Guidelines for the Hemodialysis Prescription

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The Hemodialysis Prescription

Recipe

Q_B  HCO_3^-
K^+  Na^+
UF
Hemodialysis Prescription
Treatment Selection

Hemodialysis:
- Intermittent Hemodialysis
- SLED
- Ultrafiltration without dialysis

CRRT:
- CRRT
- CVVH
- CVVHD
- CVVHDF
- SLED
- SCUF
Hemodialysis Prescription: Iteration of Complex & Interactive Variables

**GOAL**--Correct the alterations in body fluid volume and composition including:

- ✔ Removal of uremia toxins
- ✔ Correction of dysregulated electrolytes
- ✔ Correction of depleted solutes
- ✔ Normalization of acid-base balance
- ✔ Correction of excess or deficit fluid volume
- ✔ Removal of exogenous toxins
- ✔ Normalization of altered systemic physiology
Hemodialysis Prescription

Patient Variables

- Degree of azotemia
- Hemodynamic stability: weight, volemia, blood pressure, hydration
- Hematocrit
- Electrolyte and acid-base status
- Oxygenation capacity
- Bleeding potential: surgery, stroke/ulcers, punctures, coagulopathy
Hemodialysis Prescription

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Hemodialysis Prescription Treatment Variables

- **Hemodialyzer:** surface area, bundle volume, Kd, Kuf, biocompatibility
- **Blood flow rate (Qb)**
- **Dialysis time (Td)**
- **Ultrafiltration rate (UFR)**
- **Dialysate composition**
- **Dialysate flow rate (Qd)**
- **Anticoagulation**
- **Ancillary treatments/additives**
Hemodialysis Prescription
Dialytic Priorities for Acute Uremia

- Resolve the azotemia
- Correct the hyperkalemia
- Correct fluid imbalances
- Correct metabolic acidosis
- Correct mineral imbalances
- Resolve persisting nephrotoxins
- Correct other electrolyte & chemical abnormalities

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>ANION GAP</td>
<td>38 MM/L</td>
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<tr>
<td>SODIUM</td>
<td>160 MM/L</td>
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<tr>
<td>POTASSIUM</td>
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<td>CHLORIDE</td>
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<td>CO2 TOTAL</td>
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<td>CALCIUM</td>
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<td>PHOSPHORUS</td>
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<td>CREATININE</td>
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<td>UREA NITROGEN</td>
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<td>GLUCOSE</td>
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<td>TOTAL PROTEIN</td>
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<tr>
<td>ALBUMIN</td>
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<tr>
<td>GLOBULIN</td>
<td>2.4 G/DL</td>
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<tr>
<td>ALT</td>
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<tr>
<td>AST</td>
<td>37 IU/L</td>
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<td>BILIRUBIN TOTAL</td>
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<td>CHOLESTEROL</td>
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<tr>
<td>GAMMA GT</td>
<td>&lt;3 IU/L</td>
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Hemodialysis Prescription
Treatment Intensity
Hemodialysis Prescription
Treatment Intensity

water
The intensity of the dialysis treatment \((K_d \& t)\) directly influences the safety of the dialysis session.
Hemodialysis Prescription
Treatment Intensity

<table>
<thead>
<tr>
<th>Dialysis Prescription / Treatment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney:</td>
<td></td>
</tr>
<tr>
<td>Tubing:</td>
<td></td>
</tr>
<tr>
<td>Priming:</td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td></td>
</tr>
<tr>
<td>HCO3</td>
<td></td>
</tr>
<tr>
<td>FLEET ml Temp Qd</td>
<td></td>
</tr>
<tr>
<td>Heparin Prime Additive</td>
<td></td>
</tr>
<tr>
<td>Time of heparin Single needle</td>
<td></td>
</tr>
<tr>
<td>Target Time min Actual Time min</td>
<td></td>
</tr>
<tr>
<td>UF ml</td>
<td></td>
</tr>
<tr>
<td>Qb ml/min</td>
<td></td>
</tr>
<tr>
<td>Qp L</td>
<td></td>
</tr>
<tr>
<td>CQb @ -200mmHg Reversed Lines</td>
<td></td>
</tr>
</tbody>
</table>

Complication /Danger Scale

- **Safe:**
- **Unsafe:** (too fast)

