Benefits of an Incremental PD Care Strategy

Peritoneal Dialysis Workshop
ICON 2022: Beyond the Call of Duty

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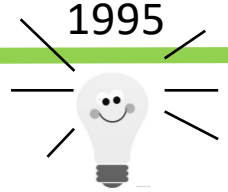
UNIVERSITY HEALTH NETWORK, TORONTO

My Timeline as a PD Prescriber

1985

2L 4xday for everybody

1995



The great revelation

2005

More cycler and flexibility

2015 onward

Incremental PD titrated to residual kidney function

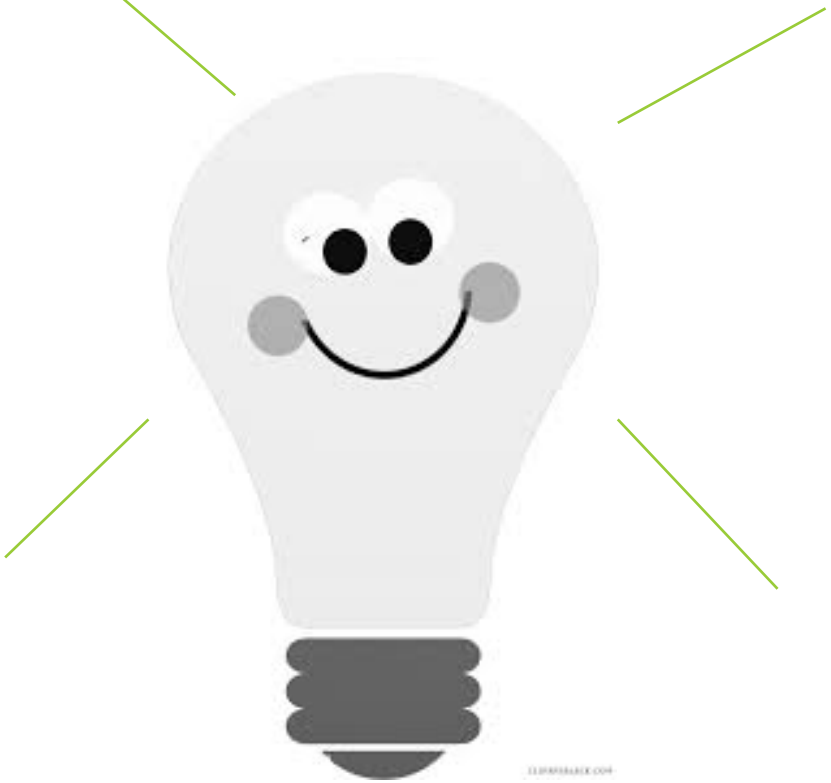
The Great Revelation:
My First Incremental PD Patient

78 year old man with advanced chronic kidney disease secondary to nephrosclerosis

GFR 8 ml/min

He and his wife would do his exchanges

"Let's start with 3 exchanges a day instead of 4 for now."



My First Incremental PD Patient

Patient stayed on 3 exchanges/day for 5 years until he died (sudden death at home)

GFR in year 5: still 8 ml/min!

My First Incremental PD Patient

The patient and his wife did 1 less exchange every day, compared to conventional PD

That is 365 fewer exchanges each year, X 5 years

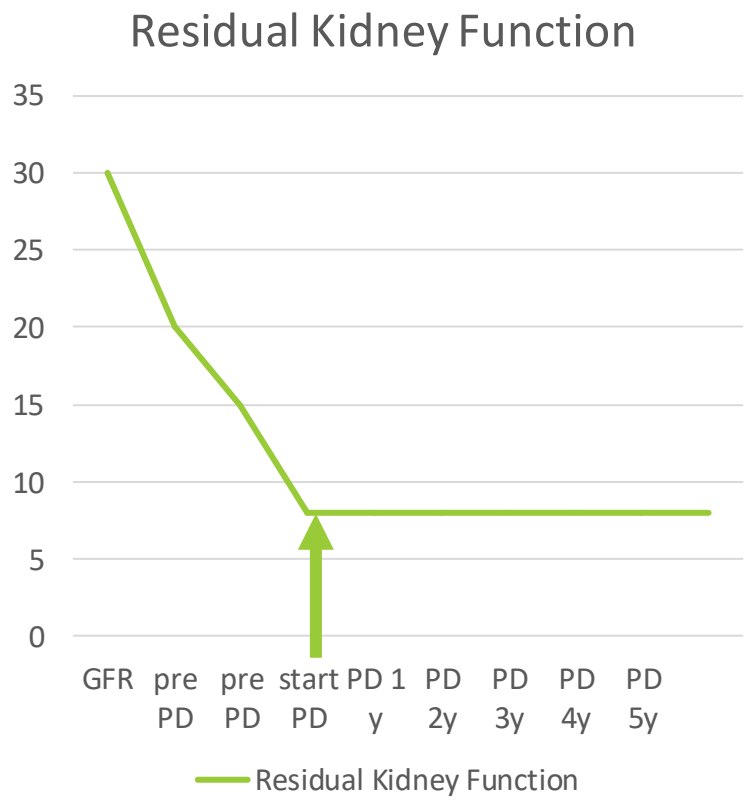
1825 saved exchanges

My First Incremental Patient

Another Question

If the GFR declined to 8 ml/min, why didn't it continue to decline?

Why did it stabilize?



Could PD Actually Protect the Kidneys?

Gently reduce hyperfiltration of remaining nephrons?

Removal of nephrotoxic uremic toxins?

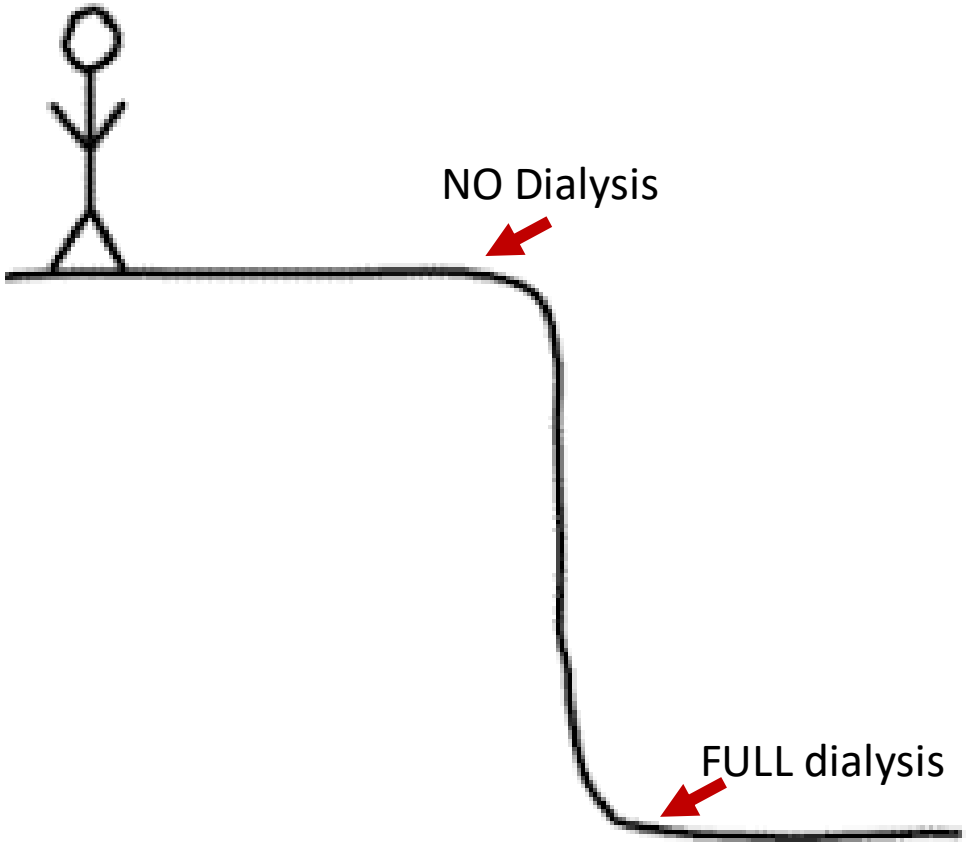
Correction of hyperphosphatemia?

