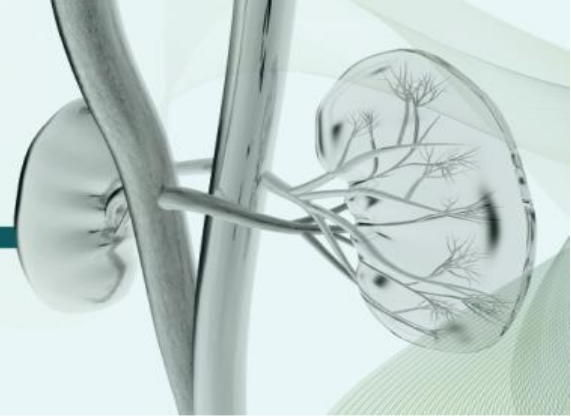
ΕΛΛΗΝΙΚΗ ΝΕΦΡΟΛΟΓΙΚΗ ΕΤΑΙΡΕΙΑ
HELLENIC SOCIETY OF NEPHROLOGY
25ο Πανελλήνιο Συνέδριο ΝΕΦΡΟΛΟΓΙΑΣ
19-21 ΙΟΥΝΙΟΥ 2024
ΜΕΓΑΡΟ ΔΙΕΘΝΕΣ ΣΥΝΕΔΡΙΑΚΟ ΚΕΝΤΡΟ - ΑΘΗΝΑ



Οξεία νεφρική βλάβη στον βαρέως πάσχοντα

Χρήστος Πλέρος
Νεφρολόγος
ΠΑΓΝΗ

NO

Hospitalized patients
47,574

Model of AKI	AKI incidence	Deaths/ subgroup (% dead)	Adjusted odds ratio of mortality (95% CI)*	AUC
sCr increase				0.93
<0.3 mg/dl (no AKI)	N/A	223/14,882 (1.5%)	referent	
≥0.3 mg/dl or to ≥150% of baseline or initiation of dialysis (AKIN stages 1–3)	4,365/19,249 (22.7%)	470/4,365 (10.8%)	4.43 (3.68–5.35)	
sCr increase				0.94
<0.3 mg/dl (no AKI)	N/A	223/14,882 (1.5%)	referent	
≥0.3 mg/dl or to 150–199% of baseline (AKIN stage 1)	3,042/19,249 (15.8%)	193/3,042 (6.3%)	2.81 (2.24–3.52)	
to 200–299% of baseline (AKIN stage 2)	514/19,249 (2.7%)	85/514 (16.5%)	6.69 (4.86–9.20)	
to ≥300% of baseline or [sCr ≥4.0 with increase ≥0.5] or initiation of dialysis (AKIN stage 3)	809/19,249 (4.2%)	192/809 (23.7%)	8.36 (6.43–10.87)	

AKI stages based upon the AKIN staging system [7].
* Adjusted for age, sex, race (black/white/other), chronic kidney disease, and ln(UHC expected mortality).
AUC = Area under receiver-operating characteristic curve.

Wang et al. Am J Nephrol 2012

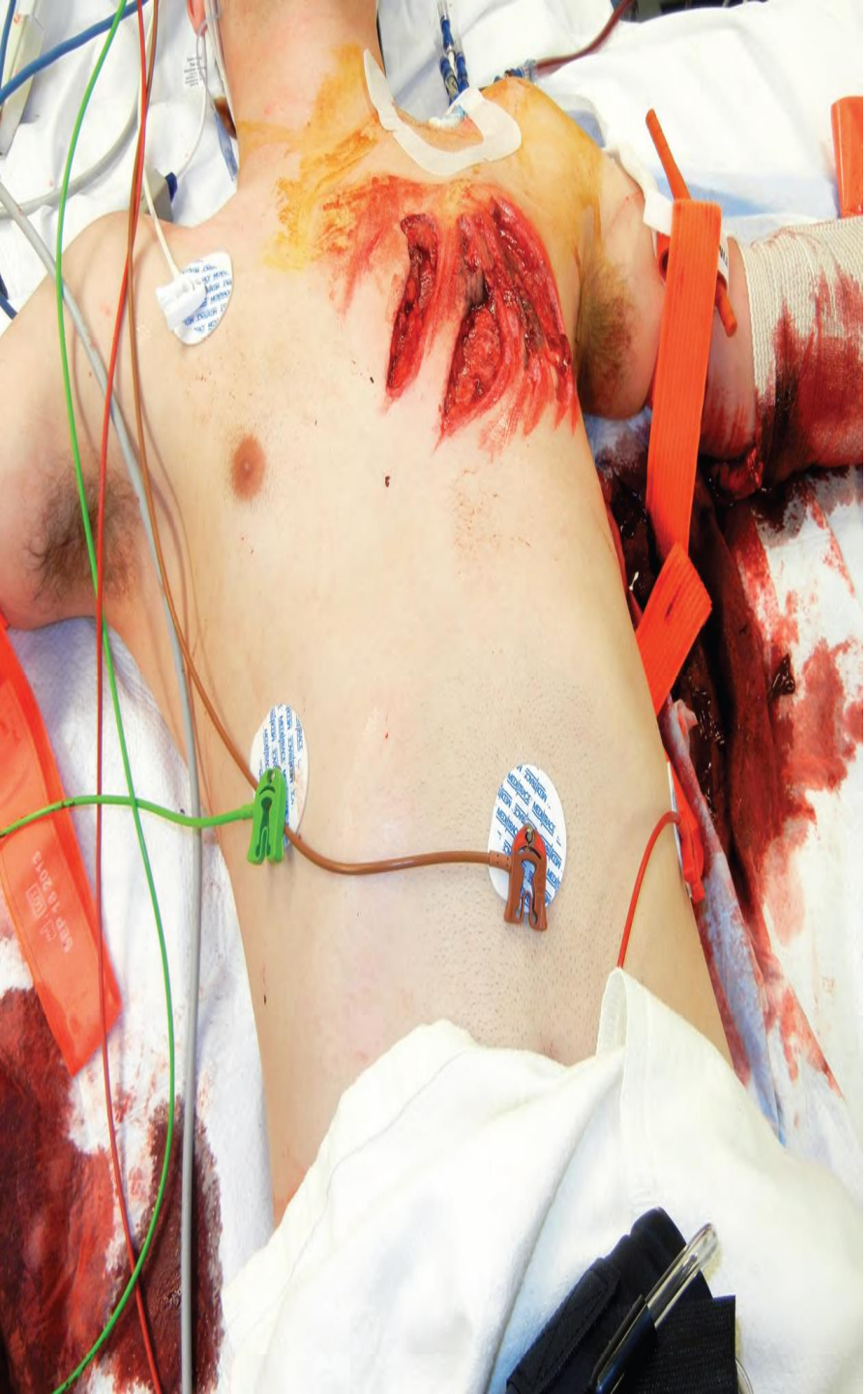


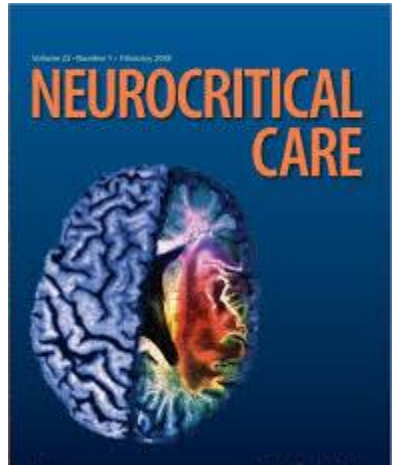
Table 1 Included studies of acute kidney injury (AKI) in ICU trauma patients

First author (publication year)	AKI criteria	Criteria adherence	Population	Recruitment	AKI follow-up time	*N* total	*N* (%) with AKI
Bagshaw (2008) [1]	RIFLE	Modified[a]	Mixed trauma	RCS	24 h	9449	1711 (18)
Yuan (2009) [57]	RIFLE	Modified[a]	Mixed trauma	RCS	In-hospital	3945	423 (11)
Costantini (2009) [41]	AKIN	Original	Mixed trauma	RCS	Unspecified	571	170 (30)
Makris (2009) [49]	RIFLE	Original	Mixed trauma	PCS	5 days	31	11 (36)
Bihorac (2010) [40]	RIFLE	Modified	Mixed trauma	PCS	28 days	982	253 (26)
de Abreu (2010) [38]	RIFLE	Modified	Mixed trauma	RCS	Hospital stay	129	52 (40)
Fang (2010) [43]	RIFLE	Modified	TBI	RCS	Not specified	171	53 (31)
Gomes (2010) [45]	RIFLE	Original[a]	Mixed trauma	PCS	ICU stay	436	217 (50)
Li (2011) [47]	AKIN	Original	TBI	RCS	In-hospital	136	31 (23)
Shashaty (2012) [53]	AKIN	Modified	Mixed trauma	PCS	5 days	400	147 (37)
Li (2013) [48]	AKIN	Original	TBI	PCS	Hospital stay	55	13 (24)
Podoll (2013) [50]	AKIN	Modified	Mixed trauma	RCS	72 h	901	54 (6)
Skinner (2014) [2]	RIFLE	Modified	Mixed trauma	RCS	Hospital stay	666	102 (15)
Ahmed (2015) [39]	AKIN	Original	TBI	RCS	Hospital stay	95	11 (12)
Eriksson (2015) [42]	KDIGO	Modified[a]	Mixed trauma	PCS	1 year	413	103 (25)
Heegard (2015) [26]	KDIGO	Modified[a]	Military	PCS	14 days	134	46 (34)
Reilly (2015) [52]	AKIN	Modified	Mixed trauma	PCS	6 days	497	134 (27)
Stewart (2016) [56]	KDIGO	Modified[a]	Military	RCS	7 days	3807	474 (13)
Fujinaga (2017) [44]	KDIGO	Original[a]	Mixed trauma	PCS	ICU stay	333	66 (20)
Raju (2017) [51]	AKIN	Unknown	Mixed trauma	PCS	Not specified	90	14 (16)
Skinner (2017) [54]	KDIGO	Modified[a]	Mixed trauma	RCS	Not specified	310	46 (15)
Ülger (2017) [27]	KDIGO	Original[a]	Mixed trauma	RCS	Not specified	198	147 (74)
Haines (2018) [46]	KDIGO	Modified	Mixed trauma	RCS	7 days	830	163 (20)
Skrifvars (2018) [55]	KDIGO	Original	TBI	RCT	7 days	603	82 (14)

Sovik et al. Intensive Care Med 2019

Table 1. Demographic Data and Clinical Characteristics of the Control Cohort and AKI Patients.[a]

Parameter	All Patients	Control Group	AKI	*P* Value
Epidemiology				
Patients, n (%)	681 (100)	602 (88.4)	79 (11.6)	
Gender, M/F (%)	377 (55.4)/304 (44.6)	326 (54.2)/276 (45.8)	51 (64.6)/28 (35.4)	.092
Age, median (IQR)	62.5 (49-73)	61.5 (48-73)	69.0 (58-76)	<.01
SAPS II score at admission	29 (22-37)	29 (21-36)	34 (28.8-42)	<.01
Diagnosis at admission				
Neurologic autoimmune disorder, n (%)	15 (2.2)	13 (2.2)	2 (2.5)	.6894
Intracranial hemorrhage, n (%)	330 (48.5)	299 (49.7)	31 (39.2)	.0937
Infection of the CNS, n (%)	75 (11)	68 (11.3)	7 (8.9)	.701
Ischemic stroke, n (%)	97 (14.2)	75 (12.5)	22 (27.8)	<.01
Tumor, n (%)	99 (14.5)	89 (14.8)	10 (12.7)	.735
Others, n (%)	65 (9.5)	58 (9.6)	7 (8.9)	1.0
Comorbidities				
Hypertension, n (%)	400 (58.7)	342 (56.8)	58 (73.4)	<.01
Diabetes mellitus, n (%)	127 (18.5)	98 (16.3)	29 (36.7)	<.01
Coronary artery disease, n (%)	127 (18.6)	105 (17.4)	22 (27.8)	<.05
Peripheral artery disease, n (%)	25 (3.7)	17 (2.8)	8 (10.1)	<.01
Cerebrovascular disease, n (%)	325 (47.7)	271 (45)	54 (68.4)	<.01
Chronic kidney disease, n (%)	57 (8.4)	25 (4.2)	32 (40.5)	<.01
Risk profile				
Surgery, n (%)	458 (67.3)	412 (68.4)	46 (58.2)	.0749
Contrast agents, n (%)	473 (69.5)	424 (70.4)	49 (60.8)	.1524
Antibiotic therapy, n (%)	539 (79.1)	464 (76.9)	75 (94.9)	<.01
Infection, n (%)	508 (74.6)	437 (72.6)	71 (89.9)	<.01
Nephrotoxic agents				
Anti-infectives, n (%)	182 (26.7)	143 (23.8)	39 (49.4)	<.01
Contrast dye, n (%)	473 (69.5)	424 (70.4)	49 (62.0)	.152
Nephrotoxic medication, n (%)	206 (30.2)	166 (27.6)	40 (50.6)	<.01
Contrast dye + nephrotoxic medication	148 (21.7)	122 (20.3)	26 (32.9)	.7735
Others, n (%)	32 (4.7)	29 (4.8)	3 (3.8)	1.0
Intensive care				
Length of ICU stay, days, median (IQR)	10 (4.5-16)	9 (4-16)	11 (5-21)	<.05
Length of hospital stay, days, median (IQR)	16 (10-25)	16 (10-24)	20 (10-33)	.058
Duration of mechanical ventilation, hours, median (IQR)	122 (5-330.5)	111 (2-309.3)	240 (98-525)	<.01
SAPS II score maximum, median (IQR)	35 (28-45)	34 (26-43)	48.5 (38.8-59)	<.01
SAPS II score cumulative, median (IQR)	271 (119-482)	241 (112-452)	468.5 (270-876)	<.01
Mortality, n (%)	110 (16.2%)	80 (13.3)	30 (38.0)	<.01



Büttner et al. J Intensive Care Med 2020

Table 1 Summary of publications between 2010 and 2015 on critically ill cancer patients with AKI

Reference	Multicenter (Yes/No)	Type of cancer	Population	Reasons for admission to ICU	Definition of AKI	Incidence of AKI	Cause(s) of AKI/ contributing factors
[46]	No	Hemato	537 with induction chemo	-	50 % rise in SCr above baseline RIFLE	36 % RIFLE R: 15 % I: 10 % F: 11 %	?
[48]	No	Hemato	344	Infections/ noninfectious complications	?	16.6 %	?
[47]	No	Hemato	94	Severe sepsis/ shock: 71 % Renal failure: 17 % Respiratory failure: 12 %	Need for RRT RIFLE	RIFLE R:7 % I: 33 % F: 60 %	Septic AKI: 54 % Nonseptic AKI: 46 % Nephrotoxic drugs: 15/94 Hypovolemic: 13/94 TLS: 11/94
[32]	No	All	3795 medical/ surgical pts	Oncology ICU Not specified	Assess link to outcome of increases of SCr cfr RIFLE	21.8 % RIFLE R: 12.5 % I: 4.9 % F: 4.5 %	Multiple
[40]	Yes	All	All AKI 773 pts Ca pts: 118 (15.2 %) Solid cancer: 73 % Hemato: 27 %	Serious comorbidities	RIFLE before start of RRT	118/773 100 % AKI RIFLE R: 25 % I: 24 % F: 52 %	Sepsis: 78 % Ischemia/shock: 74 % Toxins/contrast: 32 %
[45]	No	Hemato	199 pts onco	Oncology ICU Respiratory failure: 33 % Postoperative: 20 % Sepsis: 21.1 %	? Need for RRT?	8 % on ICU admission	?

