Home Hemodialysis Prescriptions

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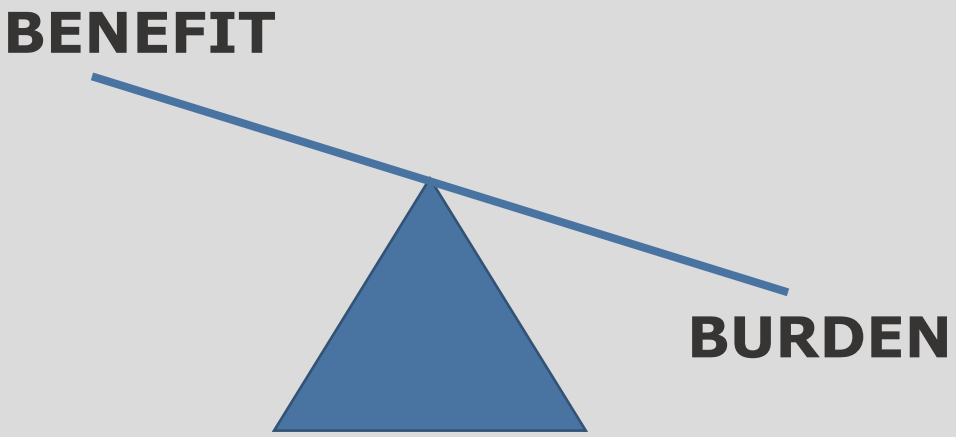
Home Dialysis Prescriptions

- Solute removal
  - Electrolytes
  - Small solute – urea
  - Middle molecules
- Fluid removal
- Quality of life
  - Maximize benefit and minimize burden of therapy

Why do patients stay on home dialysis? The benefit outweighs the burden!



Always minimize burden and maximize benefit

Burden = everything associated with treatment!

Patient – centric: TEAM EFFORT!

What is adequate dialysis if achieving a target Kt/ is not a sufficient measurement?

- Sense of well being (patient reported QOL)
- Functional and cognitive status
- BP and volume control
- Middle molecule clearance
- Nutrition
- Bone and mineral metabolism
- Acid base balance
- Inflammation
- Anemia
- Cardiovascular risks/lipid control
- Small solute clearance

Patients meet their goals and not necessarily ours.

What is Kt/V?

- KT = dialysis dose = liters of dialysate that are completely saturated with urea ($D/P_{urea} = 1$)
- V = volume distribution of urea

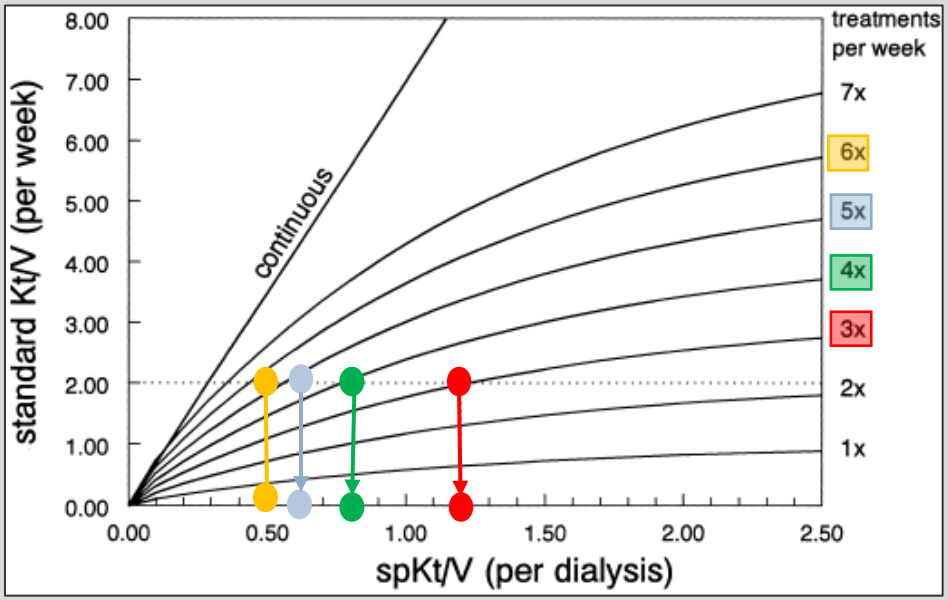
What is Kt for an in-center HD patient?

- If Kt/V= 1.4
- Weight = 100 Kg
- TBW = 50L
- Kt = (1.4)(50) = 70 L
- At Qd 600 mL/min, for 4 hours (240 min), dialysate volume is ~144 liters
- How saturated with urea is the dialysate?
  - ~70/144 = 0.5
- When we change Kt/V for an in-center HD patient by changing Qb or Qd we are changing the amount of dialysate we use and/or how well saturated it us

std Kt/V Target is 2.0 (weekly)

Gotch FA. Nephrol Dial Transplant. 1998;13(suppl 6): 10-14.

$$stdKt/V = 168 * [1 - exp(-eKt/V)]/t/[1 - exp(-eKt/V)eKt/V + 168/N/t - 1$$



Target spKt/V to achieve STD Kt/V >2			
	6 days	5 days	4 days
sp Kt/V	0.5	0.6	0.8

