

In the name of GOD

Delivering good quality dialysis , what should be measured ?

17th international congress of nephrology ,dialysis , transplant

Tabrize ,IRAN

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- First we need to pay attention that
 - Kt/v was developed by Dr. Frank Gotch and Dr. John Sargent as a way to measure the dose of dialysis

Clin J Am Soc Nephrol 12: 839–847, 2017.

- Urea kinetics play an important role in defining a minimum small molecule clearance required to avoid unacceptable levels of morbidity and mortality .

Kidney Int 28: 526–534, 1985

- However, there is a general consensus that increasing the dialysis doses according to just small molecule clearance are unlikely to yield further major advances in patients health and survival

Beyond Kt/V. Semin Dial 27: 98–107, 2014

The reasons that reaching "adequate" Kt/V targets does not confer optimal quality of life

- Because We call it 'adequate' when the mortality rate of patients who are 'adequately' treated is at least 4 times more than that of general population (*that can be compared with many cancers*)

Nephrol Dial Transplant 2012 . doi : 10 ,1093/ndt/gfr 786 first published online: january 23,2012

- Apart from the clearance of small molecules obtained by Kt/V multiple measures and goals should be considered when assessing optimal dialysis :
 - Residual kidney function
 - Volume status
 - Biochemical measures
 - Nutritional status
 - Cardiovascular function
 - Symptoms and the patient's experiences and goals

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- To investigate the importance of other solutes including:
 - Middle and large solutes
 - protein-bound molecules
 - carbamylated molecules, and
 - metabolic products of intestinal bacteria as potential contributors to poor functional status, symptoms, comorbidities, and mortality among patients , research is need

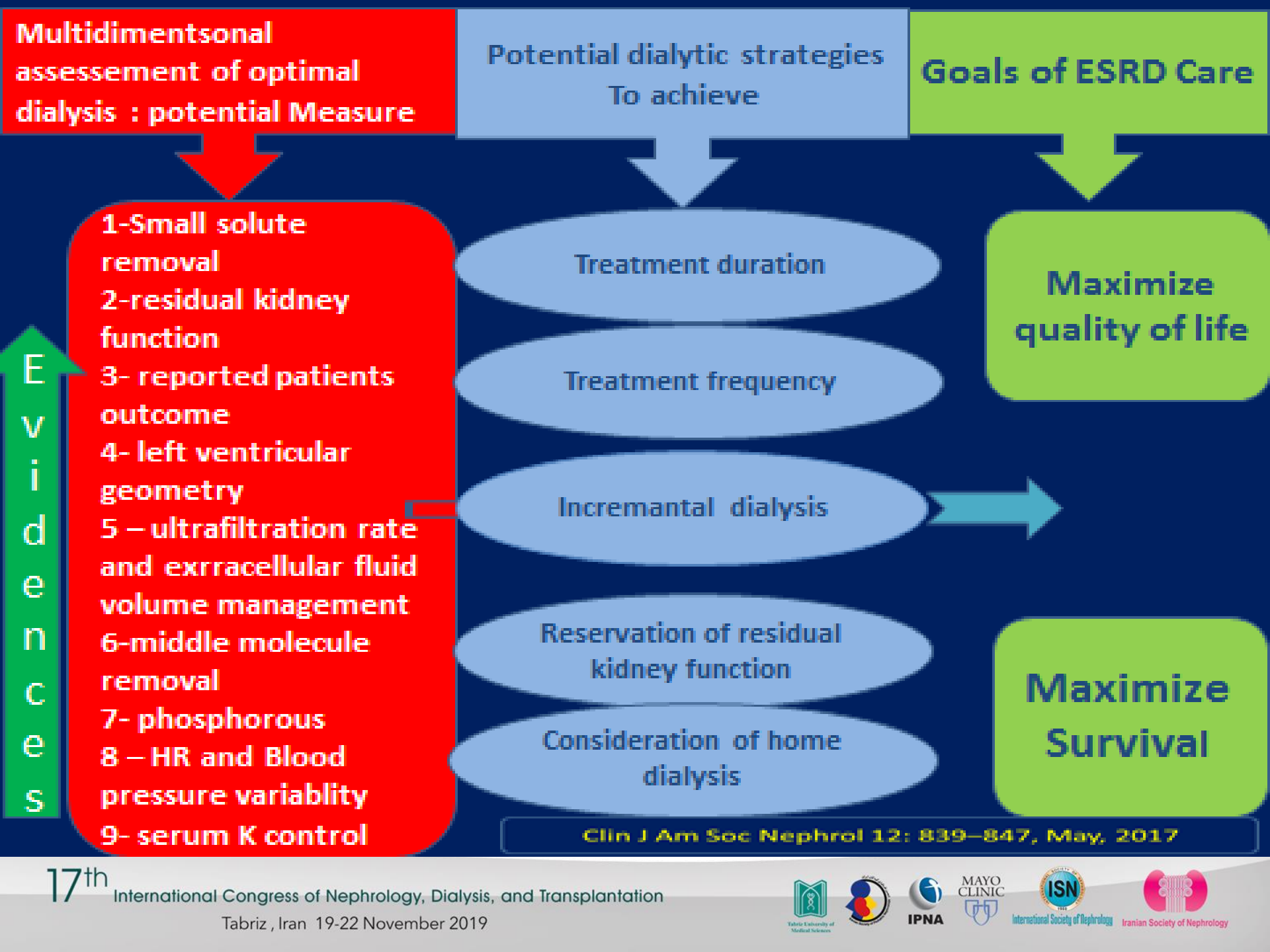
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- It seems that the term of “adequate dialysis” be changed to “goal directed or optimal dialysis

