

Stratégies d'initiation de l'EER



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Conflict of interest

*AKIKI 1, AKIKI 2 and ICRAKI trials funded by **grants from French Ministry of Health***

Christophe Vinsonneau

1967-2024

Continuous venovenous haemodiafiltration versus intermittent haemodialysis for acute renal failure in patients with multiple-organ dysfunction syndrome: a multicentre randomised trial

Christophe Vinsonneau, Christophe Camus, Alain Combes, Marie Alyette Costa de Beauregard, Kado Khouche, Thierry Boulain, Jean-Louis Pallot, Jean-Daniel Chiche, Pierre Taupin, Paul Landais, Jean-François Dhainaut, for the Hemodiaffe Study Group*

Lancet 2006
HEMODIAFFE



THE LANCET

JANUARY 21, 1961

OPTIMUM TIME FOR DIALYSIS IN ACUTE REVERSIBLE RENAL FAILURE

Description and Value of an Improved Dialyser with Large Surface Area

F. M. PARSONS

M.B., B.Sc. Leeds

ASSISTANT DIRECTOR

METABOLIC DISTURBANCES IN SURGERY (M.R.C.) UNIT

C. R. BLAGG

M.B. Leeds, M.R.C.P.

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SHIRLEY M. HOBSON

A.M.I.L.T.

TECHNICAL ASSISTANT

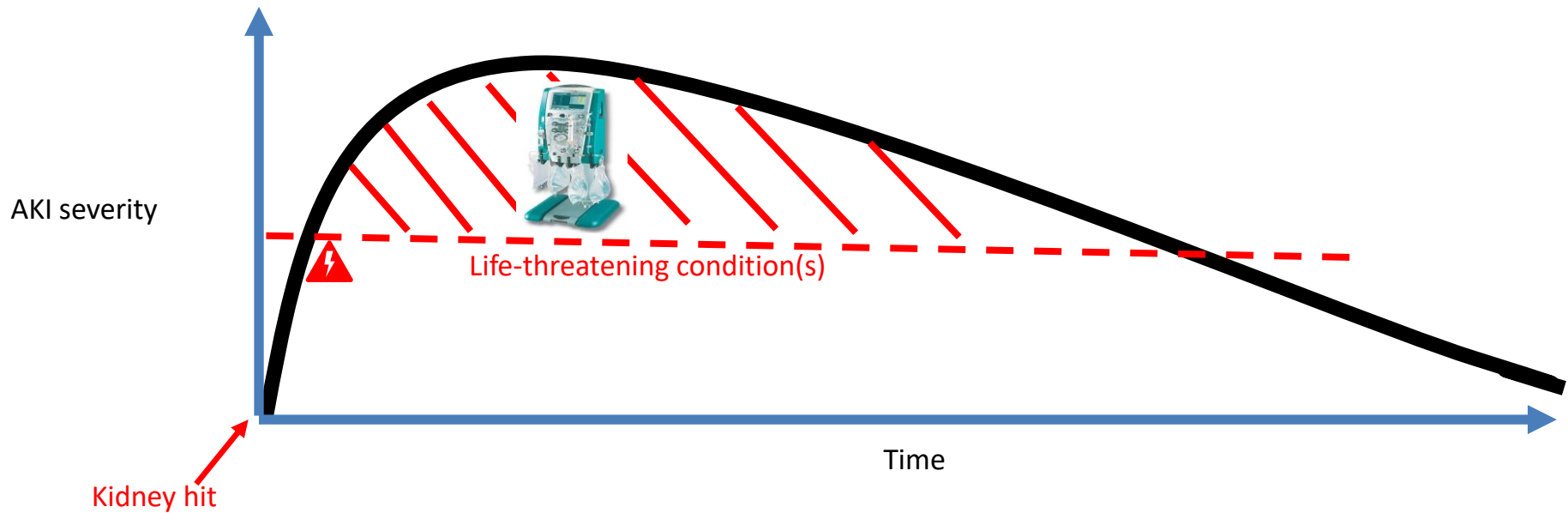
B. H. McCracken

M.D. Wisconsin, M.R.C.P.

LATELY LECTURER*

From the General Infirmary at Leeds

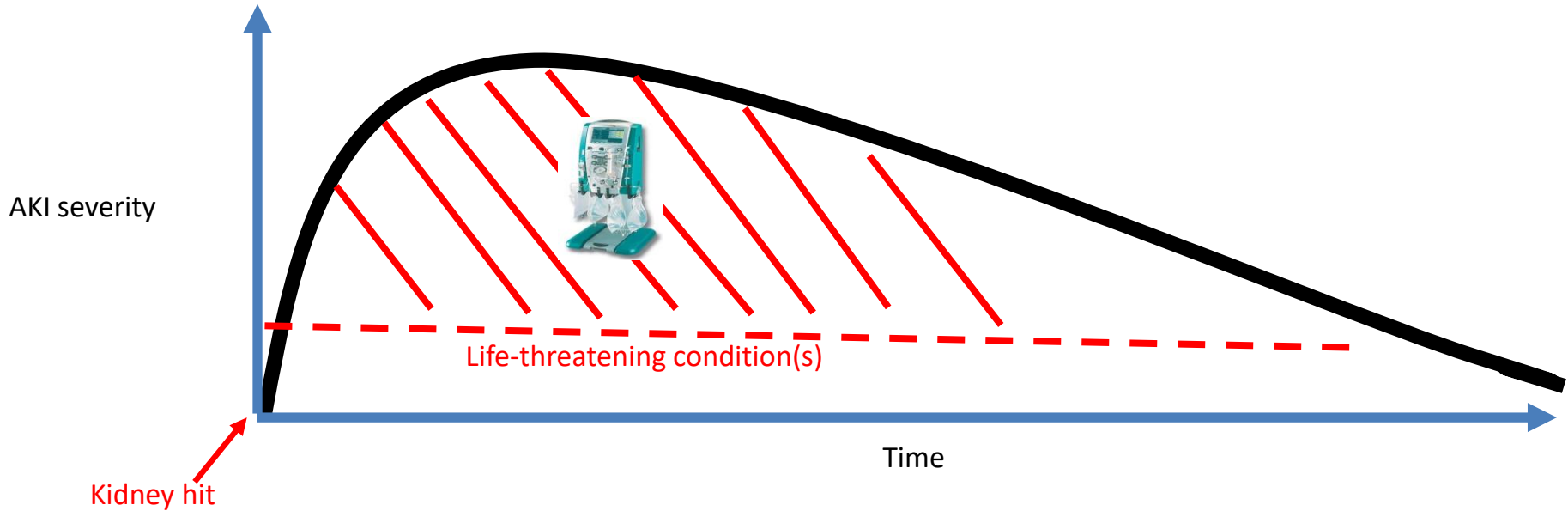
RRT ?



RRT ?



Hypothetical solution: « early » or « preventive » RRT?

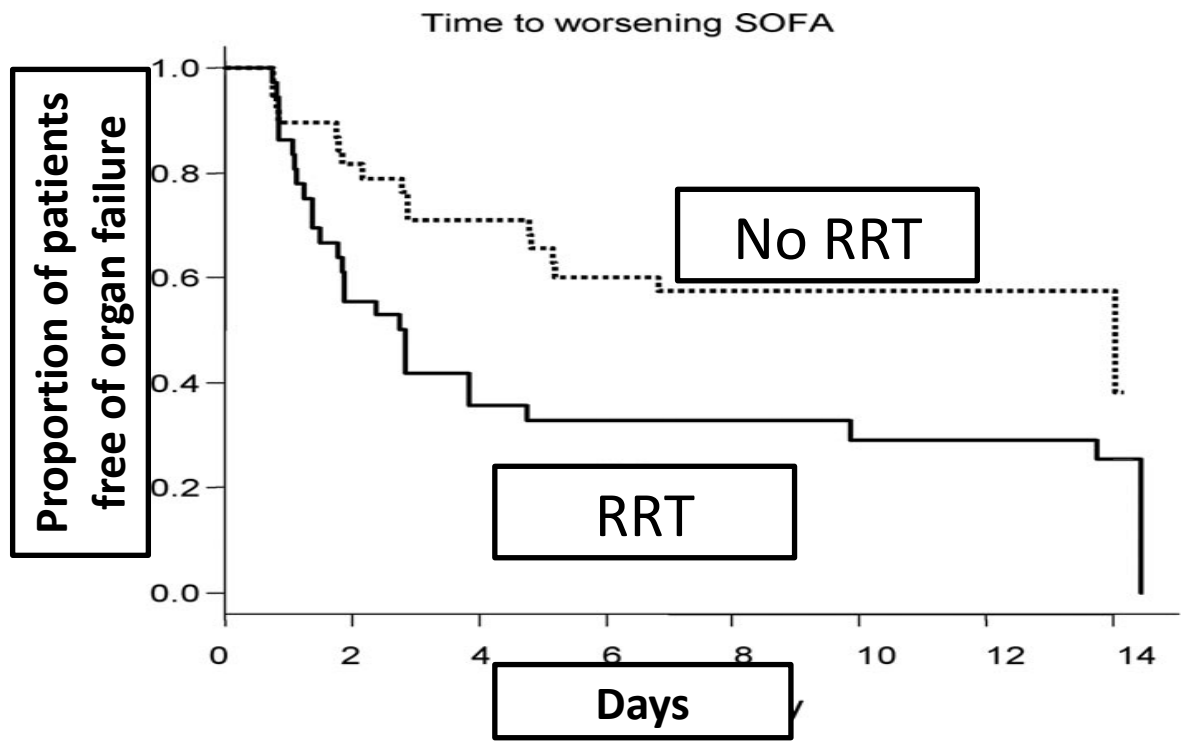


Impact of continuous venovenous hemofiltration on organ failure during the early phase of severe sepsis: A randomized controlled trial*

Didier Payen, MD, PhD; Joaquim Mateo, MD; Jean Marc Cavaillon, PhD; François Fraitse, MD; Christian Floriot, MD; Eric Vicaut, MD, PhD; for the Hemofiltration and Sepsis Group of the Collège National de Réanimation et de Médecine d'Urgence des Hôpitaux extra-Universitaires

Crit Care Med 2009 Vol. 37, No. 3

Hypothetical solution: « early » or « preventive » RRT?



RRT complications....

Hemorrhage

Thrombosis

Bloodstream infections

Hypotensions during the sessions

Metabolic: hypophosphatemia

Heparin Use in Continuous Renal Replacement Procedures: The Struggle Between Filter Coagulation and Patient Hemorrhage¹

J. van de Wetering, R.G.J. Westendorp,² J.G. van der Hoeven, B. Stolk, J.D.M. Feuth, and P.C. Chang

THROMBOSIS IN CHALLENGING POPULATIONS | DECEMBER 8, 2012

Catheter-related thrombosis: lifeline or a pain in the neck?

Pieter W. Kamphuisen, Agnes Y. Y. Lee

RESEARCH

Open Access

Central venous catheter-related bloodstream infection and colonization: the impact of insertion site and distribution of multidrug-resistant pathogens

Vassiliki Pittiriga¹, Petros Kanellopoulos², Ioannis Bakalis², Elsa Kampos², Ioannis Sagris², George Saroglou² and Athanasios Tsakris¹



HYPOTENSION

And others....





An old (and forgotten) concept...formulated in 1971



Does Hemodialysis Delay Recovery from Acute Renal Failure?

