In The Name Of God

Chronic Hemodialysis Prescription

Dr. Mehdi khaje azad

Nephrologist

Outlines :

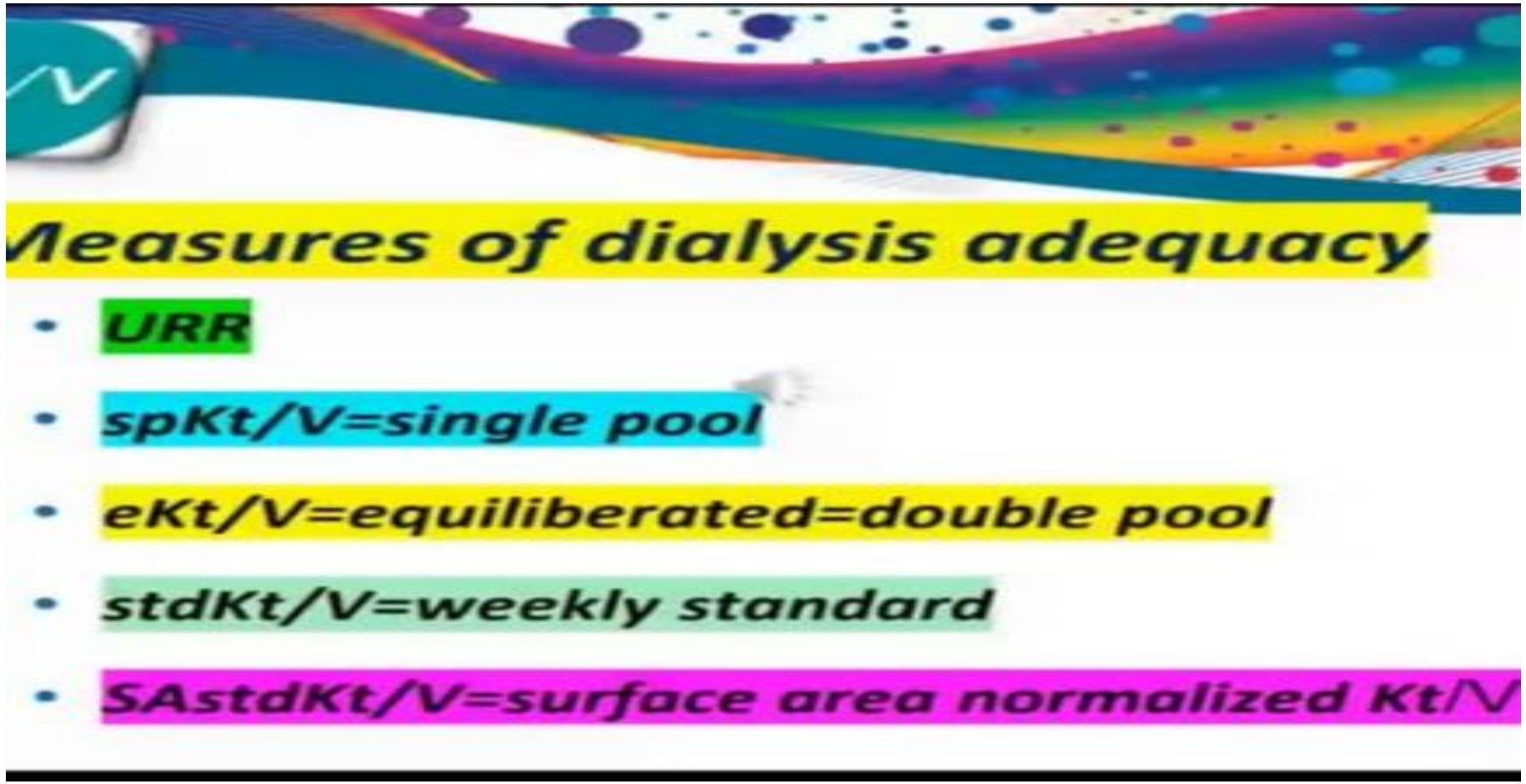
- Chronic dialysis indications
- Dialysis adequacy
- Writing the initial prescription
- Checking the delivered dose of dialysis
- Choice of dialyzer
- Fluid removal order
- Dialysis solutions
- Patient monitoring

Chronic dialysis indications

Indications for emergent dialysis	Indications for chronic dialysis
Intractable volume overload and/or HTN	Hyperphosphatemia refractory to dietary and to treatment with phosphorus binders
Refractory hyperkalemia	Unexplained decline in functioning or well-being
Refractory metabolic acidosis	Anemia refractory to erythropoietin and iron treatment
Pleuritis or pericarditis without other explanation	Recent weight loss or deterioration of nutritional status, especially if accompanied
Bleeding diathesis	Nausea, vomiting, or other evidence of gastroduodenitis
	Neurologic dysfunction (e.g., neuropathy, psychiatric disturbance, encephalopathy,)