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What is optimal dialysis

- Optimal Dialysis Is a "Moving Target"
- We should not think there is one simple way to describe 'optimal dialysis.'
- It will be a moving target, and the description will change through the time



The Importance of Time for reaching HD Goal

- The removal of uremic retention solutes is directly related to the duration of dialysis, especially large solutes, such as b2M, and sequestered solutes, such as phosphate

PLoS One 11: e0147159, 2016

Kidney Int 73: 765–770, 2008

- Also recently, several large observational studies have found an association between longer dialysis sessions and lower mortality risk, however, reduced mortality with longer dialysis time is not evident in all such analyses

Am Soc Nephrol 25: 2113–2120, 2014

Am J Kidney Dis 66: 459–468, 2015

The Importance of Frequency

- On the one hand the majority of patients who initiate and are maintained on HD receive 3 sessions/W regardless of their RKF, urine output, clearance requirements, cardiovascular status, quality of life, or preference.
- And there is some evidence that in patients with significant RKF, less frequent dialysis ie(twice weekly) can be associated with preservation of RKF.

Am J Kidney Dis 64: 181–186, 2014

- On the other hand When patients are dialyzed 3 times a week , swing wildly back and forth from acidosis to alkalosis, from hyperkalemia to hypokalemia, and from fluid overload to fluid contraction
- but when patients are switched to daily dialysis the fluctuations are much less

- As we know higher RKF is associated with better survival, one can postulate that an incremental dialysis frequency approach can be more favorable in the selected patients.
- And RKF itself should be an important metric to consider in the evaluation of optimal dialysis.

Am J Kidney Dis 66: 884–930, 2015

- In contrast, frequent hemodialysis sessions were associated with decreased mortality, improved electrolytes, BP control, and quality of life in observational studies.