John D. Conger

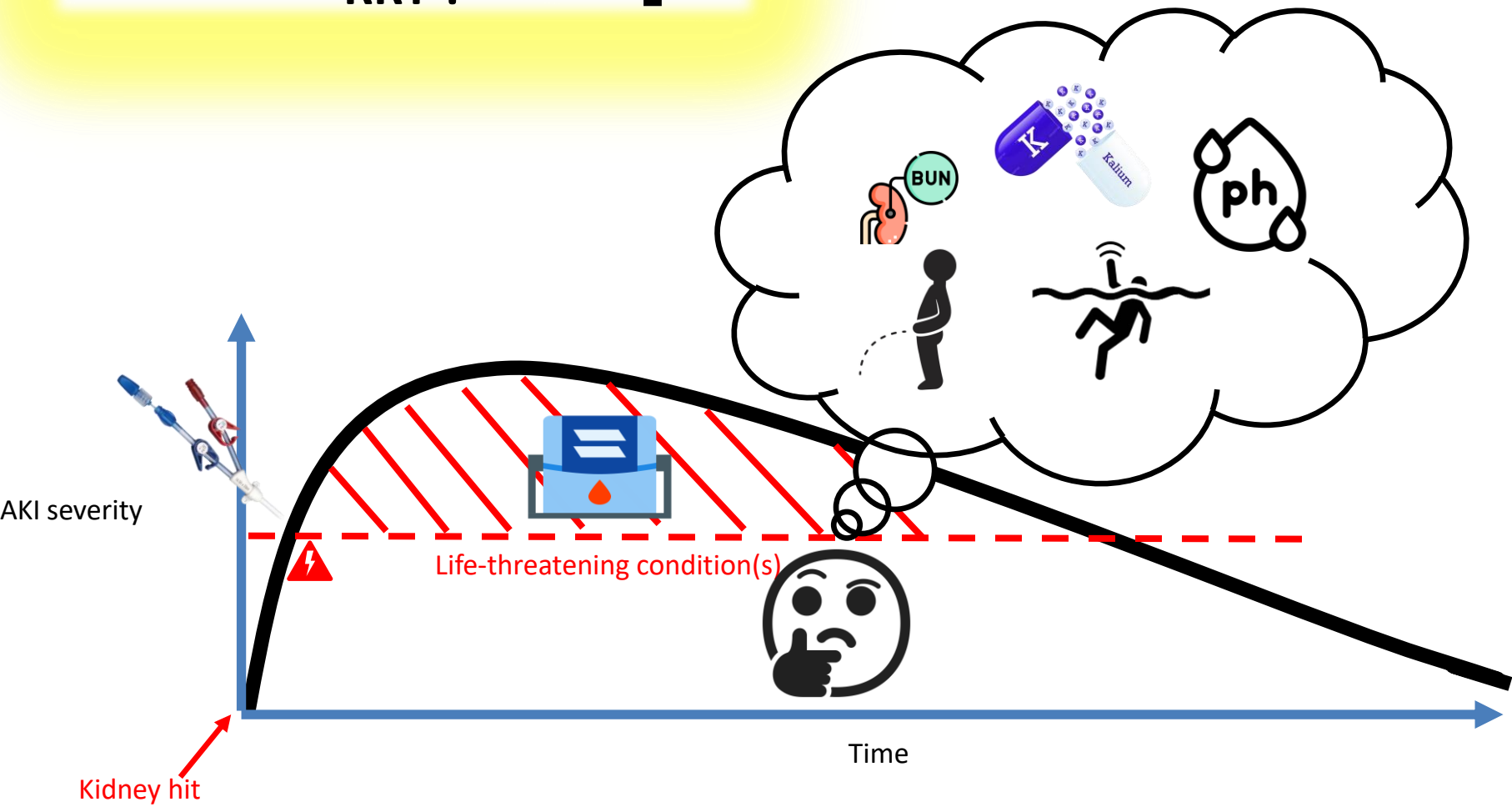
University of Colorado School of Medicine and the VA Medical Center, Denver, Colorado

Seminars in Dialysis—Vol 3, No 3 (July–Sept) 1990 pp 146–148

Over the past two decades, several observations surrounding the use of hemodialysis in acute renal failure have suggested the possibility that this therapy—while clearly a life-sustaining substitute for kidney function—may actually contribute to the prolongation of renal failure. Concern initially came from experiences in the management of acute renal failure in combat casualties in Viet Nam (1). Nearly all patients had renal ischemia (hypoperfusion) due to trauma or surgery. Hemodialysis was carried out daily or every other day and often complicated by transient hypotension. Disturbingly, the duration of renal shutdown frequently was prolonged up to 3 to 4 weeks.

In a number of these patients with prolonged acute renal failure biopsies were performed and in others that died suddenly (from complications such as pulmonary emboli, septic shock or hemorrhage) immediate postmortem tissue was obtained. A surprising and consistent finding was the presence of focal areas of fresh tubular necrosis estimated to be 48 to 72 hours old and, therefore, unlikely to be the result of the initial ischemic insult 3 to 4 weeks earlier. Moreover, there were no hemodynamic catastrophes in the 4 to 5 days prior to biopsy (or sudden death) that would account for the fresh ischemic foci.

RRT ?





Absolute indications to start RRT

Life-threatening complications

2012

- Refractory **severe hyperkalemia**
- Refractory **severe metabolic acidosis** (pH<7.15)
- **Pulmonary edema** resistant to diuretics

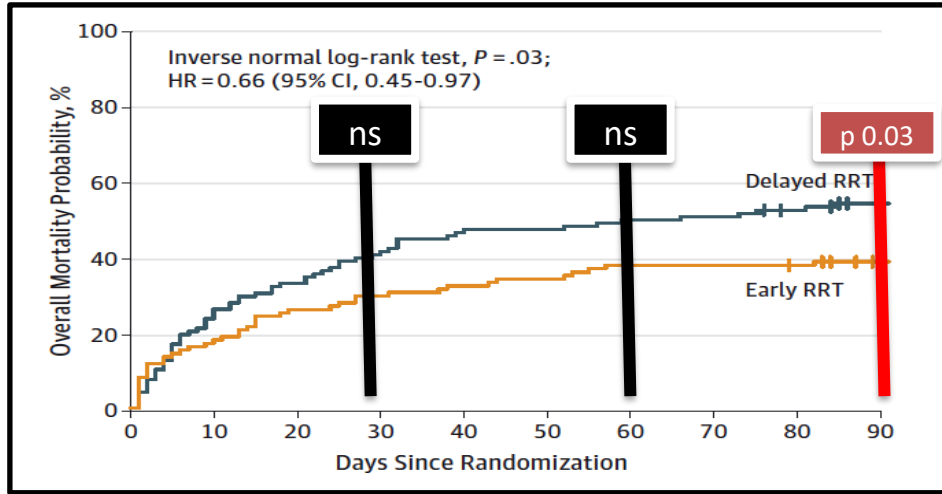


Absolute indications to start RRT

Life-threatening complications

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Early vs delayed RRT

eTable S1: Advanced inclusion criteria for dialysis initiation

	Early (n=112)	Delayed (n=119)	Absolute difference Early - Delayed [95% CI]	p-value
Fluid overload or worsening pulmonary edema, No. (%)	82 (73.2)	93 (78.2)	-4.9% [-16.0%, 6.1%]	0.38





N. LAMEIRE
Professor of Medicine
University Hospital of
Ghent

About ELAIN

“ELAIN investigated the effect of delaying dialysis in patients who really needed it: severe pulmonary edema is universally recognized as an absolute indication for emergent RRT.

The fact that over 90% of patients in the delayed group eventually received dialysis underscores this. It is thus not surprising that ELAIN concluded that early start improved patient outcome”

Am J Respir Crit Care Med. 2018

What is the question ?

In critically ill patients with **severe AKI** who have **no life-threatening complication**, should we delay RRT ?

Early RRT initiation

- Pros:
 - Fluid balance control
 - Improve acid-base status
 - Corrects electrolytes abnormalities
 - Removal of toxins or cytokines in sepsis ??
- Cons:
 - Potential harm (catheter, hypotension, metabolic)
 - Costs