Correction of metabolic acidosis?

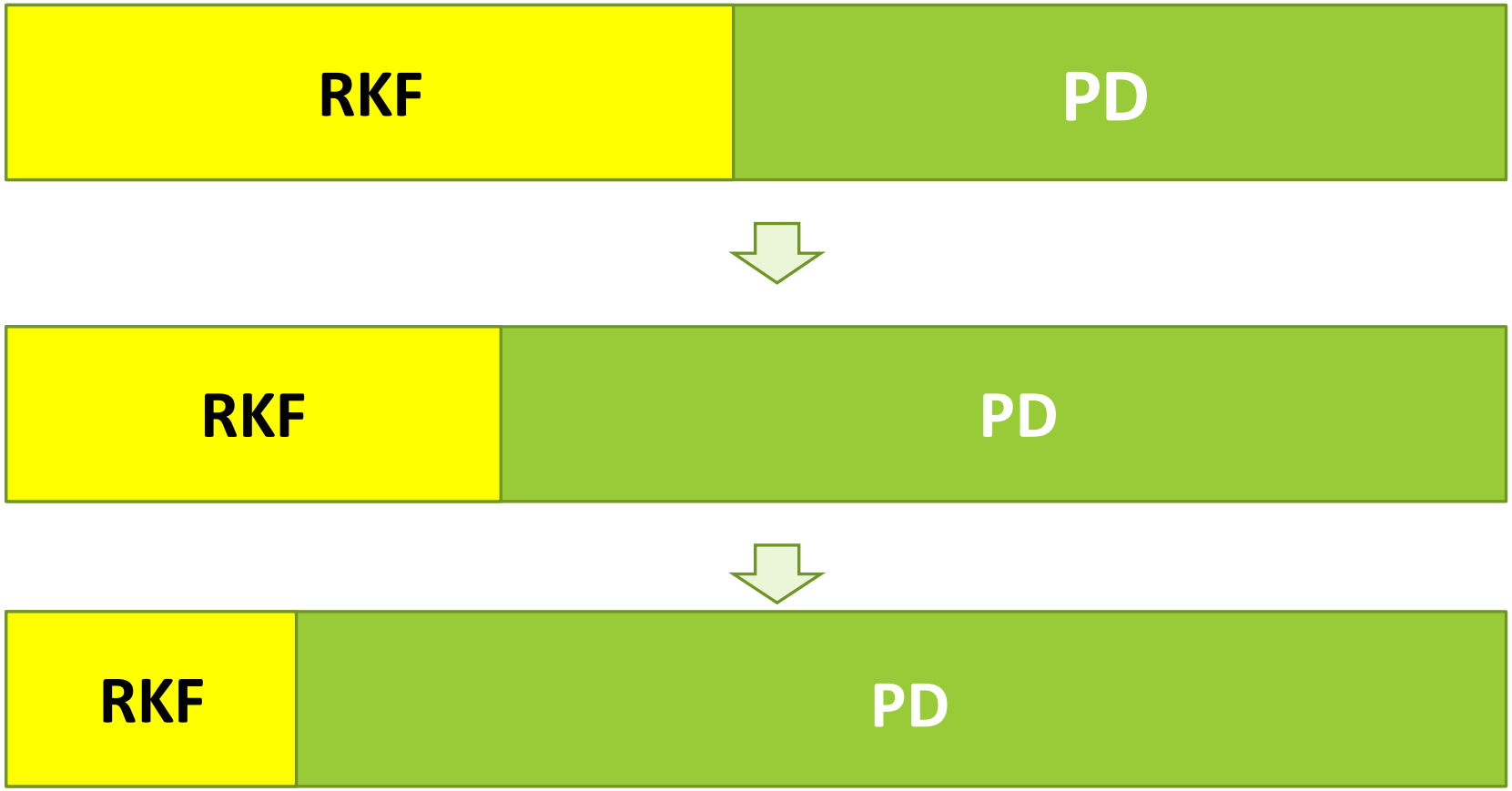
What is Incremental PD?

- Starting with less than the “usual” PD prescription in patients with residual kidney function (RKF)
- Increasing the dose of PD over time as the RKF declines

From Zero to 100: Does This Make Sense?



Incremental PD – A Schema

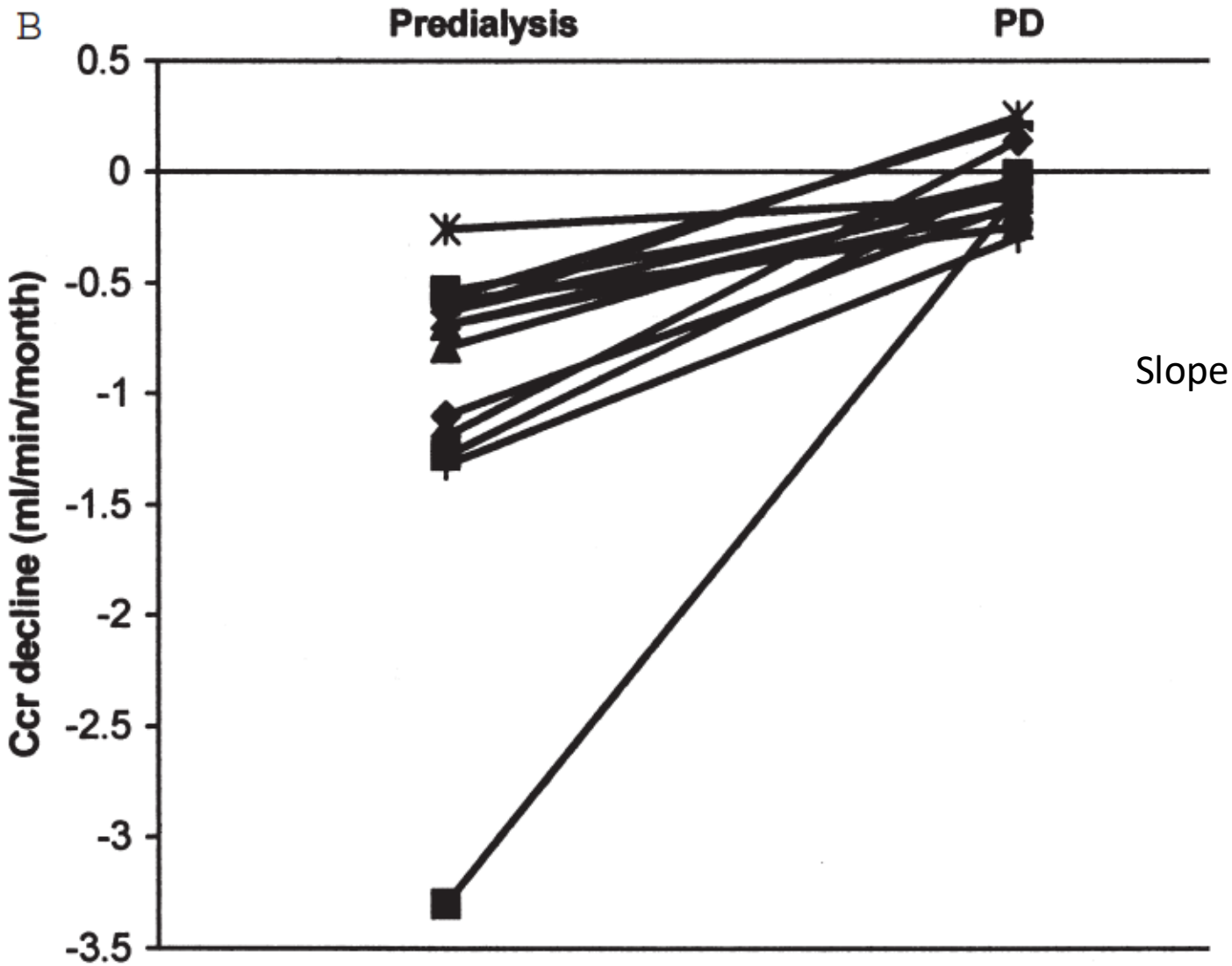


Why Incremental PD? (1)