Serum Urea Nitrogen (mg/dL) vs Time (hours)
Hemodialysis Prescription
Treatment Intensity

The intensity of the dialysis treatment \((K_d \& t)\) directly influences the safety and efficiency of the dialysis session.

\[
K_d \int Q_b = K_d = Q_b \cdot \frac{BUN_{in} - BUN_{out}}{BUN_{in}}
\]

\[
K(\text{patient}) = K_d \cdot t
\]

\[
K \ (\text{patient, mL}) = (\text{mL/min})/\text{min}
\]
Hemodialysis Prescription
Dialyzer Selection

Individualized to each patient & dialysis session:

✓ Hemodialyzer – type, surface area, materials
✓ Bundle volume
✓ Efficiency, Efficacy (Kd)
✓ Fluid removal characteristics (Kuf)
Hemodialysis Prescription
Dialyzer Selection

Low Flux Dialyzers:
- $K_0A_{\text{urea}} < 500\text{mL/min}$
- $Kuf < 10\text{ mL/mmHg/hr}$
- Effective small molecule clearance
- Low middle molecule clearance
- Variable biocompatibility and hemocompatibility
Hemodialysis Prescription
Dialyzer Selection

High-Efficiency
✓ Synthetic membrane
✓ $K_o A_{\text{urea}} > 450 \text{ mL/min}$
✓ $K_u f 10-15 \text{ mL/mmHg/hr}$
✓ Improved middle molecule clearance
✓ Biocompatible

High-Flux
✓ $K_u f > 15 \text{ mL/minHg/hr}$
✓ Protein/solute binding
✓ Significant middle molecule clearance (up to 10,000+ Da)
Hemodialysis Prescription
Dialyzer Selection

<table>
<thead>
<tr>
<th>Dialyzer</th>
<th>$K_{\text{urea}}$</th>
<th>$K_{\text{creat}}$</th>
<th>$K_{\text{phos}}$</th>
<th>$K_{\text{B12}}$</th>
<th>$K_{\text{uf}}$</th>
<th>$M^2$</th>
<th>Priming Volume</th>
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<tr>
<td>F3</td>
<td>125</td>
<td>95</td>
<td>78</td>
<td>32</td>
<td>1.7</td>
<td>0.4</td>
<td>28</td>
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<tr>
<td>Polyflux 6H</td>
<td>167</td>
<td>146</td>
<td>136</td>
<td>90</td>
<td>33</td>
<td>0.6</td>
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<td>Polyflux 140 H</td>
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<td>181</td>
<td>174</td>
<td>128</td>
<td>60</td>
<td>1.4</td>
<td>94</td>
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<tr>
<td>Optiflux F160NR</td>
<td>194</td>
<td>181</td>
<td>178</td>
<td>128</td>
<td>50</td>
<td>1.5</td>
<td>83</td>
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<tr>
<td>Optiflux F200NR</td>
<td>197</td>
<td>191</td>
<td>183</td>
<td>148</td>
<td>62</td>
<td>2.0</td>
<td>112</td>
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<tr>
<td>Polyflux 21R</td>
<td>192</td>
<td>187</td>
<td>185</td>
<td>149</td>
<td>83</td>
<td>2.1</td>
<td>152</td>
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Clearances in vitro; $Q_B = 200 \text{ mL/min}$, $Q_D = 500 \text{ mL/min}$
## Hemodialysis Prescription
### Dialyzer Selection

<table>
<thead>
<tr>
<th>Weight</th>
<th>Dialyzer Volume</th>
<th>Extracorp. Volume</th>
<th>% Blood Volume</th>
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</thead>
<tbody>
<tr>
<td>Cats, Dogs</td>
<td>&lt; 6 kg</td>
<td>&lt; 20 mL</td>
<td>&lt; 60 mL</td>
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<tr>
<td>Cats</td>
<td>&gt; 6 kg</td>
<td>&lt; 30 mL</td>
<td>&lt; 70 mL</td>
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<tr>
<td>Dogs</td>
<td>6-12 kg</td>
<td>&lt; 45 mL</td>
<td>&lt; 90 mL</td>
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<tr>
<td>Dogs</td>
<td>12-20 kg</td>
<td>&lt; 80 mL</td>
<td>100-160 mL</td>
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<tr>
<td>Dogs</td>
<td>20-30 kg</td>
<td>&lt;120 mL</td>
<td>150-200 mL</td>
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<tr>
<td>Dogs</td>
<td>&gt; 30 kg</td>
<td>&gt; 80 mL</td>
<td>150-250 mL</td>
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</table>
Hemodialysis Prescription
Dialyzer Selection

