

PD without Residual Kidney Function: Should We Keep Going?

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Disclosure

- ▶ **Speaker Bureau**

- ▶ PD Excellence Academy
- ▶ Home Dialysis University

- ▶ **Honorarium**

- ▶ UpToDate

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Case presentation

- ▶ 65y/m with DM, CAD s/p stenting, ESRD on PD,
 - ▶ started with Residual kidney function (TKF) 4 ml/min
 - ▶ PET 0.56
- ▶ Over next two years, his PD script was slowly increased to match the loss in his kidney function. He is active on transplant list but no donor.
- ▶ Current prescription
 - ▶ 2.3 lt x 4 exchanges over 9 hours
 - ▶ 2 lt last fill
- ▶ Recently, < 50 cc urine/day
 - ▶ Clinically: no anorexia, weight loss, fatigue, insomnia
 - ▶ Labs: Hgb at goal on stable ESA dose, CO₂; 25 meq/L, K: 3.8 meq/L
 - ▶ Intermittently high Phos and PTH: since the beginning of dialysis.
 - ▶ Kt/V 1.58

Should We Continue on PD or Transfer to HD?

- ▶ Yes
- ▶ No
- ▶ May be

Why are we asking this question?

- ▶ Re-analysis of CANUSA - Prospective cohort study of 680 PD patients in Canada and USA for 2 years
- ▶ Predictors of mortality

- ▶ Retrospective review to study the cause of death
- ▶ 296 peritoneal dialysis over a 7-year

Variable	Relative Risk	95% Confidence Limit
Age	1.02	1.005–1.044
CVD	2.42	1.499–3.904
Diabetes mellitus	1.25	0.769–2.036
Serum albumin	0.96	0.912–1.000
LA transport	1.66	0.379–7.218
HA transport	2.33	0.554–9.801
H transport	2.01	0.430–9.357
SGA	0.74	0.647–0.842
Ccrp (5 L/wk per 1.73 m ² greater)	1.00	0.898–1.105
GFR (5 L/wk per 1.73 m ² greater)	0.88	0.829–0.943

^a CVD, cardiovascular disease; LA, low average; HA, high average; H, high; SGA, subjective global assessment.

	Anuric	Not anuric	RR (95% CI)	P-value
Population of dialysis (patient-year)	1030	1480		
Causes of death				
Vascular diseases	82	60	1.96 (1.42–2.71)	<0.0001
Infections	41	41	1.44 (0.94–2.20)	0.1
Others	26	46	0.81 (0.51–1.31)	0.39
All causes	149	147	1.46 (1.18–1.80)	0.0005

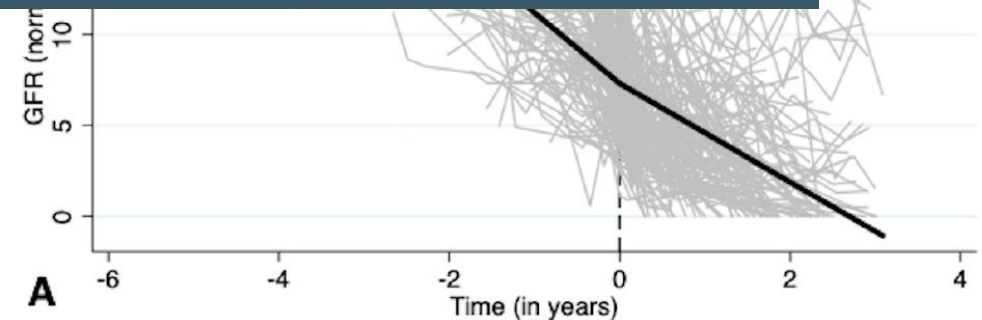
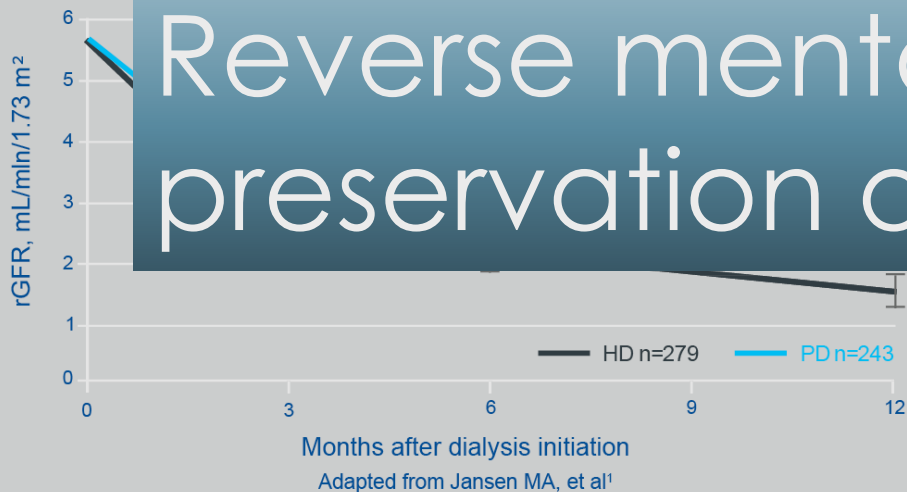
Better preservation of RKF in PD

