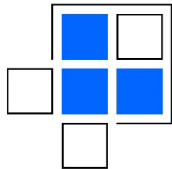


07.12.2024



„Incremental“- and „decremental“ dialysis

Inkrementelle und dekrementelle Dialyse



Georg Schlieper

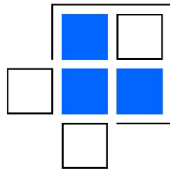
DIALYSE HANNOVER

Zentrum für Nieren-, Hochdruck und Stoffwechselerkrankungen

07.12.2024



Interessenskonflikt



Georg Schlieper

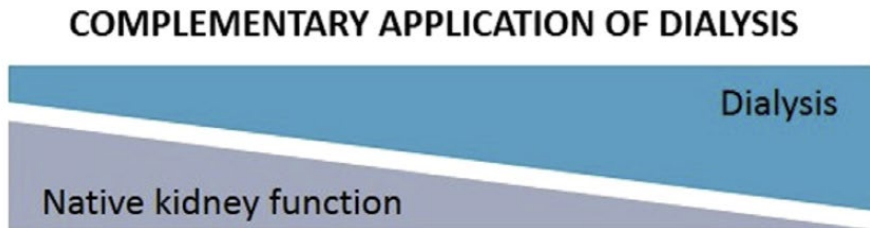
DIALYSE HANNOVER

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Inkrementelle Dialyse

KI rep 2018

Inkrementelle Dialyse =
Graduelle Anpassung (d.h. Steigerung) der
verschriebenen Dialyседosis
an die
verbliebene (abnehmende) Nieren-Restfunktion



Idee:
komplementäre Dialyседosis
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

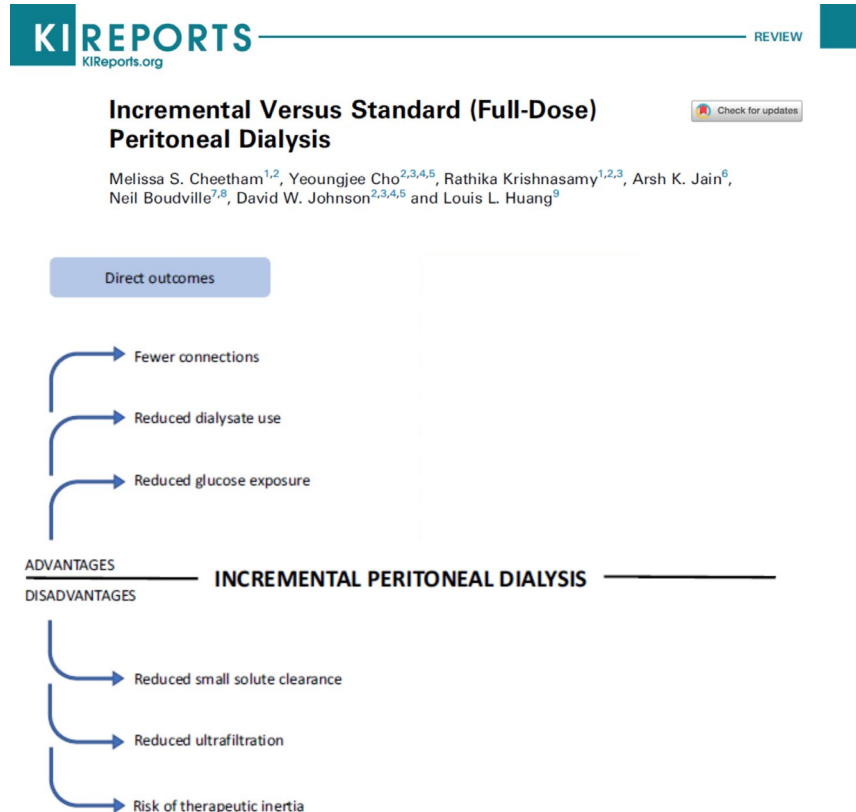


Figure 1. Potential advantages and disadvantages of incremental PD. PD, peritoneal dialysis; RKF, residual kidney function.

Inkrementelle PD

Cheetham KI rep 2022

KIREPORTS
KIReports.org

REVIEW

Incremental Versus Standard (Full-Dose) Peritoneal Dialysis

 Check for updates

Melissa S. Cheetham^{1,2}, Yeoungjee Cho^{2,3,4,5}, Rathika Krishnasamy^{1,2,3}, Arsh K. Jain⁶, Neil Boudville^{7,8}, David W. Johnson^{2,3,4,5} and Louis L. Huang⁹

