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3rd Annual ESRD New England Fall Meeting

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A Case for Home Hemodialysis

Sponsorship Disclosure

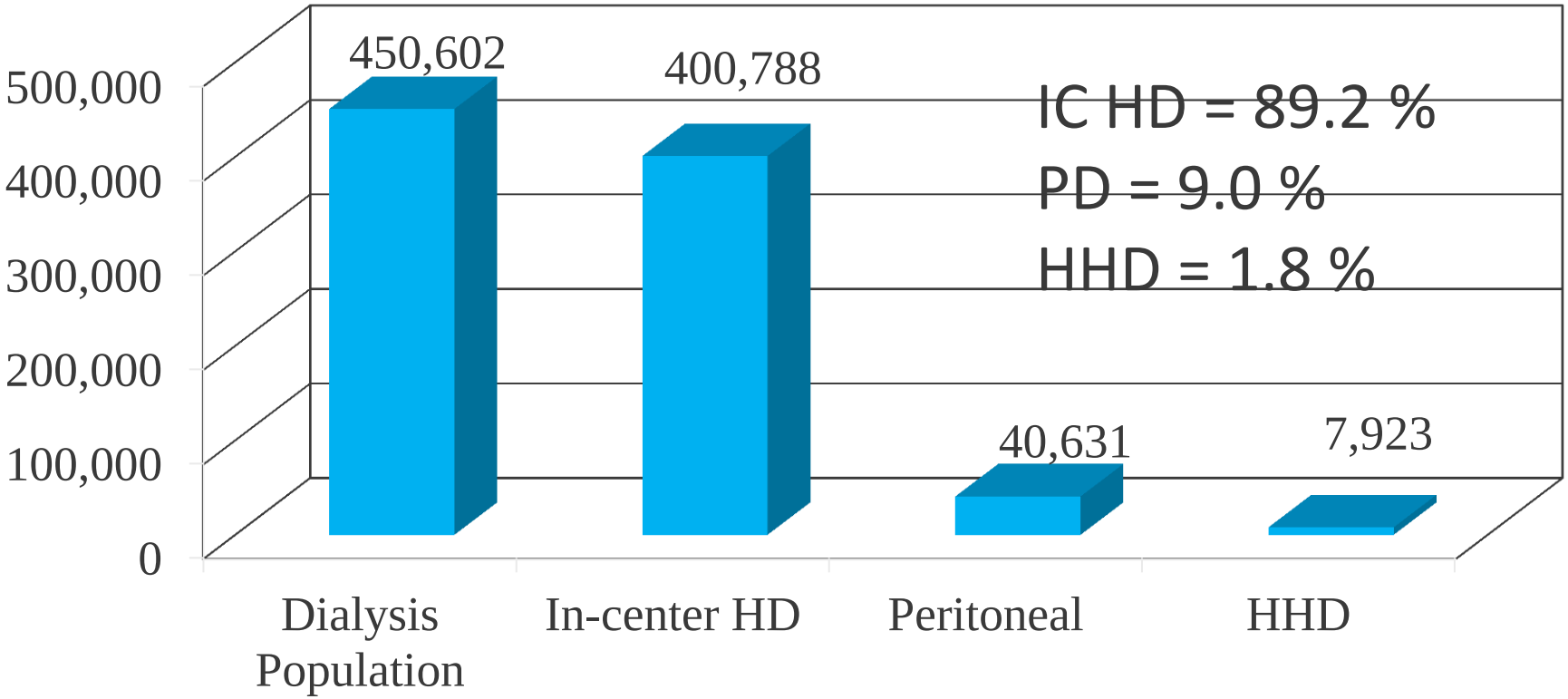
- This program is sponsored by the Advanced Renal Education Program®, an educational program of the Fresenius Medical Care Renal Therapies Group.

- This educational program has been developed by the Medical Information & Communication Office of the Fresenius Medical Care Renal Therapies Group in collaboration with the presenter.

Learning Objectives

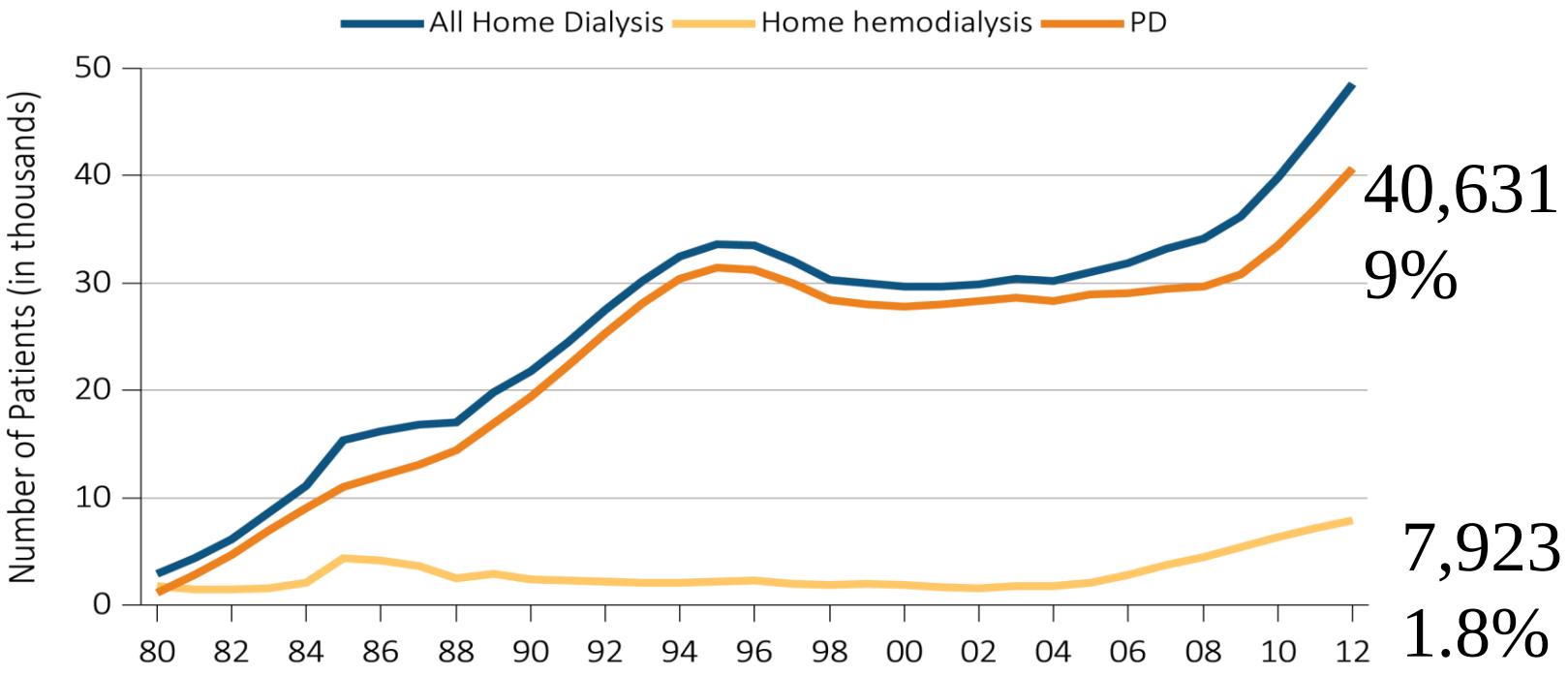
- Describe the benefits and limitations of home hemodialysis
- Identify patients who are appropriate for home hemodialysis
- Understand the practical aspects of doing home hemodialysis
- Distinguish between optimal and adequate dialysis as related to home hemodialysis

