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Dialys – vad är nytt och på gång?

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Vad tycker du?

- Det har kommit mycket ny vetenskap om dialys sista åren
- Det är mycket på gång inom dialysfältet
- Jag har ändrat min dialysbehandling sista åren

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KDIGO 2012 Clinical Practice Guideline

ACUTE KIDNEY INJURY

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KDIGO 2012 Clinical Practice Guideline

ACUTE KIDNEY INJURY

Akut njurskada definieras som minskad filtration eller urinproduktion

KDIGO Clinical Practice Guideline for Acute Kidney Injury
Kidney International Suppl. 2(1), March 2012

Stage	Serum creatinine	Urine output
1	1.5–1.9 times baseline OR ≥ 0.3 mg/dL (≥ 26.5μmol/L) increase	<0.5ml/kg/h for 6–12 hours
2	2.0–2.9 times baseline	<0.5ml/kg/h for ≥ 12 hours
3	3.0 times baseline OR Increase in serum creatinine to ≥ 4.0mg/dL (≥ 353.9 μmol/L) OR Initiation of renal replacement therapy OR, in patients <18 years, decrease in eGFR to < 35 mL/min per 1.73m^2	<0.3ml/kg/h for ≥ 24 hours OR Anuria for ≥ 12 hours

Hur mycket dialyserar vi?

CRRT

- CIVA Uppsala 92 episodes of care (EOC)
  - 11% av 805 EOC
  - Totalt 6127h or 57h per EOC

- 2000 EOC i riket
  - 5% av 40443 EOC
  - Totalt 222444h or 89h per EOC

Peritoneal dialys 42 EOC = 0.02%

IHD 301 EOC = 0.14%

Svenska Intensivvårdsregistret SIR

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Hur ofta ordinerar du dialys?

- Mer än 1 gång per vecka?
- 1 gång per vecka?
- 1 gång per månad?
- Mindre än en gång per månad?

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Vilken dos brukar du starta med?

- 20 ml/kg
- 25 ml/kg
- 30 ml/kg
- 35 ml/kg

Dialysdosrekomendationer

5.8.4: We recommend delivering an effluent volume of 20–25 ml/kg/h for CRRT in AKI *(1A)*. This will usually require a higher prescription of effluent volume. (*Not Graded*)

Vilken modalitet använder du oftast?

- IHD
- PD
- CVVH (F)
- CVVHDF
- CVVHD

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Riktlinjer om dialysmodalitet

5.6.1: **Use continuous and intermittent RRT as complementary therapies in AKI patients. (*Not Graded*)**

5.6.2: **We suggest using CRRT, rather than standard intermittent RRT, for hemodynamically unstable patients. (*2B*)**

5.6.3: **We suggest using CRRT, rather than intermittent RRT, for AKI patients with acute brain injury or other causes of increased intracranial pressure or generalized brain edema. (*2B*)**

Vilken antikoagulans använder du oftast?

- Ingen
- Lågmolekylärt heparin
- Ofraktionerat heparin
- Regional Citrat

antikoagulationsrekomendation

5.3.2.2: **For anticoagulation in CRRT, we suggest using regional citrate anticoagulation rather than heparin in patients who do not have contraindications for citrate.** ***(2B)***

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Använder du några alternativa membran

- Nej
- Hi-flux
- Adsorption

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Membranrekomendationer

5.5.1: We suggest to use dialyzers with a biocompatible membrane for IHD and CRRT in patients with AKI. (*2C*)

Adsorptionsmembran har bara proximala efficacy studier i sepsis

Volume 49, Issue 1-2
March 2020

RESEARCH ARTICLES | AUGUST 21 2019

Changes in Cytokines, Haemodynamics and Microcirculation in Patients with Sepsis/Septic Shock Undergoing Continuous Renal Replacement Therapy and Blood Purification with CytoSorb

Subject Area: Nephrology

Samuele Zuccari; Elisa Damiani; Roberta Domizi; Claudia Scorcella; Mario D'Arezzo; Andrea Carsetti; Simona Pantanetti; Sara Vannicola; Erika Casarotta; Andrea Ranghino; Abele Donati; Erica Adrario

Circulation

CURRENT ISSUE |

RESEARCH ARTICLE | Originally Published 25 February 2022 |

Check for updates

Cytokine Hemoadsorption During Cardiac Surgery Versus Standard Surgical Care for Infective Endocarditis (REMOVE): Results From a Multicenter Randomized Controlled Trial

Mahmoud Diab, PhD, Thomas Lehmann, PhD, Wolfgang Bothe, PhD, Payam Akhyari, PhD, Stephanie Platzer, PhD, Daniel Wendt, PhD, Antje-Christin Deppe, PhD, ... SHOW ALL ... on behalf of the REMOVE Trial Investigators | AUTHOR INFO & AFFILIATIONS

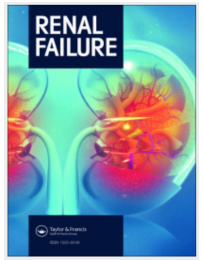
Outcomes	Hemoadsorption group (n=138)	Control group (n=144)	*P* value	Difference (95% CI)*
30-day mortality	29 (21.0)	32 (22.4)	0.782	0.94 (0.60–1.47)

