

CITRATE ANTICOAGULATION

Mechanism	Regional citrate anticoagulation chelates calcium required for the coagulation cascade to create clotting factors involved in thrombus formation.
Cautions	Hypocalcemia will occur, requiring supplemental calcium during use; metabolic complications including hyponatremia, metabolic acidosis and citrate toxicity can occur. <i>Note:</i> Blood products are preserved in citrate to prevent clotting; transfusion of a large amount of blood products or use of systemic citrate infusions can lead to hypocalcemia and reduced blood pressure unless concurrent calcium supplementation is provided.
ACD-A Solution (224 mmol/L sodium, 112.8 mmol/L citrate)	<ul style="list-style-type: none"> • Dextrose 2.45 g/100 mL • Sodium citrate 2.2 g/100 mL • Citric acid 730 mg/100 mL
Catheter Flush	4% citrate solutions have been assessed in maintaining catheter patency, but are not commercially available in large quantities; ACD-A solution has been used as an alternative; more concentrated citrate solutions have been explored for additional antimicrobial properties but can lead to metabolic effects if instilled into the systemic circulation.
Renal Replacement Therapy	Regional citrate is one option to heparin to prevent thrombosis of the hemodialysis circuit; protocols for its use should be developed in advance and persons responsible for managing trained; protocols will vary between dialysis circuits; in general, citrate anticoagulation can maintain circuits and preserve filters longer than heparin-related anticoagulants.

(continued)

<p>Example Citrate and Calcium Protocol (using ACD-A solution in CRRT)</p>	<p>Citrate infusion:</p> <ul style="list-style-type: none"> • Rate = circuit blood flow x 0.03 • Check ionized calcium q 6 hr • Adjust rate according to circuit ionized calcium level (1.0–1.4 mg/dL (e.g., if rate 200 mL/hr, increase rate 30 mL/hr if <1 mg/dL, decrease by 30 mL/hr if >1.4 mg/dL)) <p>Calcium infusion:</p> <ul style="list-style-type: none"> • Make a calcium gluconate IV solution of 12 g in 0.9% NaCl total volume of 250 cc (or 24 g in 500 cc 0.9% NaCl) • Infuse 30 mL/hr via the central line • Calcium level every 6 hr (target ionized calcium of 3.7–4.4 mg/dL) • <3 mg/dL: stop citrate for 30 min; give 4 g calcium gluconate IV over 2 hr via central line; increase calcium infusion by 20 mL/hr and decrease citrate infusion by 30 mL/hr • 3.0–3.19 mg/dL: give 2 g calcium gluconate IV over 1 hr via central line; increase calcium infusion by 15 mL/hr • 3.2–3.6 mg/dL: increase calcium gluconate infusion by 10 mL/hr • 4.5–4.8 mg/dL: decrease calcium gluconate infusion by 10 mL/hr • 4.9–5.6 mg/dL: decrease calcium gluconate infusion by 15 mL/hr • >5.6 mg/dL: hold calcium infusion <p>At very low or high levels, physician notification should be considered.</p>
-----------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

hr: hours, IV: intravenous, min: minutes, NaCl: sodium chloride, q: every

Source: Bury LD, Tung DD, Hallett D, et al. Regional citrate anticoagulation for PrismaFlex continuous renal replacement therapy. *Ann Pharmacother.* 2009;43:1419–1425.