

65° CONGRESSO NAZIONALE SIN

RICCIONE (RN) 21-24 OTTOBRE 2025

PIERGIORGIO BOLASCO

a nome del GdP Trattamento Conservativo della Malattia Renale Cronica



LA SALUTE DEI RENI È "ORA"
TRASFORMIAMO LE CURE NEFROLOGICHE

**Pro e contro di schemi dialitici differenti
dalla frequenza trisettimanale**



Review

Incremental Hemodialysis: Review of Clinical Trials Focused on Patients Undergoing Once-Weekly Hemodialysis

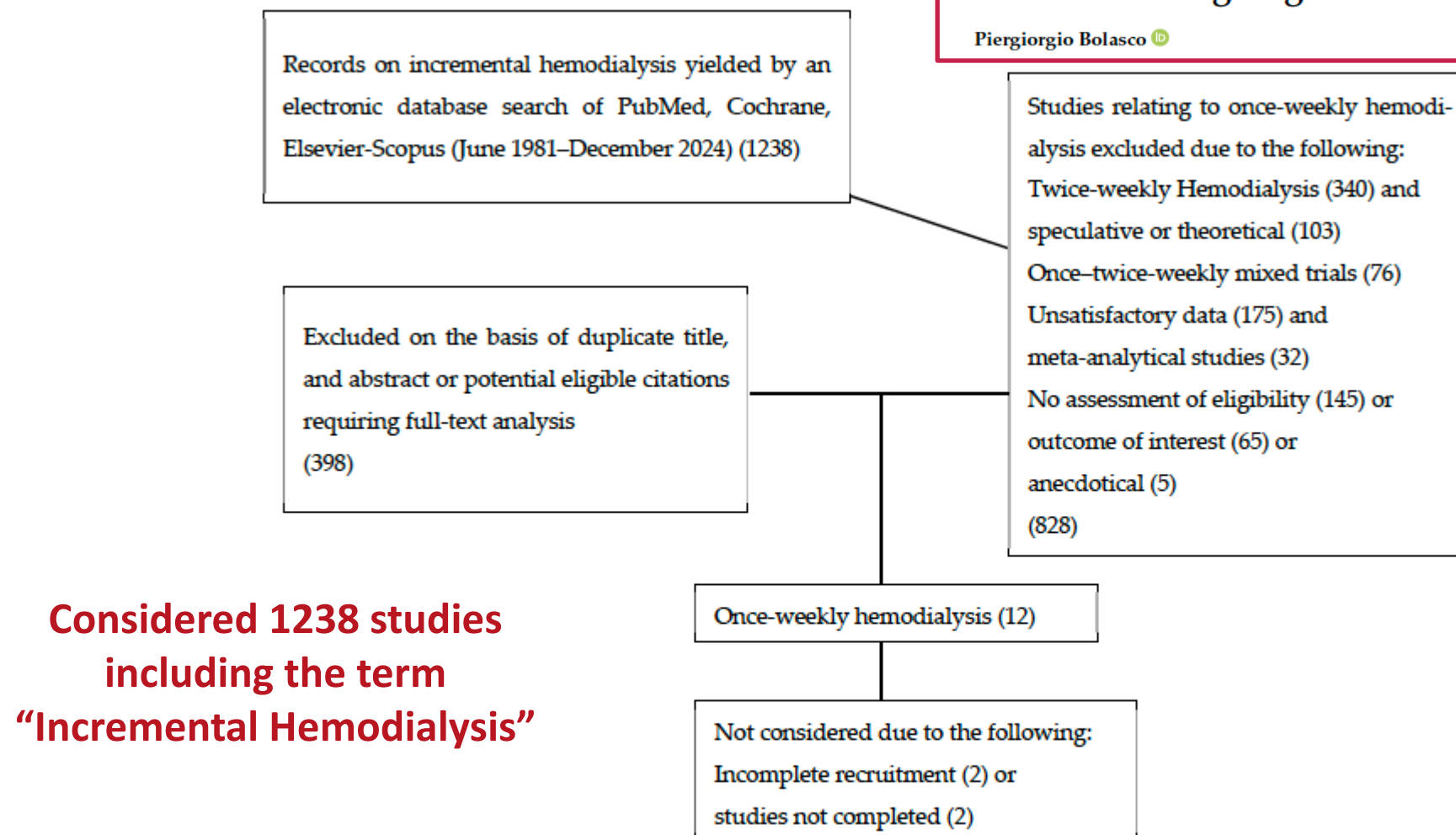
Piergiorgio Bolasco *Nutrients* **2025**, *17*, 713

Figure 1. Flowchart of selected studies assessed to identify once-weekly hemodialysis trials.



Once-weekly-hemodialysis: completed studies – 1981-2016

Study and location, methodology	recruited patients (M/F)	age of recruited patients, years	Residual Kiney Function at start, mL/min/1.73m ²	Average daily urine volume at start, mL	Average daily urine volume at the end, mL	Method for GFR measurement	Prescribed hypoproteic diet, nutritional supplement	duration of study, months	Prescribed Kt/V	Total drop-out, %	mortality, n. %	Cumulative survival at the end of the study	advantages and/or disadvantages
<i>Mitch WE et Al</i> - 1981 USA Cross-over	7 (5/2)	45	3.43 ± 0.98	n.r.	n.r.	average urea/creatinine clearances	0.4 g/kg + 10 g/day EAAs	3	n.r.	28%	n.r.	71.4%	n.r.
<i>Morelli E et Al.</i> - 1987 Italy Prospective	17 (14/3)	48.5 ± 11.8	2.0	1529 ± 420 (mediana: 1450)	682 ± 426 (mediana: 500)	average creatinine clearances	0.3 g/kg + EAAs and keto-analogues	18.2 ± 17.7 (mediana: 11)	n.r.	76,6%	5,90%	17.5%	- reduction of TAC of urea, phosphate and serum methylguanidine - lower costs
<i>Locatelli F. et Al</i> - 1994,1998 Italy Prospective	69	61 ± 3	2,46 ± 0,9	n.r.	n.r.	average urea/creatinine clearances	0.4 g/kg + EAAs and/or ketoanalogos	24	spKt/V 1.2	66,60%	n.r.	24.6%	n.r.
<i>Caria S et Al.</i> - 2014 <i>Bolasco et Al.</i> - 2016 Italy Prospective	38 (25/13)	64.5 ± 13.2	7,8 ± 1,9 (median: 6.2)	1983 ± 651	1875 ± 315	average urea/creatinine clearances	0,6g/kg + EAAs+NEAAs. free diet on the dialysis day	24	eqKt/V > 1,2	41,90%	3 (7.9%) cardiac events	50.2%	ONLY IN ONCE-WEEKLY-HD - maintenance good nutritional condition - reduction EPO dosage - reduction of phosphate binders dosage - reduction of calciomimetic drugs - decrease of C-Reactive Protein - better psychological adaptation - slowing RKF decline - 50% cost saving
	30 (19/11)	65.2 ± 11	9.2 ± 4.2 (median: 6.8)	1472 ± 133	<200 at 6th month	average urea/creatinine clearances	1,2 g/kg/day		eqKt/V > 1.2	none	10,40%	86.8%	