Dialysis Adequacy

1. Urea as a marker solute
2. Measure of dialysis adequacy



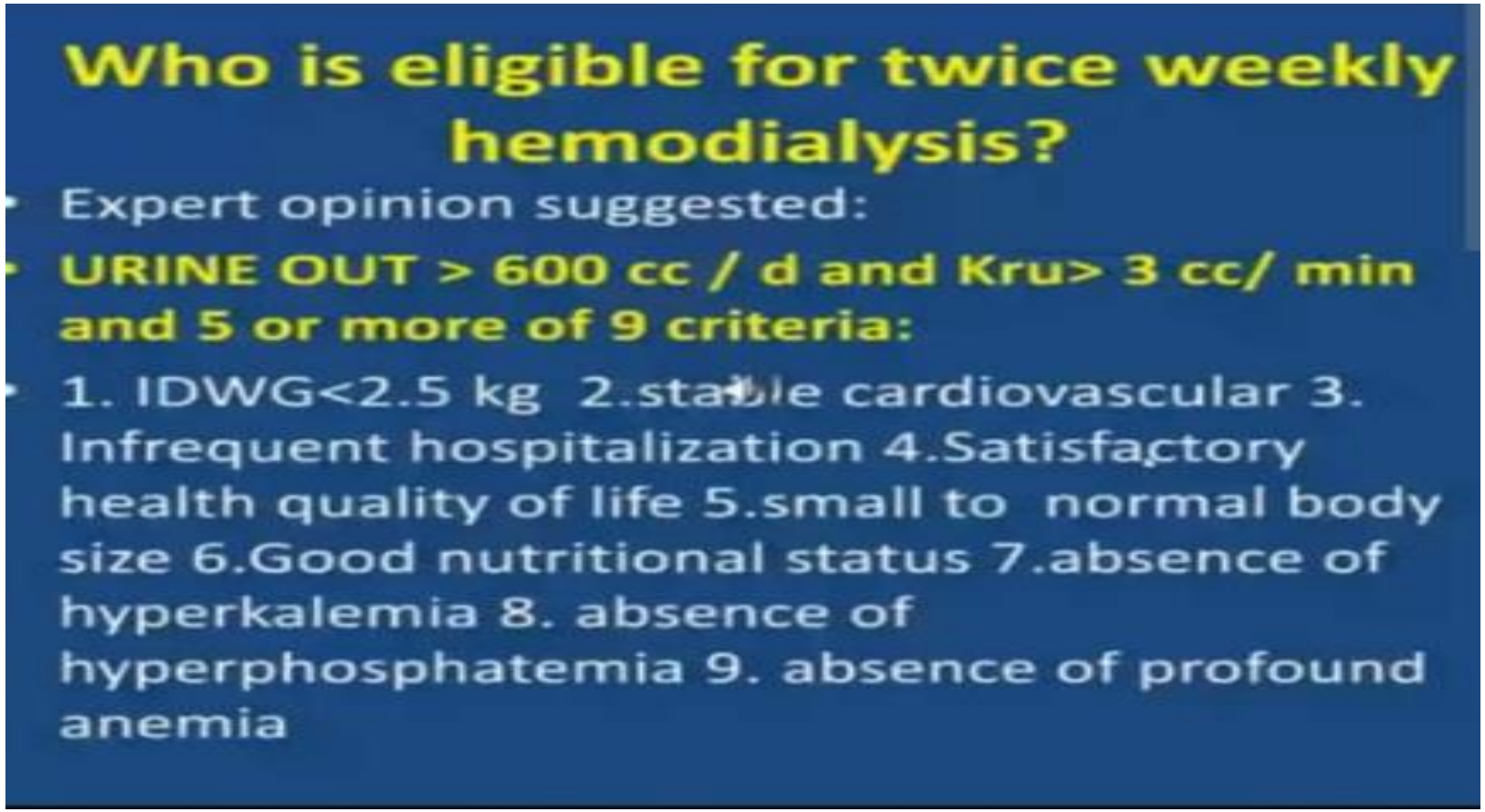
3 . Dose of dialysis in terms of urea removal for thrice weekly dialysis on basis of KDIGO guidline :

- **Minimum spkt/v must be 1.2**
- **Target value of spkt/v must be at least 1.4**