- Most PD is an elective start, with “significant” kidney function (GFR 7 ml/min or more)
- Small amounts of PD tend to result in improvement of symptoms
- It doesn’t burden the patient with the same prescription that a patient with no kidney function might need
- It allows time for the patient to become comfortable with the therapy

Why Incremental PD? (2)

- Less total glucose exposure
- Fewer exchanges, so less risk of peritonitis
- It saves money



Slope of Decline of RKF Before and with PD

Berlanga Perit Dial Int 2002

RATE OF DECLINE OF RESIDUAL KIDNEY FUNCTION BEFORE AND AFTER THE START OF PERITONEAL DIALYSIS

Lian He,[1,2] Xihui Liu,[3,2] Zi Li,[4,2] Zita Abreu,[2] Tushar Malavade,[2] Charmaine E. Lok,[2] and Joanne M. Bargman[2]

Department of Nephrology,[1] Peking University 3rd Hospital, Beijing, P.R. China; University Health Network,[2] Toronto General Hospital and the University of Toronto, Toronto, ON, Canada; Division of Nephrology,[3] Linyi People's Hospital, Linyi, Shandong, P.R. China; Department of Nephrology,[4] West China Hospital, Chengdu, Sichuan, P.R. China

- 77 incident PD patients
- rate of decline in the predialysis period compared to rate of decline while on peritoneal dialysis
- GFR estimated in predialysis period by MDRD equation
- GFR estimated in PD by averaged 24h urine creatinine and urea clearance

He Perit Dial Int 2016

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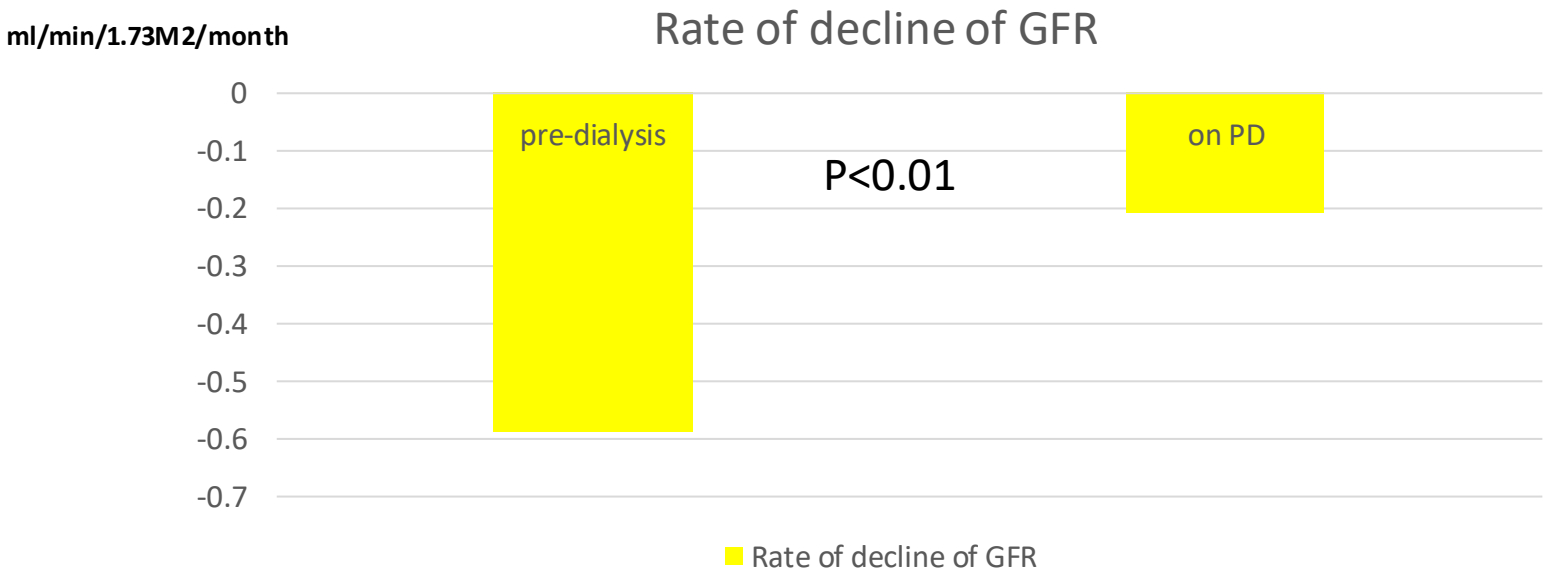
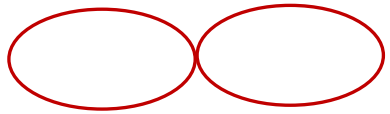


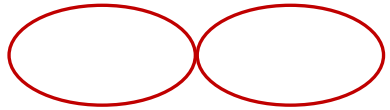
He Perit Dial Int 2016

Table 4. Trend of glomerular filtration rate over time (in mL/min/1.73m^2/yr) in the early and late dialysis start groups.

	EARLY-START GROUP				LATE-START GROUP		
	n = 79				n = 72		
Overall trend over time	-2.93 ± 0.26				-3.05 ± 0.17		
Trend during the pre- and post-dialysis initiation periods	PRE	POST	CHANGE		PRE	POST	CH
			Value (95% CI)	*P* value			Value (95%
Unadjusted model	-4.55 ± 0.68	-2.71 ± 0.28	+1.84 (0.43–3.25)	<0.001	-4.08 ± 0.39	-2.50 ± 0.19	+1.58 (0.6 2.46)
Exploratory model*	-4.68 ± 0.71	-2.71 ± 0.28	+1.97 (0.50–3.44)	0.008	-4.07 ± 0.39	-2.49 ± 0.19	+1.58 (0.7 2.46)

*Adjusted for patients' characteristics at enrollment: age, sex, ethnicity (Caucasian vs non-Caucasian), initial dialysis dose (incremental vs full), presence o mellitus and history of cardiovascular disease.





Ethier PLOS 1 2020

Original article

Incremental peritoneal dialysis: Clinical outcomes and residual kidney function preservation☆