Once-weekly-hemodialysis: completed studies – 2018-2025

Study and location, methodology	recruited patients (M/F)	age of recruited patients, years	Residual Kiney Function at start, mL/min/1.73m ²	Average daily urine volume at start, mL	Average daily urine volume at the end, mL	Method for GFR measurement	Prescribed hypoproteic diet, nutritional supplement	duration of study, months	Prescribed Kt/V	Total drop-out, %	mortality, n. %	Cumulative survival at the end of the study	advantages and/or disadvantages
<i>Nakao et Al.</i> - 2018 Japan Prospective	112 (80/32)	(median: 63)	3.8±0,8	n.r.	n.r.	creatinine clearances	0,6 g/kg salt intake 6 g/day	24	spKt/V 1.2-1.4	75,9%	11,6%	24.1%	
<i>Takkavatakarn</i> - 2021 Thailand Prospective	11 (7/4)	64.4±15.1	5,1±4,0	n.r.	n.r.	average urea clearance	inter-dialysis days 0.6-0.8 g/kg/day dialysis day 1.2 g/kg/day	9,7+6,9	spKt/V≥1,2	75,40%	n.r.	n.r.	better quality of life
<i>Torreggiani M et Al.</i> - 2022 France	1WHD 30 (17/13)	69.3±14.2 (mediana: 67.5)	9.1±6.2 (median: 8)	1800±706 (median: 1850)	(median: 1825)	CKD-EPI	0.6-0.8 g/Kg/d	17.2±10.8 (median:14)	spKt/V≥1,2	53,20%	2 /6.6%)	59.8%	saving costs on 1WHD
	3WHD 67 (38/29)	(65.9±13.2) (median:67)	9.8±3.9 (median:5.85)	937 ± 641 (median: 900)	(median: 100)		n.r	24.2±14.9 (median: 28.5)	n.r.	88%	13,40%	0%	
<i>Praditpornsilpa K. et Al</i> - 2024 <i>Kittiskulnam et Al.</i> 2025 Thailand. open-label, randomized controlled	1WHD 15	58±19.3	6.9±1.4	2226±743	1738±744	CKD-EPI	Interdialytic day 0,6 g/kg + ketoanalogues 1.0-1.2 dialysis day	12	spKt/V≥ 1.2	33.3%	none	33.3%	n.r.
	2WHD 15	61.9±16.8	6.2±1.9	1690±986	878±464		1.0-1.2 g/kg			none	none	100%	slowing RKF decline in once-weekly haemodialysis compared to twice-weekly haemodialysis - saving costs

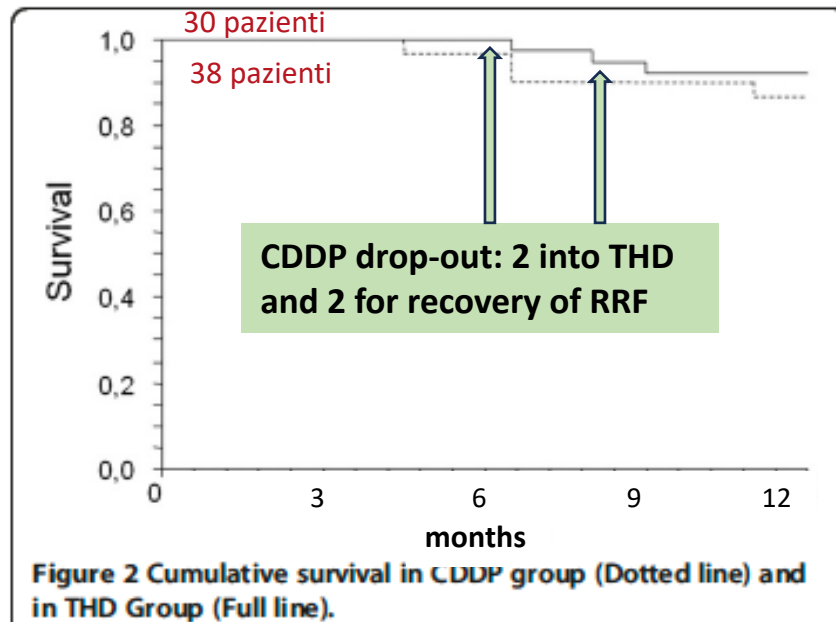
2014

RESEARCH ARTICLE

Open Access

The incremental treatment of ESRD: a low-protein diet combined with weekly hemodialysis may be beneficial for selected patients

Stefania Caria^{1*}, Adamasco Cupisti², Giovanna Sau³ and Piergiorgio Bolasco¹



I pazienti in emodialisi trisettimanale (THD) erano già oligo-anurici al 6° mese di studio

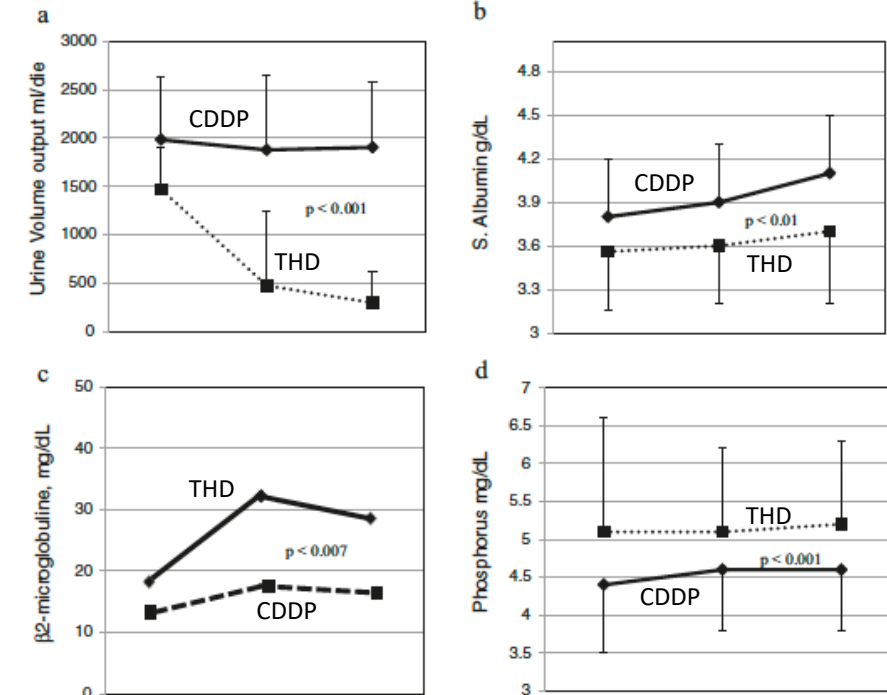



Table 1. Different Feature Recommendations Between Twice-Weekly Dialysis and CDDP

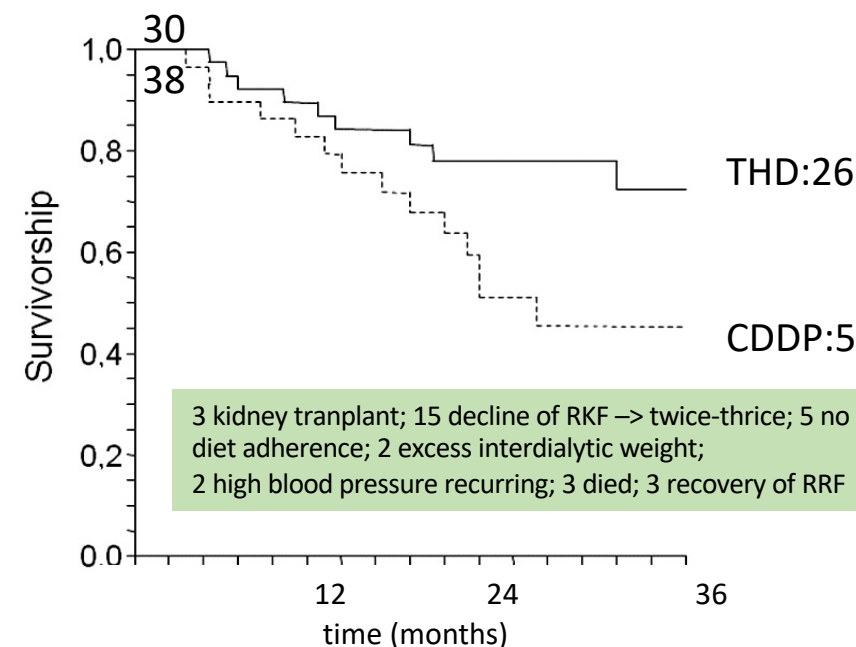
Twice-Weekly Dialysis ²¹		CDDP
1) Residual kidney function 5-10 mL/min/1.73 urine output >0.5 L/ 2) No signs of water retention or responsive to diuretic therapy; fluid interdialytic gain <5% of ideal dry weight 3) Limited or readily manageable cardiovascular or pulmonary symptom 4) Suitable larger body size relative to residual kidney function 5) Infrequent and readily manageable hyperkalemia (>5.5 mEq/L) and/or hyperphosphatemia (P > 5.5 mg/dL) 6) Good nutritional status without florid hypercatabolism 7) Lack of profound anemia (Hb > 8) and appropriate responsiveness to anemia therapy 8) Infrequent hospitalization and easily manageable comorbid conditions 9) Satisfactory health-related quality of life	3-5 mL/min/1.73 m² Urine output >500-800 L/die	1) Residual kidney function 5-10 mL/min/1.73 and urine output >0.8-1.0 L/day 2) No signs of water retention or responsive to diuretic therapy; fluid interdialytic gain <5% of ideal dry weight 3) Limited or readily manageable cardiovascular or pulmonary symptoms 4) Excluded patients with BMI >35 5) Infrequent and readily manageable hyperkalemia (>5.5 mEq/L) and/or hyperphosphatemia (P > 5.5 mg/dL) 6) Good nutritional status without any signs of hypercatabolism; adherence to nutritional therapy: low-protein (0.6 g/kg/day), low-phosphorus, high energy diet 7) Mild anemia (Hb > 9-10) and appropriate responsiveness to anemia therapy 8) Infrequent hospitalization and easily manageable comorbid conditions 9) Satisfactory health-related quality of life 10) Good dialytic adequacy: eqKt/V ≥ 1.2, session duration ≥ 4 hrs
Amino Acids supplement Biocompatible membranes		
Maintain good dialytic adequacy		
Implementation Strategies To initiate and maintain 2xW/HD, the patient should meet first criteria plus 5 of 9 of other criteria Examine these criteria every months Consider transition from 2X/w to 3X/W HD regimen in case of oligoanuria, malnutrition signs, and deteriorating general health		
Implementation Strategies To initiate and maintain 1xW/HD, the patient should meet all criteria Checking these criteria every week; twice-monthly calculating urea nitrogen appearance Consider immediately transition from 1X/W to 2-3X/W HD regimen in case of oligoanuria or malnutrition signs or general health deterioration Free acetate dialysate, synthetic membranes		