Table 1 Summary of publications between 2010 and 2015 on critically ill cancer patients with AKI *(Continu*

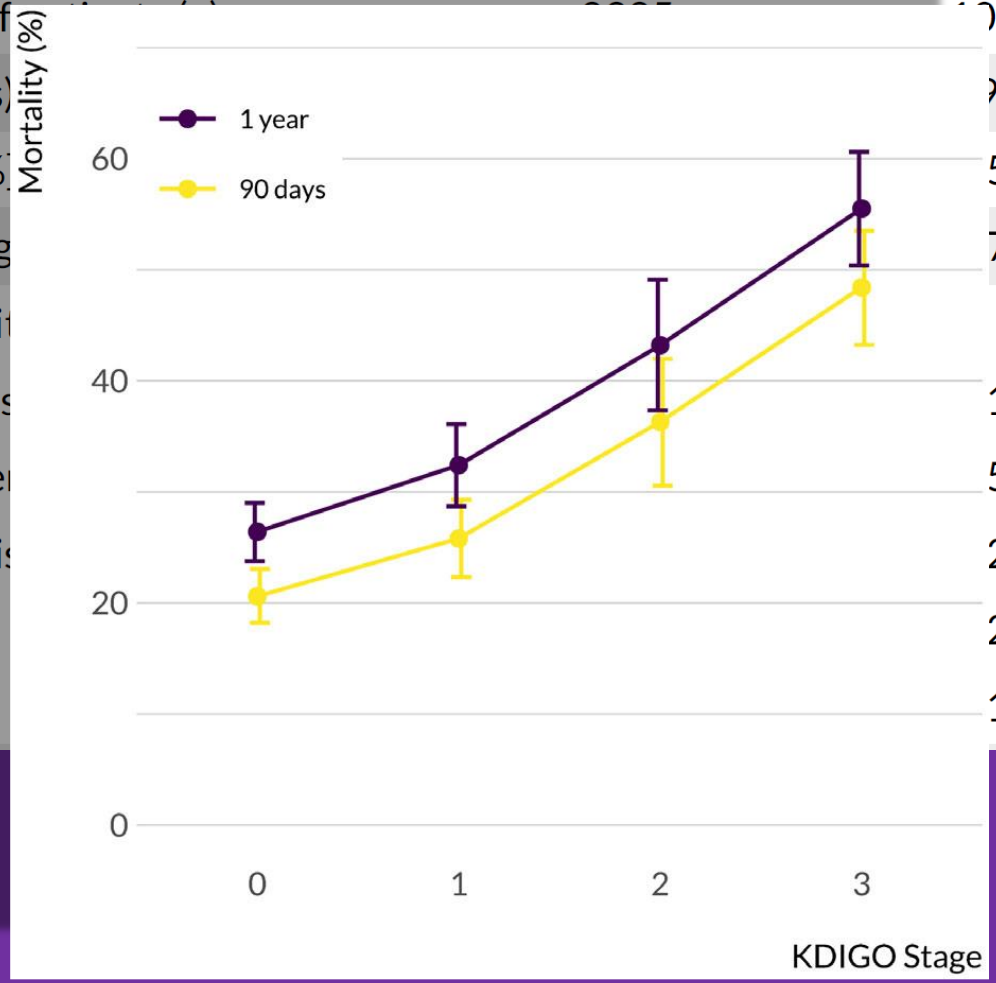
[44]	No	All	477 ca pts	ICU surgical pts	AKIN criteria	10.3 % on ICU admission	Post surgery
[6]	No	All	563 ca pts with sepsis Solid cancer: 77 % Hemato: 23 %	Sepsis	? Need for RRT?	20 % on RRT	Sepsis
[11]	No	Hemato	200 pts	Start chemo 1 day before ICU See [73]	RIFLE	Total:68.5 % RIFLE R: 27 % I: 19.7 % F: 53.3 %	Prerenal: 48.2 % TLS: 43.8 % ATN: 28.5 % Nephrotoxicity: 20.4 % Multiple causes: 45.3 %
[42]	No	All	162 ca pts Solid cancer: 104 Hemato: 35.8 %	Septic shock: 66.7 % Respiratory failure: 63.6 %	? Need for RRT?	AKI: 30 % Hemato: 41 % Solid cancer: 23 %	?
[43]	No	All	56 pts with chemo	Chemo	?	16 % Hospital nonsurvivors: 13 % Hospital survivors: 18 %	?
[33]	Yes	All	Hemato: 1741 Solid tumors: 602	Not specified	?	Hemato: 20 % Solid cancer: 11 %	?
[30]	Yes	All	Ca pts: 357 (19.8 % of all admissions) AKI-EPI study	Multiple	KDIGO	59 %	?
[41]	Yes	Hemato	Neutropenic pts: 289	Sepsis: 80 % Acute respiratory failure: 64 % Shock: 58 %	? Need for RRT?	18 %	?

Lameire et al. Critical Care 2016

53.5%

General ICU

	All	No AKI	AKI
Number of		080	1245
Age (years)		.8 (43, 70)	66.5 (56, 74)
Male (*n* [%		52 (60.4%)	770 (61.8%)
Weight (kg		76 (66, 77)	80 (70, 83)
Comorbidit			
Diabetes		19 (11%)	223 (17.9%)
Hyperte		58 (23.9%)	418 (33.6%)
Heart dis		22 (11.3%)	222 (17.8%)
COPD		25 (11.6%)	163 (13.1%)
CKD		12 (1.1%)	72 (5.8%)



Mo et al. Acta Anaesthesiol Scand 2022

Intensive Care Med (2015) 41:1411–1423
DOI 10.1007/s00134-015-3934-7

SEVEN-DAY PROFILE PUBLICATION

Eric A. J. Hoste
Sean M. Bagshaw
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Dinna N. Cruz
Kyriakos Edipidis
Lui G. Forni
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Olivier Joannes-Boyau
Michael Joannidis
Anna-Maija Korhonen
Athina Lavrentieva
Ravindra L. Mehta
Paul Palevsky
Eric Roessler
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Shigehiko Uchino
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Erick Vidal Andrade
Steve Webb
John A. Kellum

Epidemiology of acute kidney injury in critically ill patients: the multinational AKI-EPI study

Table 1 Baseline characteristics, outcomes, and adjusted odds ratios for acute kidney injury

Table 1 continued

	All patients	No AKI	AKI	*p*
History	1171 (65 %)	439 (57.0 %)	732 (70.9 %)	
ICU admission value	461 (25.6 %)	283 (36.8 %)	178 (17.2 %)	
MDRD recalculated value	169 (9.4 %)	48 (6.2 %)	121 (11.7 %)	
eGFR (mL/min/1.73 m^2)	81 (60, 96)	85 (70, 101)	76 (53, 93)	<0.001
eGFR <60 mL/min/1.73 m^2	446 (24.8 %)	118 (15.3 %)	328 (31.8 %)	<0.001
Vasoactive drugs before ICU admission	318 (17.6 %)	100 (13.0 %)	218 (21.1 %)	<0.001
Infection	272 (15.1 %)	92 (11.9 %)	180 (17.4 %)	0.001
Outcomes				
ICU outcomes				
Length of stay ICU (days)	5 (3, 9)	4 (3, 6)	6 (4, 12)	<0.001
$Creatinine_{discharge}$ (mg/dL) (n = 1165)	0.9 (0.7, 1.4)	0.8 (0.6, 1.0)	1.2 (0.8, 2.0)	<0.001
RRT at discharge (n = 1693)	118 (7.0 %)	1 (0.1 %)	117 (12.1 %)	<0.001
eGFR (mL/min/1.73 m^2)	80 (46, 104)	95 (75, 110)	57 (29, 89)	<0.001
eGFR <60 mL/min/1.73 m^2	400 (34.3 %)	70 (13.2 %)	330 (52.0 %)	<0.001
Death	266 (15.7 %)	34 (4.7 %)	232 (24.0 %)	<0.001
Hospital outcomes				
Length of stay (days)	14 (8, 26)	12 (7, 22)	15 (9, 29)	<0.001
$Creatinine_{discharge}$ (mg/dL) (n = 1057)	0.9 (0.7, 1.3)	0.8 (0.7, 1.0)	1.1 (0.8, 1.8)	<0.001
RRT at discharge (n = 1694)	44 (2.6 %)	0 (0 %)	44 (4.5 %)	<0.001
eGFR (mL/min/1.73 m^2)	79 (50, 103)	94 (72, 110)	61 (33.5, 90)	<0.001
eGFR <60 mL/min/1.73 m^2	346 (32.7 %)	71 (14.8 %)	275 (47.7 %)	<0.001
Death	312 (18.4 %)	52 (7.2 %)	260 (26.9 %)	<0.001
	Odds ratio	95 % Confidence interval	*p*	

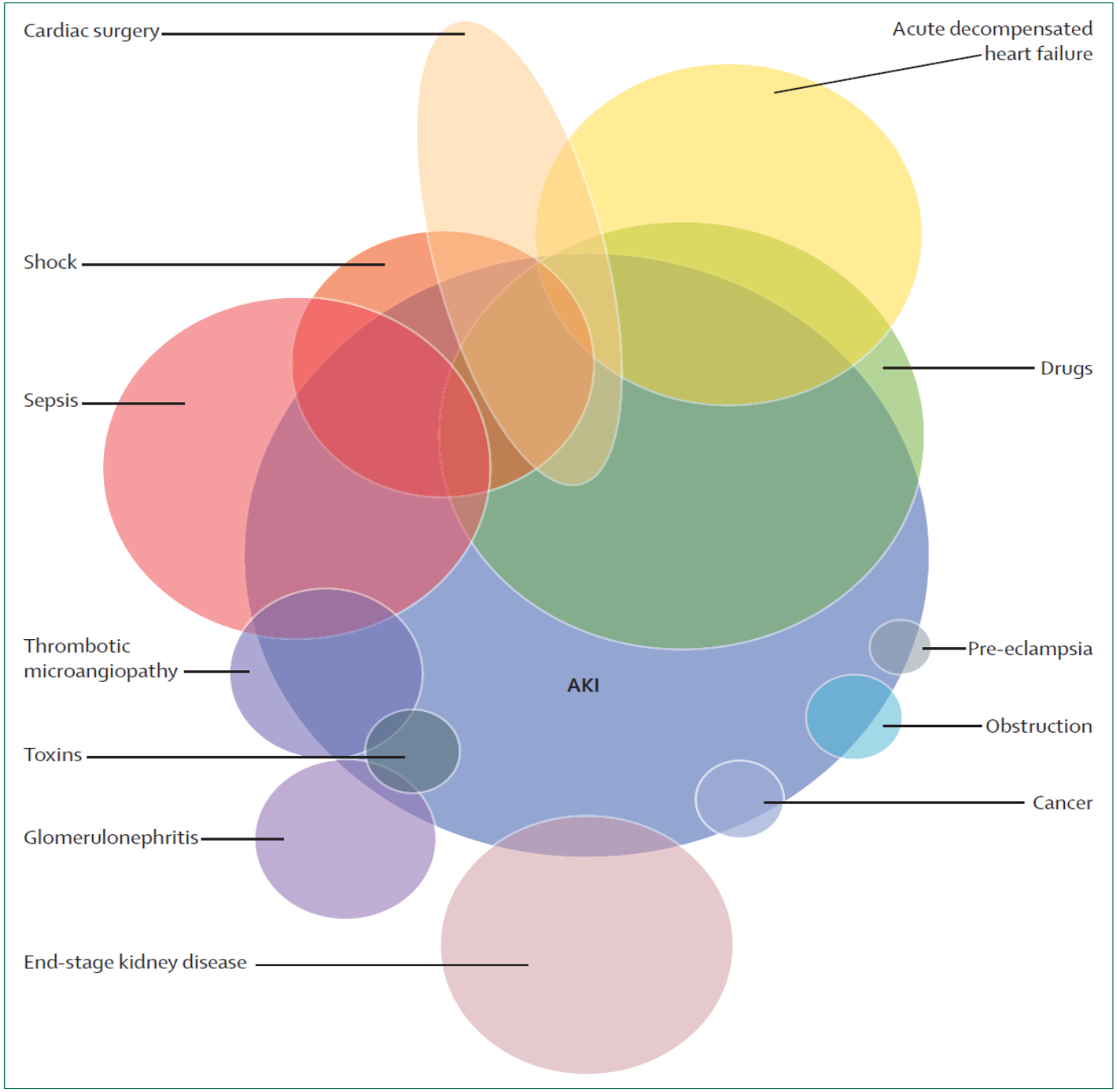
Seminar

Acute kidney injury

Claudio Ronco, Rinaldo Bellomo, John A Kellum

THE LANCET

2019



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Epidemiology of acute kidney injury in critically ill patients: the multinational AKI-EPI study

Table 2 Variables at the time of acute kidney injury ($n = 666$)

Etiology of AKI	
Sepsis	271 (40.7 %)
Hypovolemia	227 (34.1 %)
Drug related	96 (14.4 %)
Cardiogenic shock	88 (13.2 %)
Hepatorenal syndrome	21 (3.2 %)
Obstruction of the urine outflow tract	9 (1.4 %)
Predisposing factors for AKI	
Diuretic treatment	216 (32.4 %)
NSAID administration	79 (11.9 %)
Aminoglycoside administration	45 (6.8 %)
Glycopeptide administration	9 (1.4 %)
Amphotericin administration	0 (0 %)
Radiocontrast media administration	14 (2.1 %)

Surviving Sepsis Campaign

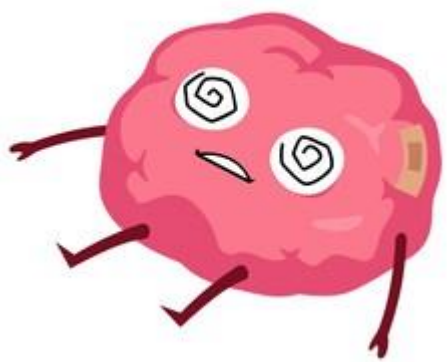
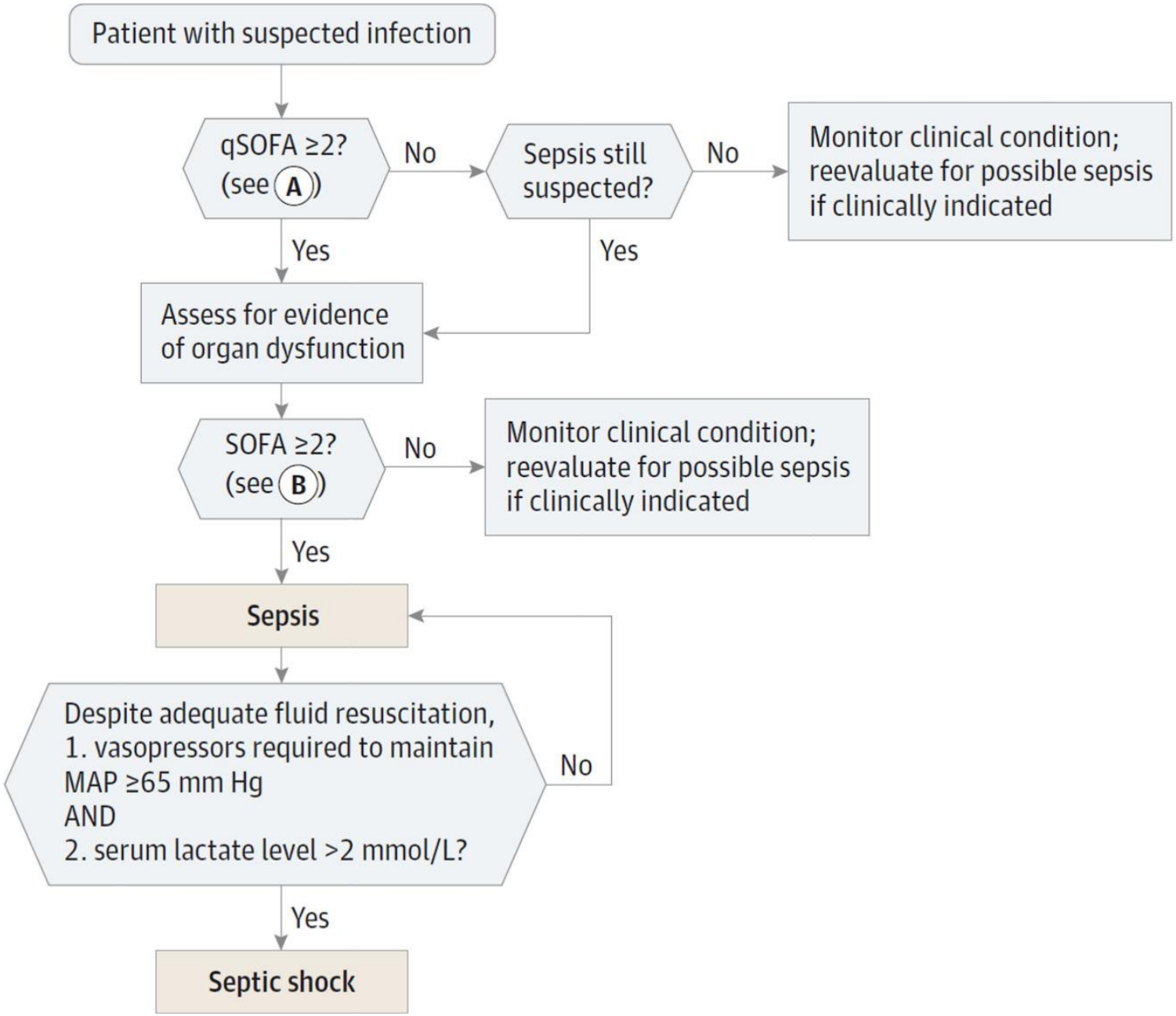


Table 1 Diagnostic criteria for sepsis

Infection, documented or suspected, and some of the following:
- General variables
  - Fever (>38.3 °C)
  - Hypothermia (core temperature <36 °C)
  - Heart rate >90 min^{-1} or more than two SD above the normal value for age
  - Tachypnea
  - Altered mental status
  - Significant edema or positive fluid balance (> 20 mL/kg over 24 h)
  - Hyperglycemia (plasma glucose >140 mg/dL or 7.7 mmol/L) in the absence of diabetes
- Inflammatory variables
  - Leukocytosis (WBC count >12,000 μL^{-1})
  - Leukopenia (WBC count <4,000 μL^{-1})
  - Normal WBC count with greater than 10 % immature forms
  - Plasma C-reactive protein more than two SD above the normal value
  - Plasma procalcitonin more than two SD above the normal value
- Hemodynamic variables
  - Arterial hypotension (SBP <90 mmHg, MAP <70 mmHg, or an SBP decrease >40 mmHg in adults or less than two SD below normal for age)
- Organ dysfunction variables
  - Arterial hypoxemia (PaO_2/FiO_2 <300)
  - Acute oliguria (urine output <0.5 mL kg^{-1} h^{-1} for at least 2 h despite adequate fluid resuscitation)
  - Creatinine increase >0.5 mg/dL or 44.2 μmol/L
  - Coagulation abnormalities (INR >1.5 or aPTT >60 s)
  - Ileus (absent bowel sounds)
  - Thrombocytopenia (platelet count <100,000 μL^{-1})
  - Hyperbilirubinemia (plasma total bilirubin >4 mg/dL or 70 μmol/L)
- Tissue perfusion variables
  - Hyperlactatemia (>1 mmol/L)
  - Decreased capillary refill or mottling