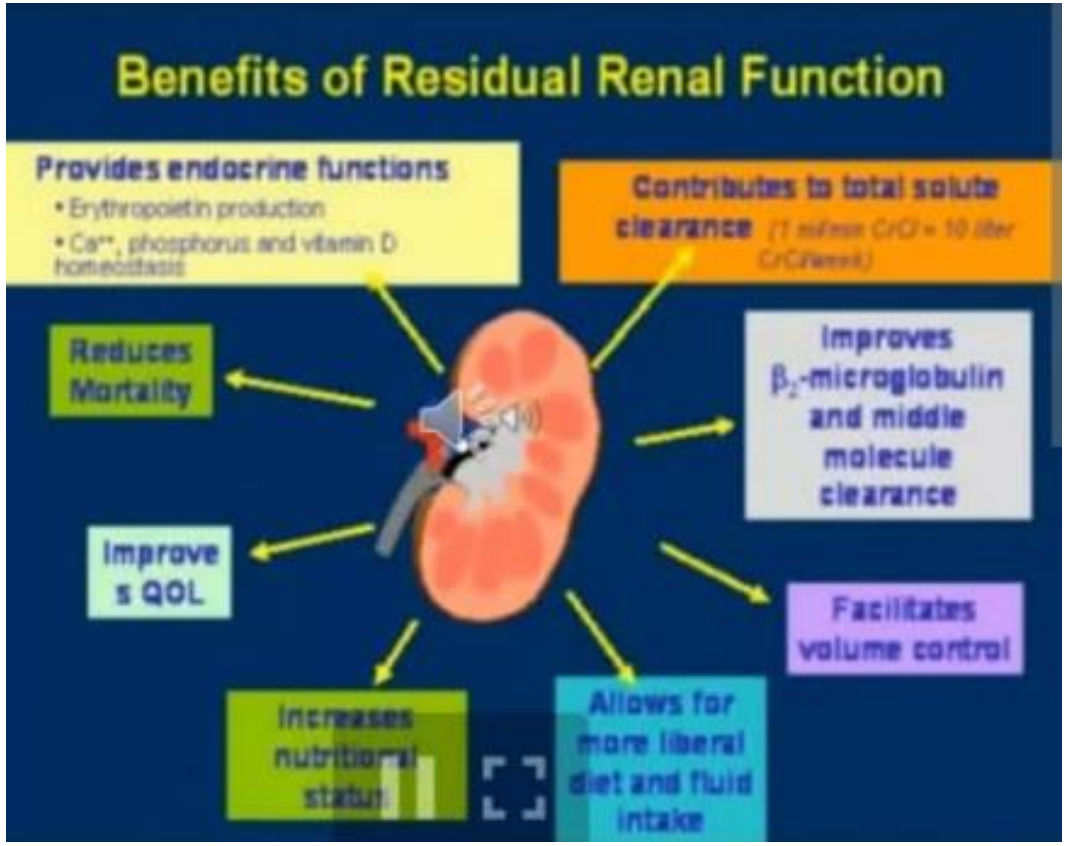
4.When dose is measured as spkt/v ; this patients should get relatively more dialysis :

- Women
- Smaller patients
- Younger patients
- Patients with less morbidity
- Patients with more activity

5. Residual renal urea clearance(Kru)



6.Benefits of residual renal function



7. Considerations for preservation of residual kidney function in hemodialysis

Table 3 | Considerations for preservation of residual kidney function in hemodialysis