BMI, body mass index; CDDP, Combined Diet Dialysis Program.

REVIEW ARTICLE

CPE Dietary Management of Incremental Transition to Dialysis Therapy: Once-Weekly Hemodialysis Combined With Low-Protein Diet

Piergiorgio Bolasco, MD,* Adamasco Cupisti, MD,† Francesco Locatelli, MD, PhD,‡
Stefania Caria, MD,* and Kamyar Kalantar-Zadeh, MD, MPH, PhD§



Blood Purification

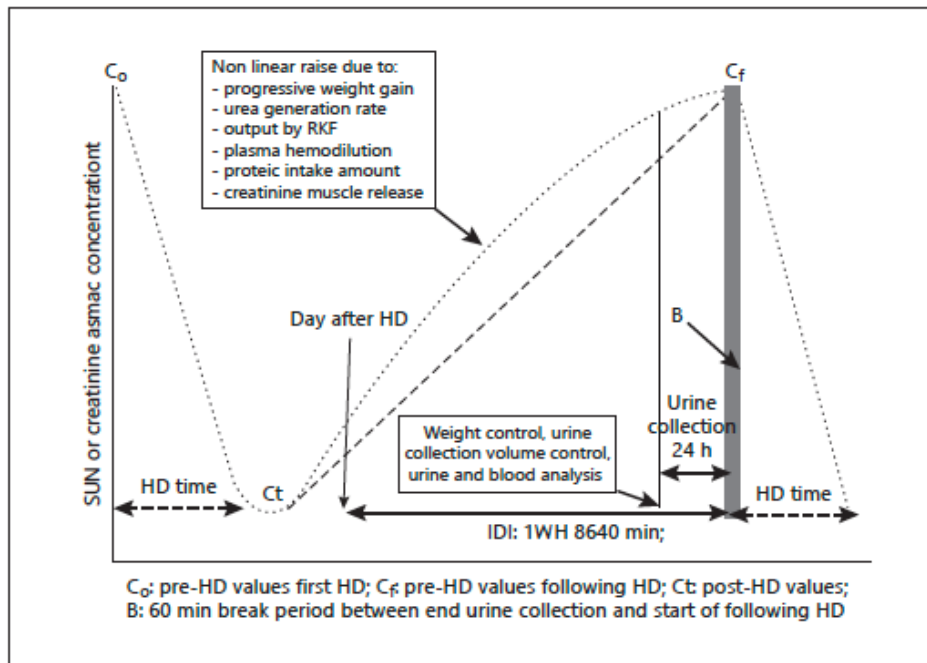
Methods

Blood Purif
DOI: 10.1159/000509790

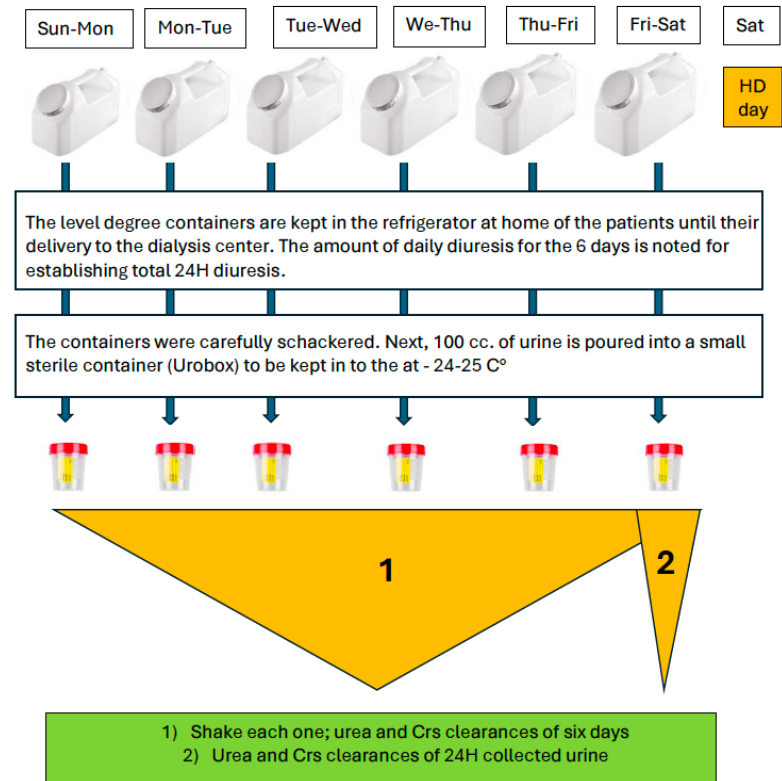
Received: April 27, 2020
Accepted: June 28, 2020
Published online: October 20, 2020

Evaluation of Residual Kidney Function during Once-Weekly Incremental Hemodialysis

Piergiorgio Bolasco^a Laura Casula^b Rita Contu^c Mariella Cadeddu^c
Stefano Murtas^c



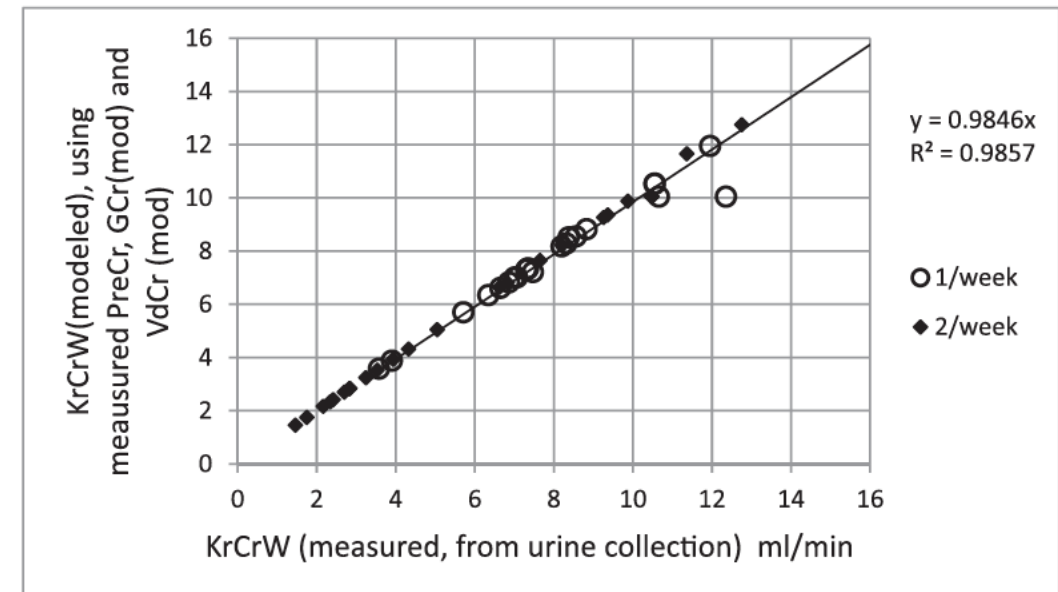
24H urine collection for both even or odd hemodialysis shifts



Creatinine Kinetic Modeling to Estimate Residual Kidney Creatinine Clearance in Patients Being Hemodialyzed Once or Twice Per Week

John T. Daugirdas^{1,2} | Piergiorgio Bolasco^{1,2}

Periodic urine collection could be problematic. In 12 patients receiving **once weekly hemodialysis** and 12 other patients being dialyzed **twice a week**, we examined the potential of predicting residual kidney creatinine (water) clearance (KrCrW) without urine collection using a creatinine kinetic model, which allows KrCrW to be estimated based on previously measured or anthropometrically estimated creatinine generation rate (GCr), volume of distribution (VdCr), and measured predialysis serum creatinine. This method of evaluation of residual kidney function is **potentially useful in patients receiving hemodialysis for risk stratification, adjusting the dialysis prescription, and early identification of renal function recovery.**





Evaluation of Residual Kidney Function

With regard to what is the best equation and which correlates the best with clinical outcomes,

As you of course know, when one has residual kidney function, the amount of dialysis Kt/V becomes less important (*Termorshuizen et Al – JASN 2004*).