Home Dialysis Utilization



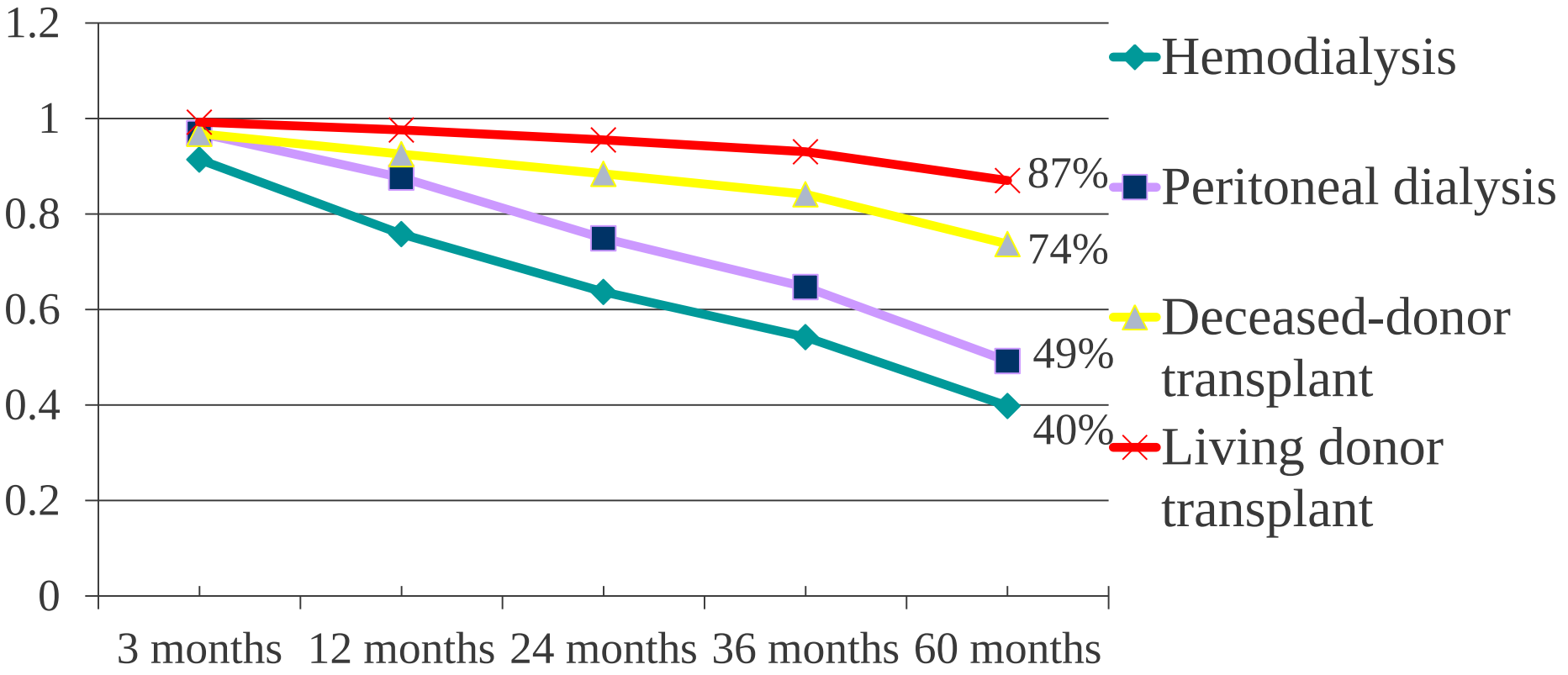
U.S. Renal Data System, USRDS 2014 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD

vol 2 Figure 1.18 Trend in the number of prevalent ESRD patients using home dialysis, in thousands, by type of therapy, in the U.S. population, 1980-2012



