

Intradialytic Hypotension

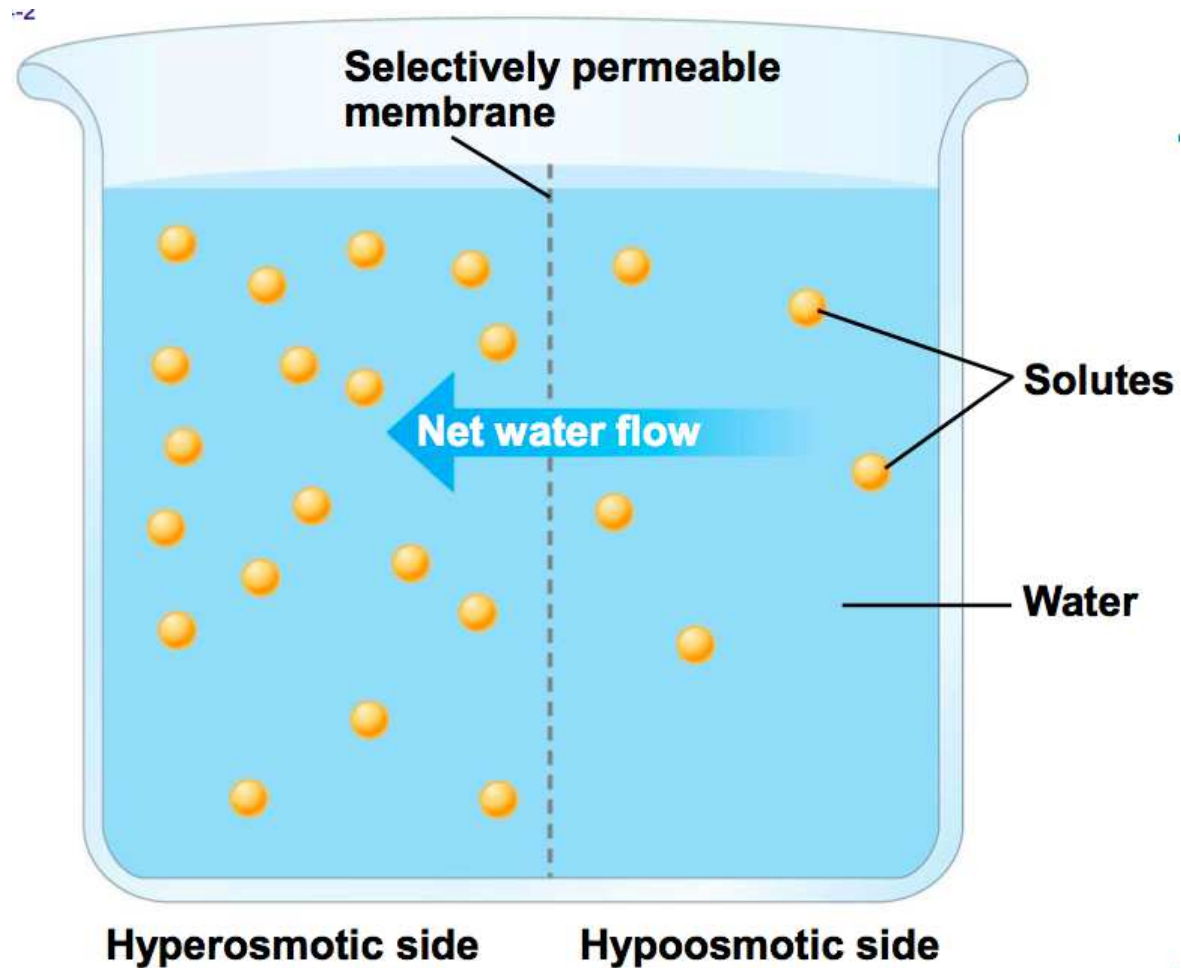
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Intradialytic Hypotension

- Three components
 1. Drop in SBP > 20 mmHg or MAP drop of > 10 mmHg
 2. Presence of symptoms of end organ ischemia
 3. Intervention necessary by in center staff
- Complicates 15-30% of all treatments
- In sicker patients can happen in up to 50% of treatments

Osmosis:

Water moves from area of low solute concentration to area of high solute concentration



