FLUID MANAGEMENT IN DIALYSIS: STRATEGIES FOR SUCCESS

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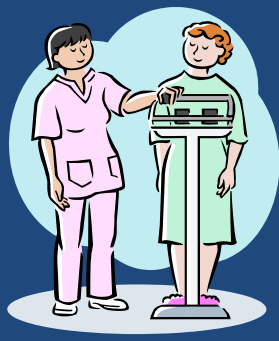
Laura D. Byham-Gray, PhD, RD
Professor & Director
Master of Science in Clinical Nutrition
Rutgers University
School of Health Related Professions
laura.byham-gray@shrp.rutgers.edu

Prepared with assistance by Deena Natale, MS, RD

Objectives:

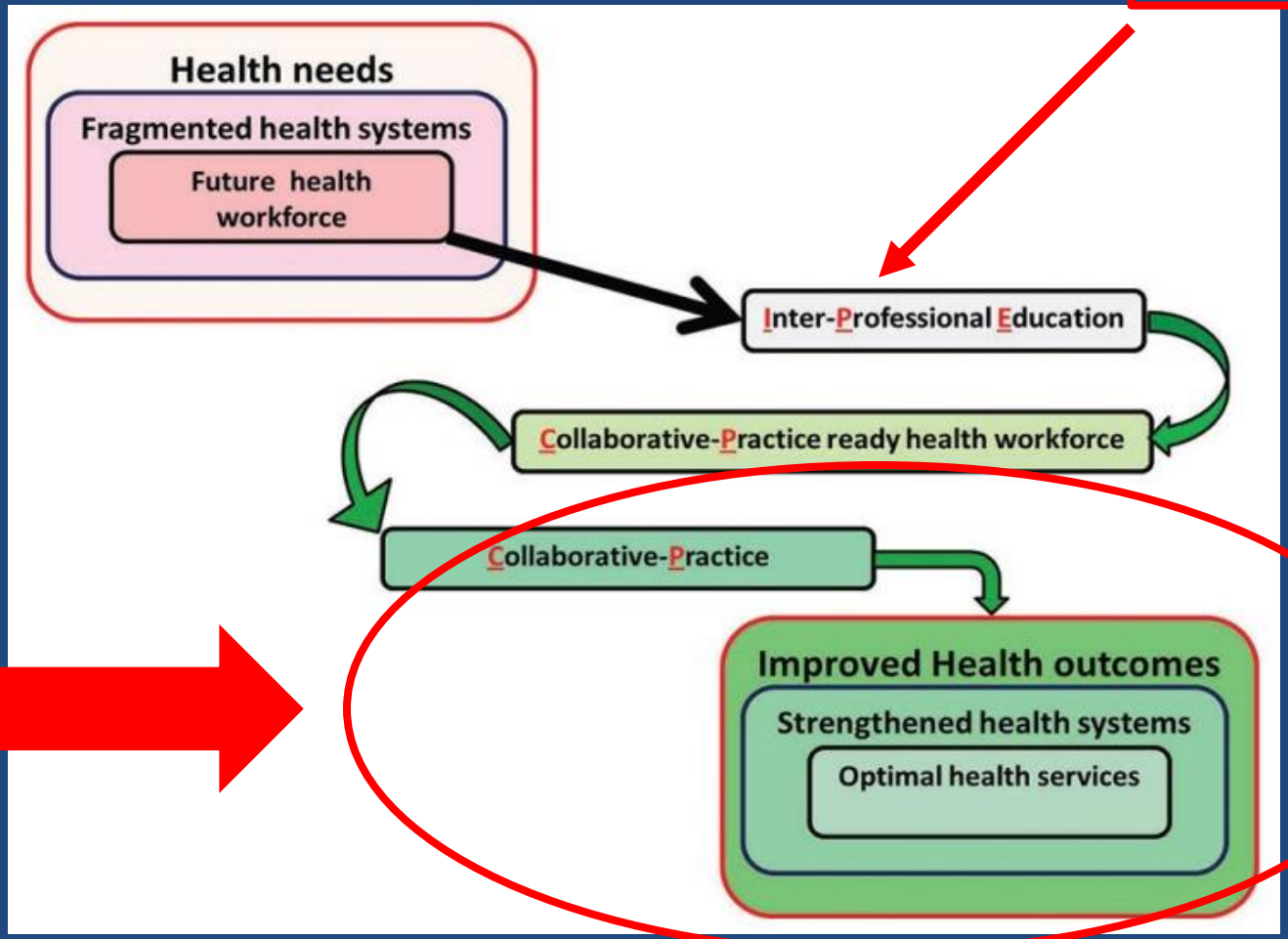


Participants will be able to:

1) Describe weight status and fluid management in dialysis
2) Outline strategies for gaining better control of fluid status, using an interprofessional team approach
3) Apply principles in the review of patient case scenarios