Kidney Int 85: 158–165, 2014

AmJKidney Dis 66: 823–836, 2015

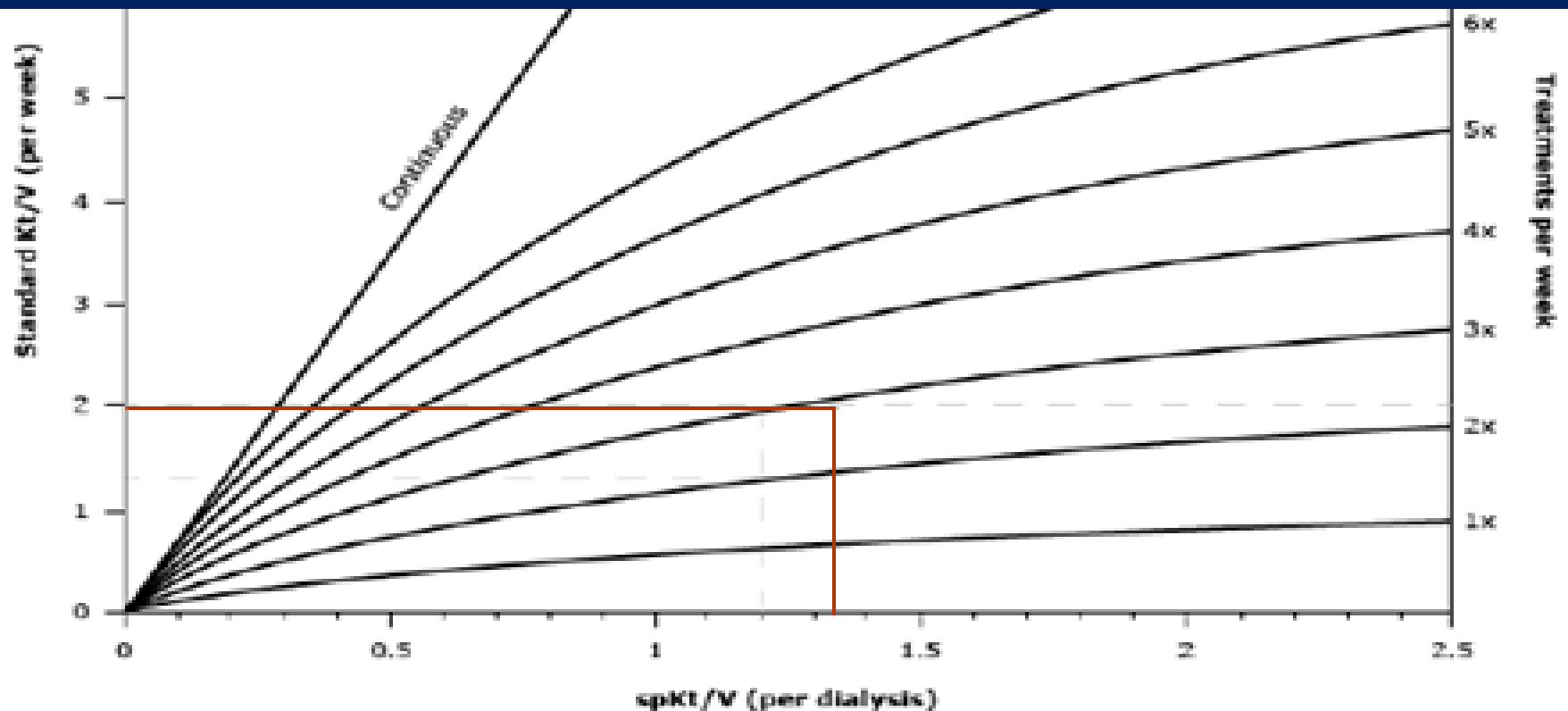
- Furthermore, the FHN Trial found that more frequent dialysis therapy (5 d/wk) led to reduced left ventricular mass, a surrogate for cardiovascular outcomes

NEngl J Med 363: 2287–2300, 2010

So overall

- How many sessions/Week ?