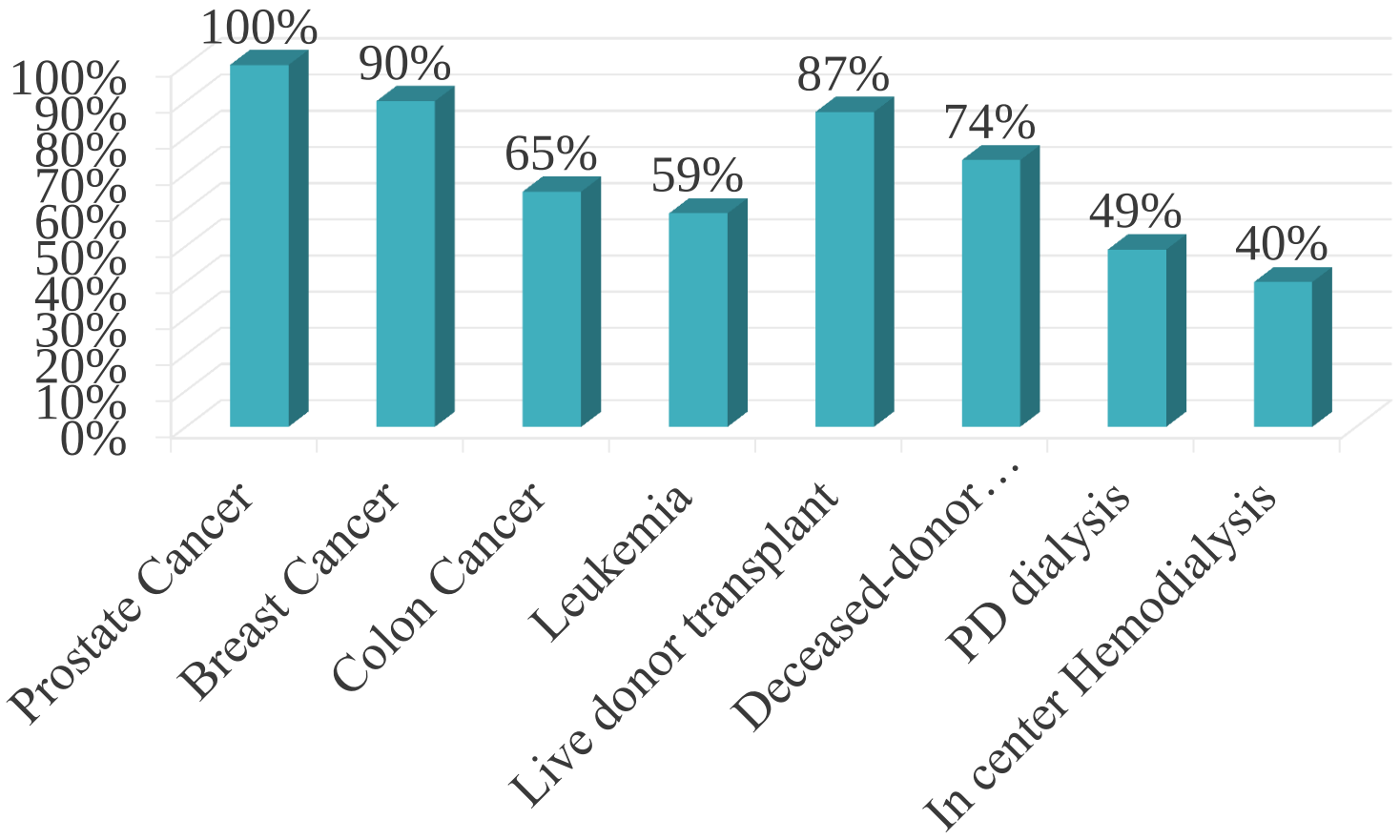
Data Source: Reference table: D.1. December 31 prevalent ESRD patients; peritoneal dialysis consists of CAPD and CCPD only. Abbreviations: CAPD, continuous ambulatory peritoneal dialysis; CCPD, continuous cycler peritoneal dialysis; ESRD, end-stage renal disease.

Adjusted survival probabilities among US ESRD patients, by months after initiation of treatment



Data Source: Reference Tables I.1-I.36, and special analyses, USRDS ESRD Database
Adjusted survival probabilities, from day one, without the 60 day rule, in the ESRD population. 2007 Cohort

5-Year Survival vs. Cancers



American Cancer out comes report 2014; Survival rates are adjusted for normal life expectancy and are based on cases diagnosed in the SEER 9 areas from 2003 to 2009, all followed through 2010.
U.S. Renal Data System, USRDS 2014 Annual Data Report: Incident ESRD patients defined at the onset of ESRD without the 60-day rule, followed from day one to December 31, 2012

Our Present "Dialysis Culture"

- In center is the default position
- "Fistula First" avoids CV catheters at all cost due to infection risk
- Kt/V quality indicator for adequacy of dialysis
- Grow PD as preferred home dialysis modality
- Urgent start PD, goal is to avoid CV catheters
- Tx time in US 3.5 hours due to patient wishes
- Second leading cause of death with incident and prevalent patients is to withdraw from dialysis
- > 120,000 on TP waiting list, 50% greater than 60 y/o


THINK
OUTSIDE
THE BOX

Factors to Consider for Prescribing HHD

Why should we prescribe HHD?

- Potential advantages associated with HHD:
  - Eliminate the 2-day killer gap
  - Eliminate recovery time
  - Control blood pressure and reduce BP medications
  - Better phosphorus control
  - Prevent myocardial stunning
  - Reduce LV mass
  - Improve quality of life
  - Improve chance of normal pregnancy
  - Improve patient survival

HHD Patient Characteristics

- Characteristics that prevent patients from doing HHD
  - Active drug addiction or alcoholism
  - Uncontrolled mental illness, psychosis, or anxiety
  - Homelessness or lack of reliable electricity
  - Medical illness that prevents care at home
  - Lack of a partner or adequate social support
  - Unsanitary home or personal hygiene concerns

HHD Patient Characteristics

- Things that can deter a patient from considering HHD:
  - Age
  - Patient and/or caregiver educational level
  - Gender
  - Ethnicity
  - Type of home
  - Type of water source

HHD Patient Characteristics

- Patients you should consider for HHD due to lifestyle wishes:
  - Any patient that asks to do HHD
  - Patients who are employed, in school, or a primary family caregiver and who want to continue these activities and are starting dialysis
  - In-center or PD patients that have "lost hope" for the future
  - Patients who have retired and who have plans for an active retirement and are now starting dialysis
  - Patients who desire a less restricted diet

HHD Patient Characteristics

- Patients you should consider for HHD due to medical conditions:
  - In-center patients who routinely become hypotensive, develop cramps, experience nausea or vomiting, or have headaches during dialysis
  - Patients who are on a cadaver transplant waiting list
  - Patients who are failing transplant
  - PD patients with declining adequacy
  - Patients with cirrhosis, hypotension, and/or ascites
  - Patients with excessive weight gain between treatments

HHD Patient Characteristics

- Patients you should consider for HHD due to medical conditions (cont):
  - In-center or PD patients with uncontrollable blood pressure or hyperphosphatemia
  - Patients with known right-sided heart failure with chronic hypotension on dialysis
  - Patients with known cardiomyopathy with repeated hospitalizations due to CHF
  - Patients who are starting dialysis that cannot be transplanted

When did I start using informed choice?