- ▶ NECOSAD2 - 24-hour average urine urea and creatinine clearance

- ▶ IDEAL study - average of 24-hour urine urea and creatinine clearance

- ▶ Before: $-4.09 \pm 0.33 \text{ mL/min/1.73 m}^2/\text{yr}$
- ▶ After: $-2.69 \pm 0.18 \text{ mL/min/1.73 m}^2/\text{yr}$

RKF in Patients Receiving Peritoneal Dialysis (PD) vs Hemodialysis (HD) Using Standard Dialysis Fluid¹



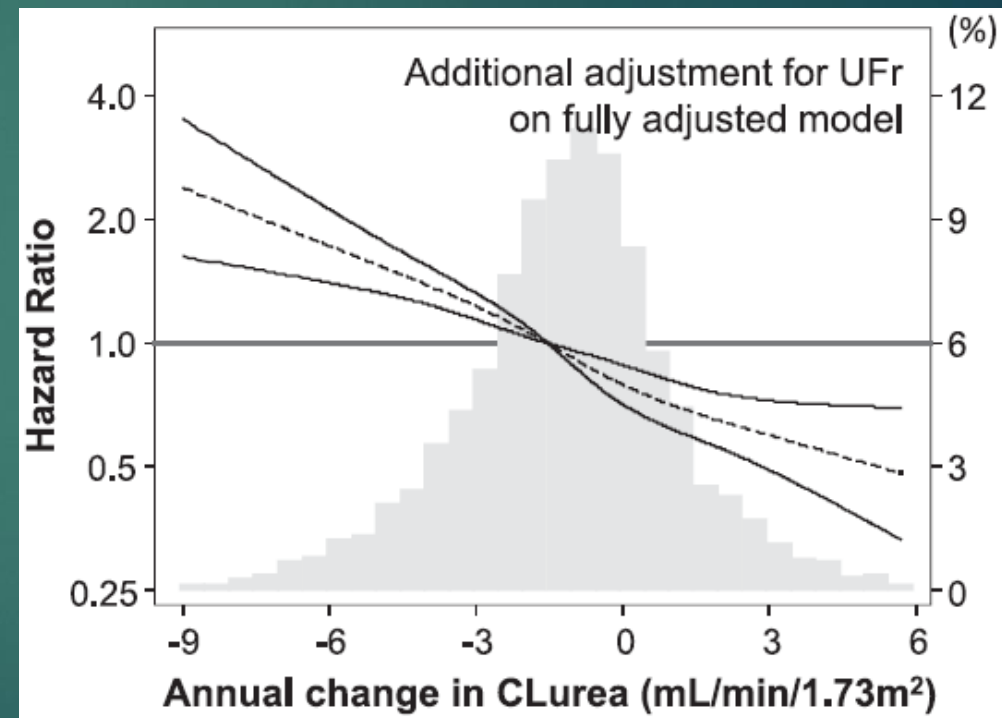
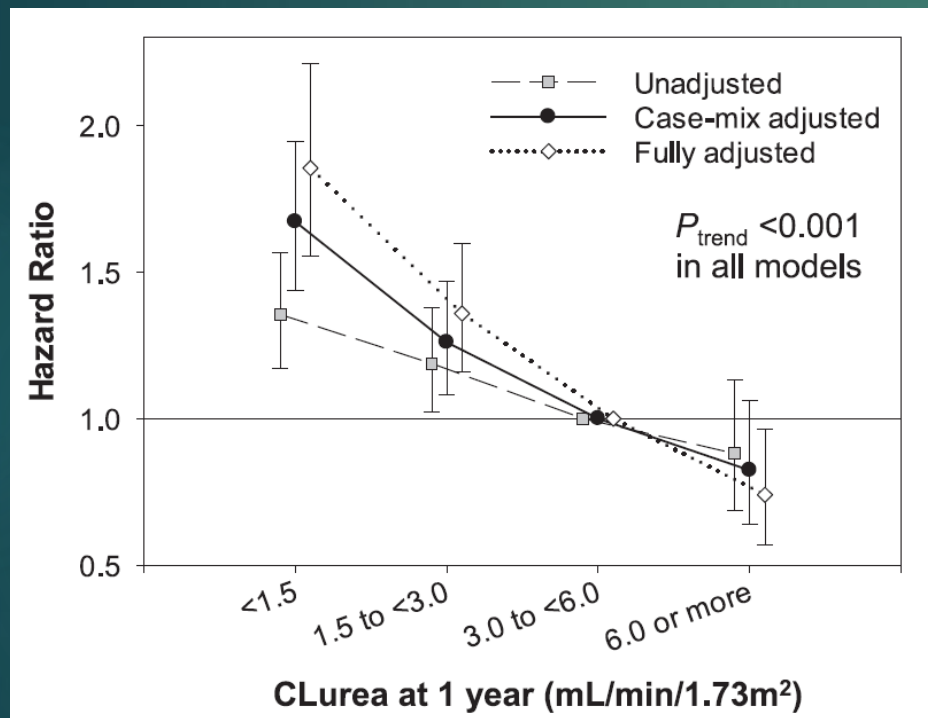
Pre-Conceived Notion