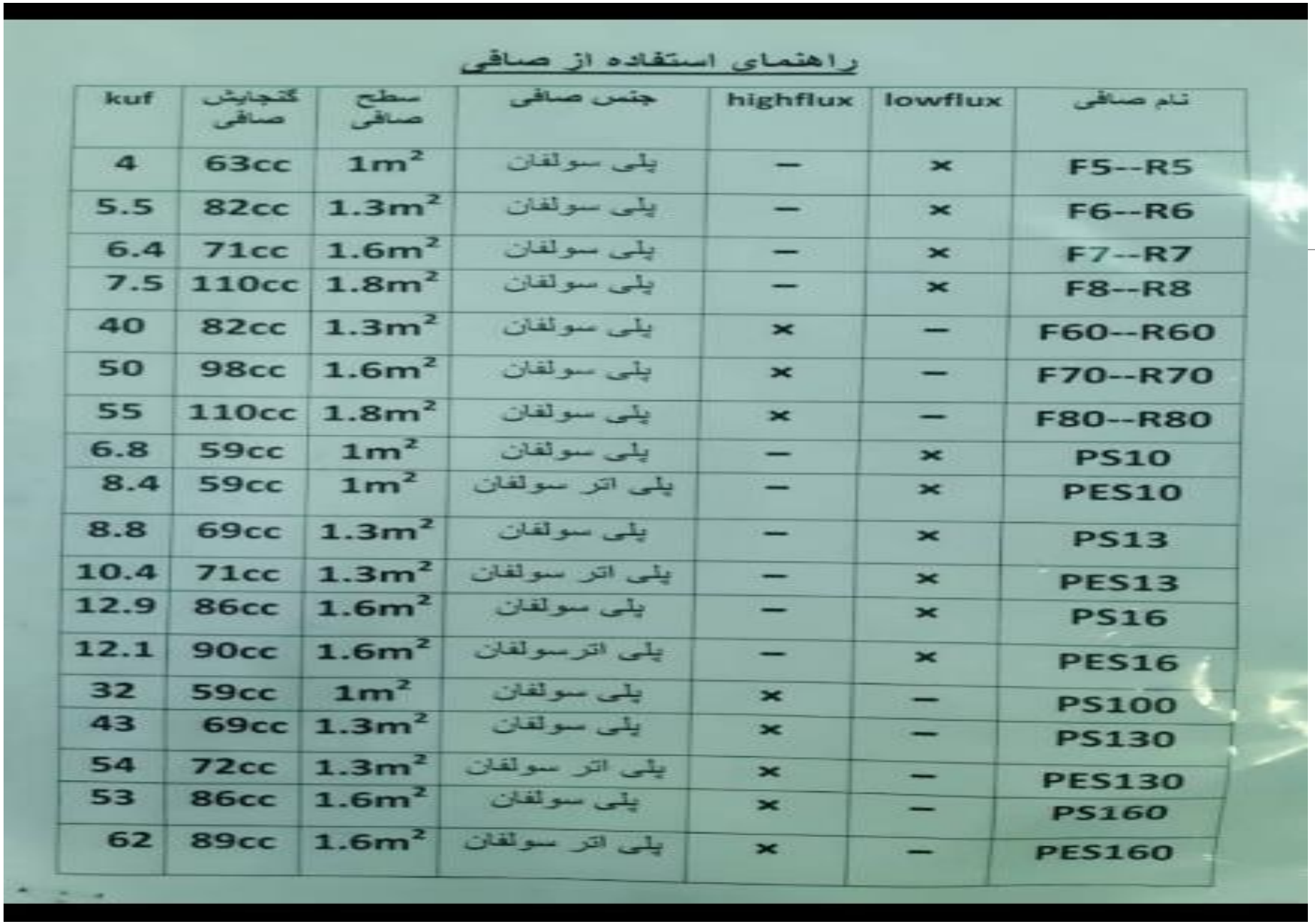
1. Measure and monitor RKF	• Measure KRU and/or interdialytic UV in all patients initiating hemodialysis • Target KRU >3 ml/min per 1.73 m^2 and UV >0.6 l/day • Monitor KRU and/or UV every month to every quarter in year 1, then every quarter to every 6 months until UV <100 ml/day or KRU <2 ml/min per 1.73 m^2 • Measure and monitor other parameters of adequacy (anemia, fluid gains, phosphate/potassium control, nutritional status, and health-related quality of life)
2. Avoid or minimize nephrotoxic events	• Radiocontrast dye • Aminoglycosides • NSAIDs and COX-2 inhibitors • Withdrawal of transplant immunosuppression
3. Control blood pressure and avoid intradialytic hypotension	• Control hypertension • Use RAAS blockade and loop diuretics
4. Adjust hemodialysis prescription	• Initial dialysis modality (twice-weekly HD or PD first approach) • Re-evaluate dialysis dose if RKF or adequacy changes • High-flux, biocompatible dialyzer membranes • Ultrapure water for dialysate • Avoid intradialytic hypotension
5. Consider low-protein diet	• Low-protein diet (0.6—0.8 g/kg per day) on nondialysis and regular- to high-protein diet (1.2 g/kg per day) on hemodialysis days