Extracorporeal cytokine elimination as rescue therapy in refractory septic shock: a prospective single-center study

Original Article | Others | Published: 06 June 2017
Volume 20, pages 252–259, (2017) Cite this article

Sigrun Friesecke, Stephanie-Susanne Stecher, Stefan Gross, Stephan B. Felix & Axel Nierhaus

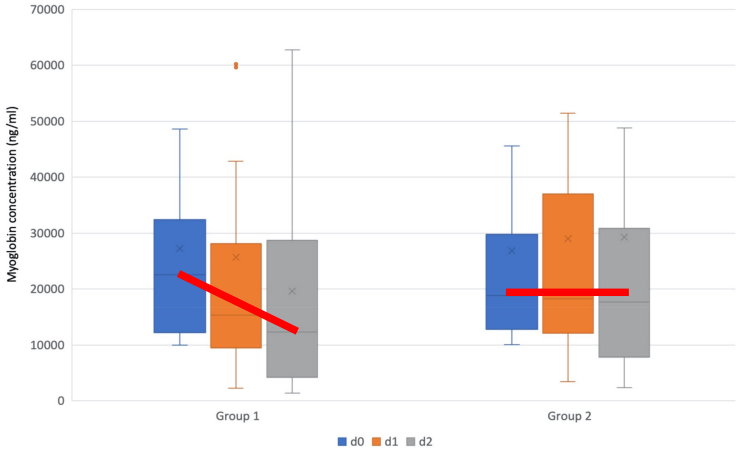
Cytosorb kan adsorbera myoglobin men mortaliteten?



The effect of cytosorb® application on kidney recovery in critically ill patients with severe rhabdomyolysis: a propensity score matching analysis

Caroline Gräfe, Uwe Liebchen, Antonia Greimel, Nils Maciuga, Mathias Bruegel, Michael Irlbeck, Lorenz Weidhase, Michael Zoller, Michael Paal & **Christina Scharf** ...show less

Article: 2259231 | Received 24 Apr 2023, Accepted 11 Sep 2023, Published online: 20 Sep 2023



	alive	dead	*Marginal Row Totals*
Group 1	18 (20.26) [0.25]	37 (34.74) [0.15]	55
Group 2	17 (14.74) [0.35]	23 (25.26) [0.2]	40
Marginal Column Totals	35	60	95 (Grand Total)

The chi-square statistic is 0.9505. The *p*-value is .329588. *Not* significant at $p < .05$.

The chi-square statistic with Yates correction is 0.5769. The *p*-value is .447524. *Not* significant at $p < .05$.

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High-flux membran, och postdilution HDF funkar men saknar endpoint-studier.

> Artif Organs. 2019 Oct;43(10):1014-1021. doi: 10.1111/aor.13480. Epub 2019 Jun 18.

High-permeability alternatives to current dialyzers performing both high-flux hemodialysis and postdilution online hemodiafiltration

Francisco Maduell [1], Lida Rodas [1], José Jesús Broseta [1], Miguel Gómez [1], Marc Xipell Font [1], Alicia Molina [1], Enrique Montagud-Marrahi [1], Elena Guillén [1], Marta Arias-Guillén [1], Nestor Fontseré [1], Manel Vera Rivera [1], Nayra Rico [2]

Critical Care Medicine

High permeability dialysis membrane allows effective removal of myoglobin in acute kidney injury resulting from rhabdomyolysis

Sorrentino, Sajoscha A. MD; Kielstein, Jan T. MD; Lukasz, Alexander MS; Sorrentino, Janine-Nicole MS; Gohrbandt, Bernhard MD; Haller, Hermann MD; Schmidt, Bernhard M. W. MD

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Basdialys i Uppsala

- Start på (ganska)strikt indikation
- Standardmembran
- Kontinuerlig venovenös hemodialys CVVHD
- Regional citrat -antikoagulation
- 25-30ml/kg/h dialysdos
- Dragning 50-100-200 ml/h

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Dialysindikationer

Table 2. Indications for KRT in Critically Ill Patients.*

Urgent indications in patients with AKI

Refractory, severe hyperkalemia†
Refractory, severe metabolic acidosis†
Refractory, severe pulmonary edema†
Uremic complications: pericarditis, bleeding, and encephalopathy‡

Urgent indications in patients without AKI

Severe intoxication due to lithium, toxic alcohol poisoning (especially from ethylene glycol or methanol), metformin, or salicylate

Nonurgent indications

Persistent, severe AKI with blood urea nitrogen level >112 mg/dl, oliguria or anuria for more than 72 hr, or both§

No indications

Severe AKI (KDIGO stage 3) in the absence of complications¶
Sepsis in the absence of complicated AKI

Gaudry et al NEJM 2022

Vid vilket kalium startar du dialys i en patient som inte kissar?

- 5
- 6
- 7
- 8
- 9

Vid vilken BE startar du dialys?

- -6
- -8
- -12
- -16

Urea

- 20
- 30
- 40
- 50

Vid vilket FiO2 startar du dialys i en patient med misstänkt lungödem som inte kissar?

- 40%
- 50%
- 60%
- 70%
- 80%
- 90%

Vid hur stor övervätskning startar du dialys om du inte kan nå negativ balans med diuretika?