3rd International Consensus for Sepsis and Septic Shock



A qSOFA Variables

- Respiratory rate
- Mental status
- Systolic blood pressure

B SOFA Variables

- PaO_2/FiO_2 ratio
- Glasgow Coma Scale score
- Mean arterial pressure
- Administration of vasopressors with type and dose rate of infusion
- Serum creatinine or urine output
- Bilirubin
- Platelet count

Singer et al. JAMA 2016

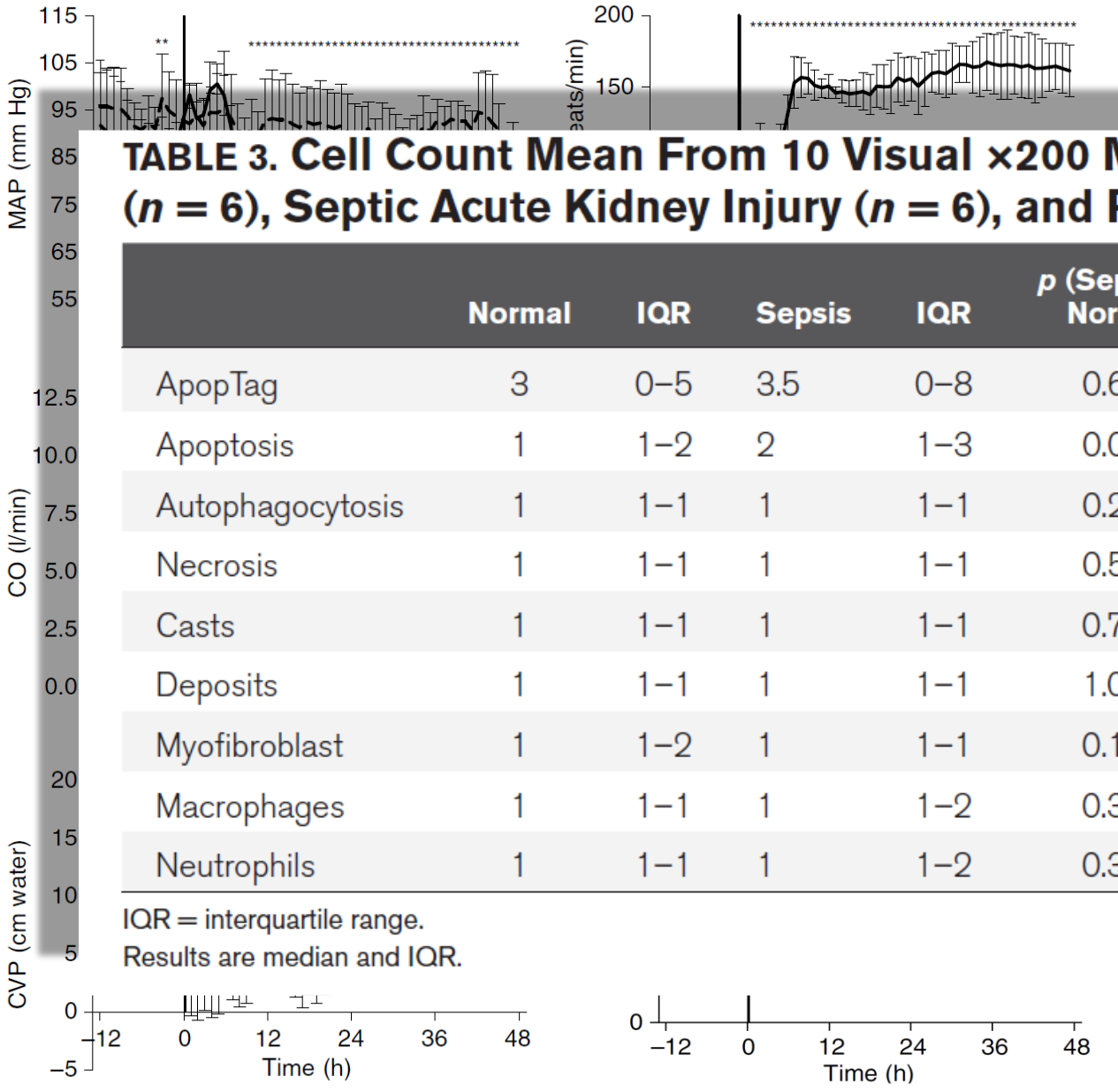


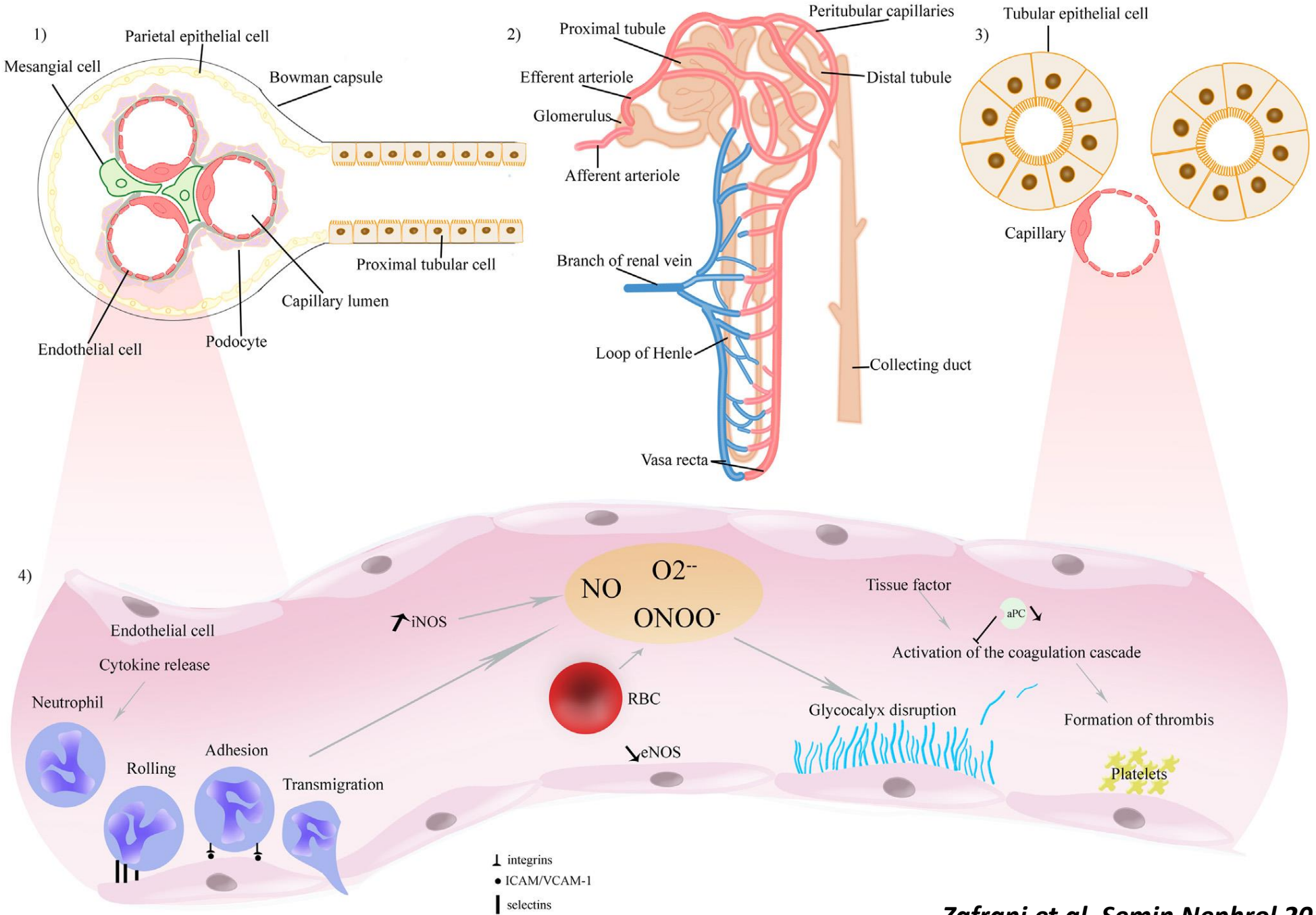
TABLE 3. Cell Count Mean From 10 Visual ×200 Microscope Fields Per Slide for Normal ($n = 6$), Septic Acute Kidney Injury ($n = 6$), and Recovered Animals ($n = 5$)

	Normal	IQR	Sepsis	IQR	*p* (Sepsis vs Normal)	Recovery	IQR	*p* (Recovery vs Normal)	*p* (Sepsis vs Recovery)
ApopTag	3	0–5	3.5	0–8	0.618	14	4–34	0.002	0.005
Apoptosis	1	1–2	2	1–3	0.071	1	1–1	0.484	0.037
Autophagocytosis	1	1–1	1	1–1	0.284	1	1–1	0.491	0.706
Necrosis	1	1–1	1	1–1	0.552	1	1–1	0.446	0.848
Casts	1	1–1	1	1–1	0.783	1	1–1	0.809	0.960
Deposits	1	1–1	1	1–1	1.000	1	1–1	0.273	0.273
Myofibroblast	1	1–2	1	1–1	0.150	1	1–1	0.075	0.590
Macrophages	1	1–1	1	1–2	0.317	1	1–1	0.483	0.098
Neutrophils	1	1–1	1	1–2	0.327	1	1–1	0.862	0.312

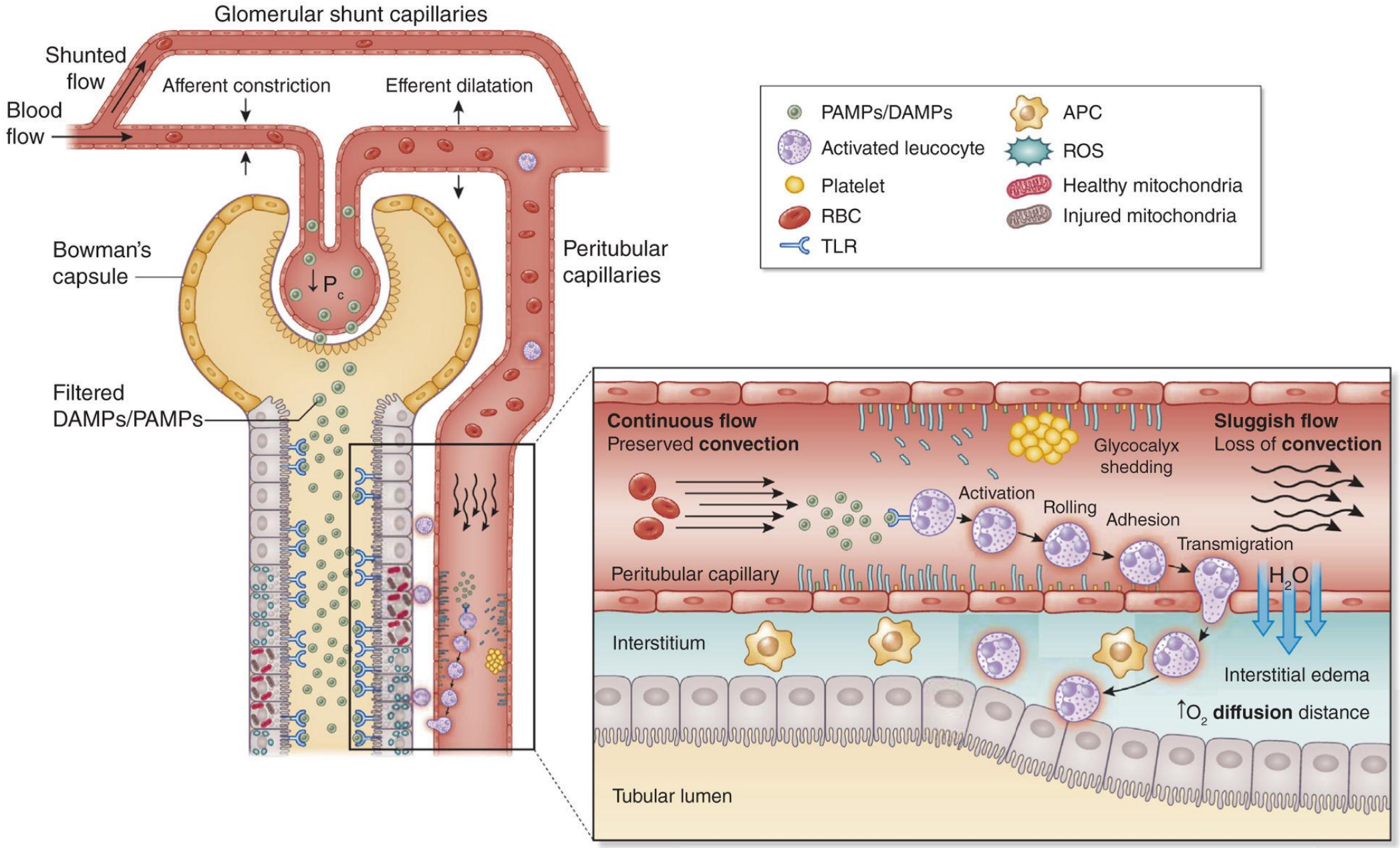
IQR = interquartile range.
Results are median and IQR.

