Good Assessment and Documentation Skills Can Lead to Improved Clinical Outcomes for Patients

Lynda K. Ball, MSN, RN, CNN
Objectives

1. Identify sources of non-dietary sodium that can potentially increase a patient’s blood pressure.

2. Discuss how oxygen needs impact a dialysis patient’s treatment.

3. Describe the impact of good physical assessment to achieve/exceed benchmark clinical quality indicators.

4. Explain how good documentation can legally protect staff.
I think we will have to lower your dry weight.

Source: Jazz Communications
Prescription

Definition:

- A written order, especially by a physician, for the preparation and administration of a medicine or other treatment.

Source: yourdictionary.com
In Dialysis....

- Dialyzer size
- Bath (e.g., 2 K+, 2.5 Ca++)
- Time
- Blood flow rate
- Needle gauge
- Medications
- Standing orders
Evaluating the Patient

Your tests reveal that you are retaining fluids!

Source: Jazz Communications
Nursing Considerations

• Assessment of patients on hemodialysis:
  ▪ Pre-dialysis
  ▪ Intradialytic
  ▪ Post-dialysis
• Sodium modeling
• Essential laboratory values
• Anemia management
• Hematocrit-based blood volume monitoring
• Morbidities and mortalities related to volume retention
• Patient education
• Correct weight documentation pre- and post-dialysis
Jugular Vein Distention

Source: emsbasics.com
Assessment for Edema

Source: osceskills.com

Source: imgbucket.com

Source: progressivehealth.com

Source: med-health.net
Lung & Heart Sounds

Source: Invivo.com
Relationship Between Ultrafiltration, Fluid Overload, Hypotension, and Dialysis Time

Source: Chazot & Jean, 2008
Intracellular Volume 28L
Extracellular Volume 11L
Intravascular Volume 5L

Source: S. Ahmad, MD
Symptomatic Hypotension

The “Crash”

Source: Meade, D.
Independent factors that increase mortality rates:

- Hypotension during dialysis; and
- Orthostatic hypotension post-dialysis.

(Shoji, Tsubakihara, Fujii, & Imai, 2004)
Causes of Death in Prevalent Dialysis Patients, 2008–2010

Source: USRDS, 2012
## Historical Perspective

<table>
<thead>
<tr>
<th></th>
<th>Sodium mEq/L</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kolff</td>
<td>126.6</td>
<td>• Longer Time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ↓ HTN 10 -30 %</td>
</tr>
<tr>
<td>1960</td>
<td>130 - 135</td>
<td>• ↓ Thirst</td>
</tr>
<tr>
<td>1970</td>
<td>130 - 135</td>
<td>• ↓ IDWG</td>
</tr>
<tr>
<td>1980</td>
<td>135 - 145</td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>&gt;140</td>
<td>• Shorter Time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ↓ Hypotension?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ↓ Muscle Cramps?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ↓ Disequilibrium Syndrome?</td>
</tr>
</tbody>
</table>

Source: Flannigan, 2004
Dialysis Outcomes and Practice Pattern Study (DOPPS) Comparison Data

Source: P. Held

Blood flow (mL/min)  HD Duration (min)  Fistula (%)

Japan
- Blood flow: 200 mL/min
- HD Duration: 240 min
- Fistula: 90.2%

Euro-DOPPS
- Blood flow: 300 mL/min
- HD Duration: 228 min
- Fistula: 73.7%

USA
- Blood flow: 400 mL/min
- HD Duration: 210 min
- Fistula: 19.9%

8/6/2014
High UF rates are associated with:

- Overall mortality in patients on hemodialysis when the UF rate is greater than 10-12 milliliters/kilogram/hour.
- Increased rate of patients with cardiovascular complications.
- Cardiac stunning and potential long-term cardiac damage and increased mortality.
- Increased rate of intradialytic hypotension.

YES!
Effects of Hypoxia During Dialysis

- Hypoxia
- Vasodilation
- Hypotension
- Ischemia
- Complications
- Anemia
  - CP
  - Ischemia
  - Complications
- Volume Overload
- Saline Bolus
- ↓ UFR

(Thorn et al., 2011; Gheuens et al., 2000; Diroll, 2013)
Myocardial Stunning

High Ultrafiltration Rates
- One liter fluid removal over 4o results in 5 times risk for stunning;
- Two liter fluid removal over 4o results in 26 times the risk for stunning

Intradialytic Hypotension (IDH)
- Causes low blood flow to the heart
- 25-30% occurrence
- IDH worsens in those patients with known congestive heart failure (CHF), and left ventricular hypertrophy (LVH)