- ▶ Survival in PD patients depends on residual kidney function
- ▶ Multiple commentaries
 - ▶ Peritoneal clearances are not equivalent to clearances achieved by kidneys
 - ▶ Better management of anemia
 - ▶ Better control of hyperphosphatemia
 - ▶ Better volume and BP control

Transfer to Hemodialysis (Technique Failure) due to inadequate dialysis (real or perceived)

- ▶ **Canadian PD patients: temporal trends in 2000-2009 compared to 1995 to 2000 (n=13,000)**
 - ▶ Reduced peritonitis but no difference in peritonitis related technique failure in 2001-2009 cohort compared to 1995-2000
 - ▶ Inadequate PD – increased in 2001-2005 but decreased in 2005-2009
- ▶ **Australia/New Zealand 1989-2014 cohort (n=9,649)**
 - ▶ Infection (52%)
 - ▶ Inadequate dialysis (19%)
 - ▶ Mechanical failure (18%) and Social reasons (11%)

Mortality on HD with progressive loss of RKF



The goal is to provide adequate dialysis. What is adequate dialysis?

- ▶ **Not just Kt/V**
- ▶ The ability of the dialysis patients to meet the needs and demands of the body at all times to maintain satisfactory performance in the steady state.
- ▶ **In broad sense control of**
 - ▶ Generalized well being including functional status
 - ▶ BP and volume status
 - ▶ Acid base status and nutrition
 - ▶ Cardiovascular risk
 - ▶ Mineral and bone disorders
 - ▶ Small and middle molecule clearance



THE EFFECT OF SMALL SOLUTE CLEARANCES ON SURVIVAL OF ANURIC PERITONEAL DIALYSIS PATIENTS

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Type of Peritoneal Dialysis (CAPD, APD) and the Number of Patients with Urea and Creatinine Clearances (CCr) Above Targets Recommended by DOQI (Weekly Kt/V of 2 for CAPD, 2.2 for APD; Weekly CCr of 60 L/week for CAPD, 66 L/week for APD)