Writing the initial description

1.Kt/v

2.Dialyzer efficiency versus flux

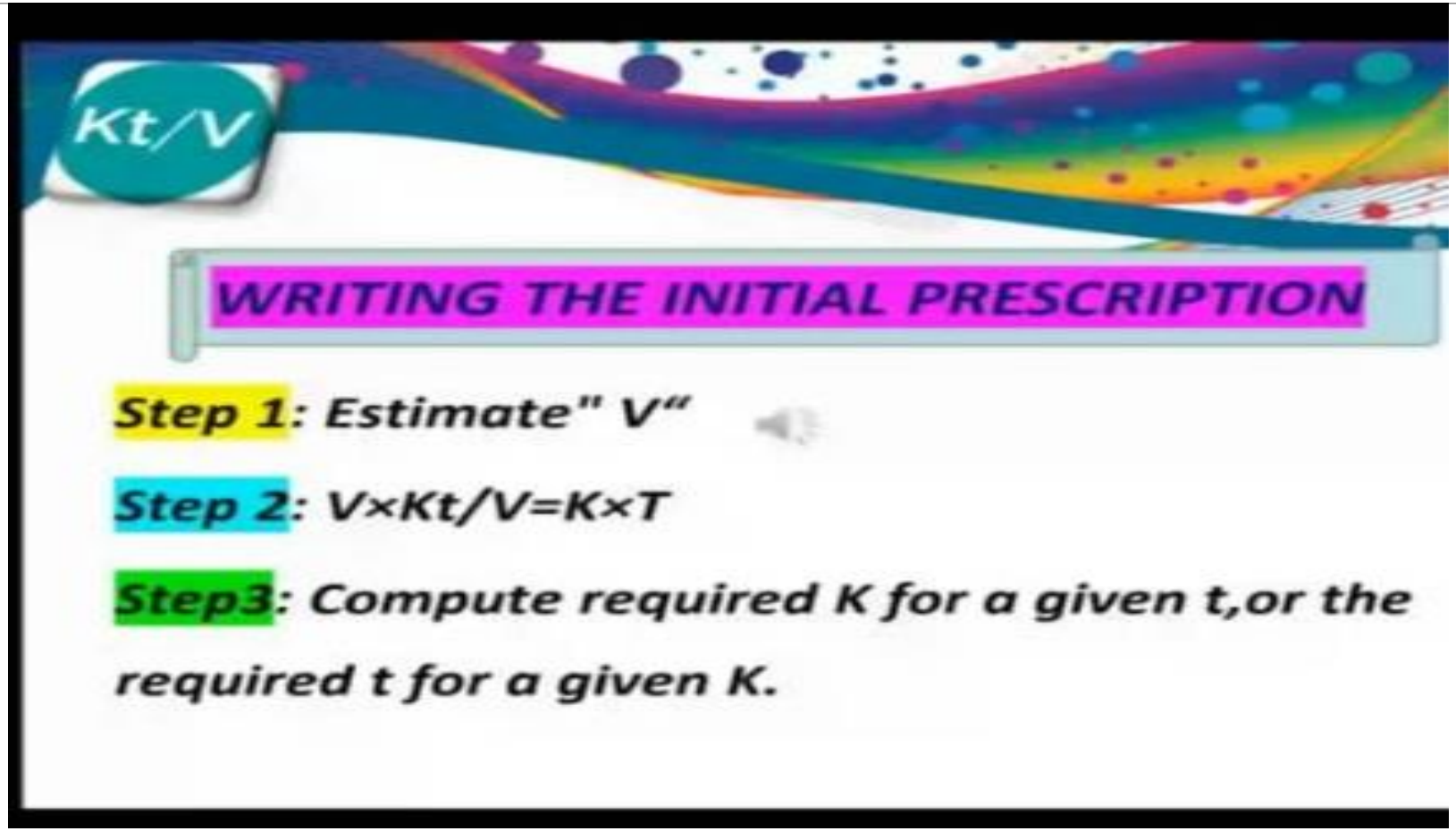
- Dialyzer efficiency : Ability for remove small solutes
- Dialyzer flux : Ability for remove very large molecules



راهنمای استفاده از صافی

kuf	گنجایش صافی	سطح صافی	جنس صافی	highflux	lowflux	نام صافی
4	63cc	$1m^2$	پلی سولفان	—	×	F5--R5
5.5	82cc	$1.3m^2$	پلی سولفان	—	×	F6--R6
6.4	71cc	$1.6m^2$	پلی سولفان	—	×	F7--R7
7.5	110cc	$1.8m^2$	پلی سولفان	—	×	F8--R8
40	82cc	$1.3m^2$	پلی سولفان	×	—	F60--R60
50	98cc	$1.6m^2$	پلی سولفان	×	—	F70--R70
55	110cc	$1.8m^2$	پلی سولفان	×	—	F80--R80
6.8	59cc	$1m^2$	پلی سولفان	—	×	PS10
8.4	59cc	$1m^2$	پلی اتر سولفان	—	×	PES10
8.8	69cc	$1.3m^2$	پلی سولفان	—	×	PS13
10.4	71cc	$1.3m^2$	پلی اتر سولفان	—	×	PES13
12.9	86cc	$1.6m^2$	پلی سولفان	—	×	PS16
12.1	90cc	$1.6m^2$	پلی اترسولفان	—	×	PES16
32	59cc	$1m^2$	پلی سولفان	×	—	PS100
43	69cc	$1.3m^2$	پلی سولفان	×	—	PS130
54	72cc	$1.3m^2$	پلی اتر سولفان	×	—	PES130
53	86cc	$1.6m^2$	پلی سولفان	×	—	PS160
62	89cc	$1.6m^2$	پلی اتر سولفان	×	—	PES160

3. The initial prescription for a specific patient to achieve a desired spkt/v



Kt/V

Example

Pt (x):