Langenberg et al. Kidney Int 2006

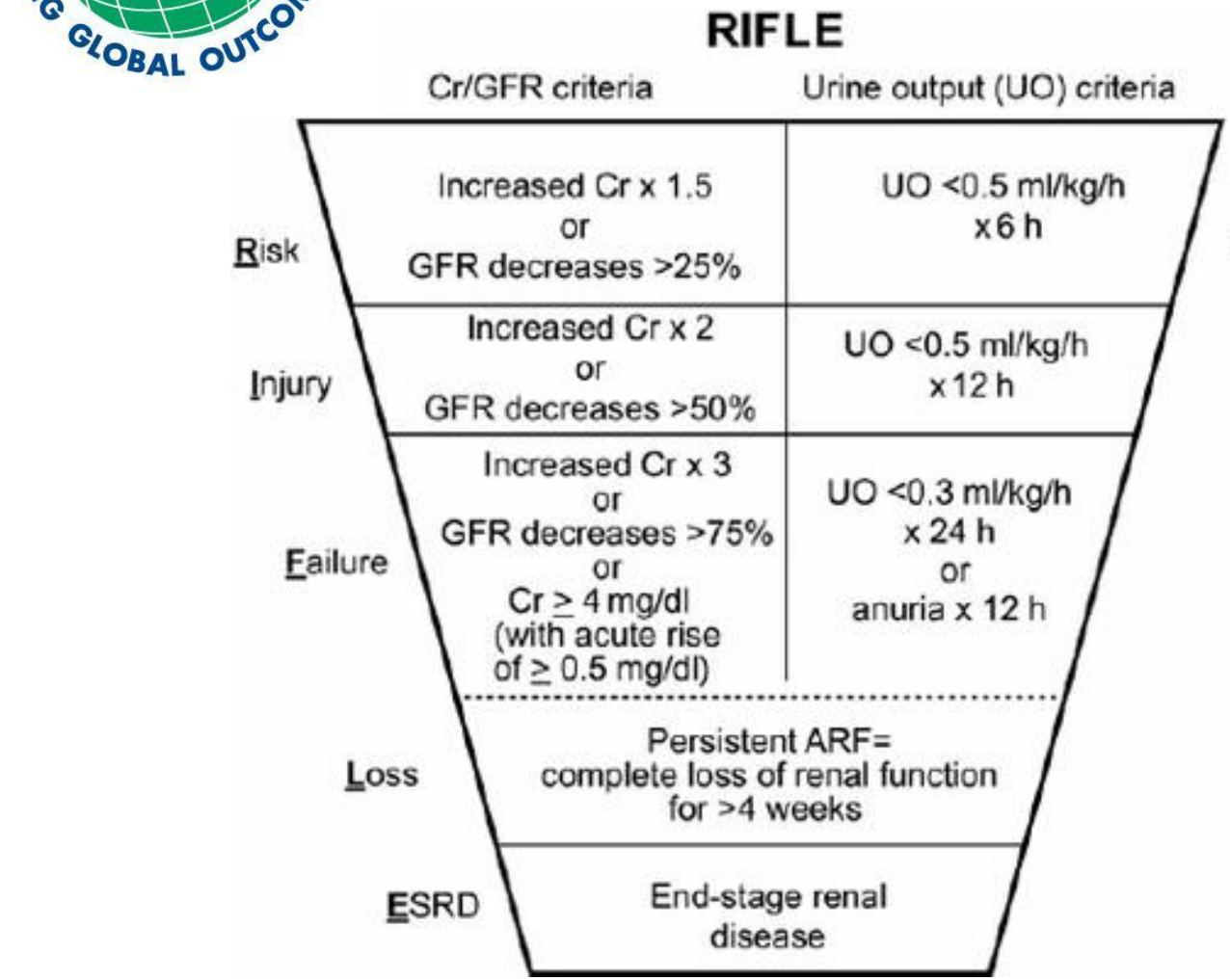
Langenberg et al. Crit Care Med. 2014

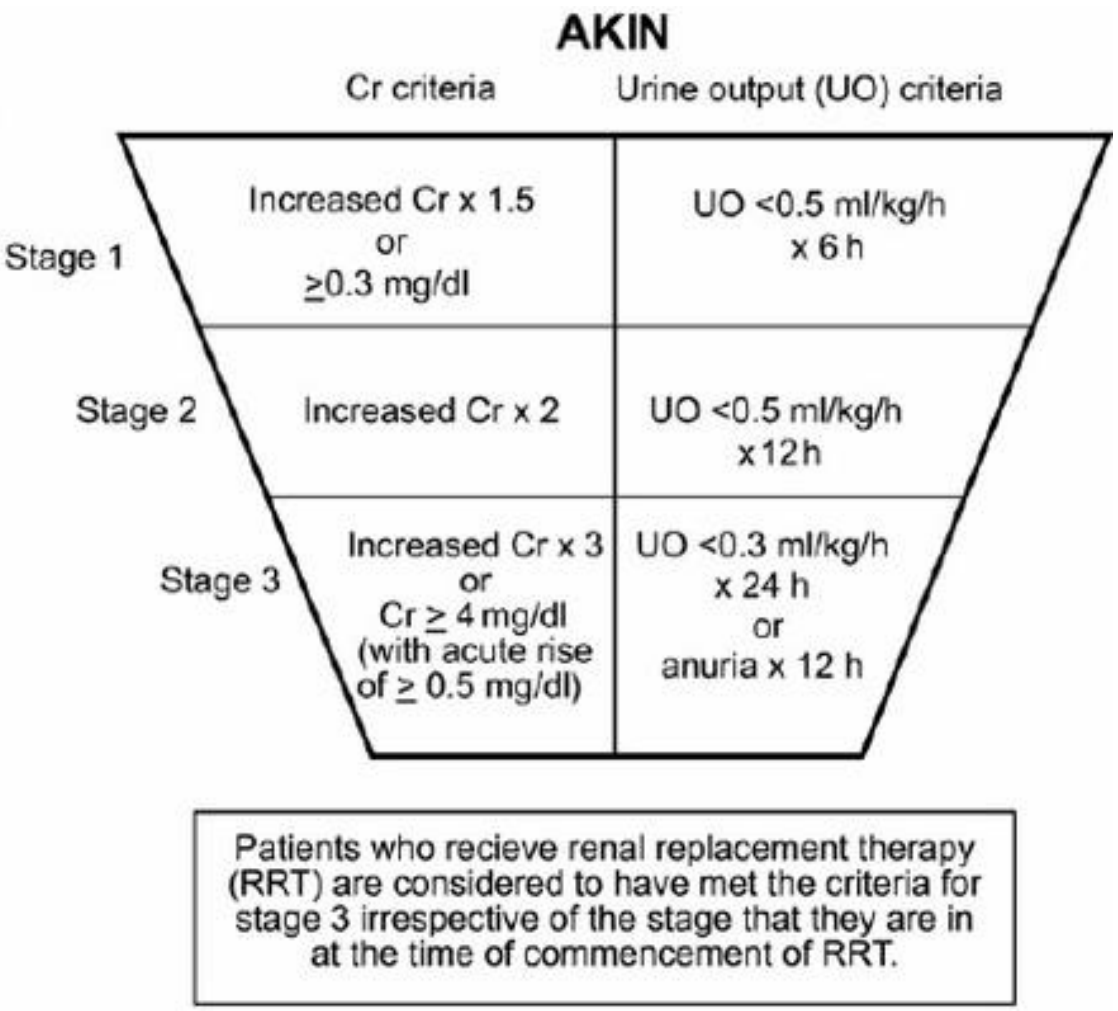


Zafrani et al. Semin Nephrol 2015



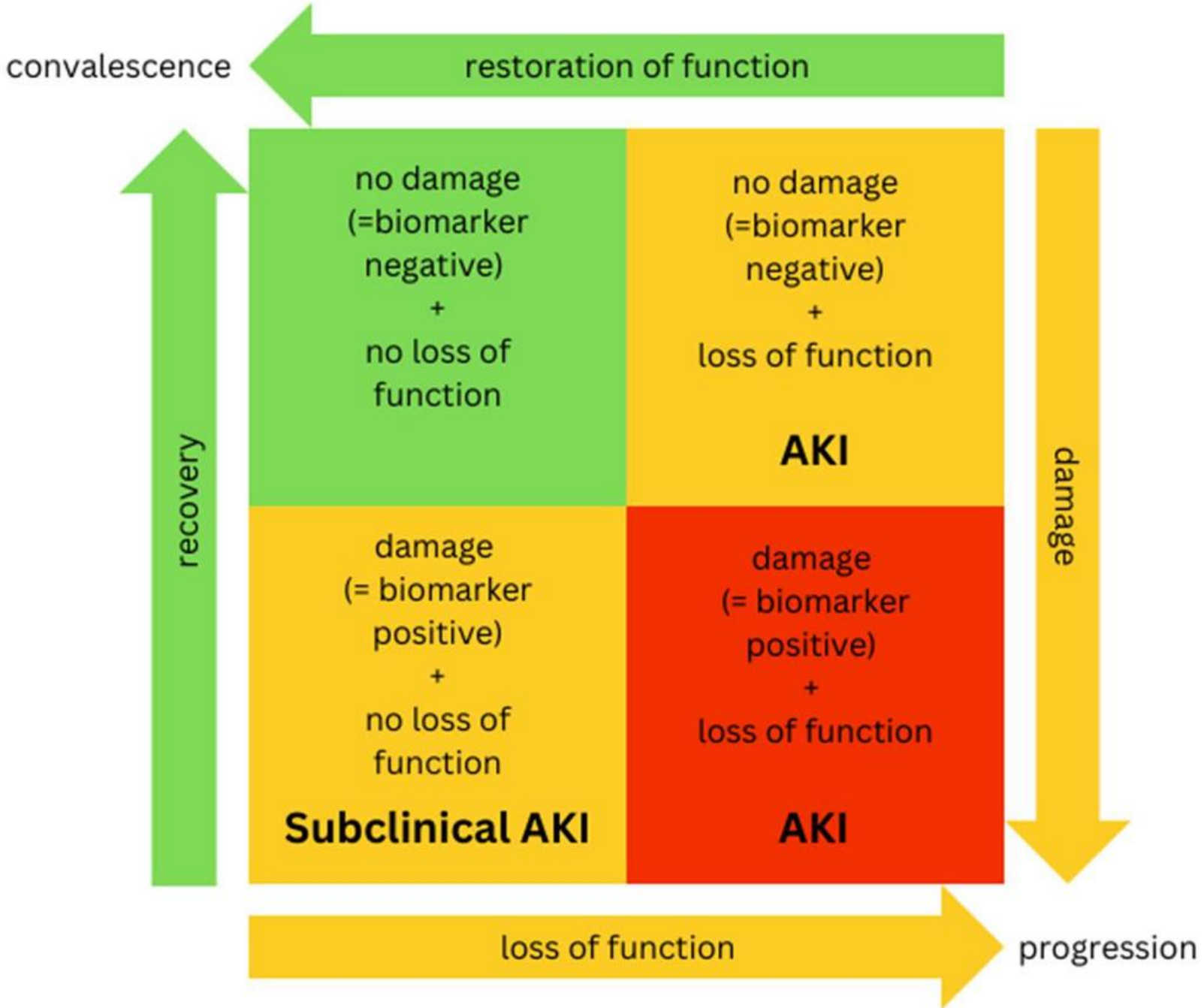
Peerapornratana et al. Kidney Int 2019


RIFLE
Cr/GFR criteria
Urine output (UO) criteria
Risk
Increased Cr x 1.5
or
GFR decreases >25%
UO <0.5 ml/kg/h
x 6 h
Injury
Increased Cr x 2
or
GFR decreases >50%
UO <0.5 ml/kg/h
x 12 h
Failure
Increased Cr x 3
or
GFR decreases >75%
or
Cr ≥ 4 mg/dl
(with acute rise
of ≥ 0.5 mg/dl)
UO <0.3 ml/kg/h
x 24 h
or
anuria x 12 h
Loss
Persistent ARF=
complete loss of renal function
for >4 weeks
ESRD
End-stage renal
disease


AKIN
Cr criteria
Urine output (UO) criteria
Stage 1
Increased Cr x 1.5
or
≥0.3 mg/dl
UO <0.5 ml/kg/h
x 6 h
Stage 2
Increased Cr x 2
UO <0.5 ml/kg/h
x 12 h
Stage 3
Increased Cr x 3
or
Cr ≥ 4 mg/dl
(with acute rise
of ≥ 0.5 mg/dl)
UO <0.3 ml/kg/h
x 24 h
or
anuria x 12 h
Patients who recieve renal replacement therapy
(RRT) are considered to have met the criteria for
stage 3 irrespective of the stage that they are in
at the time of commencement of RRT.

ADQI

Acute Disease Quality Initiative



Strauß et al. J Clin Anesth 2024

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scientific reports

Check for updates

OPEN

Machine learning for early discrimination between transient and persistent acute kidney injury in critically ill patients with sepsis

Xiao-Qin Luo[1], Ping Yan[1], Ning-Ya Zhang[2], Bei Luo[3], Mei Wang[1], Ying-Hao Deng[1], Ting Wu[1], Xi Wu[1], Qian Liu[1], Hong-Shen Wang[1], Lin Wang[1], Yi-Xin Kang[1] & Shao-Bin Duan[1]✉

Strauß et al. J Clin Anesth 2024

ΕΠΙΣΤΗΜΟΝΙΚΟ
ΠΡΟΓΡΑΜΜΑ

25ο Πανελλήνιο Συνέδριο
ΝΕΦΡΟΛΟΓΙΑΣ

19-21 ΙΟΥΝΙΟΥ 2024
ΜΕΓΑΡΟ ΔΙΕΘΝΕΣ
ΣΥΝΕΔΡΙΑΚΟ ΚΕΝΤΡΟ
ΑΘΗΝΑ

ΤΕΤΑΡΤΗ 19 ΙΟΥΝΙΟΥ 2024

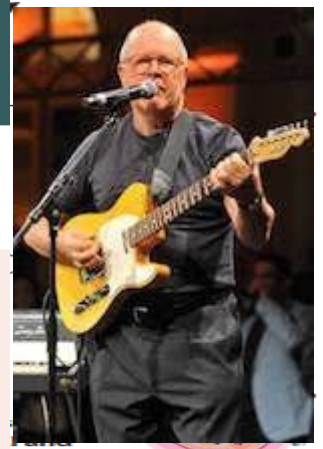
ΑΙΘΟΥΣΑ Ν. ΣΚΑΛΚΩΤΑΣ

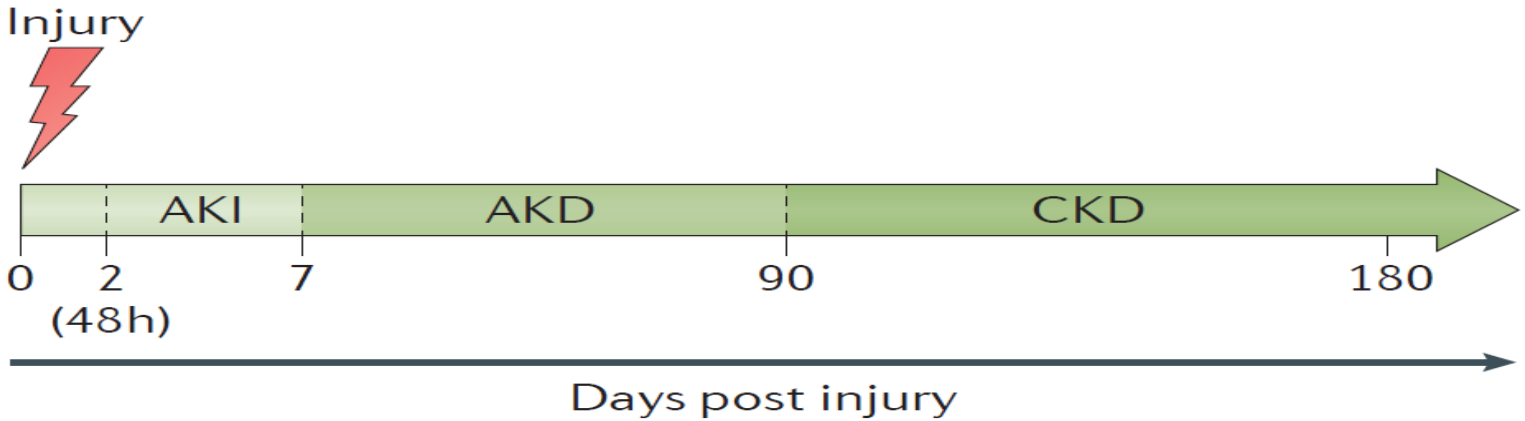
19.15–20.00 PLENARY LECTURE

Chairs: **D. Petras, D. Goumenos**

AKI as a continuum

C. Ronco





Acute Disease Quality Initiative

Table 1 | **Recommendations for AKD staging**

Stage	Definition
Stage 0*	A: Absence of criteria for B or C. B: Continued evidence of ongoing injury, repair and/or regeneration or indicators of loss of renal glomerular or tubular reserve C: Serum creatinine level <1.5 times baseline but not back to baseline levels B/C: Serum creatinine level <1.5 times baseline but not back to baseline levels, and continued evidence of ongoing injury, repair and/or regeneration
Stage 1	Serum creatinine level 1.5–1.9 times baseline
Stage 2	Serum creatinine level 2.0–2.9 times baseline
Stage 3	Serum creatinine level 3.0 times baseline or increase in serum creatinine to ≥353.6 µmol/l (≥4.0 mg/dl)‡ or ongoing need for renal replacement therapy

*Reflects that even when no apparent residual injury is present, the kidney might be vulnerable for some time after an episode of AKI. ‡Assumes the baseline serum creatinine level is <353.6 µmol/l (<4.0 mg/dl), and that an episode of AKI has occurred. AKD, acute kidney disease; AKI, acute kidney injury.

Chawla et al. Nat Rev Nephrol 2017

Table 2 Criteria for diagnosing AKI

Criterion/test	Utility	Limitations	Comments
Serum creatinine	Cheap, easily measured, readily available, well-known relationship to disease	Slow to change in response to injury, insensitive—no changes until >50% loss of function	Increases of ≥50% over ≤1 week or ≥0.3 mg/dl over ≤48 h used as consensus criteria for AKI
Urine output	Faster to change than creatinine, cheap and easy to measure	Non-specific, insensitive to certain forms of AKI, not reliably measured outside the ICU	<0.5 ml/kg/h ≥ 6 h used as consensus criteria for AKI
Serum cystatin C	Experience from CKD	Similar to creatinine	
Urine sediment	Can help identify specific causes of AKI (e.g., glomerulonephritis)	Not standardized and usually non-specific	
Kidney damage markers	Measure cellular injury rather than organ function	Not standardized nor completely validated in humans	uKIM-1, uNGAL, others
AKI risk markers	Measures of kidney stress or systemic inflammatory states rather than injury per se	Measures of kidney stress or systemic states rather than injury per se	u[TIMP-2]·[IGFBP-7], pNGAL
Functional stress tests	Examine capacity for increases in function by stressing the system	Test are not well standardized	Protein load, furosemide

CKD chronic kidney disease, *AKI* acute kidney injury, *uKIM-1* urinary kidney injury molecule-1, *uNGAL* urinary neutrophil gelatinase-associated lipocalin, *uTIMP-2* urinary tissue inhibitor of metalloproteinase-2, *IGFBP-7* insulin-like growth factor binding protein-7, *pNGAL* plasma neutrophil gelatinase-associated lipocalin

Bellomo et al. Intensive Care Med 2017

Debates in Nephrology

Urine Sediment Exam Provides More Diagnostic Information in AKI than Novel Urinary Biomarkers: PRO