- 4L
- 6L
- 8L
- 12L
- 16L

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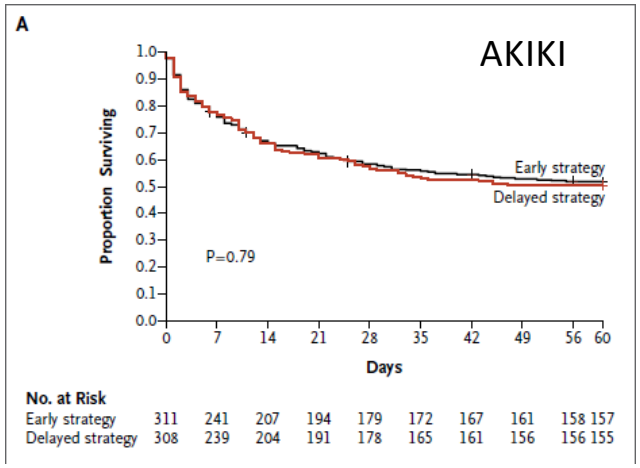
Guidelines för att starta dialys

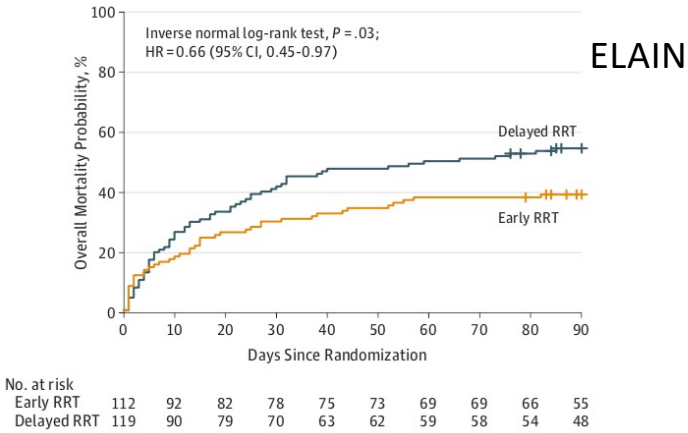
5.1.1: Initiate RRT emergently when life-threatening changes in fluid, electrolyte, and acid-base balance exist. (*Not Graded*)

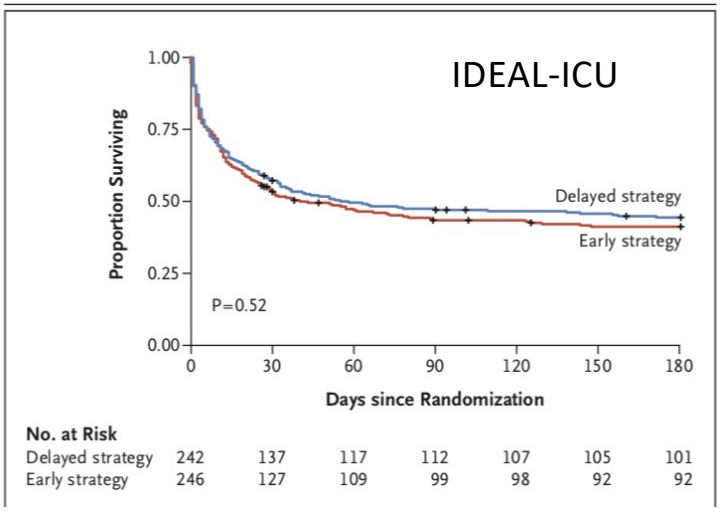
5.1.2: Consider the broader clinical context, the presence of conditions that can be modified with RRT, and trends of laboratory tests—rather than single BUN and creatinine thresholds alone—when making the decision to start RRT. (*Not Graded*)

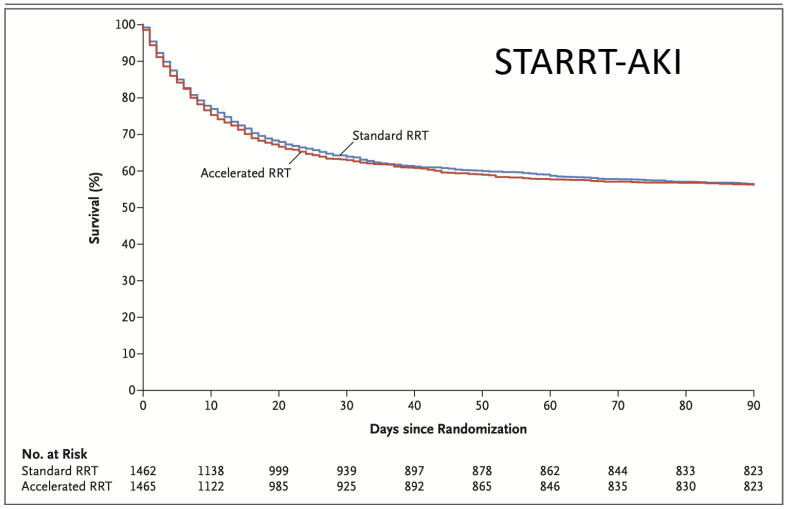
The treatment of AKI with RRT has the following goals: i) to maintain fluid and electrolyte, acid-base, and solute homeostasis; ii) to prevent further insults to the kidney; iii) to permit renal recovery; and iv) to allow other supportive measures (e.g., antibiotics, nutrition support) to proceed without limitation or complication. Ideally, therapeutic inter-