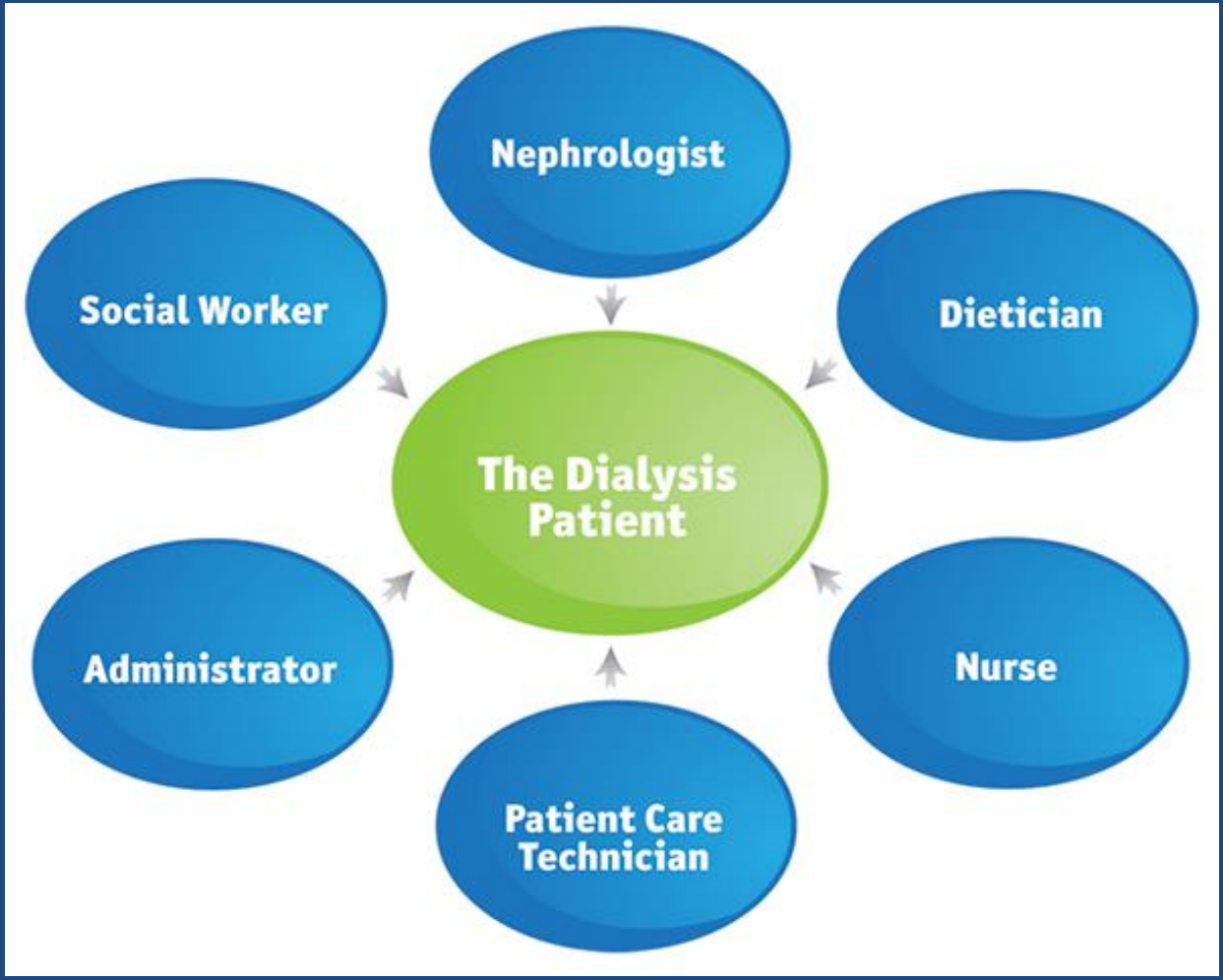
Why Team Approach to Fluid Management?

Education is of Value Pre- and/or Post-Professionally



Adapted from Inuwa, IM. *Sultan Qaboos University Medical Journal*, 12(4): 2012.

Patient-Centered Care Model



Why is Fluid Control SO Important?

- Only 52% of patients still alive after 3 years of dialysis initiation
- Cardiovascular disease(CVD)-greatest cause of death and reason for hospital admission
- Traditional and non-traditional risk factors for CVD risk have been explored

www.usrds.org

Cardiovascular Risk Factors in CKD

Unusual non-traditional risks:
Protein intake, anemia, Ca/Phos/PTH

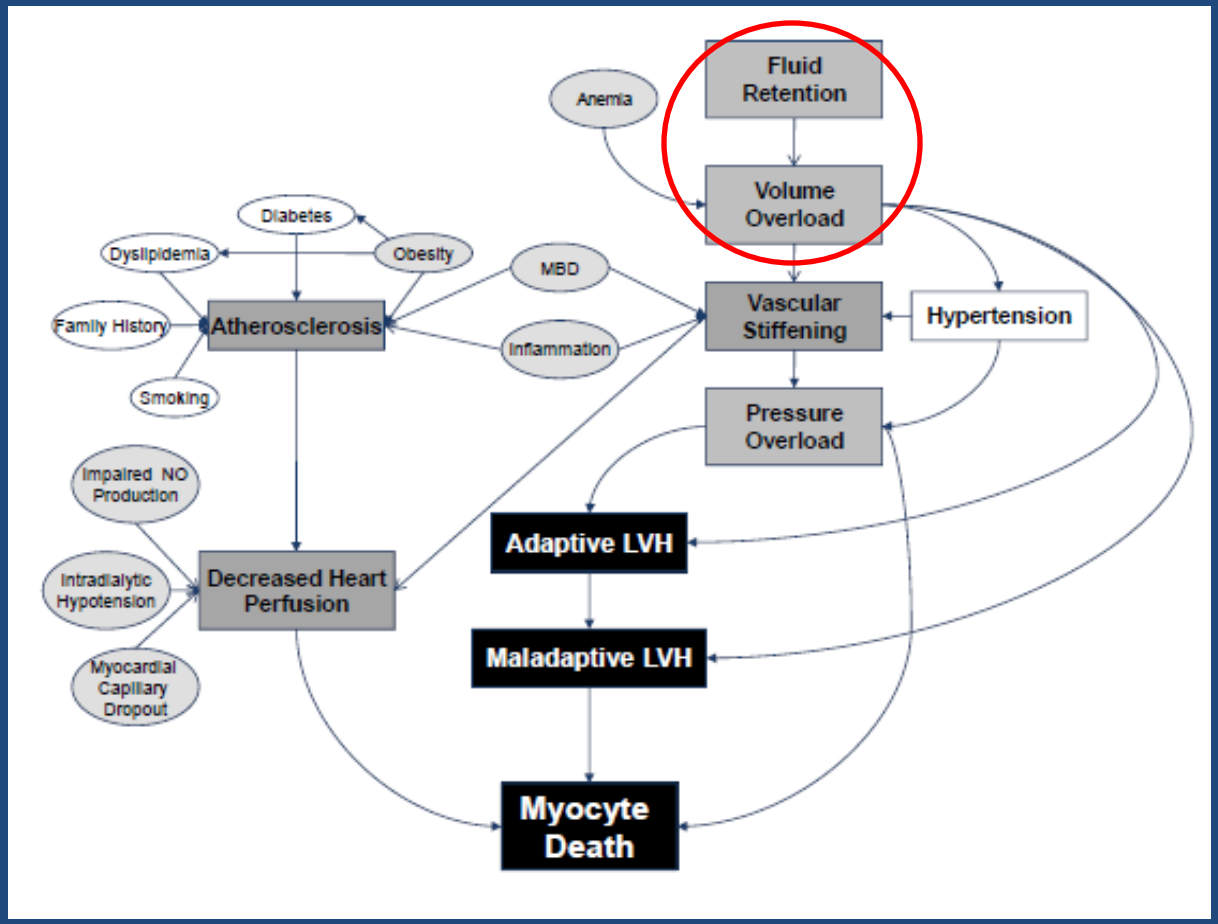
Usual non-traditional risks:
Inflammation, malnutrition, advanced glycation end products

Traditional risks:
Diabetes, hypertension, dyslipidemia, smoking, age

Shouldn't Fluid Be Listed, Too?