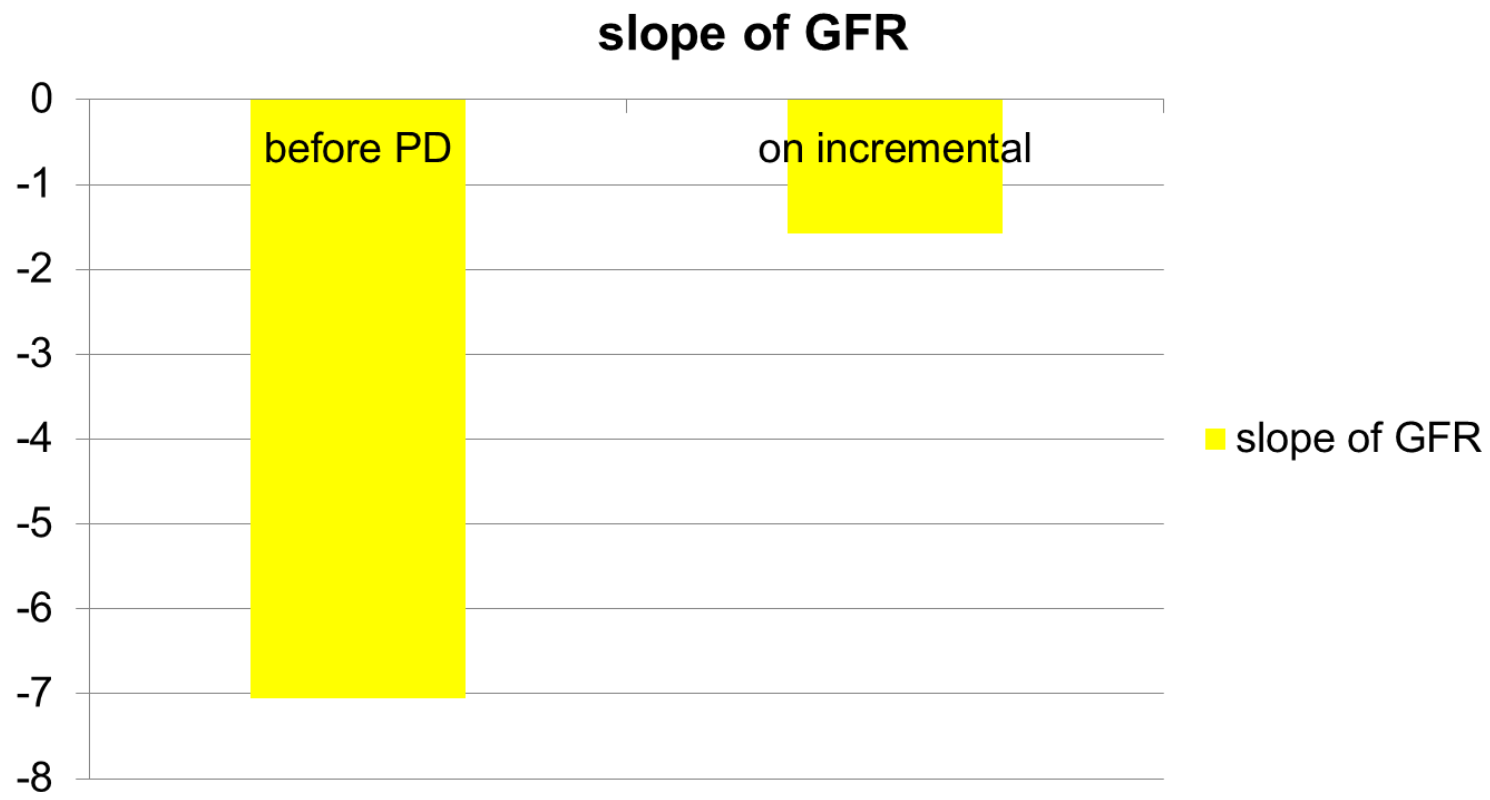
*Mercè Borràs Sans**, *Andrea Chacón Camacho*, *Carla Cerdá Vilaplana*, *Ana Usón Nuño*, *Elvira Fernández*

Servicio de Nefrología, Hospital Universitari Arnau de Vilanova, Lérida, Spain

- 46 patients receiving 3 or fewer exchanges/day
- 24 months
- many were transplanted before moving to standard PD
- good outcomes

