



National  
Kidney  
Foundation®

# Renal Replacement Therapy: Options and Choices

Marc L. Weber, M.D.  
Nephrologist  
University of Minnesota  
Minneapolis, MN

# That disclosure slide...

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



# Learning Objectives

- Identify renal replacement therapy options for patients with end stage renal disease (ESRD).



# Self Assessment Questions

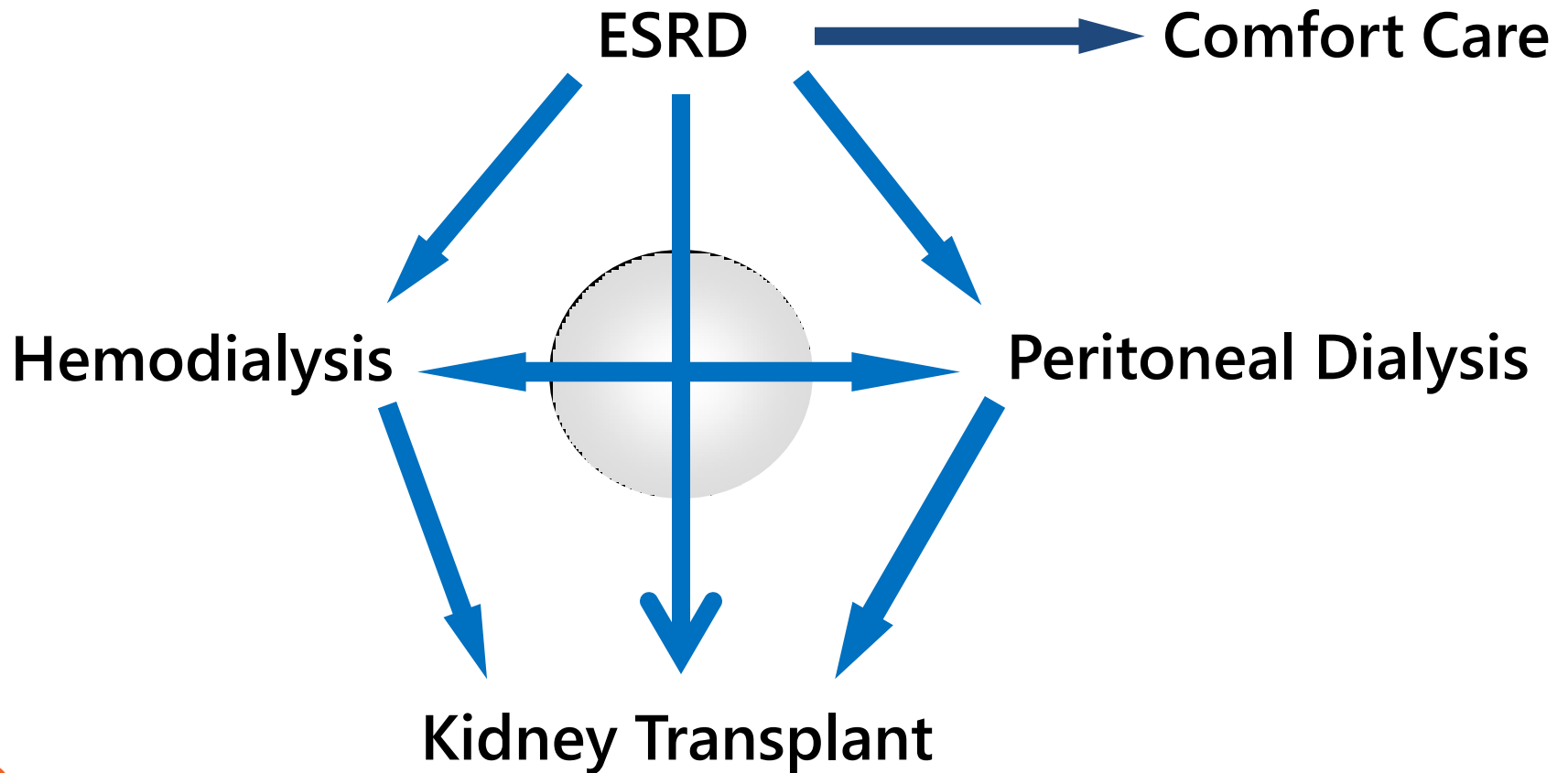
- 1. Renal replacement therapy should be considered if the patient is experiencing:
  - A. Hyperkalemia
  - B. Metabolic acidosis
  - C. Fluid overload
  - D. All of the above
- 2. Types of Hemodialysis access include:
  - A. Fistula
  - B. Graft
  - C. Catheter
  - D. All of the above



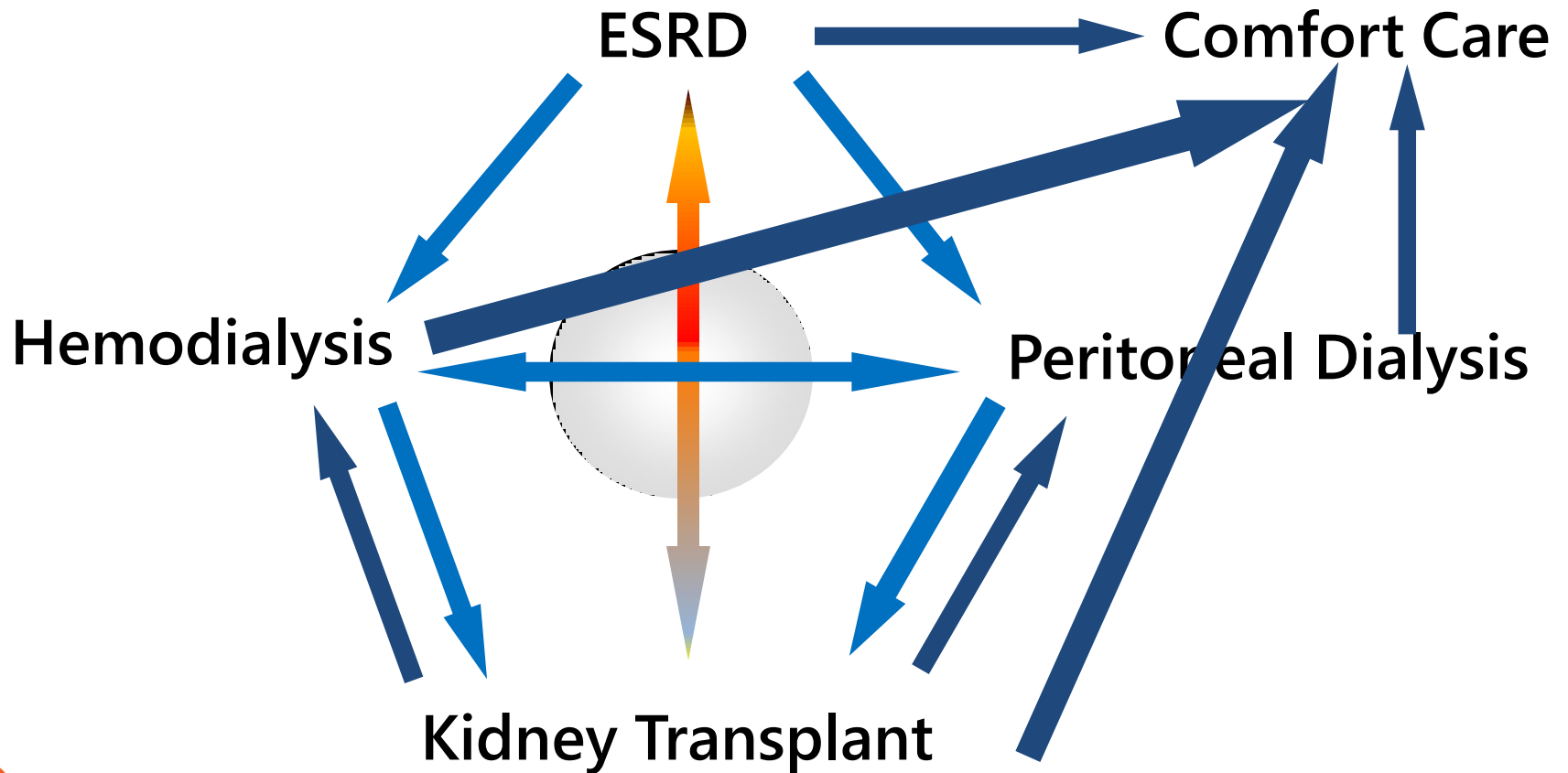
# Indications for Renal Replacement Therapy

- 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, ...

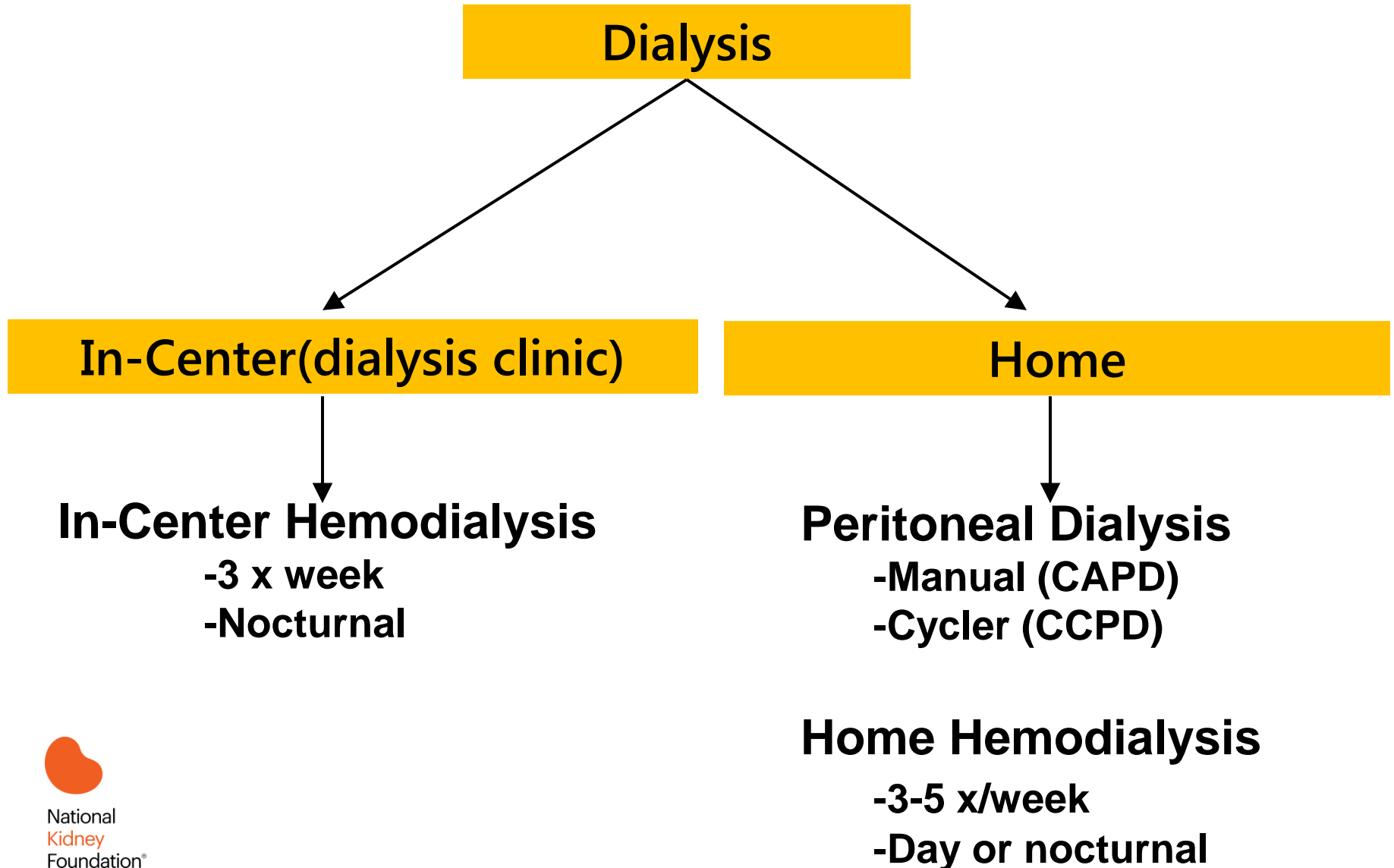
# Treatment Options for Kidney Failure



# Treatment Options for Kidney Failure



# Dialysis Options



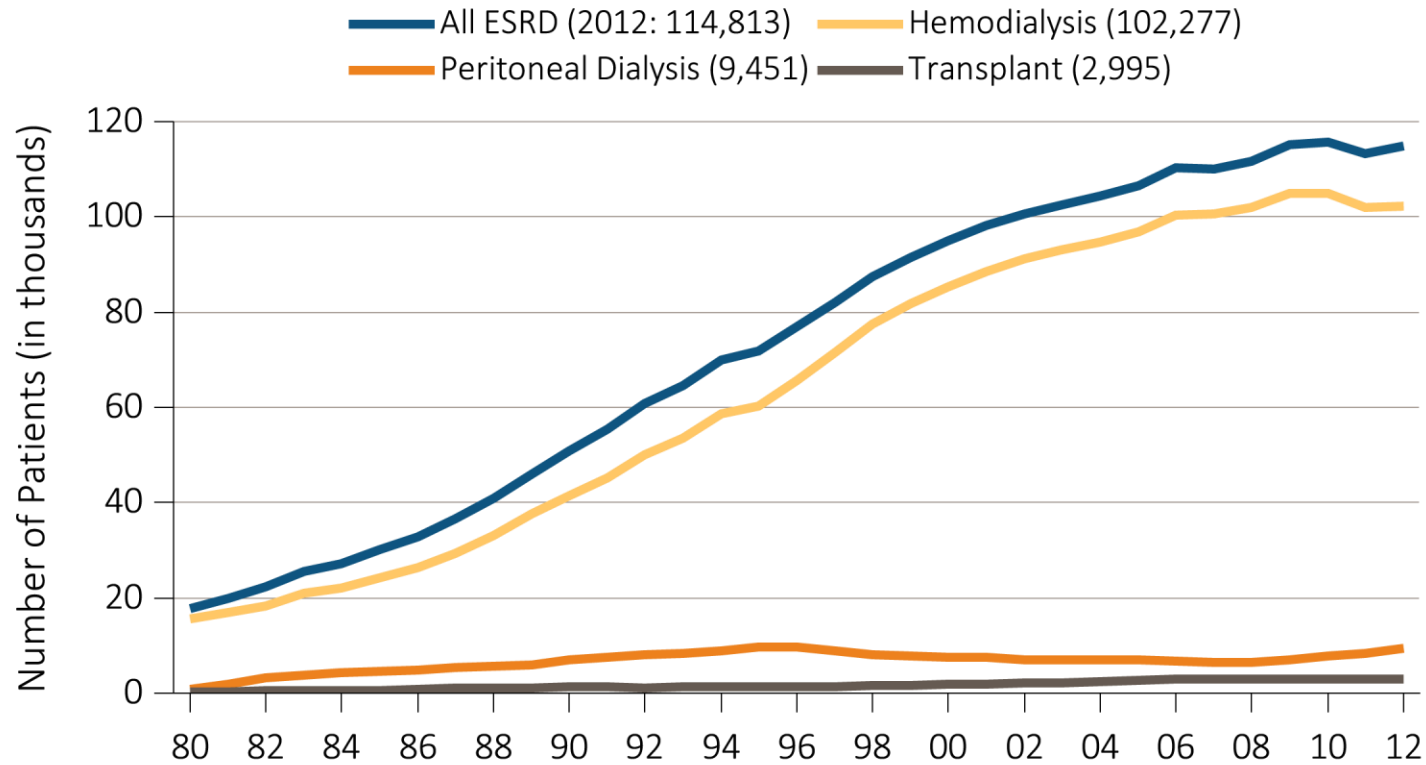


# What is the most common modality to replace kidney function?

- 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:
  - When eGFR < 30 ml/min/1.73 m<sup>2</sup>
- Education about renal replacement therapy:
  - Kidney Transplantation
    - Refer to transplant center
      - when eGFR < 20 ml/min/1.73 m<sup>2</sup>
    - Even transplant before dialysis initiation (pre-emptive)
    - Living kidney transplant (family, friends, facebook)
    - Build time on list before dialysis initiation
  - Hemodialysis (No catheters please including PICCs)
  - 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

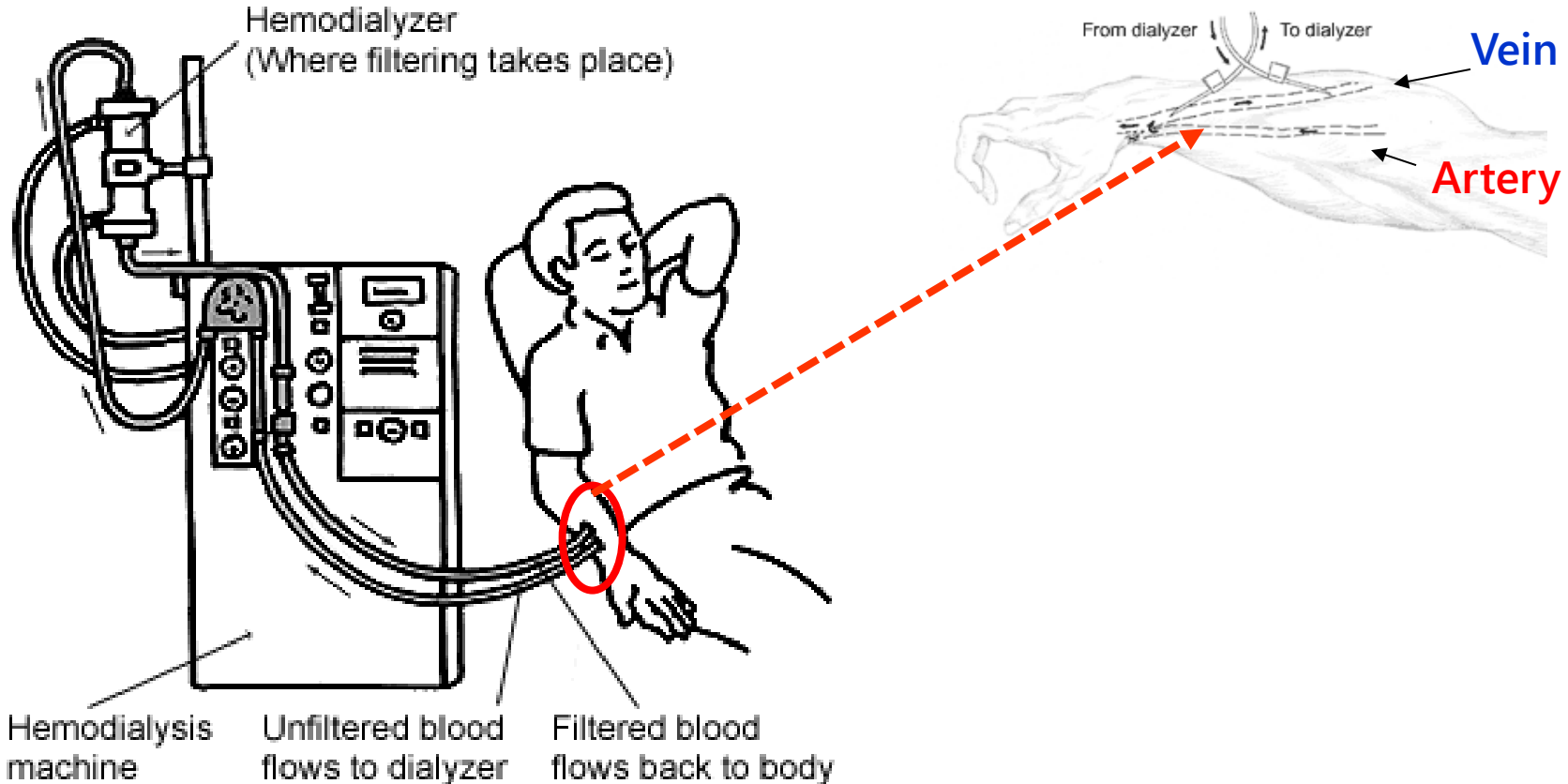
- Patient Education and counseling
  - We all need to contribute
- Protocols for laboratory and clinic visits
  - Decrease variation-use best practices!
  - Pharmacists/nurses/dietitians are probably best
- Ethical, psychological, and social care
  - Did you discuss the option of no RRT?
  - Does the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



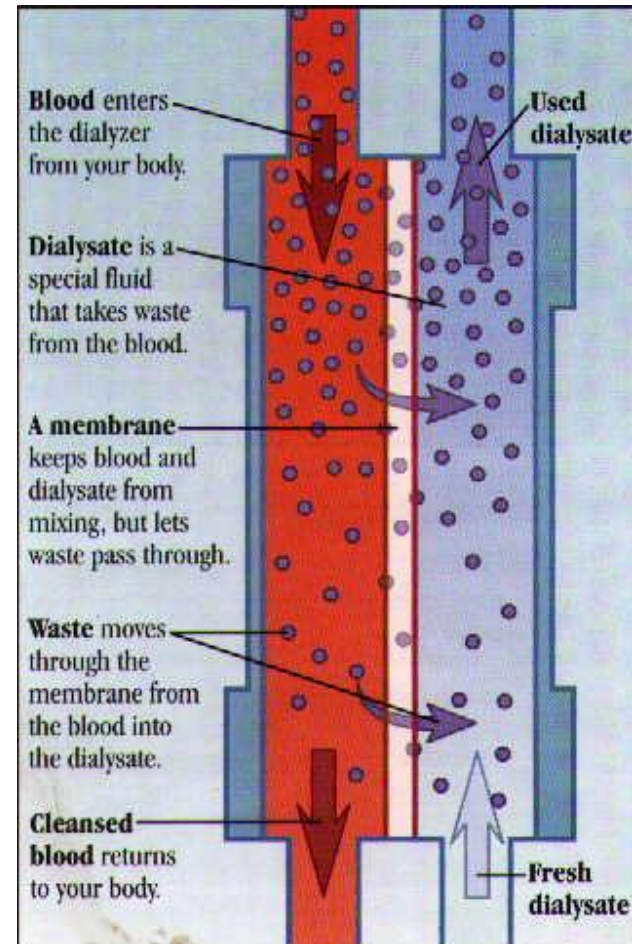
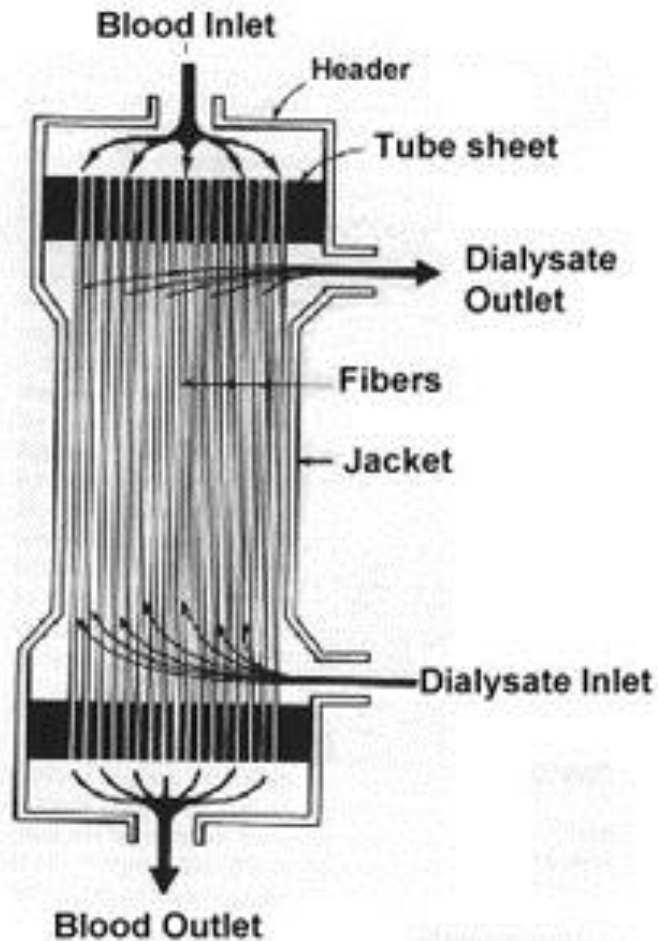
# Hemodialysis (HD)



# Principle of Hemodialysis

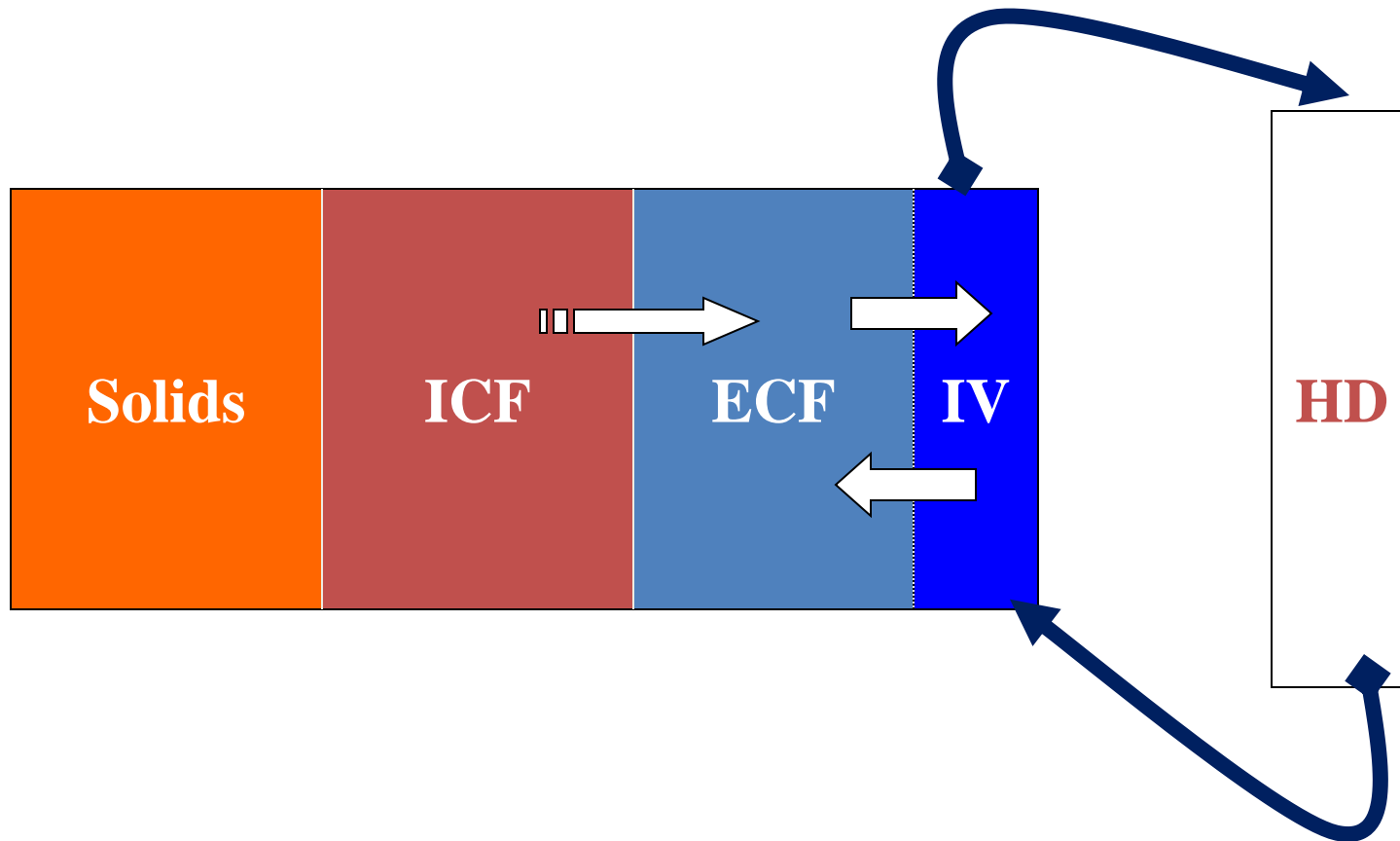


# Hemodialysis Filter (Dialyzer)





# Solute Mass Transfer During Hemodialysis



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

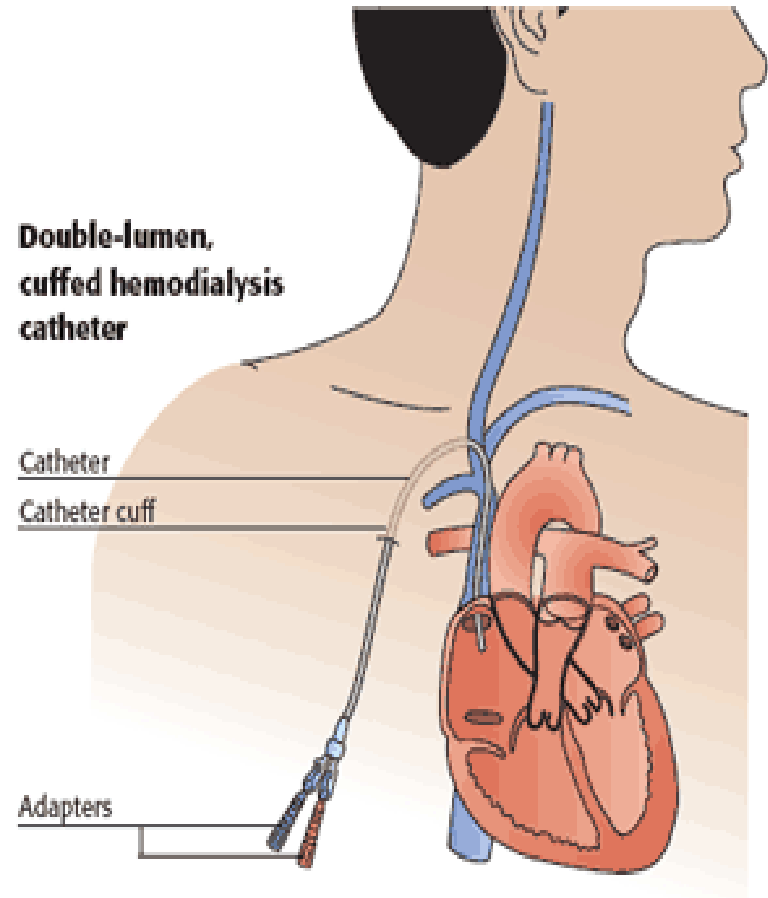
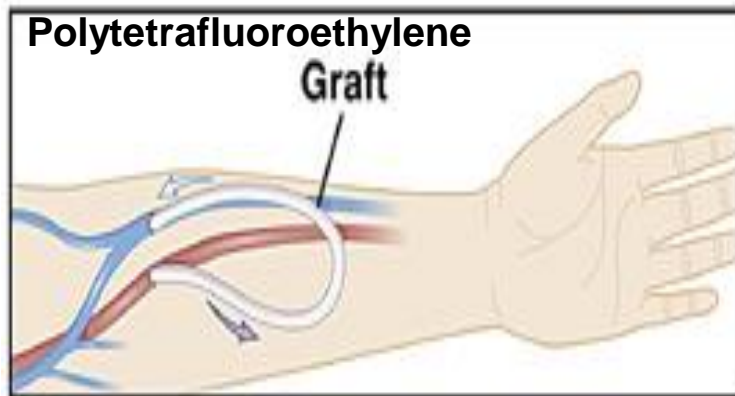
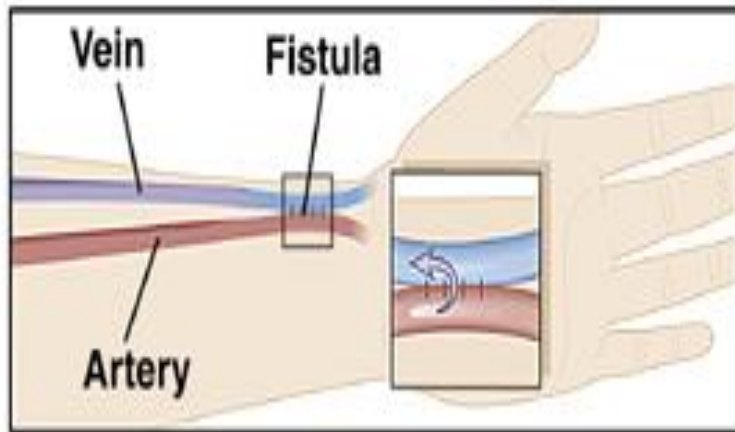


# Hemodialysis Access

- Provides access to bloodstream for dialysis
- One of the most challenging aspects of dialysis
  - Stenosis
  - Thrombosis
- Truly a “lifeline”
  - Patients run out of access sites!
  - No PICCs, blood draws, BP on non-dominant arm
  - More on this later



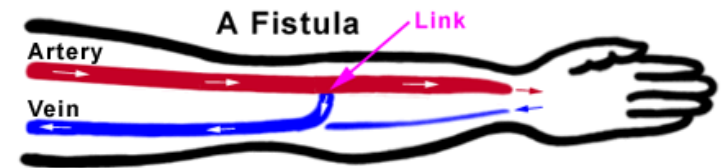
# Hemodialysis Vascular Access



# Hemodialysis Access

- AV Fistula

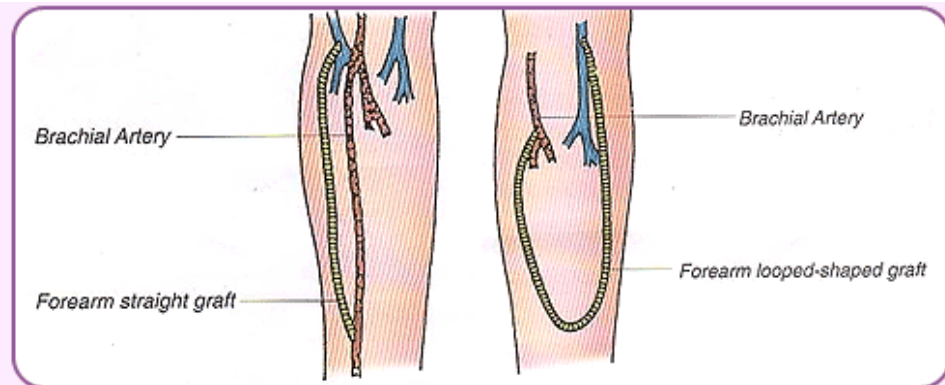
- Vein cross-cut, attached end-to-side to artery
- High-pressure flow dilates and thickens vein
- Best alternative:
  - Lowest infectious risk
  - Longest lasting with least thromboses
- Drawbacks
  - Takes 2-4 months to mature
  - Only about 50% ever mature
- Goal for all hemodialysis patients



# Hemodialysis Access

- AV Graft

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



# Hemodialysis Access

- Catheter (Internal jugular [IJ] most common)
  - Tunnelled under skin to reduce communication from skin flora with blood
  - Advantages
    - Ready for use immediately
  - 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
  - No BP measurement
  - No IV
  - No Blood Draws
  - No PICCs
- Place vascular access within a year of hemodialysis anticipation ...

***Not on Non-Dominant Arm, please!***

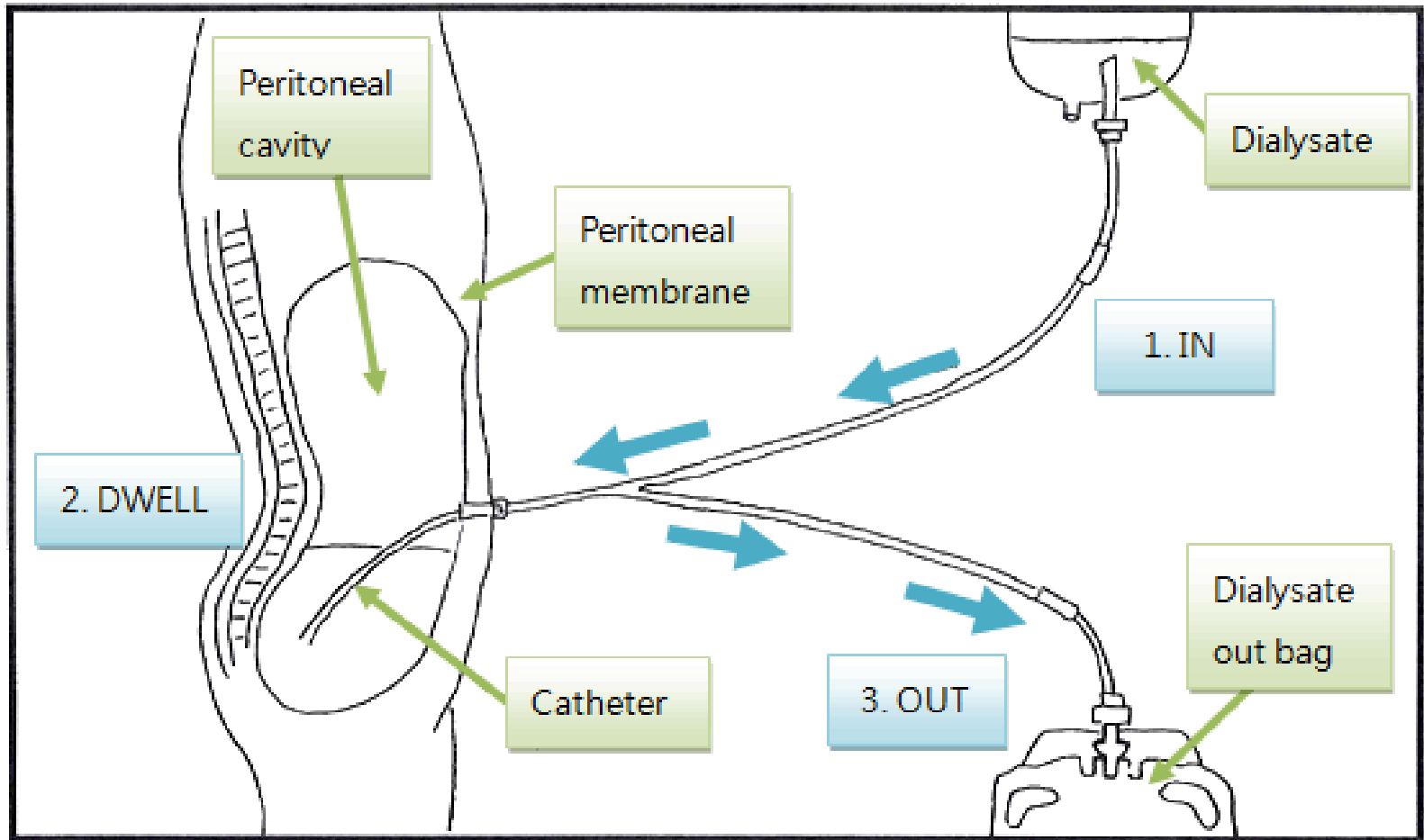




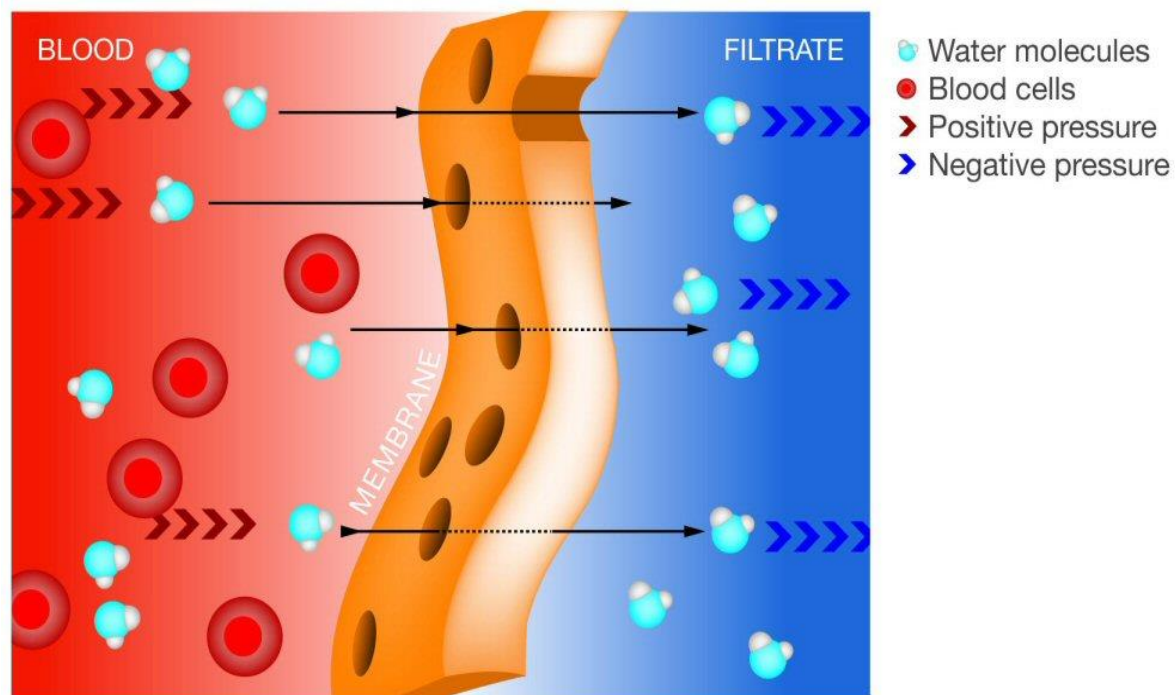
# Peritoneal Dialysis (PD)



# Principles of PD Treatment



# PD Treatment



# 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

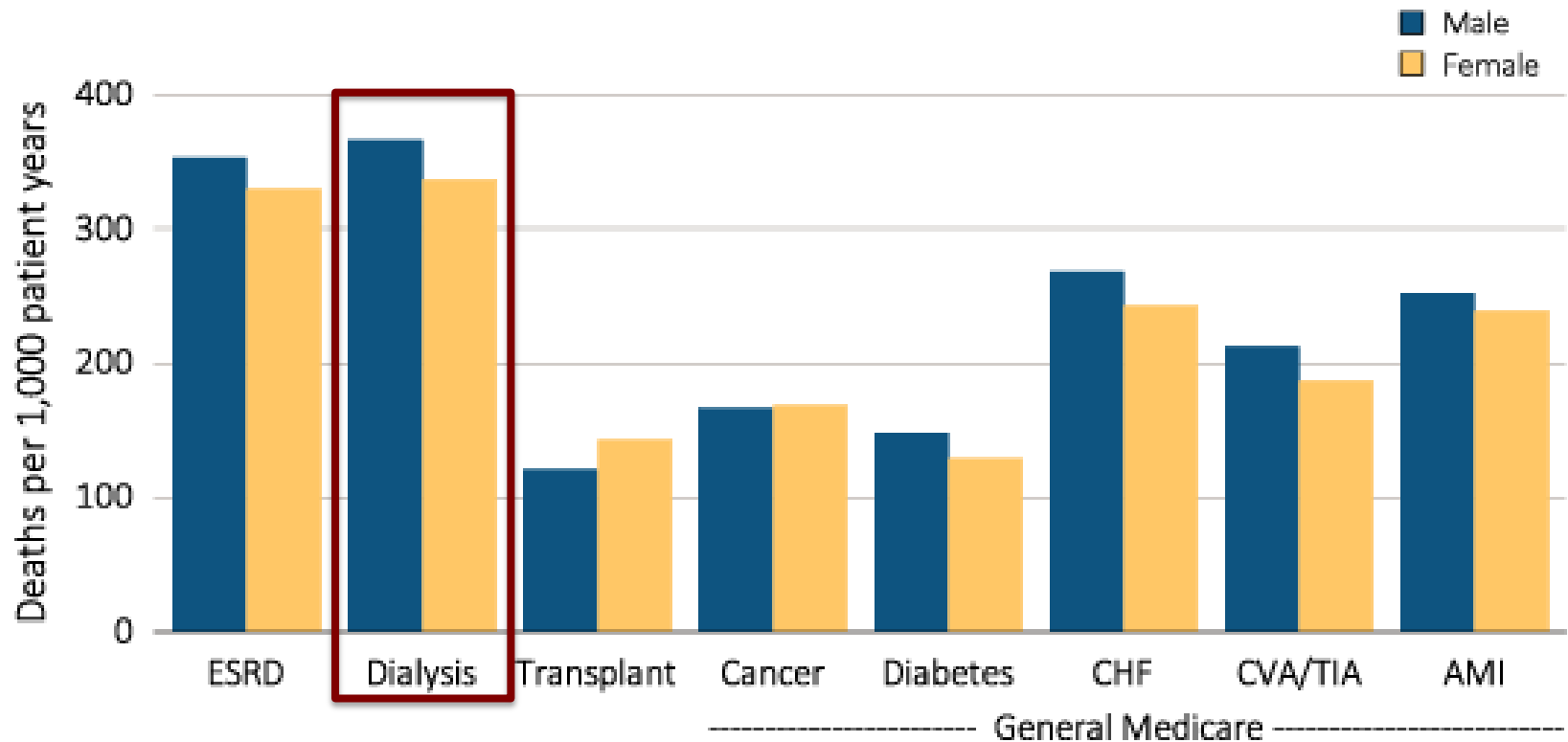
B. Cancer

C. CHF

D. AMI

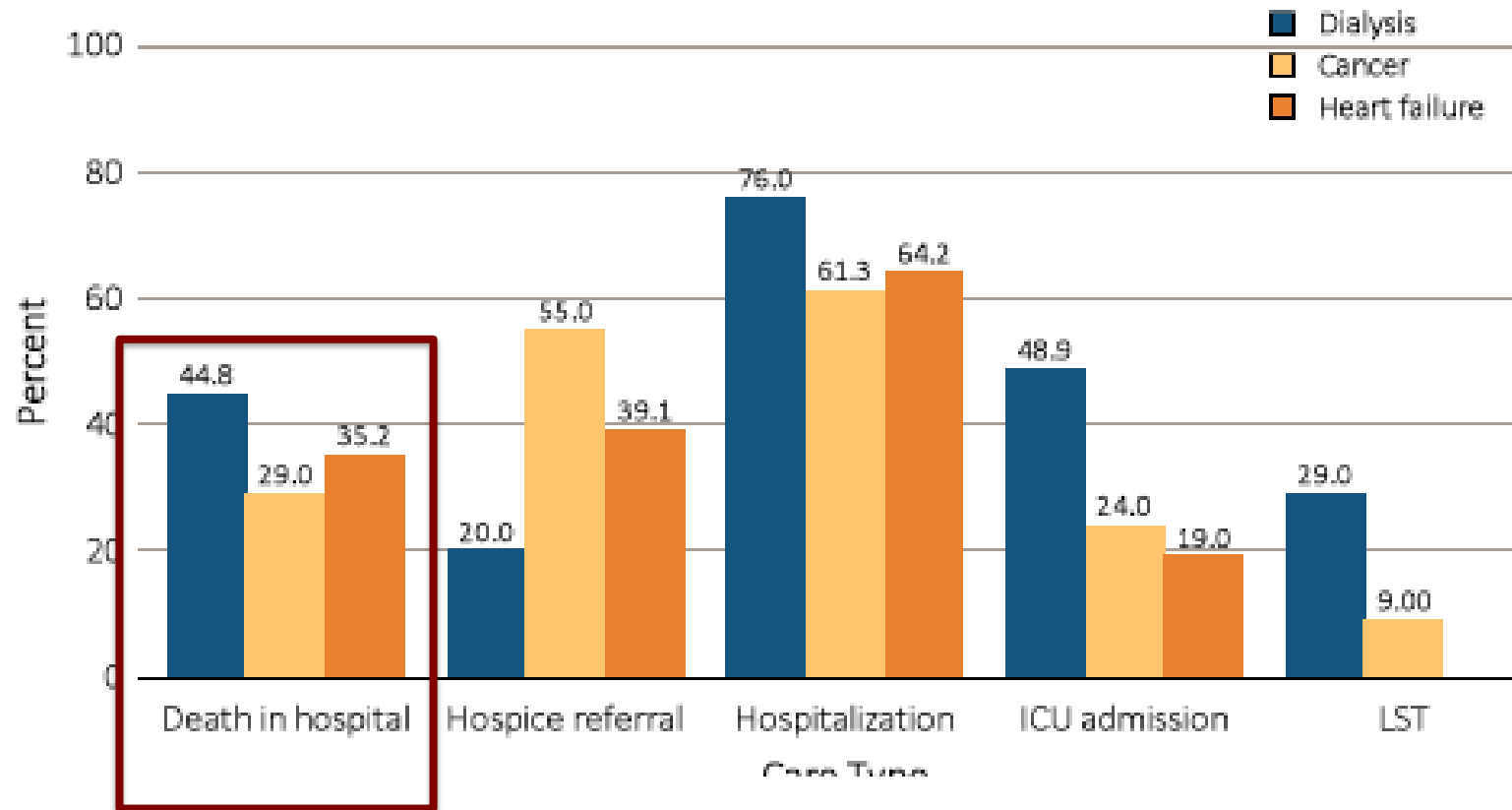


# Adjusted all-cause mortality in 2012 Age 80+



# 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

- National Kidney Foundation (2006). Kidney disease outcomes quality initiative.

[https://www.kidney.org/professionals/guidelines/guidelines\\_comments](https://www.kidney.org/professionals/guidelines/guidelines_comments)

- US Department of Health and Human Services (2004). Annual report of the U.S. organ procurement and transplantation network and the scientific registry of transplant recipients: Transplant data 1994-2003.

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

- United States Renal Data Systems (2014). Annual data report.

<http://www.usrds.org/>

