avoided until serum sodium levels are >130 and < 150 mmol/L to avoid rapid sodium change. Heparin or No Anticoagulation protocols are recommended when sodium levels are abnormal.

Citrate may cause hyponatremia or acid-base disturbances (most frequently metabolic alkalosis, acidosis may be associated with citrate toxicity). The use of hemodialysis fluid can mitigate some electrolyte disturbances, however, close monitoring of all electrolytes including ionized calcium is required. Hypocalcemia and associated cardiac arrhythmias can develop due to increased calcium removal, inadequate replacement or citrate toxicity. Citrate can also chelate magnesium, however, magnesium is somewhat protected because the dialysate contains magnesium.

8/24/2020

1

Search: CRRT | Type: Inpatient

CRRT Citrate Prescription VH  
 CRRT Heparin Prescription VH  
 CRRT No/Other Anticoagulant Prescription VH  
 CRRT H - Continuous Renal Replacement Therapy (CRRT) Heparin  
 CRRT H - Continuous Renal Replacement Therapy (CRRT) No Anticoagulation or Other Anticoagulation  
 CRRT H - Continuous Renal Replacement Therapy (CRRT) Citrate (VH)

For new orders, always choose the appropriate **Power Plan**. The Power Plan includes the CRRT prescription plus the relevant labwork, nursing instructions and medication orders. The citrate Power Plan contains the orders for calcium chloride.

Use the **stand-alone orders** if you want to make a change to an existing prescription only.

If you want to change a prescription (e.g. from no anticoagulation to citrate), discontinue the old Power Plan and initiate the appropriate new Power Plan.

Critical Care VH, David - 1214 77 13 Done

8/24/2020

2

These are the orders within the Citrate Power Plan. Note that the prescription (first order requiring details) is contained within the Power Plan along with the labwork, nursing instructions and medication orders.

You need to **initiate** this Power Plan **first** to activate the orders. The citrate prescription Power Form will automatically launch as soon as you choose initiate.

8/24/2020

3

**This Power Form launches automatically once you select initiate order.**

Choose start or update prescription. If the patient has a previous prescription, it will automatically populate the fields. You will have to modify carefully to make sure the prescription is still correct.

8/24/2020

4

\*Performed on: 2020/08/18 17:53 EDT By: Morgan, Brenda (RN)

CRRT Citrate VH

### Continuous Renal Replacement Therapy Citrate Prescription VH

CRRT Prescription Status:  Start or update prescription  Discontinue

Filter Setup: **ST 150**

Prismaflex Mode:

Blood Flow Rate:

Priming Solution: **ST 150 is the standard filter.**

Net Fluid Removal Target:  mL/hr Start at 0 mL/hr and progress to target as long as MAP is maintained

Dialysate Solution:

Dialysate Solution Rate:  mL/hr Recommended rate is 1000 mL/hr

PRE Replacement Solution via pre blood pump (PBP):

PRE Replacement Rate:  mL/hr Recommended rate to start at 250 mL/hr

Post Filter Ionized Calcium Target (adjust per protocol):

POST Replacement Solution via Replacement Pump:

POST Replacement Solution Rate:  mL/hr Recommended rate is 1000 mL/hr

Add Potassium Chloride to dialysate according to Potassium Tiration Protocol?  Yes  No

Calcium Chloride Infusion:  Adjust Calcium Chloride infusion according to Calcium Tiration Prototol to maintain a systemic ionized calcium level of 0.96-1.10 mmol/L  No

Special Instructions:

Do not use heparin if patient is HIT positive

If entering a free text ionized calcium target, please include "adjust citrate per protocol" in the response.

8/24/2020

5

\*Performed on: 2020/08/18 17:53 EDT By: Morgan, Brenda (RN)

CRRT Citrate VH

### Continuous Renal Replacement Therapy Citrate Prescription VH

CRRT Prescription Status:  Start or update prescription  Discontinue

Filter Setup: **ST 150**

Prismaflex Mode: CVVHDF

Blood Flow Rate:

Priming Solution:

Net Fluid Removal Target:  mL/hr Start at 0 mL/hr and progress to target as long as MAP is maintained

Dialysate Solution:

Dialysate Solution Rate:  mL/hr Recommended rate is 1000 mL/hr

PRE Replacement Solution via pre blood pump (PBP):

PRE Replacement Rate:  mL/hr Recommended rate to start at 250 mL/hr

Post Filter Ionized Calcium Target (adjust per protocol):

POST Replacement Solution via Replacement Pump:

POST Replacement Solution Rate:  mL/hr Recommended rate is 1000 mL/hr

Add Potassium Chloride to dialysate according to Potassium Tiration Protocol?  Yes  No

Calcium Chloride Infusion:  Adjust Calcium Chloride infusion according to Calcium Tiration Prototol to maintain a systemic ionized calcium level of 0.96-1.10 mmol/L  No

Special Instructions:

Do not use heparin if patient is HIT positive

If entering a free text ionized calcium target, please include "adjust citrate per protocol" in the response.

**Always order CVVHDF. This is the order for how to set the machine up, not the actual prescription. This allows the delivered CRRT treatment to be modified without changing the filter by adjusting flow rates.**

8/24/2020

6

8/24/2020

\*Performed on: 2020/08/18 17:53 EDT By: Morgan, Brenda (RN)

### Continuous Renal Replacement Therapy Citrate Prescription VH

CRRT Prescription Status:  Start or update prescription  Discontinue

Filter Setup: ST 150

Prismaflex Mode: CVHDF

Blood Flow Rate: Start at 150 mL/min may increase to 250 mL/min prn to manage access and return pressure

Priming Solution: Do not use heparin if patient is HIT positive

Net Fluid Removal Target

Dialysate Solution

Dialysate Solution Re

PRE Replacement Sol

PRE Replacement Re

Post Filter Ionized Cal

POST Replacement S

POST Replacement S

Add Potassium Chlori

Calcium Chloride Infus

Special Instructions

For No Anticoagulation and Heparin orders, we want the blood flow to be as high as possible to minimize the time that blood sits in the filter. This reduces filter clotting.