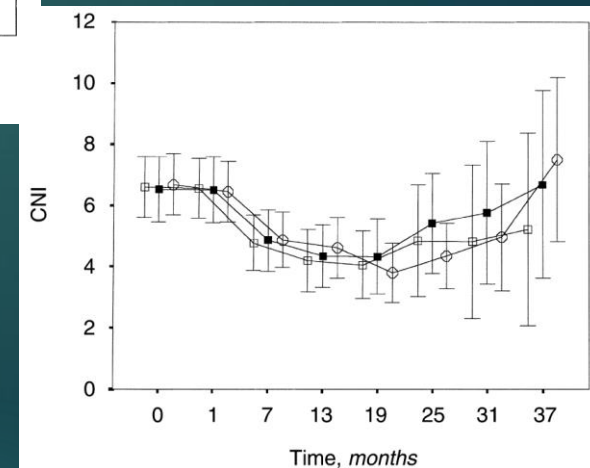
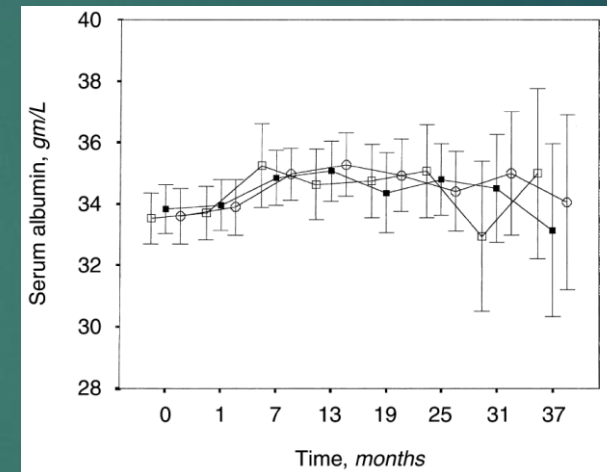
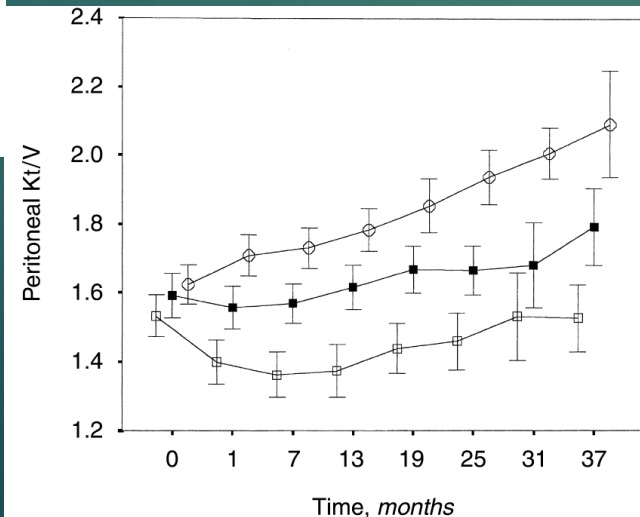
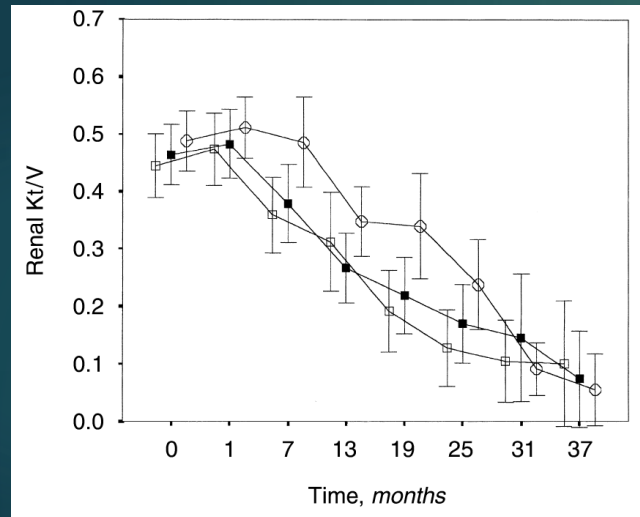
	CAPD	APD
Total	89	26
Weekly Kt/V ^a	2.07±0.31	2.6±0.6
Weekly CCr ^a (L/1.73 m ²)	57.3±8.5	65.7±18.1
Dialysate volume ^a (L/24 hr)	9.3±1.5	15.7±2.8
Patients with weekly Kt/V above targets (N)	51 (57%)	21 (81%)
Patients with weekly CCr above targets (N)	31 (35%)	9 (35%)

^a Mean ±SD.

