The Initial PD Prescription

Is 4 bags is the Way to Go?

Lily Mushahar

Department of Nephrology

Hospital Tuanku Ja'afar Seremban

MALAYSIA

18th Asian Colloquium in Nephrology

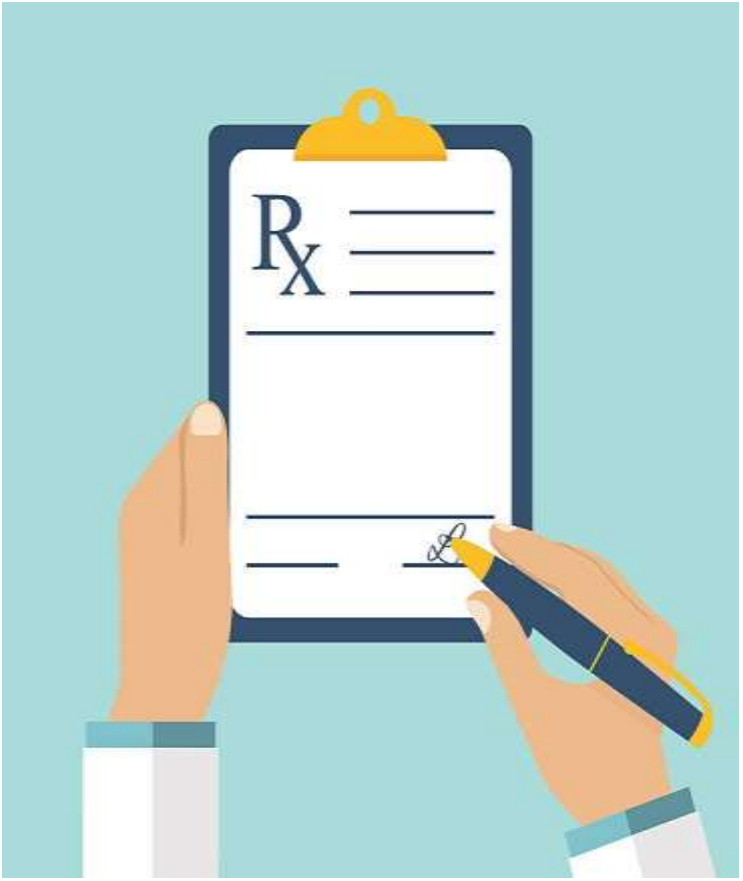
SOTANC

Best Practices in Kidney Care in Asia

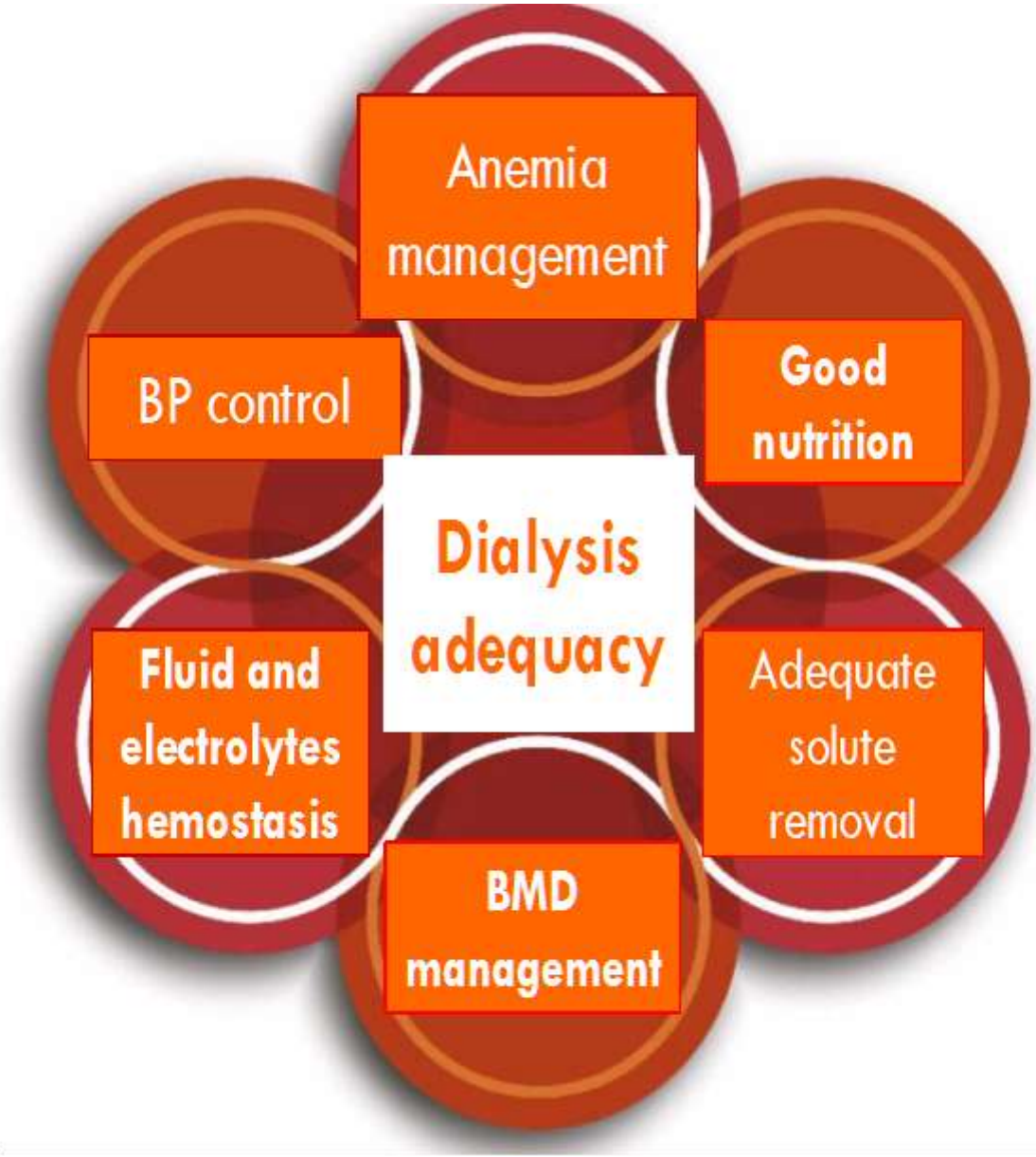
19 – 21 July 2019

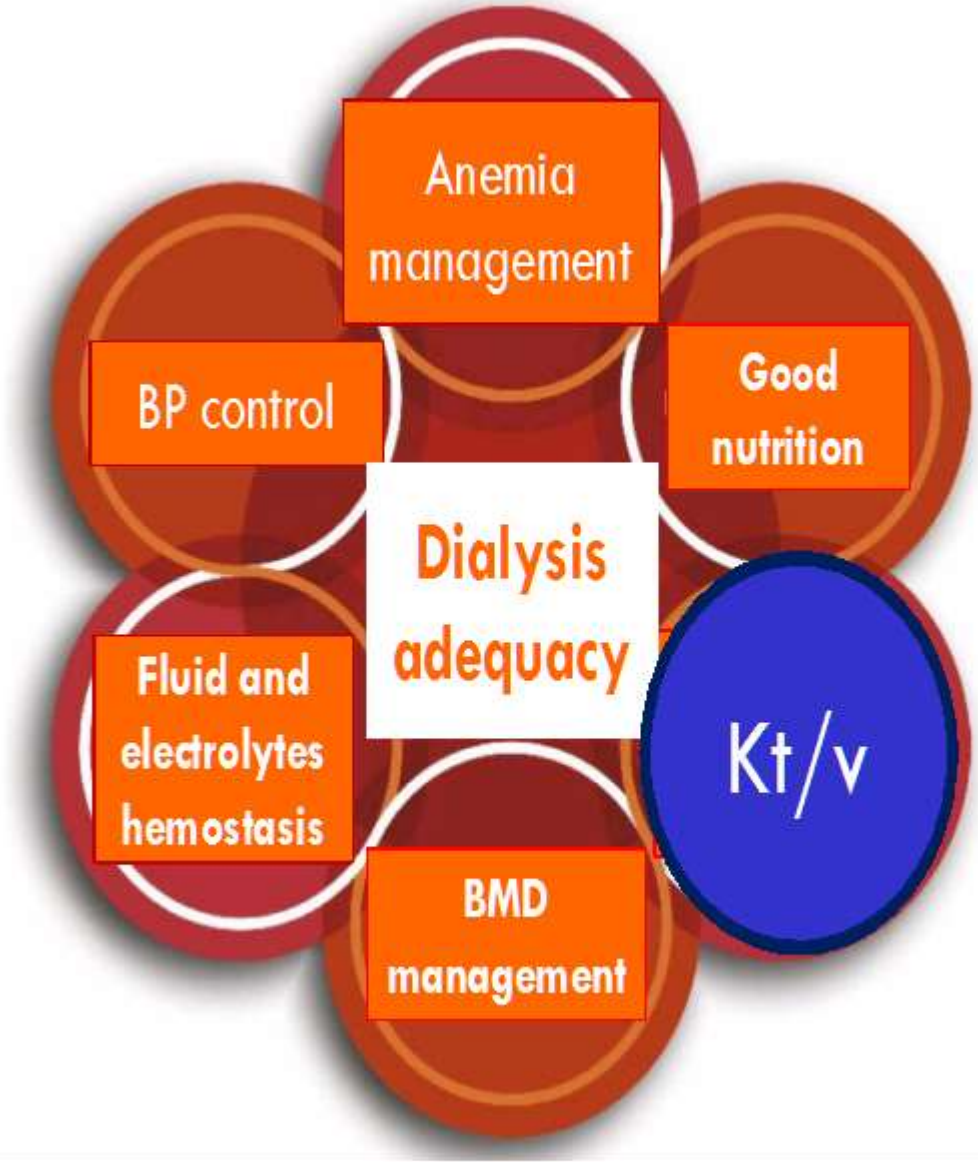
Outline

- How to plan initial CAPD prescription?
- Incremental vs full dose PD
  - Effect on residual renal function
- Prescribing incremental dialysis
  - Who is a candidate for incremental dialysis
  - How to prescribe incremental dialysis
  - Drawbacks



Initial CAPD prescription


Anemia management
BP control
Good nutrition
Dialysis adequacy
Fluid and electrolytes hemostasis
Adequate solute removal
BMD management


Anemia management
BP control
Good nutrition
Dialysis adequacy
Kt/v
Fluid and electrolytes hemostasis
BMD management

Current Patient Report

20/02/2015
Page 1 of 1

Patient Name:	[redacted]N			Collection Date:	11/02/2015
ID Number:		Gender:	F	Modality:	CAPD
Birth Date:	[illegible]	Age:	20	BSA (m²):	1.24
Height (cm):	145.00	Weight (kg):	37.80	Est. Total Body Water (Liters):	22.72

Serum Concentrations:

Urea (mmol/Liter):	16.40	Glucose (mmol/Liter):	5.40
Creatinine (µmol/Liter):	1219.00	Albumin (g/L):	29.00

24 hour Dialysate and Urine Collection:

	Urea		Creatinine			Volume In (mLs)	Volume Out (mLs)	Net Volume (mLs)
Dialysate:	15.40	(mmol/Liter)	941.40	(µmol/Liter)	Dialysate:	7200	8400	1200
Urine:	0.00	(mmol/Liter)	0.00	(mmol/Liter)	Urine:		0	0

Calculated Values:

Estimated GFR (mL/min):	0.00
Protein Catobolic Rate (nPCR) (g/kg/day):	1.23
id Removal (L/day):	1.20

Weekly Clearances:

	Total	Dialysate	Residual
Urea Clearance (L/week):	55.21	55.21	0.00
Weekly Kt/V:	2.43	2.43	0.00
Creatinine Clearance (L/week):	[illegible]	[illegible]	[illegible]
Creatinine Clearance (L/week/1.73m²):	63.30	63.30	0.00

PET Results:

Overnight Exchange:

		PET Date:	11/02/2015
% Dextrose	2.50	Dwell Time (mins):	555
Volume Infused (mL):	1800	Dialysate Urea (mmol/Liter):	15.40
Volume Drained (mL):	2200	Dialysate Creatinine (µmol/Liter):	941.40

Four Hour Equilibration Test:

% Dextrose	2.50	Infusion Time (mins):	5.00
Volume Infused (mL):	1800	Drainage Time (mins):	5.00
ume Drained (mL):	2150		

Data:

	Time (mins)	Urea (mmol/Liter)	Creatinine (µmol/Liter)	Glucose (mmol/Liter)	Corrected Creatinine (µmol/Liter)	CRT D/P
Serum						
Sample #1	120.00	16.40	1219.00	5.40	1214.43	
Dialysate						
Sample #1	0.00	2.20	131.00	72.20	69.89	0.06
Sample #2	120.00	5.00	279.00	62.80	225.85	0.19
Sample #3	240.00	10.90	522.00	60.80	470.54	0.39

Other Parameters:

Membrane Transport Type:	L
Fluid Absorption (mL/min):	2.30
Residual Dialysate Volume (mLs):	295.48
Creatinine Correction Factor:	0.846355000

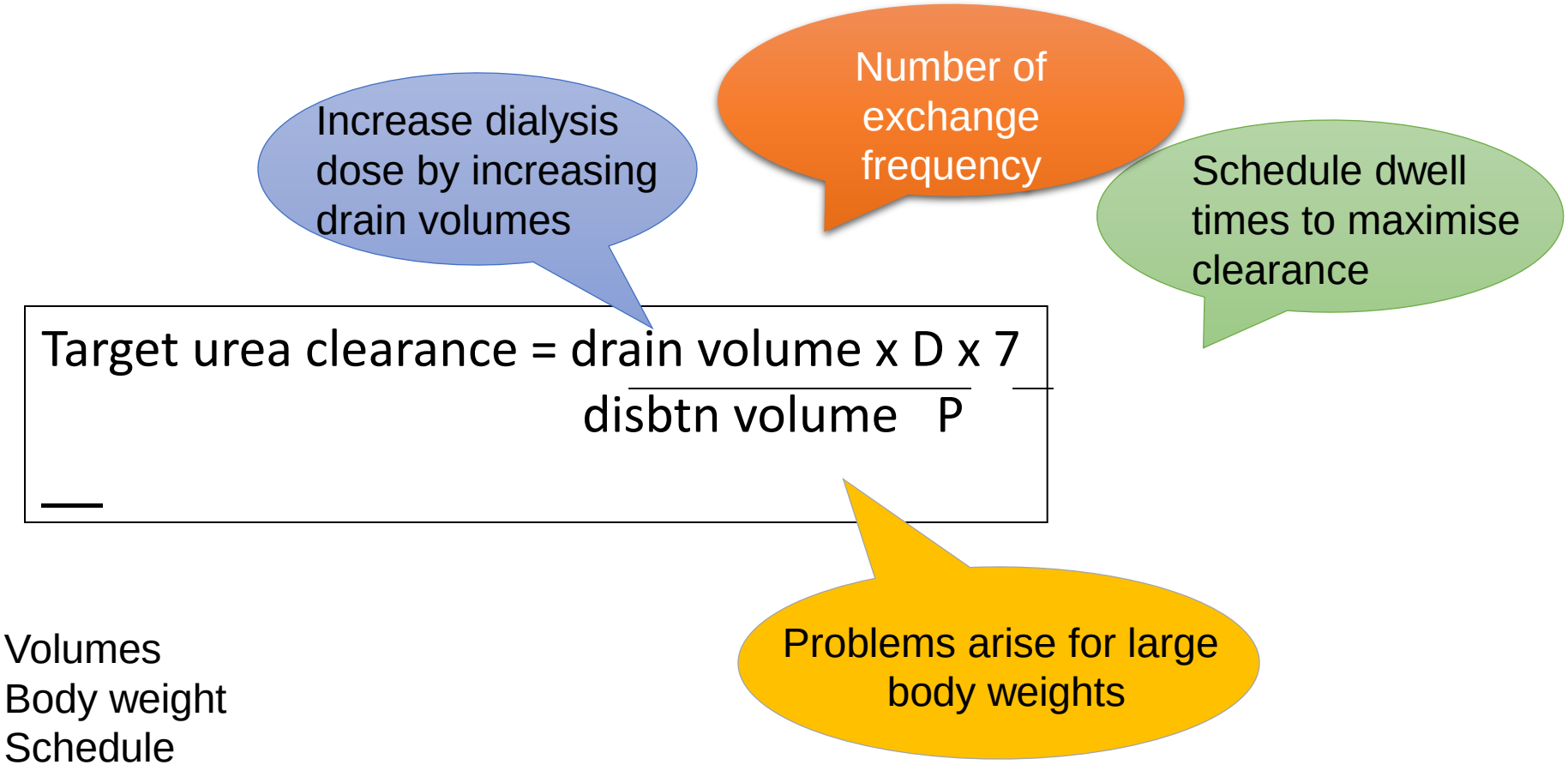
RRF

Kt/V

Ultrafiltration

Membrane transport

Optimizing peritoneal dialysis dose



1. Volumes
2. Body weight
3. Schedule

Points to consider in planning CAPD prescription

- Amount of dialysis dose
- Volume of fluid instillation
- How many PD exchanges
- Dwell time

Dialysis dose…the more the better?