Harvey, K.S., Nutrition in Kidney Disease, 2008

Yes.... FLUID OVERLOAD IS LINKED TO:



- ✓ Elevated BP (Chazot, et al, *NDT*, 2013)
- ✓ Greater Left Ventricular Hypertrophy (LVH) (Wizemann, et al, *NDT,* 2009)
- ✓ Large Interdialytic Weight Gains (DWGs) associated w/ high rates for all-cause and CVD mortality (Flythe, et al, *CJASN*, 2013; Kalantar-Zadeh, et al, *Circulation,* 2009)

Taken from Weiner, et al., *Am J Kidney Dis*, 2014

Support from Regulations & Clinical Practice Guidelines

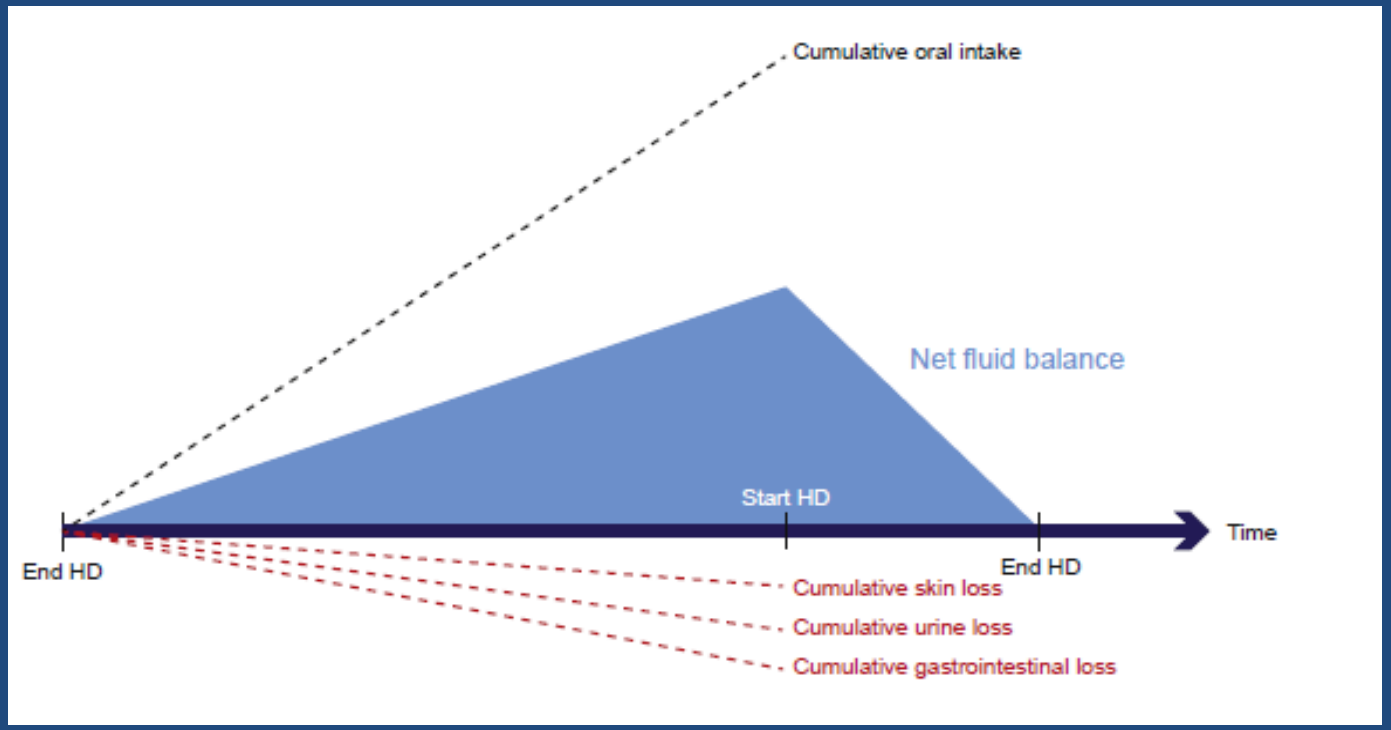
- ✓ *Conditions for Coverage (2008) by the Centers for Medicare and Medicaid Services (CMS)*-require assessment of dialysis prescription inclusive of blood pressure & fluid management.

- ✓ *National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (KDOQI)*-emphasize importance of volume control in its recommendations related to "dialysis adequacy."

CONCEPTS

Fluid Balance in Hemodialysis

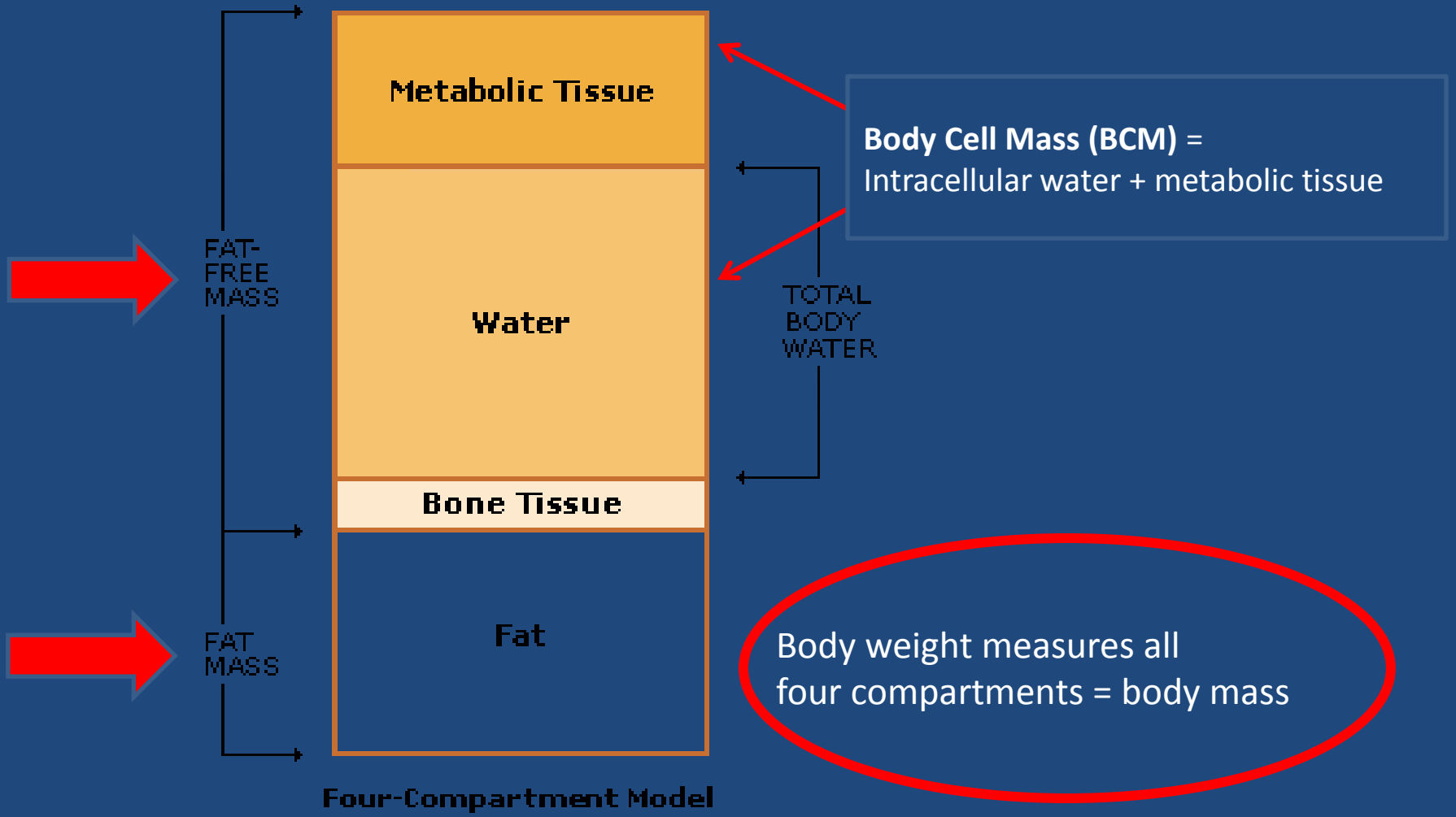
Net fluid excess is a function of interdialytic intake versus insensible, urine, and GI losses.