Loss of Contractile Function
- Dialysis-induced myocardial stunning is associated with an increased rate of intradialytic and post dialytic ventricular arrhythmias
- Left ventricular regional wall motion abnormalities (RWMAs) occur

Cardiac Remodeling
- LVH occurs in 75% of patients on dialysis
- Reduced arterial compliance
- Impaired microcirculation

Myocardial Stunning
60% occurrence rate in HD patients

Source: McIntyre
THE IMPACT OF SODIUM
Etiology of Hypertension in Renal Disease

Etiology

• Excess fluid and sodium contributing to vascular volume overload
• Malfunction of the Renin-Angiotensin (R-A) System
Mr. Smith—we’ll have to watch your blood pressure.

Source: Jazz Communications
Management of Hypertension

- Management of hypertension needs to occur from several perspectives:
  - Control fluid and salt intake
  - Dialysis to remove fluid and sodium
  - Antihypertensive medications
  - Angiotensin-Converting Enzyme (ACE) Inhibitors to control the Renin-Angiotensin system
Electrolyte Imbalance
Sodium (Na+)

• Hypernatremia is too much sodium that can cause:
  ▪ Water in the cells to exit resulting in shriveling called crenation
  ▪ Tissue swelling or edema

• Hyponatremia is too little sodium that can cause:
  ▪ Water to move into the cells resulting in cell rupture called hemolysis.
Sodium

• Sodium is the leading cause of HTN and fluid retention.
• Sodium regulates water and fluid balance.
• Many foods, especially “fast foods” contain sodium, or are preserved with sodium.

85-90% of HTN is volume dependent

Source: Mailloux
The Romance of a Dialysis Lifetime

Na+ + H₂O = forever

Source: L. Ball
## High Sodium Foods

<table>
<thead>
<tr>
<th>Canned foods</th>
<th>Ham/bacon</th>
<th>Cold cuts</th>
<th>Dried fish</th>
<th>Pickles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast foods</td>
<td>Frozen foods</td>
<td>Garlic salt</td>
<td>Soy sauce</td>
<td>Bouillon cubes</td>
</tr>
<tr>
<td>Pretzels</td>
<td>Nuts</td>
<td>Popcorn</td>
<td>Crackers</td>
<td>Smoked meats</td>
</tr>
</tbody>
</table>

10/07/2014
Why Is Fluid Control So Important?

- Adherence to fluid restriction decreases risk of heart failure
- No matter how much IDWG is considered “acceptable,” time on dialysis limits the amount of fluid that can be safely removed for a given treatment.

### Symptoms of Fluid Build-up
- Shortness of breath
- Dizziness
- Nausea
- Headaches
- High Blood Pressure
- Damage to the heart
- Swelling
- Decreased appetite
- Fatigue

### Removal of Large Amounts of Fluid
- Low Blood Pressure
- Cramping
- Nausea and Vomiting
- Headaches
- Lightheadedness
- Trigger for life-threatening arrhythmias

Source: A. Dingle, RD
8/6/2014
The sources of non-dietary sodium for patients on dialysis include:

- The prime at the start of dialysis
- Saline flushes during dialysis
- Rinse back at the end of dialysis
- Medications
- Dialysate sodium
- Sodium modeling
- Hypertonic saline
RECOMMENDATIONS AND GUIDELINES
• Patients need to be assessed to see if the dialysis prescription is appropriate, including blood pressure and management of fluid status.
  ▪ Appraise each patient’s requirement for fluid management strategies;
  ▪ Examine trends over time;
  ▪ Avoid intradialytic complications; and
  ▪ Investigate potential barriers to managing volume status.

(Department of Health and Human Services, 2008)
Kidney Disease Outcomes Quality Initiative (KDOQI) CVD Guidelines state:

- Increasing the hematocrit with recombinant erythropoietin (rhEPO) can lead to several adverse side effects, including worsening of hypertension.

- Patients who are at greater risk for developing hypertension during rhEPO therapy are those with severe anemia, those in whom anemia is corrected too rapidly, and those with pre-existing hypertension.

- It has been suggested that blood pressure of less than 150/90 mmHg is a reasonable goal for most patients undergoing HD.
The *Nephrology Nursing Scope and Standards of Practice* section on Fluid Balance and Congestive Heart Failure lists the following six outcomes:

- The patient will be euvolemic and normotensive.
- The patient will be on minimal antihypertensive medications.
- The patient will not develop congestive heart failure.
- The patient will not be hospitalized for fluid related issues.
- The patient will maintain residual kidney function.
- The patient will demonstrate knowledge of the implications of optimal fluid balance.