- More frequent PD or HD did not improve clinical outcomes

- More frequent and lengthy dialysis may even accelerate RRF decline

Daurgidas et al,Kidney Int 2013;83:949-958

Initial CAPD prescription

~~X~~ 4 bags exchanges is the Way to Go

….. incremental PD should be considered as initial PD prescription

Concept of Incremental Dialysis

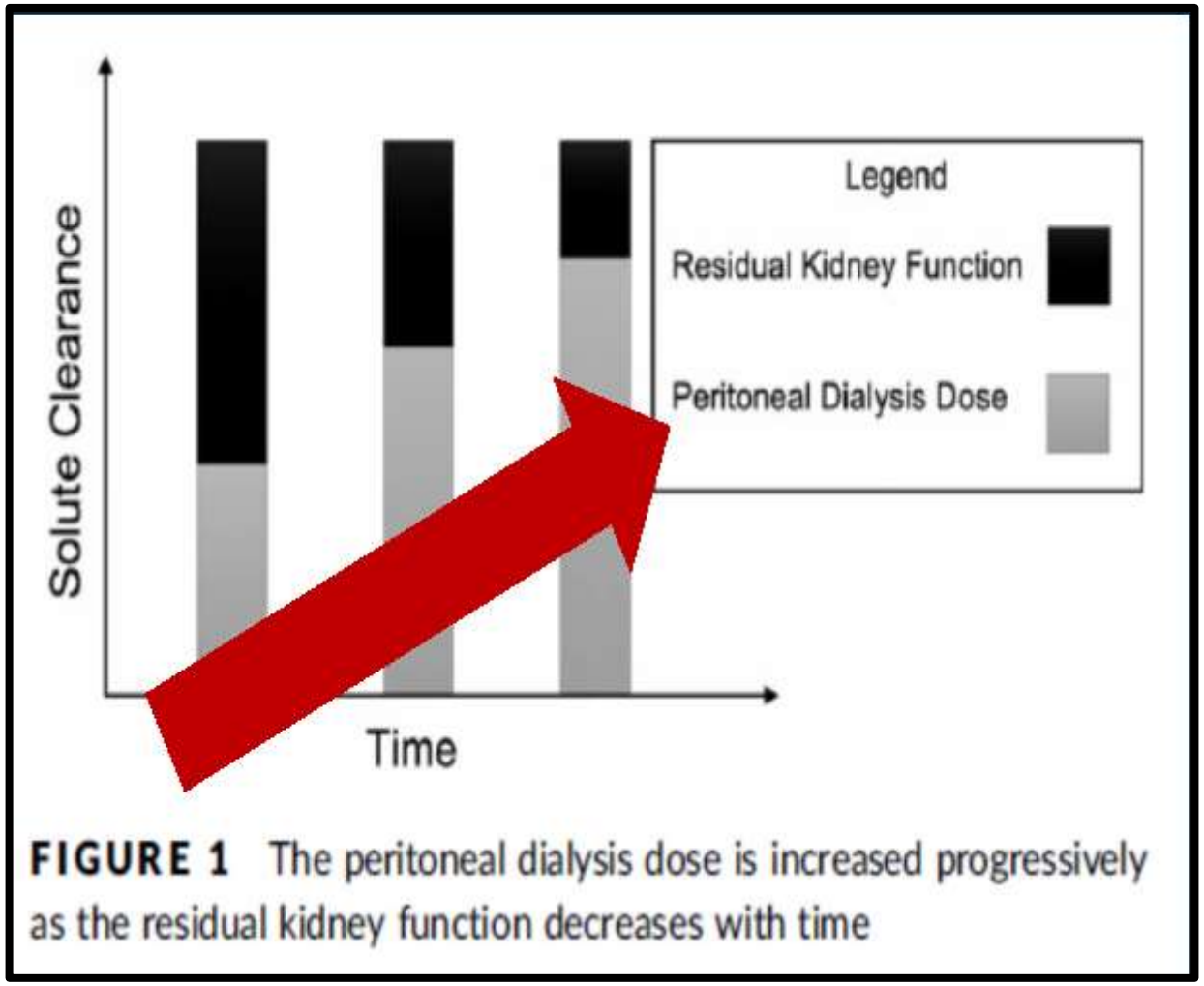


FIGURE 1 The peritoneal dialysis dose is increased progressively as the residual kidney function decreases with time

Auguste et al, Seminarsin Dialysis 2018;1-4

Incremental PD

Practice of starting PD at a lower dose that is typically prescribed for someone with residual renal function

Total solute clearance =

Peritoneal/Dialysis clearance + Residual Renal Clearance

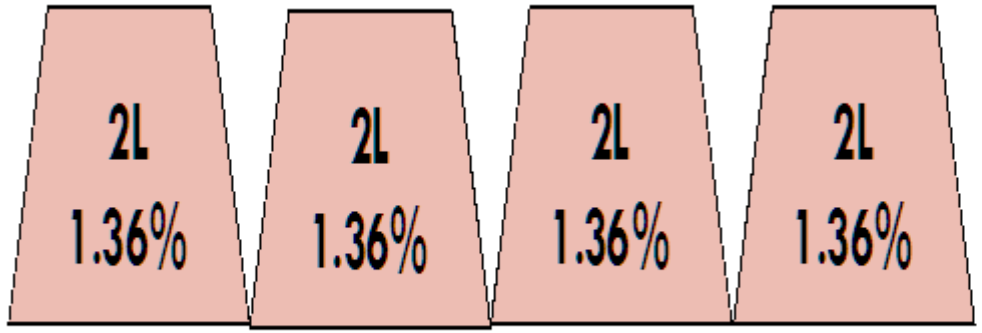
Benefits of Incremental PD

- *Less onerous* with less frequent exchanges
- Result of greater simplicity and *less workload* for the patient and caregiver
- Excellent opportunity to provide patients with an *initial small dose of dialysis* while continually addressing patient fears and misconceptions

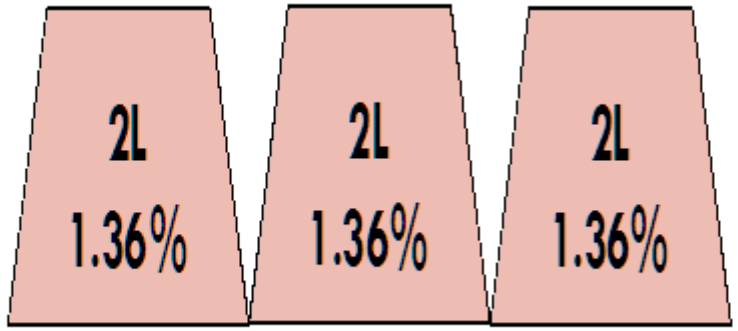
Benefits of Incremental PD (2)

- Less costly than standard 4 PD exchanges
- CAPD with 3 dwells *cost 25% less* than 4 PD exchanges

Benefits of Incremental PD (3)