Pathophysiology of BP changes during HD

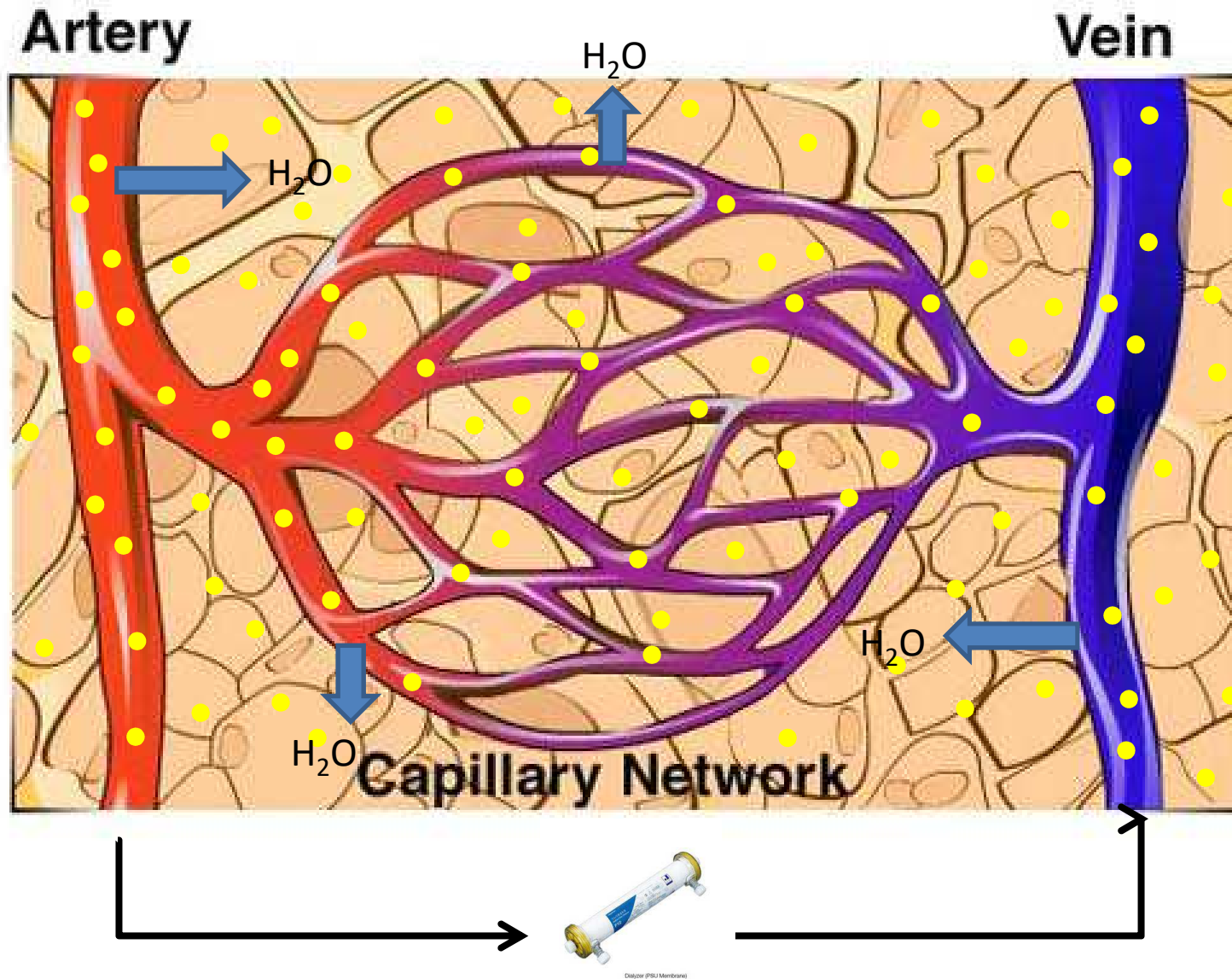
Hypotension

- Drop in plasma osmolality
 - Comparison of HD vs UF vs hypertonic mannitol HD vs Isotonic mannitol HD (Henrich, *KI*:18:480, 1980)
 - UF alone (with no change in osm) and hypertonic mannitol HD avoided post dialysis hypotension
- Impaired sympathetic response
- Poor cardiac reserve
- Rapid ultrafiltration rates with impaired vascular reactivity
- Dialysate to plasma tonicity gradient and ultrafiltration /plasma refilling