For Citrate, we want to use a fixed blood flow rate to keep the citrate and calcium chloride requirements as stable as possible. The dropdown menu is being revised to the wording shown below.

Nurse need to adjust the blood flow rate to manage access and return pressures, but the goal with citrate is to keep a steady blood flow rate of ~150 ml/min.

Blood flow 150-200 to optimize access/return pressures. Maintain stable rate to avoid fluctuations in ionized calcium

7

8/24/2020

\*Performed on: 2020/08/18 17:53 EDT By: Morgan, Brenda (RN)

### Continuous Renal Replacement Therapy Citrate Prescription VH

CRRT Prescription Status:  Start or update prescription  Discontinue

Filter Setup: ST 150

Prismaflex Mode: CVHDF

Blood Flow Rate: Start at 150 mL/min may increase to 250 mL/min prn to manage access and return pressure

Priming Solution: 5,000 units of heparin sodium in 1 litre of 0.9% sodium chloride then reprime with 1 litre of 0.9% sodium chloride

Net Fluid Removal Target

Dialysate Solution

Dialysate Solution Re

PRE Replacement Sol

PRE Replacement Re

Post Filter Ionized Cal

POST Replacement S

POST Replacement S

Add Potassium Chlori

Calcium Chloride Infus

Special Instructions

Prime with heparin (even when using citrate), UNLESS there is a concern of HIT/allergy. The heparin adheres to the filter but is rinsed out of the circuit with the second prime. This helps to reduce filter clotting by providing a layer of heparin.

The patient does not receive a heparin bolus when using an ST 150 filter as this filter requires a 2 L prime. If using a smaller filter such as an ST 100 (rarely used in adults now), a heparin bolus would be given as this filter requires a single prime.

entering a free text ionized calcium target, please include "adjust citrate or protocol" in the response.

**Citrate Titration Protocol**

Post-Filter Ionized Calcium: Less than target

Citrate Infusion Adjustment: Decrease by 10 mL/hour

**Potassium Titration Protocol**

Add KCl to dialysate and all replacement fluids according to the following protocol. Prismaflex solution contains zero KCl at baseline.

8

\*Performed on: 2020/08/18 17:53 EDT By: Morgan, Brenda (RN)

CRRT Citrate VH

### Continuous Renal Replacement Therapy Citrate Prescription VH

CRRT Prescription Status  Start or update prescription  Discontinue

Filter Setup ST 150

Prismaflex Mode CVVHDF

Blood Flow Rate Start at 150 mL/min may increase to 250 mL/min prn to manage access and return pressure

Priming Solution 5,000 units of heparin sodium in 1 litre of 0.9% sodium chloride then reprime with 1 litre of 0.9% sodium chloride Do not use heparin if patient is HIT positive

Net Fluid Removal Target 100 mL/hr Start at 0 mL/hr and progress to target as long as MAP is maintained

Dialysate Solution

Dialysate Solution Rate **Enter desired net fluid removal. Nurses will start at 0 and then attempt to achieve this target based on hemodynamic stability.**

PRE Replacement Solution

PRE Replacement Rate Recommended rate to start at 250 mL/hr

Post Filter Ionized Calcium Target (adjust per protocol)

POST Replacement Solution via Replacement Pump

POST Replacement Solution Rate Recommended rate is 1000 mL/hr

Add Potassium Chloride to dialysate according to Potassium Titration Protocol? Yes

Calcium Chloride Infusion  Adjust Calcium Chloride infusion according to Calcium Titration Protocol to maintain a systemic ionized calcium level of 0.96-1.10 mmol/L

Special Instructions  No

**Citrate Titration Protocol** **Potassium Titration Protocol**

Post-Filter Ionized Calcium Citrate Infusion Adjustment Add KCl to dialysate and all replacement fluids according to the following protocol. Prisma solution

8/24/2020

9

\*Performed on: 2020/08/18 17:53 EDT By: Morgan, Brenda (RN)

CRRT Citrate VH

### Continuous Renal Replacement Therapy Citrate Prescription VH

CRRT Prescription Status  Start or update prescription  Discontinue

Filter Setup ST 150

Prismaflex Mode CVVHDF

Blood Flow Rate Start at 150 mL/min may increase to 250 mL/min prn to manage access and return pressure

Priming Solution 5,000 units of heparin sodium

Net Fluid Removal Target 100 mL/hr

Dialysate Solution

Dialysate Solution Rate **PrismoCAL**

PRE Replacement Solution via pre blood pump (Prisma)

PRE Replacement Rate

Post Filter Ionized Calcium Target (adjust per protocol)

POST Replacement Solution via Replacement Pump

POST Replacement Solution Rate

Add Potassium Chloride to dialysate according to Potassium Titration Protocol?

Calcium Chloride Infusion  Adjust Calcium Chloride infusion according to Calcium Titration Protocol to maintain a systemic ionized calcium level of 0.96-1.10 mmol/L

Special Instructions  No

**Citrate Titration Protocol** **Potassium Titration Protocol**

**Choose PrismoCAL when ordering Citrate**

PrismoCAL contains zero potassium, glucose and CALCIUM. Calcium free solution reduces the amount of citrate needed to maintain filter anticoagulation. Potassium is added by the nurse to achieve a minimum 2 mmol/L by protocol.

PrismoCAL contains the same concentration of sodium (140 mmol/L) and bicarbonate (32 mmol/L) as PrismaSOL 0 and 4. It has no glucose which may cause hypoglycemia or normoglycemia (consider DKA for patients with unexplained anion gap acidosis when PrismoCAL is being used).