Hong Kong PD Adequacy Study: Drop in RKF didn't associate with poor nutrition

Drop in RKF and increase in peritoneal clearance over 3 years

No change in albumin or Composite nutrition index (CNI)

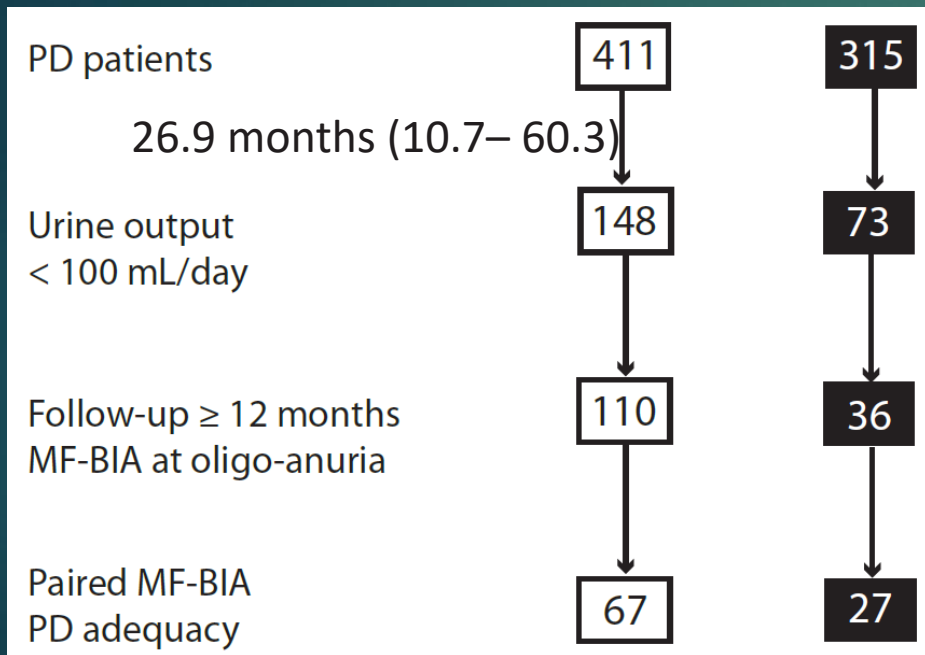


No difference in weight and markers of nutrition

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	Anuric	Not anuric
No. of patients	149	147
Duration of dialysis (months)	59.7 ± 30.3	23.3 ± 22.4
Body weight (kg)	58.2 ± 10.3	59.7 ± 9.4
Body height (m)	1.61 ± 0.09	1.62 ± 0.08
Kt/V	1.62 ± 0.33	1.64 ± 0.36
CCr (l/week/1.73 m ²)	41.0 ± 9.5	46.0 ± 11.8
Serum albumin (g/l)	26.1 ± 4.7	26.4 ± 4.8
NPNA (g/kg/day)	0.91 ± 0.16	0.92 ± 0.22
%LBM	59.6 ± 10.6	57.8 ± 11.6

