Eliminačné metódy

Jaroslav Rosenberger

FMC – dialyzačné služby s. r. o.
Transplantačné oddelenie UNLP Košice
I. Interná klinika a Ústav psychológie zdravia UPJŠ Košice

NephroCare

FRESENIUS MEDICAL CARE

CEEA 2017 Košice

Akútne obličkové zlyhanie: definícia

NephroCare

je syndróm, v rámci ktorého organizmus nevie udržať homeostázu:

stály objem a zloženie extracelulárnej tekutiny

acidobázickú rovnováhu

osmolalitu

dochádza k retencii katabolitov

Diagnostické kritériá

NephroCare

FRONTIERS IN NEPHROLOGY

J Am Soc Nephrol 14: 2178–2187, 2003

Acute Renal Failure Definitions and Classification: Time for Change?

RAVINDRA L. MEHTA* and GLENN M. CHERTOW†

*Divisions of Nephrology, Departments of Medicine, *University of California San Diego and †University of California San Francisco, for the PICARD Study Group.*

Diagnostické kritériá

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22 štúdií

16 diagnostických kritérií

nárast kreatinínu

- o nejakú % hodnotu
- o nejakú absolútnu hodnotu
- stupňované kritériá

pokles klírensu kreatinínu

nárast urey

ADQI

Consensus development in acute renal failure: the Acute Dialysis Quality Initiative

John A. Kellum[a], Claudio Ronco[b], Ravindra Mehta[c] and Rinaldo Bellomo[d]

Curr Opin Crit Care 11:527–532.

[a]Department of Critical Care Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania, USA; [b]Department of Nephrology, St Bortolo Hospital, Vicenza, Italy; [c]Division of Nephrology, University of California at San Diego, San Diego, California, USA; and [d]Department of Intensive Care, Austin Hospital, Melbourne, Australia

Correspondence to John A. Kellum, MD, Clinical Research, Investigation, and Systems Modeling of Acute Illness Laboratory, Department of Critical Care Medicine, University of Pittsburgh, 3550 Terrace Street, Pittsburgh, PA 15261, USA
Tel: 412 647 6966; fax: 412 647 3791; e-mail: kellumja@ccm.upmc.edu

Current Opinion in Critical Care 2005, 11:527–532

Table 1. Acute Dialysis Quality Initiative (ADQI) conferences.

Conference	Venue	Topic
ADQI I: 2000	New York, New York	Continuous renal replacement therapy
ADQI II: 2002	Vicenza, Italy	Research in acute renal failure
ADQI III: 2003	Miami Beach, Florida	Blood purification in non-renal critical illness
ADQI IV: 2004	Vicenza, Italy	Prevention of acute renal failure

ADQI a RIFLE

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Research

Open Access

Acute renal failure – definition, outcome measures, animal models, fluid therapy and information technology needs: the Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group

Rinaldo Bellomo[1], Claudio Ronco[2], John A Kellum[3], Ravindra L Mehta[4], Paul Palevsky[5] and the ADQI workgroup[6]

[1]Department of Intensive Care and Medicine, Austin Health, Melbourne, Australia
[2]Department of Nephrology, San Bortolo Hospital, Vicenza, Italy
[3]Departments of Critical Care Medicine and Medicine, University of Pittsburgh Medical Center, and Renal Section, VA Pittsburgh Healthcare System, Pittsburgh, Pennsylvania, USA
[4]Department of Medicine, University of California, San Diego, California, USA
[5]Department of Medicine, University of Pittsburgh Medical Center, and Renal Section, VA Pittsburgh Healthcare System, Pittsburgh, Pennsylvania, USA
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Received: 27 March 2004

Accepted: 22 April 2004

Published: 24 May 2004

Critical Care 2004, 8:R204-R212 (DOI 10.1186/cc2872)

This article is online at: http://ccforum.com/content/8/4/R204

ADQI a RIFLE

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Research

Open Access

Acute renal failure – definition, outcome measures, animal models, fluid therapy and information technology needs: the Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group

Rinaldo Bellomo[1], Claudio Ronco[2], John A Kellum[3], Ravindra L Mehta[4], Paul Palevsky[5] and the ADQI workgroup[6]