What is interesting is, **the amount of "weight"** in these equivalent renal clearance calculations with the various equations.

StdKt/V: Kru is weighted at about **0.7**;

Modified StdKt/V (per KDOQI 2015 adequacy update): Kru is weighted at **1.0**;

Original Casino Lopez equation: Kru is weighted at **1.0**;

New "variable" Casino-Basile equation – NDT 2025: Kru is weighted as **2.0**;

I don't see how anyone can answer this question, because I don't know of any comparative studies that look at the dose in terms of equivalent renal clearances vs. outcome.

(John Daugirdas – 12 ottobre 2025)

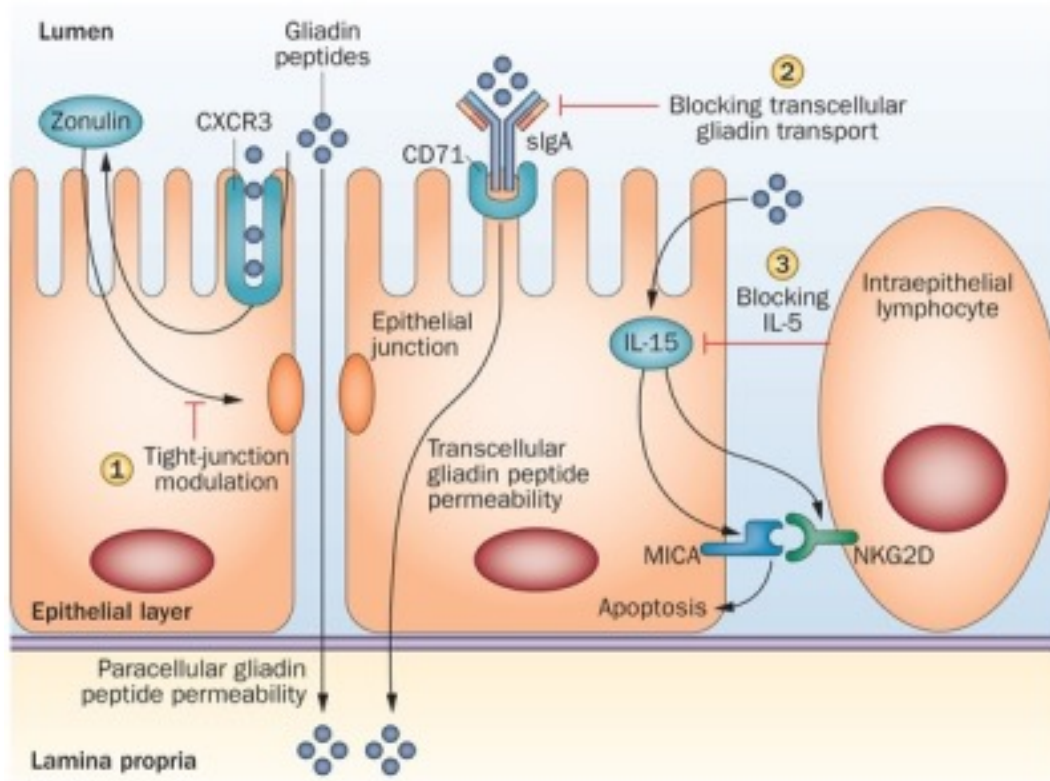
La necessità di una supplementazione aminoacidica

- ❑ La necessità di aminoacidi indispensabili (IAAs) è di **0.184 g/kg/die**
- ❑ Nei pazienti in emodialisi con una prescrizione di proteine di 1.2 g/kg/die la quantità di amino acidi soprattutto essenziali è di circa il 54%; con dieta ipoproteica di **0.6 g/kg/die è ridotta al 27%**; con una dieta di 0.4 g/kg/die è del 18%:
- ❑ Uomo 70 kg: dieta **1 g/kg/die = necessità IAAs di 12.8g/die**; **dieta 0.6 g/kg/die intake IAAS 4.9 g/kg/die (deficit circa 8 g/kg/die)**; **dieta 0.4 g/kg/die = intake IAAs 3.3 (circa - 9.0-10.0 g/die)**;
- ❑ Si aggiungono altri numerosi fattori che riducono l'assorbimento e l'utilizzazione ottimale degli IAAs: insufficiente apporto calorico, ridotta digeribilità (DIAAs), ridotto assorbimento intestinale, microbiota uremico, acidosi metabolica, efficacia dell'insulina.... (Wolf RR-Nutr Rev 2016)
- ❑ Nella once-weekly-hemodialysis l'alimentazione ipoproteica aiuta a ridurre la progressione della Residual Kidney Function (Takkavatakarn K -Int J Artif Organs. 2021)
- ❑ Oltre al deficit aminoacidico esistono fattori dialisi dipendenti.....





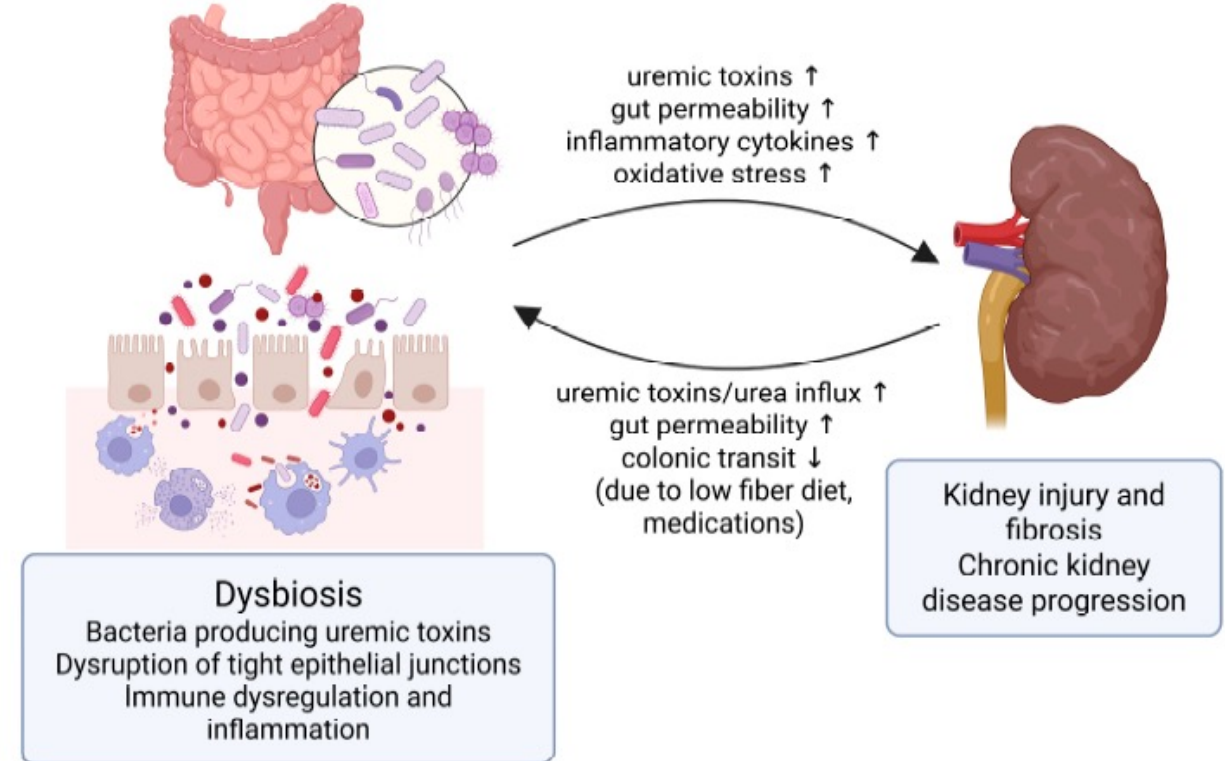
> Zonulina fecale = disregolazione permeabilità intestinale



Per studiare l'impatto di numerose patologie sul microbiota viene misurata la zonulina, una pre-proteina dell'aptoglobina2, secreta dalle cellule epiteliali intestinali in risposta a fattori che inducono stress, principalmente a causa dell'aumento di patobionti che si verifica in patologie come neoplasie, patologie intestinali di vario genere malattie autoimmuni, celiachia, LES.....