Total Glucose Absorbed 27.2gx4 = 108.8g



Total Glucose Absorbed 27.2gx3 = 81.6g

Less exposure of peritoneal membrane to glucose, GDPS and systemic glucose absorption

Incremental peritoneal dialysis: Effects on the choice of dialysis modality, residual renal function and adequacy

G Viglino[1], L Neri[1] and S Barbieri[1]

[1]Renal and Dialysis Unit, San Lazzaro Hospital Alba (CN), Italy

Kidney International (2008) 73, S52–S55; doi:10.1038/sj.ki.5002601

- The effects of Incremental Dialysis (Incr_Dial) on RRF and dialytic adequacy were assessed in **11 patients treated with 2 CAPD exchanges per day for a total of 106 months** (mean±sd 9.7±6.5), and then treated with **three CAPD exchanges per day for an additional 105 months** (9.4±8.3). Median actuarial survival on CAPD-2 before requiring additional dose of dialysis was 8.1 months.
- All patients used 25mmol/l bicarbonate/15mmol/l lactate-buffered, glucose-based dialysis solutions (Physioneal; Baxter Healthcare, Rome, Italy, SpA).
- 11 patients (males 7; mean age 66.1 ± 10.3 years; BMI in males: 30.1 ± 3.7; BMI in females:27.4 ± 2.7) had the following etiologies of ESRD :
  - 7 with diabetes, 2 with nephroangiosclerosis, 1 with glomerulonephritis, and 1 with adult polycystic kidney disease (APKD).

Viglino G, Neri L, Barbieri S. Incremental peritoneal dialysis: Effects on the choice of dialysis modality, residual renal function and adequacy. Kidney International (2008) 73, S52–S55; doi:10.1038/sj.ki.5002601

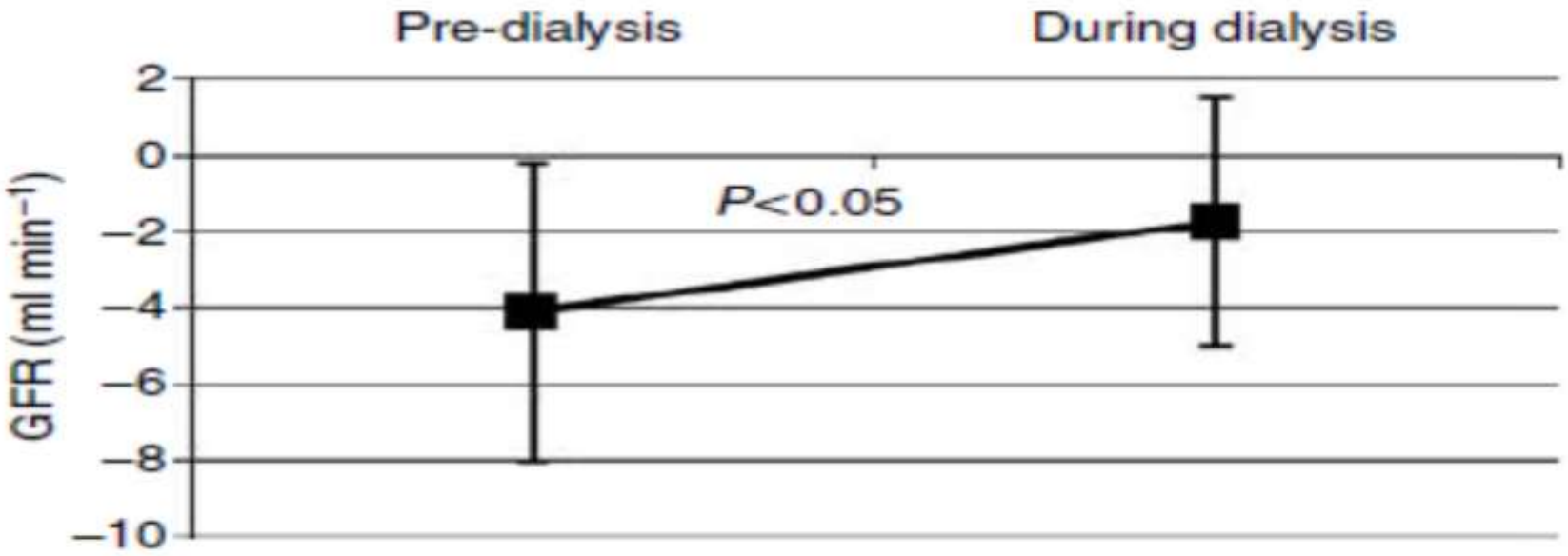


Figure 2 | Reduction in GFR from before to during incremental dialysis (11 pts treated with two and three exchanges per day CAPD)

Incr-PD showed a slowing in the loss of GFR compared to pre-dialysis period

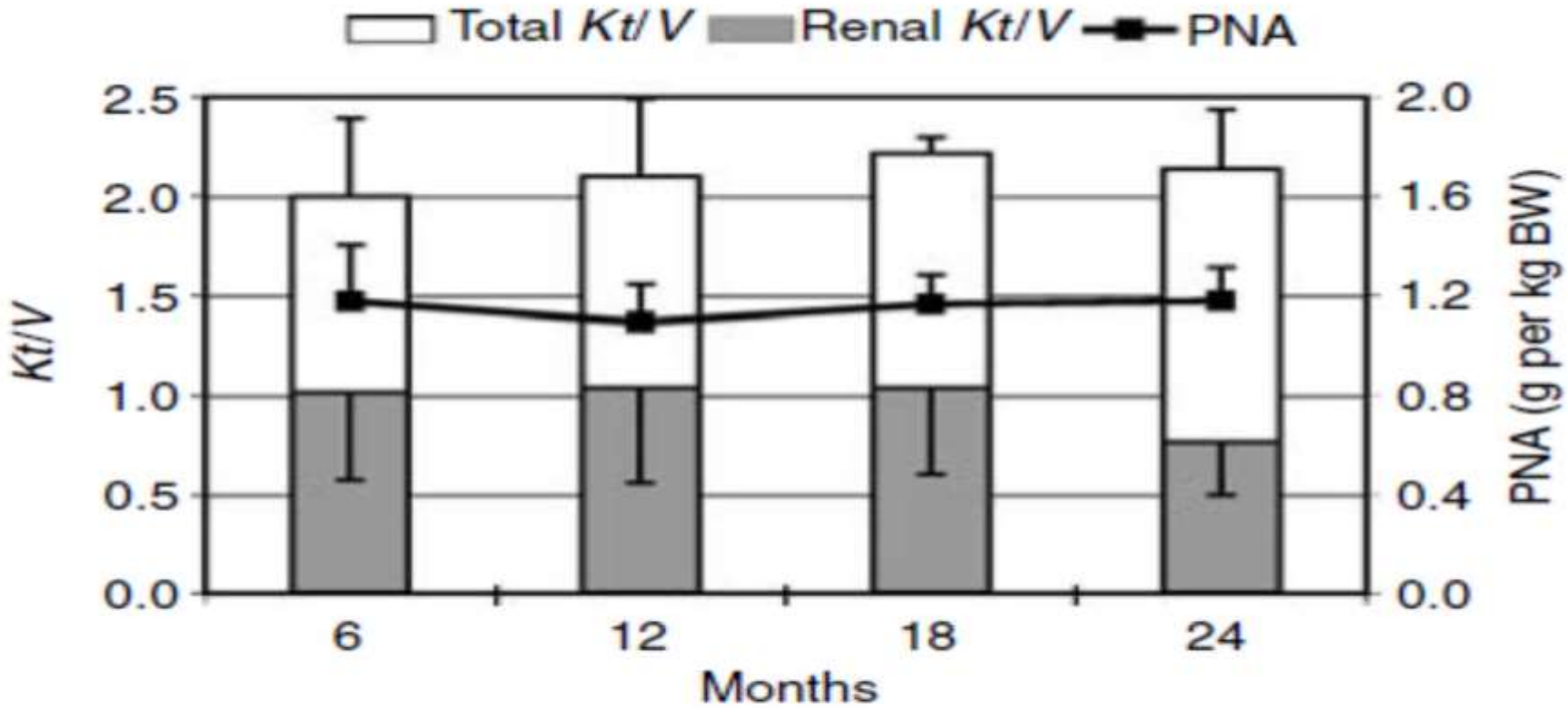


Figure 4 | Trends in *Kt/V* and PNA during incremental dialysis (11 pts treated with two and three exchange CAPD).