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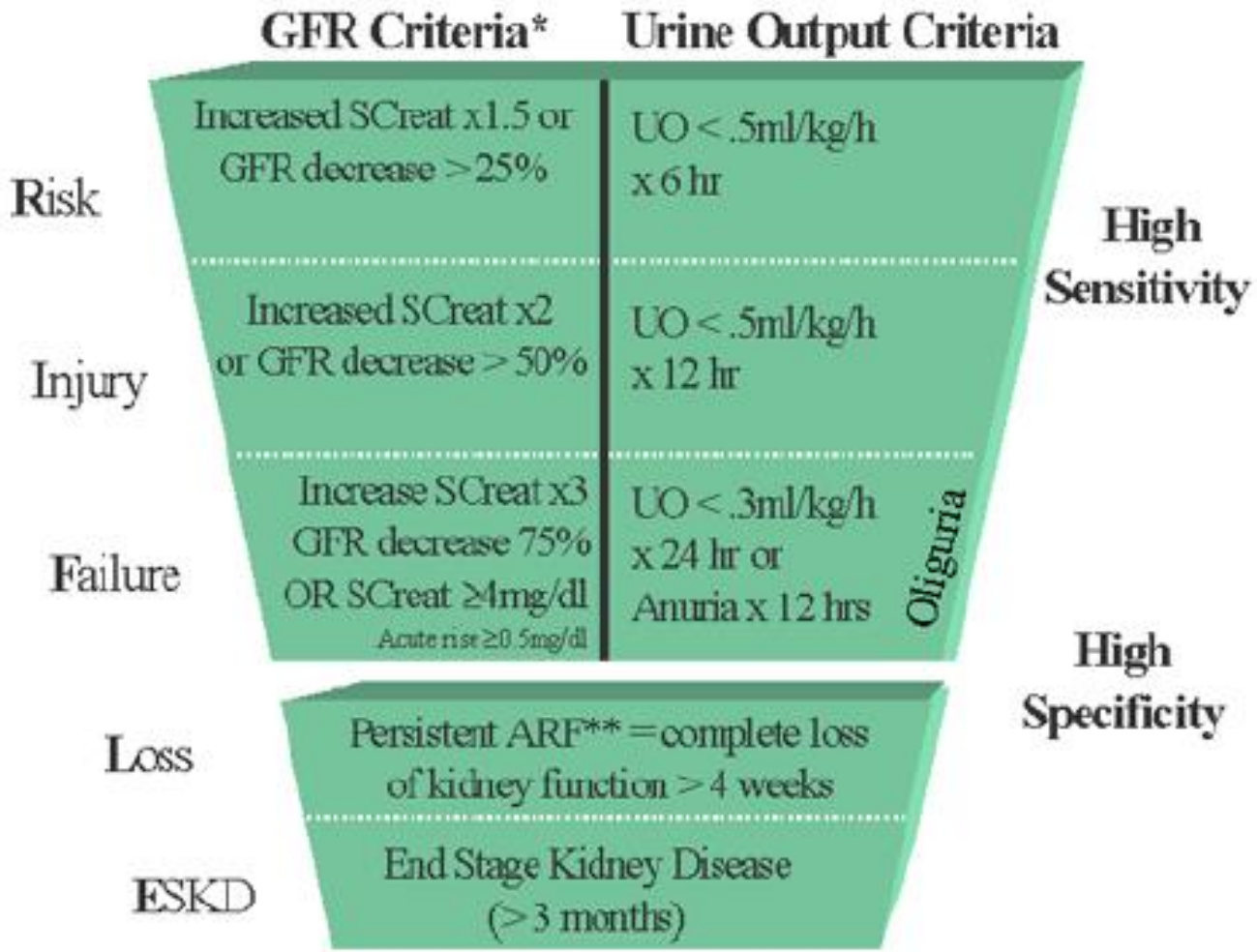
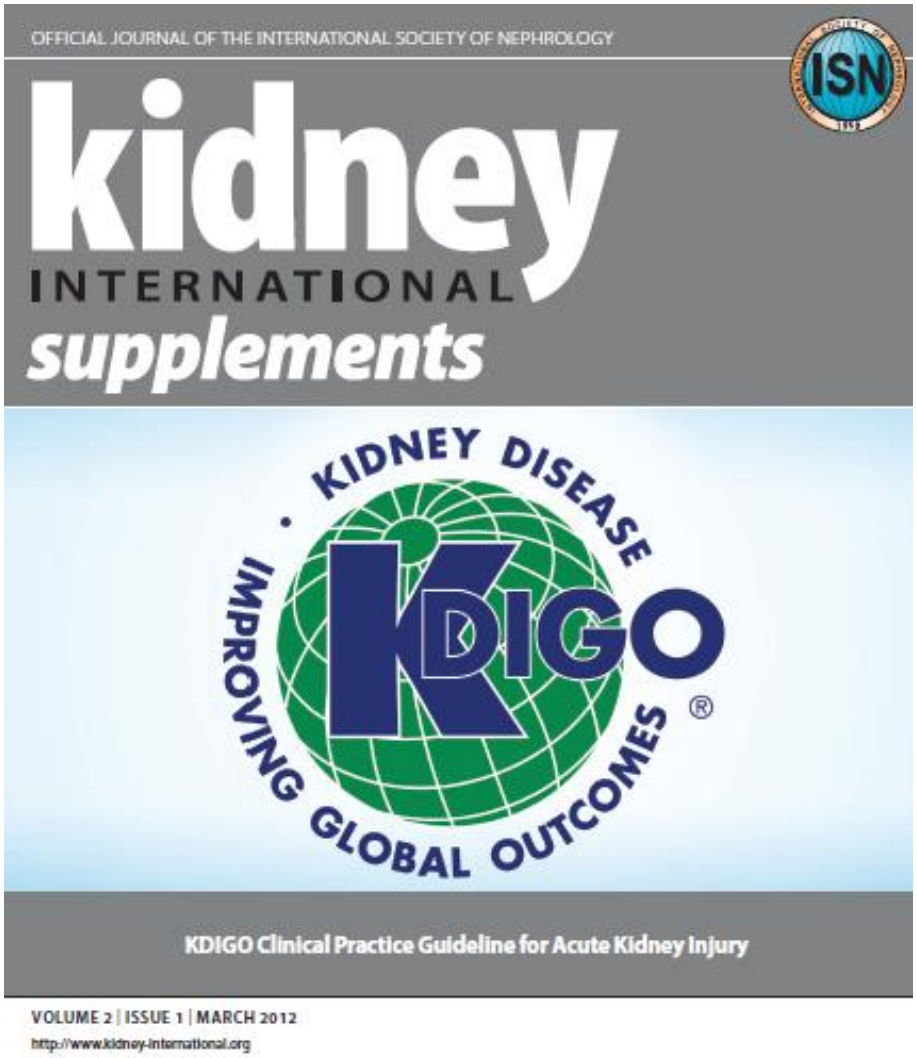
ADQI a RIFLE


GFR Criteria*
Urine Output Criteria
Risk
Increased SCreat x1.5 or GFR decrease > 25%
UO < .5ml/kg/h x 6 hr
Injury
Increased SCreat x2 or GFR decrease > 50%
UO < .5ml/kg/h x 12 hr
Failure
Increase SCreat x3 GFR decrease 75% OR SCreat ≥4mg/dl
Acute rise ≥0.5mg/dl
UO < .3ml/kg/h x 24 hr or Anuria x 12 hrs
Oliguria
Loss
Persistent ARF** = complete loss of kidney function > 4 weeks
ESKD
End Stage Kidney Disease (> 3 months)
High Sensitivity
High Specificity

Odporúčania KDIGO



Odporúčania KDIGO

OFFICIAL JOURNAL OF THE INTERNATIONAL SOCIETY OF NEPHROLOGY

2.1.1: AKI is defined as any of the following (*Not Graded*):

- Increase in SCr by ⩾0.3 mg/dl (⩾26.5 μmol/l) within 48 hours; or
- Increase in SCr to ⩾1.5 times baseline, which is known or presumed to have occurred within the prior 7 days; or
- Urine volume <0.5 ml/kg/h for 6 hours.

2.1.2: AKI is staged for severity according to the following criteria (Table 2). (*Not Graded*)

Table 2 | Staging of AKI

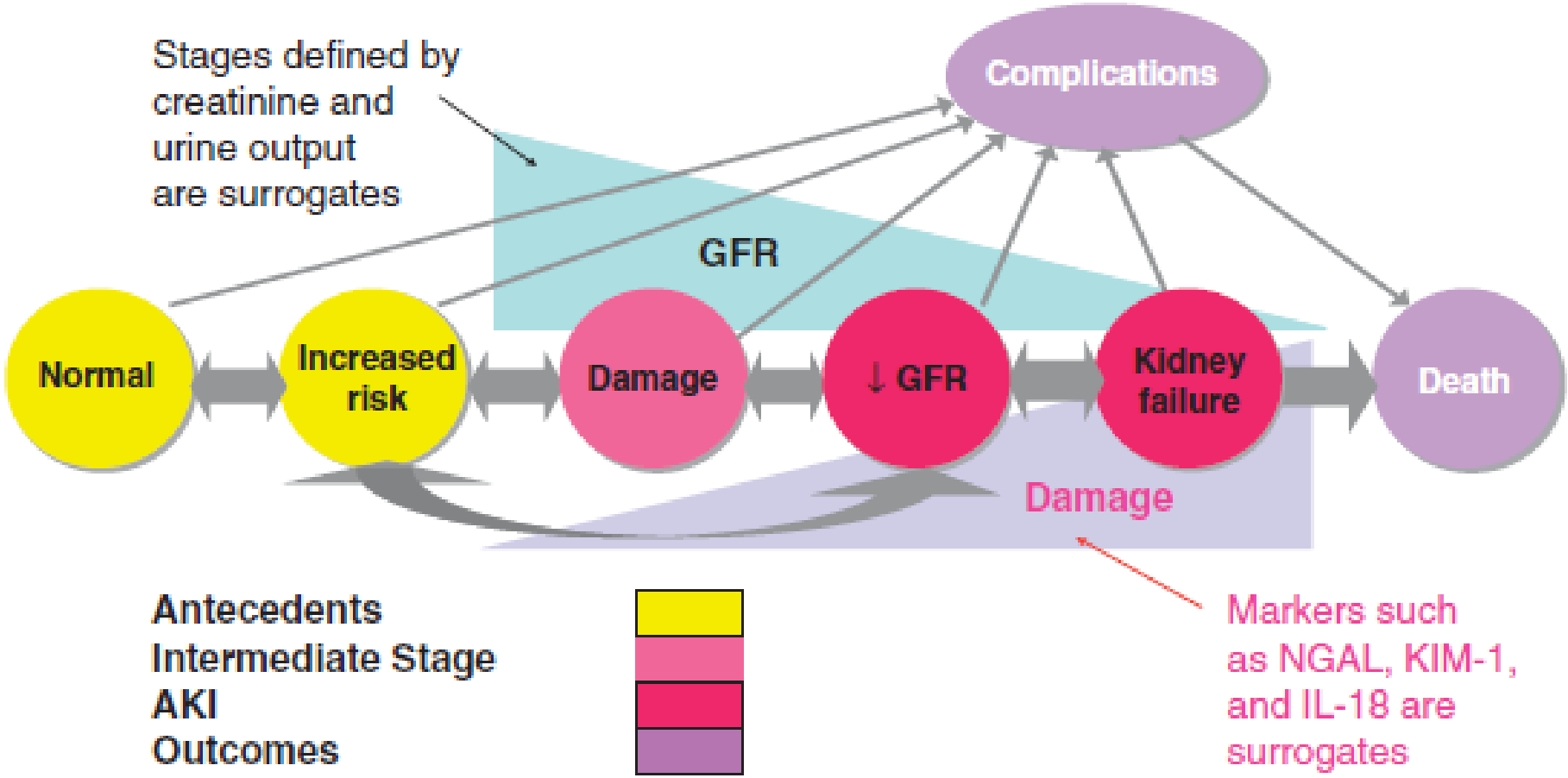
Stage	Serum creatinine	Urine output
1	1.5–1.9 times baseline OR ⩾0.3 mg/dl (⩾26.5 μmol/l) increase	<0.5 ml/kg/h for 6–12 hours
2	2.0–2.9 times baseline	<0.5 ml/kg/h for ⩾12 hours
3	3.0 times baseline OR Increase in serum creatinine to ⩾4.0 mg/dl (⩾353.6 μmol/l) OR Initiation of renal replacement therapy OR, In patients <18 years, decrease in eGFR to <35 ml/min per 1.73 m^2	<0.3 ml/kg/h for ⩾24 hours OR Anuria for ⩾12 hours