8/24/2020

10

BEFORE RECONSTITUTION		Prisma SOL 0		Prisma SOL 4		Prism OCAL	
Each 1000 mL contains							
<b>Compartment A</b>							
Sodium bicarbonate						58.8 g	
Magnesium chloride, hexahydrate		2.033 g		2.036 g			
Lactic acid		5.4 g		5.4 g			
Calcium chloride dihydrate		5.145 g		5.148 g			
Glucose anhydrous				24.2 g			
<b>Compartment B</b>							
Lactic acid						0.284 g	
Magnesium chloride, hexahydrate						0.108 g	
Sodium chloride		6.45 g		6.45 g		6.449 g	
Sodium bicarbonate		3.09 g		3.09 g			
Potassium chloride				0.314 g			

  

AFTER RECONSTITUTION		Prisma SOL 0		Prisma SOL 4		Prism OCAL	
		mmol/L	mEq/L	mmol/L	mEq/L	mmol/L	mEq/L
Calcium	Ca <sup>2+</sup>	1.75	3.50	1.75	3.50		
Magnesium	Mg <sup>2+</sup>	0.5	1.0	0.5	1.0	0.5	1.0
Sodium	Na <sup>+</sup>	140	140	140	140	140	140
Chloride	Cl <sup>-</sup>	109.5	109.5	113.5	113.5	106	106
Lactate		3.0	3.0	3.0	3.0	3.0	3.0
Bicarbonate	HCO <sub>3</sub> <sup>-</sup>	32	32	32	32	32	32
Potassium	K <sup>+</sup>	0	0	4.0	4.0	0	0
Glucose		0	0	6.1		0	0

8/24/2020

These are the 3 solutions that are stocked in CCTC. Prism OCAL is a calcium free product used only with citrate.

Note that all 3 solutions contain the same final concentration of bicarbonate and sodium. They all contain 3 mmol/L of lactate which is added for pH adjustment; the lactate is metabolized to bicarbonate. Potassium is added by the nurse to achieve a minimum concentration of 2 mmol/L by protocol.

Each 5 L bag is divided into 2 compartments (250 mL in the upper and 4750 mL in the lower compartments). These must be mixed together at the time the solution is hung (stability is only 24 hours once mixed).

Refer to the "AFTER RECONSTITUTION" for the final concentration of electrolytes.

Failure to break the seal between the bags will change the concentration to that of the lower compartment only. The bag will also run dry, potentially drawing air into the circuit and causing multiple alarms (the machine will identify the 5 L bag but only 4750 mL is accessible).

11

\*Performed on: 2020/08/18 17:53 EDT By: Morgan, Brenda (RN)

**Continuous Renal Replacement Therapy Citrate Prescription VH**

CRRT Prescription Status:  Start or update prescription  Discontinue

Filter Setup: ST 150

Prismaflex Mode: CVVHDF

Blood Flow Rate: Start at 150 mL/min may increase to 250 mL/min prn to manage access and return pressure

Priming Solution: 5,000 units of heparin sodium in 1 litre of 0.9% sodium chloride then reprime with 1 litre of 0.9% sodium chloride Do not use heparin if patient is HIT positive

Net Fluid Removal Target: 100 mL/hr Start at 0 mL/hr and progress to target as long as MAP is maintained

Dialysate Solution: PrismOCAL

Dialysate Solution Rate: 1000 mL/hr Recommended rate is 1000 mL/hr

8/24/2020

When running citrate, the delivered treatment is CVVHDF. Set a dialysis flow rate of 1000 ml/hr This will achieve a delivered prescription of > 25 ml/kg/hr in most patients.

Citrate can increase both the sodium and bicarbonate concentrations in the blood. The administration of hemodialysis solution with a sodium of 140 mmol/L and bicarbonate of 32 mmol/L prevents significant electrolyte darrangments.

If you cannot achieve adequate clearance with the standard dialysis and **post dilution** flow rates, increase the dialysis rate. Any change to the blood flow, dialysis or post dilution flow rates will disrupt the stability of the citrate-calcium chloride infusions.

12

**Continuous Renal Replacement Therapy Citrate Prescription VH**

CRRT Prescription Status:  Start or update prescription  Discontinue

Filter Setup: ST 150

Prismaflex Mode: CVVHDF

Blood Flow Rate: Start at 150 mL/min may increase to 250 mL/min prn to manage access and return pressure

Priming Solution: 5,000 units of heparin sodium in 1 litre of 0.9% sodium chloride then reprime with 1 litre of 0.9% sodium chloride Do not use heparin if patient is HIT positive

Net Fluid Removal Target: 100 mL/hr Start at 0 mL/hr and progress to target as long as MAP is maintained

Dialysate Solution: PrismOCAL

Dialysate Solution Rate: 1,000 mL/hr Recommended rate is 1000 mL/hr

PRE Replacement Solution via pre blood pump (PBP): **Citrate ACD-A**

PRE Replacement Rate:  mL/hr Recommended rate to start at 250 mL/hr

Post Filter Ionized Calcium Target (adjust per protocol):

POST Replacement Solution via Repl...

POST Replacement Solution Rate

Add Potassium Chloride to dialysate e...

Calcium Chloride Infusion:  Adjust Calc  No

Special Instructions:  Yes  No

**Citrate is administered on the PBP pump to provide immediate anticoagulation of the blood where it first enters the access line. We use 2% Citrate ACD-A for adults.**

**The volume of citrate infused also provides a small amount of predilution hemofiltration.**

8/24/2020

13

### Commonly available citrate solutions

Components	4% TSC Tri-sodium citrate	2.2% ACDA Anticoagulant Citrate Dextrose Solution-Formula A	0.5% Low concentration citrate solution
Na (mmol/l) Cl (mmol/l)	420	224	140/86
Citrate (mmol/l)	136	113	18
Citric Acid (mmol/l)	0	38.1	0
Dextrose (g/L)		24.5	0
Bag Size (ml)	500 & 1000	1000	5000

**We use 2.2% Anticoagulant Citrate Dextrose Solution-Formula A (ACDA) for adults at LHSC.**

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8/24/2020

14

\*Performed on: 2020/08/18 17:53 EDT By: Morgan, Brenda (RN)

CRRT Citrate VH

### Continuous Renal Replacement Therapy Citrate Prescription VH

CRRT Prescription Status:  Start or update prescription  Discontinue

Filter Setup: ST 150

Prismeflex Mode: CVHDF

Blood Flow Rate: Start at 150 mL/min may increase to 250 mL/min pm to manage access and return pressure