V=40 L

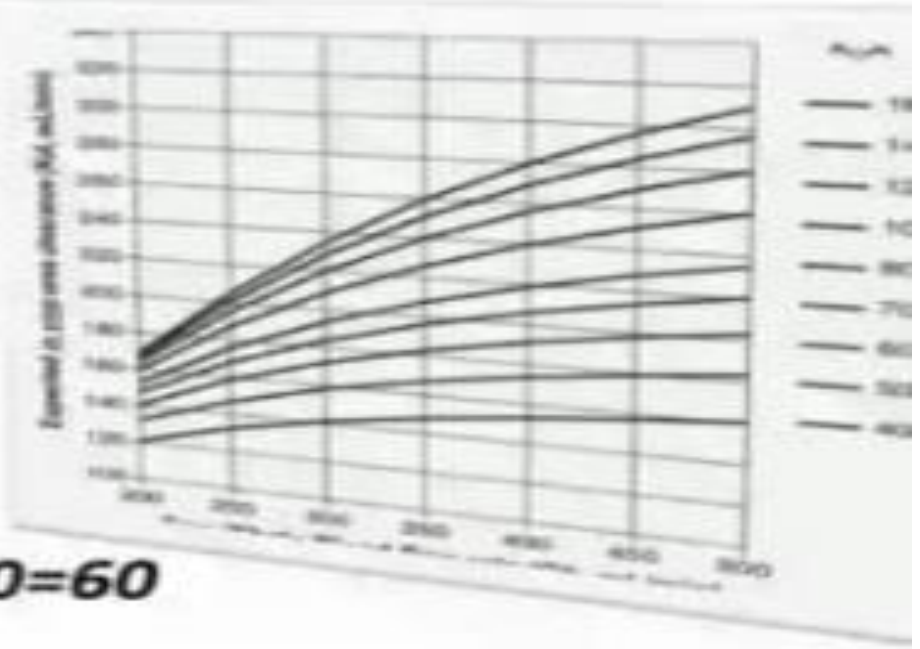
Desired spkt/v=1.5

k×t=?

Kt/v=desired spkt/v

?/40=1.5 ⟹ **1.5×40=60**

k×t=60L=60000ml



Kt/V

Given a desired session length t,how to compute required K:

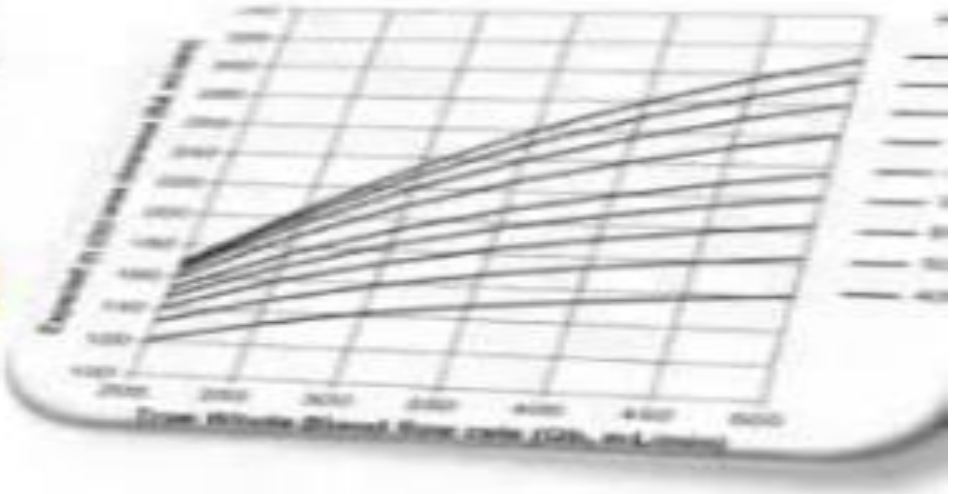
desired spKt/v=1.5,V=40 L ,K×t=60 L

desired t=240 min

K?

K×t/t=60000/240=250ml/min

Now that we know the required K,how to choose KoA ,BFR and DFR.



Given an actual BFR(Q_B).How to compute required t given 2 possible choice of Dialyzers

Target SPKT/V=1.5

V=40 L

K×T=60000 ml

BFR=400 ml/min

KoA 1=1400ml/min

KoA2=800ml/min

t1=?

t2=?