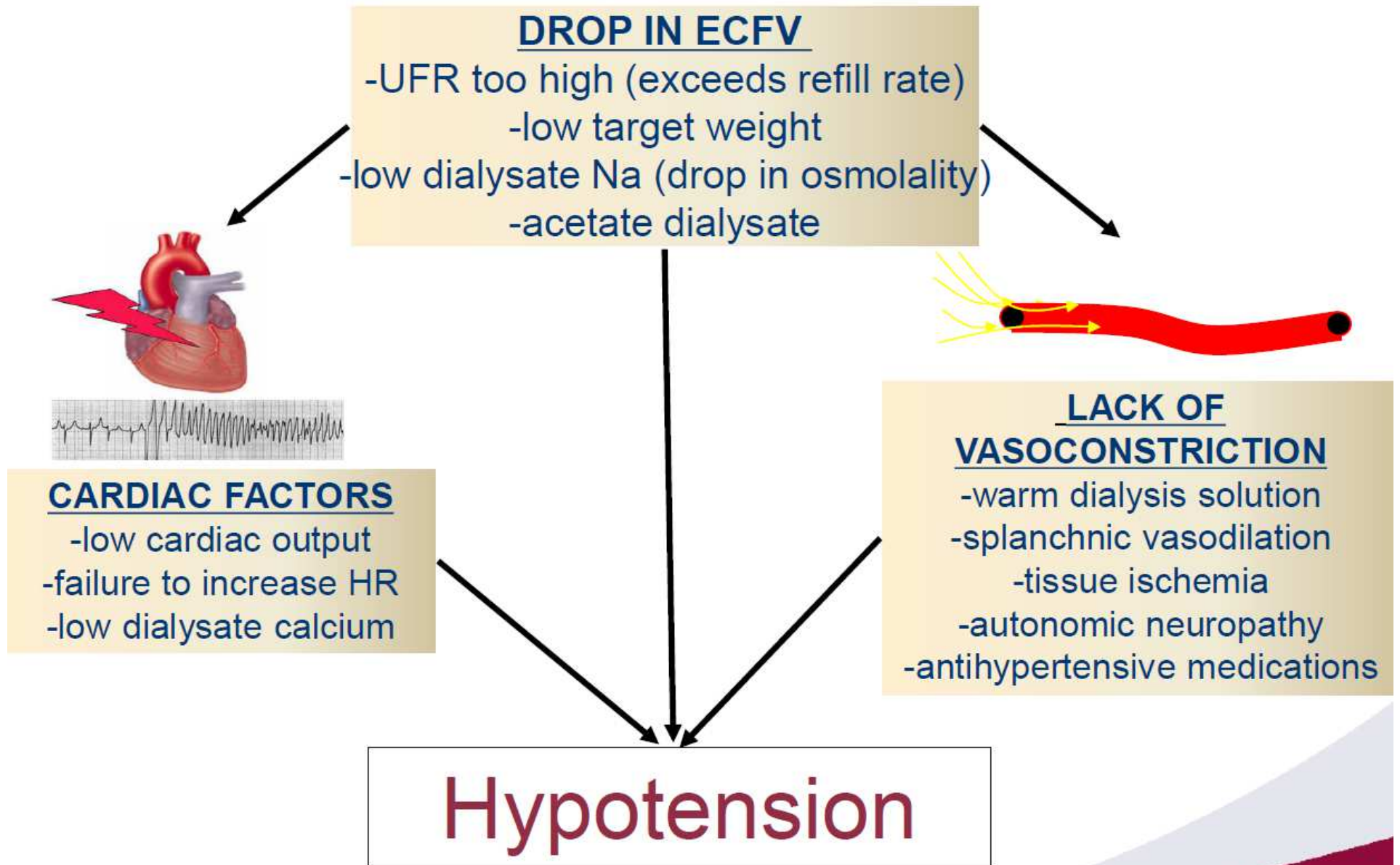
Hypertension

- Volume overload
- Sodium loading
- Sympathetic over-activity
- Activation of the renin-angiotensin aldosterone system
- Endothelial cell dysfunction
- Dialysis-specific factors
 - net sodium gain
 - high ionized calcium
 - Hypokalemia
 - Medications
 - Erythropoietin stimulating agent
 - Removal of antihypertensive medications
- Vascular stiffness

Fluid Shifts During Dialysis



Causes of Intradialytic Hypotension



Rule out acute conditions that can cause intradialytic hypotension

- Infections
 - Access related at top of list
 - Cellulitis
 - Urinary tract infection
 - Pneumonia
 - Osteomyelitis
 - Endocarditis
- Blood loss
- Myocardial ischemia
- New onset arrhythmia (e.g. SVT)
- Pericardial effusion

Reasons to avoid intradialytic hypotension

- Patient comfort
- Accelerated decline of residual renal function (Jansen, KI 2002)
- Myocardial stunning and irreversible cardiac injury (McIntyre, CJASN 2009)
- Ischemic brain injury (McIntyre, KI 2015)
- Associated with higher mortality rate (Flythe, JASN 2015)

Interventions for Intradialytic Hypotension

- Establish an accurate dry weight
- Reduce ultrafiltration rate (usually this means longer or more frequent dialysis)
- Limit interdialytic weight gain by reducing salt intake
- Prohibit food ingestion during hemodialysis
- Consider adjusting antihypertensive medications or timing
- Cool dialysate
- Ultrafiltration modeling
- Increase dialysate calcium
- L-Carnitine
- Midodrine

Cool Dialysate

- Cooling dialysate leads to vascular constriction and improved blood pressure
- Studies have shown reduction in intradialytic hypotension, improvement in volume control and ability to achieve dry weight with cooled dialysate
- Studies have show improvement in myocardial function with cool dialysate during dialysis (Selby NDT 2006)
- This intervention is usually well tolerated by patients
- Cooling of dialysate can lead to clotting of the filter and theoretically decreased clearance but this has not been seen in studies
- Normal dialysate temperature is 37 degrees Celsius
- Cool dialysate would range from 35-36 degrees Celsius
- Setting the dialysate temperature 1 degree Celsius below the body temperature is an acceptable practice
- Dialysate temperature > 37 degrees Celsius should be avoided