KDIGO Clinical Practice Guideline for Acute Kidney Injury

VOLUME 2 | ISSUE 1 | MARCH 2012

http://www.kidney-international.org

Model AKI podľa KDIGO



Diagnostika AKI

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Sérový kreatinín

Meranie hodinovej diurézy

- neposkytujú informácie o mieste a charaktere poškodenia obličiek
- hladina sKr odráža stav obličkových funkcií s dvoj- až trojdňovým oneskorením

NGAL (neutrophil gelatinase-associated lipocalin)

- umožňuje diagnostikovať AKI cca 2 hodiny po inzulte

Cystatín C

N-acetyl-β-D-glukosaminidáza (NAG)

KIM-1 (kidney injury molekule 1)

Interleukín 18

FABP (fatty acid binding protein)

Hepcidín

Osteopontín

α1-mikroglobulín

RBP (Retinol binding proteín)

Stanovenie NGAL v moči

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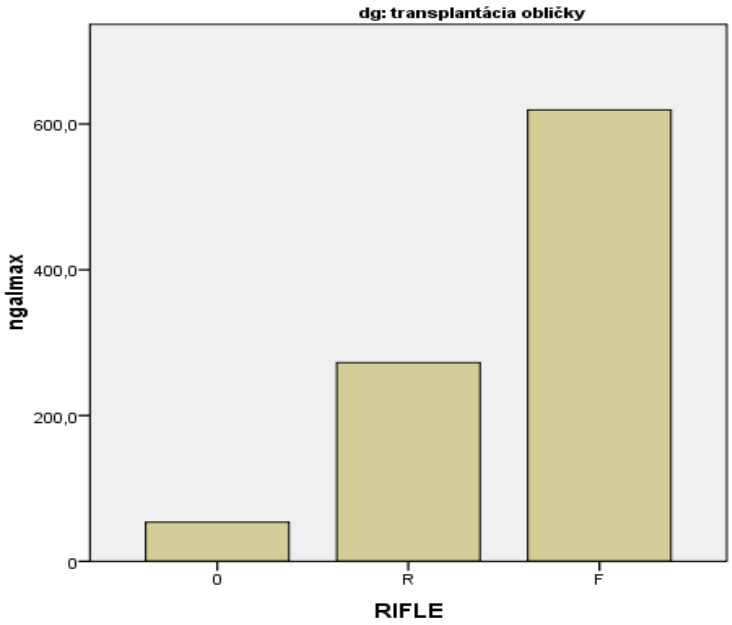
- september až november 2010

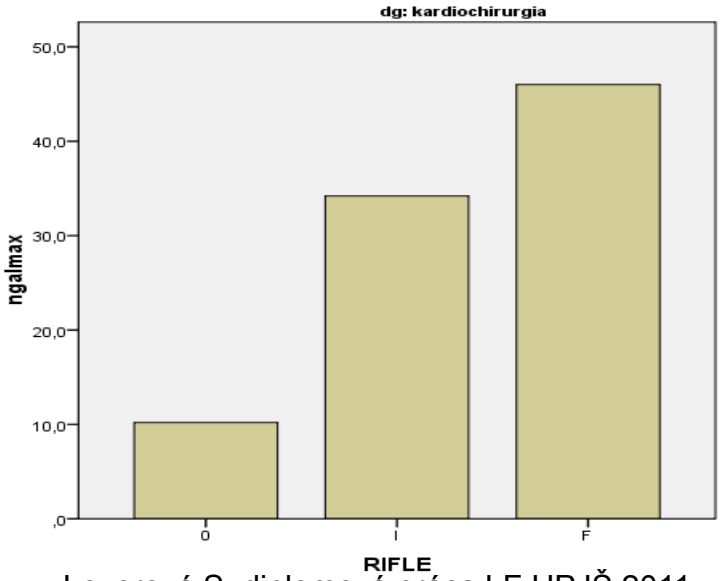
- 11 pacientov s AKI (8 ♂)
- 6 pacientov bolo po transplantácii obličky (TO), 5 pacientov po kardiochirurgickom výkone (KAIM)

- vyšetrenie NGAL v jednorazovom moči aspoň 2 hodiny po ischemicko-reperfúznom poškodení obličiek (resp. transplantovanej obličky)
- chemiluminiscenčná technológia, turbidimetrický test na prístroji Architect Abbott
- porovnanie s bežnými diagnostickými možnosťami (kreatinín, diuréza)

