That disclosure slide...

• I have no financial or other disclosures and will not discuss off label use of any medication.
Learning Objectives

• Identity renal replacement therapy options for patients with end stage renal disease (ESRD).
Self Assessment Questions

• 1. Renal replacement therapy should be considered if the patient is experiencing:
  o A. Hyperkalemia
  o B. Metabolic acidosis
  o C. Fluid overload
  o D. All of the above

• 2. Types of Hemodialysis access include:
  o A. Fistula
  o B. Graft
  o C. Catheter
  o D. All of the above
Indications for Renal Replacement Therapy

• Hyperkalemia*
• Metabolic acidosis*
• Fluid overload (recurrent CHF admissions)*
• Uremic pericarditis (rub)
• Other non specific uremic symptoms: anorexia and nausea, impaired nutritional status, increased sleepiness, and decreased energy level, attentiveness, and cognitive tasking, …

*Refractory to medical management
Treatment Options for Kidney Failure

- Hemodialysis
- Peritoneal Dialysis
- Kidney Transplant
- ESRD
- Comfort Care

ESRD, end-stage renal disease
Treatment Options for Kidney Failure

ESRD

Hemodialysis

Kidney Transplant

Peritoneal Dialysis

Comfort Care
Dialysis Options

Dialysis

In-Center (dialysis clinic)
- In-Center Hemodialysis
  - 3 x week
  - Nocturnal

Home
- Peritoneal Dialysis
  - Manual (CAPD)
  - Cycler (CCPD)
- Home Hemodialysis
  - 3-5 x/week
  - Day or nocturnal
What is the most common modality to replace kidney function?

A. In-Center(clinic) Hemodialysis

B. Peritoneal Dialysis

C. Transplantation

D. Home hemodialysis
Incident Patient Counts (USRDS) by 1st Modality

Trends in the number of incident cases of ESRD, in thousands, by modality, in the U.S. population, 1980-2012
Proper Referral & Education

• Proper (formerly early) Referral to nephrology:
  o When eGFR < 30 ml/min/1.73 m²

• Education about renal replacement therapy:
  o Kidney Transplantation
    • Refer to transplant center
      • when eGFR < 20 ml/min/1.73 m²
    • Even transplant before dialysis initiation (pre-emptive)
    • Living kidney transplant (family, friends, facebook)
    • Build time on list before dialysis initiation
  o Hemodialysis (No catheters please including PICCs)
  o Peritoneal Dialysis (The only catheter you want)
Advantages of Proper Referral

- Greater use of transplantation and home dialysis
- Fewer venous (hemo) catheters
- More peritoneal catheters
- Avoid emergent hemodialysis initiation
  - Back to the catheter issue again...
  - Takes away patient choice
- Better medication management
- More time to counsel patients
  - Challenging life transition
Multidisciplinary Care in Progressive CKD

• Patient Education and counseling
  o We all need to contribute
• Protocols for laboratory and clinic visits
  o Decrease variation-use best practices!
  o Pharmacists/nurses/dietitians are probably best
• Ethical, psychological, and social care
  o Did you discuss the option of no RRT?
  o Does the patient have a health care directive?
  o Social workers know the available resources
• Dietary/lifestyle modifications
  o Dietitians are best at this...
• Vaccination program
  o We all should heavily promote (even republicans)
Hemodialysis (HD)
Principle of Hemodialysis

Hemodialysis machine
Unfiltered blood flows to dialyzer
Filtered blood flows back to body

Hemodialyzer (Where filtering takes place)

Vein
Artery

From dialyzer
To dialyzer

National Kidney Foundation
Hemodialysis Filter (Dialyzer)

Blood enters the dialyzer from your body.

Dialysate is a special fluid that takes waste from the blood.

A membrane keeps blood and dialysate from mixing, but lets waste pass through.

Waste moves through the membrane from the blood into the dialysate.

Cleansed blood returns to your body.
Solute Mass Transfer During Hemodialysis

Harmon W, Jabs K: Hemodialysis (chap 77) in Pediatric Nephrology, 4th ed
Barratt, Avner, Harmon (ed) Lippincott, 1999
A patient with advanced CKD has opted for home-hemodialysis. Which type of vascular access is associated with better outcomes in hemodialysis patients?

A. Hemodialysis catheter

B. Arteriovenous graft

C. Arteriovenous fistula

D. Temporary central venous catheter
Hemodialysis Access

• Provides access to bloodstream for dialysis

• One of the most challenging aspects of dialysis
  o Stenosis
  o Thrombosis

• Truly a “lifeline”
  o Patients run out of access sites!
  o No PICCs, blood draws, BP on non-dominant arm
  o More on this later
Hemodialysis Vascular Access

- Polytetrafluoroethylene (PTFE)

**Diagram:**
- Vein
- Fistula
- Artery
- Graft

**Double-lumen, cuffed hemodialysis catheter**
- Catheter
- Catheter cuff
- Adapters
Hemodialysis Access

- **AV Fistula**
  - Vein cross-cut, attached end-to-side to artery
  - High-pressure flow dilates and thickens vein
  - Best alternative:
    - Lowest infectious risk
    - Longest lasting with least thromboses
  - **Drawbacks**
    - Takes 2-4 months to mature
    - Only about 50% ever mature
  - Goal for all hemodialysis patients
Hemodialysis Access

• AV Graft
  o Tube made of biocompatible material (gortex) attached end-to-side to artery and vein
  o Often required in patients with vascular disease, occluded distal veins
  o Advantages
    • Ready to use when swelling resolves (~2 weeks)
    • Able to use in most patients
  o Disadvantages
    • High stenosis/thrombosis
    • Moderate infectious risk
Hemodialysis Access

• Catheter (Internal jugular [IJ] most common)
  o Tunnelled under skin to reduce communication from skin flora with blood
  o Advantages
    • Ready for use immediately
  o Disadvantages
    • High infectious risk
    • High thrombosis risk
    • A/W increased mortality
      • Can be a sign of poor pre-dialysis care or extensive vascular disease
SAVE the Non-Dominant ARM for Vascular Access

• When GFR < 30 mL/min
  o No BP measurement
  o No IV
  o No Blood Draws
  o No PICCs

• Place vascular access within a year of hemodialysis anticipation ...

Not on Non-Dominant Arm, please!
Peritoneal Dialysis (PD)
Principles of PD Treatment
PD Treatment

- Water molecules
- Blood cells
- Positive pressure
- Negative pressure
Kidney Transplantation
Stay Tuned!
Thanks, but no thanks...Choosing not to start or to stop dialysis

To cure sometimes, to relieve often, and to comfort always—this is our work.

-Anonymous
For people >80yo, which disease has the highest mortality?

A. ESKD on dialysis

B. Cancer

C. CHF

D. AMI
Adjusted all-cause mortality in 2012 Age 80+
Where do dialysis patients die?

ESRD vs. other conditions (adapted from Wong et al., 2012)
Where do dialysis patients want to die?

A. Hospital
B. ICU
C. Dialysis unit
D. Home
In the last month of life...

- 80% of dialysis patients hospitalized
  - 50% are in the ICU
  - 30% received aggressive/invasive procedures
  - 20% referred to hospice
    - < half the national average

- 75% of dialysis patients do not want to die in the hospital
Take Home Points

• Planning ahead (proper referral) is key to improve outcomes for dialysis patients
• Education allows patients to get the care that’s right for them
• Hemodialysis catheters associated with mortality
• Hospice referral is underutilized
• Multidisciplinary team approach to care is required for improved outcomes
Self Assessment Questions

1. Renal replacement therapy should be considered if the patient is experiencing:
   - A. Hyperkalemia
   - B. Metabolic acidosis
   - C. Fluid overload
   - D. *All of the above*

Rationale: Dialysis can help regulate potassium, acid/base balance and fluid. When the kidneys can no longer balance, renal replacement therapy should be considered.

2. Types of Hemodialysis access include:
   - A. Fistula
   - B. Graft
   - C. Catheter
   - D. *All of the above*

Rationale: Fistulas, grafts, and catheters are all established types of hemodialysis access.
Questions and Answers
Additional Resources

  https://www.kidney.org/professionals/guidelines/guidelines_comments

  http://optn.transplant.hrsa.gov/converge/latestData/rptData.asp

  http://www.usrds.org/