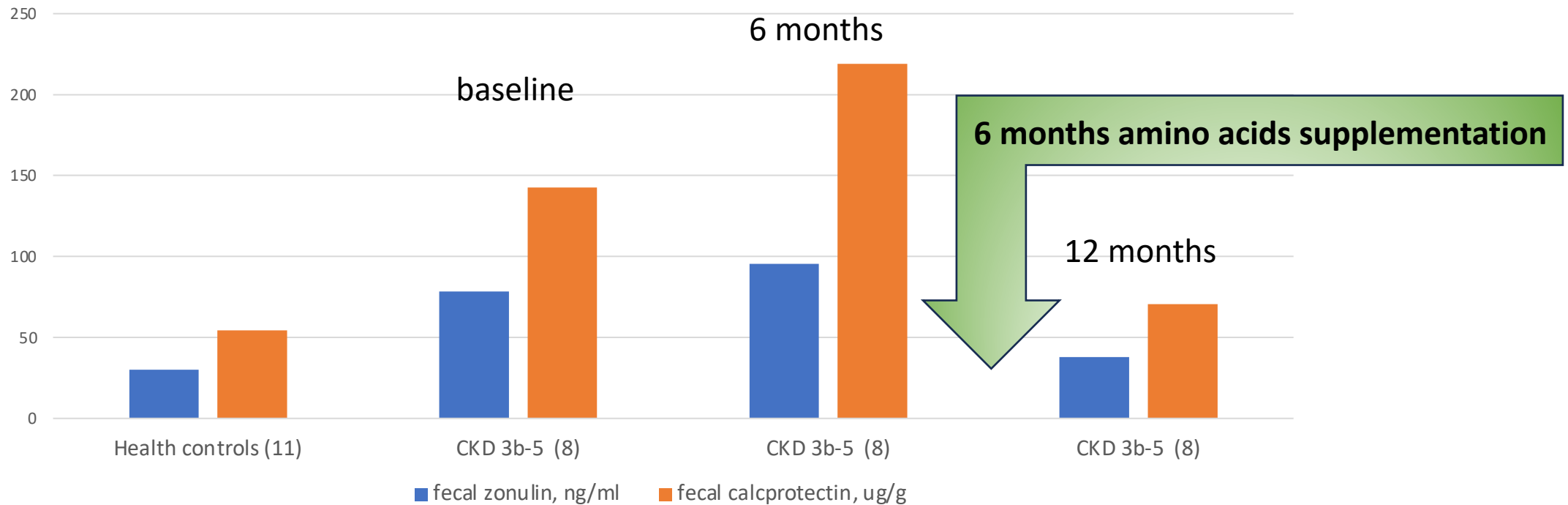
(Fasano -Physiol Review – 2011/Buttler et Al – Gut Microbes 2025)

In CKD, both serum and fecal calprotectin (FC) serve as clinically relevant markers. Recent longitudinal studies have demonstrated that serum calprotectin independently predicts cardiovascular outcomes in CKD patients, with elevated levels associated with increased mortality risk over 5–10 years of follow-up



Lee SY – Biomolecules 2025

Intestinal mucosa inflammation (calprotectin, $\mu\text{g/g}$) and permeability (zonulin, ng/ml) of eight Chronic Kidney Disease (CKD3b-5) patients at baseline and after 6 months of amino-acids oral supplementation.



Alcune tipologie di miscele amino acidiche commerciate in Italia

Contenuto per una bustina o compressa

Miscela A

Alfa-chetoleucina, 101 mg
D,L-lisina acetato 75 mg
Alfa-chetoisoleucina 67 mg
Alfa-chetovalina 86 mg
L-treonina: 53 mg
L-istidina: 38 mg
Alfa-chetofenilalanina 68 mg
D,L-Alfa-idrossimetionina 59 mg
L-tirosina: 30 mg
L-triptofano: 23 mg

Miscela B

L-Leucina 1250 mg
L-Lisina 650 mg
L-Isoleucina 625 mg
L-Valina 625 mg
L-Treonina 350 mg
L-Cistina 150 mg
L-Istidina 150 mg,
L-Fenilalanina 100 mg
Metionina 50 mg
L-Tirosina 30 mg
L-Triptofano 20 mg

Miscela C

L-leucina 560 mg
L-lisina 480 mg
L-isoleucina 400 mg
L-valina 400 mg
L-treonina 360 mg
L-cistina 340 mg
L-istidina 480 mg
L-fenilalanina 320 mg
L-metionina 180 mg
L- tirosina 240 mg
L-triptofano 140 mg
L-ornitina 100 mg
L-serina 100 mg

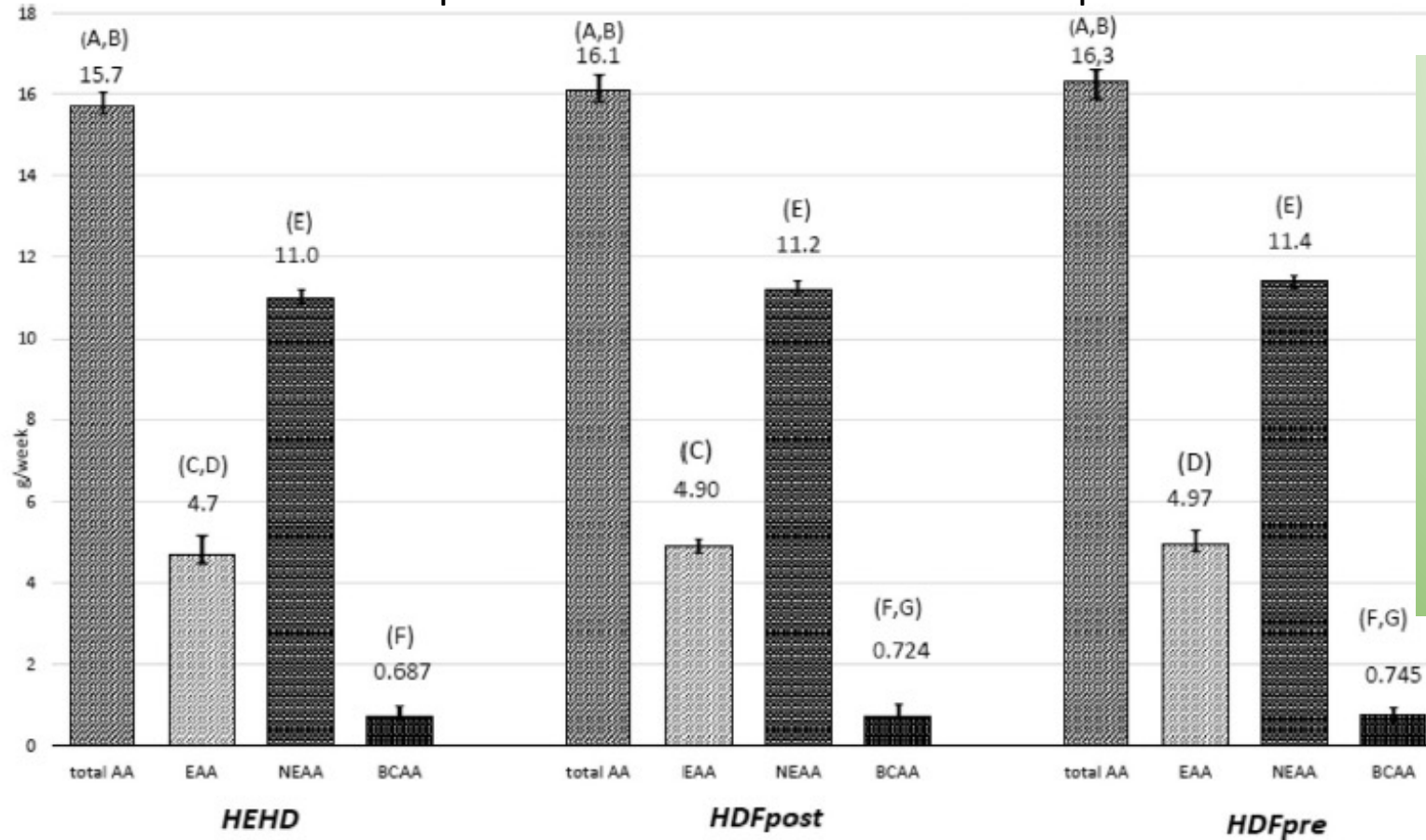
Miscela D

L-leucina 1200 mg
L-lisina 900 mg
L-isoleucina 600 mg
L-valina 600 mg
L-treonina 700 mg
L-cistina 150 mg
L-istidina 150 mg
L-fenilalanina 100 mg
L-metionina 50 mg
L-triptofano 50 mg
L-ornitina 100 mg