Stage-Based Management of AKI

High risk

1

2

3

Discontinue all nephrotoxic agents when possible

Ensure volume status and perfusion pressure

Consider functional hemodynamic monitoring

Monitor 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

Facteurs qui font débiter l'EER chez les réanimateurs européens

Matthieu Legrand
Michael Darmon
Michael Joannidis
Didier Payen

Management of renal replacement therapy in ICU patients: an international survey

ICM 2013

Urée/Créatinine

Fixed value of urea/creatinine

Metabolic acidosis

Volume overload

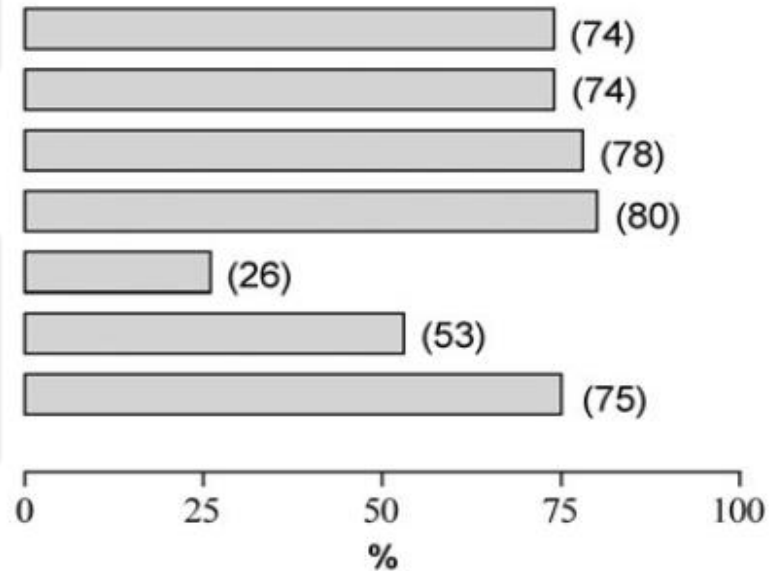
Hyperkalaemia

Urine output < 0.3ml/kg/h x 24hr

Urine output < 0.5ml/kg/h x 12hr

Urine output < 0.5ml/kg/h x 6hr

Diurèse

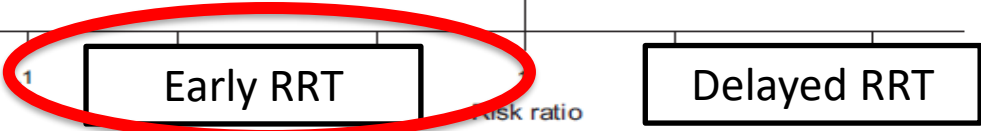
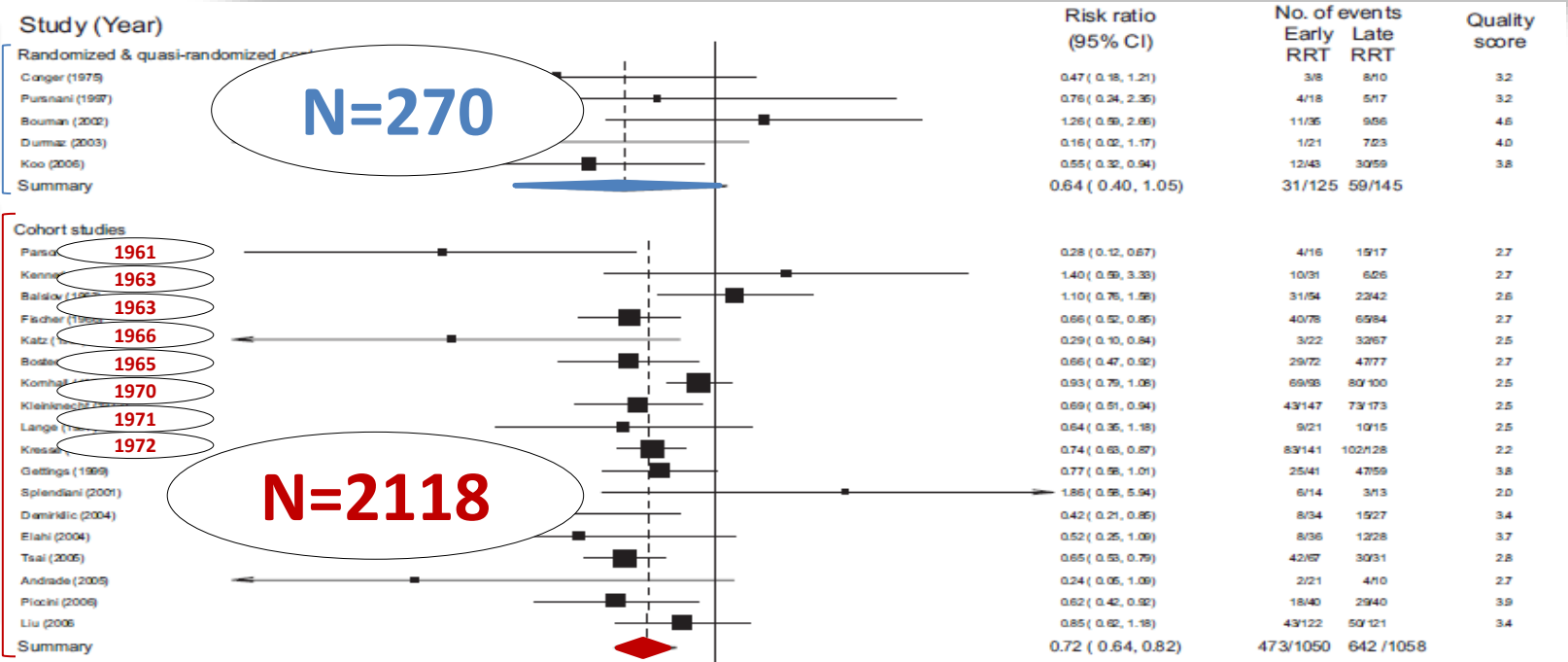


Timing of Renal Replacement Therapy Initiation in Acute Renal Failure: A Meta-analysis

American Journal of Kidney Diseases, Vol 52, No 2 (August), 2008: pp 272-284
 Victor F. Seabra, MD,¹ Ethan M. Balk, MD, MPH,² Orfeas Liangos, MD,³ Marie Anne Sosa, MD,³
 Miguel Cendoroglo, MD,⁴ and Bertrand L. Jaber, MD, MS³

RCTs

Cohort studies



Patients with AKI

```
graph TD; A[Patients with AKI] --> B[Patients managed with RRT]; A --> C[No RRT]; B --> D[Early RRT initiation]; B --> E[Late RRT initiation];
```

Patients managed with RRT

Early RRT
initiation

Late RRT
initiation

No
RRT

Patients with AKI

```
graph TD; A[Patients with AKI] --> B[Patients managed with RRT]; A --> C[No RRT]; B --> D[Early RRT initiation]; B --> E[Late RRT initiation]; subgraph Observational_studies; B; D; E; end
```

Patients managed with RRT

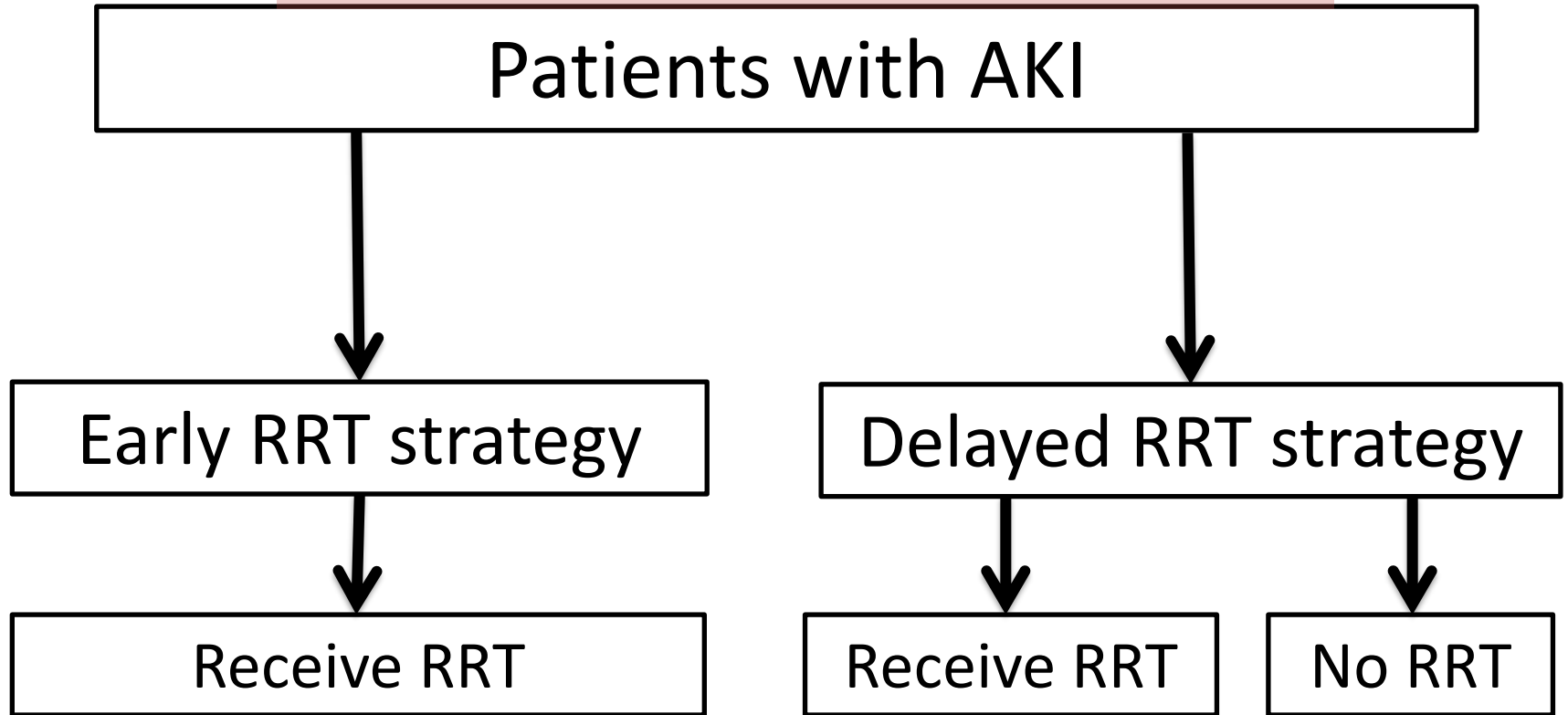
Early RRT
initiation

Late RRT
initiation

No
RRT

Observational studies

study design to adequately answer
clinical question of timing of RRT in AKI



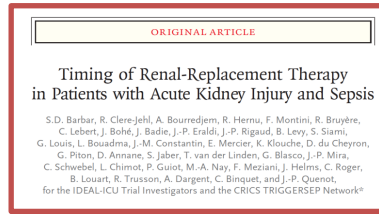
2016
NEJM



AKIKI

- **Multicenter RCT**
- **n=620**
- **Mixed ICU patients**

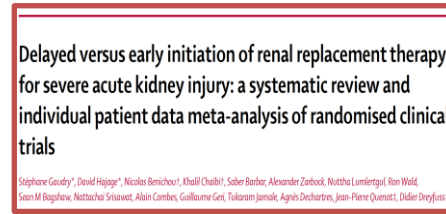
2018
NEJM



IDEAL-ICU

- **Multicenter RCT**
- **n=488**
- **Septic ICU patients**

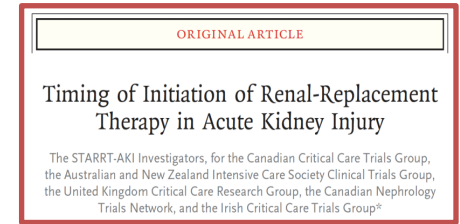
2020
Lancet



IPDMA

- **10 RCTs**
- **n=1879**

2020
NEJM



STARRT-AKI

- **Multicenter RCT**
- **n=2927**
- **Mixed ICU patients**

Initiation Strategies for Renal-Replacement Therapy in the Intensive Care Unit

Stéphane Caudry, M.D., David Hajage, M.D., Frédérique Schortgen, M.D., Laurent Martin-Lefevre, M.D., Bertrand Pons, M.D., Eric Boulet, M.D., Alexandre Boyer, M.D., Guillaume Chevrel, M.D., Nicolas Lerolle, M.D., Ph.D., Dorothee Carpenter, M.D., Nicolas de Prost, M.D., Ph.D., Alexandre Laurette, M.D., Anne Bretagne, M.D., Julien Mayaux, M.D., Saad Nseir, M.D., Ph.D., Bruno Megarbane, M.D., Ph.D., Marina Thirion, M.D., Jean-Marie Forel, M.D., Julien Maizel, M.D., Ph.D., Hodane Yonis, M.D., Philippe Markowicz, M.D., Guillaume Thery, M.D., Florence Tubach, M.D., Ph.D., Jean-Damien Ricard, M.D., Ph.D., and Didier Dreyfuss, M.D., for the AKIKI Study Group¹



5528 Had AKI and received vasoactive agent and/or invasive MV

3430 Had AKI stage 3 of KDIGO classification

Life threatening conditions

620 Underwent randomization

Early RRT Strategy
n=312

Delayed RRT Strategy
n=308

1 patient refused the use of data

619 Were included in the analysis



Initiation Strategies for Renal-Replacement Therapy in the Intensive Care Unit

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Inclusion Criteria

- Adults
- Invasive MV and/or catecholamine infusion
- AKI Stage 3 of KDIGO classification
 - Serum creatinine 3.0 times baseline or $> 354 \mu\text{mol/l}$ (4.0 mg/dl)
 - or Urine output $< 0.3 \text{ ml/kg/h}$ for 24 hours
 - or Anuric for ≥ 12 hours

Study Interventions



Early Strategy Group



RRT as soon as possible

Within 6 hours after
inclusion criteria

Delayed Strategy Group



RRT only if pre-specified
criteria present

Delayed Strategy Group

Pre-specified criteria

- **Severe hyperkalemia**
potassium > 6 mmol/l, or > 5.5 mmol/l *Despite medical treatment*
- **Severe acidosis** (pH <7.15)
- **Acute pulmonary edema** due to fluid overload
Responsible for severe hypoxemia
- **Oliguria/Anuria >72 hours**
- **Serum urea concentration > 40mmol/l**

