07.12.2024

Berliner DialyseSeminar

„Incremental“- and „decremental“ dialysis

Inkrementelle und dekrementelle Dialyse

Georg Schlieper

DIALYSE HANNOVER
Zentrum für Nieren-, Hochdruck und Stoffwechselerkrankungen

07.12.2024

Berliner DialyseSeminar

Interessenskonflikt

Georg Schlieper

DIALYSE HANNOVER
Zentrum für Nieren-, Hochdruck und Stoffwechselerkrankungen

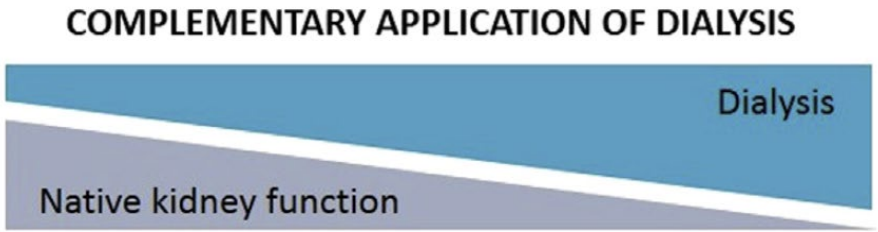
Inkrementelle Dialyse

Inkrementelle Dialyse =

Graduelle Anpassung (d.h. Steigerung) der verschriebenen Dialysedosis

an die

verbliebene (abnehmende) Nieren-Restfunktion



Idee:
komplementäre Dialysedosis
bei noch erhaltener Restnierenfunktion

SLIDO Fall 1

Frau K: 66J, PD 97-02, Z.n. NTX 2002,
12/2022 stationär eingewiesen bei Vigilanzminderung, neurologisch opB,
Akutdialyse stationär Krea 4,8 mg/dL, HN 112 mg/dL, **pH 7,0, BE -24**,
Ausscheidung gut
→ 3x Dialyse, dann Entlassung

Möchte nur 2x Woche dialysieren
(eGFR 9-10 ml/min Krea/Cys; Krea-Clear 10 ml/min; HN-Clear 5 ml/min;
iPTH 537 ng/l; PO4 1,6 mM; Hb 9,4 d/dL; K 4,8 mM)

Würden Sie inkrementelle Dialyse anbieten?

Inkrementelle PD

Cheetham KI rep 2022

KI REPORTS
KIReports.org
REVIEW

Incremental Versus Standard (Full-Dose) Peritoneal Dialysis

Melissa S. Cheetham[1,2], Yeoungjee Cho[2,3,4,5], Rathika Krishnasamy[1,2,3], Arsh K. Jain[6], Neil Boudville[7,8], David W. Johnson[2,3,4,5] and Louis L. Huang[9]

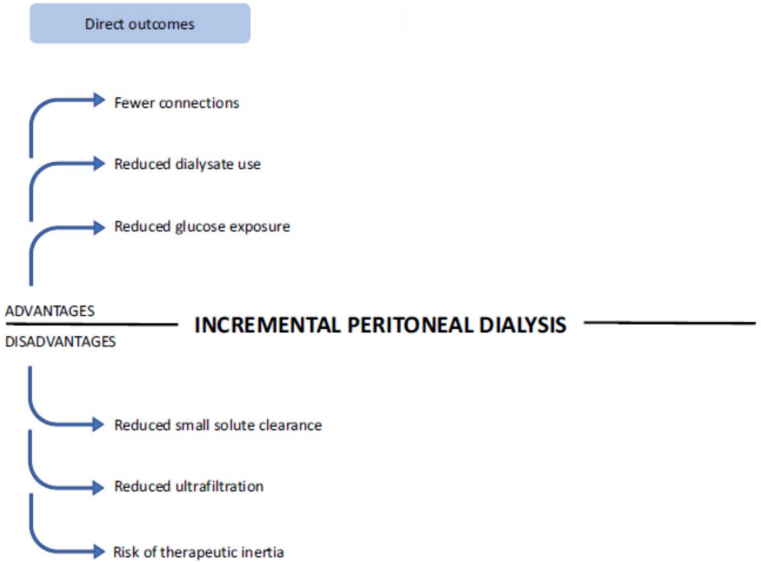


Figure 1. Potential advantages and disadvantages of incremental PD. PD, peritoneal dialysis; RKF, residual kidney function.

Inkrementelle PD

Cheetham KI rep 2022

KI REPORTS
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REVIEW

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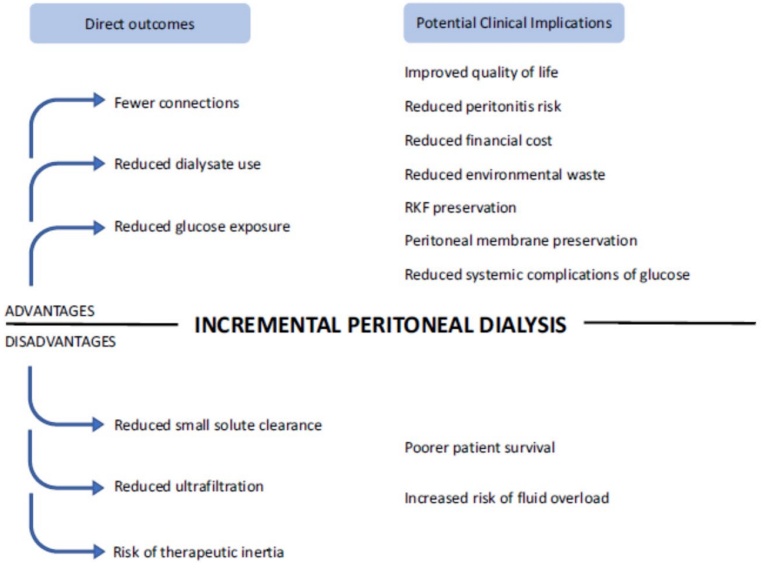


Figure 1. Potential advantages and disadvantages of incremental PD. PD, peritoneal dialysis; RKF, residual kidney function.

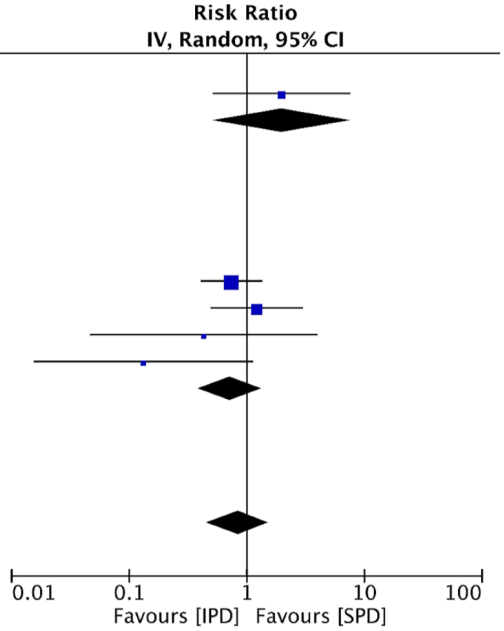
Metaanalyse Mortalität Inkrementelle PD vs. Standard PD

RESEARCH Open Access

Comparison of outcomes of incremental vs. standard peritoneal dialysis: a systematic review and meta-analysis

Xu et al. BMC Nephrology (2024) 25:308
https://doi.org/10.1186/s12882-024-03669-w