(Gomez, 2011)
Other Recommendations

- The National High Blood Pressure Education Program Work Group on chronic renal failure and renovascular hypertension recommend a goal blood pressure of 130/85 mmHg.
- In a prospective study performed in the dialysis population, identified that a blood pressure of 140/90 mmHg minimized the occurrence of LVH and death (Foley et al., 1996).
“Volume Rollercoaster”

• Ideally, patients should leave each dialysis treatment at their dry weight.
• Unfortunately, excess fluid gains prevent achievement of dry weight:
  ▪ Non-adherence to dialysis prescription;
  ▪ Too-short dialysis duration; and/or
  ▪ Excess dietary sodium.
Scenario #1

Patient AB has a history of hypertension, and is on several antihypertensive medications. She has been on dialysis for two years. For the last two weeks, AB’s dialysis treatments have looked like following treatment sheet:

<table>
<thead>
<tr>
<th>Time</th>
<th>BP</th>
<th>BFR</th>
<th>VP</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0600</td>
<td>195/99</td>
<td>450</td>
<td>270</td>
<td>Dialysis initiated.</td>
</tr>
<tr>
<td>0630</td>
<td>200/99</td>
<td>450</td>
<td>270</td>
<td></td>
</tr>
<tr>
<td>0700</td>
<td>202/101</td>
<td>450</td>
<td>265</td>
<td>No c/o.</td>
</tr>
<tr>
<td>0730</td>
<td>203/104</td>
<td>450</td>
<td>275</td>
<td>RN notified of BP.</td>
</tr>
<tr>
<td>0800</td>
<td>205/103</td>
<td>450</td>
<td>268</td>
<td>EPO 3,000 units IV.</td>
</tr>
<tr>
<td>0830</td>
<td>208/110</td>
<td>450</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>0900</td>
<td>209/110</td>
<td>450</td>
<td>275</td>
<td>Dialysis completed.</td>
</tr>
</tbody>
</table>
Scenario #2

Mr. YZ has been in your dialysis unit for six years. He typically gains 4 kg during the week, and 8 kg over the weekend. He has a history of hypertension and diabetes. He is 8 kg over EDW. One of his treatment records is below:

<table>
<thead>
<tr>
<th>Time</th>
<th>BP</th>
<th>BFR</th>
<th>UFR</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>205/110</td>
<td>500</td>
<td>2.5</td>
<td>Dialysis initiated.</td>
</tr>
<tr>
<td>1030</td>
<td>200/108</td>
<td>500</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>1100</td>
<td>198/99</td>
<td>500</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>1130</td>
<td>184/94</td>
<td>500</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>185/90</td>
<td>400</td>
<td>1.5</td>
<td>Pt. c/o cramping.</td>
</tr>
<tr>
<td>1230</td>
<td>180/93</td>
<td>400</td>
<td>1.5</td>
<td>Pt. off early.</td>
</tr>
</tbody>
</table>
Tools to Improve Safe Fluid Removal

Source: A. Sinha
Lowering Dialysate Sodium Level

<table>
<thead>
<tr>
<th>Author</th>
<th>Intervention</th>
<th>IDWG</th>
<th>BP Control</th>
<th>ID BP Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cybulsky 1985</td>
<td>133, 144</td>
<td>Improved</td>
<td>Improved</td>
<td>Worsened</td>
</tr>
<tr>
<td>Song 2002</td>
<td>138, 140, 147</td>
<td>Improved</td>
<td>Improved</td>
<td>Worsened</td>
</tr>
<tr>
<td>DePaula 2004</td>
<td>138, adjusted</td>
<td>Improved</td>
<td>Improved</td>
<td>Improved</td>
</tr>
<tr>
<td>Oliver 2004</td>
<td>132, 137</td>
<td>Improved</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Thein 2007</td>
<td>138, 141</td>
<td>No change</td>
<td>Improved</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Five prospective studies (n>10)
Decrease of IDWGs and improvement of BP control
Increase in the risk of intradialytic hypotension (?)

Source: E. Ok
Sodium Neutral Modeling

• Sodium modeling when utilized should return the patients sodium level to a level equal to their plasma sodium “set-point.”

• Plasma sodium concentrations remain stable over time, which is why they are termed sodium set-points.