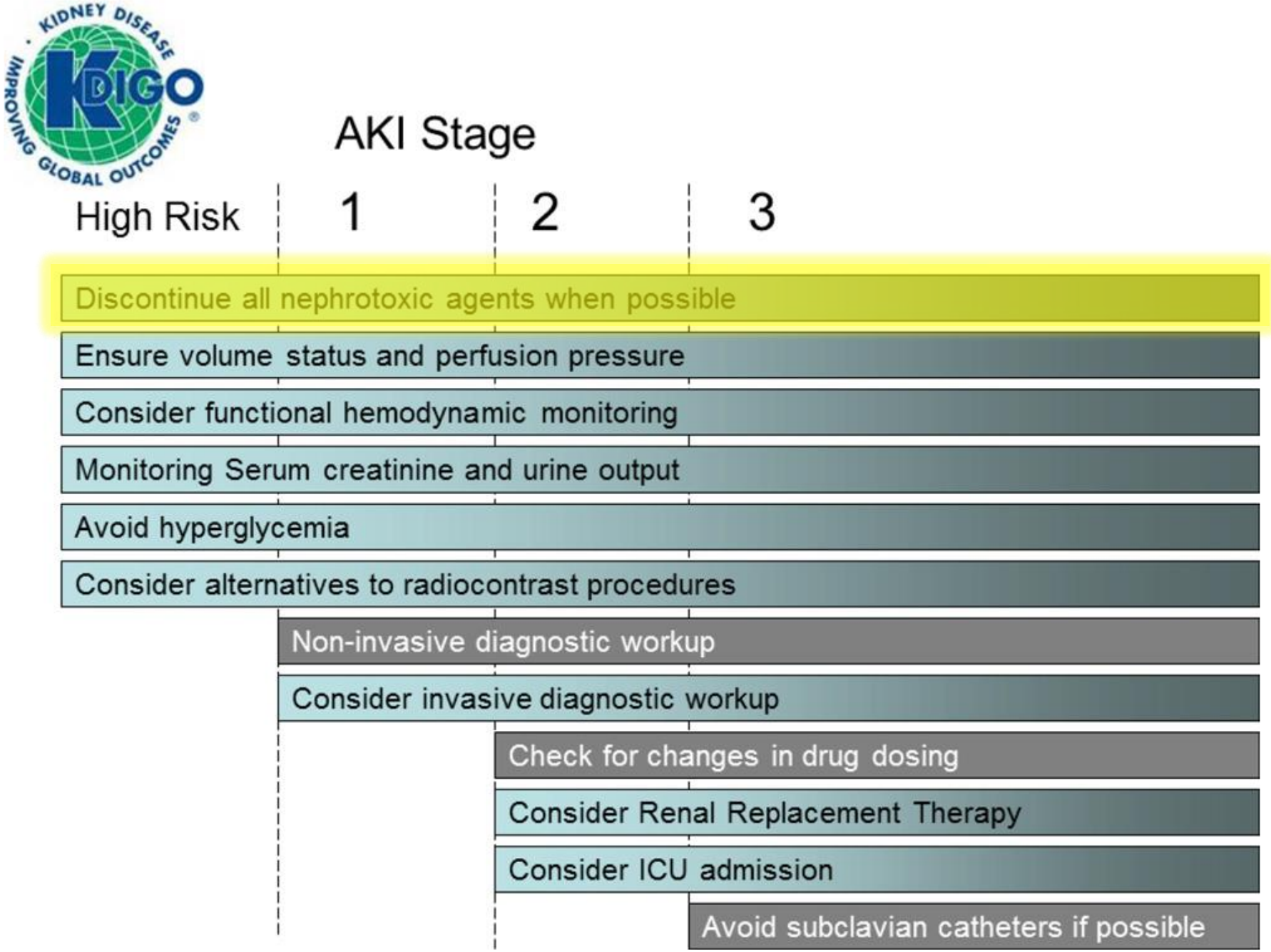
Corey Cavanaugh

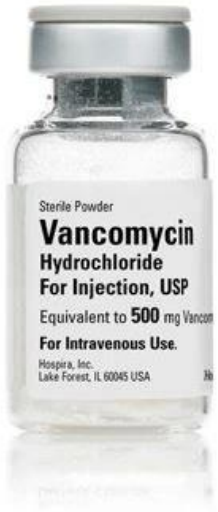
KIDNEY360 3: 597–599, 2022. doi: https://doi.org/10.34067/KID.0004872021

Debates in Nephrology

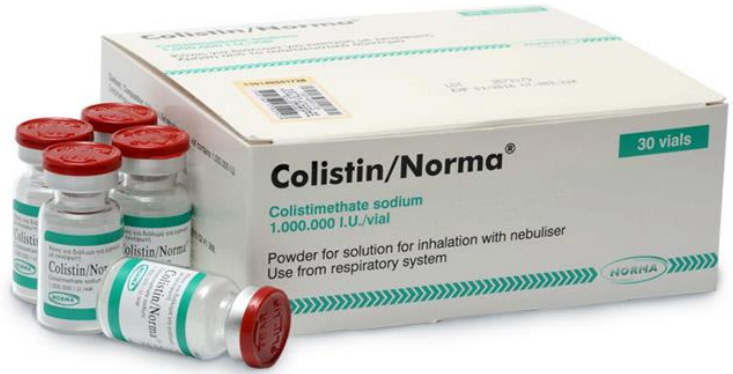
Urine Sediment Exam Provides More Diagnostic Information in AKI than Novel Urinary Biomarkers: CON

Ashley La[1] and Jay L. Koyner[2]

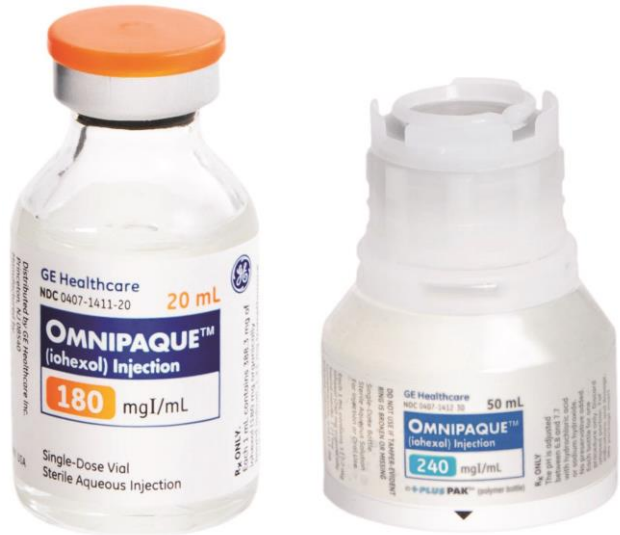

KIDNEY DISEASE
IMPROVING GLOBAL OUTCOMES
KDIGO
AKI Stage
High Risk
1
2
3
Discontinue all nephrotoxic agents when possible
Ensure volume status and perfusion pressure
Consider functional hemodynamic monitoring
Monitoring Serum creatinine and urine output
Avoid hyperglycemia
Consider alternatives to radiocontrast procedures
Non-invasive diagnostic workup
Consider invasive diagnostic workup
Check for changes in drug dosing
Consider Renal Replacement Therapy
Consider ICU admission
Avoid subclavian catheters if possible


Sterile Powder
Vancomycin
Hydrochloride
For Injection, USP
Equivalent to 500 mg Vancom
For Intravenous Use.
Hospira, Inc.
Lake Forest, IL 60045 USA


5 x 10 X 2 ml Ampoules
Gentamicin Injection BP 80 mg
For IM / IV Use
Must be diluted for IV use
2 ml


Colistin/Norma®
30 vials
Colistimethate sodium
1.000.000 I.U./vial
Powder for solution for inhalation with nebuliser
Use from respiratory system
NORMA


NONSTEROIDAL
ANTI-INFLAMMATORY
DRUGS (NSAIDS)
OSMOSIS.org


GE Healthcare
NDC 0407-1411-20
20 mL
OMNIPAQUE™
(iohexol) Injection
180 mgI/mL
Single-Dose Vial
Sterile Aqueous Injection
GE Healthcare
50 mL
OMNIPAQUE™
(iohexol) Injection
240 mgI/mL


TAZOCIN
TAZOCIN
4,5g

AMERICAN SOCIETY FOR MICROBIOLOGY | Antimicrobial Agents and Chemotherapy

Nephrotoxicity during Therapy in Combinatic Piperacillin-Tazobactar

W. Cliff Rutter,[a,b] Jessica N. Cox,[b] Craig A. M
David S. Burgess[a]
University of Kentucky College of Pharmacy, Lexington, Ken
Lexington, Kentucky, USA[b]

TABLE 2 Incidence of AKI in unm

Outcome	Unmatched cohort No. (%) of patients VAN-TZP (n = 3,605)	VAN- (n =
Any AKI	771 (21.4)	74 (1
Risk	422 (11.7)	44 (7
Injury	244 (6.8)	21 (3
Failure	105 (2.9)	9 (1.5

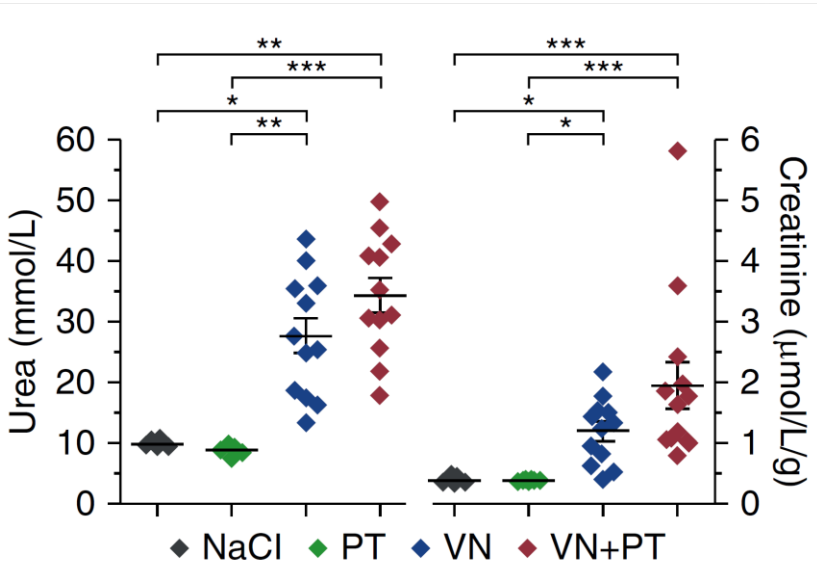
[a]FEP, cefepime; TZP, piperacillin-tazobac

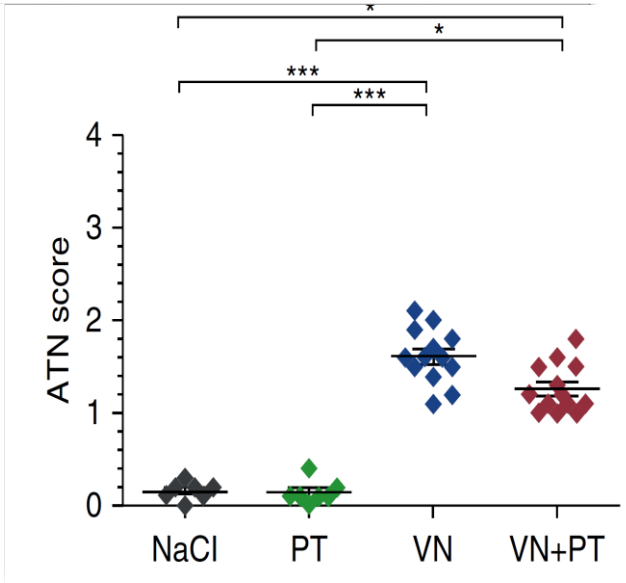
Research Letter

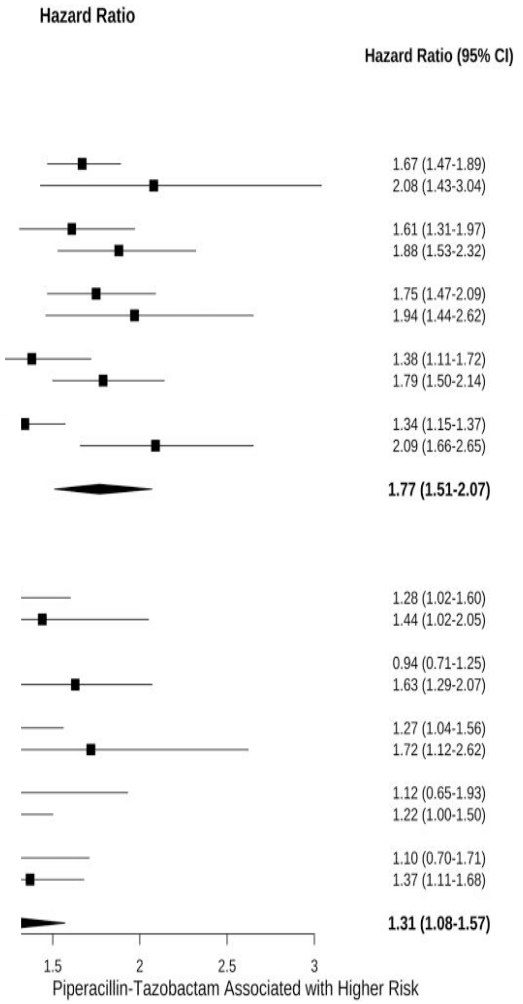
Lack of Synergistic Nephrotoxicity in a Mouse Model of Vancomycin-Induced AKI with Piperacillin-Tazobactam Coadministration

David Rozenblat,[1,2] Sandrine Placier,[1] Perrine Frere,[1] Liliane Louedec,[1] Lea Sejaan,[1] Laurent Mesnard,[1,2] and Yosu Luque[1,2]

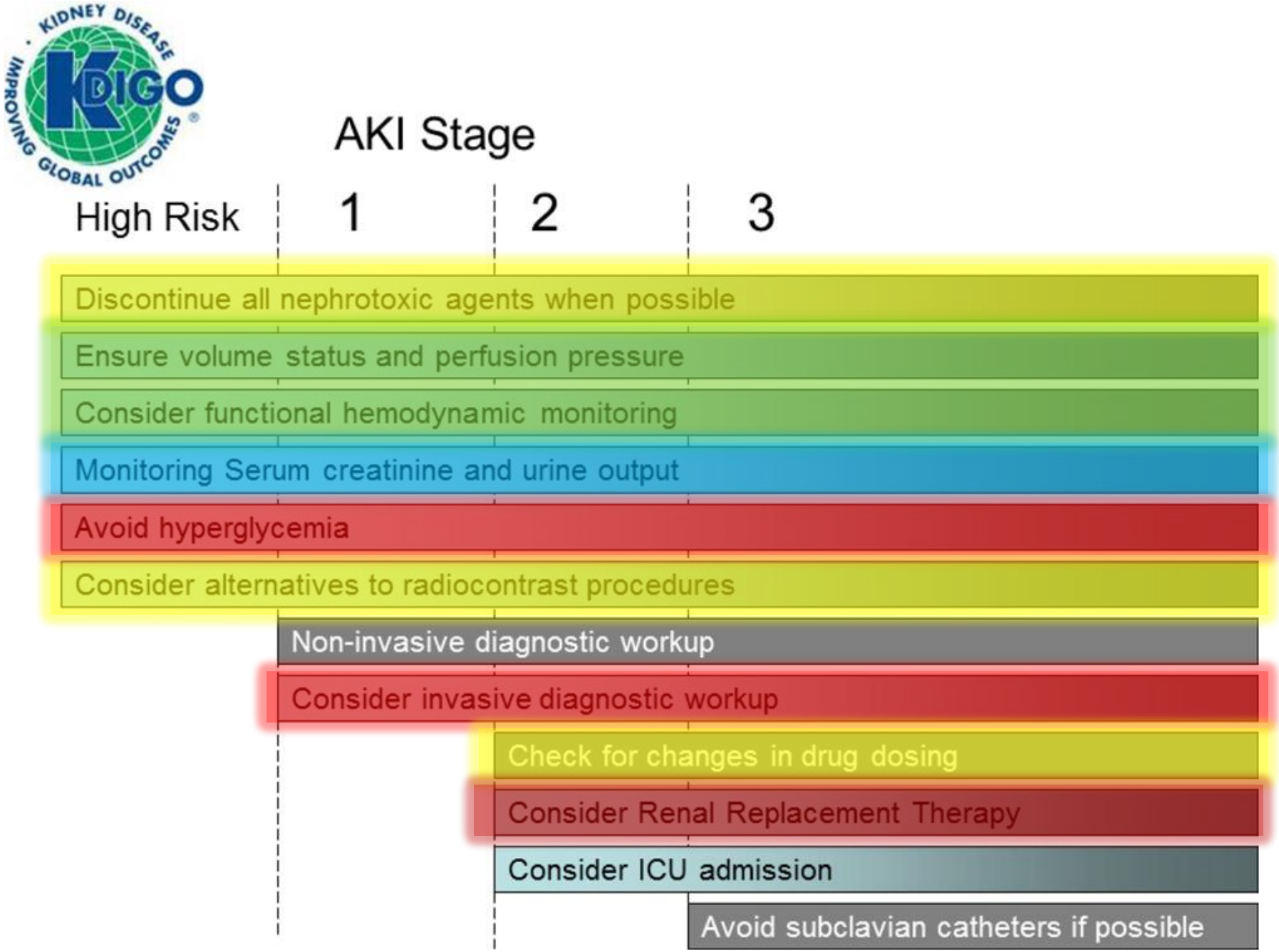
Kidney360 5: 753–755, 2024. doi: https://doi.org/10.34067/KID.0000000000000432







Tomazini et al. J Antimicrob Chemother 2024


KIDNEY DISEASE
IMPROVING GLOBAL OUTCOMES
KDIGO
AKI Stage
High Risk
1
2
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Discontinue all nephrotoxic agents when possible
Ensure volume status and perfusion pressure
Consider functional hemodynamic monitoring
Monitoring Serum creatinine and urine output
Avoid hyperglycemia
Consider alternatives to radiocontrast procedures
Non-invasive diagnostic workup
Consider invasive diagnostic workup
Check for changes in drug dosing
Consider Renal Replacement Therapy
Consider ICU admission
Avoid subclavian catheters if possible

"Early" vs "Late" RRT

AKIKI trial

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTI

Initiation Strat… …ement
Th… …it

Stépha… …n, M.D.,
Laure… …oulet, M.D.,
Alexandre … …las Lerolle, M.D., Ph.D.,
D… …e Prost, M.D., Ph.D.,
Alexandr… …tagnol, M.D., Julien Mayaux, M.D.,
Saad Nseir, M… …legarbane, M.D., Ph.D., Marina Thirion, M.D.,
Jean-Marie… …Julien Maizel, M.D., Ph.D., Hodane Yonis, M.D.,
Philippe Markowicz, M.D., Guillaume Thiery, M.D., Florence Tubach, M.D., Ph.D.,
Jean-Damien Ricard, M.D., Ph.D., and Didier Dreyfuss, M.D.,
for the AKIKI Study Group*

n=619

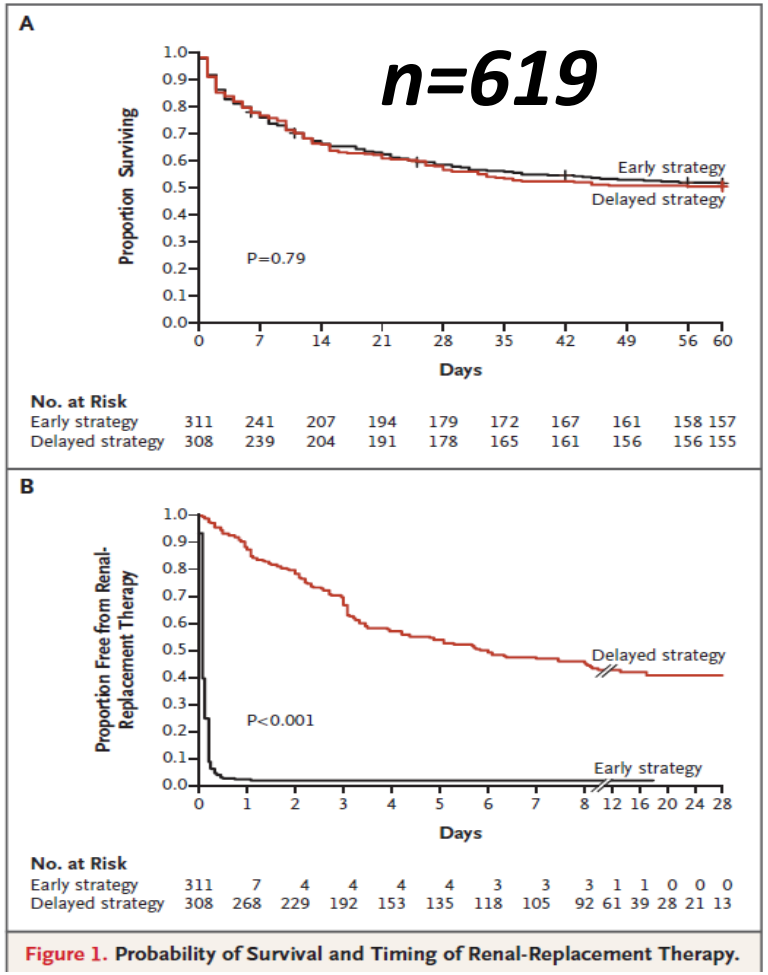


Figure 1. Probability of Survival and Timing of Renal-Replacement Therapy.