Initiation Strategies for Renal-Replacement Therapy in the Intensive Care Unit

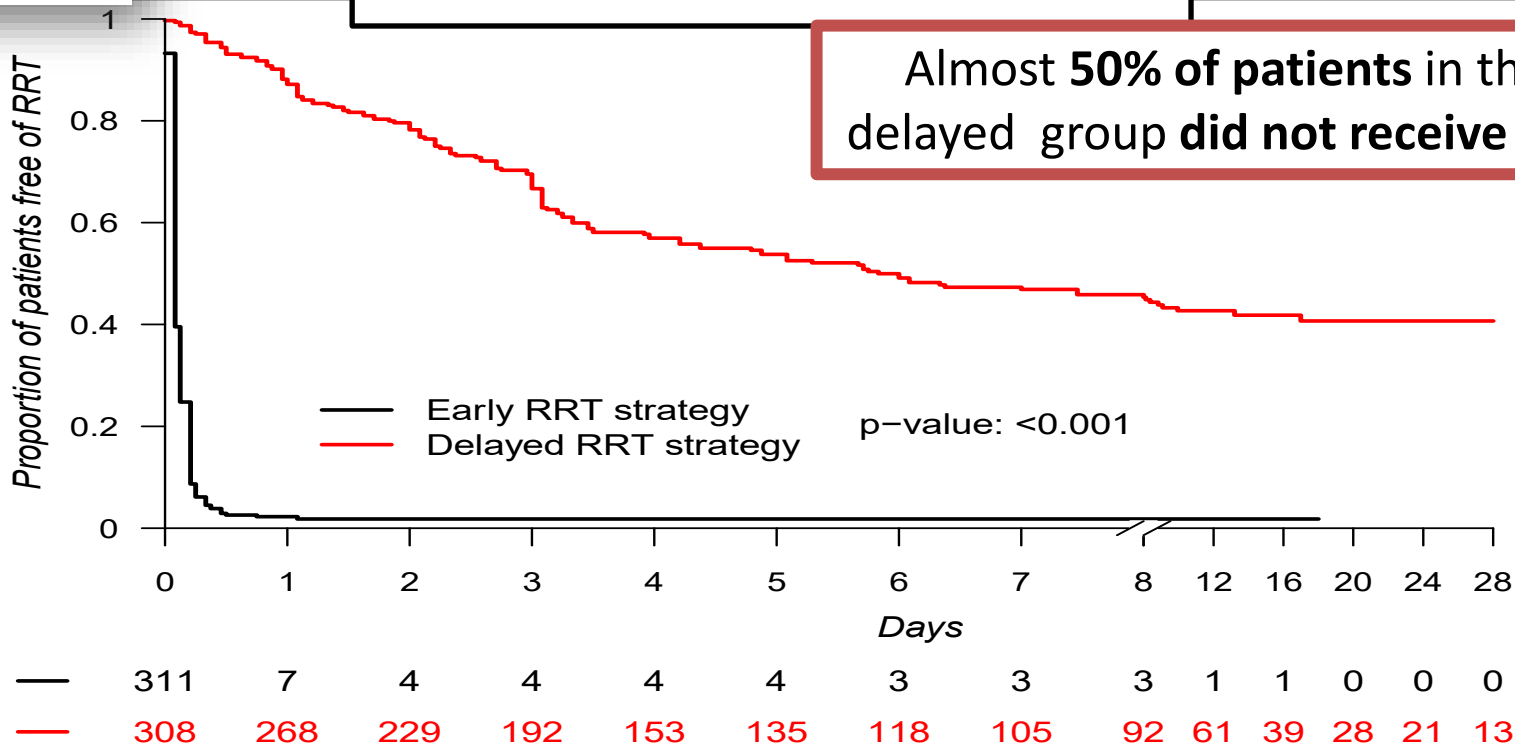
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Patients free of RRT

Almost 50% of patients in the delayed group did not receive RRT

AKIKI

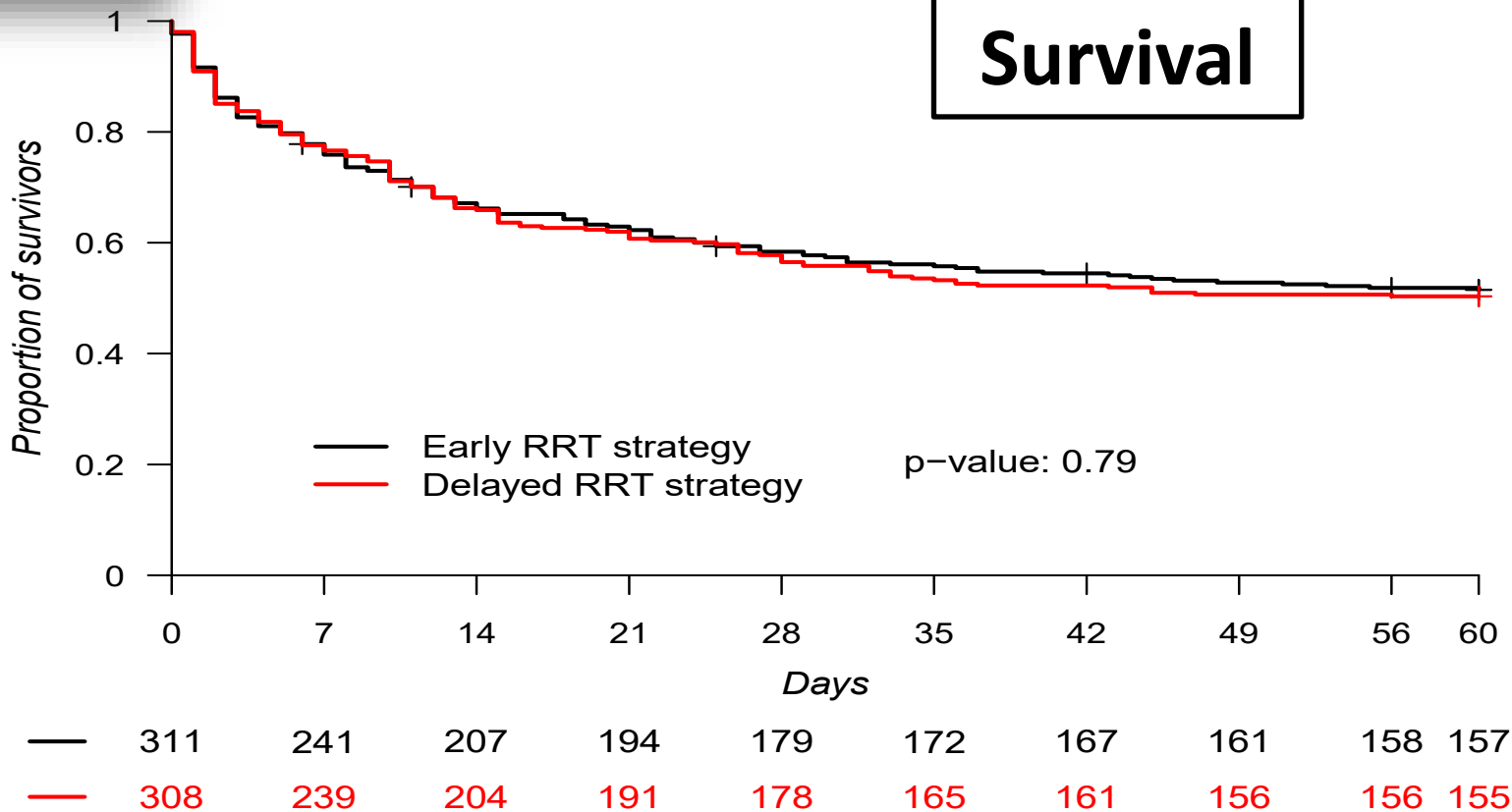


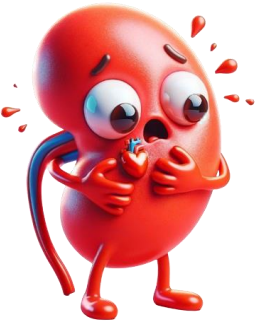
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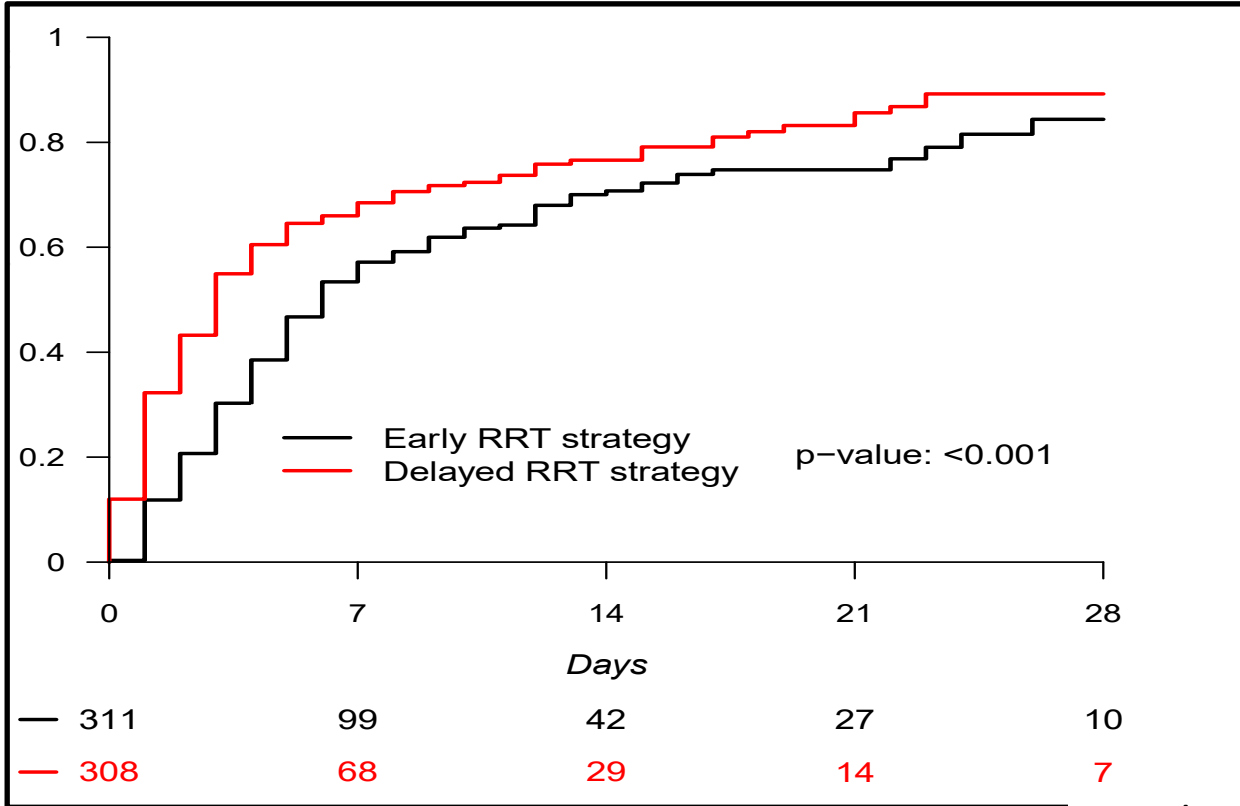


AKIKI





Adequate urine output with no need for RRT





Does Hemodialysis Delay Recovery from Acute Renal Failure?

