

Weekly Pharmacy Pearl: Osmolarity of Common Medications in ED

- In 1998, “infusion of 120 mL/kg of 814 mOsm/kg solution caused phlebitis at 5-10 mL/kg/h. However, the same volume of the same solution scarcely caused phlebitis at 15 mL/kg/h because of the shortened infusion duration. These results suggest that the tolerance osmolality of peripheral venous endothelial cells with poor blood flow is about 820 mOsm/kg for 8 h, 690 mOsm/kg for 12 h, and 550 mOsm/kg for 24 h, and that the tolerance osmolality falls as the duration of infusion increases.”
- In conclusion, **hypertonic solutions should be infused for as short a period as possible.**
- While it may not be realistic to always follow the textbook rates of administration from package inserts, it is important to acknowledge that these meds are never truly 100% safe to be administered through pIV. Every single one of these drugs have well-documented case reports of tissue necrosis.
- As ED providers and staff, we must do our due diligence of:
 1. **Choosing less hypertonic option, if available and possible**
 - Ex) Calcium gluconate for non-emergent hyperkalemia instead of calcium chloride. 2 g calcium gluconate bag goes in < 10 mins if hung by gravity.
 - Ex) Oral glucose or D10W instead of D50W – 250 ml of D10W wide open will deliver the same 25 g of dextrose
 2. **Checking to see if a large enough IV is available for a hypertonic medication**
 3. **Making sure the IV works before pushing**

Medication	Concentration Used Commonly at CMC ED	Osmolarity (mOsmol/L)	Textbook Rate of Administration through PIV
Potassium Chloride	10 mEq/100 mL	200	10 mEq/hr
Physiologic		280-310	
Calcium Gluconate	2 g/100 mL	382	Max over 10 mins adults - gravity Max over 20 mins in pediatrics
Potassium Chloride	20 mEq/100 mL	400	10 mEq/hr – central line preferred, but not required per AH policy
D10W	25 g/250 mL	500	Wide open
3% Hypertonic Saline (HTS)	3% 500 mL	1027	Wide open for elevated ICP
Sodium Bicarbonate	50 mEq/50 mL	2000	In non-cardiac arrests, 4-5 mEq/kg over 4 – 8 hours
Calcium Chloride	1 g/10 mL	2040	In non-cardiac arrests, “slow” IV push (max 1 ml/min or 100 mg/min), preferably in a central or large bore pIV in proximal site
D50W	25 g/50 mL	2530	Large bore pIV - about 95% retained when infused at a rate of 0.8 g/kg/hr (For 100 kg, over 18 minutes and for 80 kg, over 23 mins)