Step 1=find the K1 and K2

Step 2=find the t1 and t2

Kt/

Checking the delivered dose of dialysis

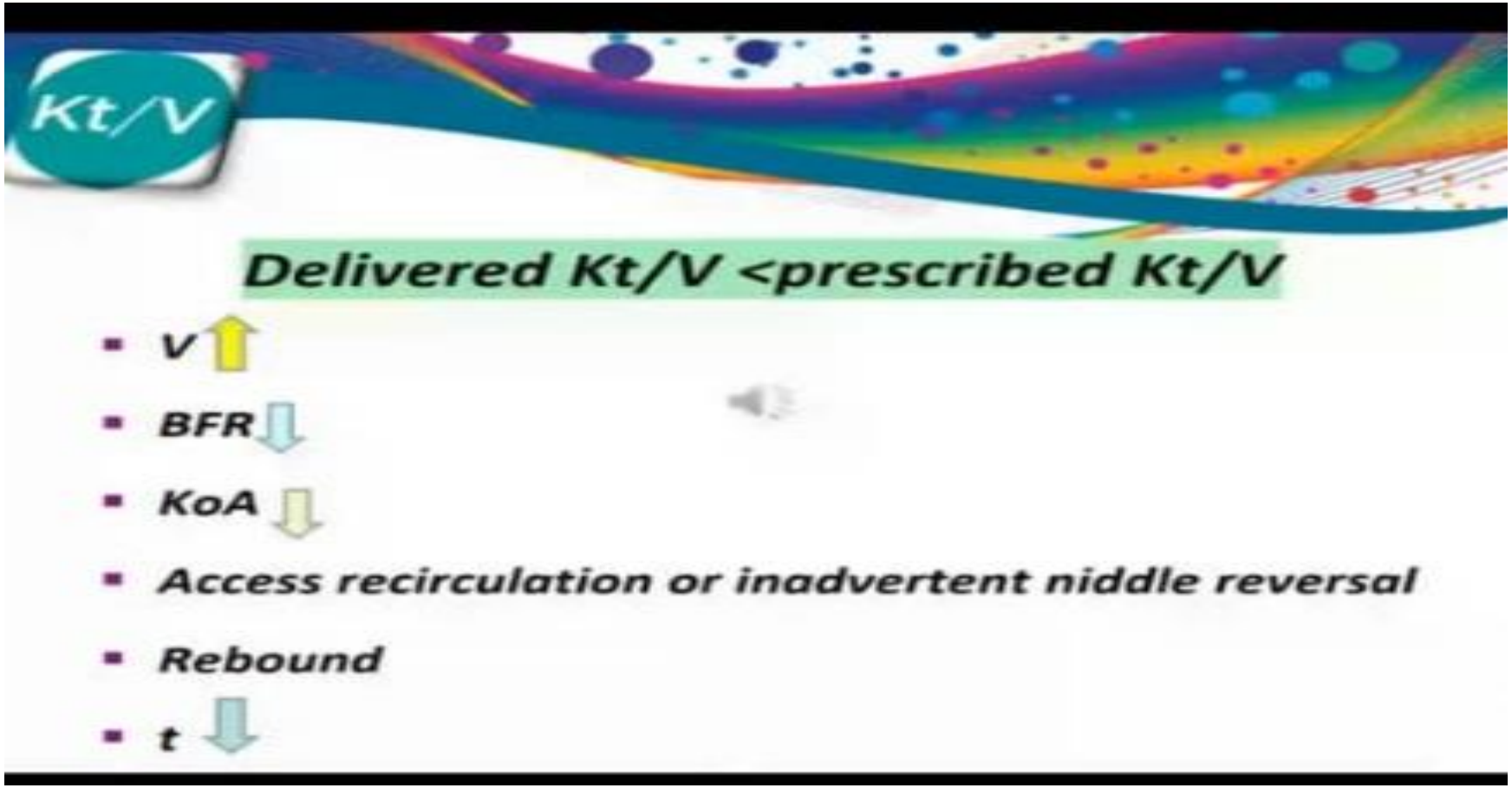
1.The dialysis dose is monitored by :

A)Monthly by drawing a predialysis and postdialysis SUN to computing the URR and delivered spkt/v

B) Checking the dialyzer sodium clearance during each treatment

C) Tracking the UV absorbance of the spent dialysate during each treatment

2.Causes of delivered kt/v is lower than prescribed kt/v



Choice of dialyzer

Benefits of high flux dialyzer using

1.Increasing of survival in patients who are on dialysis for long time

2.Reducing in cardiovascular mortality

3.May reduce the incidence of beta2 macroglobulin amyloidosis in patients dialyzed for many years

Fluid removal orders

1.Concept of " dry weight " or optimum post dialysis weight is the postdialysis weight at which all or most excess body fluid has be removed

2.Patients who have been ultrafiltered to below their optimum postdialysis weight often experience :

- Malaise

- A washed out feeling

- Cramps

-Dizziness after dialysis

-Stressfull and unpleasant postdialysis recovery

3.In practice ; the optimum postdialysis weight of each patient most be determined on trial and error

4. The optimum postdialysis weight should be reevaluated at least every two weeks

5.A progressive decrease in the optimum postdialysis weight can be a clue to an underlying nutritional disturbance or disease process

6.Methods of determination of optimum postdialysis weight :

- Clinical based on signs of edema or lung rales.This method is unreliable

-Bioimpedance devices

- lung ultrasound

7.Several approaches for reduce of fluid removal rate :

- Extension of the dialysis time

- Reducing IDWG by limiting sodium intake

- Using of diuretics

8.The patients in whom the UF rate is < 12 ml / kg per hour have a higher survival rate but it is not clear whether UF limits should be scaled to body weight ; to BSA or remain unscaled(e.g<800 cc/hr)

Dialysis solutions

1.Flow rate

-standard dialysis solution flow rate is 500 cc/min

-The optimum value for the dialysis solution flow rat is 1.5 to 2 times the blood flow rate.