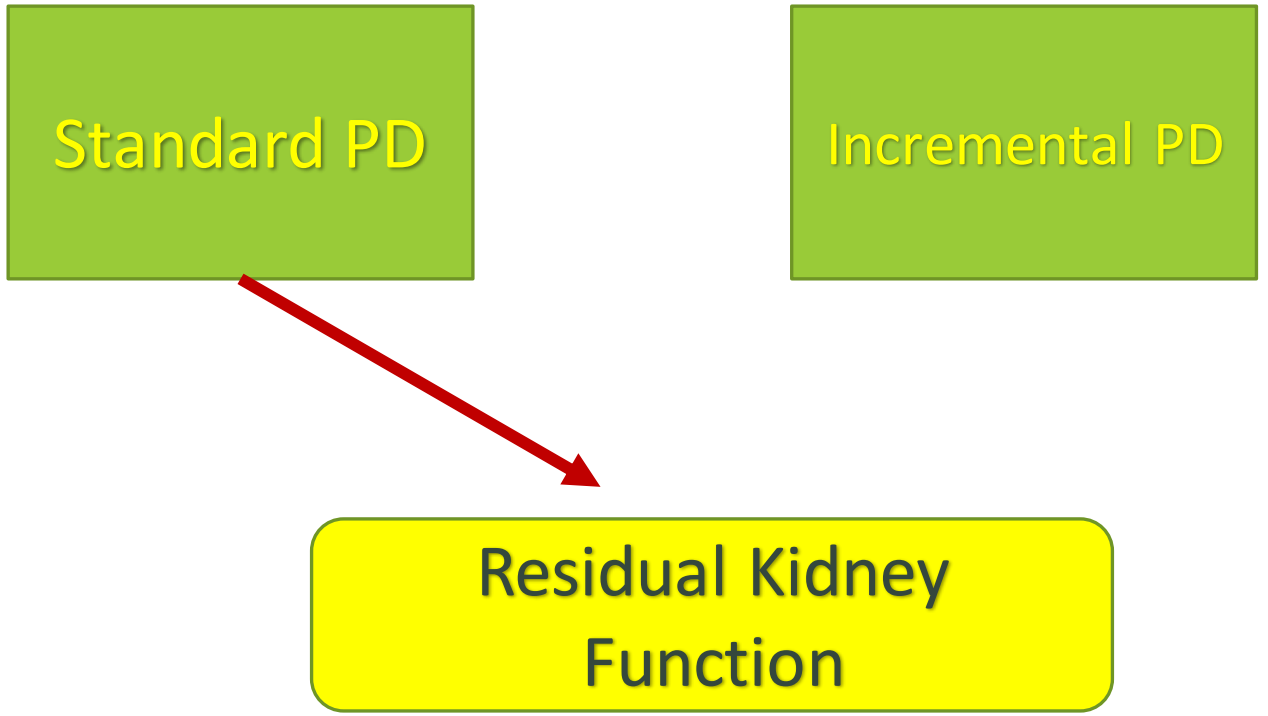
Barras Sans Nefrologia 2016

Incremental PD, Like Full-Dose PD, May Also be Kidney Protective

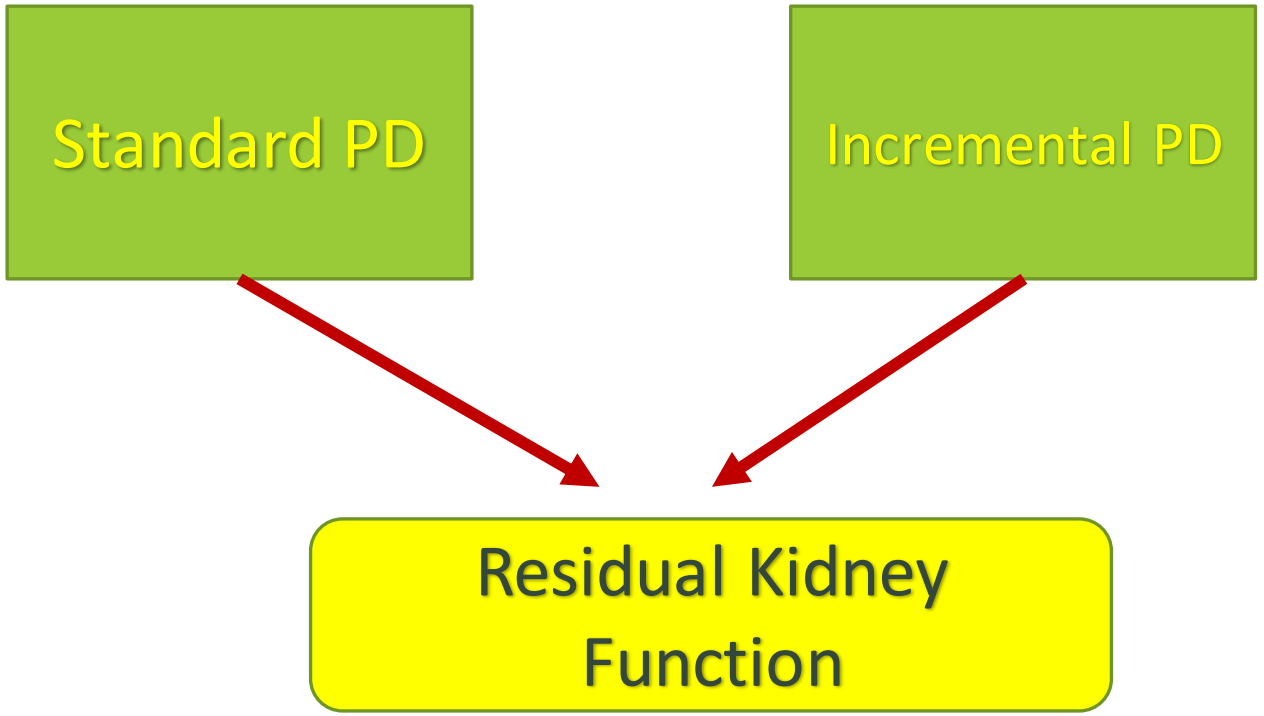


Barras Sans Nefrologia 2016

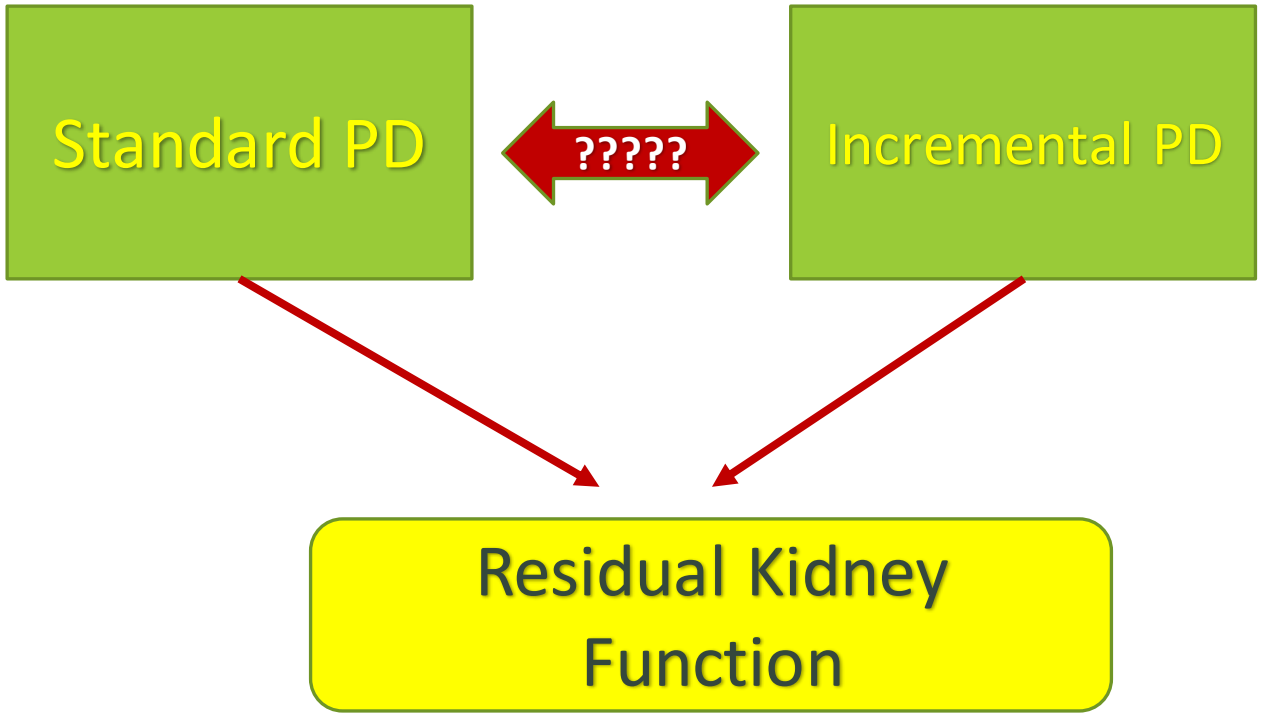
In Fact, Could Incremental PD be Even *More* Protective of Kidney Function?



Could Incremental PD be Even More Protective of Kidney Function?



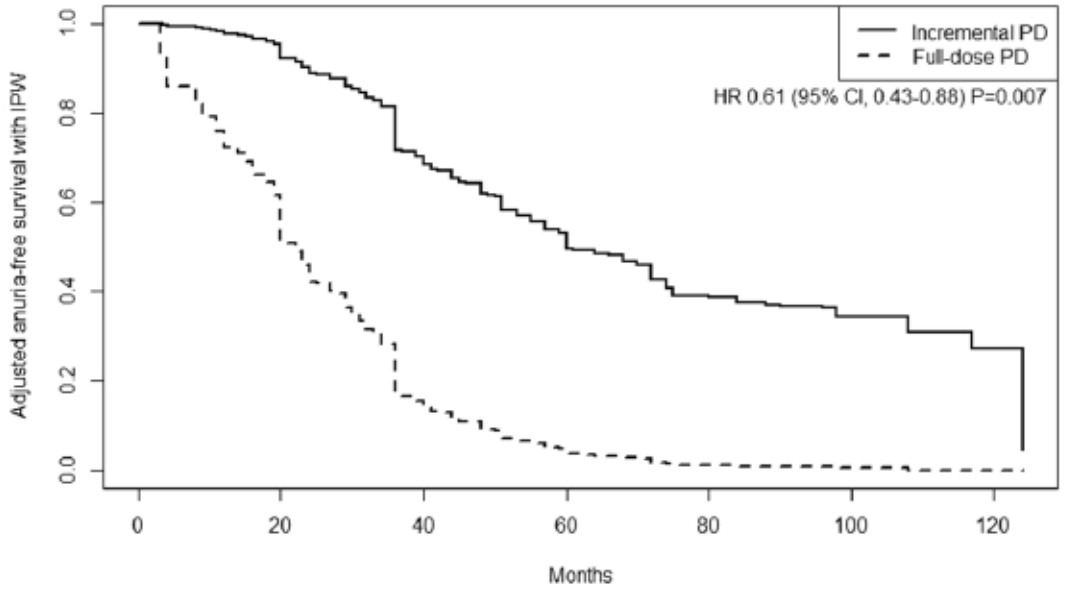
Could Incremental PD be Even More Protective of Kidney Function?



Outcome of Incremental PD

- Single center, retrospective study over 16 years
- Patients commenced PD between 2007 and 2015
- Propensity scores, IPW adjustments +++
- Incremental PD defined as 1-2 exchanges/day, 7 days a week
- The incremental group had lower risk of developing anuria (HR 0.61, 95% CI .43-.88)
- Technique survival, patient survival, peritonitis no different between the two groups