Gotch's standard weekly Kt/V (if $RKF < 2$)

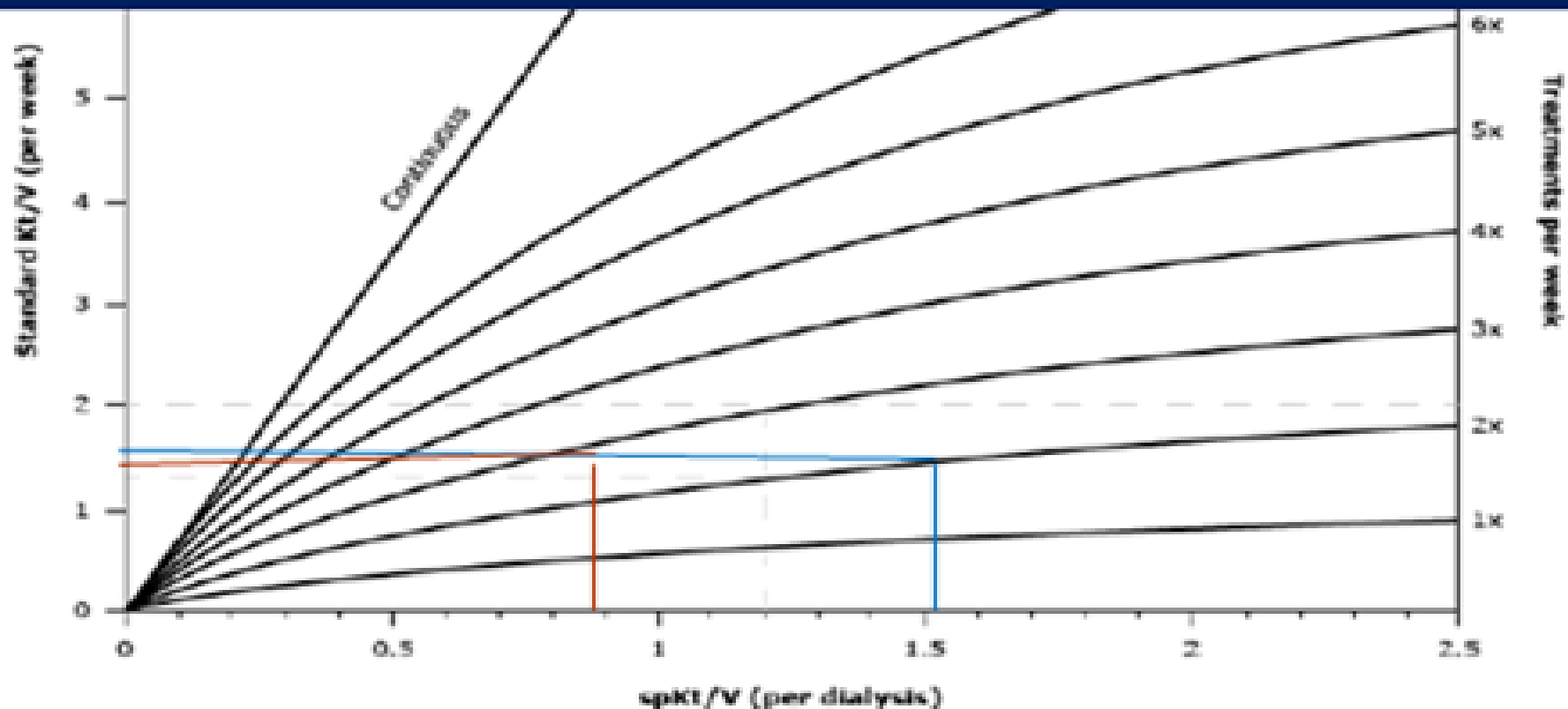


spKt/V: single-pool Kt/V

Nephrol Dial Transplant 1998;13 suppl 6:10.

Modified from: Gotch PA. The current place of urea kinetic modeling with respect to different dialysis modalities. Nephrol Dial Transplant 1998; 13(Suppl 6): 10, by permission of Oxford University Press on behalf of European Renal Association-European Dialysis and Transplant Association.

Gotch's standard weekly Kt/V ($RKF > 2$)



sp Kt/V : single-pool Kt/V .