Priming Solution: 5,000 units of heparin sodium in 1 litre of 0.9% sodium chloride then reprime with 1 litre of 0.9% sodium chloride Do not use heparin if patient is HIT positive

Net Fluid Removal Target: 100 mL/hr Start at 0 mL/hr and progress to target as long as MAP is maintained

Dialysate Solution: PrismOCAL

Dialysate Solution Rate: 1,000 mL/hr Recommended rate is 1000 mL/hr

PRE Replacement Solution via pre blood pump (FBP): Citrate ACD-A

PRE Replacement Rate: 250 mL/hr Recommended rate to start at 250 mL/hr

Post Filter Ionized Calcium Target (adjust per protocol): 1.00 mmol/L If entering a free text ionized calcium target, please include "adjust citrate per protocol" in the response.

POST Replacement Solution via Replacement Pump: 0.96-1.10 mmol/L

Special Instructions:  Yes  No

Recommended citrate starting rate is 250 ml/hour. This will be titrated by the nurse per protocol to achieve a target post filter ionized calcium. The citrate adds a small amount of predilution hemofiltration.

8/24/2020

15

\*Performed on: 2020/08/18 17:53 EDT By: Morgan, Brenda (RN)

CRRT Citrate VH

### Continuous Renal Replacement Therapy Citrate Prescription VH

CRRT Prescription Status:  Start or update prescription  Discontinue

Filter Setup: ST 150

Prismeflex Mode: CVHDF

Blood Flow Rate: Start at 150 mL/min may increase to 250 mL/min pm to manage access and return pressure

Priming Solution: 5,000 units of heparin sodium in 1 litre of 0.9% sodium chloride then reprime with 1 litre of 0.9% sodium chloride Do not use heparin if patient is HIT positive

Net Fluid Removal Target: 100 mL/hr Start at 0 mL/hr and progress to target as long as MAP is maintained

Dialysate Solution: PrismOCAL

Dialysate Solution Rate: 1,000 mL/hr Recommended rate is 1000 mL/hr

PRE Replacement Solution via pre blood pump (FBP): Citrate ACD-A

PRE Replacement Rate: 250 mL/hr Recommended rate to start at 250 mL/hr

Post Filter Ionized Calcium Target (adjust per protocol): 1.00 mmol/L If entering a free text ionized calcium target, please include "adjust citrate per protocol" in the response.

POST Replacement Solution via Replacement Pump: 0.36-0.45 mmol/L (adjust citrate per protocol)

We use a "medium" target for filter anticoagulation which is sufficient to maintain filter life. A high dose target (0.25-0.35 mmol/L) is usually unnecessary, can be more difficult to maintain and may increase the risk for citrate toxicity. Consider changing to a low dose target (0.46-0.55 mmol/L) if citrate requirements begin to increase after achieving stability (free text in the orders).

Citrate toxicity will bind with systemic ionized calcium to create a calcium-citrate complex. This increases the total calcium and lowers the ionized calcium. Life-threatening systemic hypocalcemia can develop. Consider citrate toxicity (if Total:Ionized Calcium ratio > 2.5 or upward trend, hypocalcemia, increasing calcium chloride (and citrate) requirements and/or anion gap metabolic acidosis develops. Risk increases with shock and liver failure.

8/24/2020

16



\*Performed on: 2020/08/18 17:53 EDT By: Morgan, Brenda (RN)

### Continuous Renal Replacement Therapy Citrate Prescription VH

CRRT Prescription Status:  Start or update prescription  Discontinue

Filter Setup: ST 150

Prismaflex Mode: CVVHDF

Blood Flow Rate: Start at 150 mL/min may increase to 250 mL/min pri to manage access and return pressure

Priming Solution: 5,000 units of heparin sodium in 1 litre of 0.9% sodium chloride then reprime with 1 litre of 0.9% sodium chloride Do not use heparin if patient is HIT positive

Net Fluid Removal Target: 100 mL/hr Start at 0 mL/hr and progress to target as long as MAP is maintained

Dialysate Solution: PrismOCAL

Dialysate Solution Rate: 1,000 mL/hr Recommended rate is 1000 mL/hr

PRE Replacement Solution via pre blood pump (PBP): Citrate ACD-A

PRE Replacement Rate: 250 mL/hr Recommended rate to start at 250 mL/hr

Post Filter Ionized Calcium Target (adjust per protocol): 0.36-0.45 mmol/L (adjust citrate per protocol) If entering a free text ionized calcium target, please include "adjust citrate per protocol" in the response.

POST Replacement Solution via Replacement Pump: PrismOCAL

POST Replacement Solution Rate: 1,000 mL/hr Recommended rate is 1000 mL/hr

Add Potassium Chloride to dialysate:  Yes  No

Calcium Chloride Infusion:  Adjust Calcium  Add Calcium 0 mmol/L

Special Instructions:  Yes  No

Choose PrismOCAL when ordering Citrate for both the dialysis and the post dilution replacement solution.

8/24/2020

17

\*Performed on: 2020/08/18 17:53 EDT By: Morgan, Brenda (RN)

### Continuous Renal Replacement Therapy Citrate Prescription VH

CRRT Prescription Status:  Start or update prescription  Discontinue

Filter Setup: ST 150

Prismaflex Mode: CVVHDF

Blood Flow Rate: Start at 150 mL/min may increase to 250 mL/min pri to manage access and return pressure

Priming Solution: 5,000 units of heparin sodium in 1 litre of 0.9% sodium chloride then reprime with 1 litre of 0.9% sodium chloride Do not use heparin if patient is HIT positive

Net Fluid Removal Target: 100 mL/hr Start at 0 mL/hr and progress to target as long as MAP is maintained

Dialysate Solution: PrismOCAL

Dialysate Solution Rate: 1,000 mL/hr Recommended rate is 1000 mL/hr

PRE Replacement Solution via pre blood pump (PBP): Citrate ACD-A

PRE Replacement Rate: 250 mL/hr Recommended rate to start at 250 mL/hr

Post Filter Ionized Calcium Target (adjust per protocol): 0.36-0.45 mmol/L (adjust citrate per protocol) If entering a free text ionized calcium target, please include "adjust citrate per protocol" in the response.