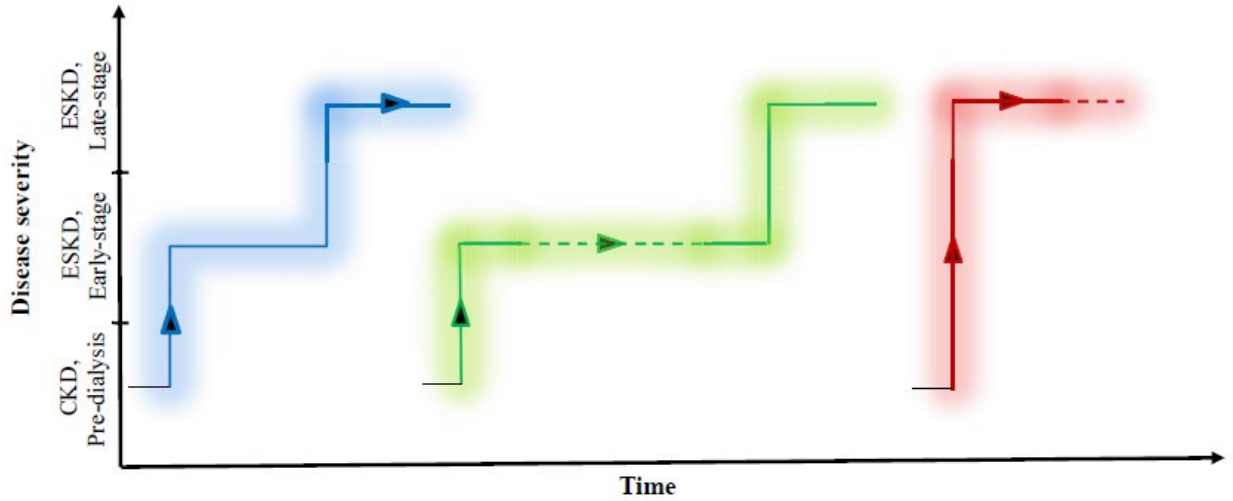
Study or Subgroup	IPD Events	IPD Total	SPD Events	SPD Total	Weight	Risk Ratio IV, Random, 95% CI	Year
1.1.1 RCT							
Yan 2016	6	70	3	69	16.0%	1.97 [0.51, 7.57]	2016
Subtotal (95% CI)		**70**		**69**	**16.0%**	**1.97 [0.51, 7.57]**	
Total events	6		3				
Heterogeneity: Not applicable							
Test for overall effect: Z = 0.99 (P = 0.32)							
1.1.2 Non-RCTs							
Sandrini 2016	9	29	32	76	42.1%	0.74 [0.40, 1.35]	2016
Lee 2019	10	176	8	171	27.8%	1.21 [0.49, 3.00]	2019
Huang 2021	1	42	3	54	6.8%	0.43 [0.05, 3.97]	2021
Fernandes 2023	1	57	4	30	7.3%	0.13 [0.02, 1.13]	2023
Subtotal (95% CI)		**304**		**331**	**84.0%**	**0.73 [0.39, 1.36]**	
Total events	21		47				
Heterogeneity: $Tau^2 = 0.10$; $Chi^2 = 3.86$, df = 3 (P = 0.28); $I^2 = 22\%$							
Test for overall effect: Z = 1.00 (P = 0.32)							
Total (95% CI)		**374**		**400**	**100.0%**	**0.84 [0.46, 1.55]**	
Total events	27		50				
Heterogeneity: $Tau^2 = 0.14$; $Chi^2 = 5.58$, df = 4 (P = 0.23); $I^2 = 28\%$							
Test for overall effect: Z = 0.55 (P = 0.58)							
Test for subgroup differences: $Chi^2 = 1.73$, df = 1 (P = 0.19), $I^2 = 42.2\%$							



Inkrementelle HD?

Murea et al KI rep 2020

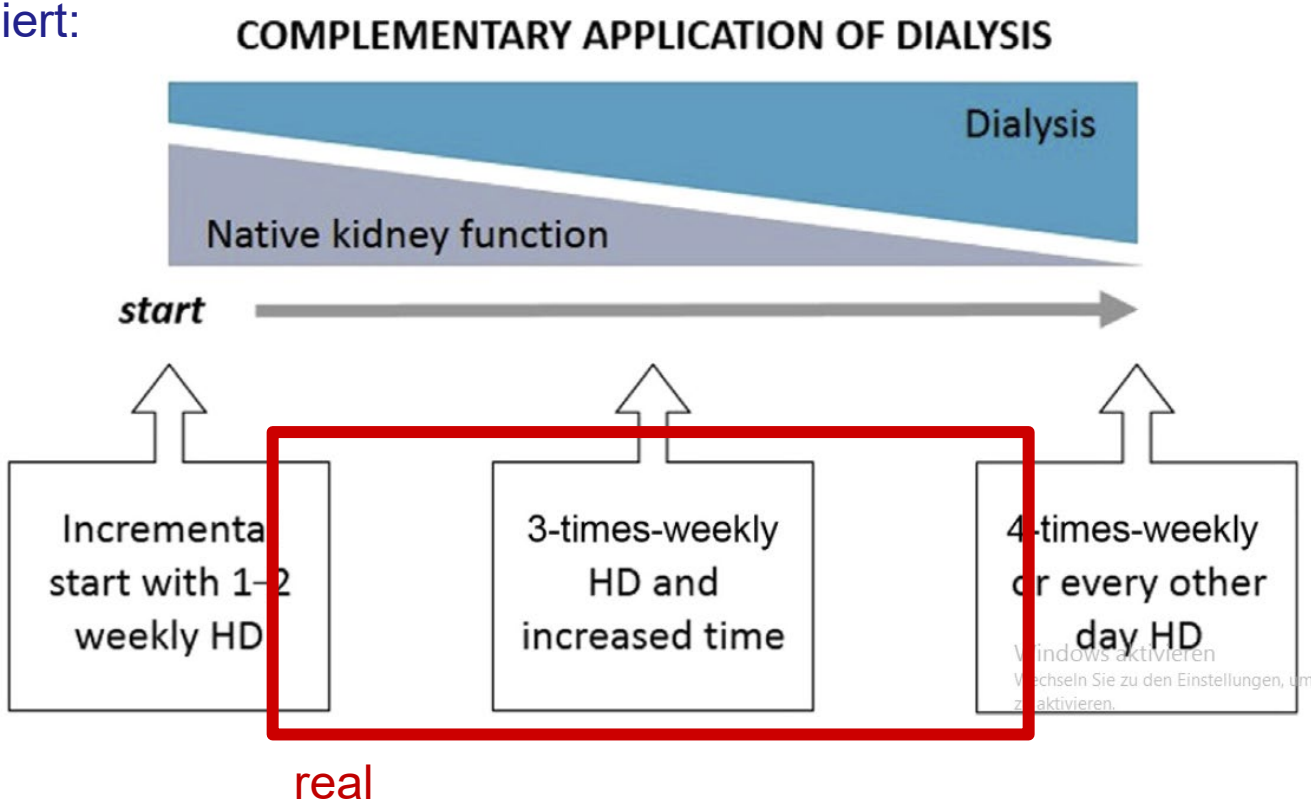
Bei langsam nachlassender (Rest-)Nierenfunktion:
ist ein plötzlicher Übergang von nicht-dialysepflichtiger Niereninsuffizienz zu 3x wöchentlicher Dialyse erforderlich oder gibt es Zwischenstufen?