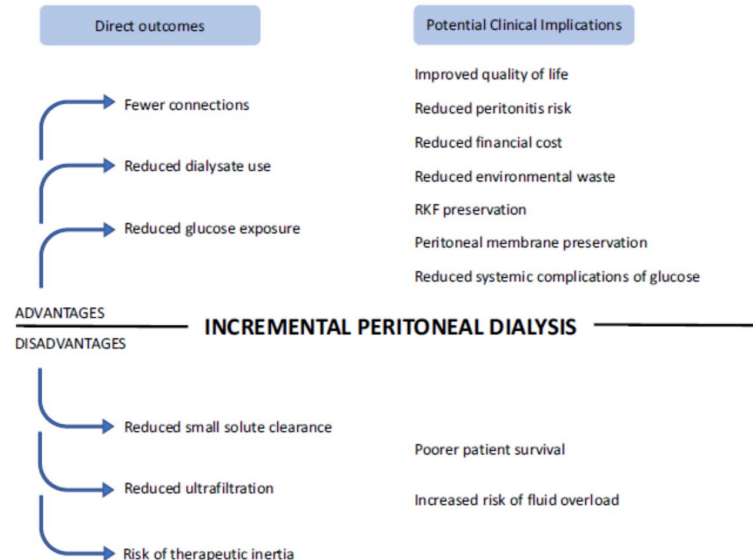


Figure 1. Potential advantages and disadvantages of incremental PD. PD, peritoneal dialysis; RKF, residual kidney function.

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



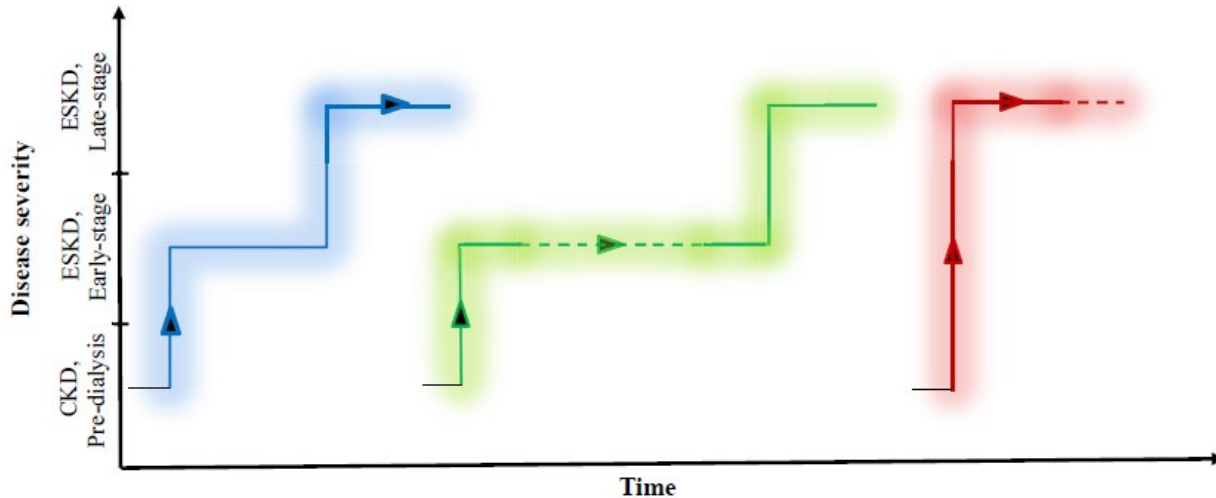
Xu et al. *BMC Nephrology* (2024) 25:308
<https://doi.org/10.1186/s12882-024-03669-w>

Study or Subgroup	IPD		SPD		Weight	Risk Ratio		Year	Risk Ratio IV, Random, 95% CI
	Events	Total	Events	Total		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

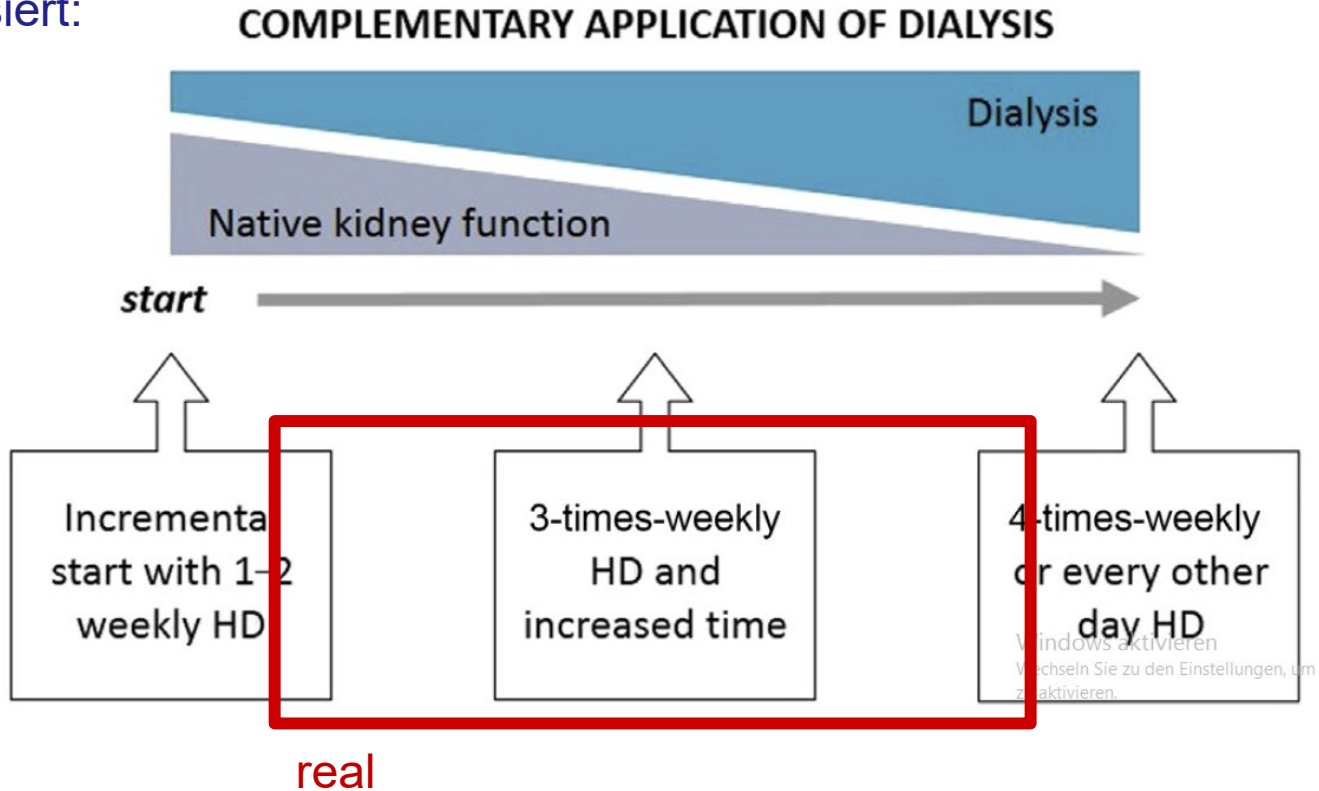
Bei langsam nachlassender (Rest-)Nierenfunktion:
ist ein plötzlicher Übergang von nicht-dialysepflichtiger
Niereninsuffizienz zu 3x wöchentlicher Dialyse erforderlich oder
gibt es Zwischenstufen?