Blood Pressure and Volume Status in Anuric PD Patients



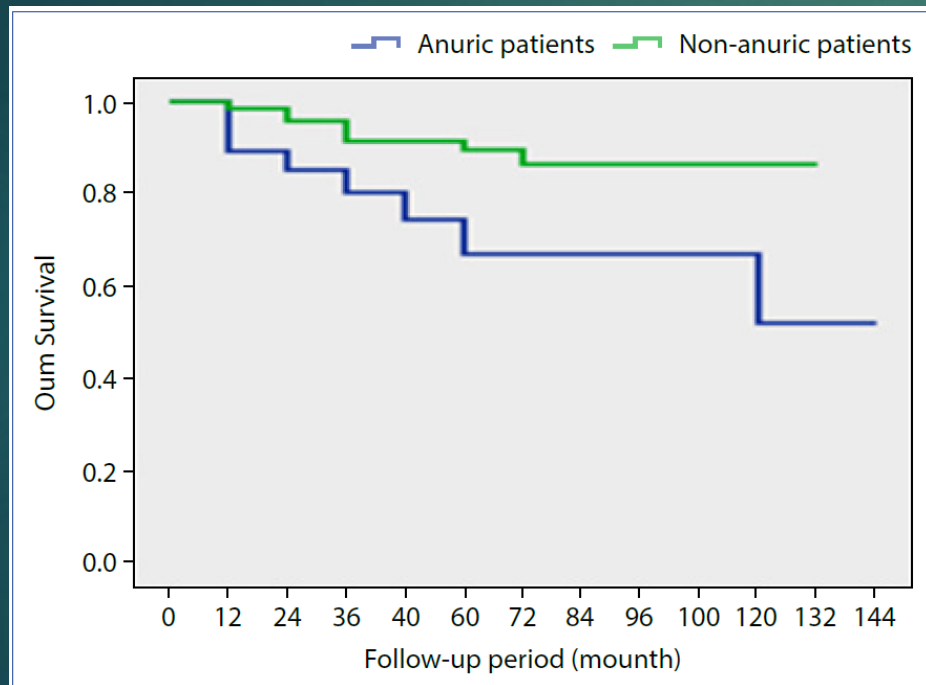
	Oligo-anuric	On follow-up ^{a,b}
Weight (kg)	69.3±14.5	69.3±15.4
SBP (mmHg)	138.9±29.1	134.9±26.3
DBP (mmHg)	81.3±17.3	78.6±15.6
MAP (mmHg)	100.6±19.6	97.4±7.6
BP meds	1 (0–2)	1 (0–1) (<i>p</i> =0.09)
ECW (L)	14.9±3.4	14.6±3.4
ECW/TBW	0.45±0.05	0.45±0.05
ECW-OH (L)	0.55 (-0.26–1.4)	0.4 (-0.22–1.4)

- ▶ Kt/v: 1.89
- ▶ 48% to 72% icodextrin

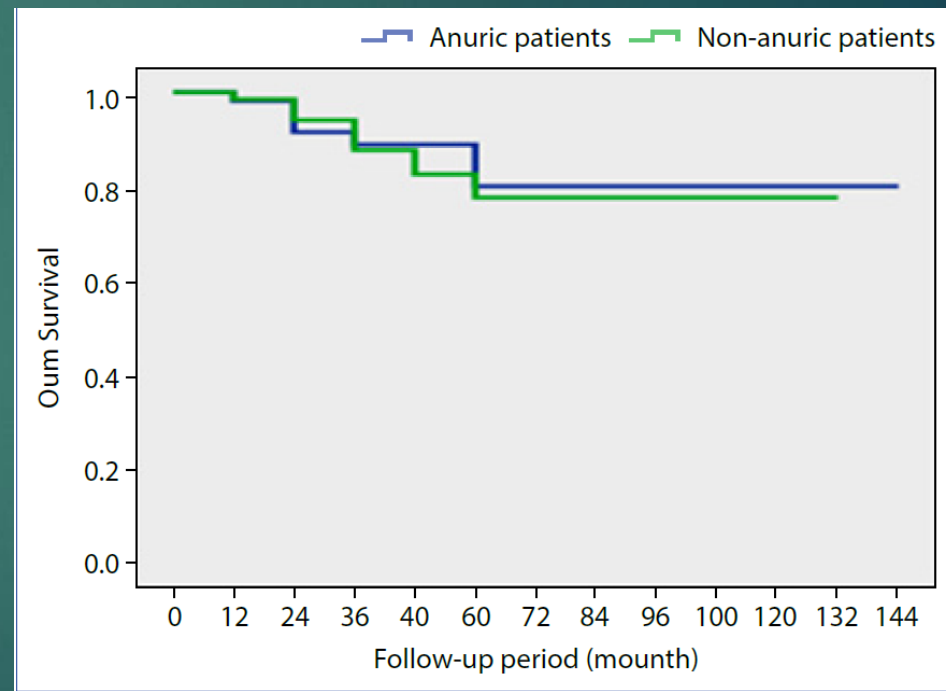
No reason give for drop from 148 to 110 (25%)