Dialyse und Restnierenfunktion

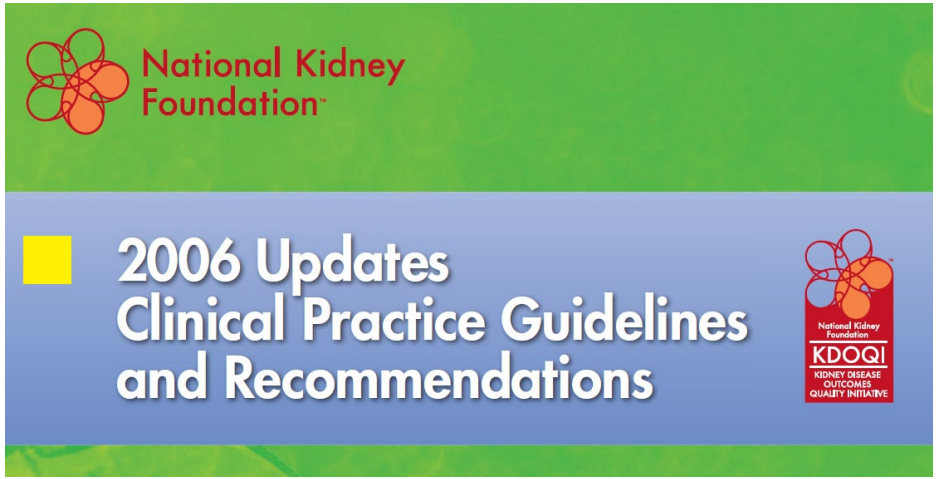
KI rep 2018

Idealisiert:



Historie

KDOQI AJKD 2006



Twice-weekly dialysis may be permissible in a **few patients** with

- **residual kidney function (RKF) greater than 2 mL/min**
- **stable function**
- **no excessive fluid gains**

Konzept der inkrementellen Hämodialyse

Am J Kidney Dis. 2014 August ; 64(2): 181–186. doi:10.1053/j.ajkd.2014.04.019.

Twice-Weekly and Incremental Hemodialysis Treatment for Initiation of Kidney Replacement Therapy

Kamyar Kalantar-Zadeh[1,2], **Mark Unruh**[3], **Philip G. Zager**[3], **Csaba P. Kovesdy**[11], **Joanne M. Bargman**[4], **Jing Chen**[6], **Suresh Sankarasubbaiyan**[7], **Gaurang Shah**[2], **Thomas Golper**[8], **Richard Sherman**[9], and **David S. Goldfarb**[10]

Rationale:

- Mit Dialysebeginn hohe Mortalität v.a. in den ersten Monaten
- Residuale Nierenfunktion: Mortalitätsprädiktor
- Hinweise: Schnellerer Verlust der residualen Nierenfunktion mit mehr Dialyse

Konzept der inkrementellen Dialyse

Kalantar-Zadeh et al AJKD 2014

Box 1

Proposed criteria for twice weekly hemodialysis

Treatment Criteria for 2x/wk HD

1	Good RKF with a urine output >0.5 L/day
2	Limited fluid retention between 2 consecutive HD treatments with a fluid gain <2.5 kg (or less than 5% of the ideal dry weight) without HD for 3 to 4 days
3	Limited or readily manageable cardiovascular or pulmonary symptoms without clinically significant fluid overload
4	Suitable body size relative to RKF; patients with larger body size may be suitable for 2x/wk HD if not hypercatabolic
5	Hyperkalemia (K, >5.5 mEq/L) is infrequent or readily manageable
6	Hyperphosphatemia (P, >5.5 mg/dL) is infrequent or readily manageable
7	Good nutritional status without florid hypercatabolic state
8	Lack of profound anemia (Hb >8 g/dL) and appropriate responsiveness to anemia therapy
9	Infrequent hospitalization and easily manageable comorbid conditions
10	Satisfactory health-related quality of life

Implementation Strategies

1	In order to initiate and maintain 2x/wk HD, the patient should meet the first criterion (urine output >0.5 Lit/day) plus most (5 out of 9) of the other criteria.
2	Examine these criteria every month in all 2x/wk HD patients and compare outcome between 2x/wk and 3x/wk HD to assure outcome non-inferiority for continuation of 2x/wk HD
3	Consider transition from 2x/wk to 3x/wk HD regimen if patient's urine output drops (<0.5 L/day) or if patient's nutritional status or general health condition shows a deteriorating trend over time

Kriterien:

1 + 5 aus 9

- **Urin > 500 ml/d**
- < 2,5 kg Gewichtzunahme
- Klinisch stabil
- Passendes KG
- Kein K Problem
- Kein PO_4 Problem
- Guter Ernährungszustand
- Hb > 8 g/dL
- Lebensqualität

➢ Monatliche Kontrolle

Konzept

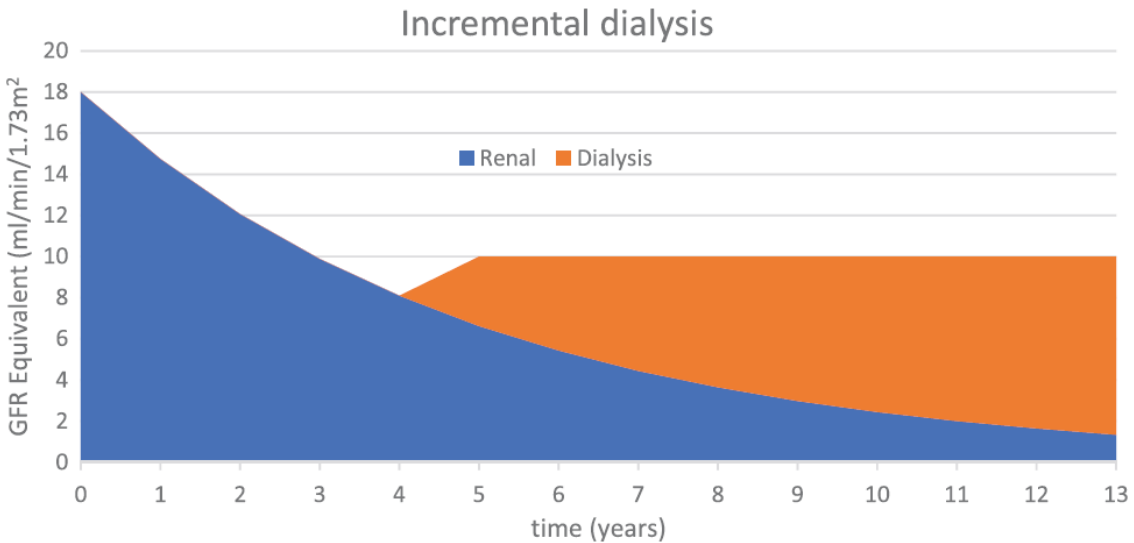
Clinical Kidney Journal, 2018, vol. 11, no. 6, 853–856

doi: 10.1093/ckj/sfy082
Advance Access Publication Date: 11 September 2018
Editorial Comment

EDITORIAL COMMENT

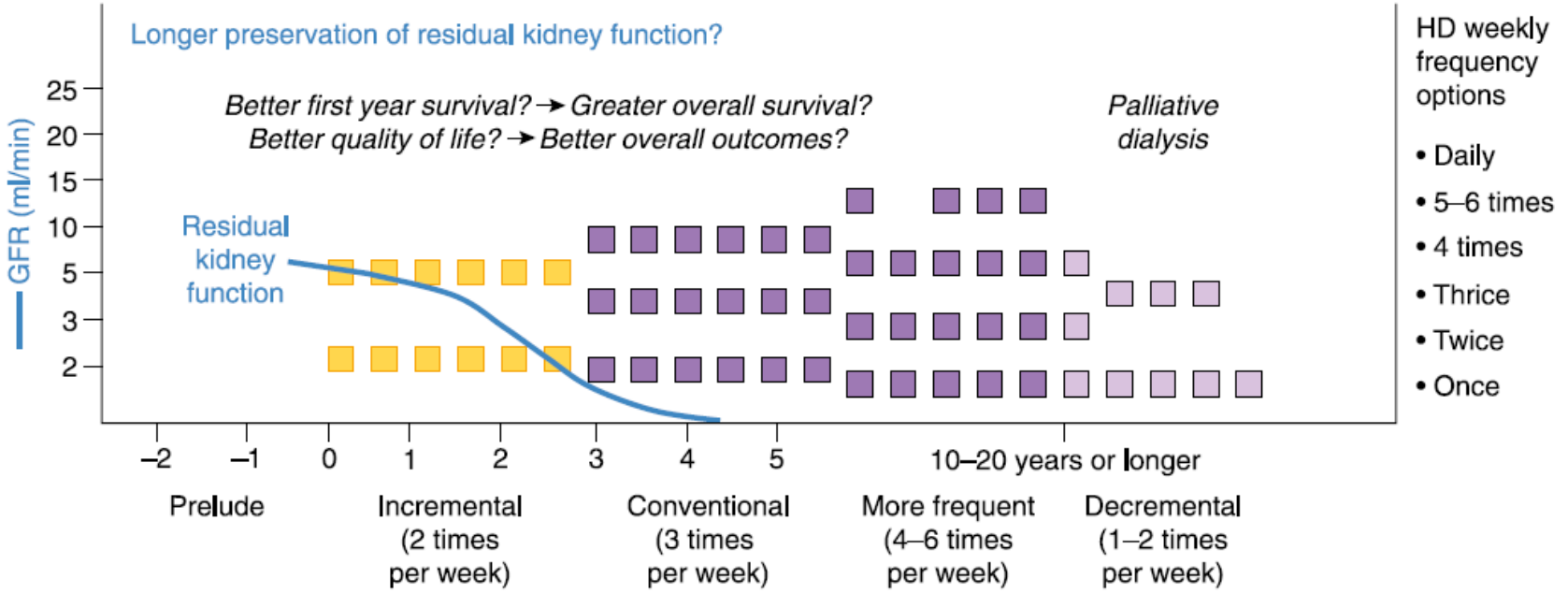
Residual renal function in incremental dialysis

James Tattersall



Konzept

Murea & Kalantar-Zadeh cJASN 2021



Offene Fragen

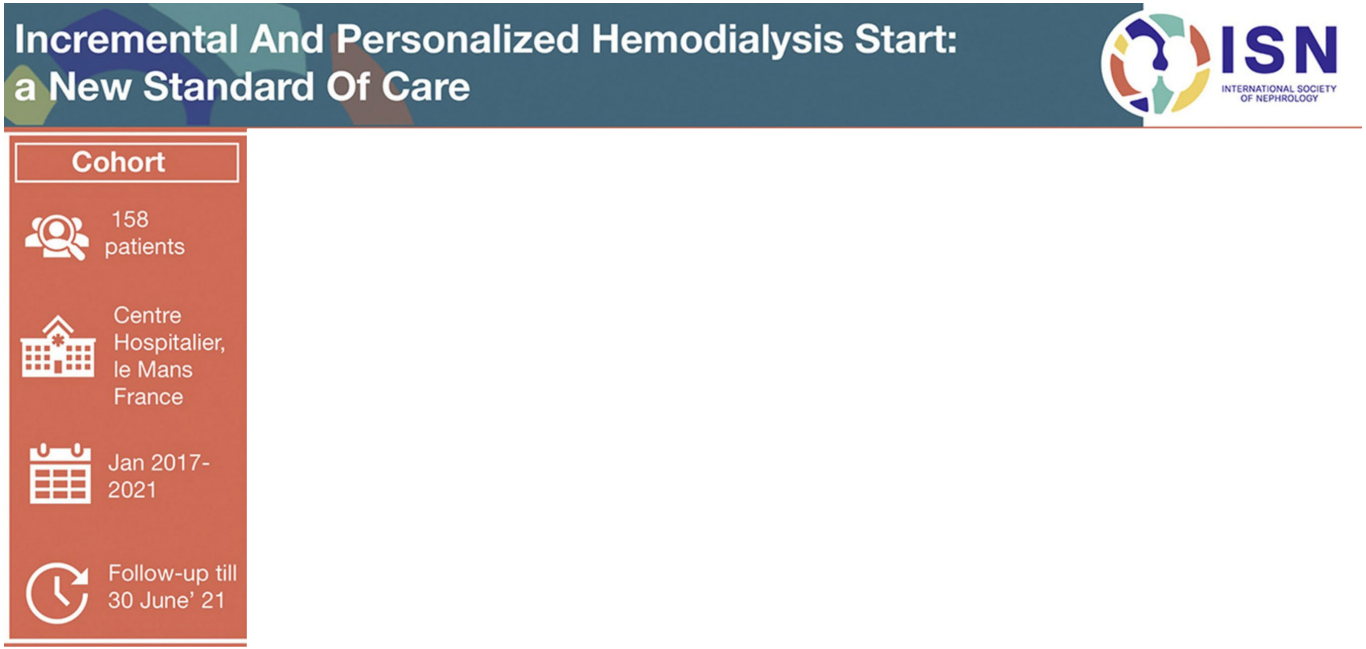
Murea & Kalantar-Zadeh cJASN 2021

Bislang ungeklärt:

- **Mortalitätsverbesserung?**
- **Adhärenz beim Wechsel von 2x/Woche zu 3x/Woche?**

Observationsstudie

Torreggiani et al KI rep 2022



Observationsstudie

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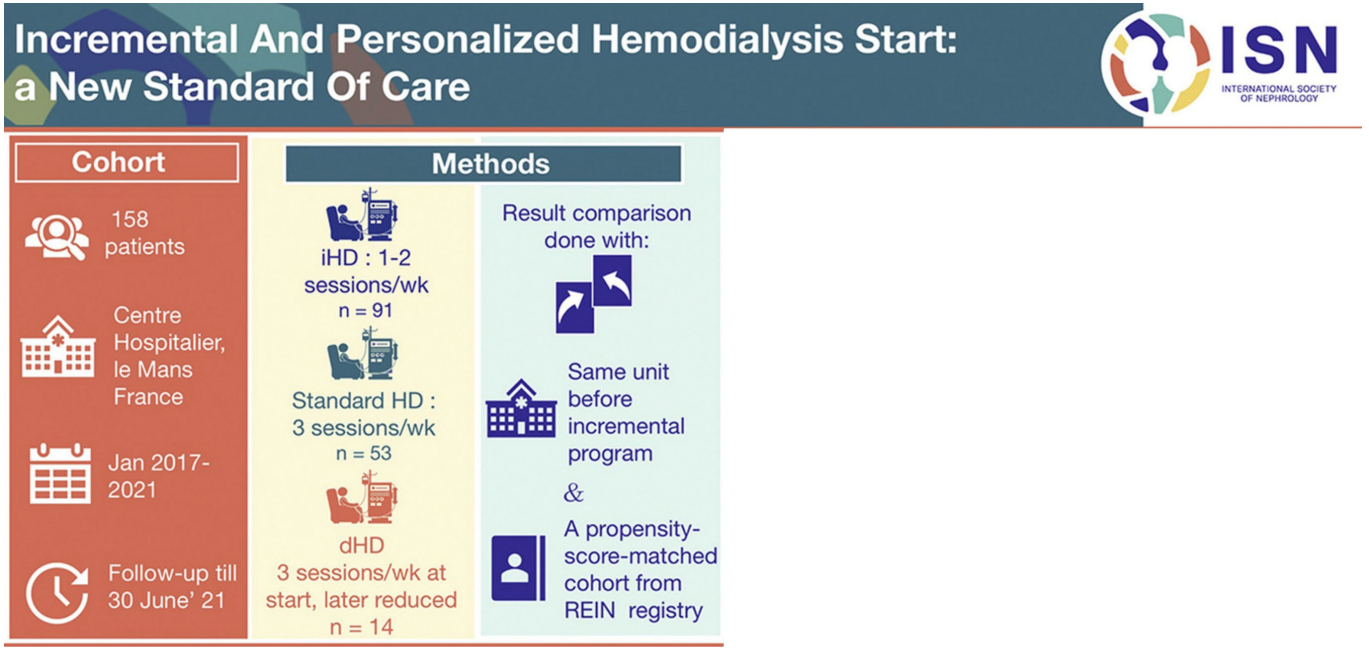

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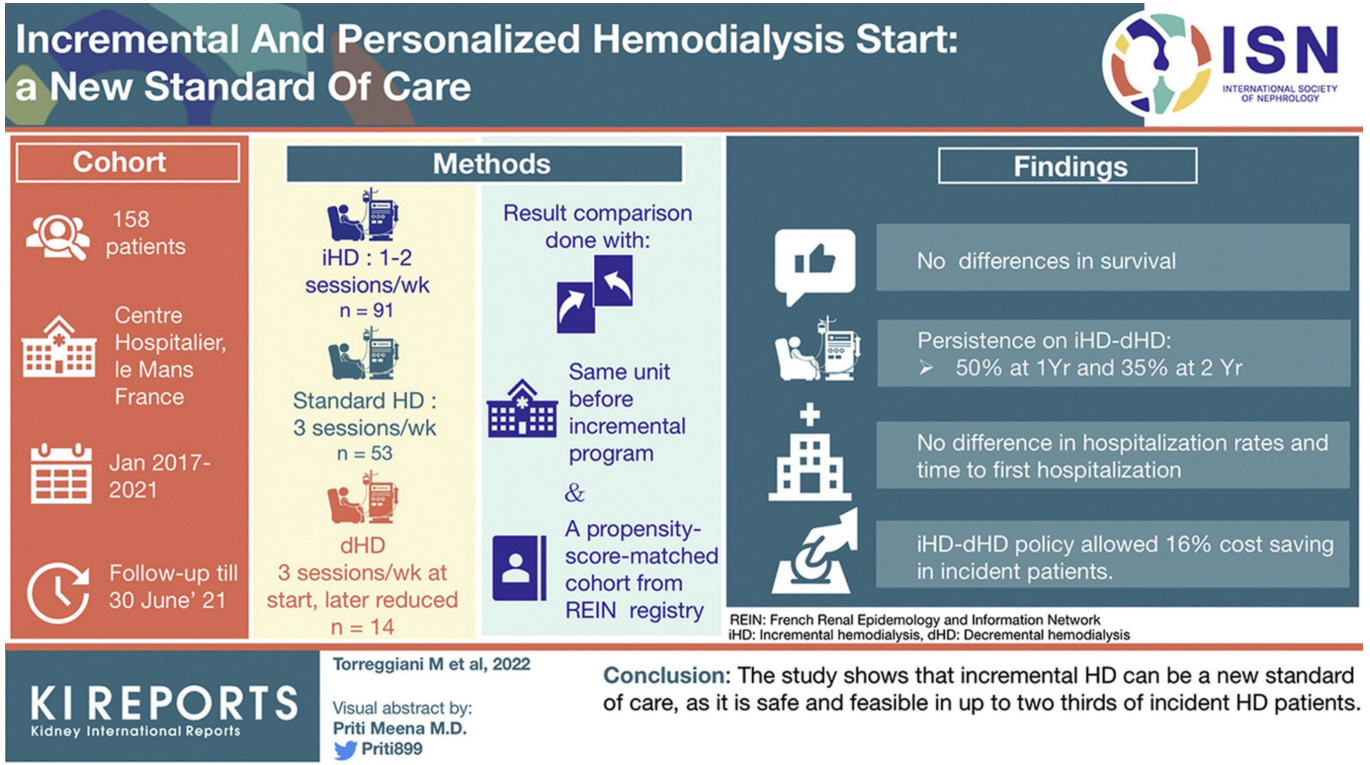
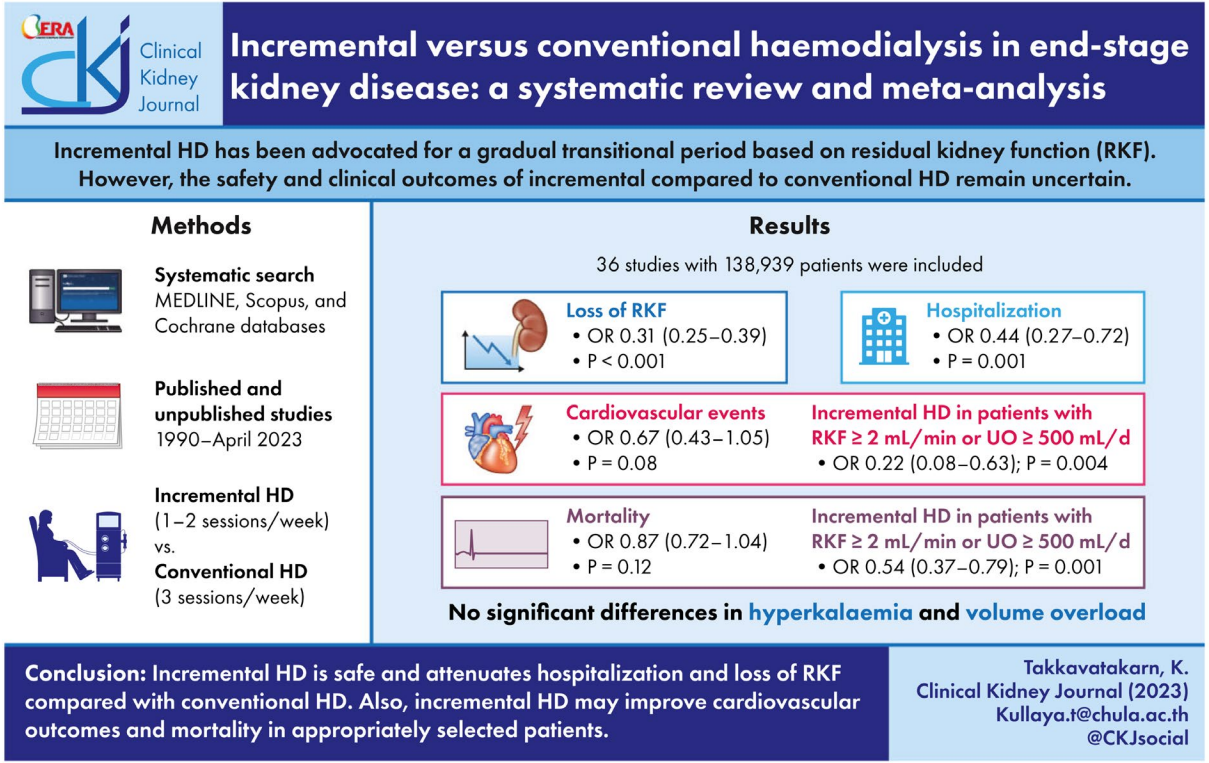


Metaanalyse

Takkavatakarn et al, CKJ 2023



Pilotstudie 1

Vilar et al KI 2022

A multicenter feasibility randomized controlled trial to assess the impact of incremental versus conventional initiation of hemodialysis on residual kidney function.

kidney INTERNATIONAL

ISN INTERNATIONAL SOCIETY OF NEPHROLOGY

STUDY SUBJECTS

321 pre-screened
106 eligible
55 randomised

Urea clearance≥ 3ml/min
+
Haemodialysis <3 months

Pilotstudie 1

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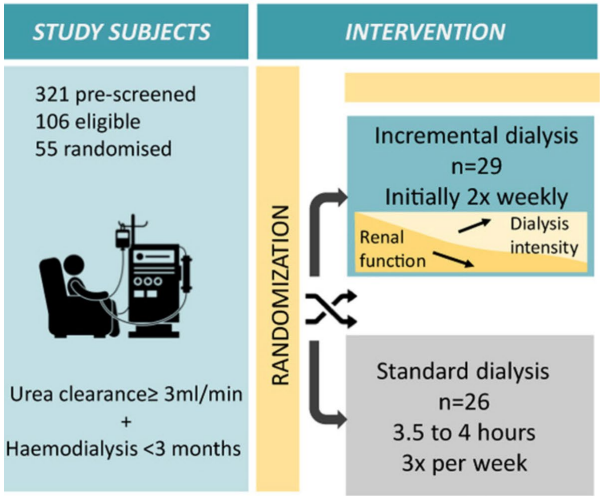
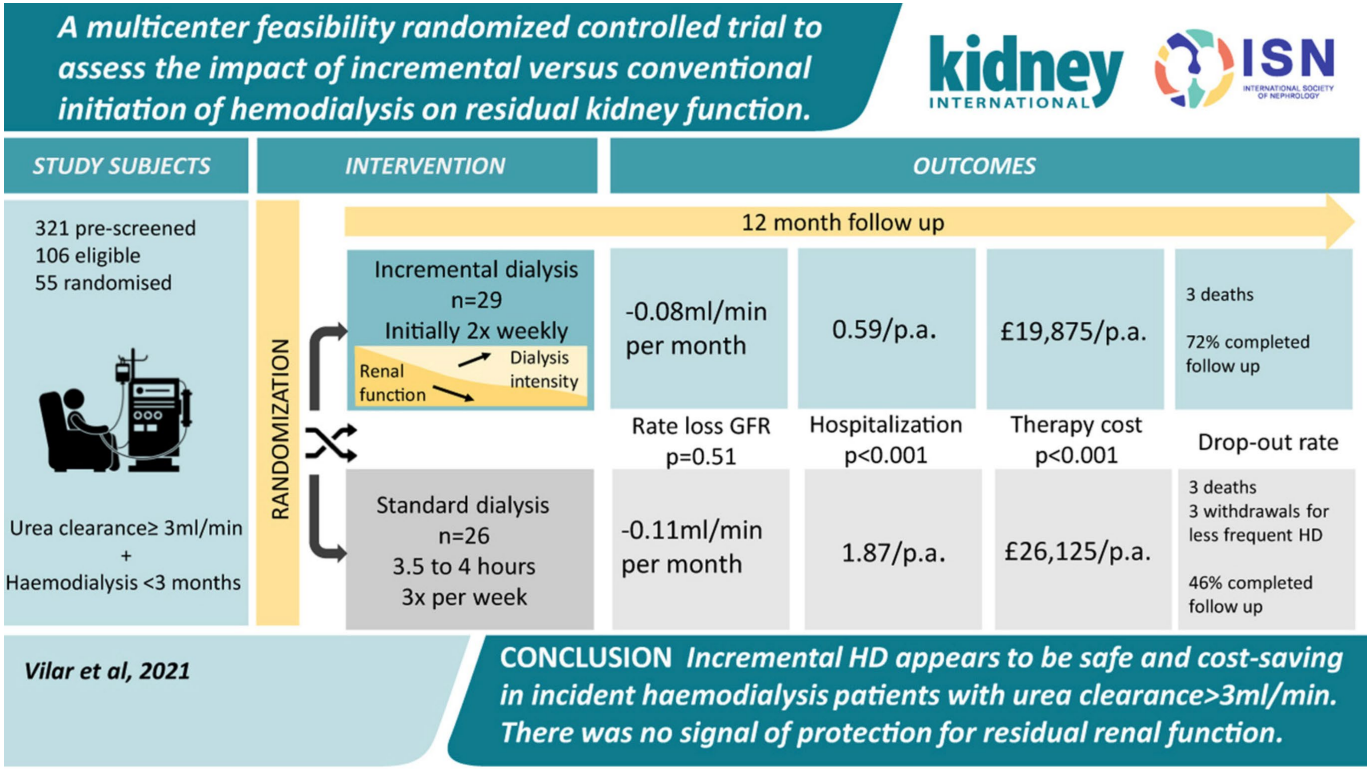


Pilotstudie 1

Vilar et al KI 2022



Pilot Studie 2

Murea et al AJKD 2022

Twice-Weekly Hemodialysis With Adjuvant Pharmacotherapy and Transition to ThriceWeekly Hemodialysis: A Pilot Study

Setting & Participants

Randomized Controlled Trial

14 dialysis facilities in North Carolina, USA

New start on chronic HD

- eGFR ≥5 mL/min/1.73 m^2
- Urine output ≥500 mL/24 h

Pilot Studie 2

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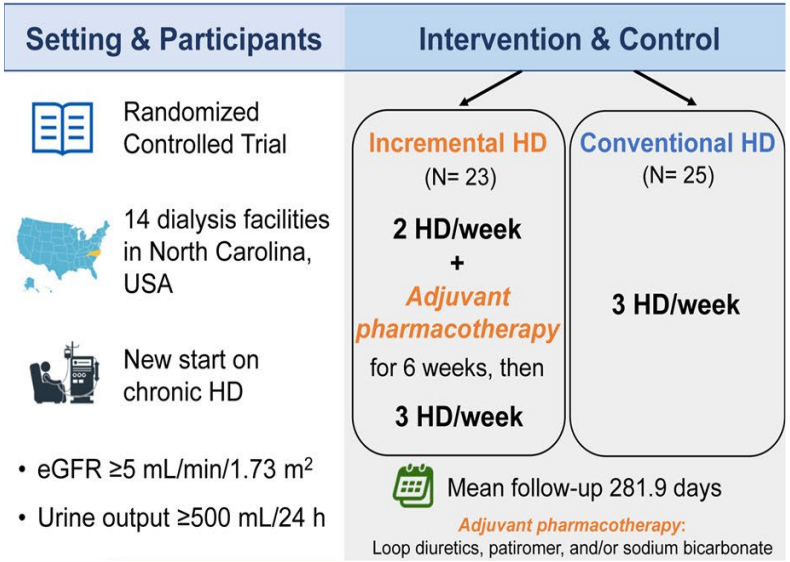

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Intervention & Control

Incremental HD
(N= 23)

2 HD/week
+
Adjuvant pharmacotherapy
for 6 weeks, then
3 HD/week

Conventional HD
(N= 25)

3 HD/week

Mean follow-up 281.9 days

Adjuvant pharmacotherapy:
Loop diuretics, patiromer, and/or sodium bicarbonate

Results

Primary Outcome: Feasibility
66% consent rate
96% adhered to assigned HD protocol
100% adhered to serial timed urine collection
0% cross over from 3 HD/week to 2 HD/week
9% cross over from 2 HD/week to 3 HD/week

Secondary outcomes, mean (95% CI) *Incremental HD vs Conventional HD*	
Urine output†*	51.0 percentage points lower decline (-0.7, 102.8)
Averaged urea and creatinine clearance‡*	57.9 percentage points lower decline (-22.6, 138.4)

*Percent change, baseline to week 24; †mL/24 h; ‡mL/min/1.73 m^2

Pilot Studie

Murea et al AJKD 2022

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*Percent change, baseline to week 24; †mL/24 h; ‡mL/min/1.73 m^2

CONCLUSION: Implementation of core components of incremental HD is feasible. Larger clinical trials are indicated to determine the efficacy and safety of incremental HD.