POST Replacement Solution via Replacement Pump: PrismOCAL

POST Replacement Solution Rate: 1,000 mL/hr Recommended rate is 1000 mL/hr

Add Potassium Chloride to dialysate:  Yes  No

Calcium Chloride Infusion:  Adjust Calcium  Add Calcium 0 mmol/L

Special Instructions:  Yes  No

Set the flow rate to 1000 ml/hr. Avoid changing the blood flow, dialysate and replacement rates if possible, which will alter the citrate:calcium chloride stability. The combined dialysate, post dilution and predilution flow rates (2.25 L) will provide a delivered prescription of > 25 mL/kg/hr in most patients.

This is the only CCTC prescription that uses *post dilution* replacement fluid for clearance vs to maintain the deaeration chamber alone. Predilution hemofiltration during citrate Post dilution provides better clearance by concentrating the blood in the filter (increases diffusion gradient). The trade-off is that filter clotting is higher with post dilution. This is not an issue with citrate.

8/24/2020

18

\*Performed on: 2020/08/18 1753 EDT By: Morgan, Brenda (RN)

CRRT Citrate Vh

Post Filter Ionized Calcium Target (adjust per protocol): 0.36-0.45 mmol/L (adjust citrate per protocol)

POST Replacement Solution via Replacement Pump: PrismOCAL

POST Replacement Solution Rate: 1000 mL/hr Recommended rate is 1000 mL/hr

Add Potassium Chloride to dialysate according to Potassium Titration Protocol? Yes

Calcium Chloride Infusion  Adjust Calcium Chloride infusion according to Calcium Titration Protocol to maintain a systemic ionized calcium level of 0.96-1.10 mmol/L

**Yes auto-populates. This enables the nurse to titrate the potassium concentration by protocol. The minimum final potassium concentration is 2 mmol/L.**

Citrate Titration Protocol	
Post-Filter Ionized Calcium	Citrate Infusion Adjustment
Less than target	Decrease by 10 mL/hour
Target	<< NO CHANGE >>
Greater than target	Increase by 10 mL/hour
Notify Nephrology and Critical Care if Citrate Infusion greater than 350 mL/hour	

Potassium Titration Protocol	
Add KCl to dialysate and all replacement fluids according to the following protocol. Prismocal solution contains zero KCl at baseline.	
Serum Potassium Level	Final KCl Concentration in Dialysate
if less than 3.0 mmol/L	* KCl bolus I.V. as per CRIT CARE - Electrolyte Replacement (Module).
	* Recheck serum Magnesium and treat as per CRIT CARE - Electrolyte Replacement (Module)
	* KCl to equal 6 mmol/L
	* Notify Nephrology and Critical Care if repeat potassium level is < 3.0 mmol/L
if 3.0 - 3.4 mmol/L	KCl to equal 5 mmol/L
if 3.5 - 4.5 mmol/L	KCl to equal 4 mmol/L
if 4.6 - 5.0 mmol/L**	KCl to equal 3 mmol/L
if 5.1 - 6.0 mmol/L**	KCl to equal 2 mmol/L
if greater than 6.0 mmol/L**	Notify Nephrology and Critical Care if repeat potassium level > 6.0 mmol/L
If the serum potassium remains above 5 mmol/L with dialysis KCl 2 mmol/L, notify Nephrology and Critical Care to review possible causes for persistent hyperkalemia.	

Calcium Chloride Titration Protocol	
Adjust calcium chloride infusion according to protocol below to maintain SYSTEMIC ionized calcium level 1.0 - 1.2 mmol/L	
Systemic Ionized Calcium	Calcium Chloride Adjustment
less than 0.80 mmol/L**	increase by 20 mL/hr give ordered bolus
0.80 - less than 1.0 mmol/L	increase by 10 mL/hr give ordered bolus
1.0 - 1.2 mmol/L	<< NO CHANGE >>

8/24/2020

19

Sign Form In: 2020/08/18 1753 EDT By: Morgan, Brenda (RN)

CRRT Citrate Vh

Post Filter Ionized Calcium Target (adjust per protocol): 0.36-0.45 mmol/L (adjust citrate per protocol)

POST Replacement Solution via Replacement Pump: PrismOCAL

POST Replacement Solution Rate: 1000 mL/hr Recommended rate is 1000 mL/hr

Add Potassium Chloride to dialysate according to Potassium Titration Protocol? Yes

Calcium Chloride Infusion  Adjust Calcium Chloride infusion according to Calcium Titration Protocol to maintain a systemic ionized calcium level of 0.96-1.10 mmol/L

Special Instruction **Adjust calcium chloride infusion auto-populates and must be selected.**

Citrate Titration Protocol	
Post-Filter Ionized Calcium	Citrate Infusion Adjustment
Less than target	Decrease by 10 mL/hour
Target	<< NO CHANGE >>
Greater than target	Increase by 10 mL/hour
Notify Nephrology and Critical Care if Citrate Infusion greater than 350 mL/hour	

Potassium Titration Protocol	
Add KCl to dialysate and all replacement fluids according to the following protocol. Prismocal solution contains zero KCl at baseline.	
Serum Potassium Level	Final KCl Concentration in Dialysate
if less than 3.0 mmol/L	* KCl bolus I.V. as per CRIT CARE - Electrolyte Replacement (Module).
	* Recheck serum Magnesium and treat as per CRIT CARE - Electrolyte Replacement (Module)
	* KCl to equal 6 mmol/L
	* Notify Nephrology and Critical Care if repeat potassium level is < 3.0 mmol/L
if 3.0 - 3.4 mmol/L	KCl to equal 5 mmol/L
if 3.5 - 4.5 mmol/L	KCl to equal 4 mmol/L
if 4.6 - 5.0 mmol/L**	KCl to equal 3 mmol/L
if 5.1 - 6.0 mmol/L**	KCl to equal 2 mmol/L
if greater than 6.0 mmol/L**	Notify Nephrology and Critical Care if repeat potassium level > 6.0 mmol/L

Calcium Chloride Titration Protocol	
Adjust calcium chloride infusion according to protocol below to maintain SYSTEMIC ionized calcium level 1.0 - 1.2 mmol/L	
Systemic Ionized Calcium	Calcium Chloride Adjustment
less than 0.80 mmol/L**	increase by 20 mL/hr give ordered bolus
0.80 - less than 1.0 mmol/L	increase by 10 mL/hr give ordered bolus

8/24/2020

20

All titration protocols appear at the end of the Power Form. These are also available on the CCTC website and are printed by nurses for ease of use.