Non sono elencati vitamine , micronutrienti, attivatori mitocondriali

Loss of Amino Acids from extra-corporeal treatments

Sequence randomized methods in 10 patients

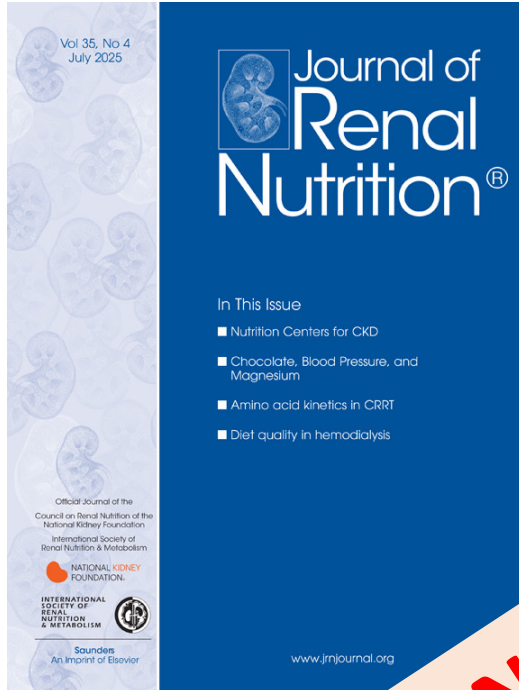


Average loss of aminoacids

Once-weekly-HD: **5.3 g/week**
= **279 g/year**

Twice-weekly-HD: **10.6 g/week**
= **558 g/year**

Thrice-weekly-HD: **15.9 g/week**
= **805 g/year**



REPLACEMENT!!!



Amino acid and protein losses in adult patients receiving maintenance dialysis: a literature review

Bruno Mafrici et Al. August 2025

- **Twenty-nine eligible records were identified (14 HD/15 PD). Amino acid losses ranged from $9.3 \pm 2.9\text{g}$ to $12.0 \pm 2.0\text{g}$ per four-hour HD session: conventional HD = $> 1,4\text{ Kg/year}$**
- **Amino acid losses 0.314g to 0.522g/day in PD;**
- **Albumin loss ranged from 0.448 g to 3.99 g per HD/HDF session and 4.23g to 6.12g/day in PD.**
- **Albumin losses were higher with post-dilution HDF compared to HD.**



L'importanza di preservare la RKF e una buona diuresi in once-weekly-hemodialysis protocol: PBUTs e fosfati.

Protein-Bound Uremic Toxins in Hemodialysis Patients Relate to Residual Kidney Function: are Not Influenced by HD/HDF Convective Transport

van Gelder KM et Al - Toxins – 2020;

PBUTs

Phosphates Hemodialysis sessions/week	phosphate intake, g/week (seven days)	average output HD, g/all sessions	phosphate binder adsorption (-25%), g/week	phosphaturia, g/week	phosphate balance, g/week
Thrice-weekly HFD	9.38	2.30 ± 0.36	7.03	-	+ 4.73
Thrice-weekly postHDF	9.38	2.47 ± 1.05	7.03	-	+ 4.66
Thrice-weekly preHF	9.38	3.06 ± 1.10	7.03	-	+ 3.97
Twice-weekly (°°)	5.82	3.6 (°)	4.37	1.14 (°°)	- 0.37
Once-weekly	4.8	1.8 (°)	3.6	2.18 (°°°)	- 0.38

Schematic Differences Between the Combined Diet Dialysis Program (CDDP) undergoing once-weekly-hemodialysis and the twice-and thrice Weekly Hemodialysis schedule Relative Level of Impact on the Item: + Low , ++ Middle , +++ High			
	once a week	twice a week	thrice a week
Nutritional support (amino acids)	0.4-0.6	0.8	≥1.2
Energy intake requirement (g/kg/day)	30-35	30-35	30-35
Vascular Access stress	+	++	+++
Protection of Residual Kidney Function	+++	++/+	+
Phophatemia Control	+++	++	+
Accomodation of dialysis schedule	+++	++	+
Clinical involvement: doctors, nursess	+++	++	++
Evaluation of weekly depurative efficacy	+++	++	++
Cost Saving	+++	++	+
Protein Bound Uremic Toxins output	+++	++	+
Amino Acids Loss & replacement	+	++	+++



Once-weekly-hemodialysis. Data detected in interdialytic period (IDI, 8640 minutes) and last 24H urine collection

	IDI urine collection		final 24h day collection
Number of cases	12		12
total number of urine collection	95		95
pre-HD Weight, Kg	66.2 ± 11.7		66.3 ± 11.8
post-HD Weight, Kg	67.6 ± 11.5		67.6 ± 11.6
Interdialytic weight gain, Lt	1.33 ± 0.73		1.39 ± 0.7
average urine volumes, mL	9501 ± 2518 §		1658 ± 434 §
start collection SUN, mg/dL	60.9 ± 12.4*		69.8 ± 13.7*
start collection sCR, mg/dL	7.2 ± 2.7		7.7 ± 3.0
average SUN urine excretion, mg/min	214.8 ± 63.5*		254.3 ± 67.1*
average sCr urine excretion, mg/min	0.03 ± 0.07 §		0.19 ± 0.37§
average Qb, mL/min	300 ± 15		300 ± 11
average Qd, mL/min	500		500
average time hemodialysis, min	240 ± 5		240 ± 4
eqKt/V	1.31 ± 0.06		1.32 ± 0.12
eqPCR 2 pool, g/Kg/die	0.83± 0.15		0.87 ± 0.13
average TAC 2 pool SUN, mg/dL	43.5 ± 9.2 §		50.1 ± 9.5 §
average TAC 2 pool sCr, mg/dL	6.5 ± 2.3§		7.7 ± 3.0§
average KR SUN, mL/min/1.73 s.m.	4.2 ± 1.1 [#]		3.9 ± 0.9 [#]
average KR sCr, mL/min/1.73 s.m.	9.1 ± 4.0		8.8 ± 4.1

Twice-weekly-hemodialysis. Data detected in interdialytic period (IDI, 4320 minutes) and last 24H urine collection

	IDI urine collection		final 24h day collection
Number of cases	12		12
total number of urine collection	47		47
pre-HD Weight, Kg	67.9 + 14.2*		68.2 + 14.1*
post-HD Weight, Kg	69.9 + 13.9		69.4 + 13.9
Interdialytic weight gain, Lt	1.94 + 0.7*		1.14 + 0.4*
average urine volumes, mL	4770 + 2838 [§]		1849 + 645 [§]
start collection SUN, mg/dL	66.2 + 9.1*		69.2 + 9.9*
start collection sCR, mg/dL	7.4 + 1.7		7.7 ± 3.0
average SUN urine excretion, mg/min	0.02 + 0.02 [°]		0.09 + 0.05 [°]
average sCr urine excretion, mg/min	0.009 + 0.005 [§]		0.19 ± 0.37 [§]
average Qb, mL/min	300 ± 8		300 ± 10
average Qd, mL/min	500		500
average time hemodialysis, min	240 ± 3		240 ± 2
eqKt/V	1.40 + 0.24		1.31 + 0.1
eqPCR 2 pool, g/Kg/die	0.74+ 0.24		0.73 + 0.13
average TAC 2 pool SUN, mg/dL	43.2 + 6.5		44.7 + 7.3
average TAC 2 pool sCr, mg/dL	7.03 + 1.6		7.09 + 4.9
average KR SUN, mL/min/1.73 s.m.	2.7 + 1.6		2.0 + 1.5
average KR sCr, mL/min/1.73 s.m.	5.4 + 3.2 [□]		7.1 + 4.9 [□]