Informed Choice

Informed Choice

- A communication between a patient and physician results in the patient agreeing to undergo a specific medical intervention
- A physician responsibility that can not be delegated
- Both an ethical obligation and a legal requirement of physicians

Informed Choice

- Nature and purpose of the proposed treatment or procedure with the risks and benefits discussed with the patient
- Alternatives (regardless of their cost or the extent to which the treatment options are covered by health insurance) with risks and benefits discussed with the patient
- The risks and benefits of not receiving or undergoing a treatment or procedure

Informed Choice Patient Tools

- Clinic Education Programs
  - FMS TOPs, DaVita Kidney Smart, Baxter LiveNow, etc

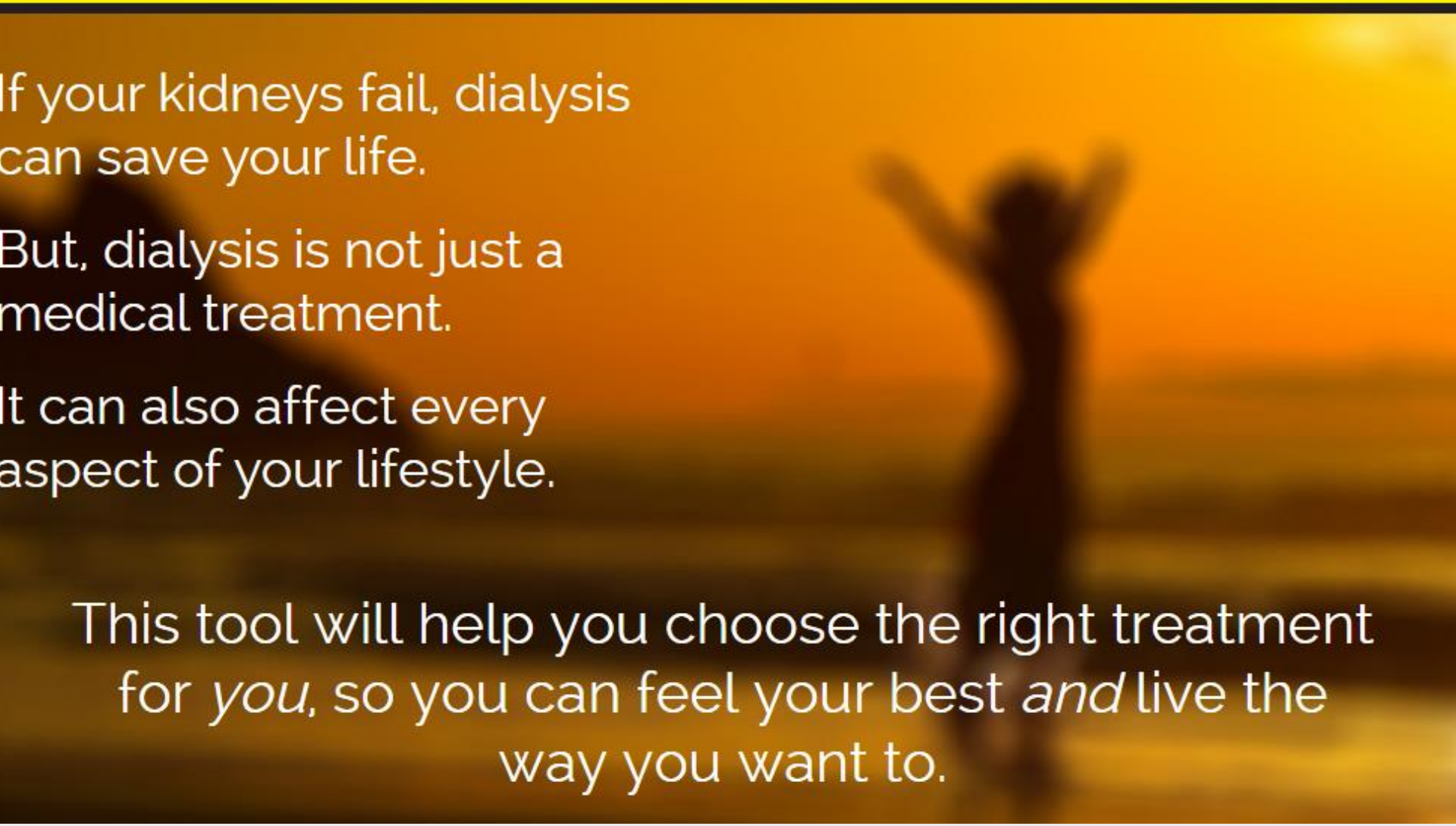
- Medical Education Institute – Kidney School

“My life, My Dialysis Choice”

http://www.mydialysischoice.org

My Life, My Dialysis Choice

a program of the non-profit mei






What matters to you?

Check the values that matter **most** to you.
For each value you select, you'll be able to rate how each treatment option fits your life.
We'll show you a summary when you're done.