Lee Sci Reports 2019



Free Survival

Incremental PD

Full-Dose PD

Lee Sci Reports 2019

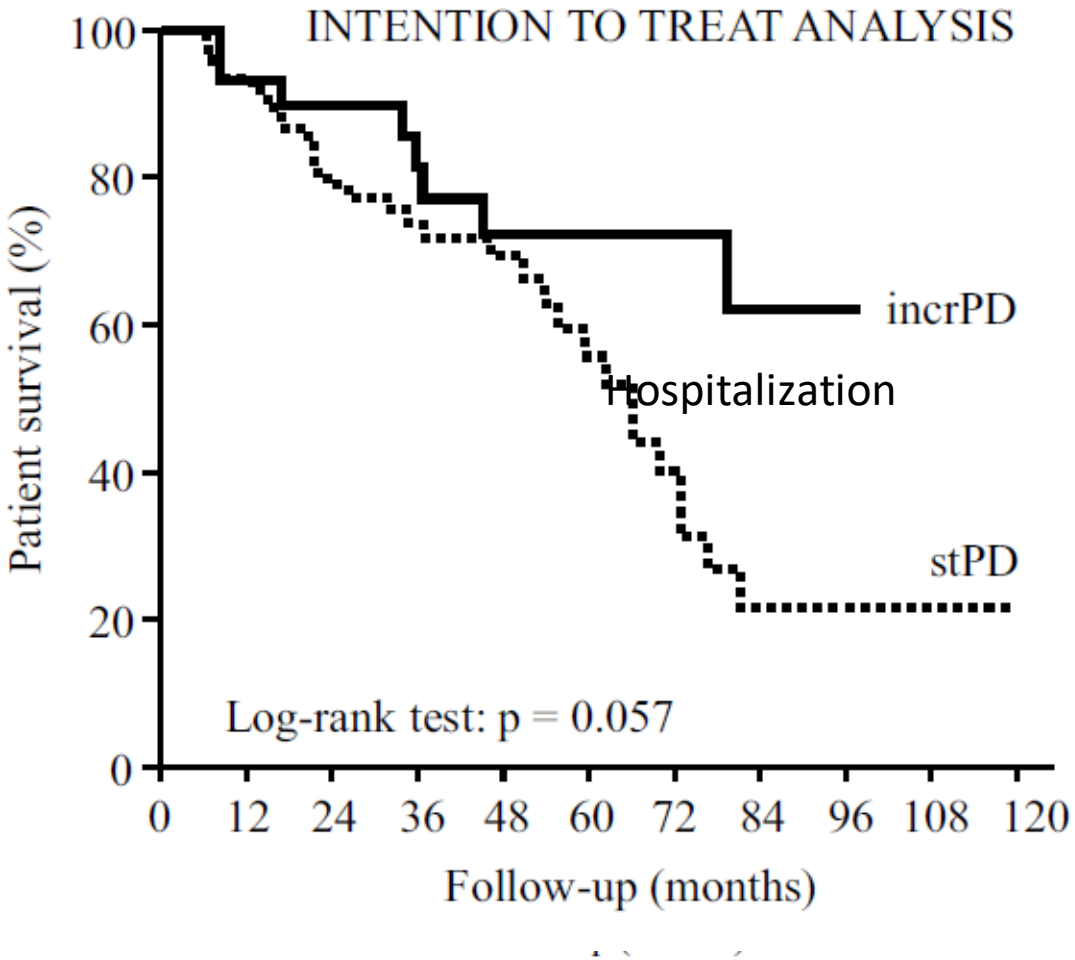
Table 1 Baseline data of the two groups: incrPD and stPD

	incrPD	stPD	*p*
Number of patients	29	76	
Male gender	13 (55%)	50 (66%)	0.611
Age (years)	63 ± 12	59 ± 18	0.200
Weight (Kg)	63.4 ± 10.2	62.8 ± 16.7	0.837
BMI (Kg/m^2)	24.3 ± 3.9	23.3 ± 3.7	0.130
RRF (ml/min/1.73 m^2 BSA)	5.74 ± 1.34	5.42 ± 1.75	0.381
D/P creatinine 4th hour	0.63 ± 0.14	0.62 ± 0.11	0.426

- 29 patients on incremental (iPD) regimen
- 76 patients on standard PD prescription (stPD)
- Median duration of iPD was 17 months

Same baseline GFR in the two groups

Sandrini J Nephrol 2016



remental PD

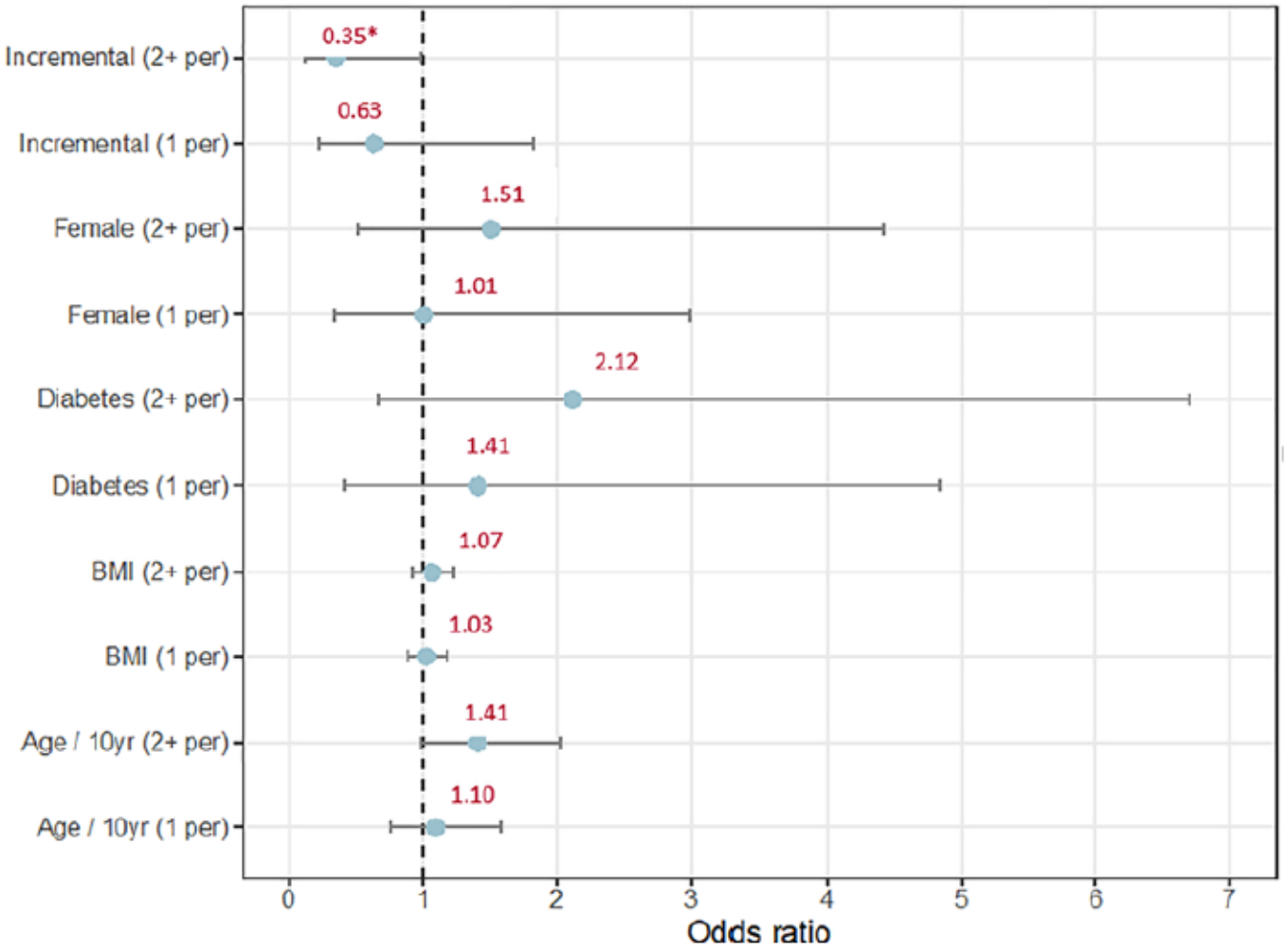
Hospitalization

Survival

Sandrini J Nephrol 2016

Figure 2

Predictors of peritonitis. Multivariate logistic regression analysis



ɔn is Associated ritonitis

*

Santos Port J Nephrol Hypert 2021

ion is Associated ique Survival

*

transfer to hemodialysis

Table III

Predictors of drop out to hemodialysis. Multivariate analysis

	OR	95% CI	P value
Age (per decade)	0.97	0.75-1.26	0.814
DM	1.52	0.69-3.34	0.303
Albumin (g/L)	0.89	0.38-2.11	0.798
Body mass index (per Kg/m^2)	1.0	0.89-1.13	0.999
Peritonitis in the first year	1.83	0.79-4.27	0.158
PD start decade	1.74	0.77-3.91	0.182
GFR (mL/min)	0.94	0.82-1.08	0.401
Incremental approach	0.41	0.19-0.92	0.030*

Santos Port J Nephrol Hypert 2021

How To Prescribe Incremental PD

CAPD

One exchange overnight

- if using a 1.5% solution, there will likely be absorption, so it depends on the fluid status of the patient
- can use 2.5% solution or icodextrin if available
- the icodextrin will usually result in ultrafiltration

How To Prescribe Incremental PD

CAPD

2 exchanges, 4h each during the day, night dry

- this works well in patients with RKF
- good incremental regimen for those who don't like fluid in the abdomen overnight

How NOT To Prescribe Incremental PD

CAPD

2 exchanges, 12 hours each may not be successful

- there will likely be fluid absorption that can result in volume overload

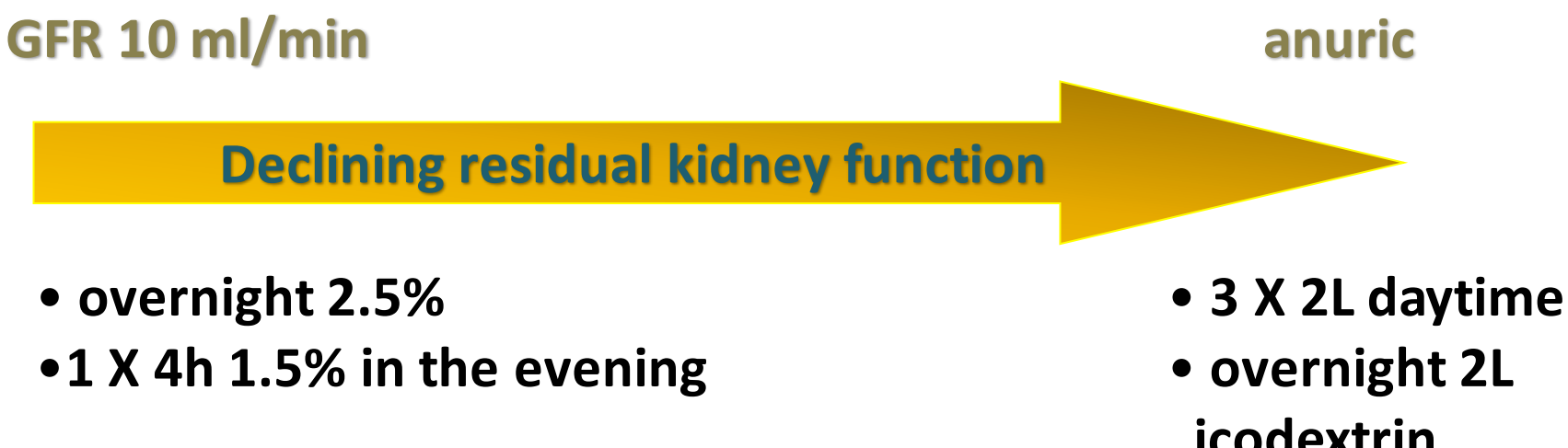
How To Prescribe Incremental PD

APD

Night cycles, day dry is a great regimen (NIPD)

- don’t have to worry about fluid absorption during the long day dwell
- Example: 3 X 1.5 L exchanges over 8 hours

Titrating the Dose of Dialysis to Residual Kidney Function *(CAPD)*



Titrating the Dose of Dialysis to Residual Kidney Function *(APD)*

GFR 10 ml/min → **anuric**

Declining residual kidney function

- **8 hours**
- **2L X 3**
- **day dry**

- **9 hours**
- **2.5 L X 4**
- **last fill 2L icodextrin**

The Volume Can Also be Increased Incrementally

- No need for a full 2 or 2.5L dwell volume at the outset
- Allow time for adjustment to the sensation
- *It takes 9 months to grow a baby for a reason*

The Best Options for Increasing the Dose of Dialysis in the Incremental APD Patient

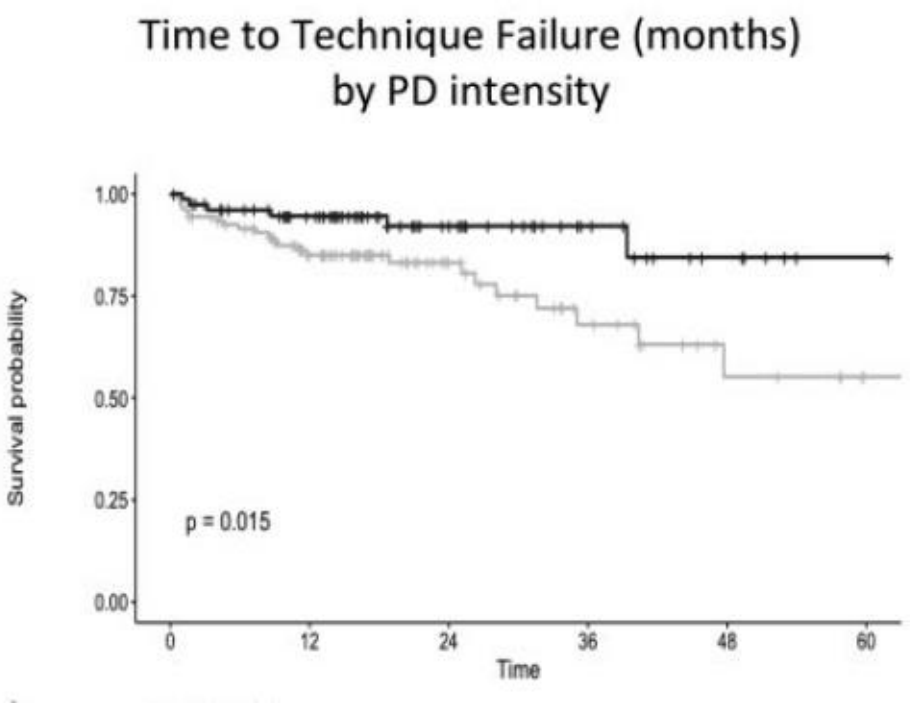
- Add a day dwell
- Increase the volume of the night dwells

The Worst Options for Increasing the Dose of Dialysis in the Incremental APD Patient

- Increase the number of exchanges overnight
- Increase the time on the cycler, especially if the patient has a day dwell

An Ineffective Way to Increase the Dose of Peritoneal Dialysis

A *Really* Ineffective Way to Increase the Dose of Peritoneal Dialysis



Prescription Improves vival

lospital, UK

sis-free days,

f the use of this flexible prescription with longer stay on PD

Reduced PD

Standard PD

Navaratnarajah Perit Dial Int 2021

FY 2019/20

Top Performance Award

This certificate is awarded to

University Health Network

For achieving the highest Home Dialysis Prevalence in Ontario

Congratulations to all staff and thank you for your continued contribution and commitment towards improving the lives of Ontario renal patients

Garth Matheson
Vice President (Temporary)
Ontario Renal Network

Dr. Peter Blake
Provincial Medical Director
Ontario Renal Network

Ontario Health

What Are The Objections to Incremental PD?