• Determine the plasma sodium model that best suits the patient to achieve baseline plasma sodium level at the end of treatment.
Sequential or Isolated Ultrafiltration

- No dialysate flow;
- Solute movement by convection ("drag" only);
- Extends treatment time; and
- Blood pressure assisted:
  - Decreased in temperature of the extracorporeal blood; and
  - Maintaining a high solute gradient.
Ultrafiltration Profiling

• Tapers the ultrafiltration rate to accommodate individual plasma refill rates (PRR).
• Can be used alone or in conjunction with sodium modeling.
• Segments represent period of time on treatment, and helps to correlate the appropriate profile.

Source: Ashai Kasei Medical
Patients’ Position During Dialysis

• Most Japanese and many European patients are dialyzed in beds in the supine position.

• Most U.S. patients are dialyzed while sitting in chairs:
  ▪ Psychologically patients would feel better.
  ▪ Would be more comfortable sitting in chairs.

• Sitting in a chair for a long time is uncomfortable:
  ▪ Translocation of body fluids to the lower extremities.
  ▪ Hypotensive episodes are more likely, especially during the second half of HD.
Additional Dialysis Treatment

• Minimizes complications during treatment, allowing patients to stay on their entire treatment.

• Focus:
  o Reduce stress on the heart
  o May decrease left ventricle hypertrophy
  o Gets patient back to their dry weight
  o Never state this will allow patients more freedom with fluids
Medication Evaluation

• Antihypertensives should be evaluated as a contributing factor to intradialytic hypotension. It is recommended that short-acting antihypertensives be avoided prior to dialysis.

• Osmotic agents:
  ▪ Hypertonic Saline (23.4% Na Cl)
  ▪ Dextrose 50% (not recommended in diabetics)
  ▪ Mannitol 25%
  ▪ Albumin
Modality Change

• A modality change should be considered when the patient is unable to tolerate adequate fluid removal to achieve euvolemia.
  ▪ Hemodiafiltration;
  ▪ Hemofiltration; or
  ▪ Peritoneal dialysis.
The Take Away Message...

Seek an Individualized Approach to Patient Care

Source: Shuttercock


References


References


For More Information

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www.network13.org
• New studies about different aspects of dialysis prescription

• New outcomes of dialysis patients

• Tools to implement dialysis prescriptions
• An alphabet soup of orders: Adequacy, BFR, Calcium bath, Dialysate sodium etc.

• On a regular basis each dialysis treatment has approximately 30 individual orders.

• Monthly orders: about 50 individual orders.
Most of the dialysis orders follow a protocol.

The orders that seems to affect the patient’s outcomes: BFR, Target Weight, Time of Dialysis, BP Control, Sodium Dialysate.
The prevalence of hypertension (defined as 1-week average pre-dialysis SBP >150 mmHg or DBP >85 mmHg or the use of antihypertensive medications) was noticed to be around 85% even in most recent trials (1).

Among HD patients, the relationship of BP with cardiovascular outcomes and mortality is still the subject of much controversy. The controversy relates to the specific relationship between the BP measurement times and technique (predialytic, postdialytic, or intradialytic BP measurements or interdialytic ambulatory BP) and outcomes. Studies suggest an association of high BP with strokes, cerebral atrophy, cardiovascular events, complex cardiac arrhythmias, the development of congestive heart failure, but not clear correlation with all-cause mortality. (4)
• There are many studies that suggest that low BP (SBP< 120mmHg) measured either predialysis or postdialysis is associated with increased mortality. 

• The phenomenon of lower BP being associated with increased mortality has been labeled as the reverse epidemiology of hypertension. This has raised concerns regarding the lowering of BP among hypertensive HD patients.
The management of dry weight poses several challenges.

First there is no universally agreed-upon definition of dry weight. Based on the most common definition, dry weight is the lowest tolerated post dialysis weight achieved via gradual change in post dialysis weight at which there are minimal signs or symptoms of either hypovolemia or hypervolemia.
• Physical examination is notoriously unreliable in excluding volume overload. For example, pedal edema does not correlate with fluid status of the patient very well.

• The assessment and achievement of dry weight is a continuous process that can often provoke uncomfortable intradialytic symptoms such as dizziness, cramping, nausea, and vomiting.
• Despite the challenge, patients benefit from attempting to reach the dry weight.

• In a recent randomized, controlled trial of hypertensive HD patients, dry weight was probed without changing the dialysis time \(^{(6)}\). Notably, in this study patients with obvious volume overload were excluded.
The effect of dry weight reduction on interdialytic ambulatory SBP and DBP in hypertensive HD patients.

Rajiv Agarwal et al. JASN 2014;25:1630-1646
• Studies among HD patients suggest that managing intradialytic relative plasma volume (RPV) may reduce the number of hospital admissions caused by fluid overload (7), improve BP control (8), and decrease hypotension-associated dialysis symptoms (9).