Lifestyle Values

- [ ] I need to be able to work or go to school
- [ ] I need to be able to travel
- [ ] I want to be able to eat and drink what I like
- [ ] I love to swim and/or take tub baths
- [ ] I will NOT give up my pets
- [ ] I want to feel well from one day to the next
- [ ] I worry about how much dialysis will cost
- [ ] I need to feel in control of my time and my life
- [ ] I don't want a dialysis machine in my home
- [ ] I'm terrified of needles
- [ ] I want professionals to take care of me

Health Values

- [ ] I want to be able to sleep as well as I can at night
- [ ] I want the best chance for a kidney transplant
- [ ] I want to avoid taking pills as much as I can
- [ ] I want to protect my bones, joints, and nerves
- [ ] I want to protect my heart
- [ ] I want to stay out of the hospital
- [ ] I want to live as long as I can

Partner & Family Values

- [ ] My sex life is important to me
- [ ] I want to have (or father) a child
- [ ] I take care of a child or a disabled or elderly person
- [ ] I don't have a care partner to help me
- [ ] I want to spend as much time as I can with my family
- [ ] I don't want to be a burden on my family

My Life, My Dialysis Choice

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Work / School

Progress: 1 of 1

I need to be able to work or go to school

You CAN work or go to school on dialysis – IF you choose a work-friendly option. Work-friendly treatments fit YOUR schedule. They give you more energy and mental focus. And, they help you stay out of the hospital, so you miss less work.

Rate how well each treatment fits this value

Peritoneal Dialysis & Work / School

rate this: ☆ ☆ ☆ ☆

- Do PD at home with a cycler at night while you sleep
- You may be able to do PD at work
- Take PD with you on work trips

But...

- Keep your PD catheter clean, as your nurse will teach you
- Your doctor may give you limits on how much weight you can lift
- Average of 11.3 hospital days per year (NOTE: Includes those who switched options during a year)

Standard Hemodialysis & Work / School

rate this: ☆ ☆ ☆ ☆

- Ask for an in-center shift before or after work or school
- You can do standard home HD on your own schedule

But...

- Do home HD on your own schedule.
- Standard in-center HD may take time out of your work or school day
- It may take 2 — 12+ hours to feel well after each treatment
- Average of 11 hospital days per year for standard in-center HD. (NOTE: Includes those who switched options during a year)
- One small study found 1/3 fewer hospital stays for standard home HD.
- You may not have much energy
- You may not think as clearly

Rate how well each treatment fits this value

Daily Hemodialysis & Work / School

rate this: ☆ ☆ ☆ ☆

- Do your treatments before or after work or school
- More treatment for more energy
- Take a small (75 lbs.) HD machine with you for work trips

But...

- Daily machine set-up and clean-up time can add up to a full day
- Average of 9.6 hospital days per year

Nocturnal Hemodialysis & Work / School

rate this: ☆ ☆ ☆ ☆

- Done at night while you sleep at home or in a clinic— no time out of your day
- Most treatment for most energy
- Take a small (75 lbs.) HD machine with you for work trips

But...

- Work travel can be a challenge if you use a large HD machine
- Average of 1-6 hospital days per year for nocturnal home HD)
- Average of 9.6 hospital days per year for in-center nocturnal HD

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Summary

Progress: Summary

Results

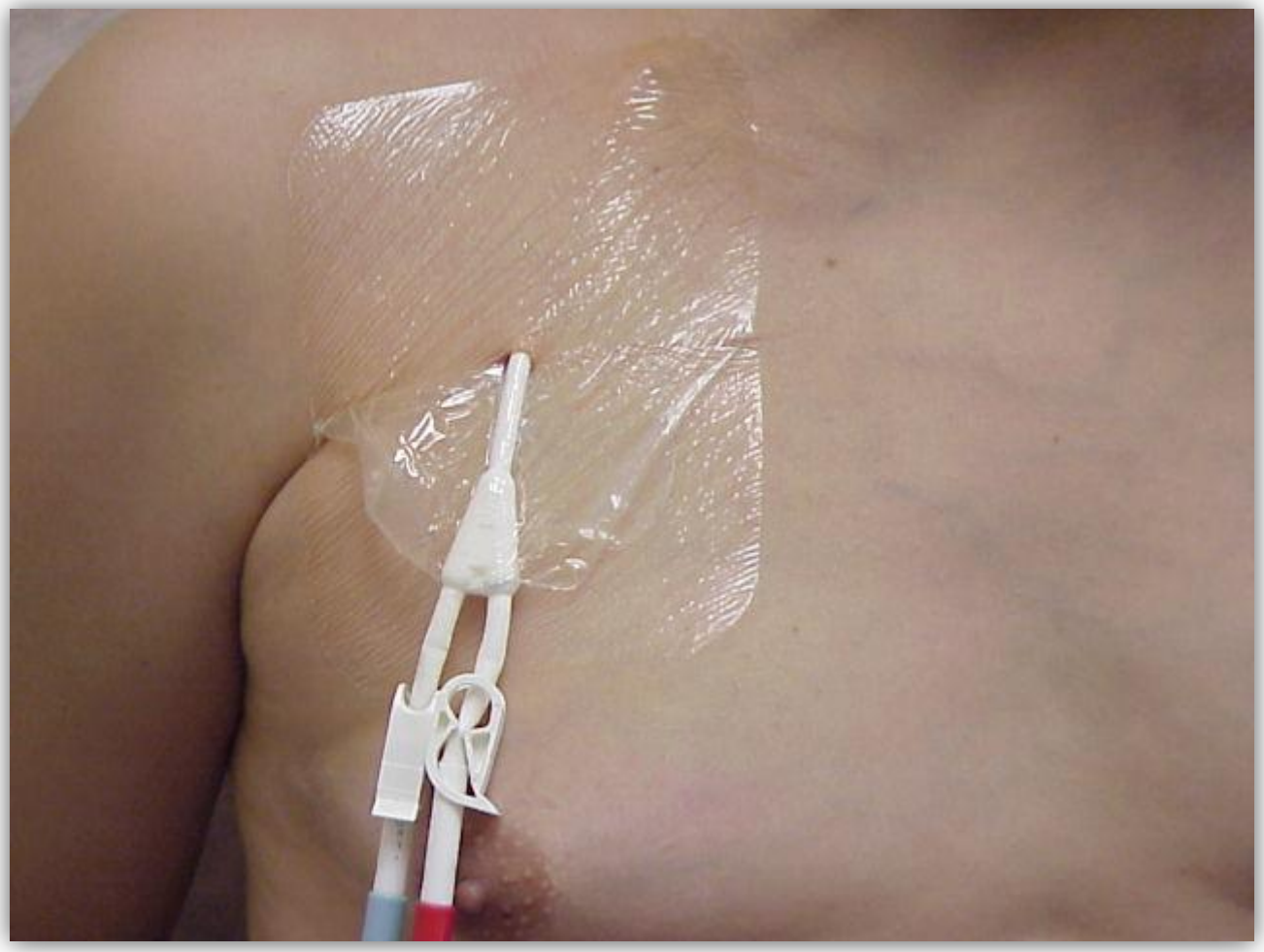
My Values	PD	Standard HD	Short Daily HD	Nocturnal HD
Work / School	★★★	★	★★★	★★★★
Pills	★★	★	★★★	★★★★
Babies	★	★	★★	★★★★
Totals	6	3	8	12

What access should be used for HHD?