Viglino et al, Kidney Int 2008;73:,S52-55

J Nephrol (2016) 29:871–879
DOI 10.1007/s40620-016-0344-z

ORIGINAL ARTICLE

Incremental peritoneal dialysis: a 10 year single-centre experience

Massimo Sandrini[1] · Valerio Vizzardi[1] · Francesca Valerio[1] · Sara Ravera[2] · Luigi Manili[1] · Roberto Zubani[1,2] · Bernardo J. A. Lucca[2] · Giovanni Cancarini[1,2]

- Single-centre cohort study. Enrollment period: January 2002–December 2007; end of follow up:December 2012.
- **Incremental dialysis dose (incrPD) was defined as one or two dwell times per day on CAPD.**
- **Standard dialysis dose (stPD) was defined as 3–5 dwell times per day, 7 days a week, for CAPD and seven nights a week for APD.**
- 29 (28 %) were in the incrPD group and 76 (72 %) in the stPD group (total 105 patients)

Table 2 Results of renal and peritoneal clearances of creatinine and urea in incrPD and stPD groups

Median duration of incrPD was 17 months

	Initial data			6th month			End of treatment[a]			p value 6 vs. initial
	incrPD	stPD	*p*	incrPD	stPD	*p*	incrPD	stPD	*p*	incrPD
Number of patients	29	75		25	66		25	65		
twKt/V	2.08 ± 0.38	2.40 ± 0.58	**0.008**	2.13 ± 0.45	2.20 ± 0.43	*0.527*	1.77 ± 0.50	2.01 ± 0.35	0.007	*0.672*
twCrCl (l/w/1.73 m^2)	81 ± 15	85 ± 18	*0.341*	83 ± 19	77 ± 20	*0.192*	66 ± 27	62 ± 21	*0.460*	*0.485*
Residual renal creatinine clearance	7.55 ± 1.94	7.36 ± 2.21	*0.690*	7.74 ± 2.97	5.81 ± 2.72	**0.004**	5.39 ± 3.85	2.62 ± 3.35	**0.001**	*0.797*
Peritoneal creatinine clearance	1.98 ± 0.70	2.80 ± 0.93	**<0.001**	2.02 ± 0.63	3.22 ± 1.21	**<0.001**	2.16 ± 0.68	4.08 ± 1.37	**<0.001**	*0.297*
Renal + peritoneal creatinine clearance	9.53 ± 1.99	10.16 ± 2.52	*0.231*	9.77 ± 2.87	9.04 ± 2.63	*0.255*	7.55 ± 3.66	6.71 ± 2.82	*0.246*	*0.600*
Peritoneal contribution to total creatinine clearance (%)	21 ± 7	28 ± 8	**<0.001**	22 ± 10	38 ± 19	**<0.001**	32 ± 13	70 ± 30	**<0.001**	*0.448*
Residual urea renal clearance	4.55 ± 1.23	3.81 ± 1.35	**0.014**	4.63 ± 1.42	3.12 ± 1.67	**<0.001**	3.27 ± 2.09	1.4 ± 1.85	**<0.001**	*0.778*
Peritoneal urea clearance	2.44 ± 0.78	4.50 ± 1.38	**<0.001**	2.54 ± 0.79	4.68 ± 1.18	**<0.001**	2.66 ± 0.81	5.66 ± 1.52	**<0.001**	*0.393*
Renal + peritoneal urea clearance	6.99 ± 1.15	8.30 ± 1.93	**<0.001**	7.17 ± 1.32	7.80 ± 1.54	*0.073*	5.94 ± 1.80	7.06 ± 1.42	*0.246*	*0.490*
Peritoneal contribution to total urea clearance (%)	35 ± 11	54 ± 11	**<0.001**	36 ± 11	61 ± 16	**<0.001**	47 ± 16	82 ± 21	**<0.001**	*0.757*
Creatinine renal clearance/urea renal clearance	1.70 ± 0.43	2.08 ± 0.92	**0.007**	1.69 ± 0.55	2.16 ± 1.24	**0.007**	1.65 ± 0.33	2.17 ± 1.58	*0.051*	*0.678*
Residual renal function	6.08 ± 1.47	5.61 ± 1.49	*0.160*	6.20 ± 2.02	4.48 ± 2.12	**<0.001**	4.36 ± 2.96	2.03 ± 2.55	<0.001	*0.792*

- **The results of this study suggest a protective role of incrPD on RRF which was stable incrPD in the first 6 months whereas it significantly decreased in stPD.**
- This stability could be the reason for a median duration of incrPD of 17 months, which co positively affect the patients' quality of life on PD due to a lesser burden of dialysis procedures.
- Patients on incrPD need a closer clinical follow-up to reduce the risk of under-dialysis.