Mariana Murea, Ashish Patel, Benjamin R. Highland , et al (2021)
@AJKDonline | DOI: 10.1053/j.ajkd.2021.12.001
AJKD AMERICAN JOURNAL OF KIDNEY DISEASES

Pilot Studie 2

Murea et al AJKD 2022

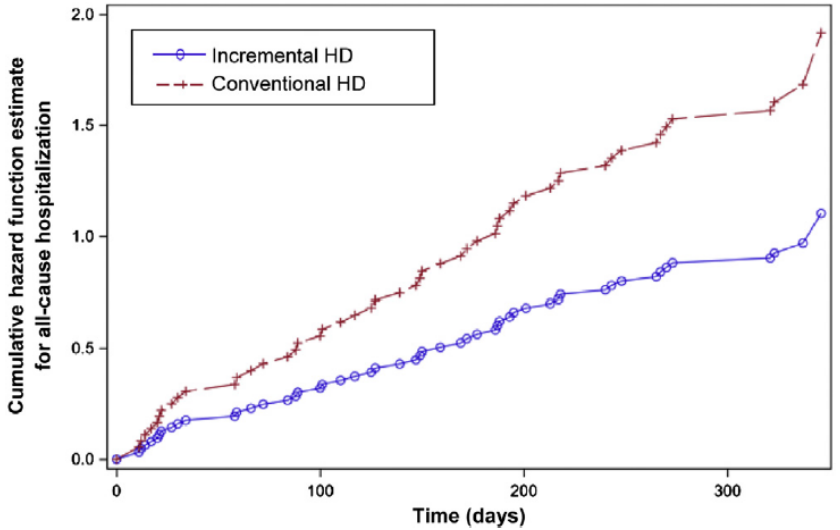
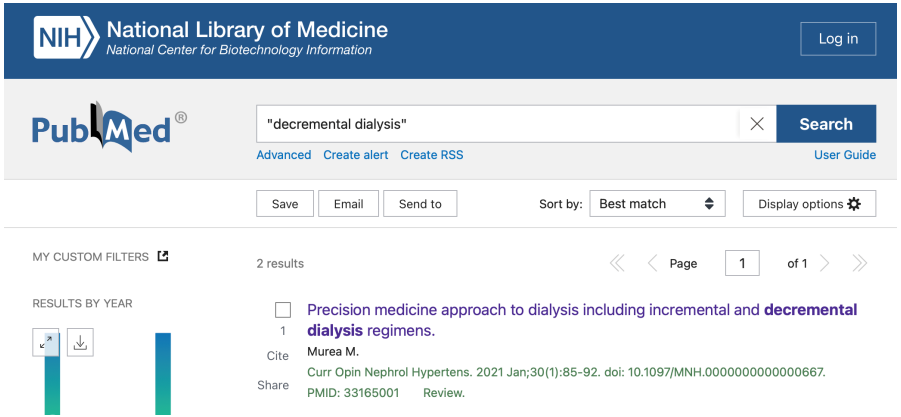


Figure 2. Cumulative hazard of hospitalization. Abbreviation: HD, hemodialysis.

Dekrementelle Dialyse



„**Deintensification of haemodialysis** treatment could be employed in patients with ESKD who seek **conservative care**.“

„The term ‘**decremental dialysis**’ indicates a **less intensive dialysis schedule** usually applied to ease the **transition to end-of-life care in patients on thrice weekly hemodialysis**.“

SLIDO Fall 2

Herr B: 50J, HD seit 4 Jahren (3x Woche), Restdiurese 1000 ml, Filtration 2-3L/HD; HN 125 mg/dL, Krea 6,7 mg/dL; eGFR 10 ml/min; Krea-Clear 12 ml/min; HN-Clear 6 ml/min; PO = 2 mM; iPTH 600 ng/L; Hb 10,8 g/dL)

Möchte nur 2x Woche dialysieren aus beruflichen Gründen (Koch)

*Würden Sie **de**krementelle Dialyse anbieten?*

Palliative Dialyse

Review

Elmer Press

J Clin Med Res. 2014;6(4):234-238

Palliative Dialysis: A Change of Perspective

Thiago Gomes Romano[a, b, c, e], Henrique Palomba[c, d]

Im palliativen Setting nur noch “notwendige” Dialyse: z.B. Ultrafiltration
“The most relevant **symptom** that palliative dialysis can aid is **dyspnea**, which is caused by either fluid overload or acidosis.”

“The concept of palliative dialysis relies on the proposal that for some patients, the traditional therapeutic targets, such as dry weight, Kt/V and serum phosphorus, must be substituted by **symptom relief** goals.”

SLIDO Fall 3 A

Herr B: 90J Shunt; 91J Beginn HD (ausgeprägte Ödeme, Dyspnoe, BE -8, K 5,7, Krea 8,4 mg/dL, HN 212 mg/dL; eGFR 5 ml/min; Krea-Clear 3 ml/min, HN-Clear 1,7 ml/min)

Würden Sie inkrementelle Dialyse anbieten?

SLIDO Fall 3 B

Herr B: 90J (Shunt); 91J Beginn HD

5 Jahre später

96J AZ-Minderung (kein akuter Infekt)

*Würden Sie **de**krementelle Dialyse anbieten?*

Pro/con debate CKJ 2024

Clinical Kidney Journal, 2024, vol. 17, no. 2, sfae020

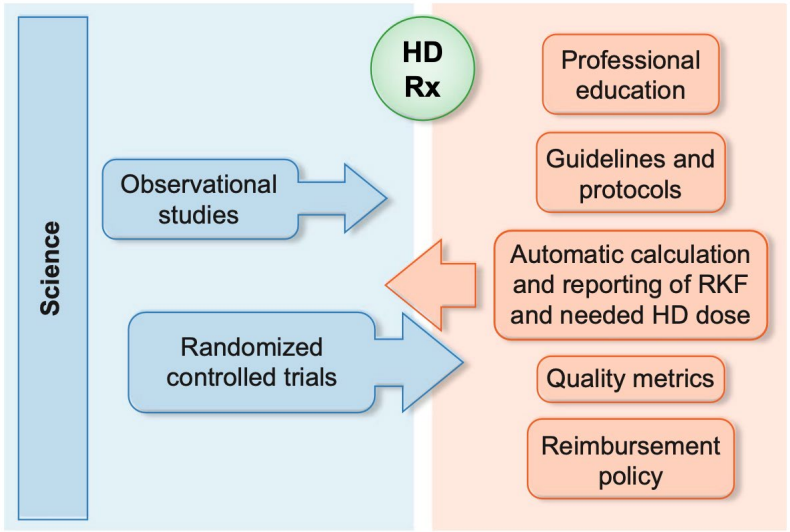
https://doi.org/10.1093/ckj/sfae020
Advance Access Publication Date: 5 February 2024
Pro/Con Debate

PRO/CON DEBATE

Incremental dialysis: two complementary views

Debaters: Francesco Gaetano Casino [1] and Mariana Murea [2]
Moderators: Jürgen Floege [3] and Carmine Zoccali [4,5]

Incremental dialysis is a rational way to start KRT. This is well accepted in PD, but not yet in HD.