Home HD Access

Buttonhole – Yes or No?

Catheter – Yes or No?



How do you prevent venous disconnects, air emboli, and hypotension while doing HHD?

Safety Considerations

Safety Aspects of Home HD

- Safety aspects of HHD are generally the same as with in-center HD and include all complications that can occur in the dialysis center
- However, there are complications or safety issues that require more attention at home
- Safety issues at home may also be more significant as the patient is at the forefront during treatment
- Notably, most complications can be offset by adequate training

Hawley CM, et al. Hemodial Int. 2008 Jul;12 Suppl 1:S21-5
Tennankore KK, et al. Am J Kidney Dis. 2015;65(1):116-21
Wong B, et al. Am

Mitigating Risks of Venous Disconnect and Hemorrhage

- Fistulae and Grafts
  - Secure access site and connections
  - Encourage constant visualization of access during dialysis
  - Monitor blood pressure/pulse
  - Use wetness detectors
    - Warning through sound or vibration alarm
    - Some devices directly interact with the machine to stop blood pump and clamp venous line
    - Patients should test battery life of monitor before each session
  - Educate patient on identifying severe vascular access hemorrhage and appropriate measures to take
  - Consider single needle

Hawley CM, et al. Hemodial Int. 2008 Jul;12 Suppl 1:S21-5
Ellison KD, et al. Kidney Int. 2012 Sep;82(6):686-92

Needle Taping Technique for Home HD

1. Needle in buttonhole

2. Tape over needle

3. Start crisscross dressing

Needle Taping Technique for Home HD

4. Continue crisscross dressing

5. Complete crisscross dressing

6. Tape over crisscross

Needle Taping Technique for Home HD

7. Place mesh over arm, secure exit of dialysis tubing at the level of the shoulder above the mesh, and start dialysis

Additional Considerations for Catheters

- Potential measures that may be beneficial for preventing venous disconnects, infection, and air emboli with catheter patients include:
  - Avoid use of standard dialysis injection caps
  - For CVC access use of "closed connector" devices.
  - Use Luer-lock syringes with "closed connector" devices for blood draw from catheters and blocking of catheters
  - Use catheter locking devices to prevent disconnect

Nesrallah GE, et al. Am J

Reducing Intradialytic Hypotension with Home HD

- Steps to minimize the risk of IDH include the following:
  - Stress that patients should always adhere to the prescription
  - Obtain accurate estimation of the dry weight
  - Control of interdialytic weight gain
  - Max fluid removal protocol
  - Examine patient-specific and HD-related factors
    - Fluid gain (sodium vs. water restriction)
    - Antihypertensive medications
    - UFR and sodium modeling
    - Avoid food during dialysate
    - Cool dialysate
    - Anemic status

Cornelis T, et al. Semin Dial. 2012 Nov;25(6):605-10
Santos SF, et al. Adv Chronic Kidney Dis. 2012 May;19(3):158-65

Home HD Adverse Events

Causes of Adverse Events

- 117,000 HHD treatments (2001 – 2012) in Edmonton, Canada
- 7 life-threatening adverse events
- Event rate: 0.060 events/1,000 treatments

Table 2. Causes of Adverse Events

Case No.	Human Error(s) or Machine/ Disposable Defects	Immediate Cause of Adverse Event	Details
1	Human error	Blood loss	Ignored machine alarms; improper threading of connections; placement of wetness detectors in incorrect position
2	Human error	Air embolism	Neglected to clamp CVC
3	Possible human error, possible disposable defect	Blood loss	Possible failed integrity of cap; possibly did not correctly thread connections
4	Possible human error, possible disposable defect	Blood loss	Improper placement of clamp; failed integrity of cap
5	Human error	Blood loss	Improper machine setup; neglected to use wetness detectors
6	Human error	Blood loss	Improper threading of connections; placement of wetness detector in incorrect position
7	Human error	Blood loss	Did not follow machine setup protocol specific to local home HD program

Abbreviations: CVC, central venous catheter; HD, hemodialysis.

Wong B, et al. Am J Kidney Dis. 2014;63(2):251-258

Adverse Events in Home HD

- Serious adverse technical events in home hemodialysis are relatively rare
- Patient retraining and periodic vascular access technique audits may mitigate risks

Table 3. Event Rates for Each Access Type Stratified by Type of Event

Event Type	Total Event Count	Event Rate (per access year)	Event Rate (per 1,000 HHD treatments)	No. of Patient-y to Have 1 Event	No. of Treatments to Have 1 Event
Needle dislodge					
AVF	17	0.037	0.153	27	6,534
AVG	1	0.015	0.068	67	14,798
Air embolism					
AVF	4	0.009	0.036	116	27,771
Dialysis catheter	2	0.009	0.035	113	28,861
Dialysis catheter damage or dislodge	2	0.009	0.035	113	28,861
Other					
Cut AVF cannulation catheter	2	0.004	0.018	232	55,541
Hypercalcemia due to RO misconnection	1	0.004	0.017	226	57,723
Total	29				
AVF	23	0.049	0.208	20	4,830
AVG	1	0.015	0.068	67	14,798
Dialysis catheter	5	0.022	0.087	45	11,545

Abbreviations: AVF, arteriovenous fistula; AVG, arteriovenous graft; HHD, home hemodialysis; RO, reverse osmosis.

Tennankore KK, et al. Am J Kidney Dis. 2015;65(1):116-121

Is real-time remote monitoring necessary for home HD?