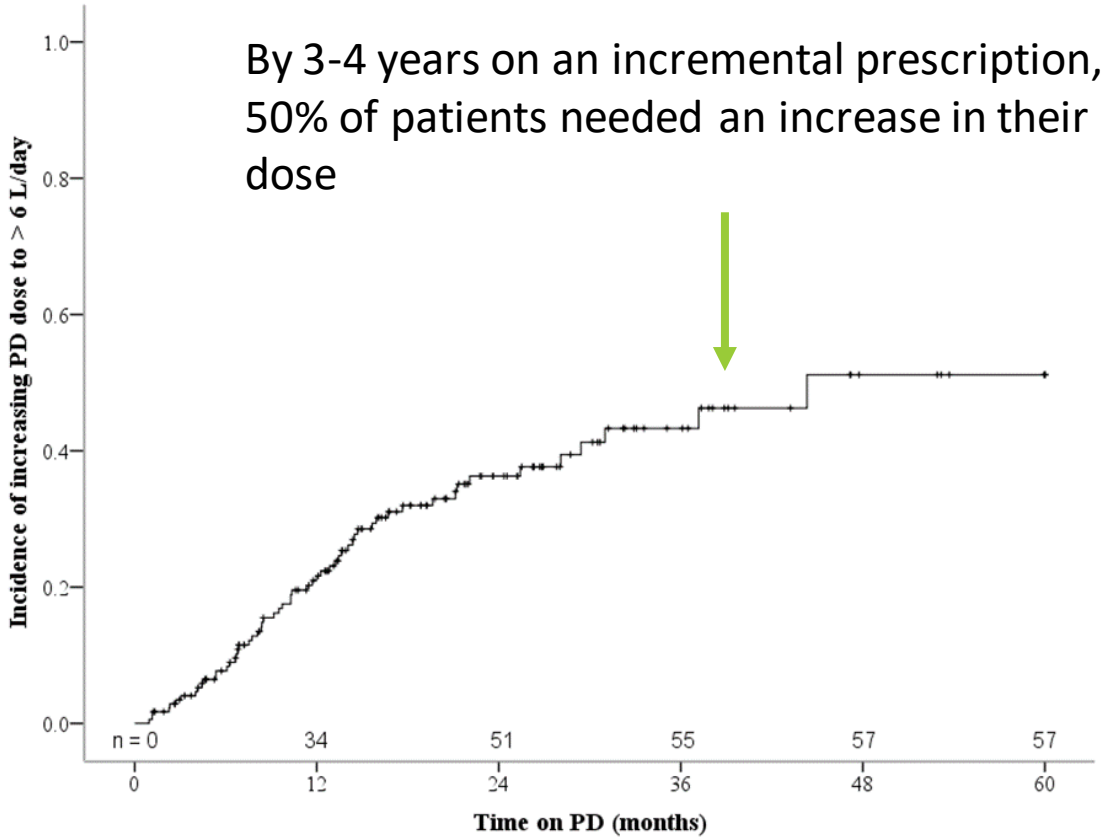
- In many units there is a reluctance to use incremental PD, because there is no “evidence” that it works and is safe
- Observational studies are confounded by indication: stable patients with good RKF would be more likely to receive an incremental prescription, but this group would do better in any case

"The Patient Will Refuse to Increase the Prescription Once the Kidney Function Declines"

- I haven't found this to be a problem
- The process has to be explained and re-explained to the patient
- Actually, transitioning from night cycler/day dry to night cycler day dwell is not usually a big disruption to life

Cumulative Incidence of Increasing the PD Dose to > 6L/Day: Our Experience

By 3-4 years on an incremental prescription, only 50% of patients needed an increase in their PD dose



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"If You Have to Get to Full Dose Eventually you Might as Well Start Off with It"

- in our experience many patients keep their RKF until death or kidney transplant or transition to HD
- Would you proceed directly to an above-knee amputation instead of a below-knee amputation if the patient may need it in the future?

"The Patient May Lose RKF Suddenly, and They Will Quickly Become Under-dialysed"

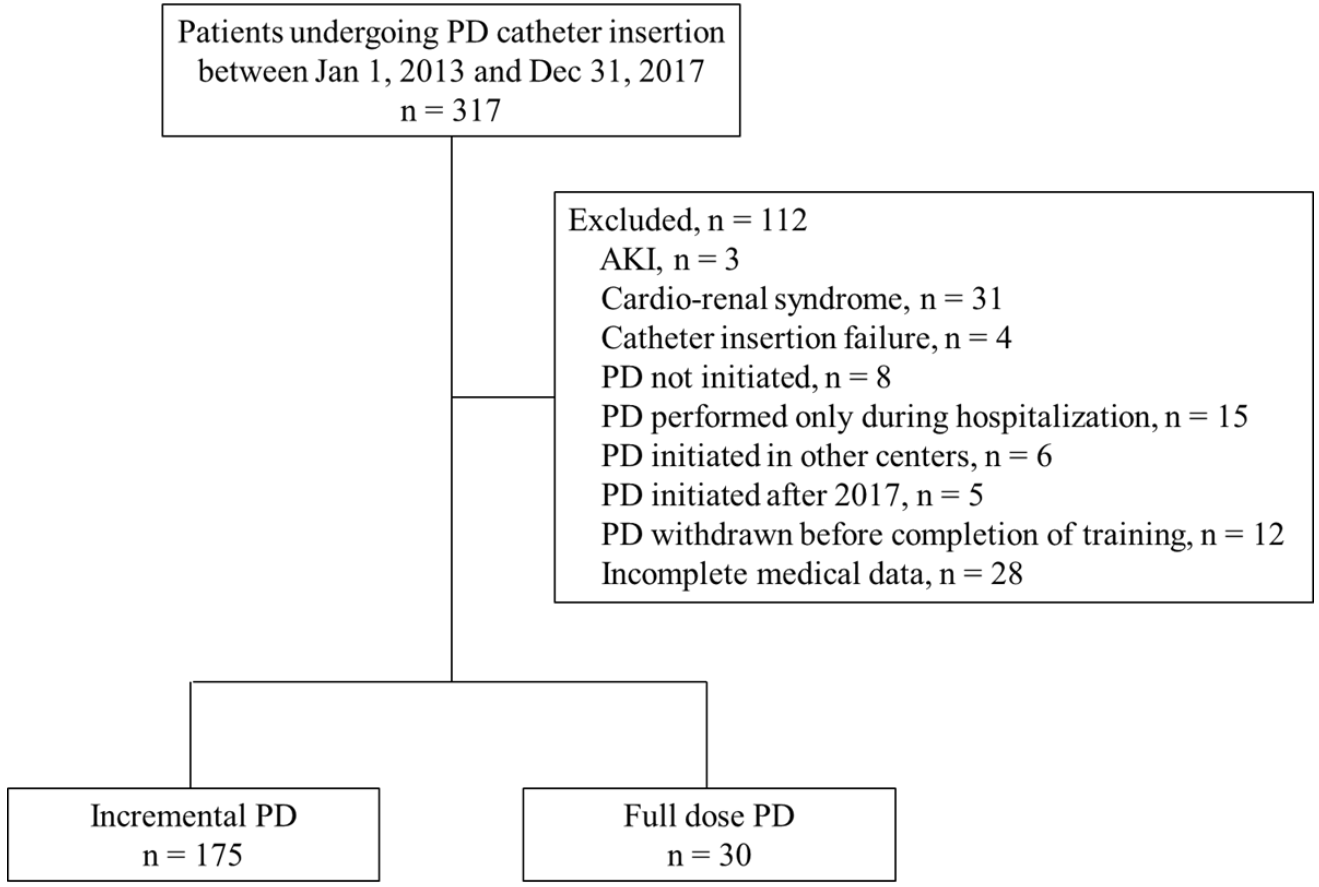
- ambulatory PD patients don't suddenly lose their RKF
- *sudden* loss of RKF is usually in the context of an intercurrent event (CHF, radiocontrast, sepsis) which, hopefully you will be aware of and can make adjustments to the PD prescription

"You Have to Carefully Monitor the Residual Kidney Function with 24h Urine Collections"

- Worth repeating: ambulatory PD patients don't *suddenly* lose their RKF without other stuff happening
- We request a 24h urine for volume/urea/creatinine every 2 to 4 months
- If the patient "forgets": if the serum creatinine is unchanged, and the prescription is unchanged, then we presume the kidney creatinine clearance is unchanged

Walking the Walk: The University Health Network Experience

Yan, Abreu and Bargman Perit Dial Int 2021



"There are No Randomized Trials to Prove that This Approach is Safe"

- true
- however, I think that most people would take 5 ml/min of KIDNEY clearance any day compared to 5 ml/min of dialytic (HD or PD) clearance
- using kidney Kt/V urea grossly *underestimates* what the kidney function is doing (volume, larger molecular weight toxin removal)

Incremental Dialysis: Summary

- Someone with some kidney function does not need the same dialysis prescription as someone with no kidney function
- Incremental PD may preserve kidney function, allowing incremental dialysis to continue
- There are many potential benefits, especially for quality of life and illness intrusion