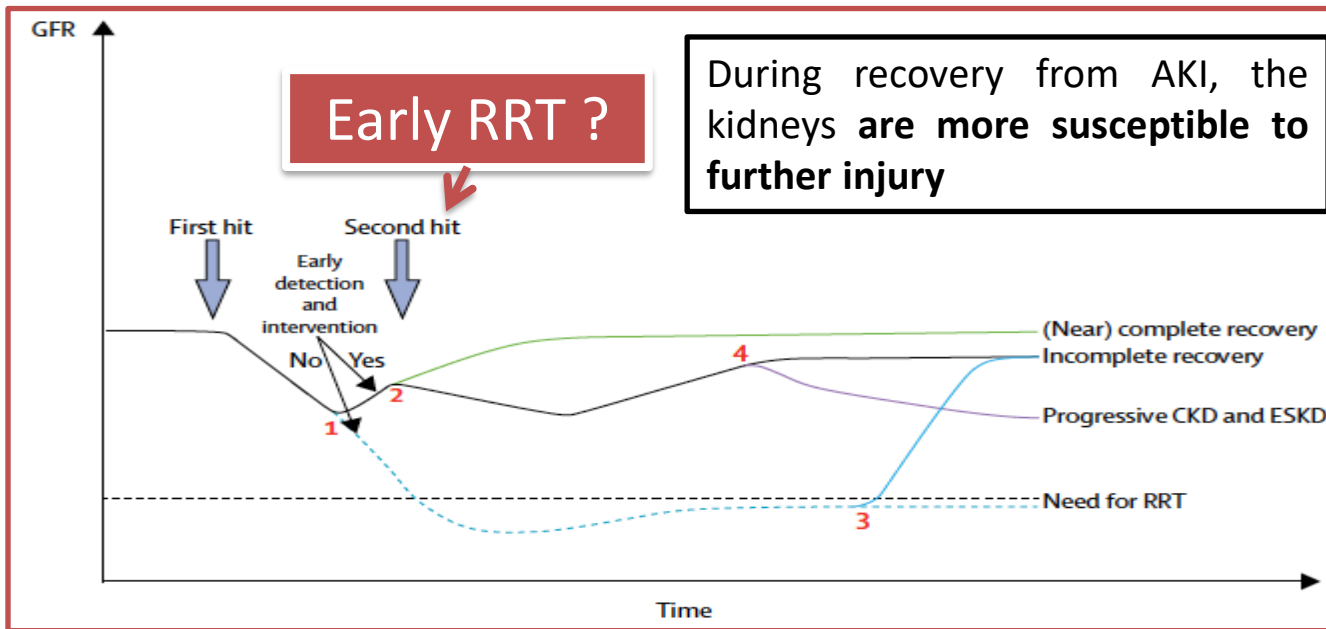
John D. Conger
University of Colorado School of Medicine and the VA Medical Center, Denver, Colorado

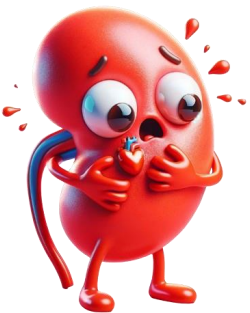
Seminars in Dialysis—Vol 3, No 3 (July–Sept) 1990 pp 146–148

Intensive care medicine and renal transplantation 1

Management of patients at risk of acute kidney injury

Jill Vanmassenhove, Jan Kielstein, Achim Jörres, Wim Van Biesen





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er, Colorado
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146-148

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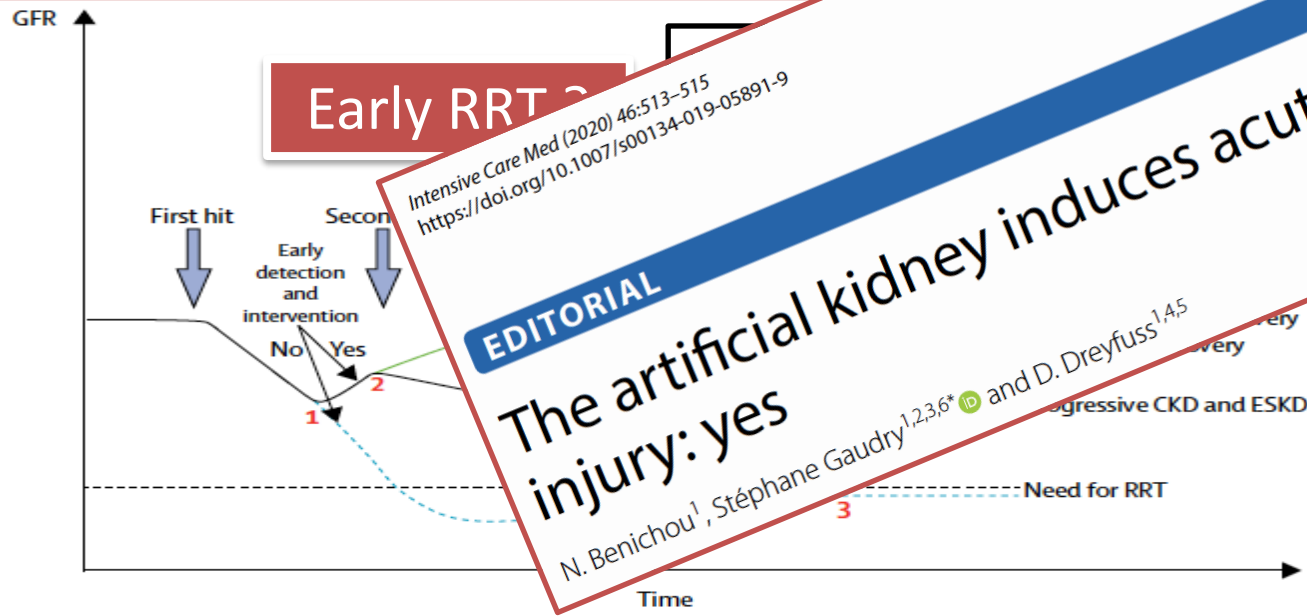
Early RRT

Intensive Care Med (2020) 46:513-515
<https://doi.org/10.1007/s00134-019-05891-9>

EDITORIAL

The artificial kidney induces acute kidney injury: yes

N. Benichou¹, Stéphane Gaudry^{1,2,3,6*} and D. Dreyfuss^{1,4,5}





Timing of Renal Support and Outcome of Septic Shock and Acute Respiratory Distress Syndrome

Stéphane Gaudry^{1,2}, David Hajage^{1,3,4}, Frédérique Schortgen⁵, Laurent Martin-Lefevre⁷, Charles Verney¹, Bertrand Pons¹⁰, Eric Boulet¹¹, Alexandre Boyer¹², Guillaume Chevrel¹³, Nicolas Lerolle¹³, Dorothée Carpentier¹⁴, Nicolas de Prost^{15,16}, Alexandre Lautrette¹⁷, Anne Bretagnol¹⁸, Julien Mayaux¹⁹, Saad Nseir^{20,21}, Bruno Megarbane²², Marina Thirion²³, Jean-Marie Foret²⁴, Julien Maizer²⁵, Hodane Yonis²⁶, Philippe Markowicz²⁷, Guillaume Thiery^{1,9}, Florence Tubach^{1,28}, Jean-Damien Ricard^{1,29,30}, and Didier Dreyfuss^{1,29,30}

URINE OUTPUT First 2 (D1-D2)

Delayed RRT

Urine output D1-D2

1881 ml

$p < 0.0001$

Early RRT

Urine output D1-D2

994 ml



Timing of Renal Support and Outcome of Septic Shock and Acute Respiratory Distress Syndrome

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ULTRAFILTRATION First 2 days (D1-D2)



Delayed RRT

UF
D1-D2

208 ml

Early RRT

UF
D1-D2

$p < 0.0001$

795 ml



Timing of Renal Support and Outcome of Septic Shock and Acute Respiratory Distress Syndrome

Stéphane Gaudry^{1,2}, David Hajage^{1,3,4}, Frédérique Schortgen⁵, Laurent Martin-Lefevre⁷, Charles Verney⁸, Bertrand Pons¹⁰, Eric Boulet¹⁵, Alexandre Boyer¹, Guillaume Chevrel², Nicolas Lenoir¹², Dorothee Carpentier¹⁴, Nicolas de Prost^{15,16}, Alexandre Lautrette¹⁷, Anne Bretagnol¹⁸, Julien Mayaux¹⁹, Saad Nseir^{20,21}, Bruno Megarbane²², Marina Thirion²³, Jean-Marie Foret²⁴, Julien Maizer²⁵, Hodane Yonis²⁶, Philippe Markowicz²⁷, Guillaume Thiery^{28,9}, Florence Tubach^{3,28}, Jean-Damien Ricard^{1,28,30}, and Didier Dreyfuss^{1,28,30}

First 2 days (D1-D2) CUMULATIVE FLUID OUTPUT



Delayed RRT

Urine output
D1-D2

UF
D1-D2

ns

Early RRT

Urine output
D1-D2

UF
D1-D2

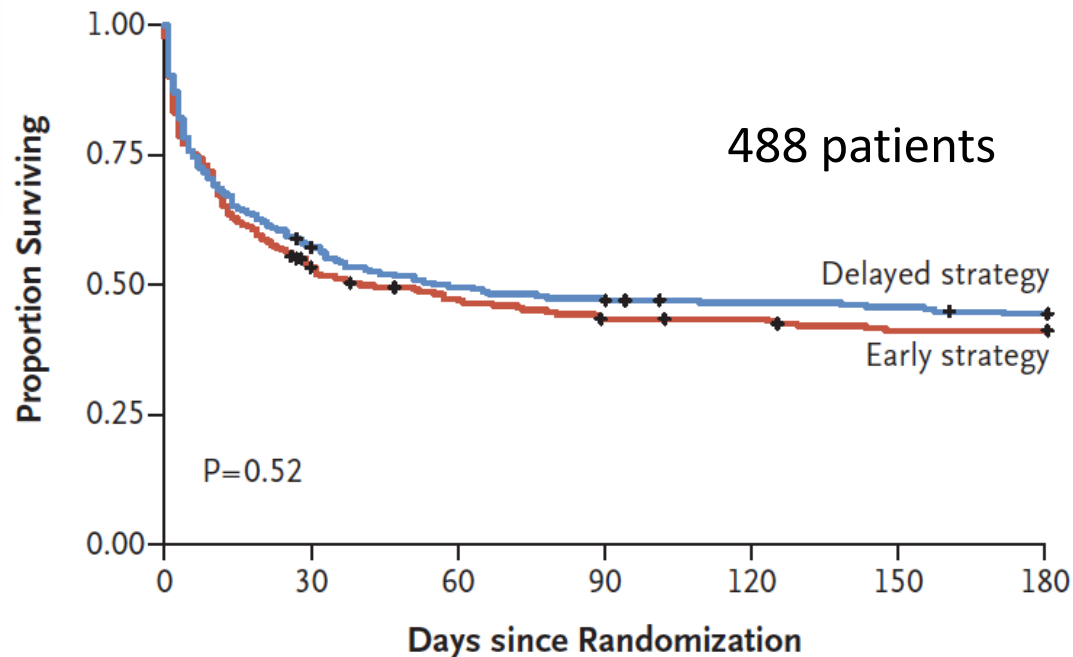


fluid balance did not differ according to RRT initiation strategy

Timing of Renal-Replacement Therapy in Patients with Acute Kidney Injury and Sepsis