- Canadian nocturnal home HD program experience:
  - 20 years and three generations of monitoring equipment
  - Most were nuisance alarms
  - Monitoring prevented clotting of the dialysis circuit several times when patients did not awaken
  - Only two life-saving episodes:
    - Hypoglycemic patient in a coma where nurse alerted the patient's wife by phone
    - Incoherent septic patient where an ambulance was dispatched

Marshall MR, et al. Semin Dial. 28(2):176-179

What drives patient and caregiver dropout?

Drop-Out

Burnout

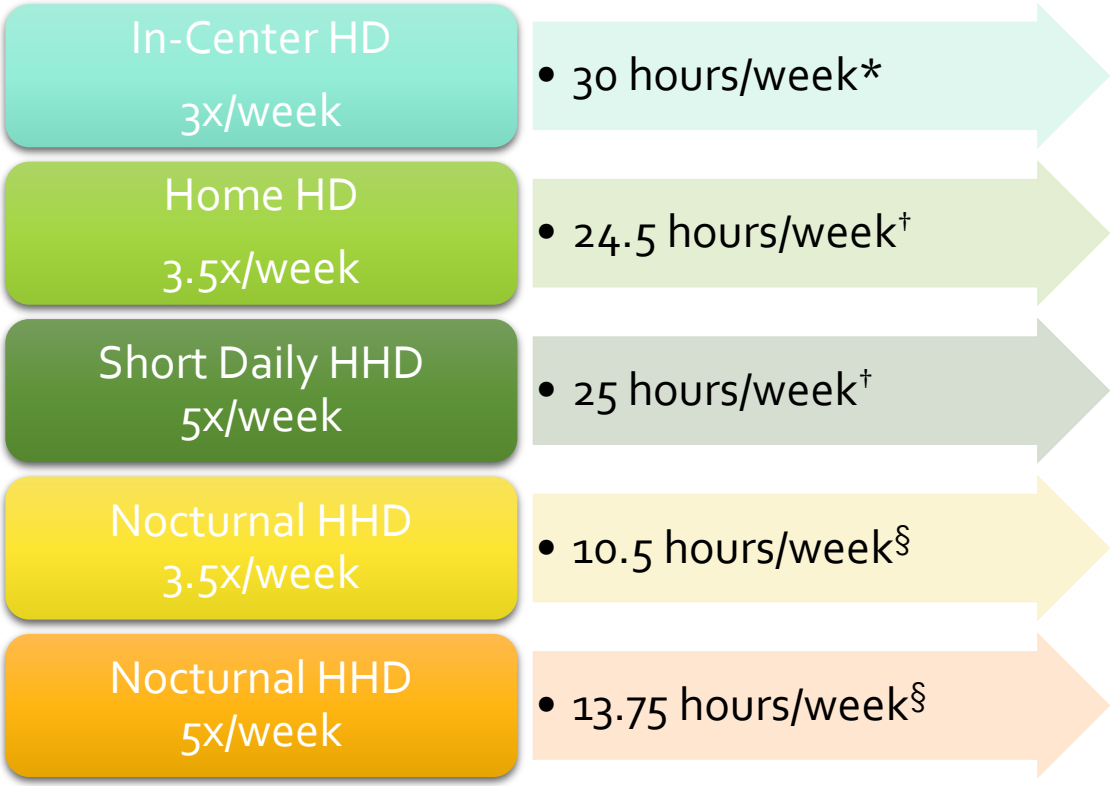
- More frequent or longer dialysis may be associated with
  - Better quality of life (determined by the standard gamble technique)
  - Better health outcomes

- However, more dialysis in patients without significant perceived benefit may lead to
  - Noncompliance with therapy
  - Patient or caregiver burnout

64:1004–1011
Hawley CM, et al. Hemodial Int. 2008 Jul;12 Suppl 1:S21-5

Patients' Perceived Time on HD

- Burden of dialysis prescription verses benefit of dialysis prescription



Kidney Int. 2003; 64:1004–1011
Hawley CM, et al. Hemodial Int. 2008 Jul;12 Suppl 1:S21-5

What should our principles be for prescribing optimal HHD for our patients?

Optimal Dialysis

Minimal Adequate Dialysis Dose

Conventional 3X/week HD

- KDOQI clinical practice guidelines and recommendations - 2006 Update: Guideline 4*
  - spKt/V of 1.2
  - If treatment time is less than 5 hours, an alternative minimum dose is a URR of 65%

K/DOQI Clinical practice guidelines for hemodialysis adequacy. Am J Kidney Dis. 2006;48 Suppl 1:S2-90

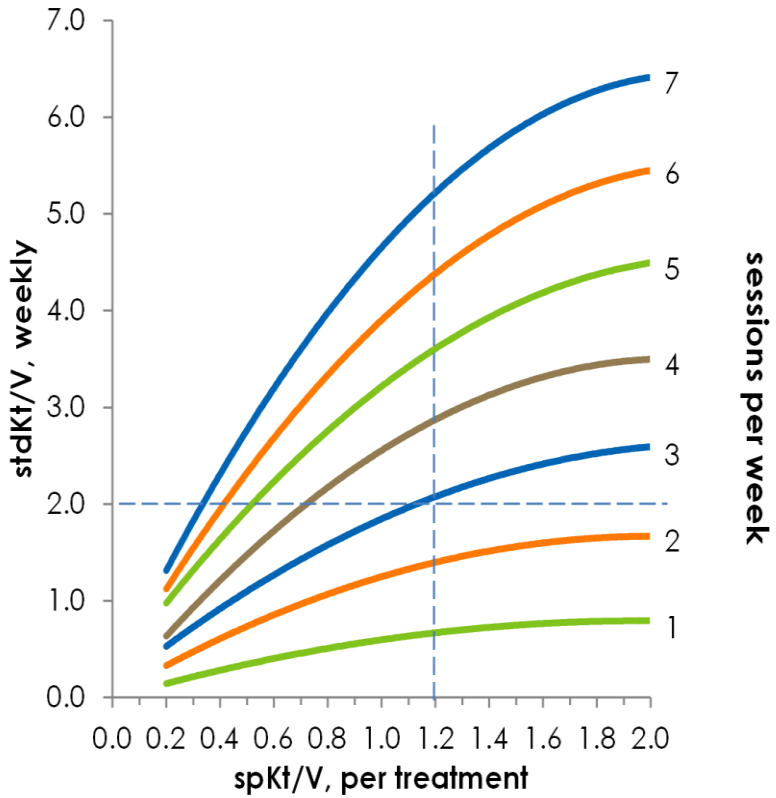
Minimal Adequate Dialysis Dose

Alternative HD Schedules

- Minimum spKt/V targets for 2, 4, and 6 times per week dialysis schedules should be different from that for the thrice weekly schedule
- In the absence of dose ranging outcomes data, minimum spKt/V targets for different schedules can be based on achieving a minimum stdKt/V of 2.0 per week.