Lozorová S, diplomová práca LF UPJŠ 2011

NGAL v moči a RIFLE





Lozorová S, diplomová práca LF UPJŠ 2011

Vývoj hladín močového NGAL v čase

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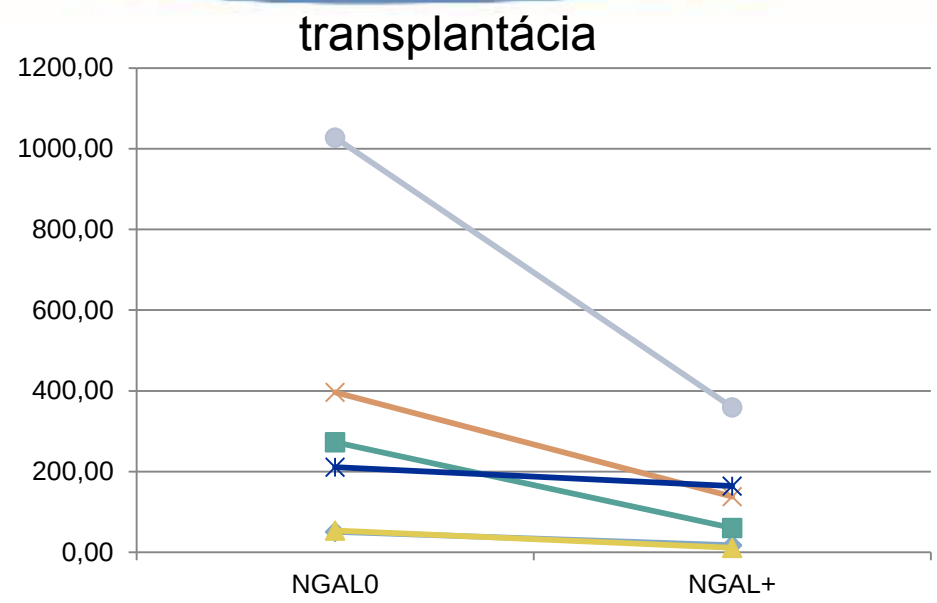
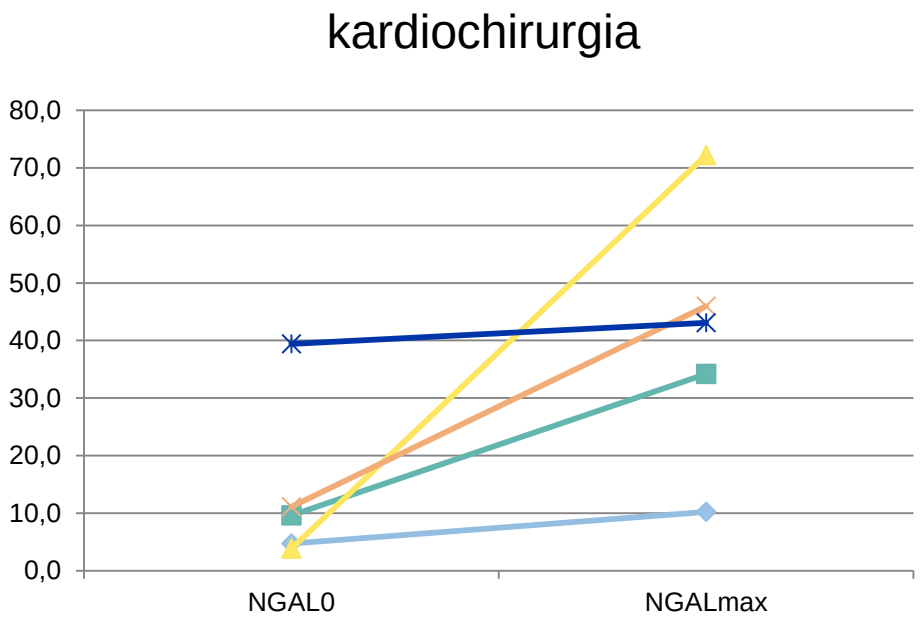
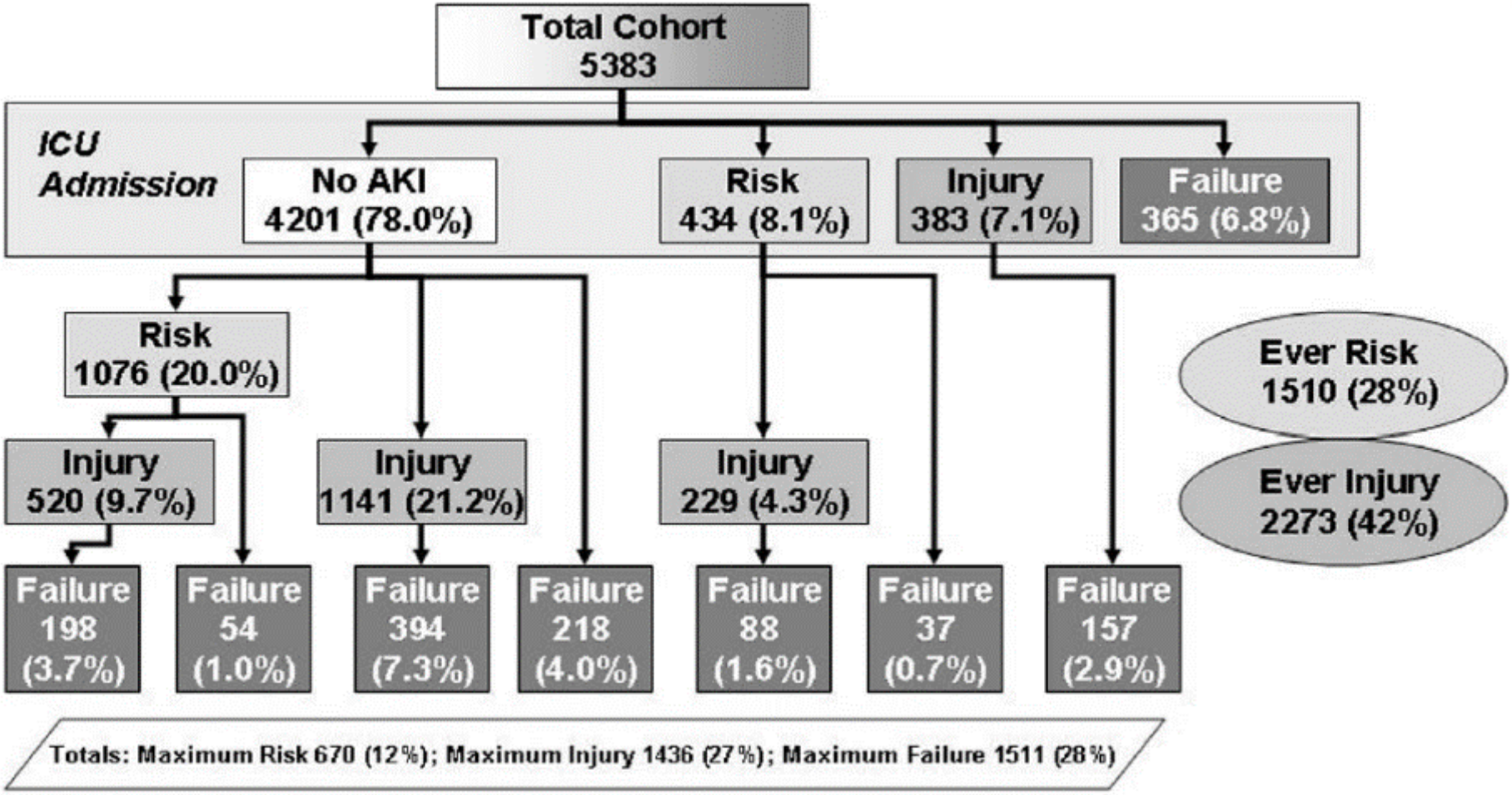




Lozorová S, diplomová práca LF UPJŠ 2011

Epidemiológia AKI

NephroCare



Pacienti spĺňajúci veľmi senzitívne RIFLE „R“ kritériá sú vo vysokom riziku progresie do štádií „I“ a „F“

Hoste et al. Crit Care 2006

Epidemiológia AKI na Slovensku (FMC + Logman)

NephroCare

- 670 pacientov s 3. št. AKI liečených eliminačnými metódami
- 4058 hemodialýz (HD)
- 559 kontinuálnych dialýz (CRRT)

- 252 pacientov zomrelo (mortalita 37,6%)
- 65 pacientov prešlo do trvalého dialyzačného programu (9,7%)