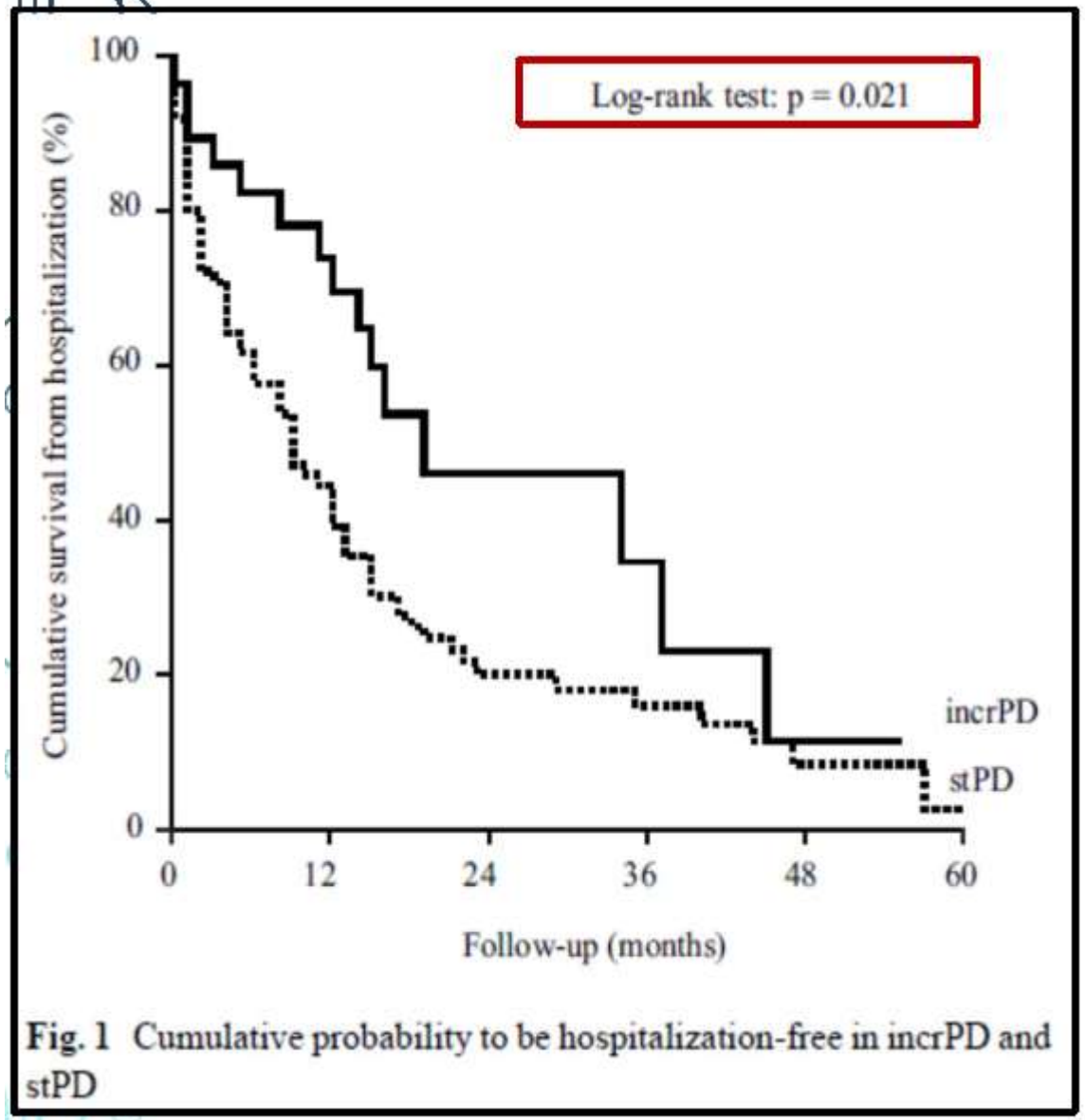


Fig. 1 Cumulative probability to be hospitalization-free in incrPD and stPD

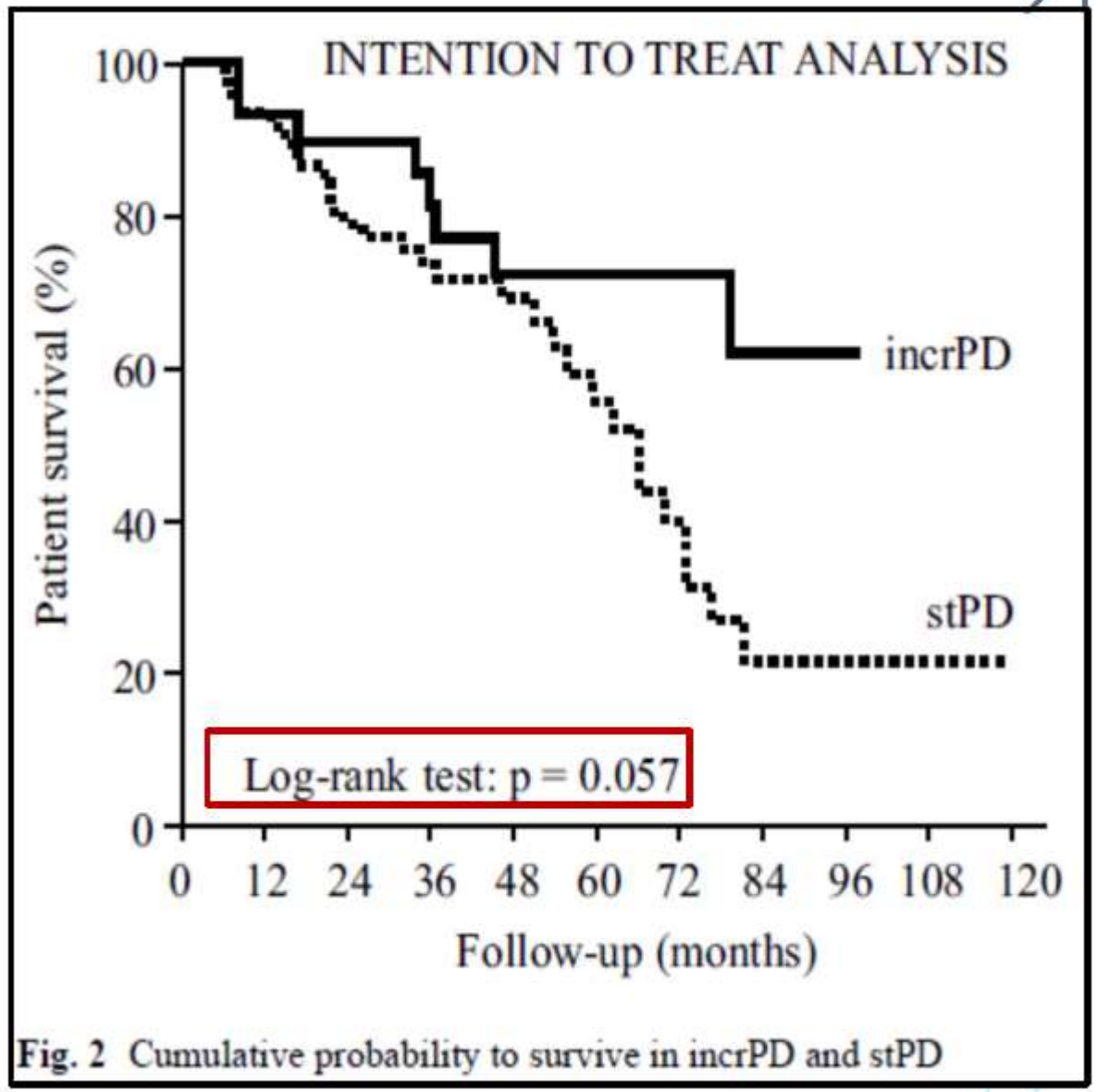


Fig. 2 Cumulative probability to survive in incrPD and stPD

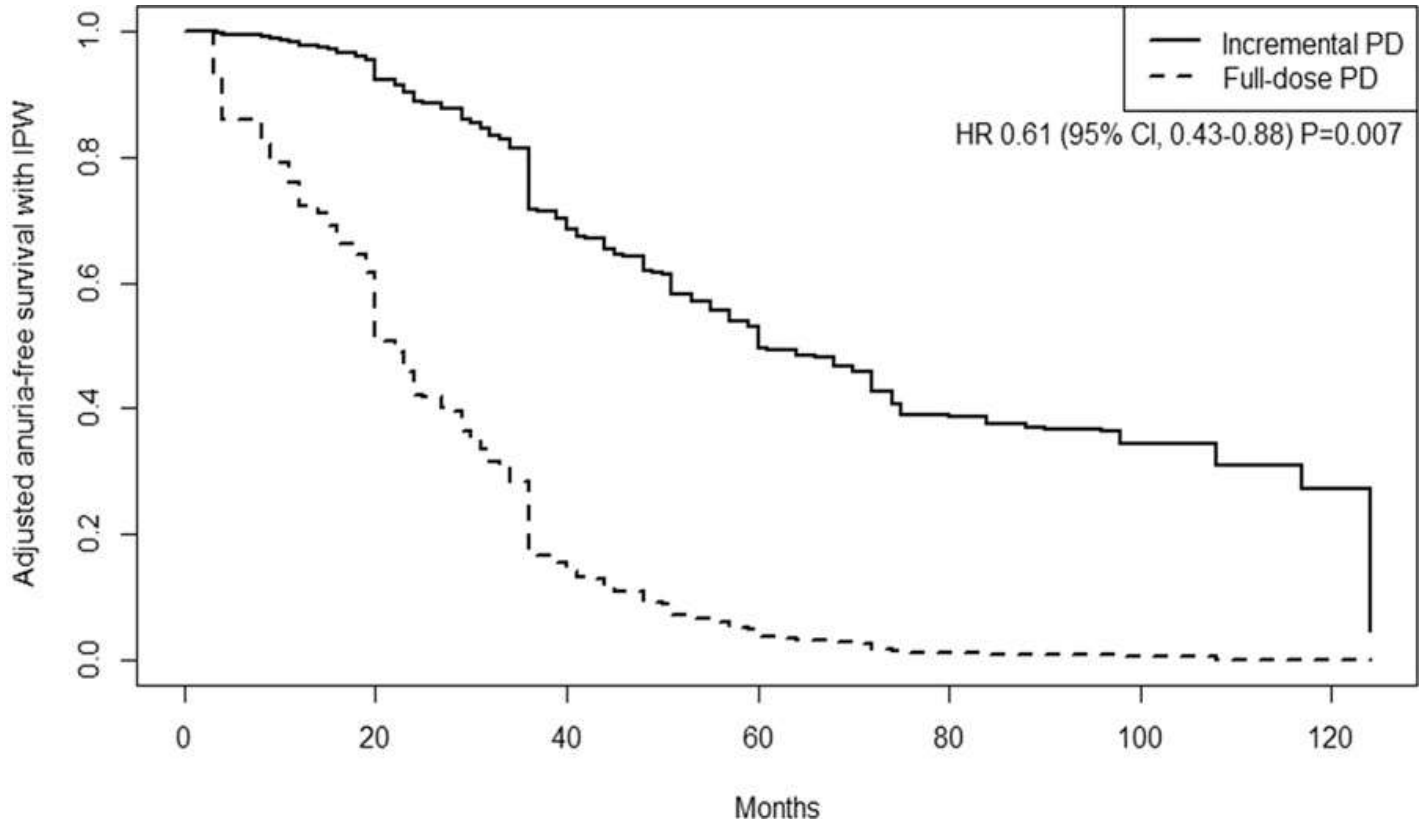
SCIENTIFIC REPORTS

Article | OPEN | Published: 12 July 2019

Incremental Peritoneal Dialysis May be Beneficial for Preserving Residual Renal Function Compared to Full-dose Peritoneal Dialysis