Dialyse und Restnierenfunktion

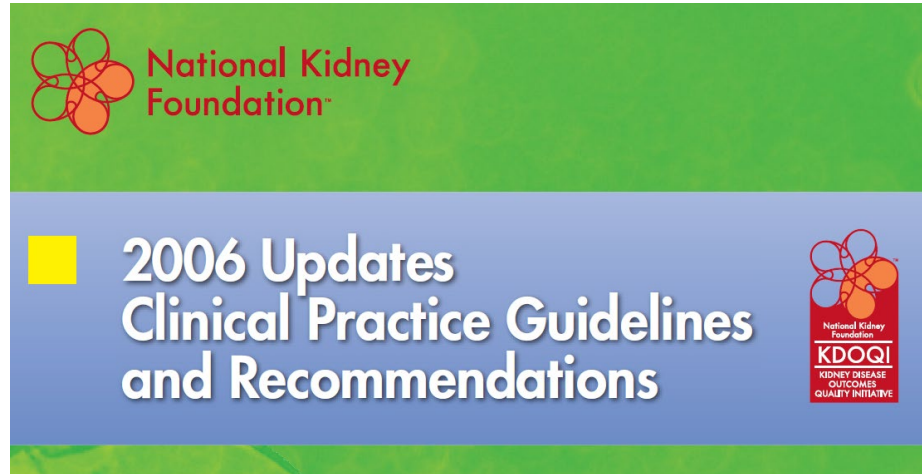
KI rep 2018

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 Unruh³, Philip G. Zager³, Csaba P. Kovesdy¹¹, Joanne M. Bargman⁴, Jing Chen⁶, Suresh Sankarasubbaiyan⁷, Gaurang Shah², Thomas Golper⁸, Richard Sherman⁹, and David S. Goldfarb¹⁰

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**
Gewichtszunahme
- **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

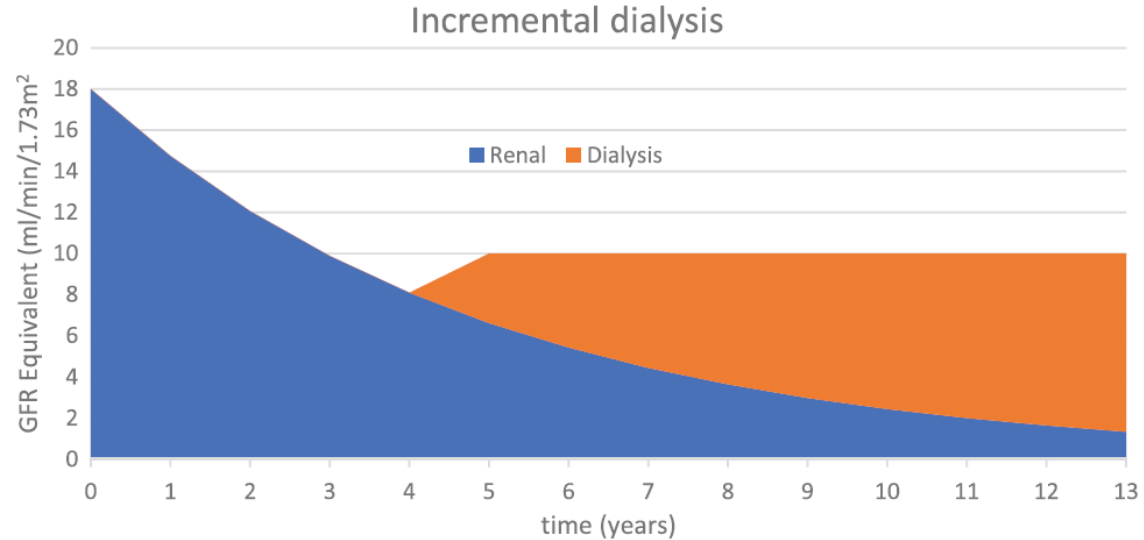
Advance Access Publication Date: 11 September 2018

Editorial Comment

EDITORIAL COMMENT

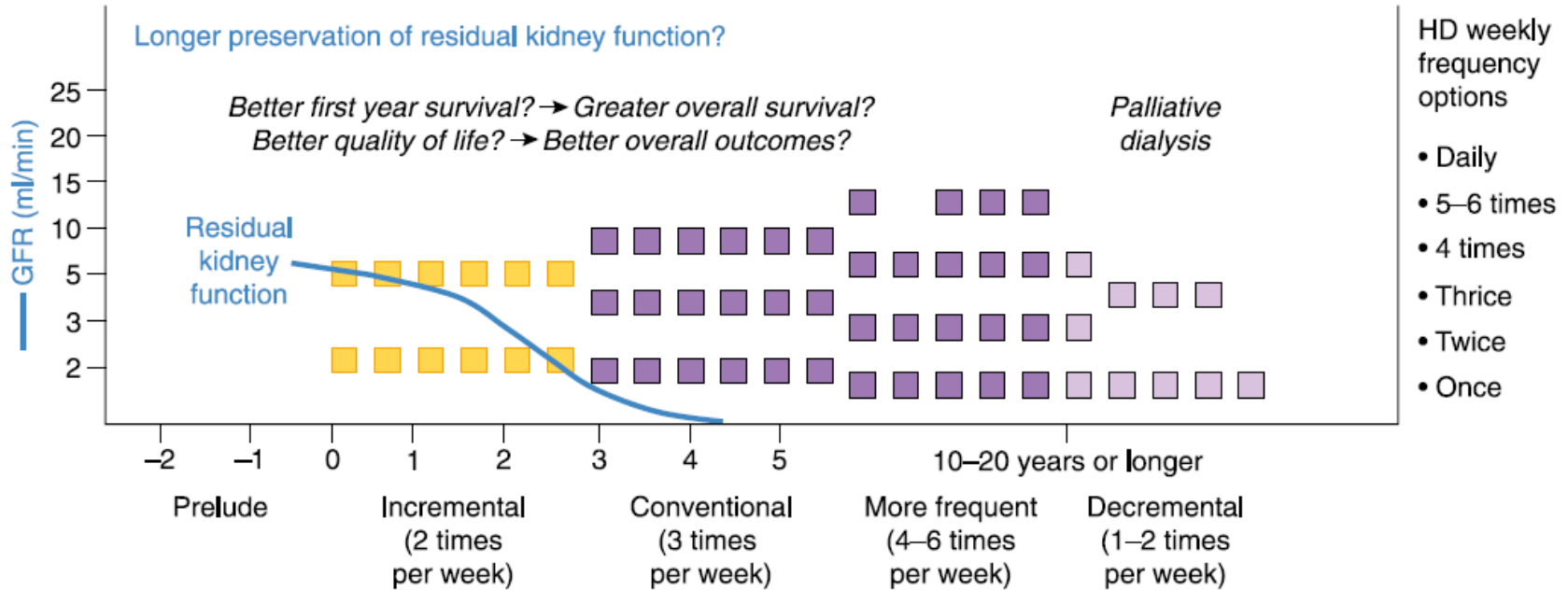
Residual renal function in incremental dialysis

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

Incremental And Personalized Hemodialysis Start: a New Standard Of Care



Cohort



158
patients



Centre
Hospitalier,
le Mans
France



Jan 2017-
2021













Follow-up till
30 June' 21

Observationsstudie

Torreggiani et al KI rep 2022

Incremental And Personalized Hemodialysis Start: a New Standard Of Care

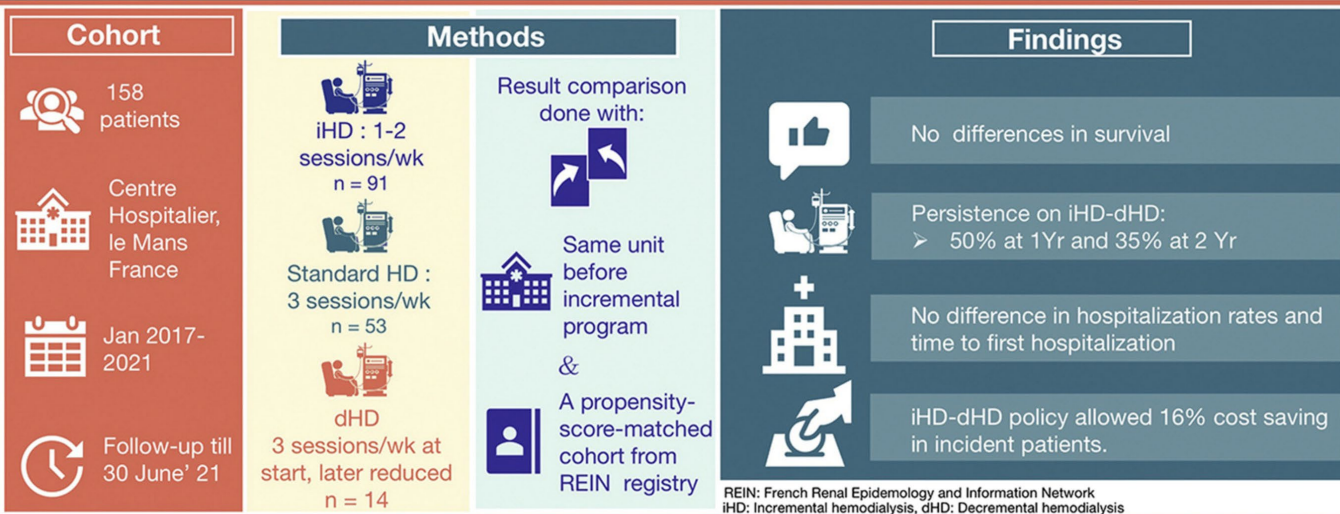


Cohort	Methods	
 158 patients	 iHD : 1-2 sessions/wk n = 91	Result comparison done with: 
 Centre Hospitalier, le Mans France	 Standard HD : 3 sessions/wk n = 53	 Same unit before incremental program
 Jan 2017-2021	 dHD 3 sessions/wk at start, later reduced n = 14	&  A propensity-score-matched cohort from REIN registry
 Follow-up till 30 June' 21		

Observationsstudie

Torreggiani et al KI rep 2022

Incremental And Personalized Hemodialysis Start: a New Standard Of Care



REIN: French Renal Epidemiology and Information Network
iHD: Incremental hemodialysis, dHD: Decremental hemodialysis

KIREPORTS
Kidney International Reports

Torreggiani M et al, 2022

Visual abstract by:
Priti Meena M.D.
 Priti899

Conclusion: The study shows that incremental HD can be a new standard of care, as it is safe and feasible in up to two thirds of incident HD patients.

Metaanalyse

Takkavatakarn et al, CKJ 2023



Clinical
Kidney
Journal

Incremental versus conventional haemodialysis in end-stage kidney disease: a systematic review and meta-analysis

Incremental HD has been advocated for a gradual transitional period based on residual kidney function (RKF). However, the safety and clinical outcomes of incremental compared to conventional HD remain uncertain.

Methods



Systematic search
MEDLINE, Scopus, and
Cochrane databases



**Published and
unpublished studies**
1990–April 2023



Incremental HD
(1–2 sessions/week)
vs.
Conventional HD
(3 sessions/week)

Results

36 studies with 138,939 patients were included



Loss of RKF

- OR 0.31 (0.25–0.39)
- P < 0.001



Hospitalization

- OR 0.44 (0.27–0.72)
- P = 0.001



Cardiovascular events

- OR 0.67 (0.43–1.05)
- P = 0.08

**Incremental HD in patients with
RKF \geq 2 mL/min or UO \geq 500 mL/d**

- OR 0.22 (0.08–0.63); P = 0.004



Mortality

- OR 0.87 (0.72–1.04)
- P = 0.12

**Incremental HD in patients with
RKF \geq 2 mL/min or UO \geq 500 mL/d**

- OR 0.54 (0.37–0.79); P = 0.001

No significant differences in hyperkalaemia and volume overload

Conclusion: Incremental HD is safe and attenuates hospitalization and loss of RKF compared with conventional HD. Also, incremental HD may improve cardiovascular outcomes and mortality in appropriately selected patients.

Takkavatakarn, K.
Clinical Kidney Journal (2023)
Kullaya.t@chula.ac.th
@CKJsocial

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



STUDY SUBJECTS

321 pre-screened
106 eligible
55 randomised



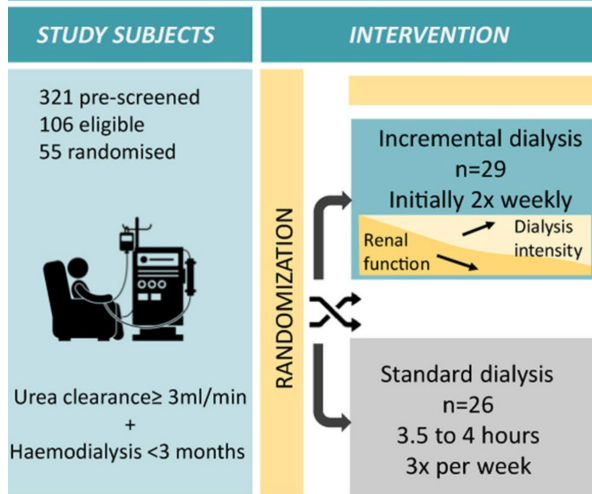
Urea clearance ≥ 3 ml/min
+
Haemodialysis < 3 months

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.

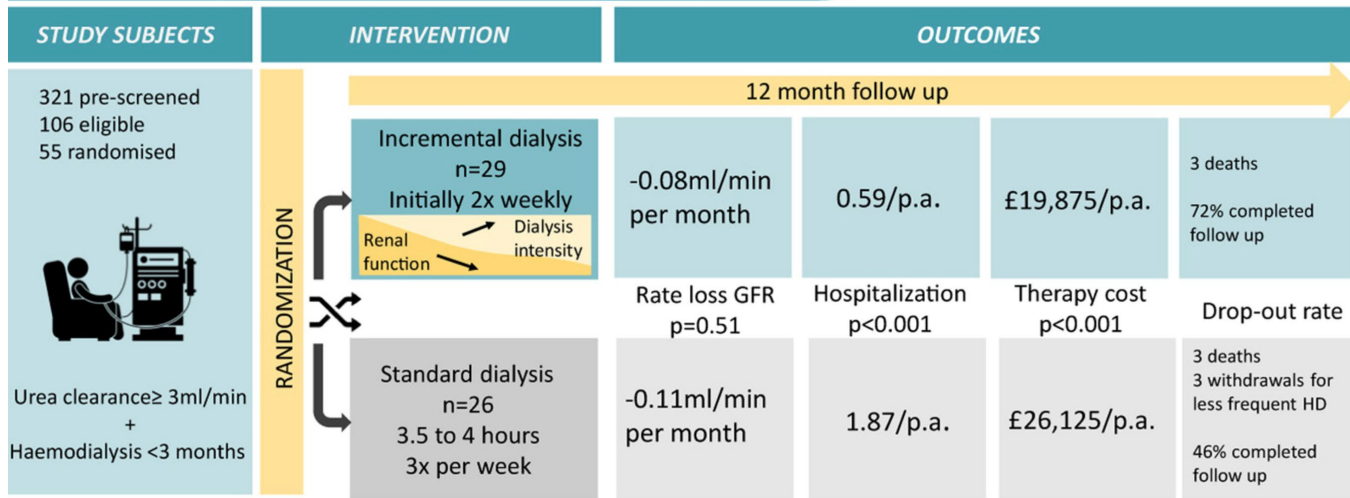
kidney
INTERNATIONAL



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.



Vilar et al, 2021

CONCLUSION *Incremental HD appears to be safe and cost-saving in incident haemodialysis patients with urea clearance $> 3\text{ml/min}$. There was no signal of protection for residual renal function.*

Pilot Study 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



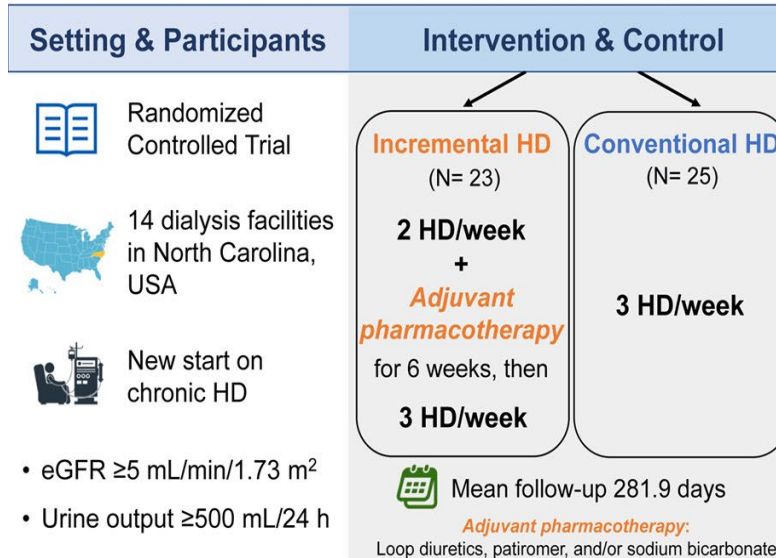
New start on
chronic HD

- eGFR ≥ 5 mL/min/1.73 m²
- Urine output ≥ 500 mL/24 h

Pilot Study 2

Murea et al AJKD 2022





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



Pilot Study 2

Murea et al AJKD 2022


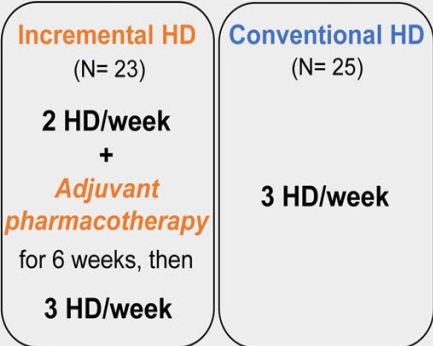


Twice-Weekly Hemodialysis With Adjuvant Pharmacotherapy and Transition to Thrice Weekly Hemodialysis: A Pilot Study

Setting & Participants	Intervention & Control	Results					
<p> Randomized Controlled Trial</p> <p> 14 dialysis facilities in North Carolina, USA</p> <p> New start on chronic HD</p> <ul style="list-style-type: none"> • eGFR ≥ 5 mL/min/1.73 m² • Urine output ≥ 500 mL/24 h 	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; border-radius: 15px; padding: 10px; width: 45%;"> <p style="text-align: center;">Incremental HD (N= 23)</p> <p style="text-align: center;">2 HD/week + <i>Adjuvant pharmacotherapy</i> for 6 weeks, then 3 HD/week</p> </div> <div style="border: 1px solid black; border-radius: 15px; padding: 10px; width: 45%;"> <p style="text-align: center;">Conventional HD (N= 25)</p> <p style="text-align: center;">3 HD/week</p> </div> </div> <p style="text-align: center;"> Mean follow-up 281.9 days</p> <p style="text-align: center;"><i>Adjuvant pharmacotherapy:</i> Loop diuretics, patiromer, and/or sodium bicarbonate</p>	<p style="background-color: #f4a460; padding: 5px;">Primary Outcome: Feasibility</p> <p>66% consent rate</p> <p>96% adhered to assigned HD protocol</p> <p>100% adhered to serial timed urine collection</p> <p>0% cross over from 3 HD/week to 2 HD/week</p> <p>9% cross over from 2 HD/week to 3 HD/week</p> <p style="background-color: #4a7ebb; color: white; padding: 5px;">Secondary outcomes, mean (95% CI) <i>Incremental HD vs Conventional HD</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #d9e1f2; padding: 5px;">Urine output^{†*}</td> <td style="padding: 5px;">51.0 percentage points lower decline (-0.7, 102.8)</td> </tr> <tr> <td style="background-color: #d9e1f2; padding: 5px;">Averaged urea and creatinine clearance^{**}</td> <td style="padding: 5px;">57.9 percentage points lower decline (-22.6, 138.4)</td> </tr> </table> <p style="font-size: small; margin-top: 5px;">*Percent change, baseline to week 24; [†]mL/24 h; [‡]mL/min/1.73 m²</p>		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)
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)						

Pilot Study

Murea et al AJKD 2022

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

Setting & Participants	Intervention & Control	Results
 Randomized Controlled Trial		Primary Outcome: Feasibility
 14 dialysis facilities in North Carolina, USA		Results
 New start on chronic HD		66% consent rate
<ul style="list-style-type: none">eGFR ≥ 5 mL/min/1.73 m²Urine output ≥ 500 mL/24 h		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

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

Pilot Studie 2

Murea et al AJKD 2022

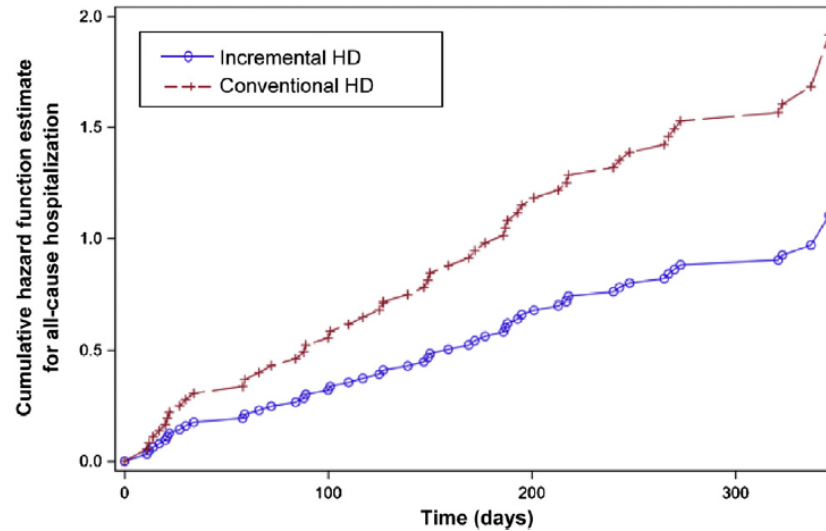


Figure 2. Cumulative hazard of hospitalization. Abbreviation: HD, hemodialysis.

Dekrementelle Dialyse

The screenshot shows the PubMed search interface. At the top, it says "National Library of Medicine National Center for Biotechnology Information" with a "Log in" button. The search bar contains the text "decremental dialysis" and a "Search" button. Below the search bar are options for "Advanced", "Create alert", "Create RSS", and "User Guide". There are buttons for "Save", "Email", and "Send to". The search results are sorted by "Best match" and "Display options" are visible. The results section shows "2 results" and "Page 1 of 1". The first result is a link to a paper titled "Precision medicine approach to dialysis including incremental and **decremental dialysis regimens**." by Murea M. The citation is "Curr Opin Nephrol Hypertens. 2021 Jan;30(1):85-92. doi: 10.1097/MNH.0000000000000667." and the PMID is 33165001. There is also a "Review" link.

dHD
3 sessions/wk at
start, later reduced
n = 14

„**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 dekrementelle Dialyse anbieten?

Palliative Dialyse

Elmer Press

Review

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 dekrementelle 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

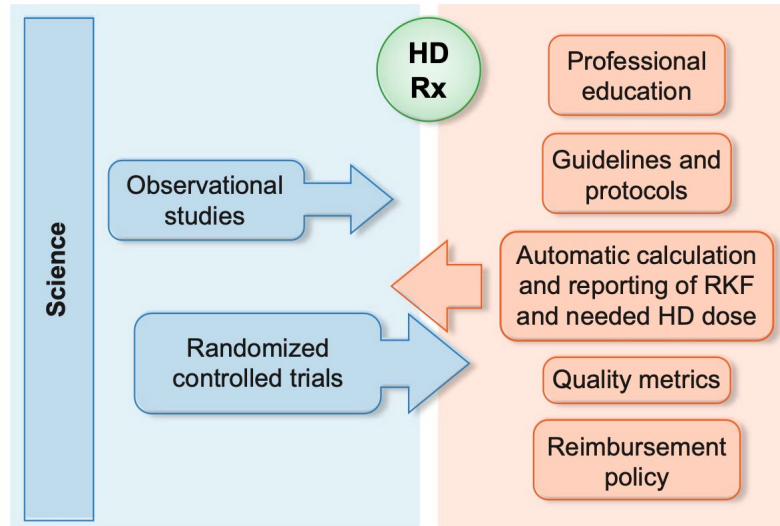
PRO/CON DEBATE

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

Journal of Nephrology

<https://doi.org/10.1007/s40620-024-01939-2>

Usama Butt¹ · A. Davenport^{3,4}  · S. Sridharan^{1,2} · K. Farrington^{1,2} · E. Vilar^{1,2}

REVIEW

Received: 3 January 2024 / Accepted: 24 March 2024

Decision aid for incremental vs conventional HD start based on patient's characteristics

Patient characteristics which favour incremental HD start

- KrU > 3ml/min/1.73m² BSA
- Urine Output > 500 ml/day
- Interdialytic weight gain < 2.5 kg or < 5 % of the target body weight
- No or infrequent episodes of pulmonary oedema
- No or infrequent episodes of hyperkalemia
- Well controlled phosphate < 2 mmol/L
- Haemoglobin > 80 g/L
- Adequate nutrition

Patient characteristics which favour conventional HD start

- KrU < 3ml/min/1.73m² BSA
- Urine output < 500 ml/day
- Interdialytic weight gain ≥ 2.5 kg or ≥ 5 % of the target body weight
- Frequent episodes of pulmonary oedema
- Frequent episodes of hyperkalemia
- Erythropoietin resistance
- Younger and more metabolically / physically active patients
- Hypercatabolic state

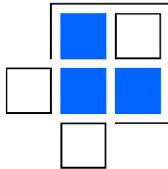
Zusammenfassung

Inkrementelle Dialyse:

- Metaanalyse mit Nutzen HD (Nierenrestfunktion, Hospitalisierung) 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

REVIEW



Precision medicine approach to dialysis including incremental and decremental dialysis regimens

Mariana Murea

Precision medicine and haemodialysis prescription Murea

	Early stage	Intermediate stage	Advanced stage	Terminal stage
Clinical manifestations	<ul style="list-style-type: none"> New onset dialysis-dependent kidney disease Presence of RKF Lack of significant volume overload Lack of significant metabolic imbalance 	<ul style="list-style-type: none"> Decline in RKF Development of volume overload and/or metabolic imbalance with less intensive HD 	<ul style="list-style-type: none"> Loss of RKF Development of systemic complications (e.g., severe vascular calcification, calcific uremic arteriopathy, hypotension) 	<ul style="list-style-type: none"> Complications refractory to treatment Failure to thrive
Biochemical manifestations	<ul style="list-style-type: none"> Urine output $\geq 500\text{mL}/24$ hours Residual renal urea clearance $> 2\text{mL}/\text{min}$ 	<ul style="list-style-type: none"> Urine output $200\text{-}500\text{mL}/24$ hours 	<ul style="list-style-type: none"> Urine output $< 200\text{mL}/24$ hours Significant elevations in serum phosphorus and PTH intact Rising levels of middle molecules 	<ul style="list-style-type: none"> Rising levels of systemic inflammation
Staging biomarkers	<ul style="list-style-type: none"> Serum concentration of non-urea uremic toxins 	<ul style="list-style-type: none"> Markers of bone turnover 	<ul style="list-style-type: none"> Cardiac injury biomarkers 	<ul style="list-style-type: none"> Temporal cascade earlier-stages biomarker
Treatment	<ul style="list-style-type: none"> Less intensive / Incremental HD Effective diuretic regimen, potassium binders Renal transplant evaluation 	<ul style="list-style-type: none"> Standard HD Renal transplant 	<ul style="list-style-type: none"> More intensive HD Hemodiafiltration Renal transplant 	<ul style="list-style-type: none"> Less intensive / Decremental HD HD withdrawal

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

Dialysebeginn

Tab. 1 Dialyseindikationen	
<i>Absolute Dialyse- indikationen</i>	Uräme Perikarditis
	Uräme Pleuritis
	Uräme Enzephalopathie
<i>Relative Dialyse- indikationen</i>	Volumenexpansion (therapierefraktär)
	Hyperkaliämie (therapierefraktär)
	Azidose (therapierefraktär)
	Hypertonie (therapierefraktär)
	Abnehmender Ernährungszustand (therapierefraktär)
	Uräme Symptome (Nausea, Müdigkeit, Malaise, kognitive Verschlechterung)
	GFR \leq 8 ml/min
<i>GFR</i> glomeruläre Filtrationsrate	