ELAIN trial

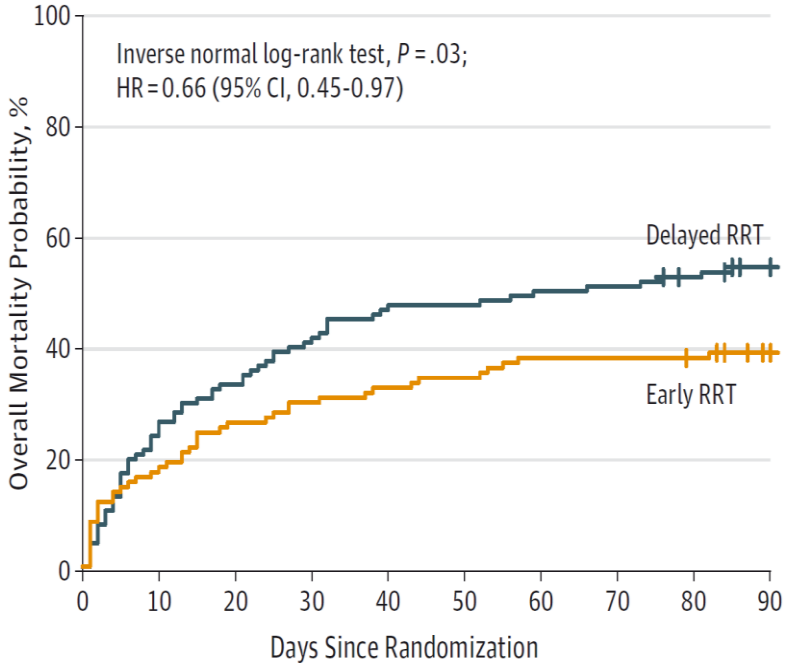
Research

JAMA | Origina…

Effect of … …al Replacement
Therapy o… …ly Ill Patients
With Acute … …Injury
The ELAIN Randomized Clinical Trial

Alexander Zarbock, MD; John A. Kellum, MD; Christoph Schmidt, MD; Hugo Van Aken, MD; Carola Wempe, PhD; Hermann Pavenstädt, MD; Andreea Boanta, MD; Joachim Gerß, PhD; Melanie Meersch, MD

n=231



STAART-AKI trial

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTI…

Timi… …ment

The … …e Trials Group,
the A… …ociety Clinical Trials Group,
the Ur… …earch Group, the Canadian Nephrology
… …nd the Irish Critical Care Trials Group*

N=3019

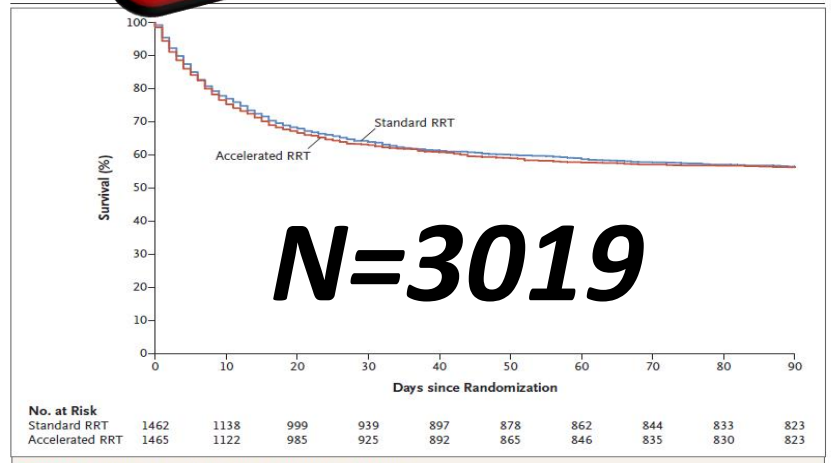


Figure 1. Kaplan–Meier Estimates of Survival at 90 Days.

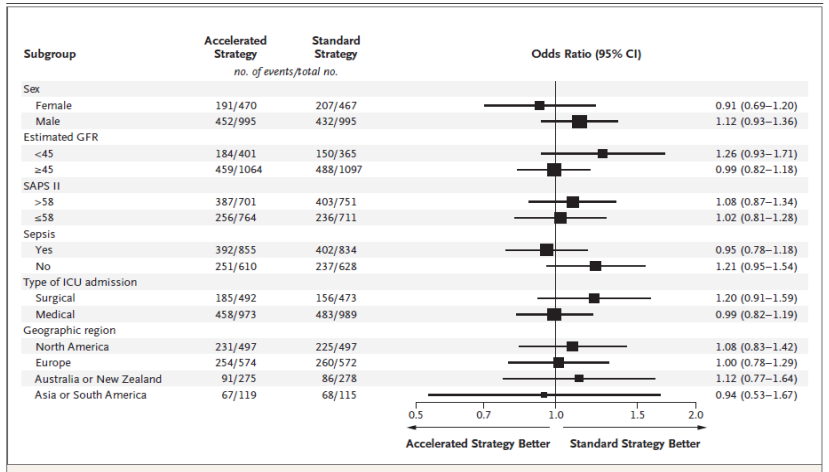


Figure 2. Subgroup Analyses.

Table 1. Characteristics of the Patients at Baseline.*

Characteristic	Early Strategy (N=311)	Delayed Strategy (N=308)
Age — yr	64.8±14.2	67.4±13.4
Serum creatinine before ICU admission — mg/dl†	0.95±0.26	0.97±0.31
Coexisting conditions — no. (%)		
Chronic renal failure	22 (7)	38 (12)
Hypertension	161 (52)	167 (54)
Diabetes mellitus	82 (26)	81 (26)
Congestive heart failure	24 (8)	32 (10)
Ischemic heart disease	30 (10)	32 (10)
SAPS III at enrollment‡	72.6±14.4	73.7±14.2
SOFA score at enrollment§	10.9±3.2	10.8±3.1
Exposure to at least one nephrotoxic agent in past 2 days — no./total no. (%)¶	194/311 (62)	195/308 (63)
Intravenous contrast	66/194 (34)	71/195 (36)
Aminoglycoside	106/194 (55)	106/195 (54)
Vancomycin	26/194 (13)	29/195 (15)
Physiological support — no. (%)		
Invasive mechanical ventilation	266 (86)	267 (87)
Vasopressor support with epinephrine or norepinephrine	265 (85)	263 (85)
Sepsis status — no. (%)‖		
Sepsis	25 (8)	21 (7)
Severe sepsis	16 (5)	19 (6)
Septic shock	209 (67)	204 (66)
Patients with oliguria or anuria — no. (%)	202 (65)	191 (62)
Serum creatinine — mg/dl	3.25±1.40	3.20±1.32
Blood urea nitrogen — mg/dl	53±24	54±24
Serum potassium — mmol/liter	4.4±0.7	4.4±0.7
Serum bicarbonate — mmol/liter	18.7±5.1	18.8±5.5

Table S2. Characteristics of the patients at baseline*

Characteristic	Early RRT strategy (N=311)	Delayed RRT strategy (N=308)
Age – yr	64.8±14.2	67.4±13.4
Male sex – no. (%)	209 (67)	198 (64)
Weight – kg	85.4±22.2	83.8±20.9
Main reason for ICU admission – no. (%)		
Medical	247 (79)	246 (80)
Surgical, emergency	48 (15)	47 (15)
Surgical, scheduled	16 (5)	15 (5)
Serum creatinine before ICU admission–mg/dl †	0.95±0.26	0.97±0.31
Coexisting condition – no. (%)		
Chronic renal failure	22 (7)	38 (12)
Hypertension	161 (52)	167 (54)
Diabetes mellitus	82 (26)	81 (26)
Congestive heart failure	24 (8)	32 (10)
Ischemic heart disease	30 (10)	32 (10)
Time from admission to randomization – days –median (IQR)	1 (1-2)	1 (1-2)
SAPS III at inclusion ‡	72.6±14.4	73.7±14.2
SOFA at inclusion ∫	10.9±3.2	10.8±3.1
Oliguric/anuric patients – no. (%)	202 (65)	191 (62)
Physiological characteristics		
Mean arterial pressure – mm Hg	75.5±13.8	75.8±15.5
Heart rate – beats/min	104.4±24.7	106.1±25.1
Exposure to at least one nephrotoxic agent in past 2 days – no.	194 (63)	195 (65)

AKI stage III

Exclusion criteria

- BUN>112mg/dl…Urea>240mg/dl
- K>6meq/l
- pH<7.15
- Fluid overload – pulmonary edema

Gaudry et al. N Eng J Med 2016

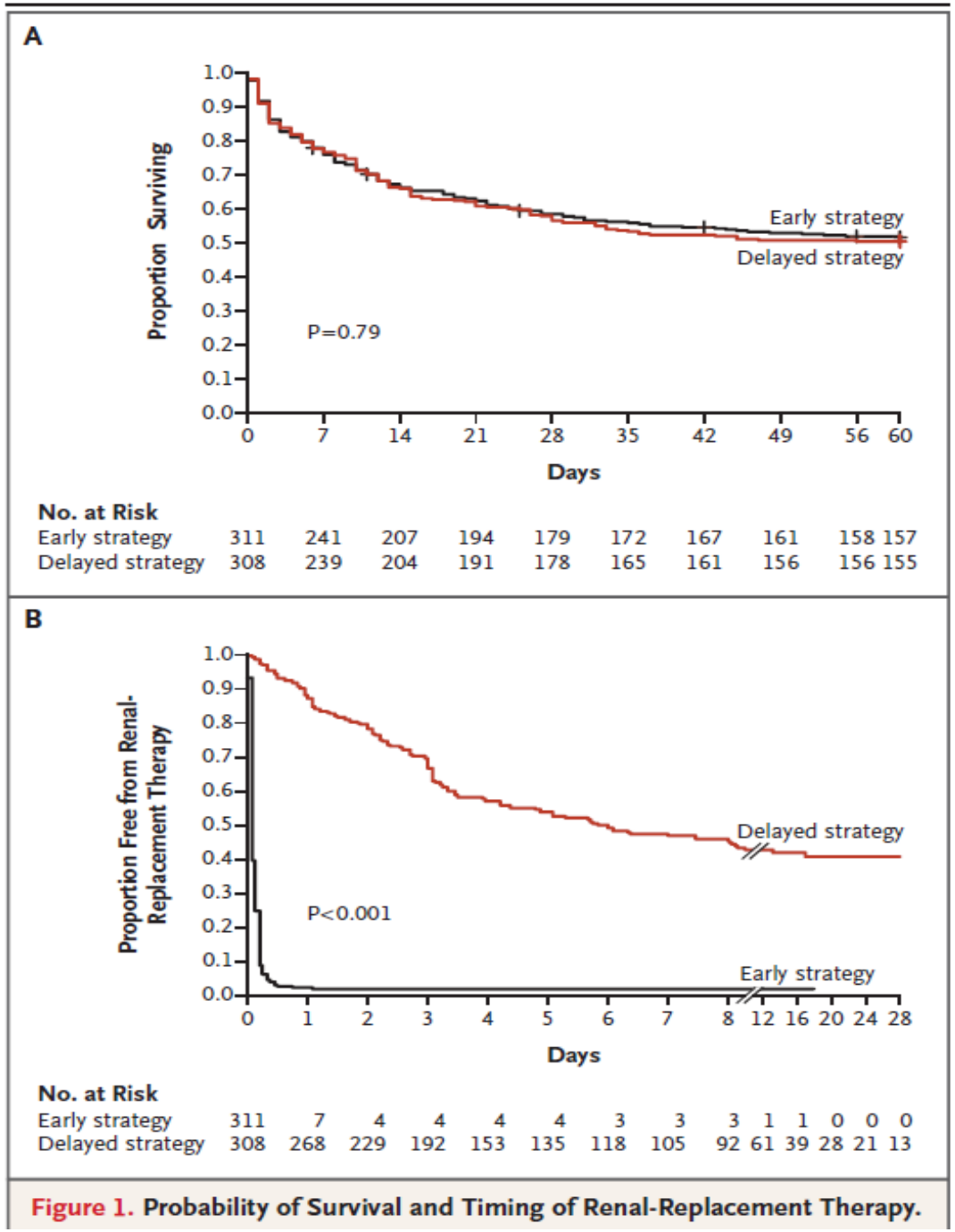


Figure 1. Probability of Survival and Timing of Renal-Replacement Therapy.

AKIKI trial

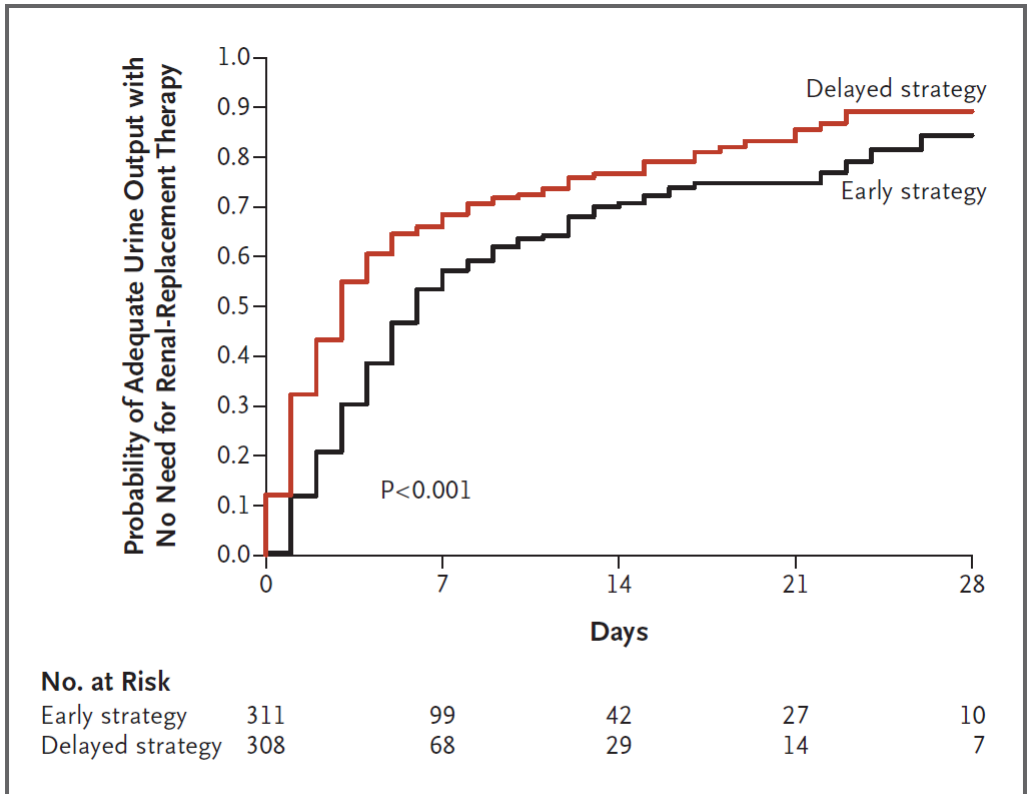


Figure 2. Probability of Adequate Urine Output without the Need for Renal-Replacement Therapy.