Modified from: Gotch PA. The current place of urea kinetic modeling with respect to different dialysis modalities. *Nephrol Dial Transplant* 1992; 13(Suppl 6): 10, by permission of Oxford University Press on behalf of European Renal Association-European Dialysis and Transplant Association.

Incremental dialysis

- prescribing a lower HD dose depending on the RKF
- Major clinical trials of HD dosing, such as (HEMO) study, did not consider residual kidney function in dialysis dosing
- Twice-weekly was only used for the first few months regarding the progressive declining RKF
Am J Kidney Dis 2014;64:181.

So

- The decision whether to consider RKF in the dialysis dose is best made by the patients and their nephrologis

Nephrol Dial Transplant 2015; 30:1939.

Incremental dialysis

- As a general rule, urine output at the initiation of HD must be sufficient to keep interdialytic weight gain <3 pounds.
- UF at HD to remove that volume should be well tolerated.
- Serum K and P should be well controlled with diet and p- binders before starting dialysis.
- Patients should have no history of CHF or history of requiring UF to maintain euvolemia.
- Patients should have good nutritional status based on numerous parameters

Am J Kidney Dis 2014;64:181

Risks in incremental dialysis

- Under-dialysis due to unrecognized loss of RKF
- Patients Reluctancy in increasing the number of dialysis sessions or increasing treatmet duration
- Possible increased risk of HF, HTN, hyperphosphatemia, acidemia, and hyperkalemia

Medicine (Baltimore)2016,95:e2767

Benefits of incremental dialysis

- Fewer hemoaccess complications
- Better preservation of RKF
- better quality of life

BMC Nephrol 2014;15:172.

Kidnet int rep (2017) 2, 781-784

Short daily or quotidian HD

- The patients suffering from refractory uremic complications
 - Refractory fluid overload
 - Resistant hypertension
 - Intradialytic hypotension.
- This modality would be prescribed
 - Five to seven days per week
 - Each session would take 1.5 to 2.5 hours

The effects of Patient-specific parameters on dialysis dose

- **Gender :**
 - Women need 15% more dialysis than men if they have the same volume of distribution
 - Because V/BSA in women is 12-15% > men
- **Small body size :**
 - Because V/BSA is higher more dialysis needed
- **Malnutrition :**
 - Dialysis should be done base on healthy weight , not for current reduced weight

Volume management and optimal HD

- Fluid management is thought to be critical_ in optimal dialysis.
- unlike small solute clearance and electrolyte balance, extracellular volume is not easily measured

Clin J Am Soc Nephrol 12: 839–847, May, 2017

- IDWG >3.5% of body wt is associated with an increase in HD induced morbidity and Failure to achieve target weight has been associated with mortality . That

BMC Nephrol 16: 113, 2015.

Clin J Am Soc Nephrol 10: 808–816, 2015

- can be due to ventricular remodeling and subsequent heart failure and arrhythmia .

Am J Kidney Dis 64: 111–118, 2014

- Specifically, intradialytic hypotension is associated with problems, such as vascular access thrombosis and accelerated loss of RKF and

J Am Soc Nephrol 22: 1526–1533, 2011

More ultrafiltration volume is associated with prolonged recovery time after dialysis.

Am J Kidney Dis 64: 86–94, 2014

Furthermore, when ultrafiltration rate induces hemodynamic instability and hypotension, reactive fluid boluses may lead to chronic volume expansion and its unpleasant consequences.