Citrate Titration Protocol	
<u>Post-Filter Ionized Calcium</u>	<u>Citrate Infusion Adjustment</u>
Less than target	Decrease by 10 mL/hour
Target	<< NO CHANGE >>
Greater than target	Increase by 10 mL/hour
Notify Nephrology and Critical Care if Citrate Infusion greater than 350 mL/hour	

  

Calcium Chloride Titration Protocol	
Adjust calcium chloride infusion according to protocol below to maintain SYSTEMIC ionized calcium level 1.0 - 1.2 mmol/L	
<u>Systemic Ionized Calcium</u>	<u>Calcium Chloride Adjustment</u>
less than 0.80 mmol/L**	increase by 20 mL/hr give ordered bolus
0.80 - less than 1.0 mmol/L	increase by 10 mL/hr give ordered bolus
1.0 - 1.2 mmol/L	<< NO CHANGE >>
greater than 1.2 mmol/L	decrease by 10 mL/hr
** Call Nephrology and Critical Care for order for calcium bolus if systemic calcium less than 0.80 mmol/L; repeat systemic IONIZED calcium 1 hour post bolus. If less than target, repeat bolus and notify provider.	

  

Potassium Titration Protocol	
Add KCl to dialysate and all replacement fluids according to the following protocol. Prisma solution contains zero KCl at baseline.	
<u>Serum Potassium Level</u>	<u>Final KCl Concentration in Dialysate</u>
if less than 3.0 mmol/L	* KCl bolus I.V. as per CRIT CARE - Electrolyte Replacement (Module). * Recheck serum Magnesium and treat as per CRIT CARE - Electrolyte Replacement (Module) * KCl to equal 6 mmol/L * Notify Nephrology and Critical Care if repeat potassium level is < 3.0 mmol/L
if 3.0 - 3.4 mmol/L	KCl to equal 5 mmol/L
if 3.5 - 4.5 mmol/L	KCl to equal 4 mmol/L
if 4.6 - 5.0 mmol/L**	KCl to equal 3 mmol/L
if 5.1 - 6.0 mmol/L**	KCl to equal 2 mmol/L
if greater than 6.0 mmol/L**	Notify Nephrology and Critical Care if repeat potassium level > 6.0 mmol/L
If the serum potassium remains above 5 mmol/L with dialysis KCl 2 mmol/L, notify Nephrology and Critical Care to review possible causes for persistent hyperkalemia.	

8/24/2020

21

Click the green check box in top left corner to sign the form and complete the prescription order.

Sign Form In: 2020/08/18 1753 EDT By: Morgan, Brenda (RN)

CRRT Citrate Vh Post-Filter Ionized Calcium Target (adjust per protocol) 0.36-0.45 mmol/L (adjust citrate per protocol)

PrismaDICAL 1000 mL/hr Recommended rate is 1000 mL/hr

um Titration Protocol? Yes

According to Calcium Titration Protocol to maintain a systemic ionized calcium level of 0.96-1.10 mmol/L

Special Instructions  Yes  No

Citrate Titration Protocol	
<u>Post-Filter Ionized Calcium</u>	<u>Citrate Infusion Adjustment</u>
Less than target	Decrease by 10 mL/hour
Target	<< NO CHANGE >>
Greater than target	Increase by 10 mL/hour
Notify Nephrology and Critical Care if Citrate Infusion greater than 350 mL/hour	

  

Calcium Chloride Titration Protocol	
Adjust calcium chloride infusion according to protocol below to maintain SYSTEMIC ionized calcium level 1.0 - 1.2 mmol/L	
<u>Systemic Ionized Calcium</u>	<u>Calcium Chloride Adjustment</u>
less than 0.80 mmol/L**	increase by 20 mL/hr give ordered bolus
0.80 - less than 1.0 mmol/L	increase by 10 mL/hr give ordered bolus
1.0 - 1.2 mmol/L	<< NO CHANGE >>
greater than 1.2 mmol/L	decrease by 10 mL/hr
** Call Nephrology and Critical Care for order for calcium bolus if systemic calcium less than 0.80 mmol/L; repeat systemic IONIZED calcium 1 hour post bolus. If less than target, repeat bolus and notify provider.	

  

Potassium Titration Protocol	
Add KCl to dialysate and all replacement fluids according to the following protocol. Prisma solution contains zero KCl at baseline.	
<u>Serum Potassium Level</u>	<u>Final KCl Concentration in Dialysate</u>
if less than 3.0 mmol/L	* KCl bolus I.V. as per CRIT CARE - Electrolyte Replacement (Module). * Recheck serum Magnesium and treat as per CRIT CARE - Electrolyte Replacement (Module) * KCl to equal 6 mmol/L * Notify Nephrology and Critical Care if repeat potassium level is < 3.0 mmol/L
if 3.0 - 3.4 mmol/L	KCl to equal 5 mmol/L
if 3.5 - 4.5 mmol/L	KCl to equal 4 mmol/L
if 4.6 - 5.0 mmol/L**	KCl to equal 3 mmol/L
if 5.1 - 6.0 mmol/L**	KCl to equal 2 mmol/L
if greater than 6.0 mmol/L**	Notify Nephrology and Critical Care if repeat potassium level > 6.0 mmol/L
If the serum potassium remains above 5 mmol/L with dialysis KCl 2 mmol/L, notify Nephrology and Critical Care to review possible causes for persistent hyperkalemia.	