Diagnózy vedúce do 3. št. AKI

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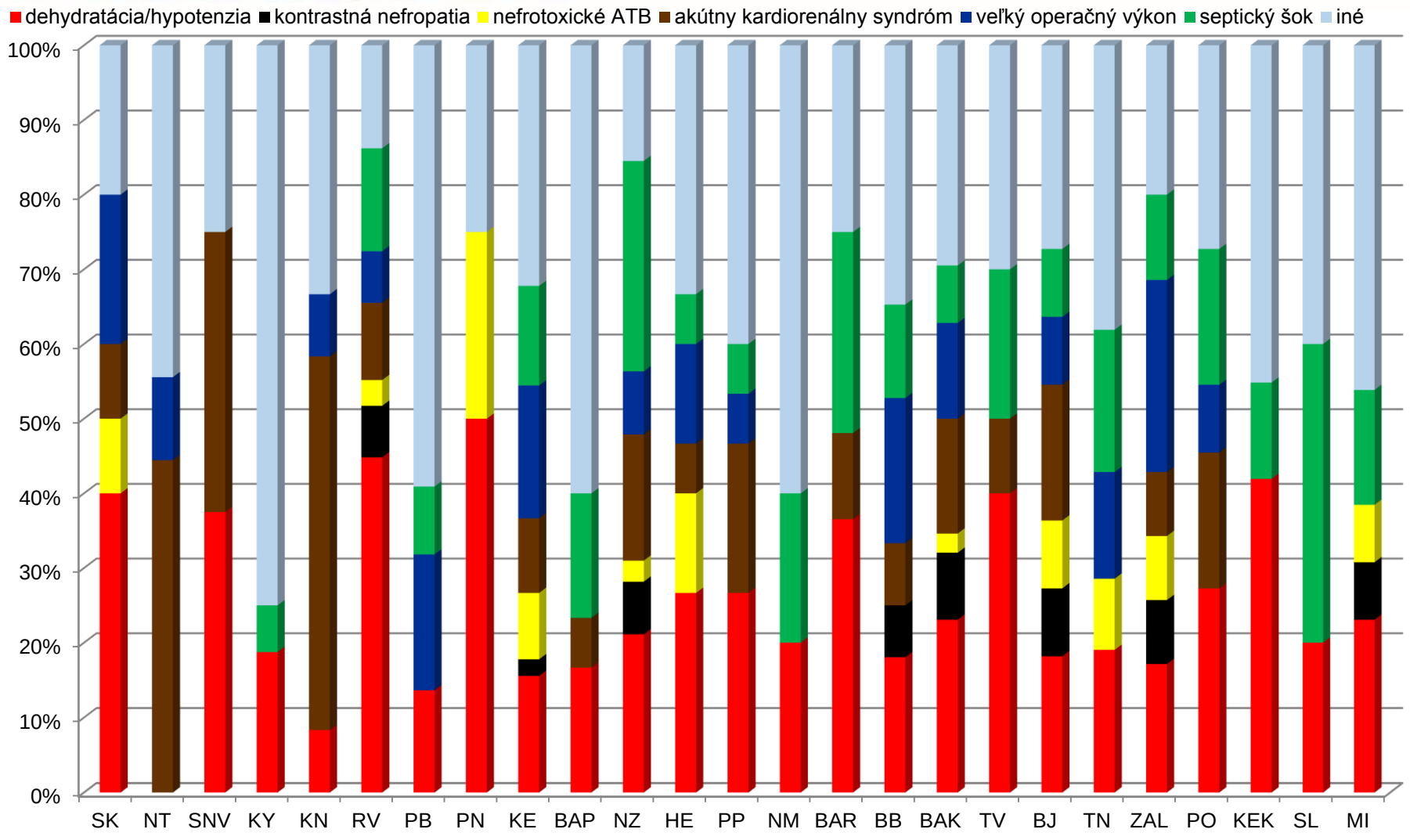

Zhrnutie

- **AKI je časté najmä na OAIM a JIS (do 33%), inak má incidenciu asi 5%**
- **AKI má vysokú mortalitu (20-40%)**
- **asi v 10% prípadov pacienti prejdú do PDL**
- **klasifikácia na tri štádiá AKI (podľa zmeny kreatinínu a/alebo diurézy)**
- **moderná sľubná (ale drahá) dg. metóda: NGAL v moči**
- **v rámci Slovenska sú rozdiely v diagnostike, klasifikácii a následne výsledniciach**
- **najčastejšie príčiny AKI:**
  - dehydratácia/hypotenzia (23%)
  - septický šok (14%)
  - akútny kardiorenálny syndróm (11%)
  - veľký operačný výkon (10%)
  - kontrastná nefropatia (4%)
  - AKI po nefrotoxických liekoch (4%)

Stratégia prevencie a liečby AKI podľa KDIGO

NephroCare

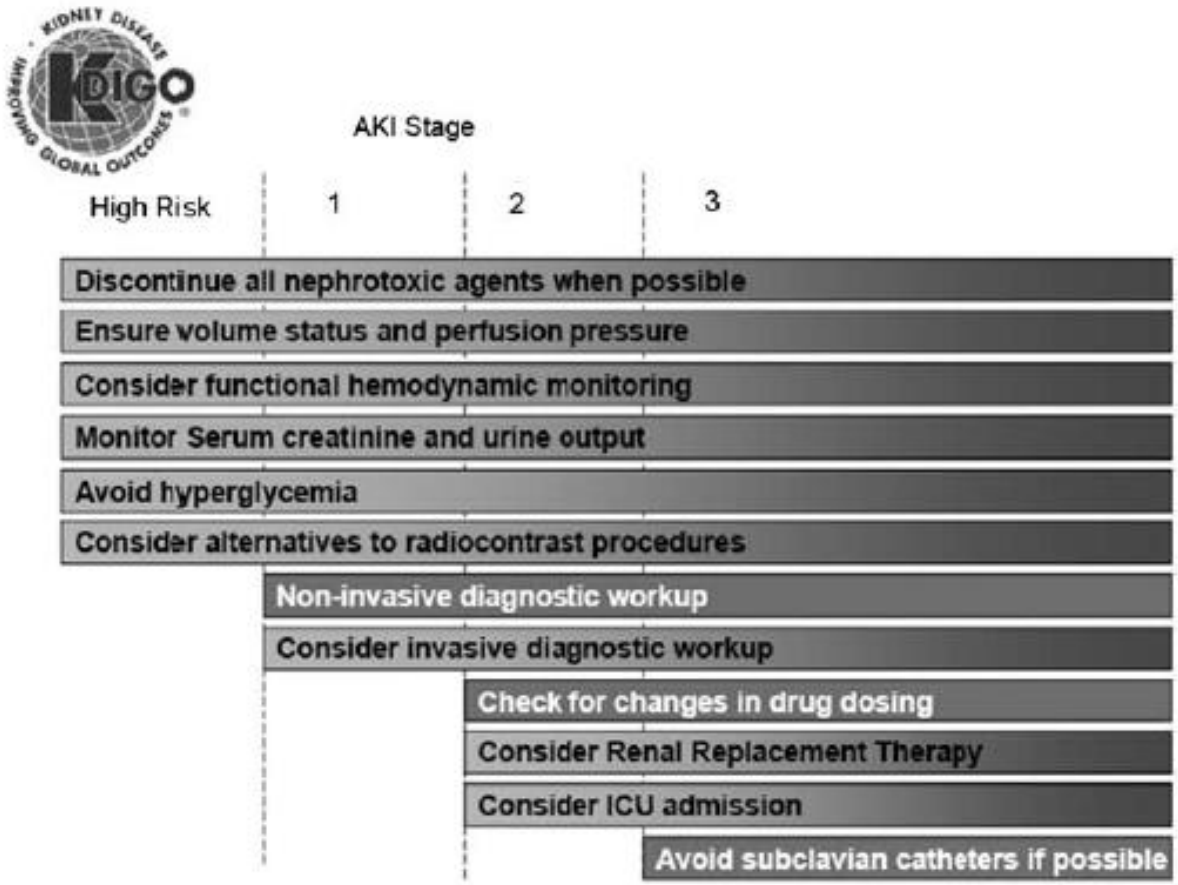

Figure 4 | Stage-based management of AKI. Shading of boxes indicates priority of action—solid shading indicates actions that are equally appropriate at all stages whereas graded shading indicates increasing priority as intensity increases. AKI, acute kidney injury; ICU, intensive-care unit.