• However, there are studies that show the opposite outcomes: the multicenter randomized Crit-Line Intradialytic Monitoring Benefit (CLIMB) trial demonstrated that RPV-guided therapy was associated with worse outcomes, contrary to the original hypothesis (2).
• This shows that there are potential hazards related to probing dry weight too, such as an increased risk of clotted dialysis access, reduction in residual renal function, and complications related to intradialytic hypotension.

• Intradialytic hypotension can be complicated by cerebral hypoperfusion, seizures, myocardial dysfunction, and mesenteric ischemia. Furthermore, it has been associated with mortality.
• The pre-dialysis serum sodium concentration appears to be unaffected by the dialysate sodium concentration. The relationship between serum, dialysate sodium, and mortality appears to be variable. Further research is warranted to determine the biological mechanisms for these associations and to re-examine the total body sodium handling in hemodialysis (10).
Sodium Lowering In Dialysate (SoLID) trial: a randomized controlled trial of low(135) versus standard(140) dialysate sodium concentration during hemodialysis for the regression of left ventricular mass. The trial will evaluate the hypothesis that lower dialysate [Na+] during HD results in lower left ventricular (LV) mass.

Since its inception, observational evidence has suggested an increased mortality risk with lower dialysate [Na+], possibly due to exacerbation of intra-dialytic hypotension and subsequent myocardial injury.
DIALYSIS IS COMPLICATED

- Light box with words
- Place to hang things
- Pretty buttons
- White Thingys
- Patriotic buttons
- Parking brake
- Rolly things
• There is a continuous struggle to find the best dialysis prescription: not too wet/not too dry, not too high BP/ not too low BP, not too much salt / or not enough salt.

• Most will probably not find an answer for everybody but applications of current information to each dialysis patient, individualized care, will be most successful.

• “The heart of the matter - Cardiac adequacy in hemodialysis.”

• “The best Cardiologist for a dialysis patient is still the Nephrologist.”
• Mortality rates in end-stage renal disease (ESRD) and dialysis populations are declining even though they remain much higher than in the general population, according to the 2013 Annual Data Report from USRDS.

• The adjusted mortality rate among ESRD patients (per 1,000 patient years at risk) decreased from 351 in 1996 to 241 in 2011, a decline of 31.3%.

• The death rates fell by 15% in the first year of treatment in new patients, and by about 19% in prevalent patients—National Kidney Foundation News Release, March 26, 2015.
There are many reasons for the decline in death rates of the dialysis patient: better drug-based management of heart disease, higher vaccination rates, and changes in treatment of anemia, but overall the improvements seems to be related to better overall dialysis prescription.
• **The Most Common State Citations:**
  - 1. Dialysis
  - 2. Infection Control
  - 3. Administration
  - 4. Environment and Physical Plant
  - 5. ER

• **The Most Common Federal Citations:**
  - 1. Infection Control
  - 2. Patient Assessment
  - 3. Water Quality
  - 4. Physical Environment
  - 5. Plan of Care
• Why are dialysis orders not followed?
  - Nobody intentionally tries not to follow the orders.

• How can we solve/improve this problem?
  - Better dialysis order protocols, better and easier to access computer programs
  - Most important tools: **education, documentation, and communication**
DIALYSIS PRESCRIPTION

- **Education:**
  - Patients—by physicians, nurses, dieticians, etc.
  - Dialysis personnel—by physicians, nurses, educational programs etc.

- **Communication:**
  - Patients, physicians, nurses and dialysis personal

- **Documentation:**
  - Every change to the existing order
DIALYSIS PRESCRIPTION

• **EDUCATION:**
  - Team approach: nurses, physicians, dieticians, and social workers.
  - Sitting down rounds every month.

I don’t care what day it is. Four hours is four hours.
• **DOCUMENTATION:**
  - Is important from a practicing standpoint
  - Is important from the patient care standpoint, continuity of care, etc.
  - Needs to be easy to do.
• **COMUNICATION:**
  - The circle of trust:
  - Nurse $\rightarrow$ Patient $\rightarrow$ Physician $\rightarrow$ Dialysis Team
• Communication is essential in patient centered care not just with the physician, but with the patient and patient families.

• Technology, Transparency, and Attitude can improve dialysis practice for patients and dialysis units.
REFERENCES


REFERENCES


REFERENCES


• 10. Dialysate sodium, serum sodium and mortality in maintenance hemodialysis-Finnian R. McCausland, Steven M. Brunelli, and Sushrut S. Waikar-2012