RKF and Technique Failure: Turkey Experience

- ▶ 2000-2010: At the PD initiation, 58 patients with anuria and 144 patients without anuria.



Patient Survival



Technique Survival

Bottom Line

- ▶ Residual kidney function impacts the survival and quality of life of dialysis patients.
- ▶ Its longer preservation is a major advantage to any dialysis patient and should be the goal for every dialysis patient.
- ▶ Anuric patients no longer benefit from such advantage, depend on dialysis to achieve adequate solute and volume control.
- ▶ This challenge can be successfully dealt with by individualizing the dialysis prescription and lifestyle changes.
- ▶ PD allows a satisfactory patient survival while keeping the benefits of home dialysis and preserving vascular network.
- ▶ An integrated and individualized care plan – responsibilities lie on us

Response to Inadequate Dialysis – CMS ESRD PD Clinical Performance Measures Project

	Time Period 1	Time Period 2	Total	No. (%) of Patients
Kt/V < 2.0 and CrCl < 60.0 L/week/1.73m ² (no. of patients)	127	61	188	
Change in prescription (no. of patients)	56	25	81	
Changed prescription information recorded	46	19	65	
Change in total prescribed daily volume				
+ 2000 mL				35 (55)
+ 2500 mL				11 (17)
+ 3000 mL				6 (9)
Other volume change				12 (19)
Change in number of exchanges				
From				
3 exchanges → 4 exchanges				3 (5)
4 exchanges → 5 exchanges				26 (41)
5 exchanges → 6 exchanges				3 (5)
4 exchanges → 6 exchanges				1 (2)
No change in number of exchanges				31 (48)

- ▶ 60% were anuric
- ▶ Other reasons
 - ▶ High BSA or Vd
- ▶ 78-86% had improved Kt/V after change in script.

Approach

- ▶ Preservation of RKF
- ▶ Adequate solute clearance and maintenance of volume homeostasis while being cognizant of burden of increased exchanges or extra volume on quality of life
- ▶ Volume homeostasis
 - ▶ Constant reminder of need of healthy dietary behaviors
 - ▶ Icodextrin for long fills to avoid neg UF, rather gain some positive UF
 - ▶ Careful review of flowsheets to monitor drain times and UF
 - ▶ Constipation is common in this patient population and leads to poor catheter function



2 slices of bread = 800 mg
Slice of cheese = 300 mg
Layer/s of meat = 800 mg
Mayo = 100 mg
Mustard = 100 mg
Bag of chips = 250-500 mg

Na = 2600 mg
Added inorg PO₄

Achieving Solute Clearance

- ▶ Automated PD
 - ▶ Allows more frequent exchanges and higher total volume
 - ▶ Increase small solute clearance
- ▶ Increase dwell volume
 - ▶ Nighttime to up to 3 lt
- ▶ Last fill and Mid-day exchange (post work)
 - ▶ Increase middle molecule clearance
- ▶ Use of adjusted body weight to calculate Vd in obese patients since the body water proportion is less in adipocytes
 - ▶ Adjusted wt = Ideal weight + [0.4 x (actual wt – ideal wt)]
- ▶ Limitations
 - ▶ High muscle mass, low transporter status

PD without Residual Kidney Function: Should We Keep Going?

- ▶ YES, as long as adequate dialysis is achieved
 - ▶ Patient is happy, functional and free of uremic symptoms
 - ▶ Achieves euvolemia and good BP control
 - ▶ Meets anemia goals, control of acidosis, hyperkalemia etc.
 - ▶ Kt/V may or may not be at goal

THANK YOU!