Diffusion

Filtration Equilibrium
Hemodialysis Prescription

Dialyzer Selection

Filtration Equilibrium @ 50 mL/min (Ex 100%)
Filtration Equilibrium @ 75 mL/min (Ex 100%)
Filtration Equilibrium @ 100 mL/min (Ex 97%)
Filtration Equilibrium @ 150 mL/min (Ex 91%)
Hemodialysis Prescription
Dialyzer Selection

Filtration Equilibrium @ 50 mL/min (Ex 100 %)

Filtration Equilibrium @ 75 mL/min (Ex 100%)

Filtration Equilibrium @ 100 mL/min (Ex 100%)

Filtration Equilibrium @ 150 mL/min (Ex 91%)
Hemodialysis Prescription
Extracorporeal Blood Flow

Blood flow ($Q_B$) directly influences treatment intensity—faster flow, more (and more rapid) treatment

**Minimal Tx (initial Rx)**
- ✓ BUN > 300 mg/dL: $Q_B$ 0.5-1.0 mL/kg/min
- ✓ BUN 150-300 mg/dL: $Q_B$ 1.0-2.0 mL/kg/min
- ✓ BUN < 150 mg/dL: $Q_B$ 2.0-5.0 mL/kg/min

**Moderate Tx**: $Q_B$ 5-10 mL/kg/min

**Intensive Tx**: $Q_B$ 10-20 mL/kg/min
Hemodialysis Prescription
Extracorporeal Blood Flow

Canine Hemodialysis Treatments
Fresenius F160NR Dialyzer

Urea Reduction Ratio (%) vs. Blood Processed (L/kg BW)
Hemodialysis Prescription
Extracorporeal Blood Flow

Urea Reduction Ratio (%)

Blood Processed (L/kg BW)

Feline Hemodialysis Treatments
Fresenius F3 Dialyzer
# Hemodialysis Prescription Blood Flow Guidelines

<table>
<thead>
<tr>
<th>Initial Treatment:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BUN &lt; 200 mg/dL</strong></td>
</tr>
<tr>
<td>Variable URR, @ no greater than 0.1 URR per hour</td>
</tr>
<tr>
<td><strong>200 to 300 mg/dL</strong></td>
</tr>
<tr>
<td>Variable URR, @ no greater than 0.1 URR per hour</td>
</tr>
<tr>
<td><strong>&gt; 300 mg/dL</strong></td>
</tr>
<tr>
<td>Variable URR, @ no greater than 0.05 - 0.07 URR per hour</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2nd Treatment:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BUN &lt; 200 mg/dL</strong></td>
</tr>
<tr>
<td>Variable URR, @ 0.12 - 0.15 URR per hour</td>
</tr>
<tr>
<td><strong>200 to 300 mg/dL</strong></td>
</tr>
<tr>
<td>Variable URR, @ no greater than 0.1 URR per hour</td>
</tr>
<tr>
<td><strong>&gt; 300 mg/dL</strong></td>
</tr>
<tr>
<td>Variable URR, @ no greater than 0.05-0.07 URR per hour</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3rd and Subsequent Treatments:</th>
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</thead>
<tbody>
<tr>
<td><strong>BUN &lt; 150 mg/dL</strong></td>
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<tr>
<td>Variable URR, @ &gt; 0.15 URR per hour</td>
</tr>
<tr>
<td><strong>150 to 300 mg/dL</strong></td>
</tr>
<tr>
<td>Variable URR, @ 0.1 - 0.15 URR per hour</td>
</tr>
<tr>
<td><strong>&gt; 300 mg/dL</strong></td>
</tr>
<tr>
<td>Variable URR, @ &lt; 0.1 URR per hour</td>
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</tbody>
</table>
Hemodialysis Prescription
Severe Azotemia

For animals with BUN concentrations > 250 mg/dL, an extended-slow treatment is better tolerated, more effective, and safer than short intensive treatments.