Gaudry et al. N Eng J Med 2016

Table 1. Baseline Characteristics for Critically Ill Patients Receiving Early vs Delayed Initiation of Renal Replacement Therapy

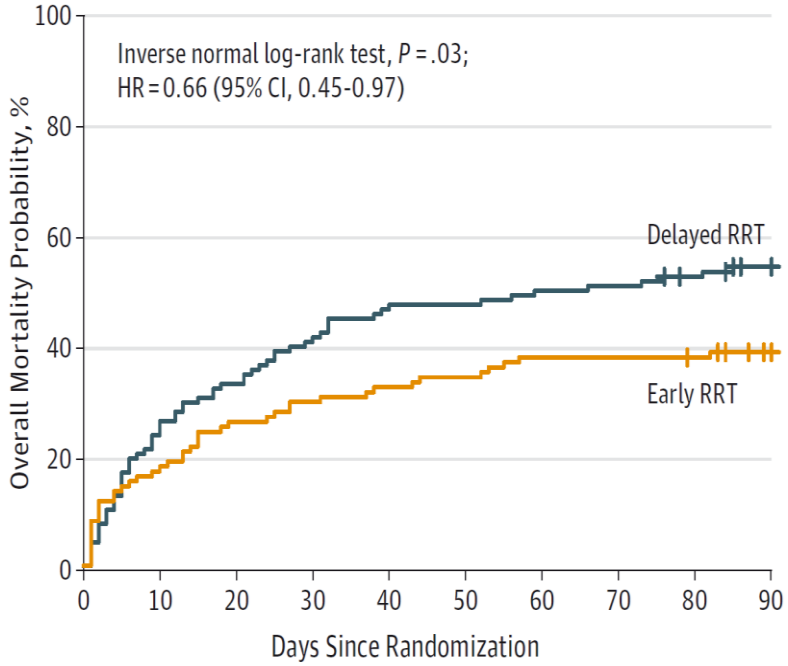
	Early (n = 112)	Delayed (n = 119)
Age, mean (SD), y	65.7 (13.5)	68.2 (12.7)
Sex, No. (%)		
Men	78 (69.6)	68 (57.1)
Women	34 (30.4)	51 (42.9)
Baseline creatinine, mean (SD), mg/dL	1.1 (0.4)	1.1 (0.4)
Estimated GFR, mean (SD), mL/min/1.73 m^2	56.2 (13.8)	55.9 (14.5)
SOFA score, mean (SD)	15.6 (2.3)	16.0 (2.3)
APACHE II, mean (SD)	30.6. (7.5)	32.7 (8.8)
Comorbidities, No. (%)		
Hypertension	97 (86.6)	92 (77.3)
Congestive heart failure	49 (43.8)	47 (39.5)
Diabetes	17 (15.2)	28 (23.5)
Chronic obstructive pulmonary disease	20 (17.9)	21 (17.6)
Chronic kidney disease (estimated GFR<60)	42 (37.8)	52 (44.8)
Cardiac arrhythmia	37 (33.0)	53 (44.5)
Source of admission, No./total No. (%)		
Cardiac		
Total	56/112 (50.0)	52/119 (43.7)
CABG only	11/56 (19.6)	16/52 (30.8)
Valve only	13/56 (23.2)	10/52 (19.2)
Combination or others	32/56 (57.1)	26/52 (50.0)
Trauma	14/112 (12.5)	14/119 (11.8)
Abdominal		
Total	34/112 (30.4)	44/119 (37.0)
Bowel resection	8/34 (23.5)	5/44 (11.4)
Esophageal resection	5/34 (14.7)	2/44 (4.5)
Liver transplant	3/34 (8.8)	7/44 (15.9)
Others	18/34 (52.9)	30/44 (68.2)
Others	8/112 (7.1)	9/119 (7.6)
Neurosurgical	2/8 (25.0)	3/9 (33.3)
Pulmonary	6/8 (75.0)	6/9 (66.7)
Cumulative fluid balance until randomization, median (Q1, Q3), mL	6811.0 (3897.0, 10 189.0)	6334.0 (3951.5, 10 700.5)
Mechanically ventilated, No. (%)	98 (87.5)	105 (88.2)
Medication, No. (%)		
Vasopressors	96 (85.7)	108 (90.8)

DESIGN, SETTING, AND PARTICIPANTS Single-center randomized clinical trial of 231 critically ill patients with AKI Kidney Disease: Improving Global Outcomes (KDIGO) stage 2 (≥2 times baseline or urinary output <0.5 mL/kg/h for ≥12 hours) and plasma neutrophil gelatinase-associated lipocalin level higher than 150 ng/mL enrolled between August 2013 and June 2015 from a university hospital in Germany.

INTERVENTIONS Early (within 8 hours of diagnosis of KDIGO stage 2; n = 112) or delayed (within 12 hours of stage 3 AKI or no initiation; n = 119) initiation of RRT.

RRT Delivery

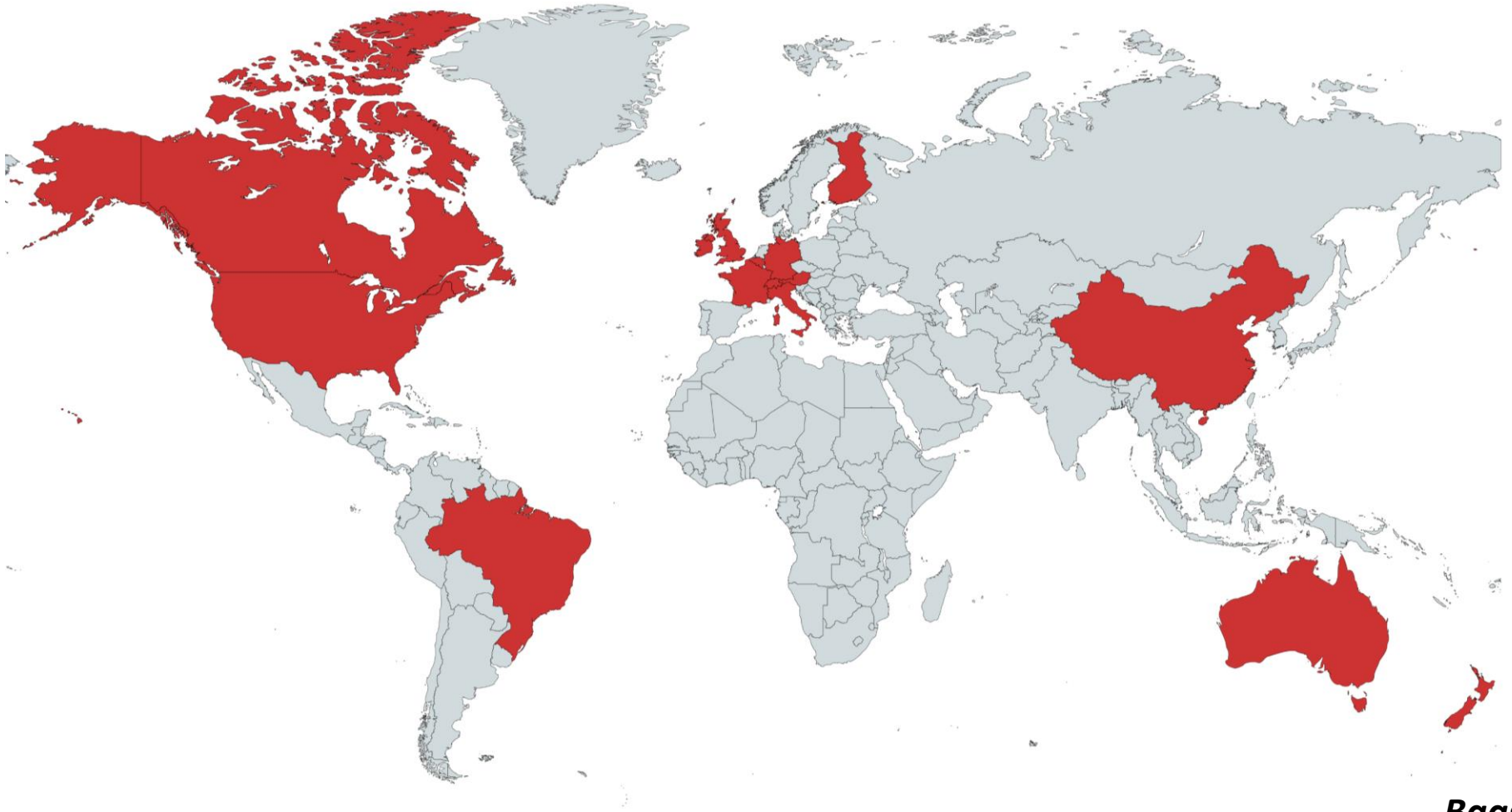
Once RRT was initiated, identical settings were used in both treatment groups according to the KDIGO guidelines. To ensure uniformity of treatment between early and delayed RRT groups, specific protocols for the performance of RRT were strictly adhered to. All patients in both groups were treated using continuous venovenous hemodiafiltration. Replacement fluid was delivered into extracorporal circuit before the filter (ie, predilution), with a ratio of dialysate to replacement fluid of 1:1. The effluent flow prescribed was based on the patient's body weight at the time of randomization and was 30 mL/kg/h (additional fluid removal without replacement was not considered part of the prescribed dose). Blood flow was kept above 110 mL/min. The delivered dose of RRT was monitored based on bloodside urea kinetics. Regional anticoagulation with citrate was used to prevent circuit clotting. RRT was discontinued if renal recovery defined by urine output (>400 mL/24 h without and 2100 mL/24 h with diuretic treatment) and creatinine clearance (>20 mL/min) occurred. If cessation criteria were not fulfilled after 7 days, continuous renal replacement therapy could be changed to an intermittent procedure (sustained low-efficiency daily dialysis [SLEDD], slow continuous ultrafiltration or intermittent hemodialysis).



Zarbock et al. JAMA 2016

N=3019

STAART-AKI trial



Bagshaw S, Wald R et al. NEJM 2020

Table S2: Eligibility criteria.
Inclusion criteria are (all must be fulfilled):
1. Age ≥18 years on the day of eligibility screening
2. Admission to an intensive care unit
3. Evidence of kidney dysfunction: serum creatinine ≥100 µmol/L [1.13 mg/dL] [women] or ≥130 µmol/L [1.47 mg/dL] [men] based on last bloodwork available prior to screening that has not declined by >27 µmol/L [0.3 mg/dL] compared to the highest value recorded in the preceding 48 hours
4. Evidence of severe acute kidney injury based on at least ONE of the following three criteria: i) 2-fold increase in serum creatinine from baseline; OR ii) current serum creatinine is ≥354 µmol/L [4.0 mg/dL] with a minimum increase of 27 µmol/L [0.3 mg/dL] from the baseline serum creatinine; OR iii) urine output <6 mL/kg in the prior 12 hours
Exclusion criteria are (none may be present):
1. Potassium at time of screening >5.5 mmol/L
2. Bicarbonate at time of screening <15 mmol/L
3. Presence of a drug overdose or dialyzable toxin that necessitates renal-replacement therapy
4. Lack of commitment to provide renal-replacement therapy as part of philosophy of care
5. Receipt of any renal-replacement therapy in the preceding 2 months
6. Kidney transplant within the past 365 days
7. Known advanced chronic kidney disease defined by an estimated glomerular filtration rate (eGFR) <20 mL/min/1.73 m^2
8. Presence or strong clinical suspicion of renal obstruction, rapidly progressive glomerulonephritis, vasculitis, thrombotic microangiopathy or acute interstitial nephritis

STAART-AKI trial

AKI stage II & III

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Table 1. Characteristics of the Patients at Baseline.*

Characteristic	Accelerated Strategy (N=1465)	Standard Strategy (N=1462)
Age — yr	64.6±14.3	64.7±13.4
Female sex — no. (%)	470 (32.1)	467 (31.9)
Weight — kg	88.0±27.4	88.0±25.1
Serum creatinine — mg/dl†	1.4±1.0	1.3±1.0
Estimated glomerular filtration rate — ml/min/1.73 m²‡	66.0±29.8	67.3±29.8
Preexisting conditions — no./total no. (%)		
Chronic kidney disease	658/1465 (44.9)	626/1462 (42.8)
Hypertension	814/1465 (55.6)	823/1462 (56.3)
Diabetes mellitus	439/1465 (30.0)	459/1461 (31.4)
Heart failure	204/1465 (13.9)	204/1461 (14.0)
Coronary artery disease	320/1465 (21.8)	328/1461 (22.5)§
Liver disease	172/1465 (11.7)	165/1461 (11.3)
Metastatic cancer	77/1465 (5.3)	84/1462 (5.7)
Hematologic cancer	87/1465 (5.9)	83/1462 (5.7)
HIV infection or AIDS	13/1465 (0.9)	13/1462 (0.9)
Admission category — no. (%)		
Scheduled surgery	207 (14.1)	184 (12.6)
Unscheduled surgery	285 (19.5)	289 (19.8)
Medical	973 (66.4)	989 (67.6)
Hospital-acquired risk factor for AKI in previous wk — no./total no. (%)		
Cardiopulmonary bypass	112/1465 (7.6)	118/1462 (8.1)
Aortic aneurysm repair	71/1465 (4.8)	74/1461 (5.1)
Other vascular surgery	76/1465 (5.2)	77/1462 (5.3)
Major trauma	62/1465 (4.2)	55/1462 (3.8)
Obstetric complication	5/1465 (0.3)	5/1462 (0.3)
Exposure to radiocontrast material	382/1463 (26.1)	375/1460 (25.7)
Receipt of aminoglycoside	154/1463 (10.5)	148/1458 (10.2)
Receipt of amphotericin B	9/1464 (0.6)	12/1460 (0.8)
Clinical condition at randomization		
Sepsis — no. (%)	855 (58.4)	834 (57.0)
Septic shock — no. (%)	640 (43.7)	643 (44.0)
SAPS II value¶	58.1±17.4	59.4±17.4
SOFA score‖	11.6±3.6	11.8±3.6
Mechanical ventilation — no. (%)	1103 (75.3)	1148 (78.5)
Vasoactive support — no. (%)	1008 (68.8)	1052 (72.0)
Serum creatinine — mg/dl	3.6±1.7	3.4±1.6
Serum potassium — mmol/liter	4.5±0.8	4.5±0.8
Serum bicarbonate — mmol/liter	19.7±4.7	19.5±4.5
Median urinary output (IQR) — ml/24 hr**	450 (190–945)	478 (187–975)
Oliguria or anuria — no./total no. (%)††	647/1415 (45.7)	618/1420 (43.5)

STAART-AKI trial

Table 1. (Continued.)

Characteristic	Accelerated Strategy (N=1465)	Standard Strategy (N=1462)
Median cumulative fluid balance (IQR) — ml‡‡	2581 (820–5362)	2819 (836–5603)

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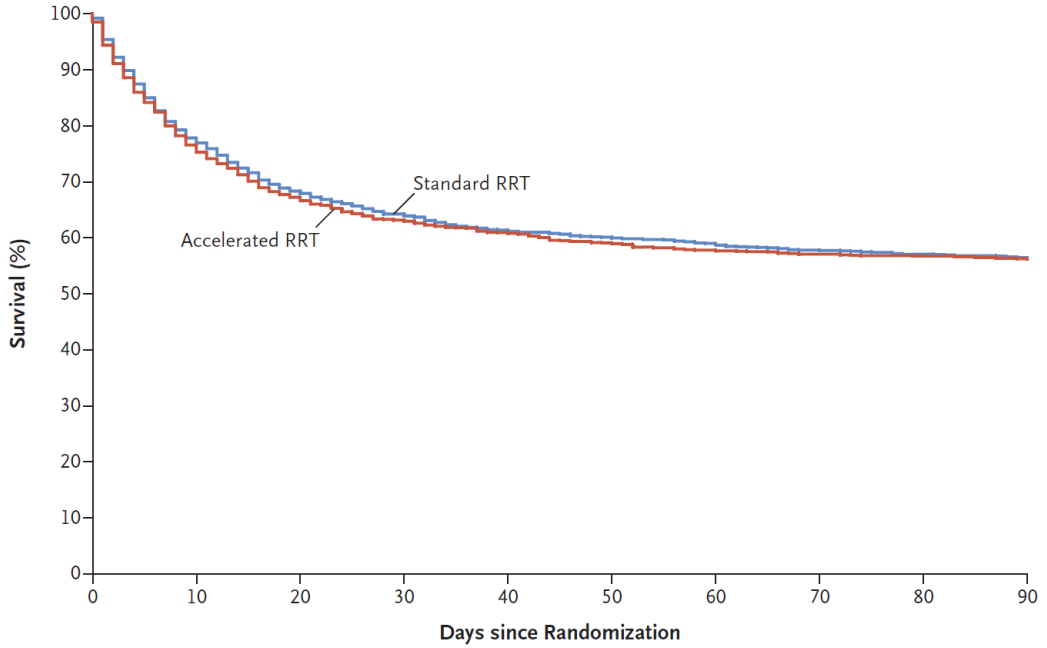

No. at Risk

Standard RRT	1462	1138	999	939	897	878	862	844	833	823
Accelerated RRT	1465	1122	985	925	892	865	846	835	830	823

Figure 1. Kaplan–Meier Estimates of Survival at 90 Days.

In the modified intention-to-treat analysis, death at 90 days occurred in 643 patients (43.9%) in the group that received an accelerated strategy for renal-replacement therapy (RRT) and in 639 (43.7%) in the group that received a standard strategy, for an absolute risk difference of 0.2 percentage points (P=0.92). P=0.75 for the between-group difference in the Kaplan–Meier time-to-event analysis.