Yeonhee Lee, Sung Won Chung, Seokwoo Park, Hyunjin Ryu, Hajeong Lee, Dong Ki Kim, Kwon Wook Joo, Curie Ahn, Joongyub Lee & Kook-Hwan Oh

Scientific Reports **9**, Article number: 10105 (2019) | Download Citation



- Single centre,, 2007-2015, follow up -6 years
- Retrospective, N=347 patients
- Excluded if urine <200mls/day at time initiate PD or previous HD
- Incr-PD (n=176): 1-2 PD bag exchange
- Full-PD (n=171): 3 or more PD bag exchange

Incr-PD associated with *significantly lower risk* of anuria

Similar peritonitis, technique survival, & mortality rates

Table 5 Papers published regarding clinical experiences in incrPD

Author, year	Period of time	Study design	No. pts on incrPD	incrPD schedule	Initial GFR (ml/min)	Time on incrPD (patient-months)	Peritonitis rate (episode/patient-months)	Results/outcomes
Williams, 1999 [14]	NA	Pilot study	15	CAPD 1 dwell/day	9.8 ± 1.9	90	1/30	Adequacy (good) Hospitalization (3 admissions) Survival (patients and technique)
De Vecchi et al., 2000 [15]	1995–1999	Pilot prospective, not controlled	25	CAPD 1–2 dwells/day	6–10	262	1/21	Good rehabilitation with incrPD Better quality of life with incrPD Adequacy (good) Exit-site infections (8 episodes) Complications Hospitalization (3 days/year) Survival (patients and technique)
Burkart et al., 2000 [7]	1997–1999	Non randomized, prospective	13	CAPD 1–3 dwells/day	6.7 ± 2.4	159	1/53	Adequacy (good) Complications Survival (patients and technique)
Foggensteiner et al., 2002 [8]	1997–2000	Pilot, not randomized, prospective	39	CAPD 1 dwell/day	10	422	1/30	Adequacy (good) Complications Hospitalization (3.6 days/year) Survival (patients and technique)

Table 5 Papers published regarding clinical experiences in incrPD

Author, year	Period of time	Study design	No. pts on incrPD	incrPD schedule	Initial GFR (ml/min)	Time on incrPD (patient-months)	Peritonitis rate (episode/patient-months)	Results/outcomes
Neri et al., 2003 [16]	2000–2001	Preliminary experience	5	APD 3–4 sessions/week	7–9	84	none	Adequacy Peritonitis Compliance Complications Survival (patients and technique)
Viglino et al., 2008 [27]	2004–2007	Retrospective	11	CAPD 2 dwells/day	7.3 ± 2.7	106	NA	Choice of dialysis modality RRF and adequacy (good) Technique survival
Domenici et al., 2011 [28]	2000–2008	Retrospective	17	?	6.9 ± 1.1	480	1/48	Reduced rate of loss of RRF
Jeloka et al., 2013 [29]	2006–2011	Retrospective	13	CAPD 1 dwell/day	7.8 ± 2.6	244	1/56	Adequacy (good)
Barràs Sans et al., 2016 [30]	2003–2012	Retrospective	46	CAPD 3 dwells/day	8.0 ± 3.2	1035	1/99	Reduced rate of loss of RRF Reduced dose of erythropoietin

Sandrini M et al. Incremental peritoneal dialysis: a 10 year single-centre experience. J Nephrol (2016) 29:871–879

Peritoneal Dialysis International, inPress
www.PDIConnect.com

0896-8608/16 $3.00 + .00

KINETIC MODELING OF INCREMENTAL AMBULATORY PERITONEAL DIALYSIS EXCHANGES

Steven Guest,[1] John K. Leypoldt,[1] Michelle Cassin,[2] and Martin Schreiber[2]

JOURNAL OF THE INTERNATIONAL SOCIETY FOR PERITONEAL DIALYSIS
Peritoneal Dialysis
INTERNATIONAL

A large database report on PD patients across all membrane transport were used, and urea kinetic modelling determination of possible incremental regimens performed for an individual membrane type

Results:

Patient with significant RRF at the start of dialysis may not need the full dose dialysis regimen compared to long term dialysis patient who may be anuric

However, therapy need to also focus on ultrafiltration as UF maybe not be adequate despite fullfil the creatinine clearance target

Drawback of Incremental Dialysis

- It *requires regular monitoring of residual renal function* as its rate of loss is unpredictable

- Patient who starts incremental prescription may find it *challenging to transition* to a more intensive prescription

How to Prescribe Incremental CAPD

Factors to Consider

- Patients lifestyle
- Patient body size
- Patient's RRF
- Peritoneal membrane Type
- Volume/Ultrafiltration Requirements
- Solute clearance Requirements

Who is A Candidate for Incremental PD

- By definition ***requires significant residual renal function*** (GFR > 5 mls/min)
  - Not appropriate for patients with no residual renal function
- Requires clinical judgement:
  - Patient body size and dialysis requirements
  - Other metabolic control: bicarbonate level, potassium, phosphate level
  - Ability to achieve adequate volume control
- Patients who adherent to treatment and willing to convert to FULL dose PD/intensification of treatment when RRF falls

Bargman et al, Blood Purif 2018; 45;218-223

Incremental dialysis in special population

Heart Failure

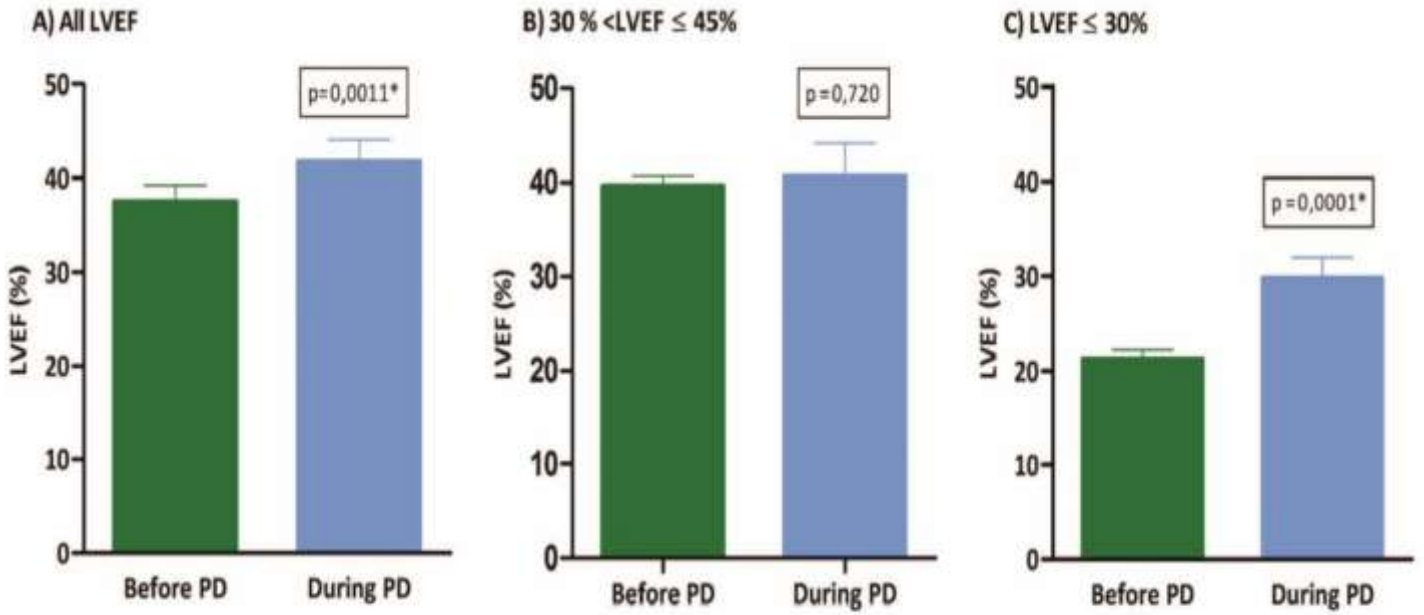


Figure 1 – (A) Left ventricular ejection fraction (LEVF) improved after peritoneal dialysis (PD) therapy in the study population. (B) Patients with better cardiac function did not have a major change in ejection fraction, (C) but those with a low ejection fraction experienced significant improvement.