Kryštaloidy, vazopresory, hemodynamika a oxygenácia!

3.1.1: In the absence of hemorrhagic shock, we suggest using isotonic crystalloids rather than colloids (albumin or starches) as initial management for expansion of intravascular volume in patients at risk for AKI or with AKI. (*2B*)

3.1.2: We recommend the use of vasopressors in conjunction with fluids in patients with vasomotor shock with, or at risk for, AKI. (*1C*)

3.1.3: We suggest using protocol-based management of hemodynamic and oxygenation parameters to prevent development or worsening of AKI in high-risk patients in the perioperative setting (*2C*) or in patients with septic shock (*2C*).

Z každého rožka troška ...

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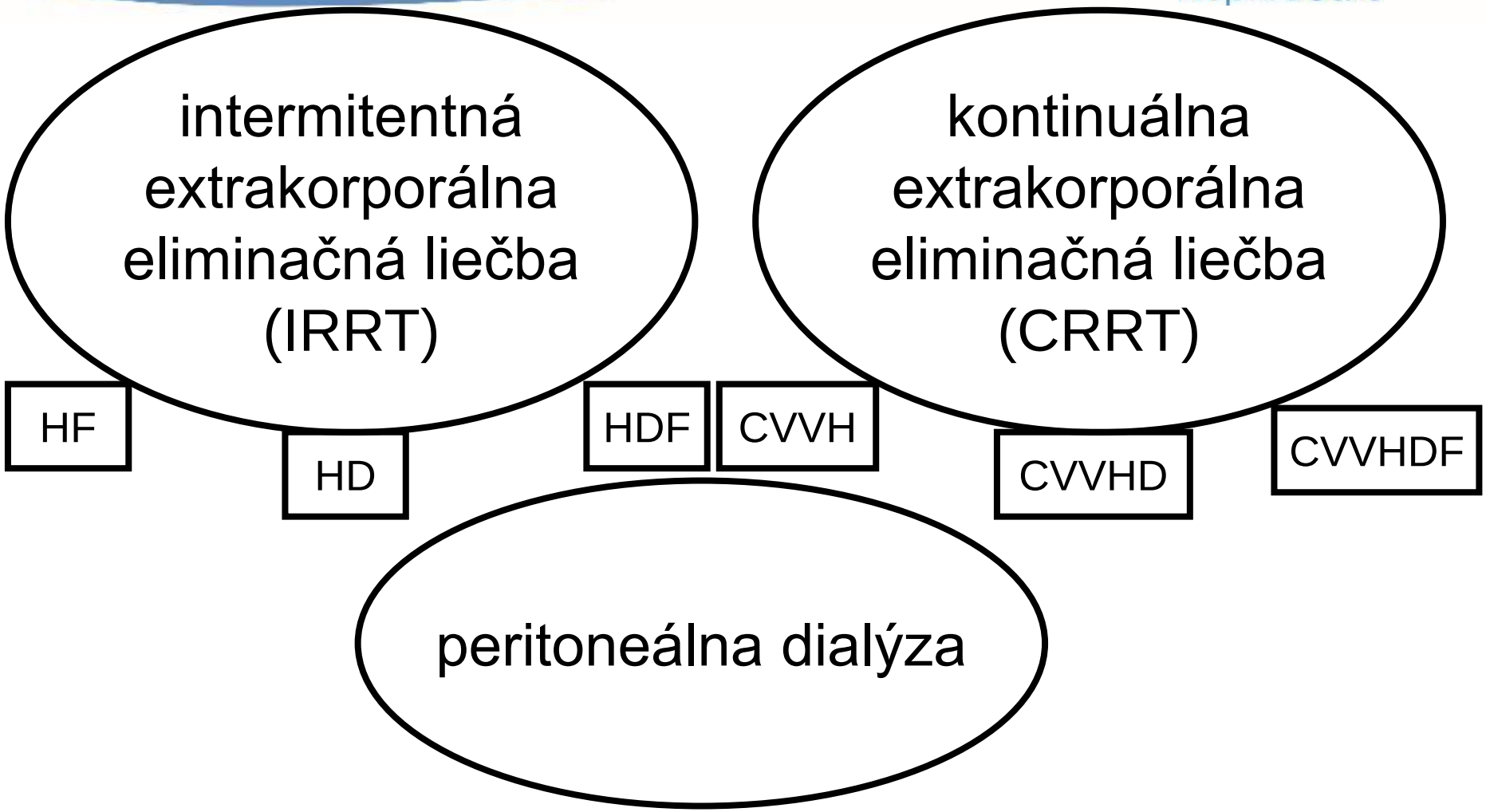
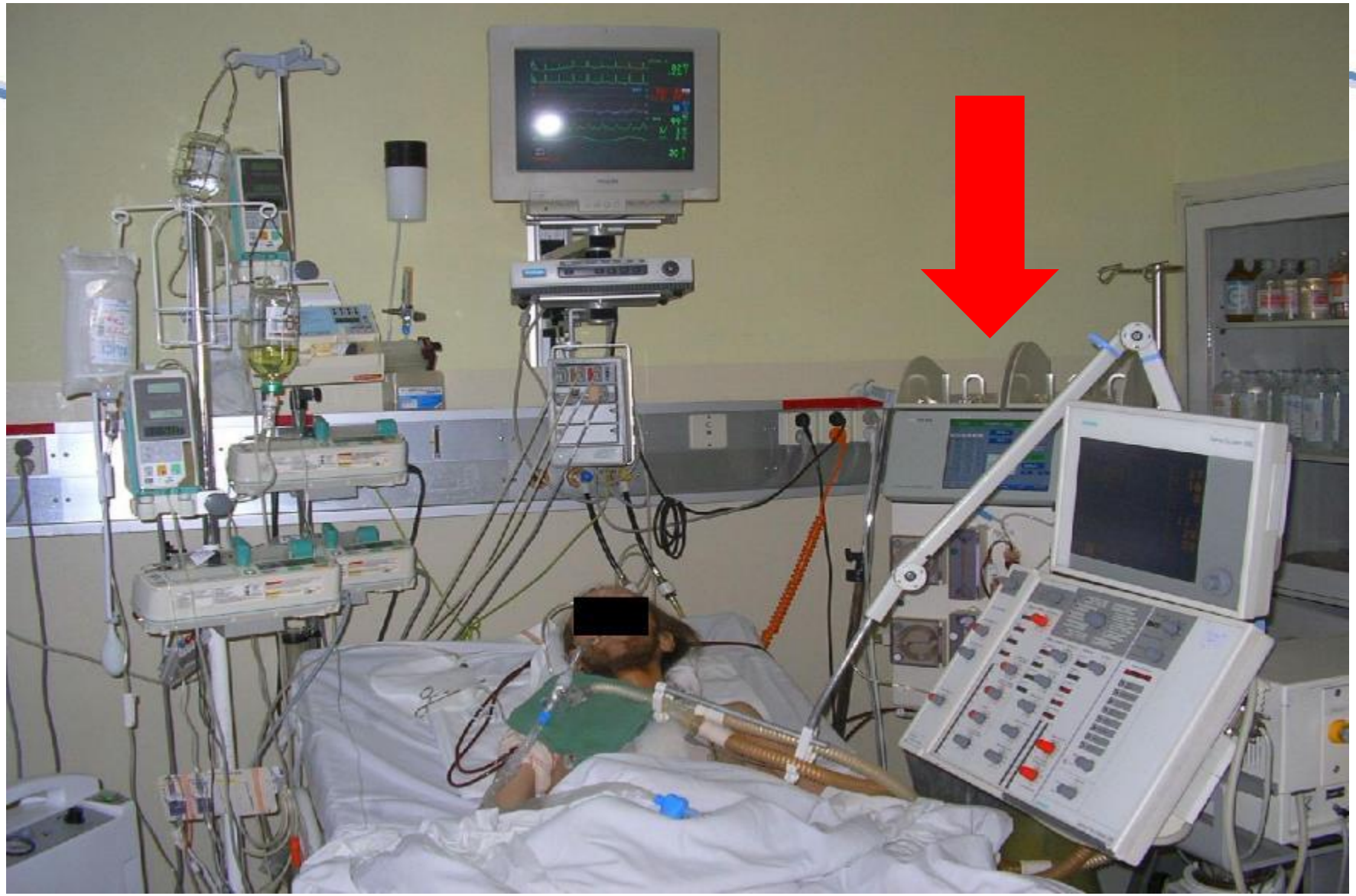
- **Normoglykémia (2C)**
- **Dostatočné energetické krytie (20-30 kcal/kg/d), skôr eneterálne (2C)**
- **Nie nízkobielkovinová diéta! Naopak, dostatok bielkovín! (2D)**
- **Diuretiká neslúžia ani na prevenciu (1B) ani na liečbu AKI! (2C)**
- **„renoprotektívna dávka dopamínu“ je nezmysel (1A)**
- **Nepoužívať fenoldopam (2C), ANP (2C, 2B) ani IGF (1B)**
- **Aminoglykozidy používať v režime 1x denne (2B) a iba keď nie je iná nenefrotoxická alternatíva (2A), treba sledovať hladiny (1A, 2C)**
- **Radšej používať iné možnosti liečby ako klasický amfotericín B (1A)**
- **NAC nepoužívať ako prevenciu AKI pri hypotenzii (2D) a po chirurgickej intervencii (1A)**
- **Zabudnite na profylaktickú dialýzu! (2C)**
- **Kontinuálne eliminačné terapie sú komplementárne k intermitentným, kontinuálne sú vhodnejšie pre nestabilných pacientov a pacientov s opuchom mozgu (2B)**
- **Akútna intermitentná dialýza: týždenné Kt/V 3,9 (1A)**
- **Kontinuálne eliminačné metódy: dávka 20-25 ml/kg/hod (1A)**