Serum Urea Nitrogen (mg/dL)

Dialysis Sessions

URR = 0.4

URR = 0.67
Hemodialysis Prescription
Severe Azotemia

The hourly URR for animals with severe azotemia should be no greater than 0.05-.07 per hour— but that may be difficult with standard procedures.
Blood Flow Prescription

<table>
<thead>
<tr>
<th>BUN Range</th>
<th>URR Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 200 mg/dL</td>
<td>Variable URR, @ no greater than 0.1 URR per hour</td>
</tr>
<tr>
<td>200 to 300 mg/dL</td>
<td>Variable URR, @ no greater than 0.1 URR per hour</td>
</tr>
<tr>
<td>&gt; 300 mg/dL</td>
<td>Variable URR, @ no greater than 0.05 - 0.07 URR per hour</td>
</tr>
</tbody>
</table>

- Blood to process: \( (5.5 \text{ kg}) \times (0.40 \text{ L/kg}) = 2.2 \text{ L} \)
- Treatment Time (Td): \( \frac{0.5 \text{ URR}}{0.05 \text{ URR/hr}} = 10 \text{ hr} \)
- Blood flow (Qb): \( \frac{2200 \text{ mL}}{600 \text{ min}} = 3.6 \text{ mL/min} \)
Initial Treatment: 5.5 kg Cat; Initial BUN = 350 mg/dL

<table>
<thead>
<tr>
<th>BUN</th>
<th>Treatment</th>
</tr>
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<tbody>
<tr>
<td>&lt; 200 mg/dL</td>
<td>Variable URR, @ no greater than 0.1 URR per hour</td>
</tr>
<tr>
<td>200 to 300 mg/dL</td>
<td>Variable URR, @ no greater than 0.1 URR per hour</td>
</tr>
<tr>
<td>&gt; 300 mg/dL</td>
<td>Variable URR, @ no greater than 0.05 - 0.07 URR per hour</td>
</tr>
</tbody>
</table>

![Graph showing time (hours) vs. serum urea nitrogen (mg/dL) for different blood flow prescriptions.](image)
Blood Flow Prescription

\[ Q_b = 3.6-4.0 \text{ mL/min} \]
- Not achievable on most IHD machines
- Blood in extracorporeal circuit for > 18 minutes
- Circuit will clot

\[ Q_b = 10 \text{ mL/min} \]
- Treatment intensity too high
- Hourly URR = 0.13/hr
- Blood in extracorporeal circuit for > 7 minutes
- Circuit likely to clot
- Must extend the treatment time
Blood Flow Prescription

VETsmart Machine
✓ Qb 2 mL/min to 250 mL/min @ 1.0 mL/min resolution
✓ However, minimum circuit is 45 mL to 59 mL...so still have blood in circuit 11 to 15 min
Hemodialysis Prescription
Slowing the Treatment Intensity

Treatment Goal: URR = 0.5
Hourly URR: 0.05
Required treatment: 2.2 L

- Minimum Qb = 10 mL/min
- Desired Qb = 4 mL/min
- Must extend treatment over a 2.5 X greater time to achieve desired hourly URR
Blood Flow Prescription

**Q_b = 4 mL/min**
- $t = 575$ minutes
- Processed blood = 2,300 mL
- URR = 0.5 at 0.05 URR/hr

**Q_b = 10 mL/min**
- $t = 230$ minutes
- Must extend the treatment by 2.5-3 times
- 5 min dialysis @ 10 mL/min; 10 min in bypass at 60 mL/min for 10 hours
- New $t = 600$ minutes
- Blood processed, 200 mL/hr; 2,000 mL in 10 hours
- URR = 0.5 at 0.05 URR/hr
Blood Flow Prescription

- $Q_b = 10 \text{ mL/min}$
- At $Q_b$, $10 \text{ mL/min}$ the $K_{urea} = 10 \text{ mL/min}$
- 5 min dialysis @ 10/min; 10 min in bypass at 60 mL/min for 10 hours (4 cycles/hr)
- New $t = 600$ minutes
- Blood processed, 200 mL/hr; 2,000 mL in 10 hours
- URR = 0.5 at 0.05 URR/hr
**Blood Flow Prescription**

- **During dialysis:** @ Qb, 10 mL/min $K_{\text{urea}} = 50 \text{ mL/5 min}$ (10 mL/min x 5 min)
  - Hourly clearance = 200 mL
  - Total clearance = 2,000 mL