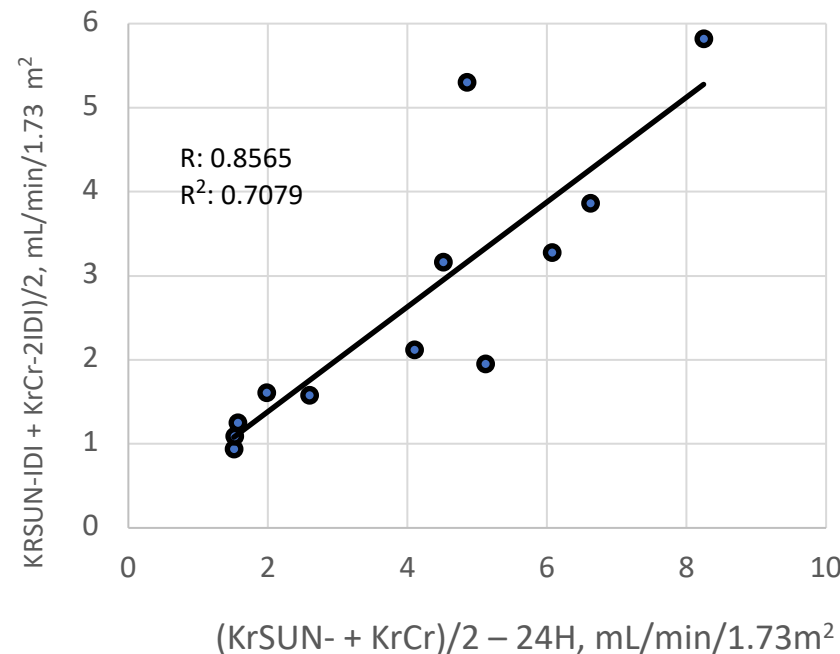
Onde evitare estenuanti
raccolte urine
nell'intervallo inter-dialitico
Si può utilizzare la raccolta
urine le 24H precedenti
l'ultima emodialisi, infatti

esiste anche una
significativa correlazione
(KrSUN+KrCr)/2 – 24H sia
in once-weekly-
hemodialysis = **R:0.7911**
and
in twice-weekly-
hemodialysis = **R: 0.8565**

Evaluation of Residual Kidney Function during Once-Weekly Incremental Hemodialysis

Piergiorgio Bolasco^a Laura Casula^b Rita Contu^c Mariella Cadeddu^c
Stefano Murtas^c

**Twice-Weekly-Hemodialysis: Correlation (KrSUN+ KrCr)/2
between inter-dialytic urine collection (IDI= 8640 min)
and last 24H collection (1440 min)**



John T. Daugirdas ha dovuto modificare
l'algoritmo del «*solute solver urea*,
version 2.13, January 6, 2020, for urea
and solute solver Cr and version
1.24, January 20, 2020, poiché
la diuresi settimanale dei pazienti era
superiore a 8L/settimana (6,7-14,4
L/sett.)



Twice-weekly-hemodialysis

Precision Medicine in End-Stage Kidney Disease and Personalized Renal Replacement Therapy

Hamid Moradi, MD, and Kamyar Kalantar-Zadeh, MD, MPH, PhD, Guest Editors

July 2018 Volume 38 - Issue 4p315-432

Incremental hemodialysis transition in veterans and nonveterans with kidney failure

Rhee, Connie, M. Kovesdy, Csaba P. Unruh, Mark; Crowley, Susan; Geller, David; Goldfarb, David S.; Kraut, Jeffrey; Rastegar, Mandana; Rifkin, Ian R.; Kalantar-Zadeh, Kamyar

Current Opinion in Nephrology and Hypertension 34(1):p 33-40, January 2025.



Ten criteria:

1. daily urine volume ≥ 600 ;
2. (Kru) of at least 3 ml/min;
3. intradialytic weight gain 2,5 Kg
4. stable cardiovascular status;
5. infrequent hospitalization;
6. satisfactory health-related QoL;
7. small to normal body size;
8. good nutritional status;
9. absence of hyperkalemia, and hyperphosphatemia
10. profound anemia

Murea, Mariana; Kalantar-Zadeh, Kamyar – CJASN – 2021

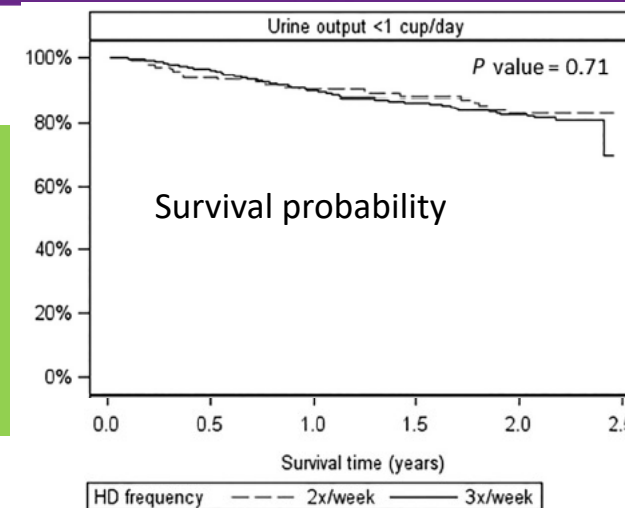
North Carolina, California



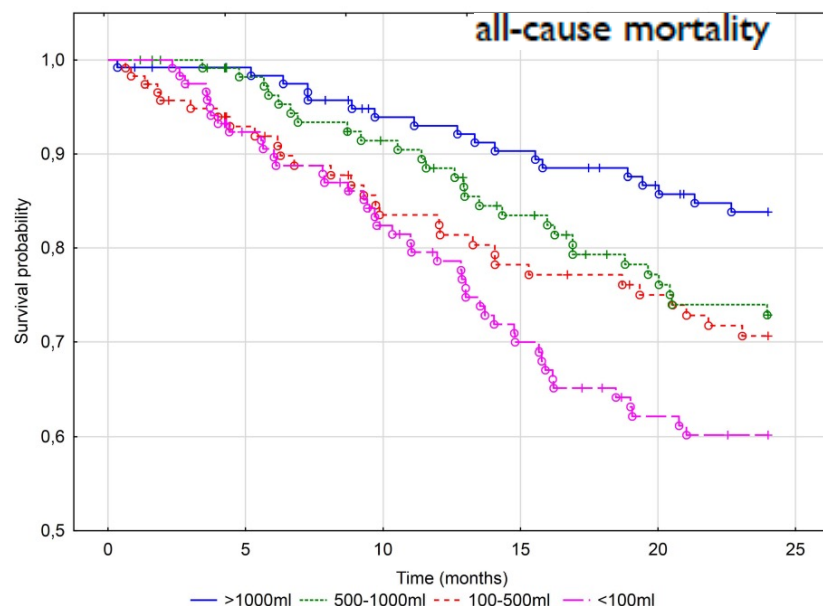
Twice-Weekly Hemodialysis and Clinical Outcomes in the China Dialysis Outcomes and Practice Patterns Study

Yan Y et Al – Shangai - 2018

133/256 pazienti
non avevano RKF;
Nei 6 giorni inter-dialisi
dieta iposalina, ed
ipoproteica n.s.