Subgroup	Accelerated Strategy	Standard Strategy	Odds Ratio (95% CI)
	no. of events/total no.		
Sex			
Female	191/470	207/467	0.91 (0.69–1.20)
Male	452/995	432/995	1.12 (0.93–1.36)
Estimated GFR			
<45	184/401	150/365	1.26 (0.93–1.71)
≥45	459/1064	488/1097	0.99 (0.82–1.18)
SAPS II			
>58	387/701	403/751	1.08 (0.87–1.34)
≤58	256/764	236/711	1.02 (0.81–1.28)
Sepsis			
Yes	392/855	402/834	0.95 (0.78–1.18)
No	251/610	237/628	1.21 (0.95–1.54)
Type of ICU admission			
Surgical	185/492	156/473	1.20 (0.91–1.59)
Medical	458/973	483/989	0.99 (0.82–1.19)
Geographic region			
North America	231/497	225/497	1.08 (0.83–1.42)
Europe	254/574	260/572	1.00 (0.78–1.29)
Australia or New Zealand	91/275	86/278	1.12 (0.77–1.64)
Asia or South America	67/119	68/115	0.94 (0.53–1.67)

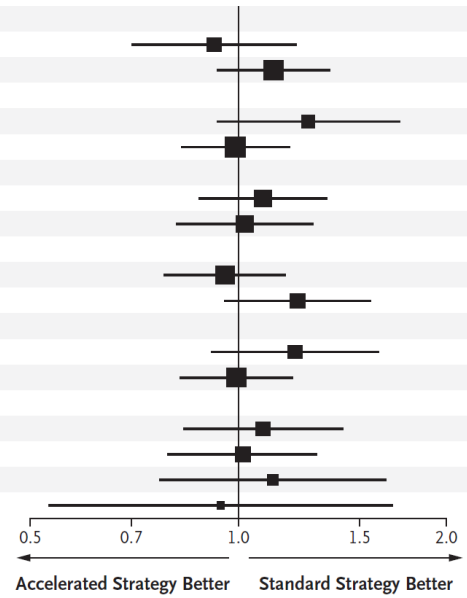

Figure 2. Subgroup Analyses.

Shown is a forest plot of the risk of the primary outcome (death from any cause at 90 days) in the accelerated-strategy group and the standard-strategy group. The size of the square representing the odds ratio reflects the relative number of patients in each subgroup. Results for the Simplified Acute Physiology Score (SAPS) II range from 0 to 163, with higher scores indicating more severe disease and a higher risk of death. GFR denotes glomerular filtration rate, and ICU intensive care unit.

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PLOS ONE

RESEARCH ARTICLE

Consulting to nephrologist when starting continuous renal replacement therapy for acute kidney injury is associated with a survival benefit

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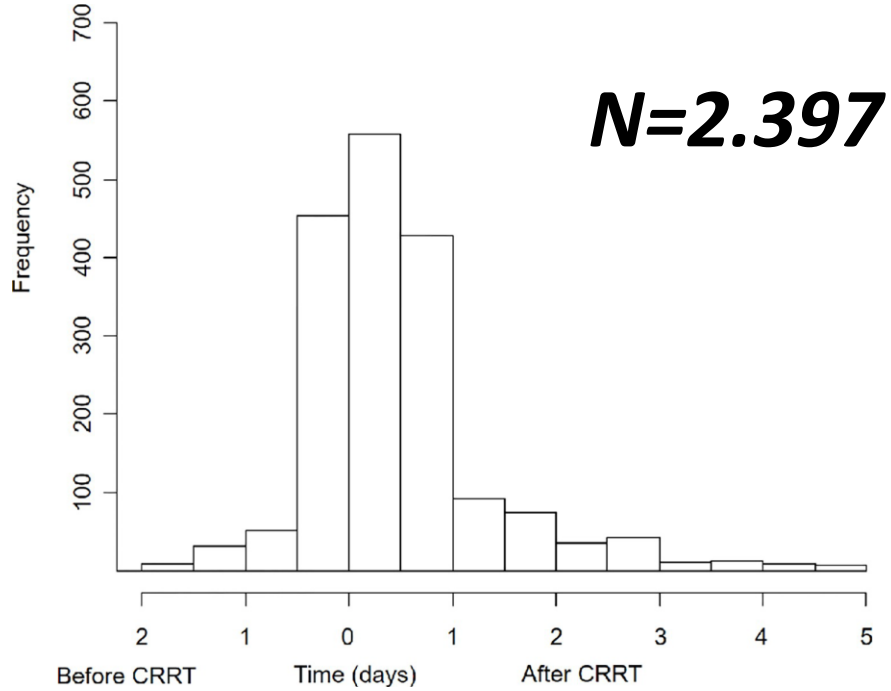
N=2.397



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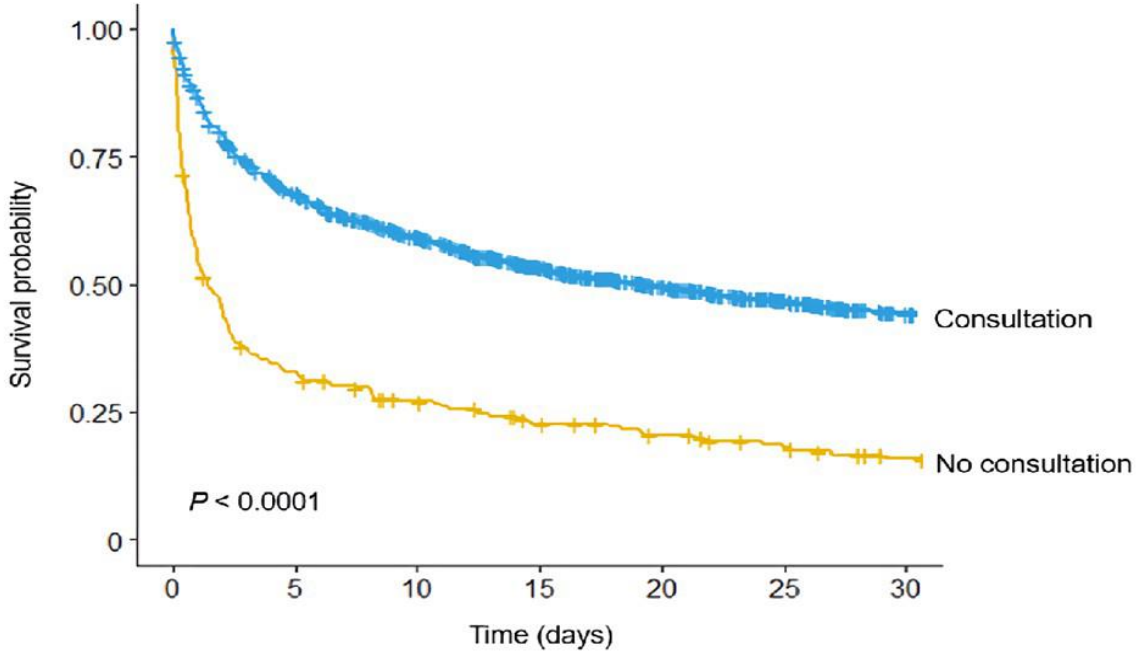

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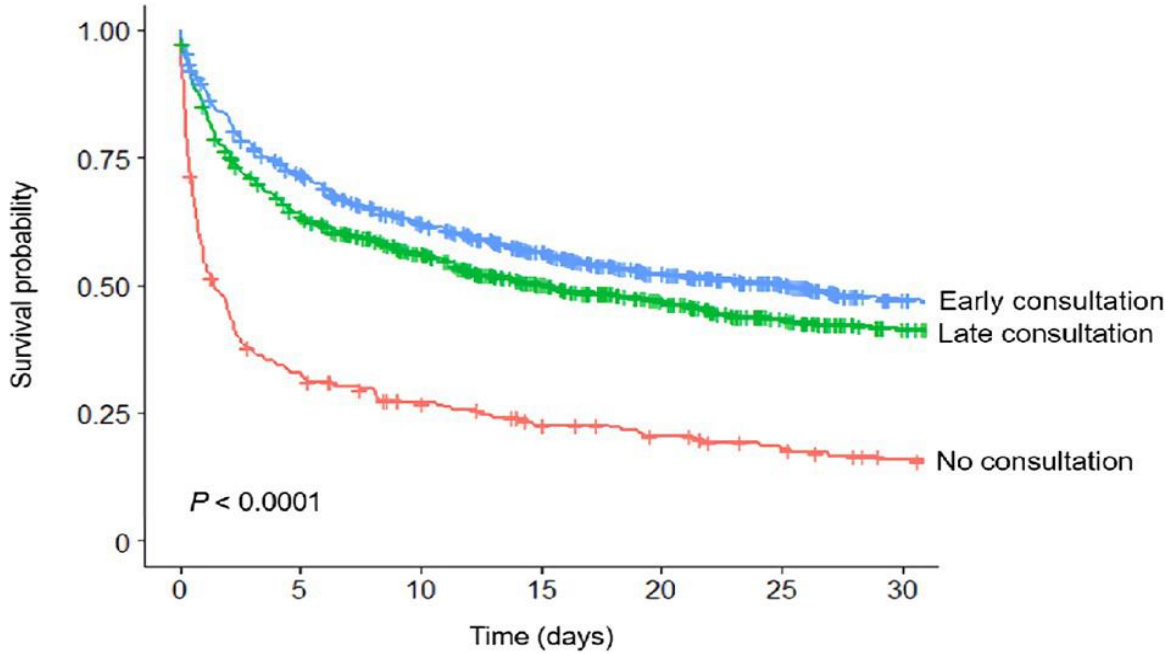


CRRT Machines

Modality	Potential setting in AKI	Advantages	Disadvantages
IHD	Hemodynamically stable	Rapid removal of toxins and low-molecular-weight substances Allows for "down time" for diagnostic and therapeutic procedures Reduced exposure to anticoagulation Lower costs than CRRT	Hypotension with rapid fluid removal Dialysis disequilibrium with risk of cerebral edema Technically more complex and demanding
CRRT	Hemodynamically unstable Patients at risk of increased intracranial pressure	Continuous removal of toxins Hemodynamic stability Easy control of fluid balance No treatment-induced increase of intracranial pressure User-friendly machines	Slower clearance of toxins Need for prolonged anticoagulation Patient immobilization Hypothermia Increased costs

Chapter 5.8: Dose of renal replacement therapy in AKI

5.8.1: The dose of RRT to be delivered should be prescribed before starting each session of RRT. (*Not Graded*) We recommend frequent assessment of the actual delivered dose in order to adjust the prescription. (*1B*)

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*)

RATIONALE

The judgment and awareness of how much of a particular therapeutic procedure should be, and actually it is, delivered is essential for a good medical practice. However, recent surveys have shown a disappointingly low number of physicians that report being aware of, or calculating, RRT consider parameters other than small-solute clearance, such as patients' fluid balance, acid-base and electrolyte homeostasis, and nutrition, among others, as possible components of an optimal RRT dose. In fact, positive fluid balance appears to be an independent risk factor for mortality in AKI patients.[83]

5.8.3: We recommend delivering a Kt/V of 3.9 per week when using intermittent or extended RRT in AKI. (*1A*)

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*)

Chapter 5.2: Criteria for stopping renal replacement therapy in AKI

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*)

Table 3 Potential predictors of successful discontinuation collected on day 2

	All patients $n = 92$	Successful stop CRRT $n = 61$ (66%)	Unsuccessful stop CRRT $n = 31$ (34%)	*P*-value
Primary study variables				
Urine output (L)	2.160 (1.276)	2.424 (1.232)	1.640 (1.217)	0.005
Creatinine clearance, ml/min	20 [7, 41]	29 [14, 56]	7 [4, 16]	< 0.001
Creatinine ratio (day 2/ day 0)	1.35 [1.06, 1.63]	1.16 [0.91, 1.39]	1.63 [1.42, 1.81]	< 0.001
Urinary NGAL (ng/ml)/ creatinine (mmol/L) (n = 63)	152 [15, 601]	80 [10, 249]	583 [203, 1027]	0.002
Vasopressor use, nr (%)	22 (24)	10 (16)	12 (39)	0.018
Non-renal SOFA score	4 [3, 7]	4 [3, 5]	6 (3)	0.080
Secondary study variables				
Duration of CRRT (days)	5 [3, 10]	4 [3, 9]	7 [4, 17]	0.014
Cumulative fluid balance, day 0–2 (L)	−0.430 (3.129)	−1.284 (2.884)	1.250 (2.942)	< 0.001

Mean (standard deviation) for normally distributed variables, median [25th and 75th percentile] for non-normally distributed variables, number (percentage) when appropriate

NGAL neutrophil gelatinase-associated lipocalin, *SOFA* sequential organ failure assessment, *CRRT* continuous renal replacement therapy

Stads et al. BMC Nephrol 2019

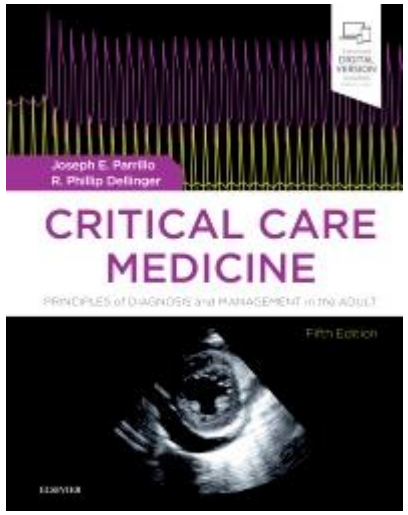
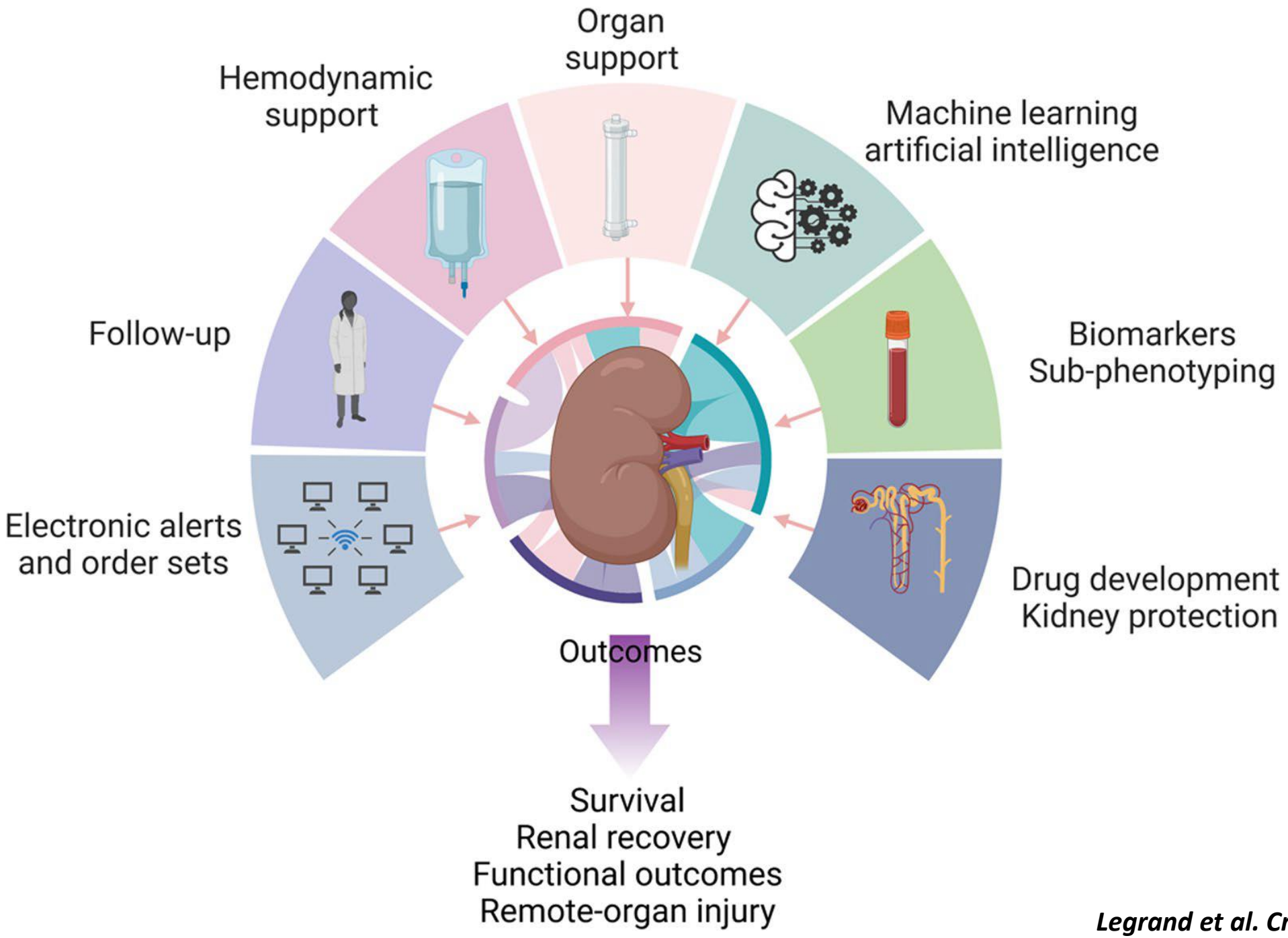


TABLE 52.2 Nutritional Provisions in Critically Ill Patients With Acute Kidney Injury

Type of Enteral Formulation	Standard, Polymeric Fluid-Restricted Formula[a]
Energy requirements	25–30 kcal/kg per day (actual body weight)
Protein requirements	1.2–2 gm/kg per day (up to 2.5 g/kg per day with frequent continuous renal replacement therapy)

[a]Specialized formulations with reduced electrolyte content may be necessary in patients with electrolyte abnormalities.



Legrand et al. Critical Care 2024