Možnosti liečby AKI



Pacient v kritickom stave s AKI



Antikoagulačná liečba

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žiadna

heparín (nefrakcionovaný)

nízkomolekulový heparín

(hirudín)

prostaglandíny

citrát

Antikoagulačná liečba – naše pracoviská do roku 2009

NephroCare

Cieľom tejto práce je porovnať rôzne metódy antikoagulačnej liečby z hľadiska dĺžky trvania mimotelovej eliminačnej liečby vykonávanej pri lôžku pacienta

Charakteristiky práce

NephroCare

retrospektívna
observačná

selekcia!
výber liečby závisel na stave pacienta a dohody nefrológa a intenzivistu

58 kriticky chorých pacientov s akútnym poškodením obličiek
hospitalizovaní na:

- I. KAIM FNLP Košice
- OAIM VÚSCH Košice

142 výkonov CRRT (zväčša CVVHD), obrat aspoň 35 ml/kg/hod

Antikoagulačná liečba

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žiadna (N=6)

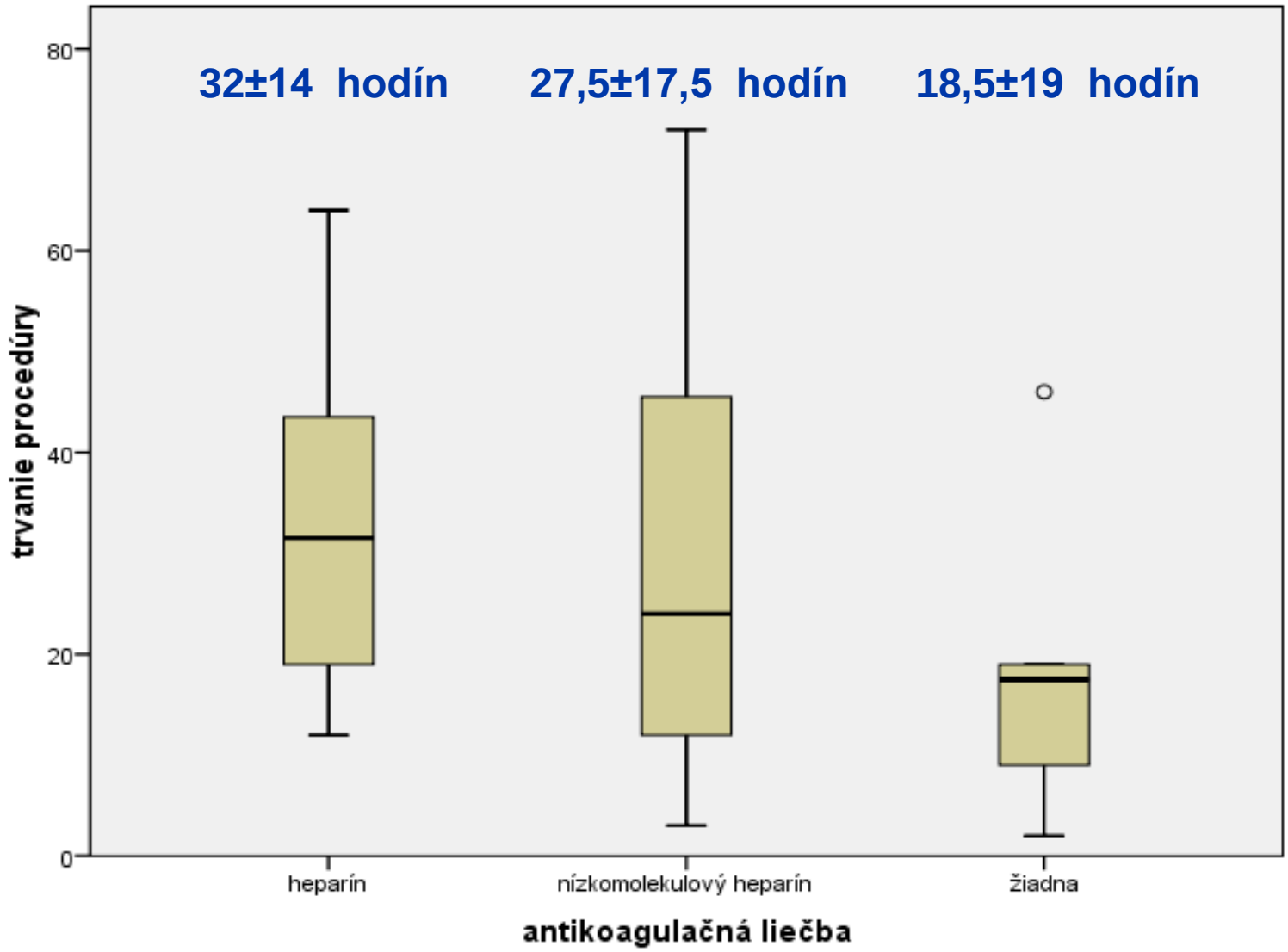
nízkomolekulový heparín (N=87)