In patient with cardiorenal syndrome, left EF improved significantly and 90% reduction in hospitalisation after PD initiation

Caurivaud el at, Perit Dial Int 2017

Incremental dialysis in special population

Chronic Liver Disease

- Require only 1-2 PD exchanges with good amount of ultrafiltration
- Difficult to control UF --→May decompensate haemodynamic status

Incremental Dialysis Prescription

- The dose of PD prescription can be individualized
- Some patient can start 1 CAPD exchange per night
- If patient prefers dry abdomen at night, 2 daytime exchange may be performed
- 4 hours exchanges is recommended as opposed to 12 hours due to fluid absorption over long dwells

Impact of larger CAPD volumes vs 4th exchange on Kt/V

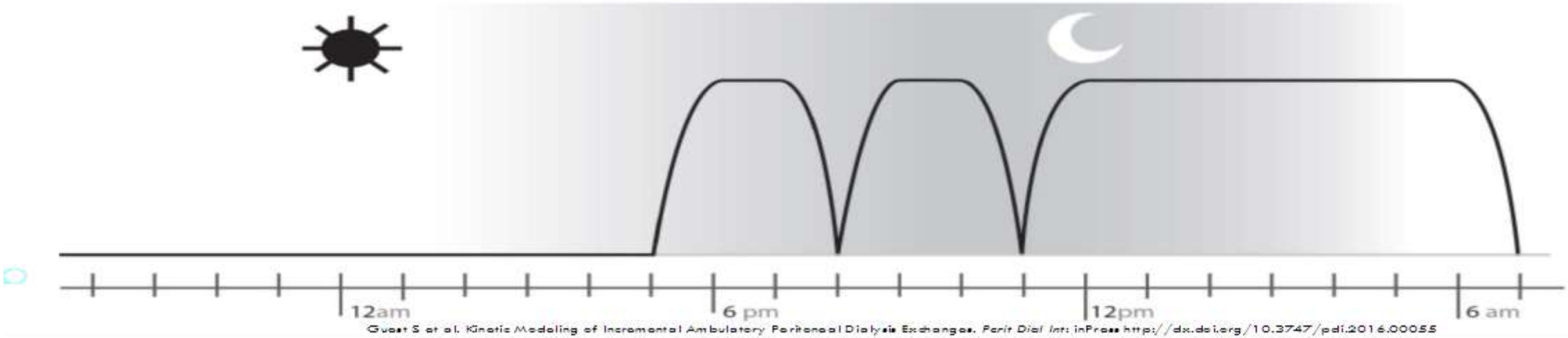
No. of exchanges	**3**	**4**	**3**
Kt/V	1.56	1.78	1.9
Dwell volume	2000	2000	2500

Incremental CAPD

Single overnight exchange: Glucose or icodextrin

Dry Night

Partially Dry Day



Guest S et al. Kinetic Modeling of Incremental Ambulatory Peritoneal Dialysis Exchanges. *Perit Dial Int*; inPress http://dx.doi.org/10.3747/pdi.2016.00055

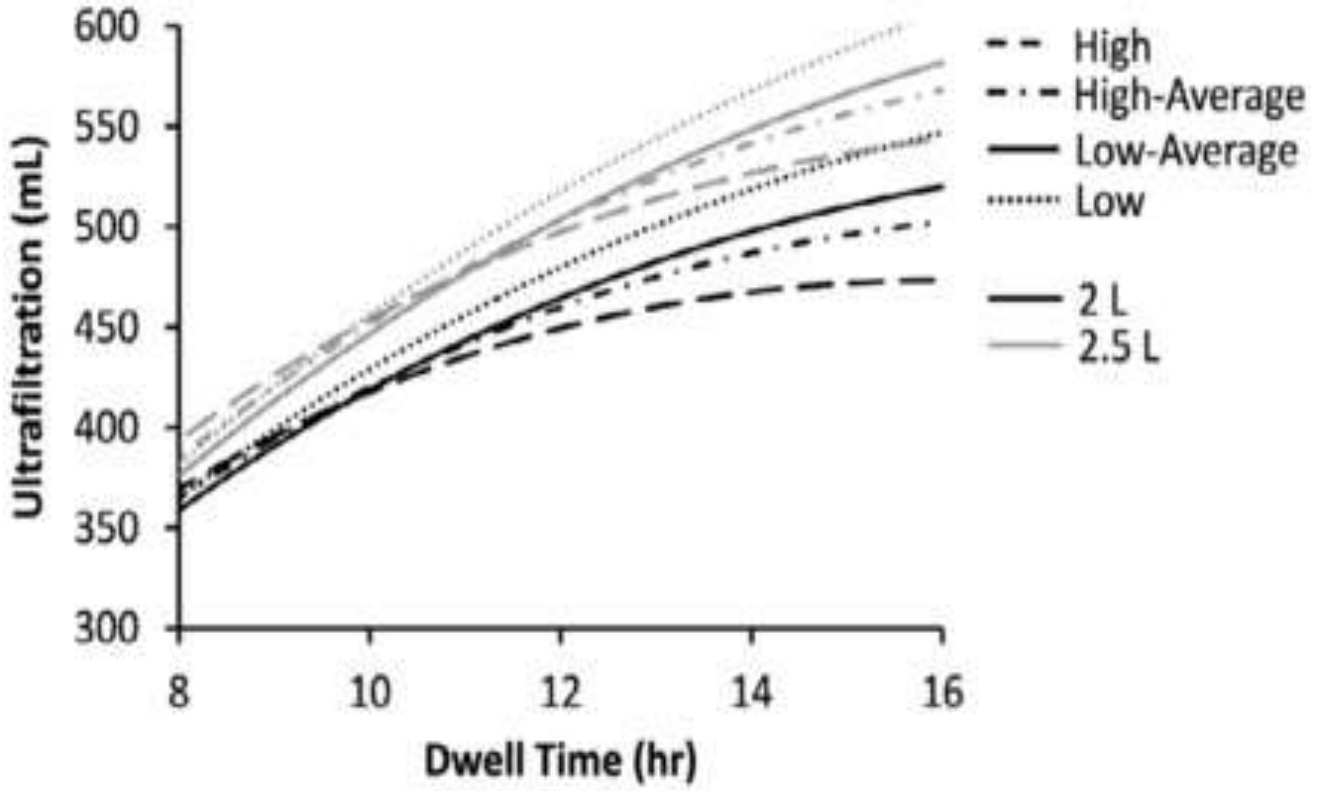
Peritoneal Dialysis International, Vol. 38, pp. 119–124
www.PDIConnect.com

0896-8608/18 $3.00 + .00

SINGLE DAILY ICODEXTRIN EXCHANGE AS INITIAL AND SOLITARY THERAPY

Baris U. Agar and James A. Sloand

Global Science and Technology, Baxter Healthcare Corporation, Deerfield, IL, USA



- Utilised a 3-pore kinetic model to predict fluid and solute removal for different transport type
- Single daily icodextrin exchanges over 8-16 hours with 2-2.5L bag

- A single daily icodextrin tailored to augment urea, UF & Na removal.
- Maybe reasonable initial therapy for some incident ESRD

Summary

- No strict and fast rule on standard 4 bags PD exchanges….*incremental dialysis is another approach*

- Transition of a patient from CKD to dialysis in a timely manner is an art
  - Preservation of residual renal function
  - Allow initial PD initial incremental PD exchange
  - Change PD prescription in a stepwise manner

- Incremental PD exchange:
  - Reduce treatment burden, reduce cost, reduce glucose exposure and preserve residual renal function

THANK YOU FOR YOUR ATTENTION