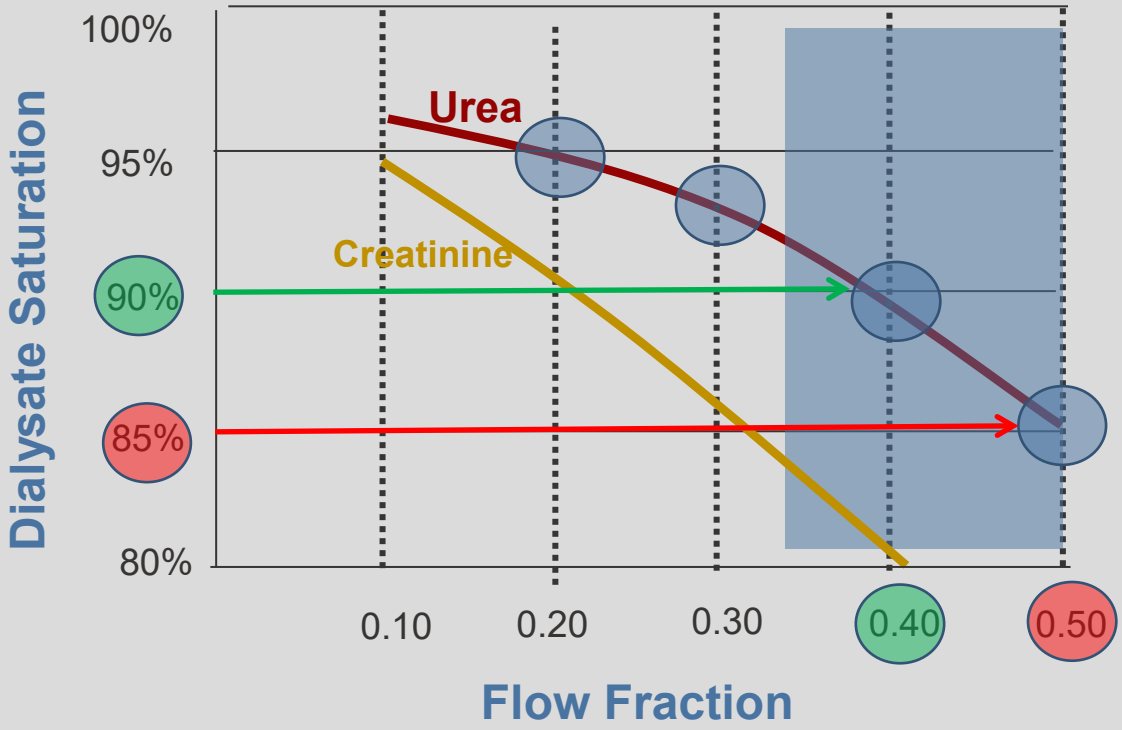
NxStage Therapy System

Bags: Sterile Fluid*

PureFlow: Batch dialysate production**

*Just like PD
**Limited options – like PD

FF (Qd/Qb) and dialysate saturation: Leypoldt et al. ASN. 2005



To achieve 85% saturation flow fraction, Qd/Qb, needs to be about 0.5 (50%)

How could we estimate prescription volume and fluid saturation (FF) to achieve target spKt/V for NxStage?

Peritoneal Dialysis

$$Kt/V_{urea}\ (\text{Per week}) = \frac{(D/P_{urea})(\text{Dialysate drain volume/day})(7\ \text{days})}{V_D\text{Urea (TBW)}}$$

spKt/V NxStage (per tx) =

$$\frac{\mathbf{(D/P_{urea})}(\text{Dialysate drain volume})}{V_D\text{Urea (TBW)}}$$

Variables =Kt

Fixed

D/P_{urea} is percent saturation and is determined by flow fraction

NxStage: Time of therapy is a dependent variable

- We Order:
  - Dialysate Volume
  - UF
  - Blood Flow (Qb)
  - Flow Fraction (Qd/Qb)
  - Machine sets dialysate flow rate
    - If blood flow decreases then dialysate flow rate decreases
  - UF is included in the dialysate drain volume. If more UF then longer treatment time

Flow Fraction:
Relationship between dialysate volume, UF volume, Qb and FF (Qd/Qb)

Assume fixed Qb unless stated otherwise

Treatment time increases with:

- Larger dialysate volume (fixed FF)
- Greater UF (fixed FF)
- Lower FF (fixed volume)
- Slower Qb

Treatment time decreases with:

- Smaller dialysate volume (fixed FF)
- Less UF (fixed FF)
- Higher FF (fixed volume)
- Faster Qb

Traditional Technology: Fresenius 2008K@home

- All modalities
- Online monitoring
- Reliable technology
- Requires electrical/plumbing modifications
- **Requires separate water treatment**
  - Additional RO machine
  - Requires machine disinfection
  - Monthly water and dialysate cultures
- Increase in water/electric bills

Traditional Technology: Fresenius 2008K@home – SDHD Rx

- **Clearance**
  - Qb 400; Qd 600 (2.5 hr treatment spKt/V ~ 0.8)
- **Time on therapy**
  - 2.5 hours (minimum 12 hours/week)
- **Potassium**
  - Adjust accordingly
- **Bicarbonate**
  - Adjust accordingly
- **Calcium**
  - Adjust accordingly
- **Heparin**
  - Bolus 1500-3000 units

Cases

NxStage LDVA Prescriptions

- For SDHD: Pick a reasonable dialysate volume, according to patient weight, and a reasonable flow fraction. Then measure spKt/V (and calculate stdKt/V). If you do not achieve target spKt/V change flow fraction or dialysate volume or both and measure spKt/V again.
- Example of reasonable initial prescriptions for 5 treatments/week:

Dialysate volume

Small: (<70 kg)	**20 liters**
Medium: (70-85 kg)	**25 liters**
Large: (>85 kg)	**30 liters**

Flow fraction

About 0.40 or 40% (saturation will be ~90%)