Recent trials of when to start dialysis









Systematic metaanalysis of when to start RRT

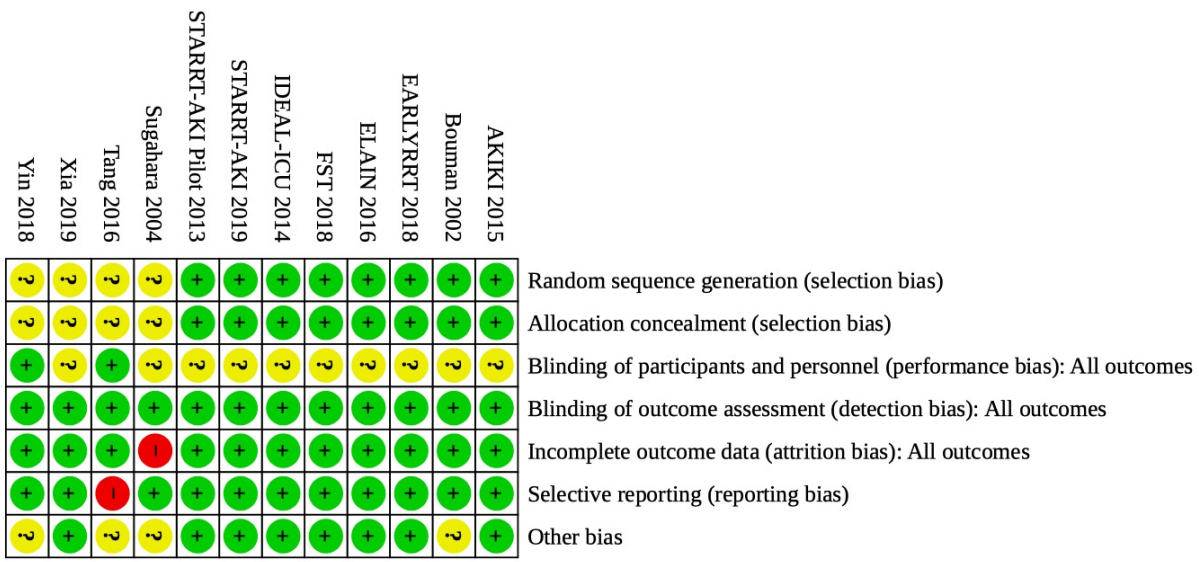
Cochrane Library
Trusted evidence.
Informed decisions.
Better health.

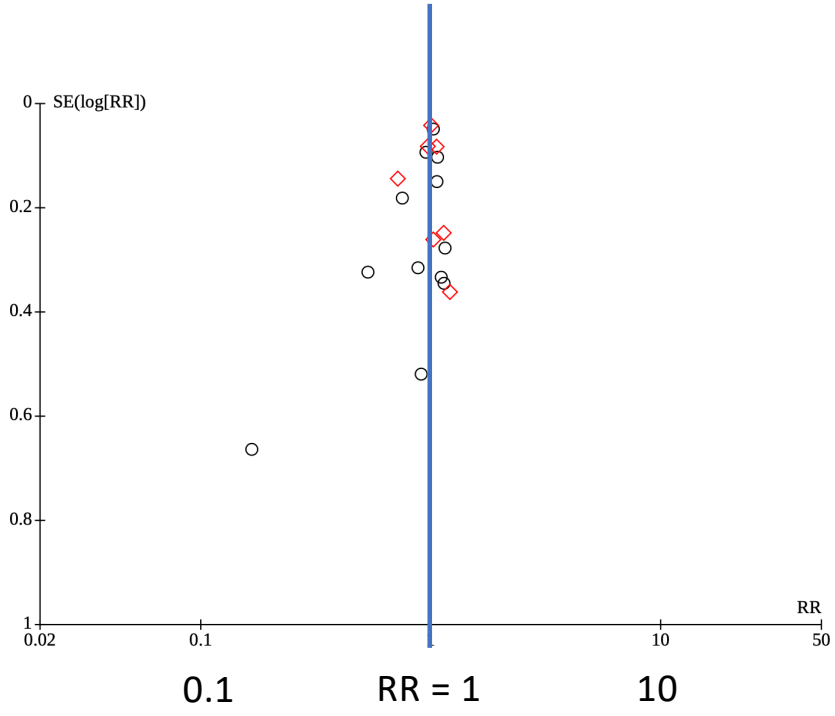
Cochrane Database of Systematic Reviews

[Intervention Review]

Timing of kidney replacement therapy initiation for acute kidney injury

Alicia Isabel Fayad[1], Daniel G Buamscha[2], Agustín Ciapponi[3]





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Algoritmbaserat beslutsstöd

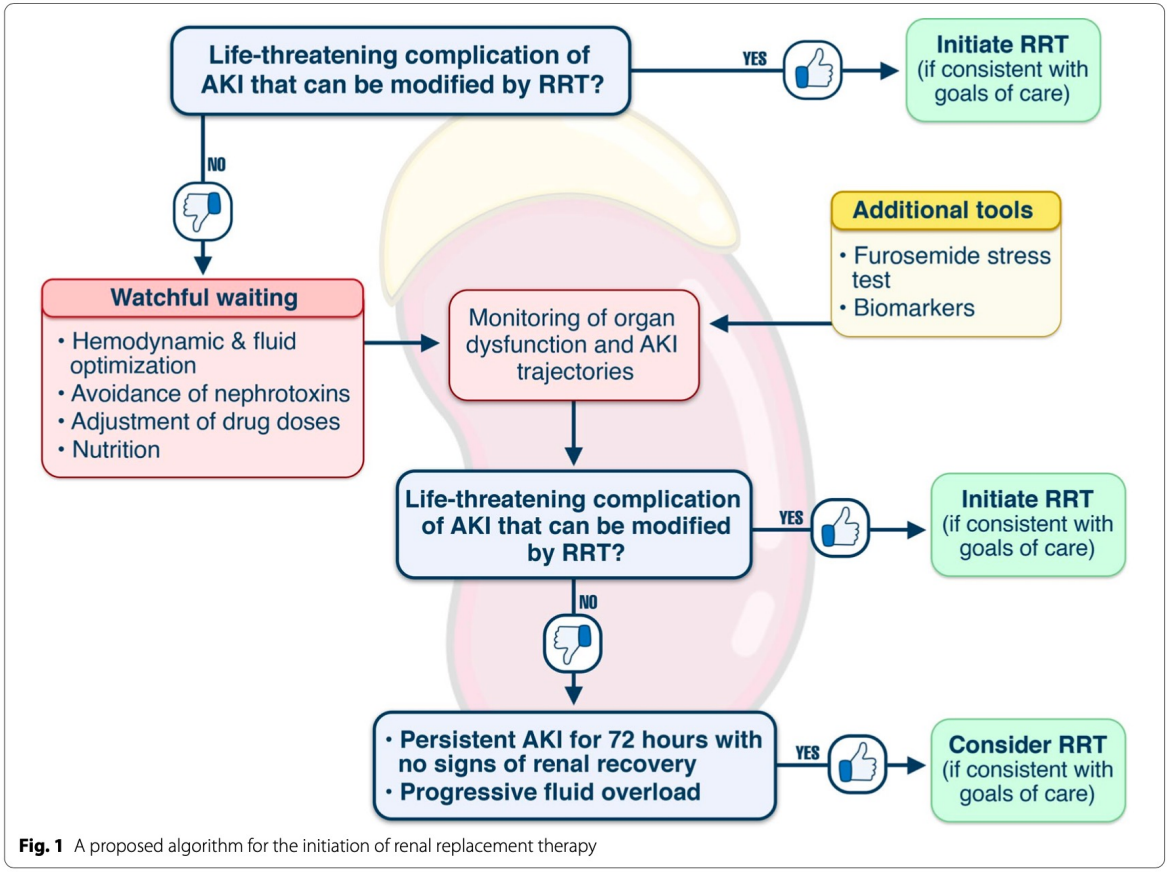

Fig. 1 A proposed algorithm for the initiation of renal replacement therapy

Intensive Care Med (2022) 48:1368–1381

Delivering optimal renal replacement therapy to critically ill patients with acute kidney injury

Ron Wald[1,2*], William Beaubien-Souligny[3], Rahul Chanchlani[4], Edward G. Clark[5], Javier A. Neyra[6], Marlies Ostermann[7], Samuel A. Silver[8], Suvi Vaara[9], Alexander Zarbock[10] and Sean M. Bagshaw[11]

Vad använder du för att förutsäga om en patient klarar sig utan dialys?

- Urinproduktion under dialys
- Urinproduktion vid dialyspaus
- Kreatinin clearance under dialys
- Kreatininökning vid dialyspaus
- Annat?

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Guidelines för att avsluta dialys

5.2.1: Discontinue RRT when it is no longer required, either because intrinsic kidney function has recovered to the point that it is adequate to meet patient needs, or because RRT is no longer consistent with the goals of care. (*Not Graded*)

Urine Volume: OR = 1.078 per 100 mL/day

Creatinine Clearance: OR = 1.108 [1.05–1.17] per 1 mL/min

Critical Care Medicine 37(9):p 2576-2582, September 2009.

Discontinuation of continuous renal replacement therapy: A *post hoc* analysis of a prospective multicenter observational study*

Uchino, Shigehiko MD; Bellomo, Rinaldo MD; Morimatsu, Hiroshi MD; Morgera, Stanislao MD; Schetz, Miet MD; Tan, Ian MD; Bouman, Catherine MD; Macedo, Ettiene MD; Gibney, Noel MD; Tolwani, Ashita MD; Straaten, Heleen Oudemans-van MD; Ronco, Claudio MD; Kellum, John A. MD

Journal of Critical Care

Volume 27, Issue 6, December 2012, Pages 744.e1-744.e5

Use of 2-hour creatinine clearance to guide cessation of continuous renal replacement therapy ☆, ☆☆, ★

Stephen Fröhlich MB, BCh, FRCA [a], Amy Donnelly MB, BCh [b], Orsolya Solymos MB, BCh, FCARCSI [c], Niamh Conlon MD, FCARCSI [d]

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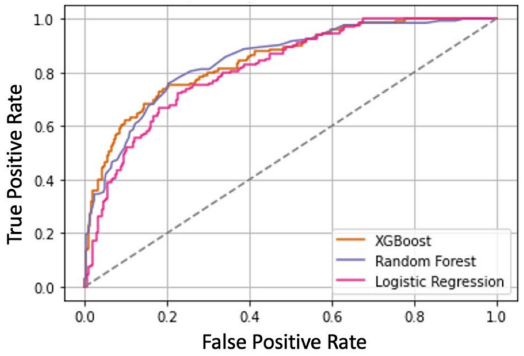
AI predictive approaches



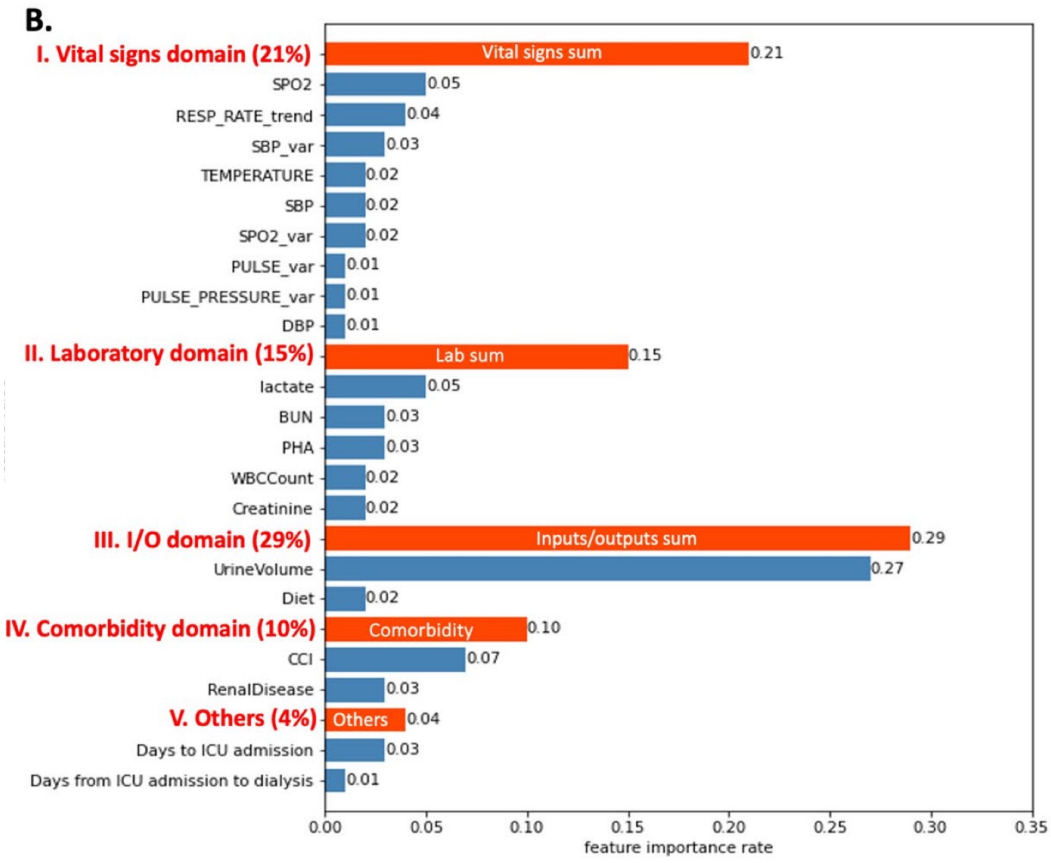
AUC ROC 85%

scientific reports

(2024) 14:13142

Predictive approach for liberation from acute dialysis in ICU patients using interpretable machine learning

Tsai-Jung Wang[1,2,3], Chun-Te Huang[2], Chieh-Liang Wu[1,4], Cheng-Hsu Chen[2,4], Min-Shian Wang[1], Wen-Cheng Chao[1,4], Yi-Chia Huang[3,5] & Kai-Chih Pai[6]✉



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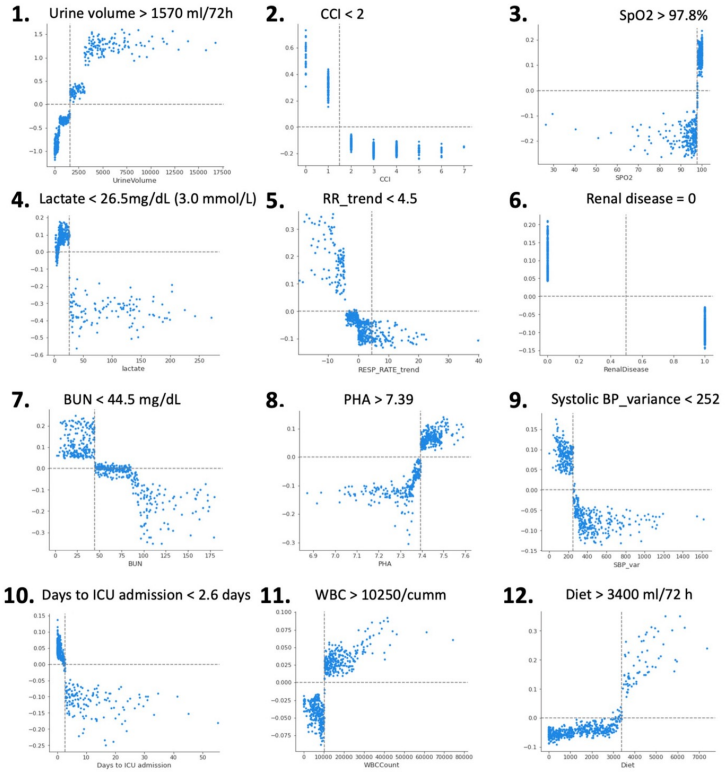

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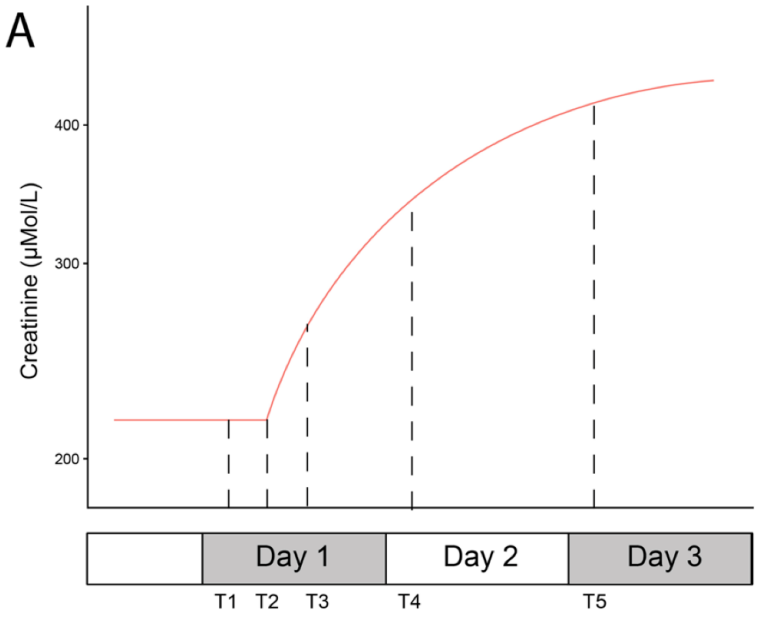
Dynamic creatinine clearance



scientific reports

(2024) 14:21098

Estimation of renal function immediately after cessation of continuous renal replacement therapy at the ICU

T. T. Pieters[1], M. J. van Dam[2], M. A. Sikma[2,4], A. van Arkel[2], W. B. Veldhuis[3], M. C. Verhaar[1], D. W. de Lange[2,4] & M. B. Rookmaaker[1,5]✉

Vad är din övre gräns för dragning i dialysen?

- 100 ml/h
- 200 ml/h
- 400 ml/h

Dragningsguideline saknas i KDIGO AKI 2012

5.8.2: Provide RRT to achieve the goals of electrolyte, acid-base, solute, and fluid balance that will meet the patient's needs. (*Not Graded*)

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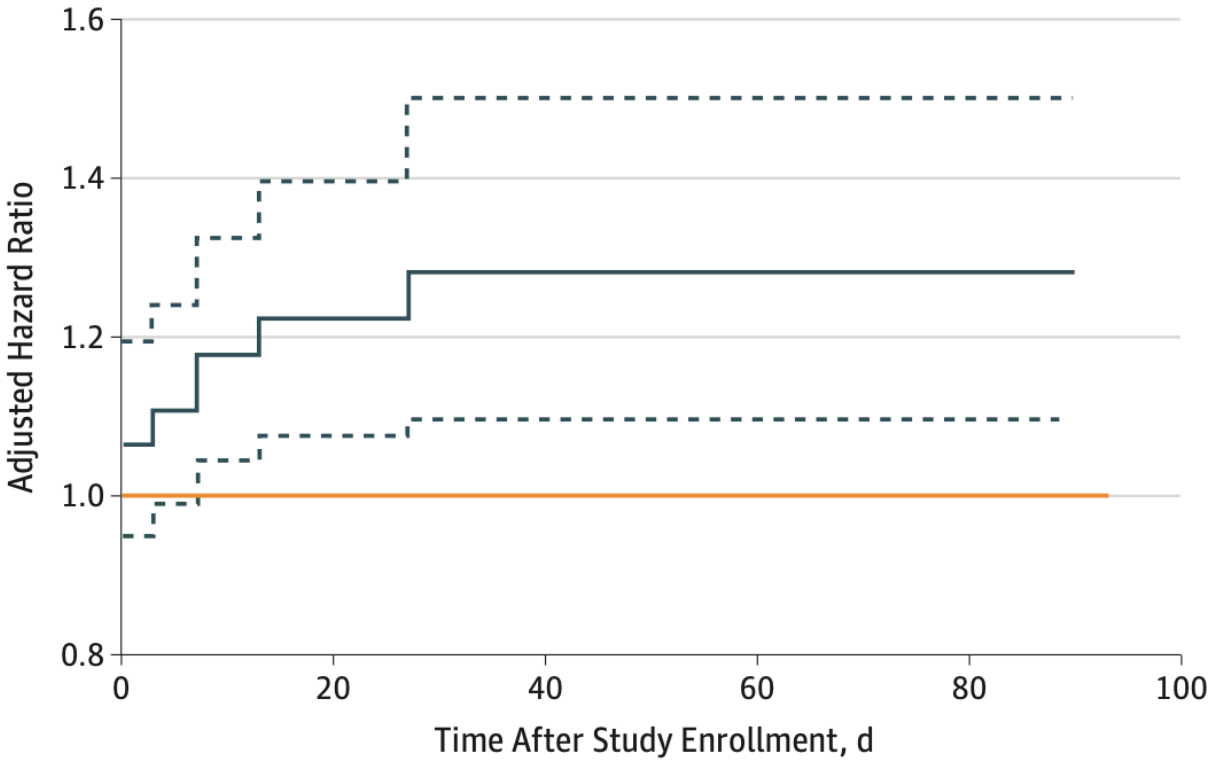
Sikta på 1 ml/kg/h, kanske



Every 0.50-mL/kg/h increase in NUF rate was associated with death:

5% for day 3 to 6,
8% for day 7 to 12,
11% for day 13 to 26,
13% for day 27 to 90.

NUF <1 ml/kg/h was the safest

JAMA Network Open
2019;2(6):e195418. doi:10.1001/jamanetworkopen.2019.5418

Association of Net Ultrafiltration Rate With Mortality Among Critically Ill Adults With Acute Kidney Injury Receiving Continuous Venovenous Hemodiafiltration
A Secondary Analysis of the Randomized Evaluation of Normal vs Augmented Level (RENAL) of Renal Replacement Therapy Trial

Raghavan Murugan, MD, MS, FRCP; Samantha J. Kerti, MS; Chung-Chou H. Chang, PhD; Martin Gallagher, MD, PhD; Gilles Clermont, MD, MSc; Paul M. Palevsky, MD; John A. Kellum, MD, MCCM; Rinaldo Bellomo, MD, PhD

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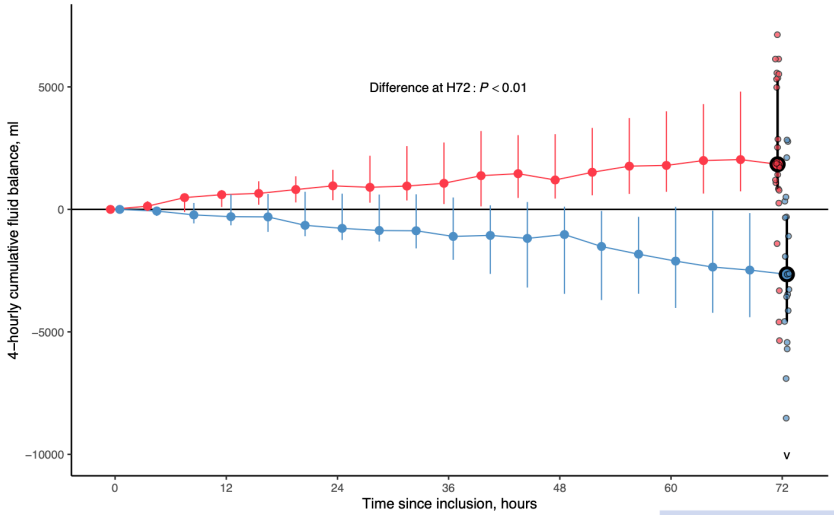
GO NEUTRAL

Net ultrafiltration
25 ml/h vs ≥100ml/h

55 patients randomized



ICM

Fluid balance neutralization secured by hemodynamic monitoring versus protocolized standard of care in patients with acute circulatory failure requiring continuous renal replacement therapy: results of the GO NEUTRAL randomized controlled trial

Laurent Bitker[1,2,3*], Claire Dupuis[4], Pierre Pradat[5], Guillaume Deniel[1,2,3], Kada Klouche[6,7,8], Mehdi Mezidi[1], Louis Chauvelot[1], Hodane Yonis[1], Loredana Baboi[1], Julien Illinger[9], Bertrand Souweine[4] and Jean-Christophe Richard[1,2,3]

Death at H72, *N* (%)	4/30 (13%)	4/25 (16%)	−3% (−22% to 16%)	> 0.99
Death at day 28, *N* (%)[C]	17/30 (57%)	16/25 (64%)	−7% (−32% to 18%)	> 0.99
Death at day 90, *N* (%)[C]	18/30 (60%)	17/25 (68%)	−8% (−32% to 17%)	> 0.99

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Guidelines update started 2023

Global Action. Local Change.

Scope of Work

KDIGO Clinical Practice Guideline for
Acute Kidney Injury (AKI) and Acute Kidney Disease (AKD)
Update 2023

Sammanfattning: Vad är nytt och på gång?

- På A svarar jag, inte så mycket.
- Och på B inte heller så mycket.

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Slutsatser

- Gammalt
  - CRRT med regional citratdialys, standardfilter och dos 25-30ml/kg/h
  - Väldigt svaga evidens
- Nytt
  - Nej
- På väg
  - Nya guidelines
  - Endpointstudier för dragning
  - Endpointstudier för avslut