- dávka podľa hmotnosti
- intermitentne 1-3x denne i. v.
- niekedy úprava podľa vyšetrenia antiXa

nefrakcionovaný heparín (N=32)

- iniciálne 1000 j./hod i. v., kontinuálne
- úprava podľa APTT

Trvanie procedúry



Citrátová antikoagulácia

NephroCare

3 pacienti

4 procedúry:

- 80 hodín
- 80 hodín
- 24 hodín – ukončenie CVVHD, prechod na HD
- 43 hodín – ukončenie CVVHD, transport

Diskusia

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liečba bez antikoagulácie je problematická

heparín je najúčinnejšou klasickou antikoagulačnou liečbou

v prípade krvácavých komplikácií, resp. rizika krvácania je najlepšou alternatívou regionálna citrátová antikoagulácia

And the winner is: Regional citrate anticoagulation

Table 1. Randomized controlled trials comparing the safety and efficacy of regional citrate anticoagulation and systemic heparins

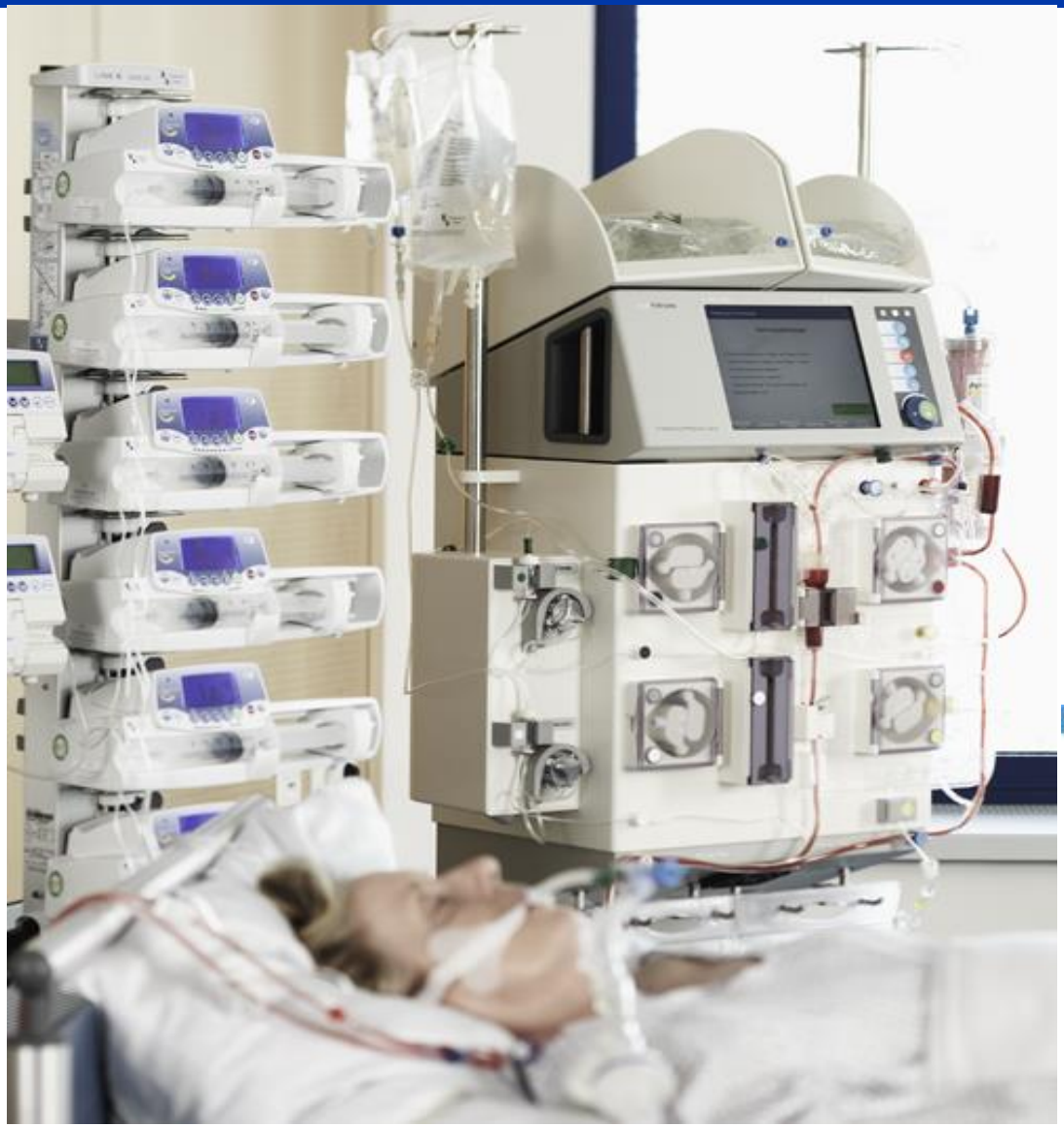
Author	Study Design (Number of Patients)[a]	Anticoagulation Monitoring	CRRT Modality	Filter	Q_B (mL/min)	Q_{UF} (mL/hr)	Citrate (mmol/L Q_B)	Median Circuit Survival (hr)	Major Bleeding Events	Units of PRC per Day of CRRT
Oudemans-van Straaten et al (7)	RCA 97, LMWH 103	Fixed dose LMWH and RCA	Postdilution CVVH	CTA 1.9 m^2	220	2000–4000	3	RCA 27, LMWH 26 ($p = 0.68$)[b]	RCA 6, LMWH 16 ($p = 0.08$)	RCA 0.27, LMWH 0.36 ($p = 0.31$)
Monchi et al (9)	Cross-over RCA-UFH 8, UFH-RCA 12	Circuit iCa <0.3 mmo/L, APTT 60–80 sec	Postdilution CVVH	PS 1.9 m^2	150	35 mL/kg/hr	4.3	RCA 70, UFH 40 ($p = 0.007$)[b]	RCA 0, UFH 1 (p = NR)	RCA 0.2, UFH 1 ($p = 0.0008$)
Betjes et al (8)	RCA 21, UFH 27	Circuit iCa 0.25–0.3 mmo/L, APTT 50–70 sec	Postdilution CVVH	CTA 1.9 m^2	150	1500	3	RCA 36, UFH 38.4 (p = NS)[b]	RCA 0, UFH 10 ($p < 0.01$)	RCA 0.43, UFH 0.88 ($p = 0.01$)
Kutsogiannis et al (10)	RCA 16, UFH 14	Circuit iCa 0.25–35 mmo/L, PTT 45–65 sec	Predilution CVVHDF	AN 69 1.0 m^2	125	1000, Q_D 1000 mL/hr	3.3	RCA 124.5, UFH 38.3 ($p = 0.001$)	RCA 0, UFH 7 (p = NR)	RCA 0.17, UFH 0.33 ($p = 0.13$)

RCA, regional citrate anticoagulation; LMWH, low molecular weight heparin; UFH, unfractionated heparin; iCa, ionized calcium; (A)PTT, (activated) partial thromboplastin time; CVVH, continuous veno-venous hemofiltration; CVVHDF, continuous veno-venous hemodiafiltration; CTA, cellulose triacetate; PS, polysulfone; AN69, polyacrilonitrile; Q_B, blood flow; Q_{UF}, ultrafiltrate flow; Q_D, dialysate flow; NS, not significant; NR, not reported; PRC, packed red cell; CRRT, continuous renal replacement therapy.

[a]Inclusion criteria, patients without contraindications for citrate or systemic heparin; [b]Routine circuit disconnection after 72 hrs.

Bouman CSC. Crit Care Med 2009

Ďakujem za pozornosť!



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