S.D. Barbar, R. Clere-Jehl, A. Bourredjem, R. Hernu, F. Montini, R. Bruyère, C. Lebert, J. Bohé, J. Badie, J.-P. Eraldi, J.-P. Rigaud, B. Levy, S. Siami, G. Louis, L. Bouadma, J.-M. Constantin, E. Mercier, K. Klouche, D. du Cheyron, G. Piton, D. Annane, S. Jaber, T. van der Linden, G. Blasco, J.-P. Mira, C. Schwebel, L. Chimot, P. Guiot, M.-A. Nay, F. Meziani, J. Helms, C. Roger, B. Louart, R. Trusson, A. Dargent, C. Binquet, and J.-P. Quenot, for the IDEAL-ICU Trial Investigators and the CRICS TRIGGERSEP Network*

In the delayed-strategy group, **38%** (93 patients) did not receive RRT



No. at Risk

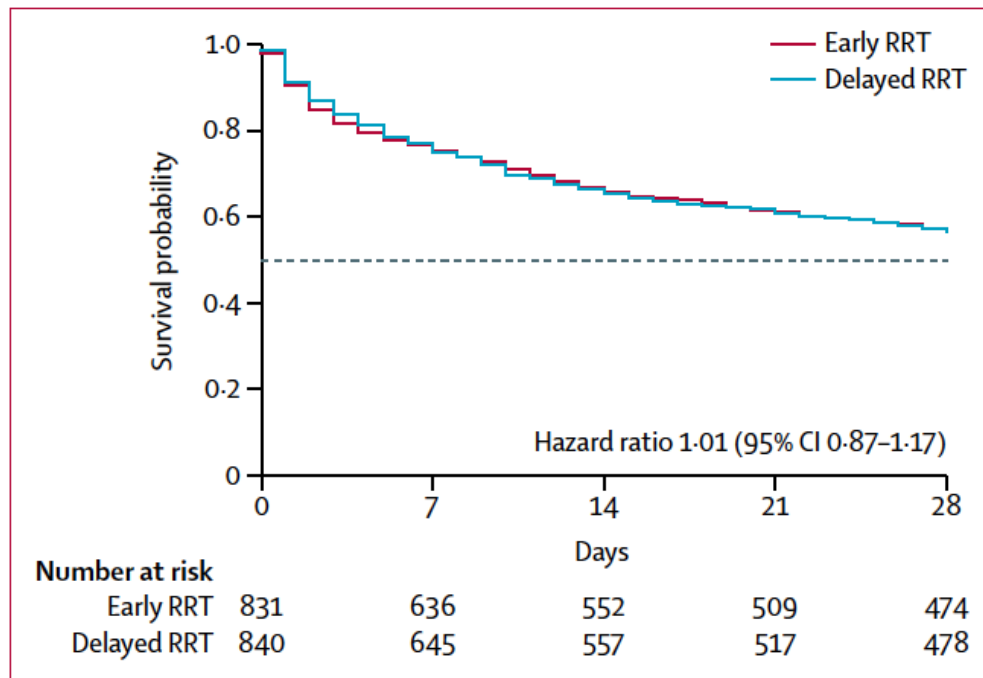
Delayed strategy	242	137	117	112	107	105	101
Early strategy	246	127	109	99	98	92	92

Delayed versus early initiation of renal replacement therapy for severe acute kidney injury: a systematic review and individual patient data meta-analysis of randomised clinical trials



2020
Lancet

Stéphane Gaudry*, David Hajage*, Nicolas Benichou†, Khalil Chaïbit†, Saber Barbar, Alexander Zarbock, Nuttha Lumlertgul, Ron Wald, Sean M Bagshaw, Nattachai Srisawat, Alain Combes, Guillaume Geri, Tukaram Jamale, Agnès Dechartres, Jean-Pierre Quenot‡, Didier Dreyfus‡

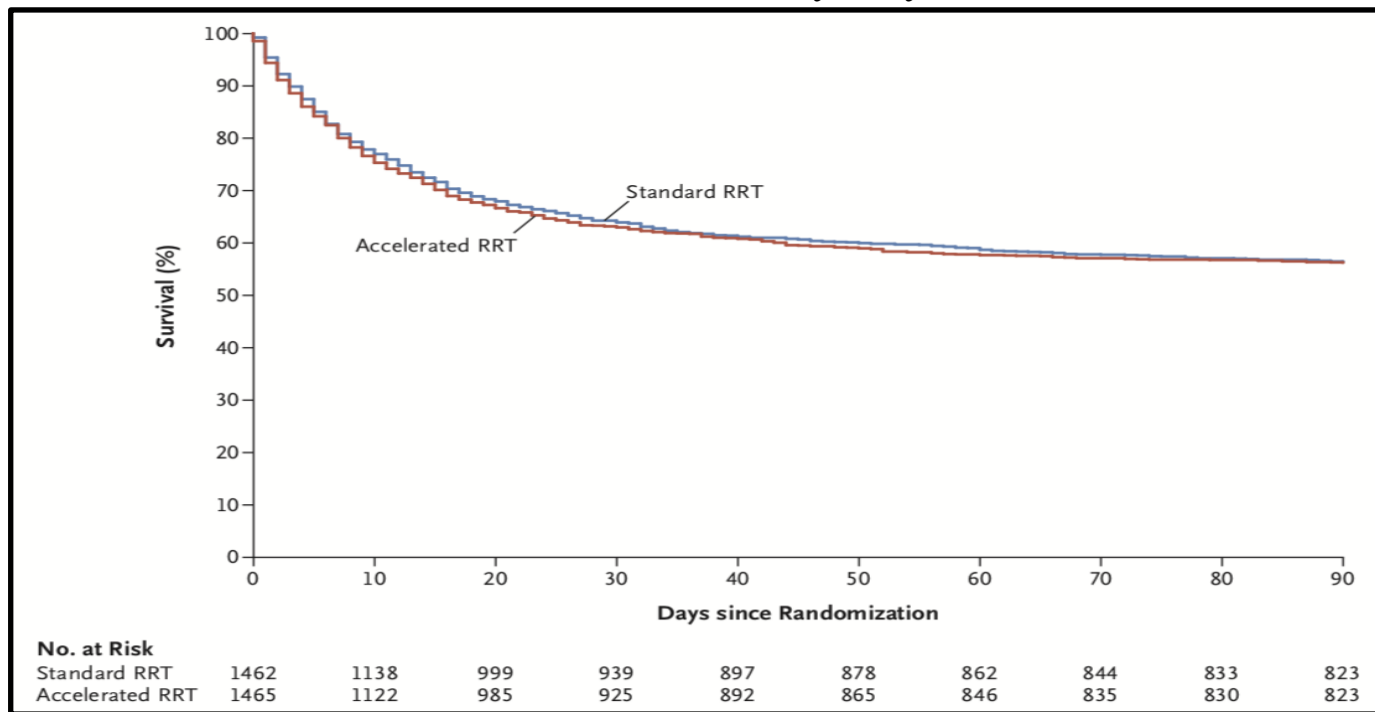


42% never received RRT in the delayed group

Timing of Initiation of Renal-Replacement Therapy in Acute Kidney Injury

The STARRT-AKI Investigators, for the Canadian Critical Care Trials Group, the Australian and New Zealand Intensive Care Society Clinical Trials Group, the United Kingdom Critical Care Research Group, the Canadian Nephrology Trials Network, and the Irish Critical Care Trials Group*

All-cause mortality Day 90



STARRT-AKI confirmed that the “wait and see” approach should be the **standard of care**



Artificial Kidney-Induced Kidney Injury

ORIGINAL ARTICLE

Timing of Initiation of Renal-Replacement Therapy in Acute Kidney Injury

The STARRT-AKI Investigators, for the Canadian Critical Care Trials Group, the Australian and New Zealand Intensive Care Society Clinical Trials Group, the United Kingdom Critical Care Research Group, the Canadian Nephrology Trials Network, and the Irish Critical Care Trials Group*

Confirmation of this concept



RRT dependence after 90 days
Early strategy: 10.4% vs **Delayed strategy: 6.0%**
RR:1.74 (95% CI: 1.24 to 2.43)

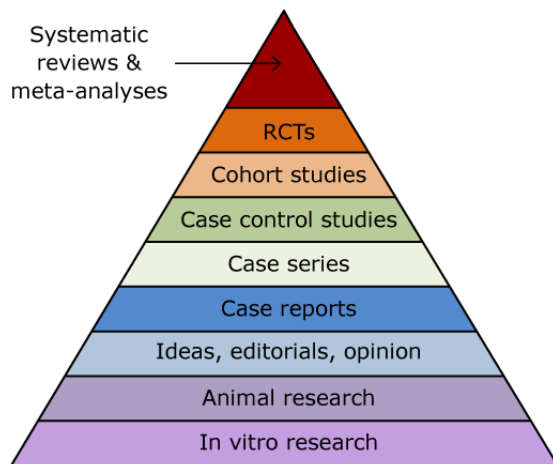
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The STARRT-AKI Investigators, for the Canadian Critical Care Trials Group, the Australian and New Zealand Intensive Care Society Clinical Trials Group, the United Kingdom Critical Care Research Group, the Canadian Nephrology Trials Network, and the Irish Critical Care Trials Group*

Delayed versus early initiation of renal replacement therapy for severe acute kidney injury: a systematic review and individual patient data meta-analysis of randomised clinical trials

Stéphane Gaudry, David Hajage*, Nicolas Benichou†, Khalil Chaibit, Saber Barbar, Alexander Zarbock, Nuttha Lumertgul, Ron Wald, Sean M Bagshaw, Nattachai Srisawat, Alain Combes, Guillaume Geri, Tukaram Jamale, Agnès Dechartres, Jean-Pierre Quenot‡, Didier Dreyfuss‡*

In the context of severe AKI, and in the absence of life-threatening complications (refractory severe hyperkalemia, refractory severe metabolic acidosis or pulmonary edema resistant to diuretics), delaying RRT initiation is recommended