2.Base

- Bicarbonat dialysis solution is the fluid choice

- Usually bicarbonate is 32 mM plus 4mM acetate

-Goal of predialysis plasma bicarbonate concentration is 20 -23 mmol/l

3.Potassium

The usual dialysis solution potassium levele is 2 mmol unless :

-The patients usual predialysis plasma potassium concentration is <4.5

-The patient is receiving digitals

4.Sodium

-The usual dialysis solution sodium level is between 135 and 145 mmol

- Level above 138 mmol are associated with increased thirst and weight gain between dialysis

- Dialysis solution sodium levels lower than 135 mmol predispose to hypotension and cramps

5.Dextrose

- Dialysis solution dextrose level is 100 or 200 mg/dl

- Presence of dextrose may reduce of hypoglycemia during dialysis

6.calcium

-Dialysis solution is from 1.25 to 1.5 mm (2.5-3 mEq/l)

7.Magnesium

- The usual dialysis solution magnesium level is

0.25-0.5mm(0.5 – 1 mEq/l)

8.Temperature

-The dialysis temperature should be set as low as possible without engendering patient discomfort; generally in the range of

34.5 -36.5 c.

-Individualization of cool dialysis by measuring patient tympanic membrane temperature

Patient monitoring prior to dialysis

A .Weight

- Patients should strive to keep their interdialysis weight gain below 1 kg per day

- Patients must limiting sodium rather than fluid intake

-Complaints of a washed out feeling or of persistent muscle cramps after dialysis suggest that the target postdialysis weight is too low

- A large interdialysis weight gain ; especially when coupled with symptoms of ortopnea or dyspnea should prompt a complete cardiovascular examination and reassessment of the target weight.

B. Blood pressure

1.In some patient blood pressure can increase during dialysis despit fluid removal.

2.Volume –resistance hypertensive patients sometimes benefit from further fluid removal ; and blood pressure may decrease only after a lag period of several months.

3.For management of high blood pressure must be focus on:

- Sodium restriction

-Lengthening the weekly dialysis time

- Moving to a more frequent dialysis schedule

-Abiding by a maximum of UF rate

-Reduce interdialysis weight gain

-Use of whole body bioimpedance

4.Patient with HTN are routinely counseled to withhold their BP medication on the day of dialysis to limit the incidence of dialysis hypotension

C.Temperature

1.Temperature should be measured

2.The presence of a fever prior to dialysis is a serious finding and should be investigated

3.Manifestation of infections in a dialysis patient may be subtle

4.A rise in body temperature of about 0.5 c during dialysis is normal and not necessarily a sign of infection

D. Access site

-The vascular access site should always be examined for signs of infection befor each dialysis

Monitoring during the dialysis

1.BP and PR are usually measured every 30-60 minutes

2.Any complaints of dizziness or of a washed out feeling are suggestive of hypotension and should prompt immediate measurement of the BP

3.Symptoms of hypotension may be quite subtle ; and patients sometimes remain asymptomatic until the BP has fallen to dangerously low level.

Patients monitoring with predialysis lab tests

1.Serum urea nitrogen(SUN)

SUN should be measured monthly as part of the URR

2.Serum albumin

-Should be measured every 3 months

-Is an important indicator of nutritional state

-A low serum albumin level is a very strong predictor of subsequent illness or death in dialysis patients

-The increased mortality risk begins at serum albumin level<4 gr/dl

3.Serum creatinine

- Is measured monthly

- The usual mean value in hemodialysis patients is about 10 mg/dl with a common range of 5-15 mg/dl

-In dialysis patients ; high serum creatinine level are associated with a low risk of mortality probably because the serum creatinine value is an indicator of muscle mass and nutritional status

-The serum creatinine and urea nitrogen levels should be examined in tandem

4.Serum total cholesterol

- In an indicator of nutritional status

-A predialysis value of 200-250 mg/dl is associated with the lowest mortality risk in dialysis patients

- Low serum total cholesterol values ; especialy <150 mg/dl are associated with an elevated mortality risk in dialysis patients ; probably because they reflect poor nutritional status

5.Serum potassium

-Dialysis patients with a predialysis serum potassium level of 5-5.5 mmol/l have the lowest mortality risk

-The mortality risk increases greatly for values over 6.5 and under 4mmol

6.Serum phosphorus

-Measure monthly

-The predialysis value associated with the lowest mortality is below 5.5 mg/dl

-Mortality rates increase sharply for values over 9 mg/dl and under 3mg/dl

7.Serum calcium

-Measure monthly

-The target value should be a calcium within the normal range

-Mortality rates increase markedly at values over 12mg/dl and under 7mg/dl

8.Serum alkaline phosphatase

-Measured every 3 months

-High values are a sign of hyperparathyroidism or liver disease

-High levels are associated with elevated mortality risk

9.Serum bicarbonate

-Measure monthly

-Lowest mortality is for values between 20-22.5mmol/dl

10.Hemoglobin

-This is checked at least monthly ; and in many cases every 2 weeks

-Serum ferritin levels ; iron levels ; and TIBC should be checked every 3 months

11.Serum aminotransferase

-Are checked monthly

-High or even high-normal values may unmask silent liver disease ;especially hepatitis or hemosiderosis

-Blood should be screened for HBS Ag and HCV Ab

12.PTH

-Should be checked every 3-6 months


با سپاس فراوان از توجه شما