K/DOQI Clinical practice guidelines for hemodialysis adequacy. Am J Kidney Dis. 2006;48 Suppl 1:S2-90

spKt/V *vs.* stdKt/V

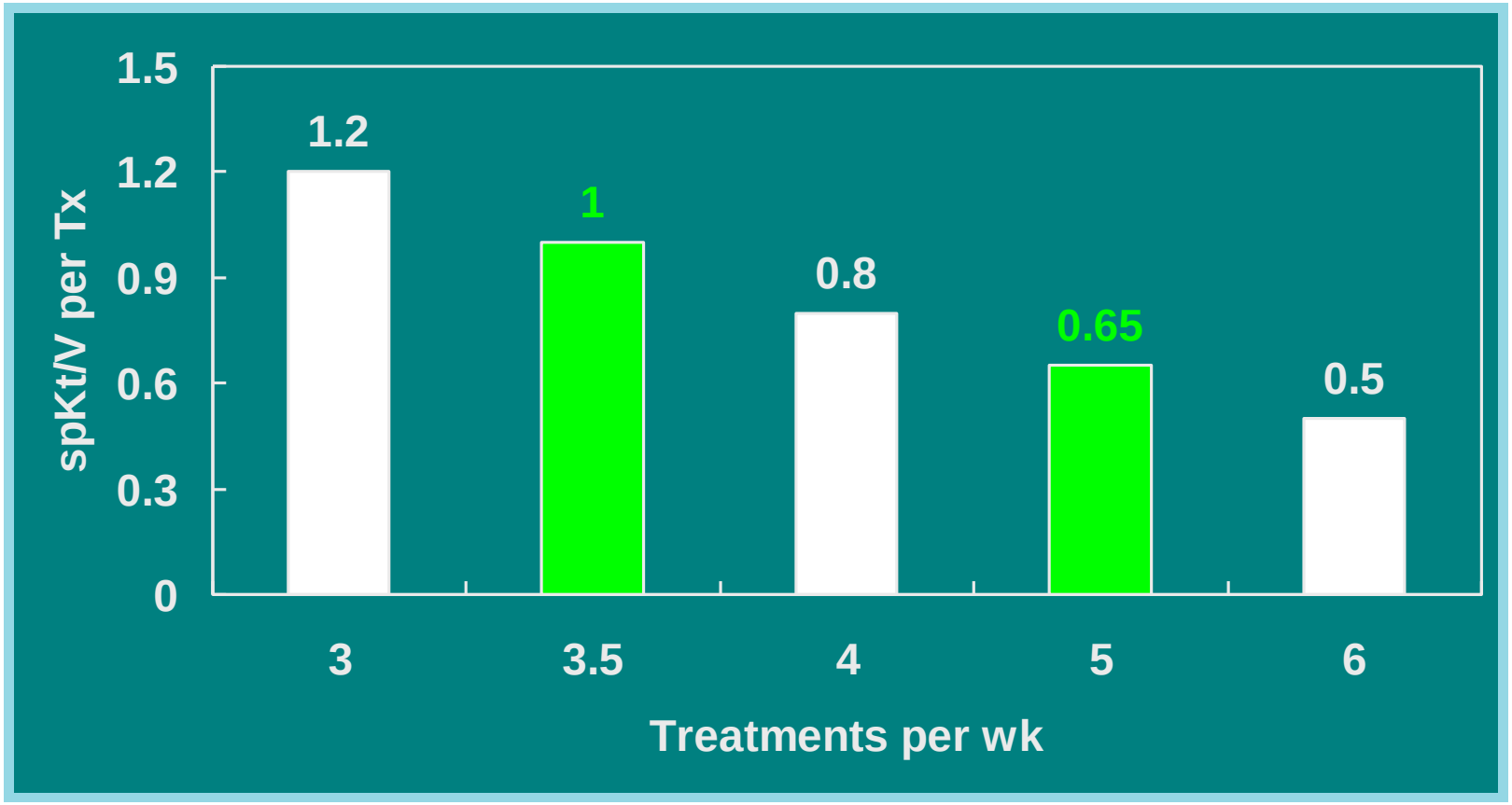


- spKt/V: Predicts a linear decline in urea and an immediate equilibration between the blood and tissue compartments after a single dialysis session

- stdKt/V: Provides a measure of continuous urea clearance over a 1-week period normalized to the total volume of distribution of urea (total body water)

Gotch FA. Nephrol Dial Transplant. 1998;13 Suppl 6:10-4
K/DOQI Clinical practice guidelines for hemodialysis adequacy. Am J Kidney Dis. 2006;48 Suppl 1:S2-90

Minimum spKt/V Values to Achieve stdKt/V of 2.0 per Week During HD



Leypoldt JK, et al. Semin Dial. 2004;17(2):142-5

Opportunities With Home HD to Provide Optimized Dialysis

- At least 3.5 treatments per week
- At least 15 hours treatment time per week
- Never miss two consecutive days
- Ultrafiltration
  - Max pull of no more than 10 ml/kg/hour for SD HHD
  - Max pull of 400-500 mL/hour for Nocturnal HD
- Balance:
  - Burden vs benefit for the prescription for each patient
  - Treatments/week with risk for burnout

Thank you!

If you have any questions, do not hesitate to call or text me at

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or email me at

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