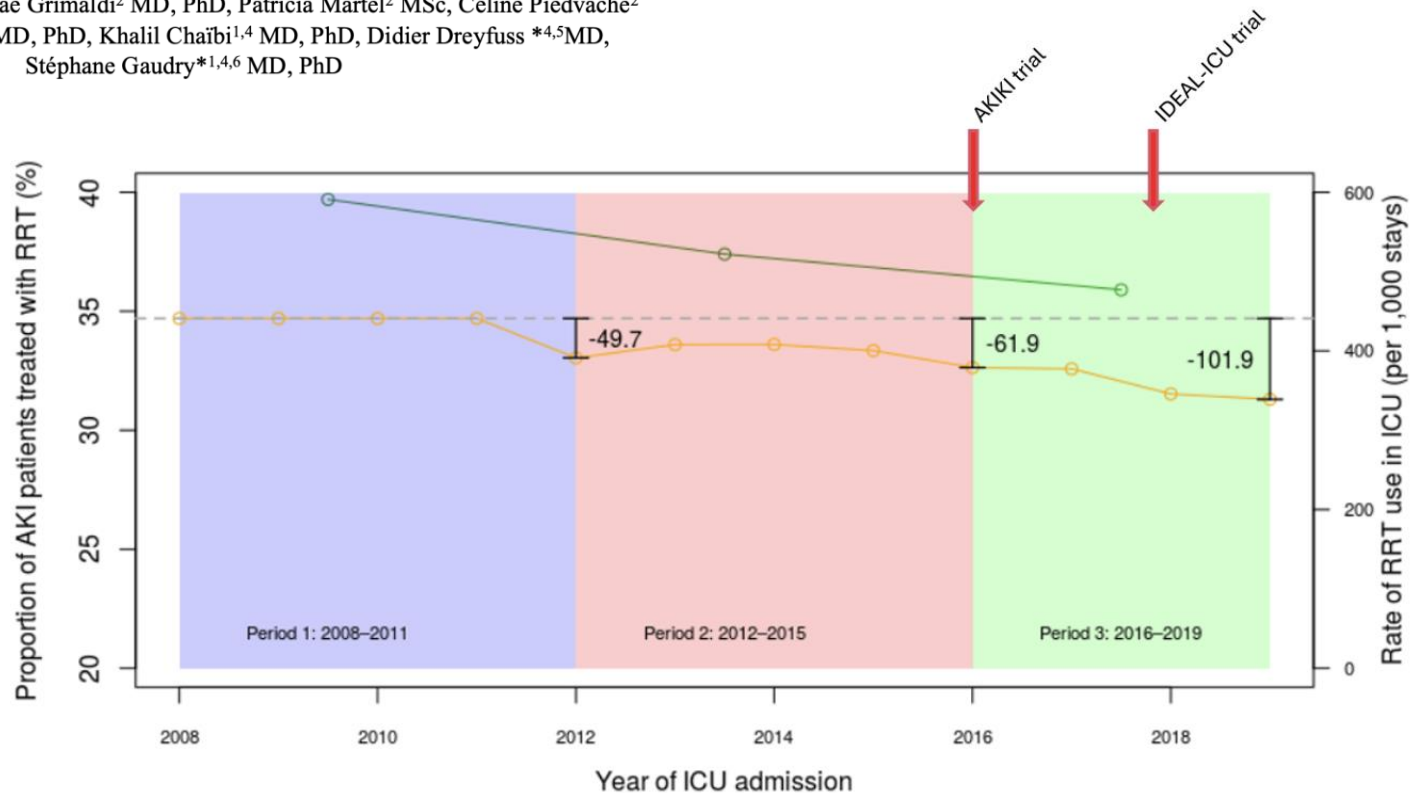


High level of evidence

Trends in renal replacement therapy use in intensive care unit: insights from a French multicenter cohort

Under review

Julien Schmidt¹ M.D, Lamiae Grimaldi² MD, PhD, Patricia Martel² MSc, Céline Piedvache² MSc, Bertrand Guidet³ MD, PhD, Khalil Chaïbi^{1,4} MD, PhD, Didier Dreyfuss^{*4,5} MD, Stéphane Gaudry^{*1,4,6} MD, PhD



○ Proportion of AKI patients treated with RRT (%) — Reduction in RRT use based on 2008-2011 period
○ Rate of RRT use in ICU (per 1,000 stays)

Duration for which RRT can be postponed ?

ICU admision

RRT initiation
Optimal window ?

??

Severe AKI



Duration for which RRT can be postponed ?

ICU admision

RRT initiation
Optimal window ?

??

Severe AKI

The Artificial Kidney Initiation in Kidney Injury 2 (AKIKI 2) A Multi-Centre, Randomized, Controlled Trial

Comparison of two delayed strategies for renal replacement therapy initiation for severe acute kidney injury (AKIKI 2): a multicentre, open-label, randomised, controlled trial



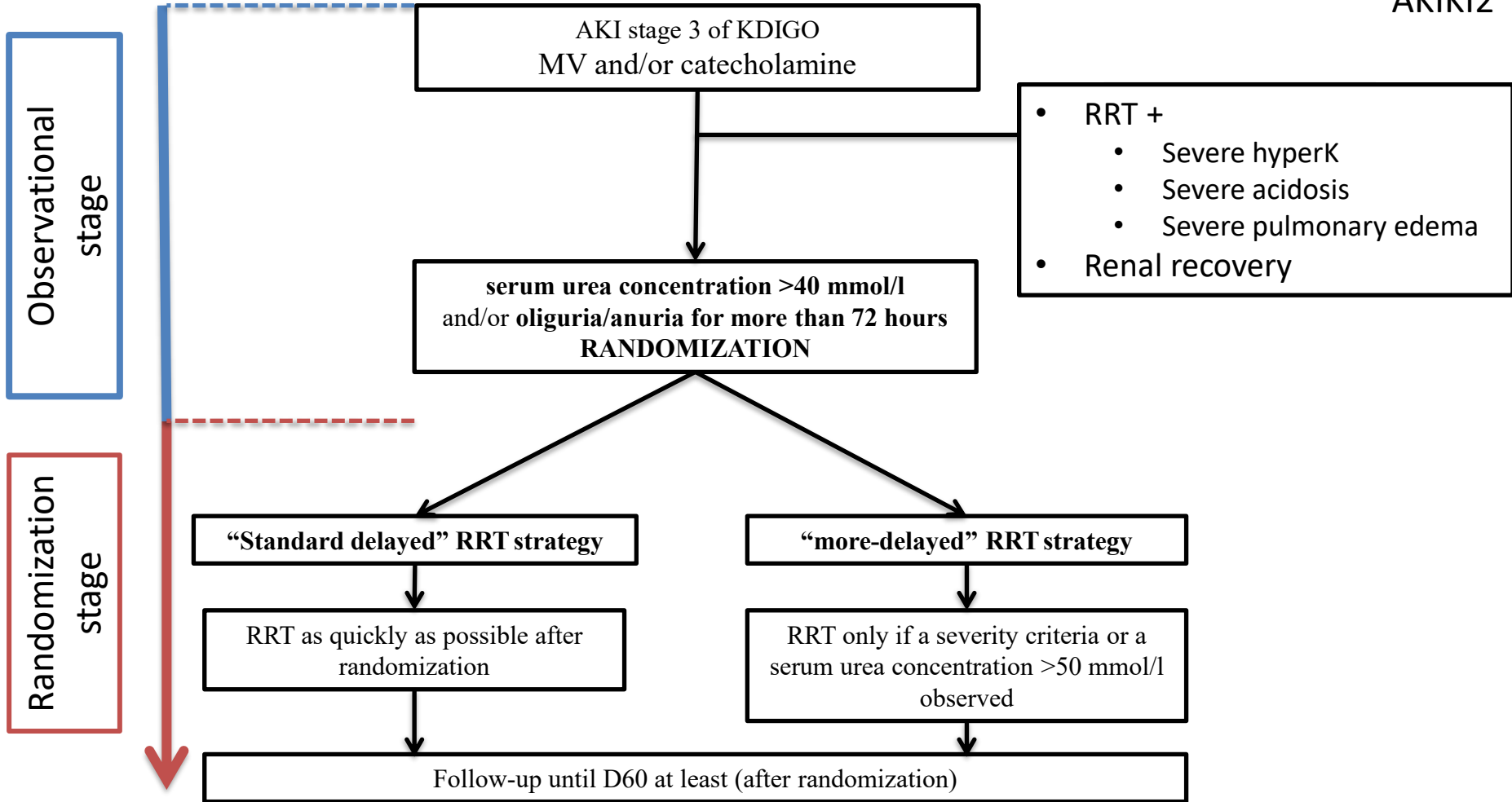
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Lancet 2021

Delayed Strategy Group

Pre-specified criteria

- **Severe hyperkalemia**
potassium > 6 mmol/l, or > 5.5 mmol/l *Despite medical treatment*
- **Severe acidosis** (pH <7.15)
- **Acute pulmonary edema** due to fluid overload
Responsible for severe hypoxemia
- **Oliguria/Anuria >72 hours**
- **Serum urea concentration > 40mmol/l**



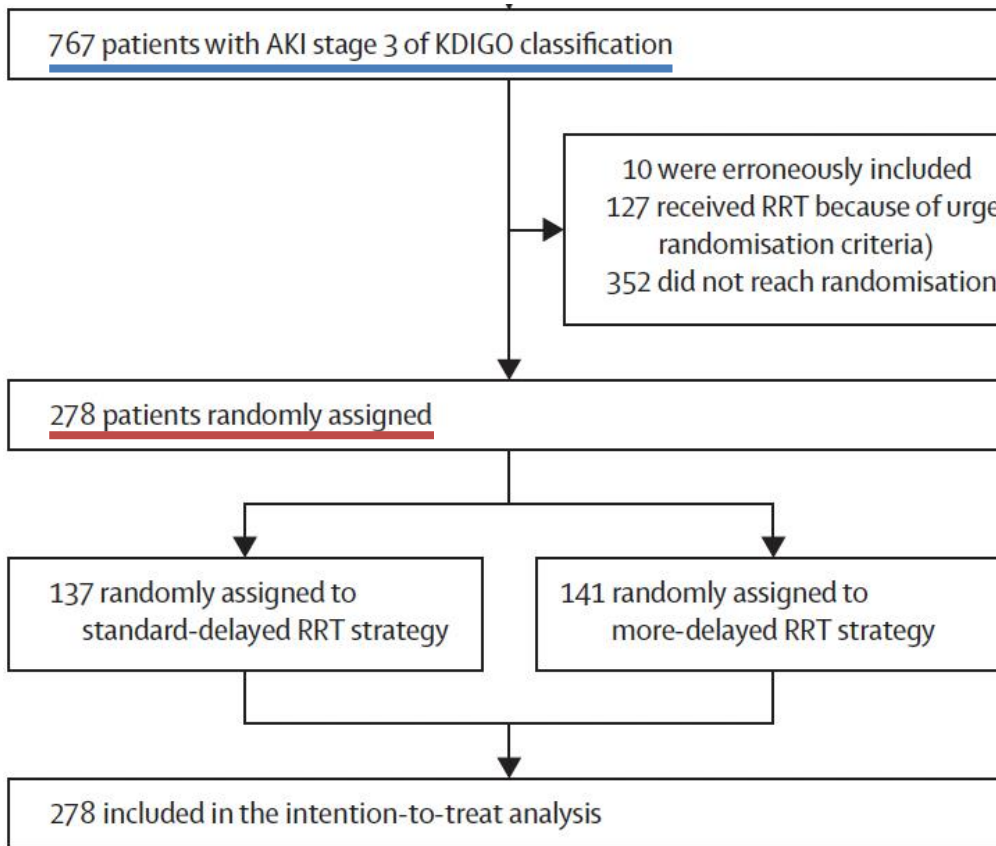
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Observational
stage

Randomization
stage



Comparison of two delayed strategies for renal replacement therapy initiation for severe acute kidney injury (AKIKI 2): a multicentre, open-label, randomised, controlled trial



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Primary endpoint

The **median number of RRT-free days** was 12 days (IQR 0-25) in the delayed strategy and 10 days (IQR 0-24) in the more-delayed strategy (**p=0.93**)

Prespecified multivariate analysis

Odds ratio for **death at 60 days**
2.16 (95% CI, 1.17 – 4.01, **p=0.014**)
with **more-delayed** versus delayed strategy