8/24/2020

22

Reconciliation Status  
 ✓ Meds History Admission Discharge

Document In Plan

Component Status Dose Details

NEPH - Continuous Renal Replacement Therapy (CRRT) Citrate (VH) (Initiated Pending)

CRRT Citrate Prescription VH Order

Notify Provider Order Neph/Crit Care: Daily systemic total calcium/systemic ionized calcium ratio greater than 2.5:1; Systemic ionized calcium less than 0.75 mmol/L post calcium chloride IV bolus

Notify Provider Order Neph/Crit Care: Systemic ionized calcium less than 0.75 mmol/L post calcium chloride IV bolus

Notify Provider Order Neph/Crit Care: Serum sodium greater than or equal to 150 mmol/L

POC Ionized Calcium Order 2020/08/18 17:53 EDT, QNCE, systemic, prior to starting treatment

POC Ionized Calcium Order 2020/08/18 17:53 EDT, per protocol, Post filter (Blue port) 1 hour post initiation of therapy, then q2hours until 2 results obtained within target, th...

POC Ionized Calcium Order 2020/08/18 17:53 EDT, per protocol, Arterial line (systemic) 1 hour post initiation of treatment, then q2hours until 2 results obtained within target, th...

Details for CRRT Citrate Prescription VH

Details Order Comments Offset Details

\*Requested Start Date/Time: 2020/08/18 17:53 EDT \*Reason/Clinical History:

Special Instructions

You will be brought back to this page to sign the orders. You will not be able to sign until you enter a reason for initiation of CRRT in the details section. If the highlighted Reason/Clinical History box does not appear, click on the CRRT Citrate Prescription at the top.

8/24/2020

23

Full screen Print 11 minutes ago

Reconciliation Status  
 ✓ Meds History Admission Discharge

Component Status Dose Details

NEPH - Continuous Renal Replacement Therapy (CRRT) No Anticoagulation or Other Anticoagulation (Initiated Pending)

CRRT No/Other Anticoagulant Prescription VH Order

Electrolytes (Na/K/Cl/CO2) Nurse order when Order q6 hour schedule while on CRRT

Phosphate, Magnesium Nurse Order When Order q6 hour schedule while on CRRT

Urea Nitrogen Nurse order when Order q12 hour schedule while on CRRT

Creatinine Serum Nurse order when Order q12 hour schedule while on CRRT

Urea Fluid Nurse order when Order q12 hour schedule while on CRRT

Communication Order Nurse to discontinue CRRT No anticoagulation powerplan when CRRT prescription discontinued

sodium citrate (sodium citrate 4% injectable solution) Order 2.5 mL injection, BLOCK, as directed, PRN for Other: See Comments, Start: 2020/08/18 16:57 EDT Instill 4% sodium citrate solution into each catheter limb (total volumes limb volume = 0.1 mL)

Details for CRRT No/Other Anticoagulant Prescription VH

Orders For Nurse Review Save as My Favorite Initiate Now Orders For Signature

The detail box may be difficult to view. If you cannot see the details, drag the box up to make it visible.

8/24/2020

24

Document in Plan:

Component	Status	Dose ...	Details
NEPH - Continuous Renal Replacement Therapy (CRRT) Citrate (VH) (Initiated Pending)			
CRRT Citrate Prescription VH	Order		
Communication Order	Order		Monitor ionized calcium levels that are not corrected to pH
Notify Provider	Order		Neph/Crit Care: Daily systemic total calcium/systemic ionized calcium ratio greater than 2.5:1; Systemic ionized calcium less than 0.75 mmol/L post calcium chloride IV bolus
Notify Provider	Order		Neph/Crit Care: Systemic ionized calcium less than 0.75 mmol/L post calcium chloride IV bolus
Notify Provider	Order		Neph/Crit Care: Serum sodium greater than or equal to 150 mmol/L
Notify Provider	Order		Neph/Crit Care: Serum bicarbonate (from electrolyte panel) greater than 36 mmol/L
POC Ionized Calcium	Order		2020/08/18 17:53 EDT, ONCE, systemic, prior to starting treatment
POC Ionized Calcium	Order		2020/08/18 17:53 EDT, per protocol, Post filter (Blue port) 1 hour post initiation of therapy, then q3hours until 2 results obtained within target, th...
POC Ionized Calcium	Order		2020/08/18 17:53 EDT, per protocol, Arterial line (systemic) 1 hour post initiation of treatment, then q3hour until 2 results obtained within target, th...

**Details for CRRT Citrate Prescription VH**

\*Requested Start Date/Time: 2020/08/18 17:53 EDT

\*Reason/Clinical History: AKI

Special Instructions:

Orders For Nurse Review | Save as My Favorite | **Orders For Signature**

Enter a reason for starting CRRT then choose "order for signature".

8/24/2020

25

Document in Plan:

Order Name	Status	Start	Details
NEPH - Continuous R... Initiated ... placing 23 order(s)			
CRRT Citrate Prescription VH	Order	2020/08/18 17:53	Reason: AKI
Communication Order	Order	2020/08/18 17:53	Monitor ionized calcium levels that are not corrected to pH
Notify Provider	Order	2020/08/18 17:53	Neph/Crit Care: Daily systemic total calcium/systemic ionized calcium ratio greater than 2.5:1; Systemic ionized calcium less than 0.75 mmol/L post calcium chloride IV bolus
Notify Provider	Order	2020/08/18 17:53	Neph/Crit Care: Systemic ionized calcium less than 0.75 mmol/L post calcium chloride IV bolus
Notify Provider	Order	2020/08/18 17:53	Neph/Crit Care: Serum sodium greater than or equal to 150 mmol/L
Notify Provider	Order	2020/08/18 17:53	Neph/Crit Care: Serum bicarbonate (from electrolyte panel) greater than 36 mmol/L
POC Ionized Calcium	Order	2020/08/18 17:53	2020/08/18 17:53 EDT, ONCE, systemic, prior to starting treatment
POC Ionized Calcium	Order	2020/08/18 17:53	2020/08/18 17:53 EDT, per protocol, Post filter (Blue port) 1 hour post initiation of therapy, then q3hours until 2 results obtained within target, then q6hours.
POC Ionized Calcium	Order	2020/08/18 17:53	2020/08/18 17:53 EDT, per protocol, Arterial line (systemic) 1 hour post initiation of treatment, then q3hour until 2 results obtained within target, then q6hours.
Electrolytes (Na/K/Cl/CO2) Nurse ...	Order	2020/08/18 17:53	q6 hour schedule while on CRRT
Urea Serum Nurse order when	Order	2020/08/18 17:53	q12 hour schedule while on CRRT
Creatinine Serum Nurse order when	Order	2020/08/18 17:53	q12 hour schedule while on CRRT
Urea Fluid Nurse order when	Order	2020/08/18 17:53	q12 hour schedule while on CRRT
Calcium Serum Plasma Nurse order when	Order	2020/08/18 17:53	daily schedule while on CRRT
Communication Order	Order	2020/08/18 17:53	Nurse to discontinue CRRT Citrate powerplan when CRRT prescription is discontinued

Continuing Request Details | Orders For Nurse Review | **Sign**

Sign the Order

8/24/2020

26

Normal view 7 minutes ago

Reconciliation Status  
 Meds History Admission Discharge

Document In Plan

Component	Status	Dose ...	Details
Processing. Please refresh.			

Details

Refresh

Orders For Nurse Review Save as My Favorite Orders For Signature

8/24/2020

27

NEPH - Continuous Renal Replacement Therapy (CRRT) Citrate (VH) (Initiated)  
 Last updated on: 2020/08/18 17:58 by: Morgan, Brenda (RN)

Category	Item	Status	Reason/Details
Patient Care	CRRT Citrate Prescription VH	Ordered	Reason: AKI
	Communication Order	Ordered	Monitor ionized calcium levels that are not corrected to pH
	Notify Provider	Ordered	Neph/Crit Care: Daily systemic total calcium/systemic ionized calcium ratio greater than 2.5:1; Systemic ionized calcium less than 0.75 mmol/L post calcium chloride IV bolus
	Notify Provider	Ordered	Neph/Crit Care: Systemic ionized calcium less than 0.75 mmol/L post calcium chloride IV bolus
	Notify Provider	Ordered	Neph/Crit Care: Serum sodium greater than or equal to 150 mmol/L
	Notify Provider	Ordered	Neph/Crit Care: Serum bicarbonate (from electrolyte panel) greater than 36 mmol/L
	POC Ionized Calcium	Ordered	2020/08/18 17:53:00 EDT, ONCE, systemic, prior to starting treatment
	POC Ionized Calcium	Ordered	2020/08/18 17:53:00 EDT, per protocol, Post filter (Blue port) 1 hour post initiation of therapy, then q3hours until 2 results obtained within target, then q6hours.
	POC Ionized Calcium	Ordered	2020/08/18 17:53:00 EDT, per protocol, Arterial line (systemic) 1 hour post initiation of treatment, then q3hour until 2 results obtained within target, then q6hours.
	Electrolytes (Na/K/Cl/CO2) Nurse order when	Ordered	q6 hour schedule while on CRRT
Urea Serum Nurse order when	Ordered	q12 hour schedule while on CRRT	
Creatinine Serum Nurse order when	Ordered	q12 hour schedule while on CRRT	
Urea Fluid Nurse order when	Ordered	q12 hour schedule while on CRRT	
Calcium Serum Plasma Nurse order when	Ordered	daily schedule while on CRRT	
Communication Order	Ordered	Nurse to discontinue CRRT Citrate powerplan when CRRT prescription is discontinued	
Continuous Infusions	calcium chloride - additive 7 g + sodium chloride 0.9% 500 mL	Ordered	IV continuous, 30 mL/hr. Total volume (mL): 500. Start: 2020/08/18 17:53:00 EDT Start infusion 15 minutes before initiating dialysis treatment. Adjust as per protocol below to maintain SYSTEMIC ionized Calcium lev...
Medications	sodium citrate (sodium citrate 4% injectable solution)	Ordered	2.5 mL, injection, BLOCK, as directed, PRN for Other: See Comments, Start: 2020/08/18 17:53:00 EDT Instill 4% sodium citrate solution into each catheter limb (total volume: limb volume + 0.1 mL)
	calcium chloride (calcium chloride bolus dose)	Ordered	1,000 mg = 72 mL, injection, IV, as directed, PRN for Other: See Comments, infuse over 15 min, Start: 2020/08/18 17:53:00 EDT administer from calcium chloride infusion bag, for use with citrate protocol for systemic ionized calcium less than or equal to 0.8 m...
	calcium chloride (calcium chloride bolus dose)	Ordered	500 mg = 36 mL, injection, IV, as directed, PRN for Other: See Comments, infuse over 15 min, Start: 2020/08/18 17:53:00 EDT administer from calcium chloride infusion bag, for use with citrate protocol for systemic ionized calcium less than or equal to 0.81-0...
Laboratory	Liver Function/Enzymes		
	Alkaline Phosphatase (ALP)	Ordered (Dispatched)	Now, 2020/08/18 17:53:00 EDT, Blood, until 2020/08/18 17:58:00 EDT
	Alanine Aminotransferase (ALT)	Ordered (Dispatched)	Now, 2020/08/18 17:53:00 EDT, Blood, until 2020/08/18 17:58:00 EDT
	Bilirubin, Total (BILT)	Ordered (Dispatched)	Now, 2020/08/18 17:53:00 EDT, Blood, until 2020/08/18 17:58:00 EDT
	Bilirubin, Total (BILT)	Ordered	AM Routine, 2020/08/19 3:00:00 EDT, Blood, Frequency: daily.

Orders have been completed

8/24/2020

28