- **During Bypass:** $K_{\text{urea}} \neq 0$ mL/min. Due to ongoing equilibration of dialysate (60 mL) in the bypass period there is an additional 60 mL/10 min of $K_{\text{urea}}$
  - Hourly clearance = 240 mL
  - Total clearance = 2,400 mL

- Therefore, need to take this clearance into account
  - Hourly clearance = 440 mL
  - Total clearance = 4,400 mL
Blood Flow Prescription

During dialysis: @ Qb, 10 mL/min $K_{urea} = 50$ mL/5 min (10 mL/min x 5 min)
- Hourly clearance = 100 mL
- Total clearance = 1,000 mL

During Bypass: $K_{urea} = 60$ mL/25 min.
- Hourly clearance = 120 mL
- Total clearance = 1,200 mL

Combined Clearance:
- Hourly clearance = 220 mL
- Total clearance = 2,200 mL
Option: Permit equilibration of dialysate (60 ml) in the bypass period provide the clearance.

Simply cycle the bypass intervals with sufficient frequency to achieve the clearance.

Hourly clearance = 240 mL
Total clearance = 2,400 mL
Management of Fluid through Ultrafiltration

GOALS—Correct the alterations in body fluid volume:

- Normalization of body fluid volume
- Correct peripheral & pulmonary edema
- Normalization of blood pressure
- Removal of ongoing fluids burdens
- Provide a “sink” for parenteral nutrition
Management of Fluid through Ultrafiltration

Ideal “Dry Weight”

✓ Weight at which additional fluid reduction would produce hypovolemia
✓ Weight at which ECF is physiologic
✓ Estimated at historical wt when the animal was normal
✓ Not static--changes over time
✓ Targeted “dry weight” must be updated over time

Positive Fluid Balance

Ideal “Dry Weight”
Prescription of Ultrafiltration

- Hemodynamic stability: weight, volemia, blood pressure, hydration
- Hydration status
- Priming solution
- UF target
- Treatment time
- UF rate
- Rinseback Solution
Prescription of Ultrafiltration

- **Hemodialyzer**: Kuf
- **Blood flow rate** (Qb)
- **Dialysis time** (Td)
- **Ultrafiltration target**
- **Ultrafiltration rate** (UFR)
- **Dialysate composition**
- **Dialysate flow rate** (Qd)
- **Anticoagulation**
Prescription of Ultrafiltration

Determine target loss-estimate:
✓ % over hydration
✓ (current wt – ideal dry wt)
✓ Projected fluid Rx – PPN, TPN, crystalloids, feedings
✓ Historical tolerance

Calculate rate-reasonable & safe:
✓ 5-10 ml/kg/hr – standard
✓ 15-20 ml/kg/hr – aggressive
✓ ~80-200 ml for cats
✓ ~500-1000 ml for 20 kg dog
Prescription of Ultrafiltration

Priming the Extracorporeal Circuit:
✓ Full prime with saline or colloid: 50-170+ ml/Tx
✓ Partial prime: 25-90 ml/Tx
✓ No prime: *watch blood pressure*

Rinseback:
✓ Air
✓ Saline
✓ D5W-increased distribution volume
Prescription of Ultrafiltration: *Isolated Ultrafiltration*

**UF without Dialysis:**
- ✔ Large UF requirement
- ✔ When risk of over dialysis
  - Severe azotemia
  - Hypophosphatemia
  - Congestive heart failure
- ✔ Machine in “bypass”
- ✔ Defined treatment option on many machines
Clinical Evaluation of Ultrafiltration

Sequential (real-time) changes in blood volume can be measured as sequential changes in HCT calculated as a % from baseline as:

$$\% \Delta BV = \left[ \frac{Hct_0}{Hct_x} - 1 \right] \times 100$$
Clinical Evaluation of Ultrafiltration

On-Line Hematocrit Monitoring

Blood Volume (% change)

Dialysis Time (hr)

-20
-10
0
10
20

0 1 2 3 4

1000 ml/hr
250 ml/hr
Clinical Evaluation of Ultrafiltration

Dr. Jong-Bok Lee and Kayo Kanakuba-2012
Clinical Evaluation of Ultrafiltration

- Changes in BV and venous $O_2$ saturation are sensitive & interactive predictors of a impending hemodynamic event
- Help to regulate the rate and volume of ultrafiltration
- Help predict ideal dry weight

