Know Your Dialysis Patient

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2012 USRDS Annual Data Report

New patients
Nearly 117,000 people began treatment for end-stage renal disease (ESRD) in 2010.

Total patients
Nearly ten times more patients are now being treated for ESRD than in 1980.

2012
USRDS
ANNUAL
DATA
REPORT

1980
1 in 11,500
U.S. patients newly diagnosed with ESRD

2010
1 in 2,900

1980
1 in 3,450
U.S. patients being treated for ESRD

2010
1 in 570

per one million
nondia in X/10

new patients
total patients

401 2,048
374 1,879
337 1,731
310 1,575

Trends in ESRD Incident Rates, by Age and Race/Ethnicity

*Adjusted for gender and race.

**Adjusted for age and gender.

United States Renal Data System.
USRDS 2007 Annual Data

Primary Causes of Kidney Failure (2005)

- 43.8% Diabetes
- 26.8% High blood pressure
- 7.6% Glomerulonephritis
- 2.3% Cystic diseases
- 2.0% Urologic diseases
- 17.5% Other
# 5 Stages of CKD

## Table 2. Stages and Prevalence of CKD

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>GFR (mL/min/1.73 m²)</th>
<th>Prevalence*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kidney damage with normal or ↑ GFR</td>
<td>≥90</td>
<td>5,900</td>
</tr>
<tr>
<td>2</td>
<td>Kidney damage with mild ↓ GFR</td>
<td>60–89</td>
<td>5,300</td>
</tr>
<tr>
<td>3</td>
<td>Moderate ↓ GFR</td>
<td>30–59</td>
<td>7,600</td>
</tr>
<tr>
<td>4</td>
<td>Severe ↓ GFR</td>
<td>15–29</td>
<td>400</td>
</tr>
<tr>
<td>5</td>
<td>Kidney failure</td>
<td>&lt;15 or dialysis</td>
<td>300</td>
</tr>
</tbody>
</table>

*Data for Stages 1–4 from NHANES III (1988–1994). Population of 177 million with age ≥20 years. Data for Stage 5 from USRDS (1998) includes approximately 230,000 patients treated by dialysis, and assumes 70,000 additional patients not on dialysis. Percentages total >100% because NHANES III may not have included patients on dialysis. GFR estimated from serum creatinine using MDRD Study equation based on age, gender, race and calibration for serum creatinine.

*For Stages 1 and 2, kidney damage was assessed by spot albumin-to-creatinine ratio >17 mg/g (men) or >25 mg/g (women) on two measurements. Reproduced with permission."
Conditions Caused by ESRD

• Uremia
• Anemia
• Secondary Hyperparathyroidism
• Electrolyte Imbalance
• Bleeding Problems
• Fluid retention
Types of Dialysis

- Hemodialysis: in-center and home hemodialysis
- Peritoneal Dialysis
- Kidney transplant
- No treatment
What is Hemodialysis?

- Blood is pumped out of patient’s body via a catheter or an arm access
- Blood goes through an artificial kidney, or a dialyzer
- Exchanged blood returns to the patient
- Blood and dialysate remain in their own compartment, separated by a semipermeable membrane
Principles of Hemodialysis

• Diffusion
• Ultrafiltration
• Osmosis
Principle of Hemodialysis

- Ultrafiltration: movement of fluid through a filter as the result of hydraulic pressure.

**Diffusion**
(Solvent moves by concentration gradient)
Ultrafiltration
(Solution moves by pressure gradient)
Osmosis
(Water moves by concentration gradient)
Hemodialysis Schedule

• Three times a week, either M-W-F or T-TH-Sat
• 3 to 5 hours each time
Most Common Complications with HD

- Hypotension: 25% to 55% of treatments
- Cramps: 5% to 20%
- Nausea and vomiting: 5% to 15%
- Headache: 5%
- Chest pain: 2% to 5%
- Back pain: 2% to 5%
- Itching: 5%
- Fever and/or chills: less than 1%

Intradialytic Hypotension

Is the most common complication during dialysis.

• The speed of volume removal is faster than the speed of plasma refill. (remove too fast)
• The amount of volume removal is more than the amount of volume in the vasculature. Pt. is at or below the estimated dry weight. (remove too much)
• Infection
• Antihypertensive medication
• Lab values: low Hgb, hypocalcemia, hypoglycemia
• Large meal before or during dialysis
• Low dialysate Na
Intradialytic Hypotension

Cardiac factors
• Diastolic dysfunction
• Arrhythmia (A-fib)
• Ischemia

Uncommon causes
• Dialyzer reaction
• Hemolysis
• Air embolism
Intradialytic Cramping

- Excessive or rapid fluid removal
- Hypo-osmolarity
- Electrolyte disorders or imbalances: low Na, Ca, K, Mg
Dialysis Disequilibrium Syndrome

- is due to water movement into the brain as a result of a reverse osmotic shift induced by urea removal.

- BUN in the blood if reduced more rapidly than the concentration in the cerebrospinal fluid and brain tissue due to the relatively slow transport of urea across the blood–brain barrier in the CSF.