- The FREEDOM Study and other observational data showed that _ daily home HD is associated with an improvement in patients mental and physical HRQoL . Also

Kidney Int 82: 561–569, 2012

- The FHN Trial found that 6 d/w in-center HD would result in a better physical health, less depression, and shorter recovery time than_ 3 times a week

NEngl J Med 363: 2287–2300, 2010

- Why selecting the optimal measures for fluid management is so complicated
_because of the Interaction among :
 - IDWG , volume expansion, and fluid removal practices and
 - lack of objective volume status measurement tools
 - and also absence of RCT data

Clin J Am Soc Nephrol 11: 1422–1433, 2016

Patient-Reported Outcomes in optimal dialysis

- It comprise symptoms, HRQoL, and experience of care.
- PROs and considering patients preference are important in patient-centered care, which may provide significant diagnostic information, and finally may affect patient s behavior, thereby inducing morbidity, resource utilization, and survival

Clin J AmSoc Nephrol 5: 220– 226, 2010

- Moreover, depression is conversly associated with survival, and those _having acute or chronic pain _experience a deterioration in HRQoL

AmJ Kidney Dis 63: 623–635, 2014

Cardiovascular Health is an important issue in optimal dialysis that should be addressed

- The high incidence of cardiovascular mortality and morbidity in maintenance dialysis is likely multifactorial , but
- several lines of evidence suggest that the modality or adequacy of solute and fluid removal can alter risk of cardiovascular outcomes in patients on maintenance dialysis

Clin J Am Soc Nephrol 11: 1422–1433, 2016

A study of Chinese patients on HD demonstrated associations between single pooled Kt/V and LVMI

CellDeathDis 2: e244, 2011

FHN Trials compared LVMI in frequent and standard HD . _the results demonstrated convincing reductions in frequent HD , especially in those with limited RKF.

Clin J Am Soc Nephrol 8: 2106–2116, 2013

Other studies have demonstrated associations between urea removal and carotid IMT .

Nephrology (Carlton) 13: 472–479, 2008

an improvement in heart rate variability with frequent hemodialysis

Nephrol Dial Transplant 29: 168–178, 2014

and an increase in risk of sudden death and arrhythmia hospitalization during the long inter dialytic interval .

N Engl J Med 365: 1099–1107, 2011

- *Thus variables for assessing cardiovascular risk, such as:*

LVMi

IMT

HR variability

Arrhythmia

can be potentially integrated with

Solute

volume

anemia

metabolism

In individual patients

- The extent of change in each variable that is selected as the `goal_` should be clearly defined
- Similarly, the optimal frequency measurement is uncertain.
 - In theory, heart rate variability or rhythm can be measured continuously.
 - Conversely, changes in LVMI and IMT are detectable only within some months.
- However, studies are needed to confirm the utility of LVMI, IMT, and heart rhythm monitoring as surrogate outcomes measures.
- Clin J Am Soc Nephrol 12: 839–847, 2017

For Action: A Multidimensional Quantification of Dialysis Delivery

- It should be mentioned that further research is needed to substantiate the use of a multidimensional measure to quantify dialysis dose.

Clin J Am Soc Nephrol 12: 839–847, 2017

Quality metric in ESRD

Clinical and safety Measures	Reported measures	Outcome or clinical performance measures
Dialysis adequacy	Lipid management	Standardized mortality rate
Vascular access AVF > graft > catheter	Glycemic control	Standardized hospitalisation rate
Target Hb	Diabetic foot care	Standardized transplantation rate
Mineral metabolism control	Secondary cardiovascular protection	Quality adjusted life years
Nutritional status	Adequate immunization	Patient safety
Infectious rate	Age appropriate screening	patient satisfaction

- It is interesting to know that **_ Payment for care is moving from fee-for-service_ to performance on the basis of CPMs.**
- Physicians' performance, similar to teachers' , is increasingly measured not by the number of encounters , but **_ by the outcomes of those encounters.**
- **Just as teachers are judged by the test results of their students, doctors are increasingly judged, and paid, by the clinical outcomes of their patients.**

Implementation of goal-directed dialysis

- Education for clinical care teams
- Tools for eliciting and documenting patient goals
- Increased flexibility for dialysis schedules
- Incorporation of symptom assessment and other patient-centered outcomes into routine clinical practice
- Establishment of metrics for success Quality assessment approaches that accommodate individualized targets
- Buy-in from multiple stakeholders
- Aligned incentives across stakeholders are needed

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• Thank you for
attention

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