	Univariable analysis		Multivariable analysis	
	Hazard ratio (95% CI)	p value	Hazard ratio (95% CI)	p value
More-delayed strategy	1.34 (0.96–1.89)	0.13	1.65 (1.09–2.50)	0.018
Simplified Acute Physiology Score III	1.03 (1.02–1.05)	<0.0001	1.03 (1.01–1.05)	0.0005
Mechanical ventilation	2.90 (1.47–5.70)	<0.0001	3.44 (1.52–7.81)	0.0020
Catecholamine infusion	1.69 (1.17–2.44)	0.0080	1.13 (0.69–1.84)	0.64
Sepsis status	..	0.064	..	0.19
Sepsis	0.78 (0.47–1.30)	..	0.56 (0.28–1.12)	..
Septic shock	1.44 (0.98–2.12)	..	0.91 (0.51–1.64)	..
Time between ICU admission and acute kidney injury	0.69 (0.36–1.31)	0.24	0.70 (0.31–1.59)	0.39

NEURAKI study

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Intensive Care Med

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ORIGINAL

Renal replacement therapy initiation strategies in comatose patients with severe acute kidney injury: a secondary analysis of a multicenter randomized controlled trial



Thomas Rambaud^{1,2}, David Hajage³, Didier Dreyfuss⁴, Saïd Lebbah³, Laurent Martin-Lefevre⁵, Guillaume Louis⁶, Sébastien Moschietto⁷, Dimitri Titeca-Beauport⁸, Béatrice La Combe⁹, Bertrand Pons¹⁰, Nicolas De Prost¹¹, Sébastien Besset¹², Alain Combes¹³, Adrien Robine¹⁴, Marion Beuzelin¹⁵, Julio Badie¹⁶, Guillaume Chevrel¹⁷, Julien Bohe¹⁸, Elisabeth Coupez¹⁹, Nicolas Chudeau²⁰, Saber Barbar²¹, Christophe Vinsonneau²², Jean-Marie Forel²³, Didier Thevenin²⁴, Eric Boulet²⁵, Karim Lakhal²⁶, Nadia Aissaoui²⁷, Steven Grange²⁸, Marc Leone²⁹, Guillaume Lacave³⁰, Saad Nseir³¹, Florent Poirson¹, Julien Mayaux³², Karim Ashenoune³³, Guillaume Geri³⁴, Kada Klouche³⁵, Guillaume Thiery³⁶, Laurent Argaud³⁷, Bertrand Rozec³⁸, Cyril Cadoz³⁹, Pascal Andreu⁴⁰, Jean Reignier⁴¹, Jean-Damien Ricard^{12,42}, Jean-Pierre Quenot^{39,43}, Romain Sonnevill^{44,45} and Stéphane Gaudry^{1,4,46,47*} 



ORIGINAL

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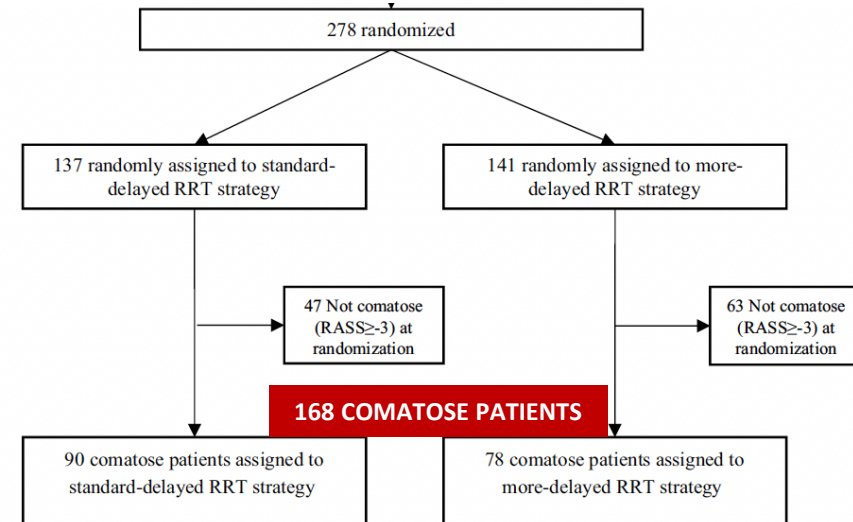
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NEURAKI study

Post-hoc analysis of the AKIKI2 trial

- Adults
- Invasive MV and/or catecholamine infusion
- AKI Stage 3 of KDIGO classification
 - + oliguria or anuria for more than 72 h
 - or BUN > 112 mg/dL (serum urea concentration of 40 mmol/L)
- **Comatose at randomization (RASS<-3)**



ORIGINAL

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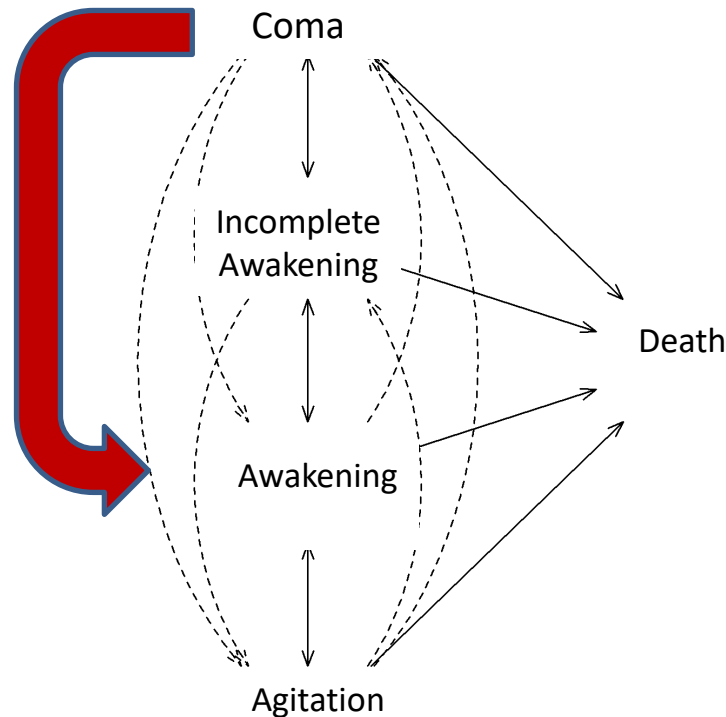
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PRIMARY OUTCOME

transition intensity from coma to awakening during the first 28 days after randomization

NEURAKI study



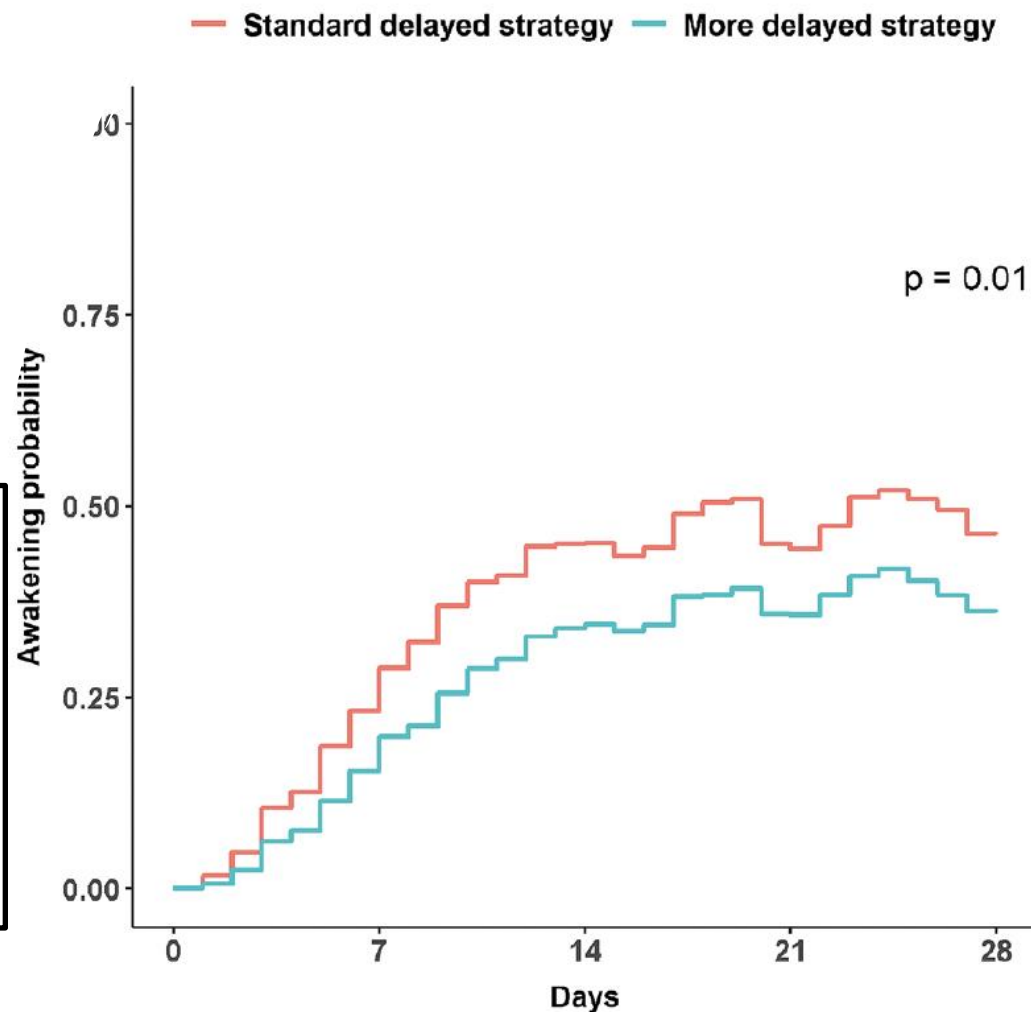
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The transition intensity from coma to awakening was **lower in the more-delayed strategy group** (HR= 0.36 (0.17–0.78); p = 0.010)

The 2 sensitivity analyses yielding comparable results



Probability of being awake according to the randomization



AKIKI

STARRT-AKI

Early RRT

Risk of Artificial Kidney-Induced Kidney Injury

Acute kidney injury (AKI) in ICU
(context of multiple organ failure)

Severity of AKI
 \geq KDIGO 2 stage

Potential severe complication

NO

AKIKI

IDEAL-ICU

STARRT-AKI

No RRT
indication

Persistent AKI
for more than 72 h

AKIKI 2

Hyperkalemia

Medical treatment
No RRT indication if
efficient

STARRT-AKI

Life-threatening
Hyperkalemia

Severe metabolic
acidosis (pH<7.20)

Sodium Bicarbonate
No RRT indication if
efficient

BICAR-ICU

Refractory severe
metabolic acidosis

Severe pulmonary
edema
(fluid overload)

Diuretic therapy
No RRT indication if
efficient

ELAIN

Refractory severe
pulmonary edema

Hyper-uremia
>40 mmol/L ?
Neurological symptoms
suggesting uremic
encephalopathy

AKIKI 2

NEURAKI

Urgent indication for RRT initiation

Thank you



AKIKI
STARRT-AKI

Acute kidney injury (AKI) in ICU
(context of multiple organ failure)

Severity of AKI
≥ KDIGO 2 stage

Potential severe complication

Early RRT
Risk of Artificial Kidney-Induced Kidney Injury

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AKIKI
STARRT-AKI
IDEAL-ICU

No RRT indication

Persistent AKI
for more than 72 h

AKIKI 2

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Hyperkalemia

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