UF = 110 ml/hr

UF = 80 ml/hr
Clinical Evaluation of Ultrafiltration

Ideal “Dry Weight”

✓ Weight at which additional fluid reduction would produce hypovolemia
✓ Weight at which ECF is physiologic
✓ Estimated at historical wt when the animal was normal
✓ Estimated with blood volume monitor
✓ Not static--changes over time
Hemodialysis Prescription
Dialysate Composition/Flow

Individualized to each patient & dialysis session:

✓ For IHD platforms, formulated from concentrates to achieve the desired treatment composition
✓ The dialysate is formulated to normalize disorders of plasma composition and minimize complications of dialysis
✓ Prescribe: Na\(^+\), K\(^+\), Ca\(^{++}\), HCO_3^- , additives, flow rate, flow direction, and temperature
Hemodialysis Prescription
Dialysate Composition—Sodium

Criteria for Sodium Prescription:
✓ Correct abnormalities in plasma Na$^+$
✓ Stabilize intradialytic hemodynamics
✓ Protect from dialysis disequilibrium
✓ Alleviate interdialysis complications: thirst, weight (fluid) gain, electrolyte shifts
Hemodialysis Prescription
Dialysate Composition--Sodium

Normotensive or hypertensive
✓ ≤145 mmol/L (dogs)
✓ ≤150 mmol/L (cat)

Predisposed to hypotension
✓ Sodium modeling (profiling)
  155:150:145 mmol/L (dog)
  160:155:150 mmol/L (cat)

Neutral Sodium Balance
Hemodialysis Prescription
Dialysate Composition--Sodium

155 mmol/L
150 mmol/L
145 mmol/L

Dialysate Sodium

Change in Blood Volume

Ultrafiltration: 500 ml
Sodium Modeling for Hemodynamic Stability (155:150:145 mmol/L)
Hemodialysis Prescription
Dialysate Composition--Sodium

Sodium Modeling for Dialysis Disequilibrium
(Na⁺: 150:155:160 mmol/L)

Dialysate Sodium Composition:
- Dialysate Sodium: 89 mOsm/kg (~60 mg/dl Urea)
- Serum Urea: 20 mOsm/kg

Graph showing the change in Serum Urea Nitrogen (mg/dl) and Dialysate Sodium (mmol/L) over time (hours) from 0 to 5 hours.
Serum Osmolality

425 mOsm/kg

335 mOsm/kg

+20 mOsm/kg (Na⁺)

Effective gap: 35 mOsm/kg (Na⁺)

Dialysis Disequilibrium Syndrome

Hemodialysis Prescription
Dialysate Composition--Sodium
Hemodialysis Prescription of Electrolyte Disorders

Mild Hyperkalemia
\( K^+ < 6 \) mEq/L

Moderate Hyperkalemia
\( K^+ = 6-8 \) mEq/L

Severe Hyperkalemia
\( K^+ > 8 \) mEq/L
Hemodialysis Prescription of Electrolyte Disorders

Within minutes of starting dialysis

✓ Increased HR
✓ Improvement in cardiotoxicity
✓ Reappearance of p-waves
✓ Short-term and long-term management

Predialysis (serum K\(^+\) = 9.6 mmol/L)

< 15 minutes hemodialysis
Hemodialysis Prescription of Electrolyte Disorders

Gromit 436223

**Potassium (mmol/L)**

- **Dialysate**
- **Serum**

**Qb = 110 mL/min**

**Qd = 20 mL/min**

**Time (min)**

- 0
- 60
- 120
- 180
- 240
- 300
- 360
- 420
- 480
- 540

**Potassium (mmol/L)**

- 0
- 2
- 4
- 6
- 8
- 10
Hemodialysis Prescription
Dialysate Composition--Potassium

Normal Potassium or Mild Hyperkalemia:
✓ Standard prescription is 3 mmol/L (3K)
✓ First half, 0K; Second half, 3K

Moderate or Severe Hyperkalemia (>7 mmol/L):
✓ Use 0 to 1.5 mmol/L K+
Bicarbonate-based dialysate
Generally prescribed at 25 to 35 mmol/L to load bicarbonate
Be cautious prescribing high bicarbonate in animals with respiratory alkalosis
Bicarbonate > 30 mmol/L will often cause panting