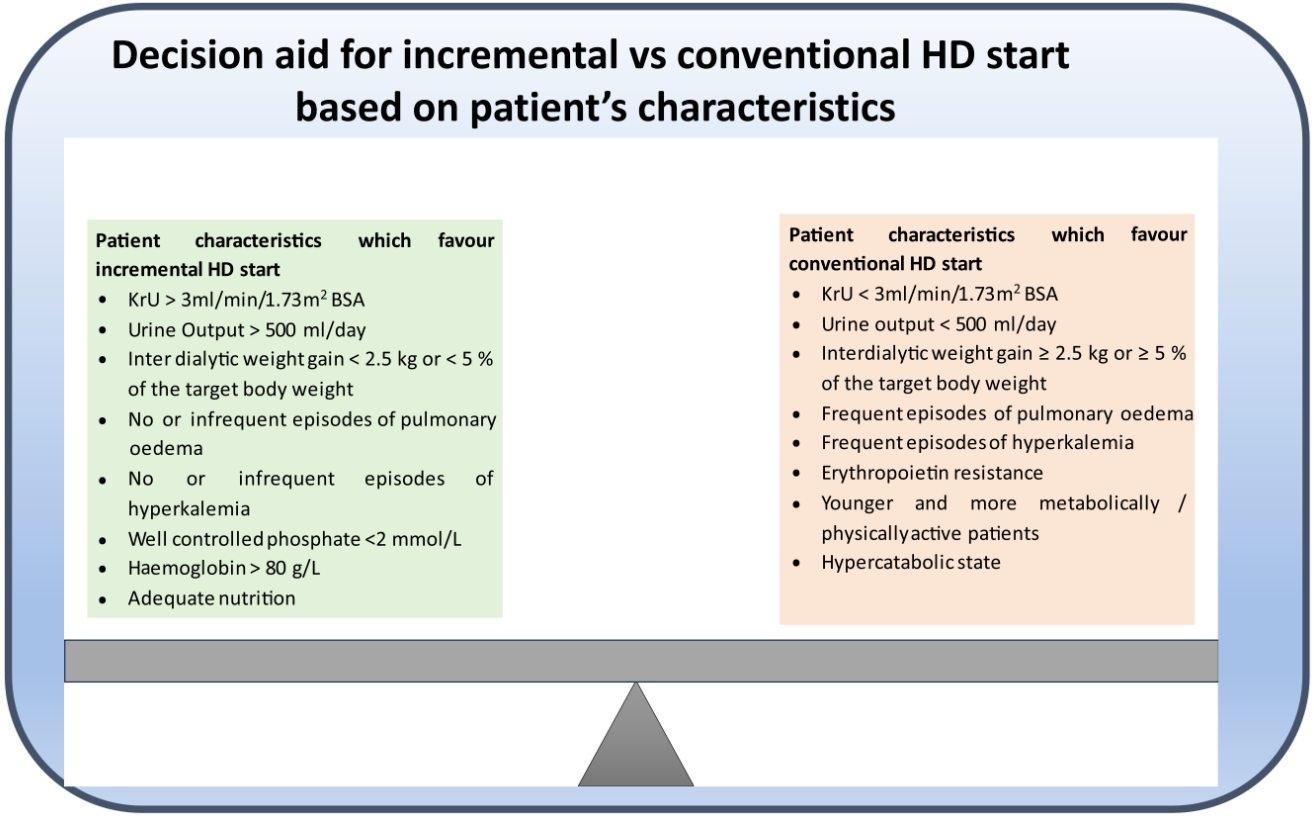
A practical approach to implementing incremental haemodialysis

Usama Butt[1] · A. Davenport[3,4] · S. Sridharan[1,2] · K. Farrington[1,2] · E. Vilar[1,2]

Journal of Nephrology
https://doi.org/10.1007/s40620-024-01939-2

REVIEW

Received: 3 January 2024 / Accepted: 24 March 2024



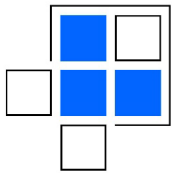
Zusammenfassung

Inkrementelle Dialyse:

- Metaanalyse mit Nutzen HD (Nierenrestfunktion, Hospitaliserung) bzw. kein Risiko PD
- 2 kleine RCT (HD): niedrigere Hospitalisierung
- Einsatz bei selektierten Patienten mit langsamen Nierenfunktionsverlust (Kriterien)
- Mehr Studien (IHDP, REAL LIFE, TWOPLUS, INCHVETS, INCH-HD)

Dekrementelle Dialyse / palliative Dialyse:

- Praktikables Konzept bislang ohne Studien



dr.schlieper@dialyse-hannover.de

DIALYSE HANNOVER
Zentrum für Nieren-, Hochdruck und Stoffwechselerkrankungen

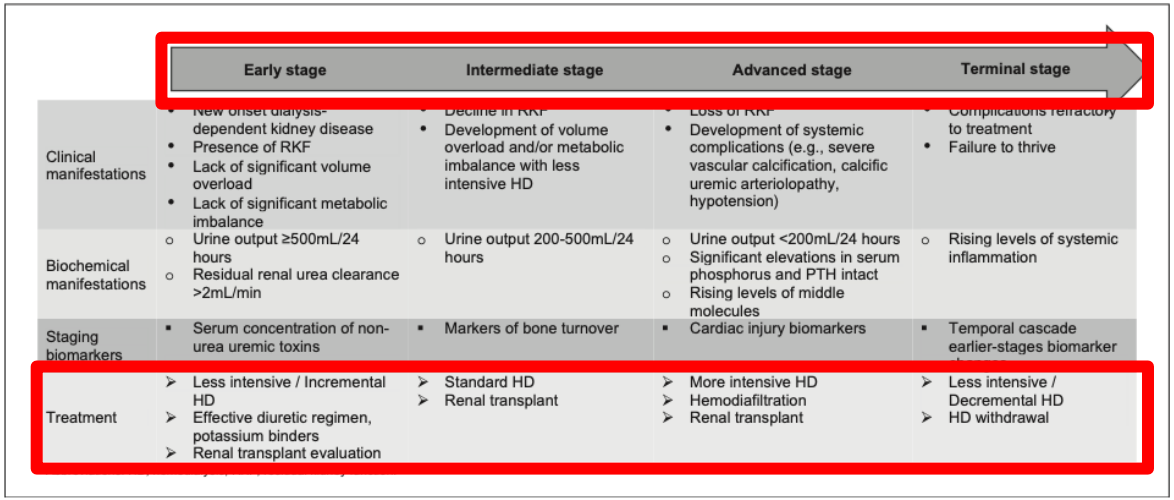
Konzept

Murea Curr Opin Nephrol Hypertens 2021

REVIEW

Precision medicine approach to dialysis including incremental and decremental dialysis regimens

Mariana Murea



	Early stage	Intermediate stage	Advanced stage	Terminal stage
Clinical manifestations	• New onset dialysis-dependent kidney disease • Presence of RKF • Lack of significant volume overload • Lack of significant metabolic imbalance	• Decline in RKF • Development of volume overload and/or metabolic imbalance with less intensive HD	• Loss of RKF • Development of systemic complications (e.g., severe vascular calcification, calcific uremic arteriolopathy, hypotension)	• Complications refractory to treatment • Failure to thrive
Biochemical manifestations	○ Urine output ≥500mL/24 hours ○ Residual renal urea clearance >2mL/min	○ Urine output 200-500mL/24 hours	○ Urine output <200mL/24 hours ○ Significant elevations in serum phosphorus and PTH intact ○ Rising levels of middle molecules	○ Rising levels of systemic inflammation
Staging biomarkers	▪ Serum concentration of non-urea uremic toxins	▪ Markers of bone turnover	▪ Cardiac injury biomarkers	▪ Temporal cascade earlier-stages biomarker
Treatment	➢ Less intensive / Incremental HD ➢ Effective diuretic regimen, potassium binders ➢ Renal transplant evaluation	➢ Standard HD ➢ Renal transplant	➢ More intensive HD ➢ Hemodiafiltration ➢ Renal transplant	➢ Less intensive / Decremental HD ➢ HD withdrawal

FIGURE 1. Framework of dialysis-dependent kidney disease stages and adaptive haemodialysis schedules.

Dialysebeginn

Aregger & Kuhlmann Nephrologie 2023

Tab. 1 Dialyseindikationen	
Absolute Dialyse-indikationen	Urämie Perikarditis
	Urämie Pleuritis
	Urämie Enzephalopathie
Relative Dialyse-indikationen	Volumenexpansion (therapierefraktär)
	Hyperkaliämie (therapierefraktär)
	Azidose (therapierefraktär)
	Hypertonie (therapierefraktär)
	Abnehmender Ernährungszustand (therapierefraktär)
	Urämie Symptome (Nausea, Müdigkeit, Malaise, kognitive Verschlechterung)
	GFR ≤ 8 ml/min

GFR glomeruläre Filtrationsrate