Adequate dialysis therapy removes fluid during the session to equal excess.

Taken from Weiner, et al., *Am J Kidney Dis*, 2014

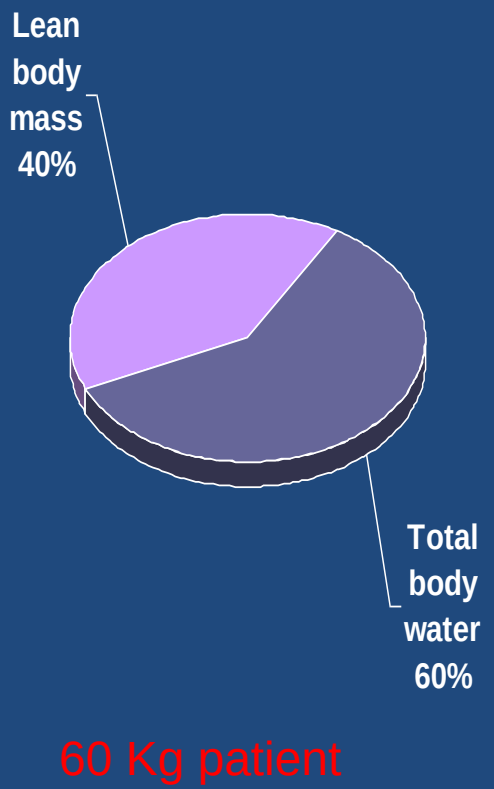
Body Compartments

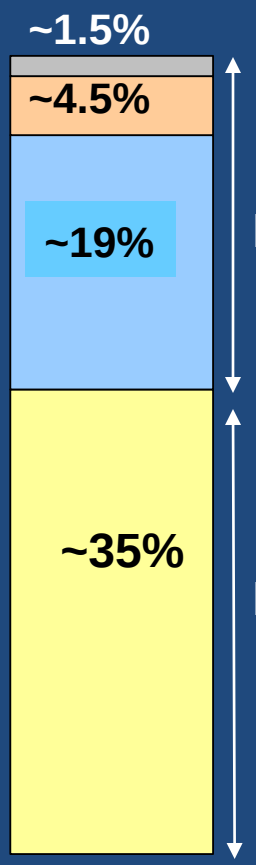


Body Cell Mass (BCM) =
Intracellular water + metabolic tissue

Body weight measures all four compartments = body mass

Fluid Compartments of the Body





Transcellular water 0.9 L

Plasma 2.7 L

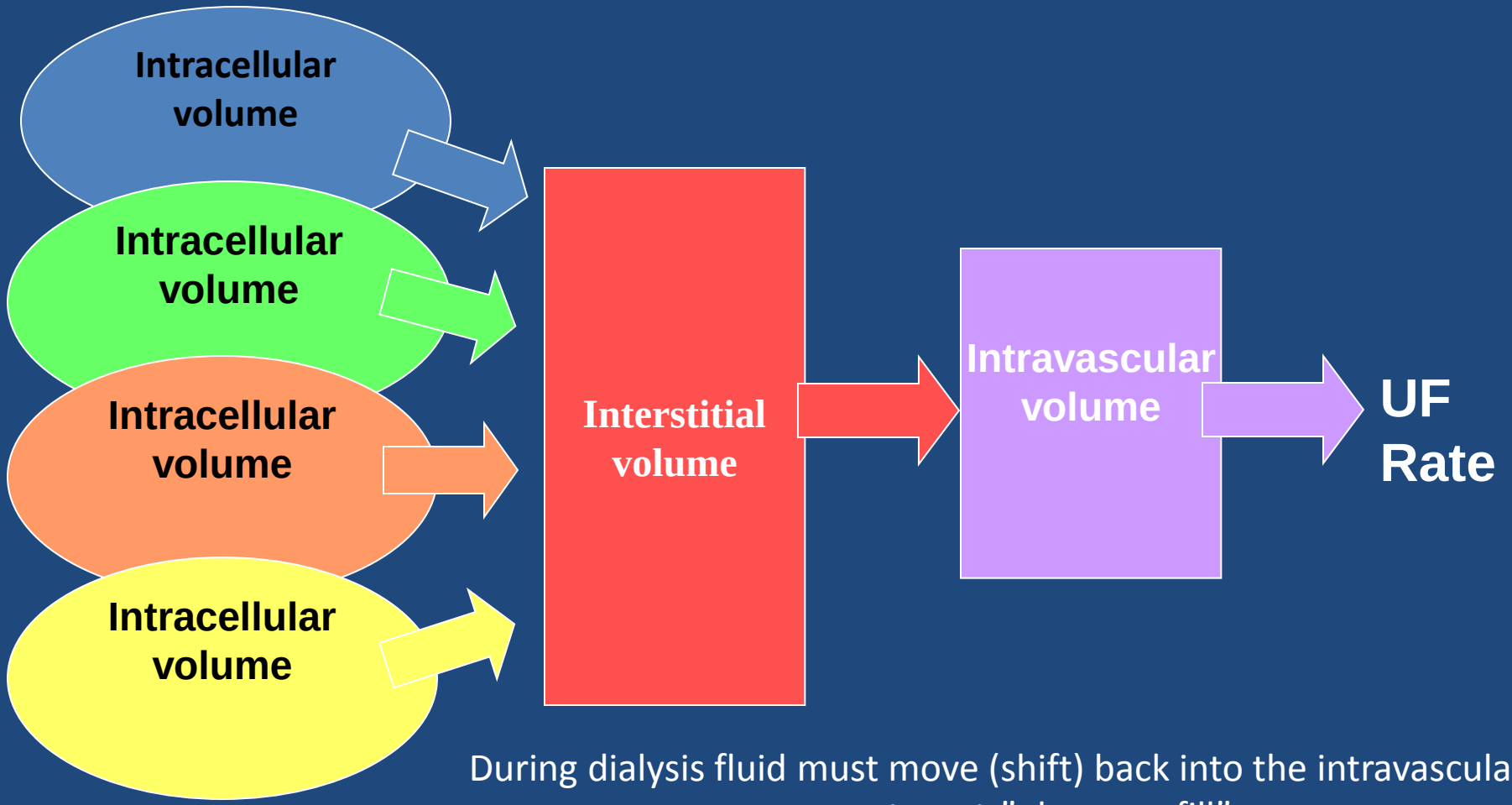
Available to dialysis

Interstitial water 11.4 L

Cellular water 21 L

Diagram by Debra Meade, BSN, RN

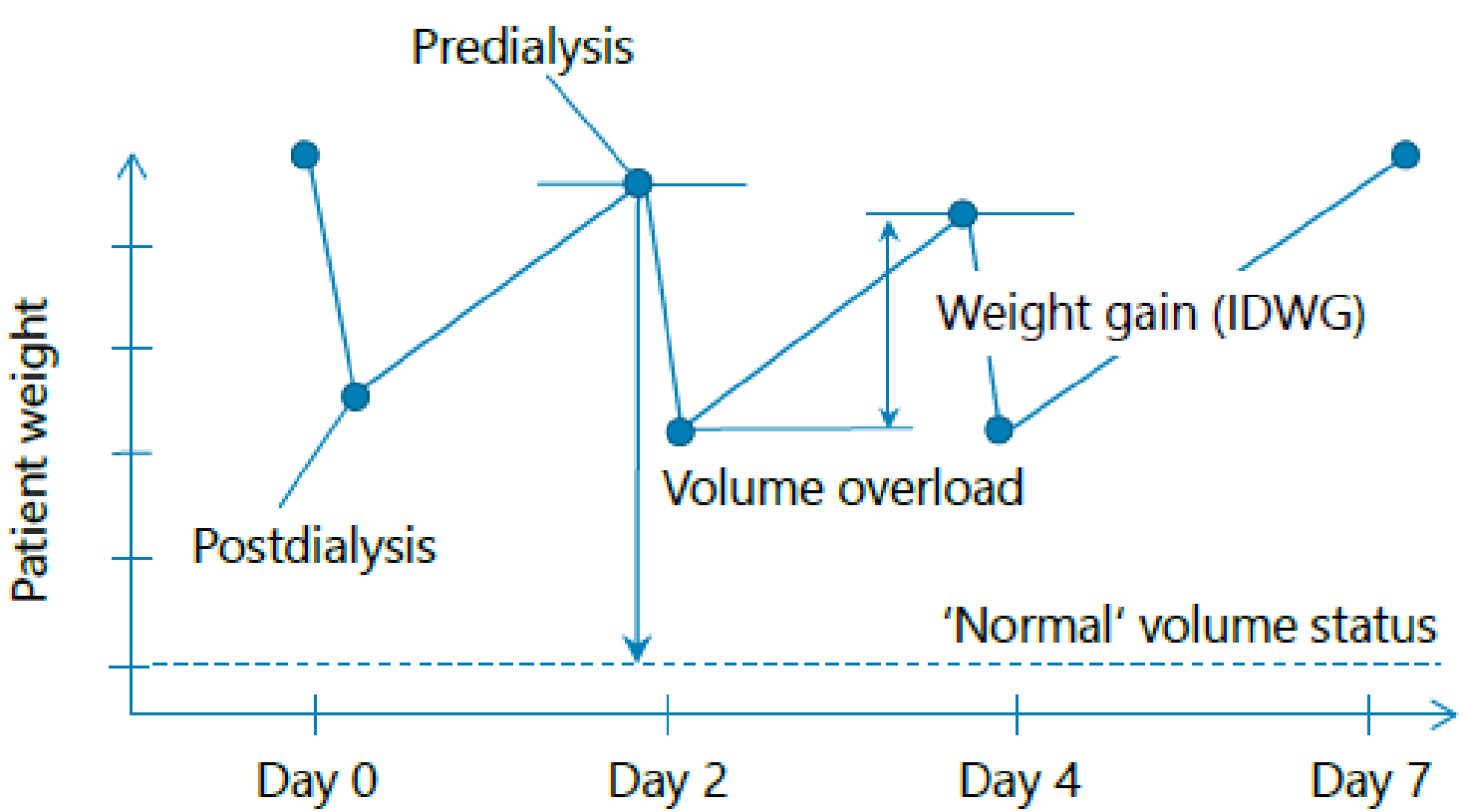
How Fluid Moves in Dialysis



During dialysis fluid must move (shift) back into the intravascular compartment-"plasma refill"

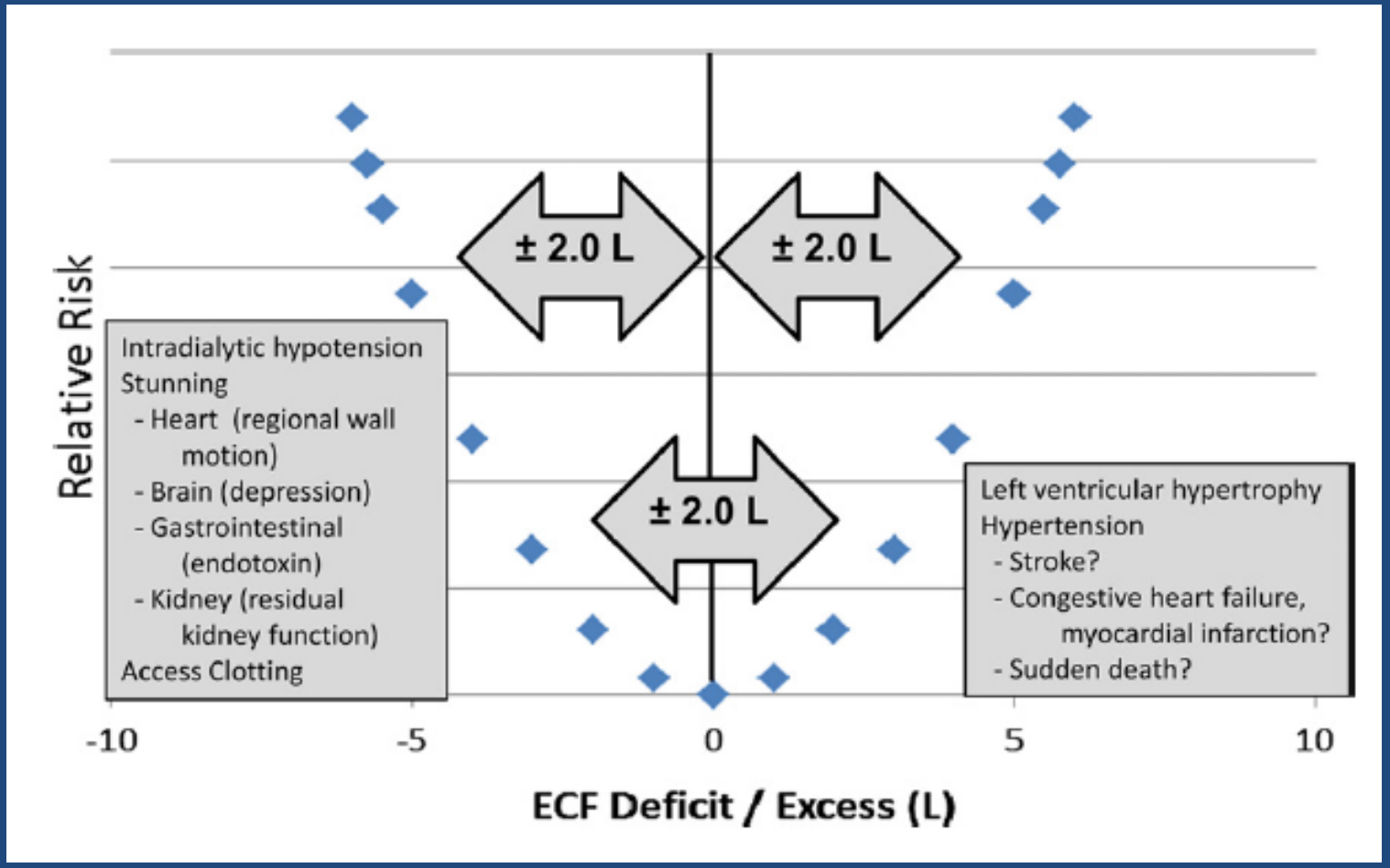
Diagram by Debra Meade, BSN, RN

Chronic Volume Overload vs. Interdialytic Weight Gains



Hecking, et al., *Am J Nephrol*, 2013

Hypothesized Relative Risks of Extracellular Fluid Volume Excess/Deficit



Daugirdas, J: *Am J Kidney Dis*, 2013

Weight, What?...

1. Optimal Body Weight for Health
2. Usual Body Weight
3. Adjusted Body Weight
4. **Pre-Dialysis Weight**
5. **Post-Dialysis Weight**
6. **Edema-Free Dry Weight/Estimated Dry Weight (EDW)**
7. **Interdialytic Weight Gains**

These weights relate to fluid management

Have any of your patients gotten confused by all of the weights???

Dry Weight du Jour

Many Definitions for Dry Weight Exist

- ✓ The post-dialysis body weight that allows normal blood pressure before and at the end of the hemodialysis session without anti-hypertensive medications, without clinical signs of over- or under-hydration and despite IDWGs (Charra, et al., *NDT*,1996)
- ✓ The lowest weight a patient can tolerate without intradialytic symptoms or hypotension, in the absence of overt fluid overload. (Jaeger & Mehta, *JASN*, 1999)
- ✓ Weight post dialysis below which the patient would demonstrate orthostatic hypotension. (Lins, et al., *Clin Nephrol*,1997)
- ✓ Weight at which patient can remain normotensive until the next dialysis session without the use of antihypertensive medications. (Mailloux & Haley, *Am J Kidney Dis*, 1998)

THEREIN LIES THE PROBLEM…

NEW PROPOSED DEFINITION OF DRY WEIGHT

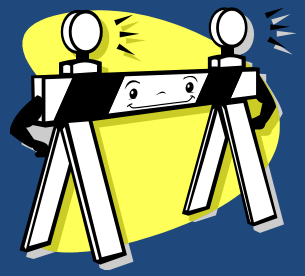
Dry Weight should be considered the post-dialysis weight that results in:

- ✓ Shortest postdialysis recovery time
- ✓ Least intradialytic hypotension/symptoms
- ✓ Fewest cardiovascular/cerebrovascular events
- ✓ Fewest hospitalizations
- ✓ Fewest hypo-volemia-related access thrombosis
- ✓ Fewest post-dialysis falls

Daugirdas, J: *Am J Kidney Dis*, 2013

Barriers… to Achieving Normovolemia

- ✓ Absence of validated dry weight assessment tools
- ✓ Potential logistical challenges
- ✓ Possibility of more frequent dialysis-associated symptoms
- ✓ Inconsistent reimbursement and payment policy
- ✓ Patient choice
- ✓ Provider factors



We, as health professionals, MUST overcome these barriers to substantially effect care and improve patient outcomes

Weiner, et al., *Am J Kidney Dis*, 2014

Consensus Recommendations

- Extracellular Fluid Status Should be Part of Sufficient Hemodialysis
- Fluid Removal Should be Gradual
- Intradialytic Sodium Loading Should be Avoided
- Nutritional Counseling Should Emphasize Sodium Control

Weiner, et al., *Am J Kidney Dis*, 2014

Extracellular Fluid Status

- Normalization of extracellular fluid volume as primary goal
- Patient with BP >150/90 mm Hg should be regarded as fluid overloaded
  - Gradual weight reduction & sodium restriction
  - More frequent ultrafiltration (in-center, home modalities)
- Evaluation and incorporation of emerging technologies studied

Weiner, et al., *Am J Kidney Dis*, 2014

Existing Approaches & Emerging Technologies

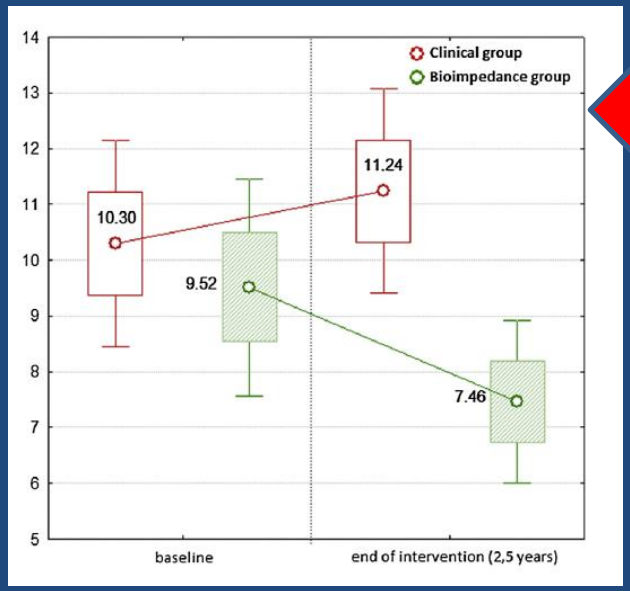
- Clinical Judgment
- Ultrasound of the vena cava
- Biochemical parameters (e.g., atrial natriuretic peptide
- Relative Plasma Volume Monitoring
- Bioimpedance Technology

Hecking, et al., *Am J Nephrol*, 2013

Bioimpedance-Guided Fluid Management in MHD-Pilot RCT (Onofriescu, et al., *Am J Kidney Dis*, 2014

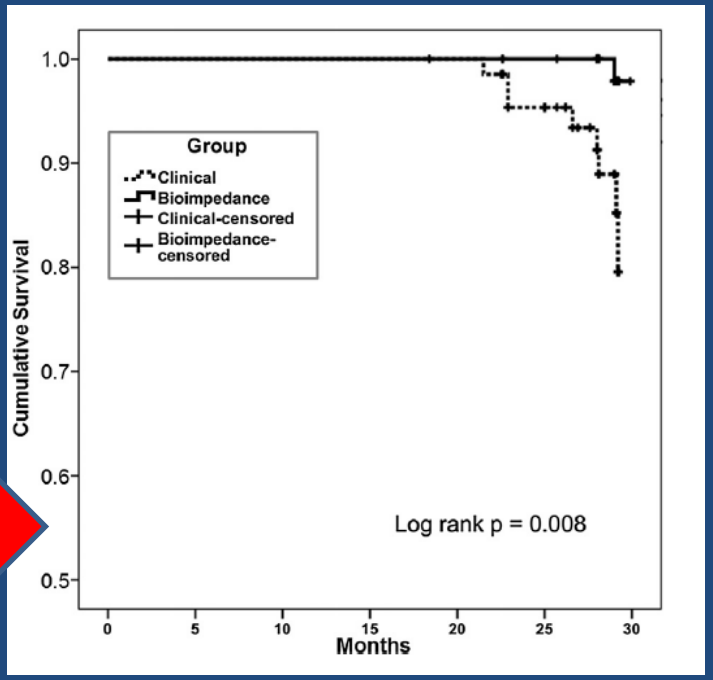
131 pts randomly assigned to either BIA-Guided therapy or Clinical Methods

Followed for 2.5 years



Mean relative fluid overload

Kaplan-Meier Survival Analyses



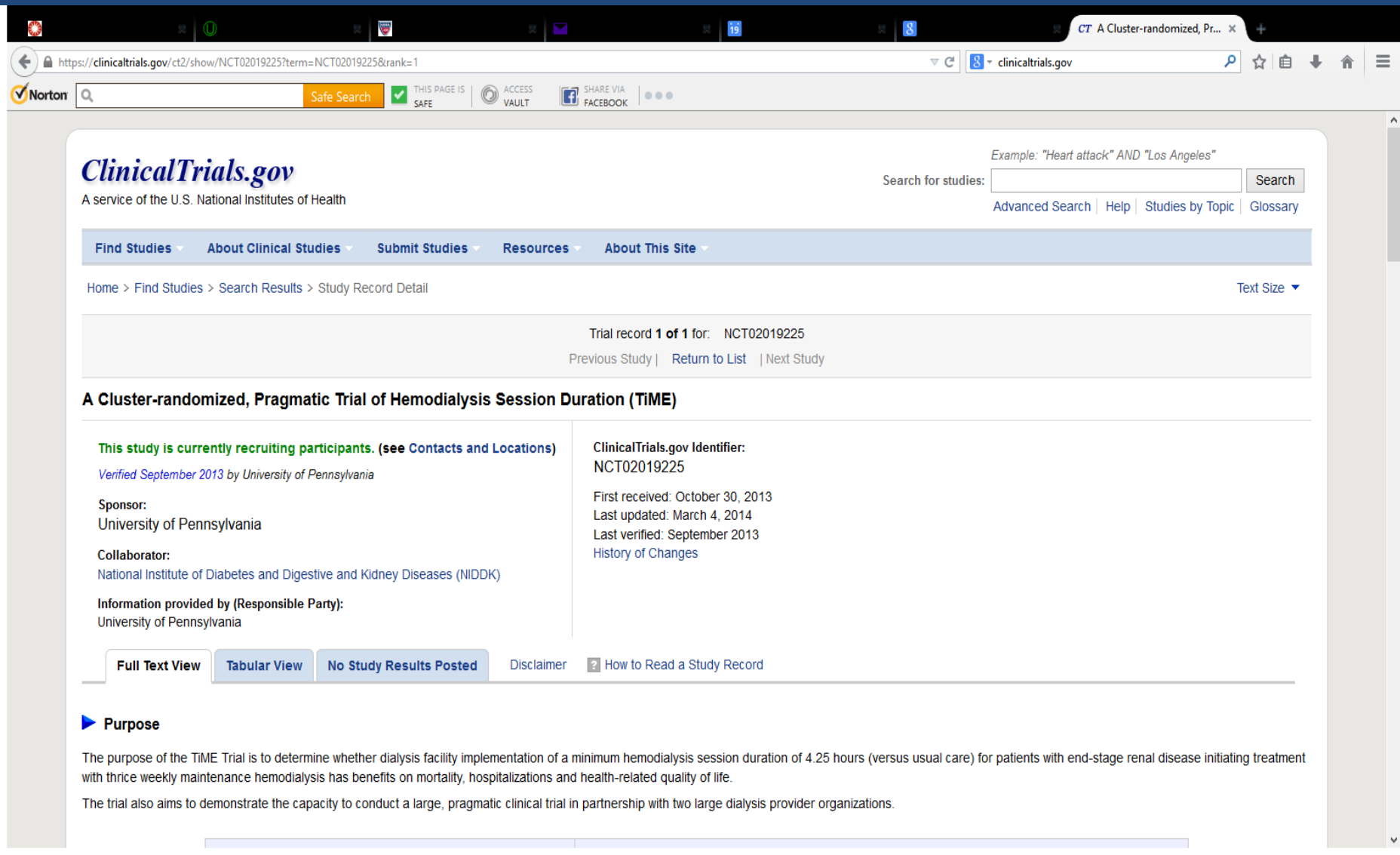
Showed significant improvement in surrogate and hard clinical end-points with dry weight assessment with BIA-guided therapies

Gradual Fluid Removal

- Based on current research evidence, propose a 4-hour first policy
  - DOPPS (Saran, et al., *Kidney Int*, 2006): UFR > 10mL/h/kg associated w/ intradialytic hypotension and all-cause mortality
  - Movilli, et al, *NDT*, 2007: Each 1 mL/h/kg increase in UFR associated w/ 22% increase in mortality risk
  - HEMO study (Flythe, et al, *Kidney Int*, 2011): Greater mortality risk 10-13 mL/h/kg
- Investigate modalities that use gradual ultrafiltration

Weiner, et al., *Am J Kidney Dis*, 2014

Time to Reduce Mortality in End-Stage Renal Disease (ClinicalTrials.gov)—TiME Study



Avoidance of Sodium Loading

- Dialysate sodium concentration 134-138 mEq/L
- Tailor dialysate sodium to patient's "set-point"
- Dialysis machine engineering to re-set dialysate sodium to default
- Avoidance of hypertonic saline/sodium modeling
- Investigation of optimal dialysate sodium concentrations & gradients

Weiner, et al., *Am J Kidney Dis*, 2014

Nutritional Counseling

- Team approach to emphasize limiting sodium intake (and relevant fluids) focuses on:
  - Including counseling strategies that empower patients
  - Evaluating eating habits within the context of cultural competency
  - Identifying available foods and resources needed for healthy food selection
  - Assessing skills for integrating a healthful approach

Clinical Applications & Collaborative Practice

Fluid Status & Dry Weight Assessment

Completed @ each dialysis session

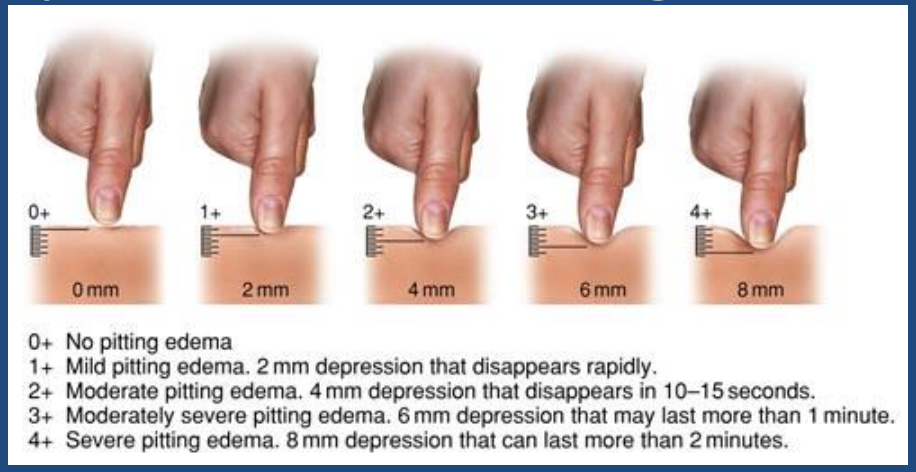
- Over the past two weeks…
  - Was the patient's post-dialysis weight 0.5 kg above or below target dry weight?
  - Were there at least 3 episodes of the patient's systolic BP to be >130 mm HG?
  - Did the patient have any symptoms?
    - Shortness of breath?
    - Coughing?
    - Fatigue?
    - Change in appetite?
    - Cramping?
    - Vomiting or Diarrhea?
    - Swelling?

Adapted from Fluid and Target Weight: 5 Point Assessment, Fresenius Medical Care, 2013

Fluid Status & Dry Weight Assessment

Completed @ each dialysis session

- Today…
  - Does the patient present with
    - Decreased breath sounds: (difficult to hear or absent)?
    - Rales: (crackles heard most on inspiration)?
    - Rhonchi: (deeper rumbling heard during expiration)?
  - Does the patient have swelling or edema?



Adapted from Fluid and Target Weight: 5 Point Assessment, Fresenius Medical Care, 2013

Case Scenarios for “Best Practice”

Case Scenario #1
(RX: three times weekly @ 3.25 hours)

- ✓ Food/Nutrition-Related History: Fair appetite, eating 1-2 meals per day; on Liquicel supplement; Fixed income
- ✓ Meds: Anti-hypertensives and anti-diuretics
- ✓ Labs: Albumin 3.4; enPCR-0.88, eKt/V-1.97
- ✓ Anthropometrics: BMI-27; EDW-72.5 kg, post-dialysis wt-70 kg; IDWGs-0.9 kg weekdays/1.4 kg weekdays
- ✓ Dialysis symptoms: BP elevated before and after treatment; Presents with decreased breath sounds, rales and rhonchi; Edematous

Concerns???

Problem List

- ✓ Poor appetite evidenced by low enPCR (low albumin complicated by fluid status)
- ✓ Limited finances
- ✓ Losing weight; post-wts below EDW; low IDWGs
- ✓ Hypertensive and edematous; symptomatic of volume overload

Treatment Plan

Who are the key members????

Treatment Plan

- Evaluate dry weight with close monitoring at dialysis visits
- Assess dialytic prescription and careful review of dialysis treatments
- Provide aggressive nutritional intervention to improve oral intake and appetite
- Identify supportive services to assist with finances

Case Scenario #2
(RX: three times weekly @ 3.25 hours)

- ✓ Food/Nutrition-Related History: Good, stable appetite. Eats-out often; Limited ability to cook and shop; Coffee-drinker
- ✓ Meds: Insulin, Anti-lipemics, Anti-diuretics
- ✓ Labs: Albumin-3.9, enPCR-1.23, eKt/V-1.72; A1c-10
- ✓ Anthropometrics: BMI-46; EDW-127 kg; Usual Body Weight-129-130.5 kg; IDWGs-6 kg weekend/4.5 weekday
- ✓ Dialysis Symptoms: BP elevated before treatment; SOB after weekend, BP low post-treatment; often shortens treatment time (1-2 times/week); Edematous

Concerns???

Problem List

- ✓ Significantly overweight, eats high-sodium diet due to reliance on processed foods and restaurant dining
- ✓ Difficulty with fluid prescription; may have excessive thirst
- ✓ High IDWGs and underdialyzed due to “signing-off early”
- ✓ Hypertensive, SOB, and edematous; symptomatic of volume overload

Treatment Plan

Who are the key members????

Treatment Plan

- Assess dialytic prescription and modality
- Evaluate dialysis treatment and goals
- Monitor closely for IDWGs and symptoms pre- and post-dialysis
- Evaluate glycemic control
- Provide nutritional intervention to improve food selections when shopping and eating-out
- Explore weight management
- Analyze the environmental factors affecting the patient's decisions

Summary

- Fluid status is a strong predictor of mortality and morbidity.
- Volume control should be emphasized along with other indicators of dialysis adequacy.
- More research is necessary to explore the best practices for improving patient outcomes.
- Successful fluid management requires an interprofessional approach

Thank you!