- Osmolarity in the CSF falls more slowly than in the blood, leading to water movement into the brain which causes cerebral edema.
Dialysis Disequilibrium Syndrome

• Most likely to occur on acute dialysis patient or new CKD patients who initiating dialysis treatment

• Less likely to occur in patients on chronic dialysis unless they are under-dialytized for various reason such as poor access, skipping dialysis.
Intradialytic Chest Pain

- Hypotension
- Angina (high incidents of CAD in dialysis population)
- Hemolysis (overheating dialysate, contaminated water supply)
- Red blood cell trauma due to poor access
- Air embolism: rare but could happen.
Arrhythmias

- common during and between dialysis treatment.
- Published frequency ranges 5 to 75%
- Causes: advanced age, CAD, myocardial dysfunction, left ventricular hypertrophy, electrolyte imbalance, rapid fluctuation of volume and electrolyte concentration

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Hemodialysis Access

• External
• Internal
External HD Access

- Temporary catheter: non-tunneled, in hospital usage only
- Cuffed and tunneled catheter: for short term use until AVF is ready to be used or on patients who can not have AV fistula or graft placement.
Common Sites of HD Catheter

- Internal jugular vein: most common
- Femoral vein
- Subclavian vein
Internal HD Access

• Fistula: is made by surgically linking an artery to a vein. 8-12 weeks to mature
• Graft: is an artificial blood vessel used to connect an artery and a vein. It can be used in 2-4 weeks.
• Dialysis Port: not being placed in Madison area.
Arterial Venous Dialysis Fistula
Arteriovenous Fistula

Arteriovenous Graft
HD Access is Patient’s Life Line

• Without a functional HD access, patient will not be able to receive life-saving treatment.
• Use HD access as the last resort
What is Peritoneal Dialysis?

- PD uses the inner lining of the abdomen (the *peritoneum*) as a dialysis filter. The peritoneum is lined with tiny blood vessels. Wastes and extra water in the blood can flow out of these blood vessels, through the peritoneum, and into special fluid (dialysate) into the abdomen. Then the fluid and waste are drained out of the body.
The catheter is usually placed about 1 inch below and to the side of the navel. It is about 1/4-inch in diameter. Only 4 – 6 inches of it are outside of your body. You and your doctor can plan where to place the catheter so that it is comfortable and hidden by clothing.
Physical Characteristics of ESRD Patients?

- Malnutrition
- Anemia
- Renal bone disease
- CHF
- Cardiac Hypertrophy
Psychological Characteristics of Hemodialysis Patients

- Anxiety
- Depression
- Need for assistance with ADL’s
- Feeling of loss of control
- Impaired food intake
- Non-Adherence
Implications for Paramedics in Caring for HD Patients in Crisis

- HD catheter
- Fistula or graft
- Hypotension
- Blood sugar
- Hyperkalemia
- Bleeding
HD Catheter

- Can be used during crisis, but only as the last resort
- Perform aseptic technique, soak and scrub the connector with betadine or Alcavis (sodium hypochlorite) or Exidine (chlorhexadine gluconate), wear gloves and mask when access the catheter ports. Scrub with alcohol pad for Tego caps.
- Aspirate 5 ml from each port and discard it before using it
- After use, flush with minimal 10 ml N.S and dwell the ports with 1000 unit/ml heparin or 4% citrate at the volume of 0.2 ml overfill the volume printed on the catheter. Do not need dwelling after NS flush with Tego caps.
Problems Associated with HD catheter

- Infection: the #2 cause of death in dialysis patients.
- Malfunction: poor flow, poor dialysis or unable to do dialysis which requires exchanges
Fistula or graft

- It is patient’s life line which requires long term investment. Should not be used by any personnel other than HD staff
- Should not have BP cuff on that extremity
- Avoid any pressure that will restrict the blood flow of the access extremity
- Avoid blood drawn on that extremity
Hypotension

- Is the most common complication with HD or direct after HD, often volume related
- It’s reversed by fluid bolus
- It could be the combination of infection, fluid depletion and antihypertensive medication
- Hypotension before HD: infection, volume overload on pt. with cardiomyopathy
Crisis Response

• When responding to a patient with known HD history, suspect blood sugar abnormality or hyperkalemia
• Do not infuse any IV fluids that contain potassium
• Communicate with HD staff about the treatment: such as how much fluids removed, BP, K bath etc.
Access Bleeding

• Dislodgement of the IJ catheter: apply direct pressure to the catheter entry site

• Fistula or graft needle site bleeding: apply direct continuous pressure to the needle site for about 10-15 minutes or until bleeding stops. If hematoma at AV fistula or AV graft grows fast and rapid, cont. holding steady pressure, take patient to ER.
Problems Associated with Missed Dialysis Treatment

- Hyperkalemia: muscle weakness or paralysis, EKG changes (tall peaked T waves with a shortened QT interval—early finding K-6’s, prolonged PR interval and QRS duration K-7’s, absent of P wave and widened QRS complex K8’s)
- Volume overload: SOB, hypertension, hypotension (heart failure patients), pulmonary edema, CHF
- Lethargic: uremic syndrome
- Anemic: not receiving erythropoietin regularly