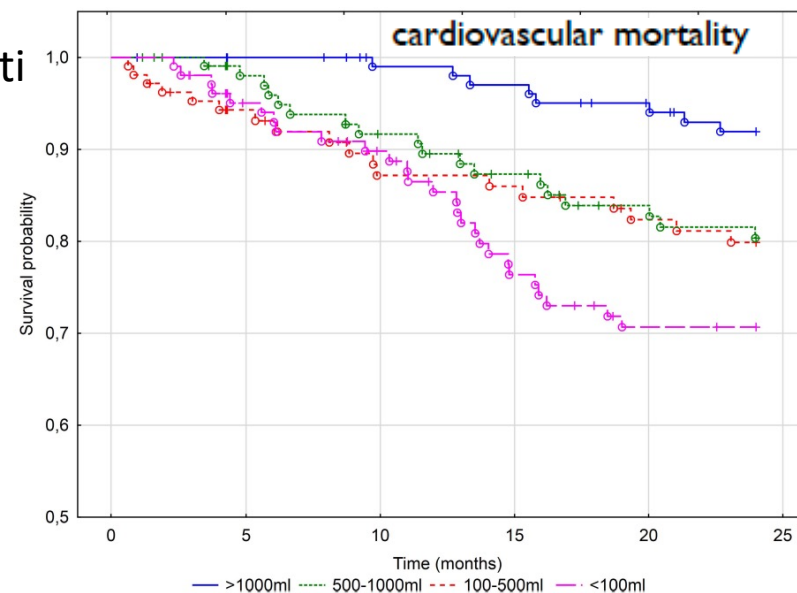


Ma uno degli elementi fondamentali per la sopravvivenza è il mantenimento il più a lungo possibile della RKF



485 pazienti

2023



La RKF è stata
calcolata dalla
media della
(KrCr_s + KBUN)



La dialisi bi-settimanale conserva il vantaggio di preservare la funzione renale residua (RKF)

- ✓ **Riduzione della mortalità:** tassi di mortalità più bassi, sia per cause cardiovascolari che per tutte le cause.
- ✓ **Miglior protezione cardiovascolare:** livelli più bassi di biomarcatori cardiaci come NT-proBNP e troponina T, indicando una migliore funzione cardiaca e una minore ipertrofia ventricolare sinistra, riduzione delle resistenze periferiche
- ✓ **Equilibrio elettrolitico:** livelli più stabili di potassio, sodio, calcio e fosfati, riducendo il rischio di iperfosfatemia e iperkaliemia. Diminuzione FGF-23
- ✓ **Controllo dell'idratazione:** prevenzione e minor incidenza sul sovraccarico di liquidi, migliorando il bilancio idrico e riducendo episodi di ipotensione durante le sessioni di emodialisi.
- ✓ **Miglior stato nutrizionale:** migliore massa magra e indice di massa magra
- ✓ **Gestione dell'anemia:** minor utilizzo di agenti stimolanti l'eritropoiesi.
- ✓ **Riduzione dell'infiammazione:** più bassi di marcatori infiammatori
- ✓ **Riduzione β 2-microglobulina:** all'output medio HD/HDF sia in one week and two weeks-HD si aggiunge l'output urine.

Se a questo si aggiunge una dieta ipoproteica si ottengono ulteriori vantaggi:

- ❑ **Protezione del GFR:** I pazienti che seguono una dieta a basso contenuto proteico hanno mostrato un rallentamento della velocità di progressione della RKF (MD = 1,37 ml/min; 95% CI: 0,18–2,55).
- ❑ **Effetto maggiore nei pazienti con GFR iniziale basso:** I pazienti con un GFR di base inferiore a 4 ml/min hanno beneficiato maggiormente, con una riduzione più lenta del declino della funzione renale.

Numerosi autori hanno confermato queste osservazioni:

- Murea M. et Al. *KI – 2025 – (comprehensive recommendations with RKF)*
- Belcher J et Al. *Kidney360 – 2025 (BISTRO trial)*
- Campo A et Al. *J Nephrol – 2025 (and save money)*
- Aoun M. et Al. *BMC Nephrology 2025 (twice = thrice survival)*
- Torreggiani et Al. *J Nephrol 2022 – (Le Mans Style)*
- Garofalo et A. *J Nephrology 2018 – (review on 12 patients in twice HD)*
-



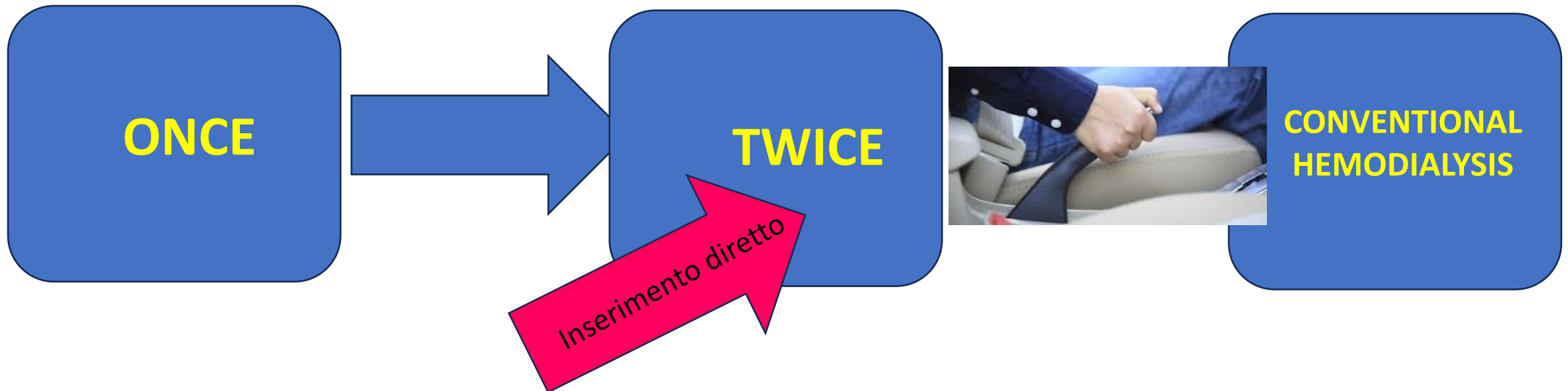
La maggior frequenza delle sessioni emodialitiche diminuisce diuresi ed RKF

- Occorre una accurata gestione dell'UFR per evitare **ipotensioni arteriose**; nei pazienti in once-weekly-HD che arrivano alla HD successiva sotto il peso secco stimato vanno **reintegrati gradatamente**.
- L'aumento dell'incremento ponderale conduce ad progressivo utilizzo dell'UFR; l'UFR correla con la perdita della diuresi e della RKF (*Yu-Ji Lee et Al - J Kidney Dis – 2021*)
- Gli effetti dello stress emodinamico dovuto ad un maggior numero sedute extra-corporee produce una forte **attivazione sui monociti pro-infiammatori CD14+CD16+** (*Bolasco P, La Nasa et Al – Blood Purif -2019*) conducendo ad una cascata ematica di tossine come durante **TNF- α , IL-6, IL-1, hs-CRP** che agiscono negativamente sul sistema endoteliale, cardiaco e sulla RKF ;
- I pazienti inseriti in emodialisi convenzionale trisettimanale **perdono la diuresi** mediamente in 6-8 mesi;

L'EMODIALISI INCREMENTALE (IH)

Prevalentemente i pazienti studiati iniziano l'emodialisi incrementale in ritmo emodialitico bisettimanale (340 studi) e molto meno frequentemente vengono studiati i pazienti che transitano dalla once- alla twice-weekly-hemodialysis (8 studi).

Oggi la vera definizione di Emodialisi Incrementale è quella che inizia con un ritmo mono-settimanale





- Oggi l'emodialisi Incrementale (IH) è una realtà **da tenere sempre in considerazione negli ambulatori pre-dialisi**;
- La once-weekly-hemodialysis può essere iniziata **in pazienti selezionati**, collaboranti con le caratteristiche precedentemente elencate;
- La once-weekly-hemodialysis deve essere iniziata e condotta **da personale infermieristico e medico adeguatamente formato e rigoroso sulle procedure**; non bisogna farsi sfuggire, quando esistono segnali di fattibilità, l'occasione di effettuare un passo verso la terapia conservativa anche se momentaneo;
- **La scelta più frequente** nei centri di Nefrologia di tutto il mondo è la **twice-weekly-hemodialysis** ma occorre sempre stare in guardia sull'equilibrio emodialisi/RKF sia per il passaggio all'emodialisi convenzionale senza farsi sfuggire, quando esistono segnali di fattibilità, **l'occasione di effettuare un passo decrementale**;
- Occorrerebbe **creare un gruppo nazionale e/o internazionale** per **redigere delle procedure precise** per la dialisi bisettimanale e soprattutto per la dialisi mono-settimanale; mancano studi randomizzati di numerosità;
- Comunque la once e la twice hemodialysis **sono periodo bridge** dell'inevitabile passaggio verso l'emodialisi convenzionale: