IRA aux soins intensifs: CRRT vs IRRT

Journal club 10 avril 2014

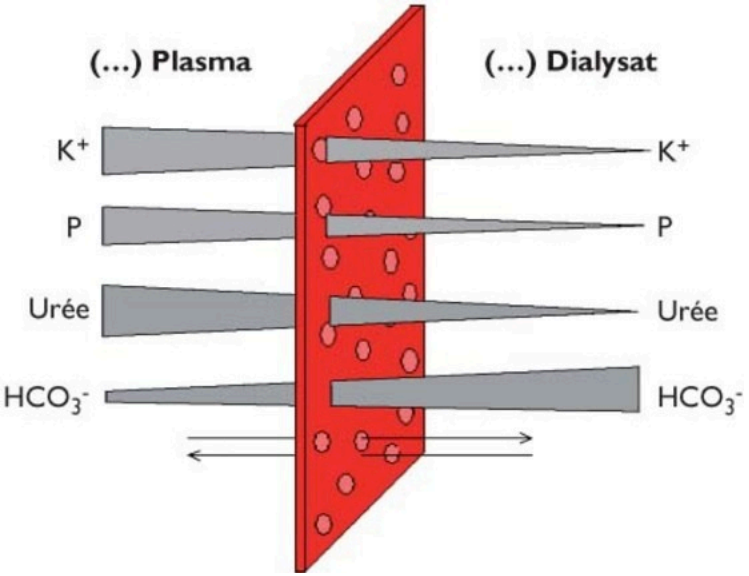
Epuration extra-rénale

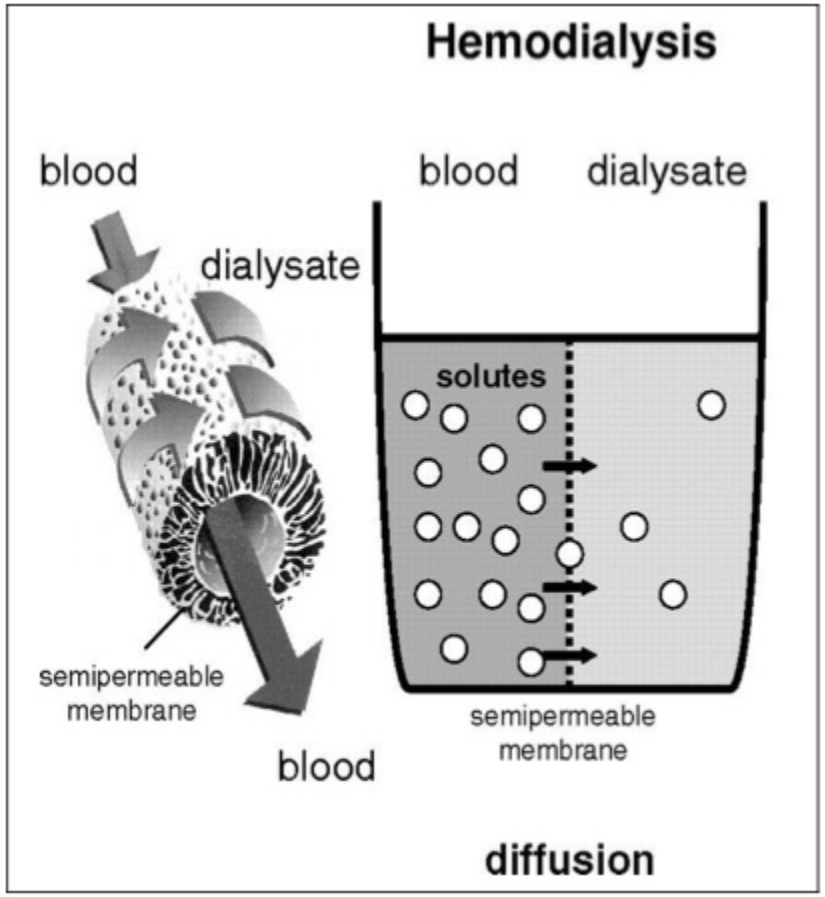
RAPPELS

Hémodialyse

- Diffusion

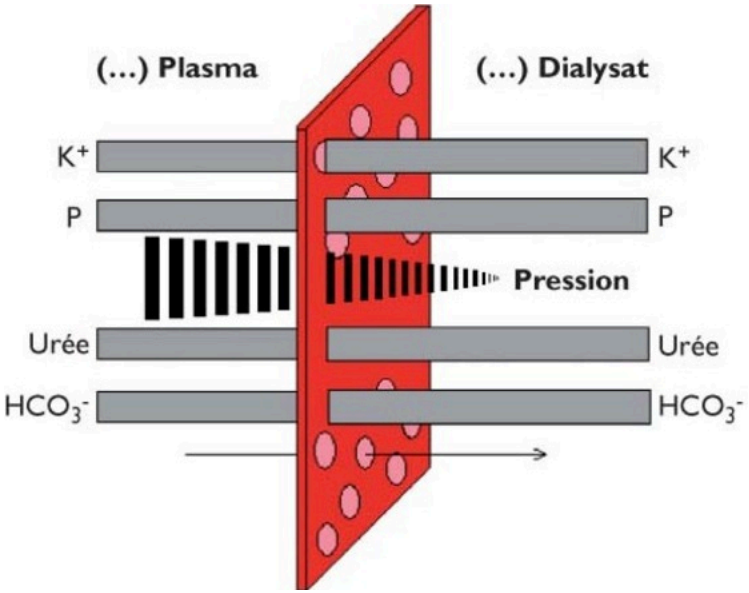
- Petites molécules

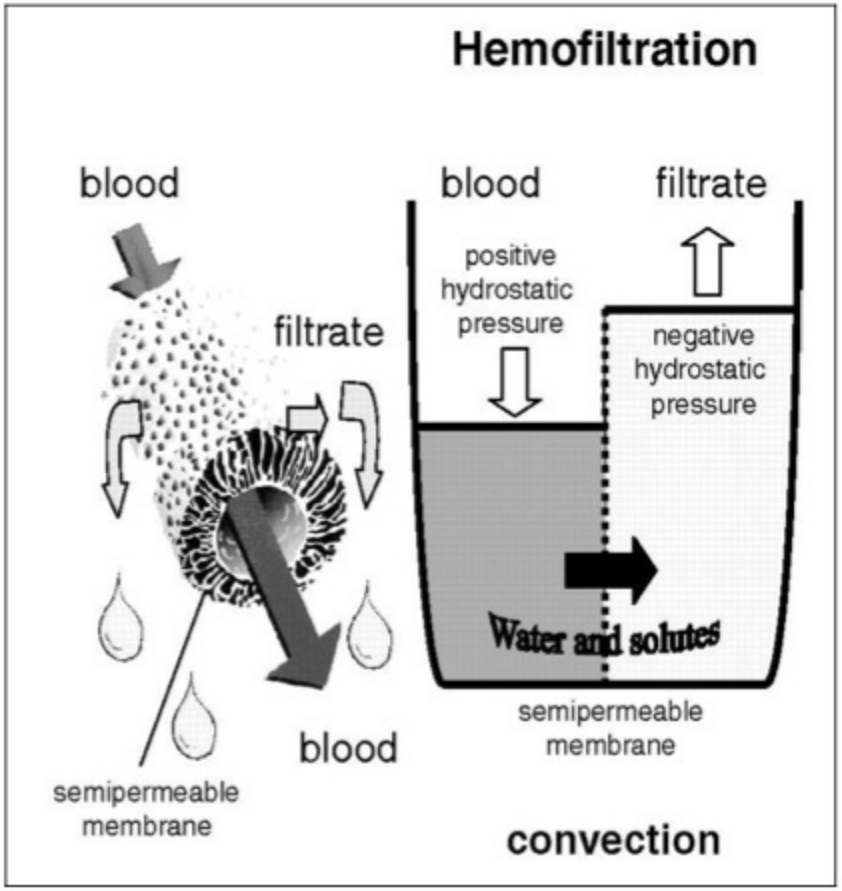




Hémofiltration

- Convection
- Moyennes molécules





Modalités

- **Intermittente → IRRT**
  - *IHD*: Intermittent hemodialysis
- **Continue → CRRT**
  - *CVVH*: Hemofiltration
  - *CVVHD*: Hemodialysis
  - *CVVHDF*: Hemodiafiltration
  - *SCUF*: Slow continuous ultrafiltration
- **SLED → Hybride**
  - Sustained low efficiency dialysis

IRA aux soins intensifs

IMPORTANCE DU PROBLÈME

Acute Renal Failure in Critically Ill Patients
A Multinational, Multicenter Study

Shigehiko Uchino, MD

JAMA, August 17, 2005—Vol 294, No. 7

SAPS II

- Etude observationnelle épidémiologique: 29'269 patients admis aux soins intensifs

- <u>Prévalence IRA = 5.7%</u>
  - 72% dialysés
  - Mortalité hospitalière = 60%

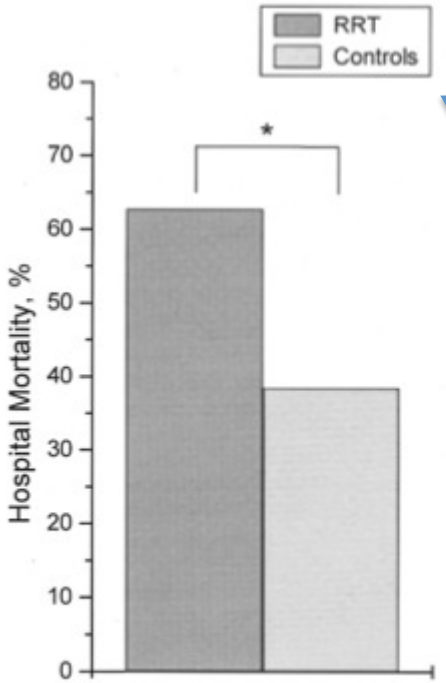
Table 3. Period Prevalence of Acute Renal Failure and Mortality by Country*

	No. of Participating Centers (N = 54)	No. of Patients (N = 1738)	Period Prevalence (95% CI), %	Predicted Mortality, %†	Hospital Mortality (95% CI), %
Australia	6	293	6.3 (5.6-7.0)	47.0	53.4 (47.7-59.1)
Belgium	3	163	8.8 (7.5-10.1)	43.2	57.7 (50.1-65.3)
Brazil	4	153	4.8 (4.0-5.5)	43.6	76.8 (70.1-83.6)
Canada	2	93	4.6 (3.7-5.6)	56.8	59.8 (49.8-69.8)
China	2	77	8.8 (6.9-10.7)	48.5	61.0 (50.1-71.9)
Czech Republic	1	21	16.8 (10.2-23.4)	44.6	61.9 (41.1-82.7)
Germany	2	129	3.3 (2.7-3.8)	39.4	61.9 (53.4-70.4)
Greece	1	5	2.4 (0.3-4.5)	62.2	80.0 (44.9-100.0)
Indonesia	1	25	4.4 (2.7-6.1)	41.4	72.0 (54.4-89.6)
Israel	1	10	2.1 (0.8-3.4)	61.3	100.0
Italy	6	109	5.4 (4.4-6.4)	32.0	50.5 (41.1-59.8)
Japan	4	90	5.5 (4.4-6.6)	40.8	64.0 (54.1-74.0)
The Netherlands	2	113	6.1 (5.0-7.2)	49.5	62.5 (53.5-71.5)
Norway	2	50	3.7 (2.7-4.7)	46.6	62.0 (48.5-75.5)
Portugal	2	36	22.1 (15.7-28.5)	53.7	63.9 (48.2-79.6)
Russia	1	14	2.6 (1.3-3.9)	82.6	61.5 (35.1-88.0)
Singapore	2	31	6.3 (4.2-8.4)	59.3	74.2 (58.8-89.6)
Spain	2	16	10.5 (5.6-15.3)	32.2	43.8 (19.4-68.1)
Sweden	1	9	4.7 (1.7-7.7)	25.7	22.2 (0-49.4)
Switzerland	1	26	3.2 (2.0-4.4)	44.3	65.4 (47.1-83.7)
United Kingdom	1	52	20.6 (15.6-25.5)	63.7	73.1 (61.0-85.1)
United States	6	194	8.0 (6.8-9.3)	44.2	52.1 (45.0-59.2)
Uruguay	1	29	12.9 (8.5-17.3)	35.6	65.5 (48.2-82.8)
Overall			5.7 (5.5-6.0)	45.6	60.3 (58.0-62.6)

Effect of acute renal failure requiring renal replacement therapy on outcome in critically ill patients*

Philipp G. H. Metnitz, MD, PhD,

Crit Care Med 2002 Vol. 30, No. 9



Cohorte prospective de 17'000 patients admis aux soins intensifs

Contrôles non-RRT matchés pour l'âge et la sévérité de la maladie ➔ Effet « indépendant »

Acute renal failure in patients undergoing renal replacement therapy presents an excess risk of in-hospital death.

Dialyse intermittente VS continue

CONTROVERSE

Acute Renal Failure in Critically Ill Patients
A Multinational, Multicenter Study

Shigehiko Uchino, MD

JAMA, August 17, 2005—Vol 294, No. 7

La CRRT est en général considérée comme la méthode de choix aux soins intensifs

Table 1. Characteristics of Patients With Acute Renal Failure and Participating Centers

	No./Total (%)
Men	1105/1738 (63.6)
Renal function	
Normal	966/1738 (55.6)
Chronic impairment	512/1738 (29.5)
Unknown	260/1738 (15.0)
Mechanical ventilation	1312/1722 (76.2)
Vasopressors/inotropes	1189/1721 (69.1)
Mode of RRT	
Continuous	1006/1258 (80.0)
Intermittent	212/1258 (16.9)
Peritoneal dialysis and slow continuous ultrafiltration	40/1258 (3.2)

Littérature: RCT

- **Articles**
  - Mehta et al. 2001
  - Uehlinger et al. 2005
  - Vinsonneau et al. 2006
  - …

- **Problèmes**
  - Résultats contradictoires
  - Qualité sub-optimale

RCT: Résultats contradictoires

Himmelfarb J: Continuous dialysis is not superior to intermittent dialysis in acute kidney injury of the critically ill patient. *Nat Clin Pract Nephrol* 2007; 3:120–121

Ronco C: Continuous dialysis is superior to intermittent dialysis in acute kidney injury of the critically ill patient. *Nat Clin Pract Nephrol* 2007; 3:118–119

RCT: Résultats contradictoires

Comparison of continuous and intermittent renal replacement therapy for acute renal failure

Dominik E. Uehlinger[1],

Nephrol Dial Transplant (2005) 20: 1630–1637

Table 2. Continuous (CVVHDF) *vs* intermittent (IHD) renal replacement therapy for acute renal failure: prediction of in-hospital mortality

Variable	Parameter	*n*	% mortality	OR	*P*-value
RRT group	CVVHDF	70	47.1	1.00	–
	IHD	55	50.9	1.16	0.36

A randomized clinical trial of continuous versus intermittent dialysis for acute renal failure

RAVINDRA L. MEHTA,

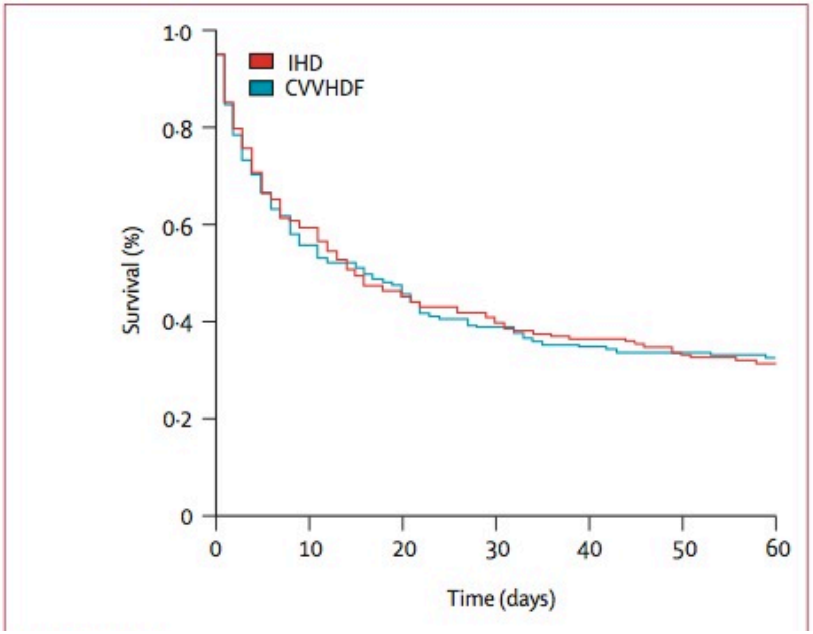
Kidney International, Vol. 60 (2001), pp. 1154–1163

Table 2. CRRT versus IHD for ARF: Prediction of ICU mortality

Variable	Parameter	*N*	% ICU mortality	OR	CI	*P*
Gender	Female	40	40	1.00	—	—
	Male	126	54	1.63	0.65–4.13	NS
Liver failure	No	106	35.9	1.00	—	—
	Yes	60	76.7	2.34	1.003–5.46	0.049
APACHE III	≤79	65	26.2	1.00	—	—
	80–100	44	47.7	1.82	0.75–4.43	NS
	>100	57	80.7	3.46	1.23–9.70	0.019
OSF	1–2	59	25.4	1.00	—	—
	3	51	47.1	1.95	0.80–4.74	NS
	>4	56	80.4	3.40	1.15–10.09	0.027
Group	IHD	82	41.5	1.00	—	—
	CRRT	84	59.5	1.58	0.74–3.35	NS

RCT: Vinsonneau et al.

- RCT multicentrique: 359 patients
- IHD vs CVVHDF
- Même filtre, même bain
- Optimisation hémodynamique de l'IHD



RCT: Qualité sub-optimale

- **Puissance**
  - Non calculée ou insuffisante
- **Randomisation**
  - Différence dans les caractéristiques de base
  - Exclusion des patients instables
- **Déroulement**
  - Taux de crossover >10% en intention-to-treat
- **Intervention**
  - Critères d'initiation de RRT non standardisés
  - Dose de dialyse prescrite/administrée non documentée

RCT: Qualité sub-optimale

A randomized clinical trial of continuous versus intermittent dialysis for acute renal failure

RAVINDRA L. MEHTA,

Kidney International, Vol. 60 (2001), pp. 1154–1163

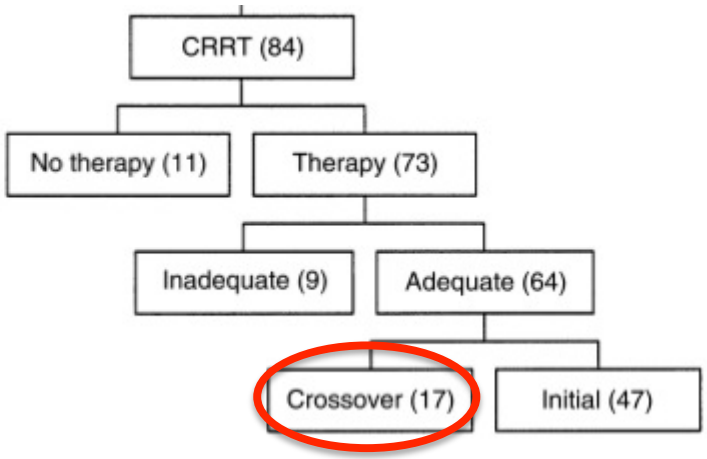


Table 1. Characteristics of patients at randomization

	IHD	CRRT	*P* value
N patients	82	84	
Demographics			
Mean age *years*	56.3	54.5	NS
% Male	68.3	83.3	<.023
% White	53.7	58.3	NS
% Surgical	31.7	23.8	NS
% ARF on CRF	31.7	23.8	NS
% Oliguric	24.4	20.2	NS
% Ventilated	56.7	64.1	NS
% DNR before consult	1.2	7.1	NS
% ARF 1st ICU day	42.7	45.2	NS
Etiology of ARF			
% Ischemic	53.7	53.6	NS
% Nephrotoxic	14.6	17.9	NS
% Multisystem/GN	7.3	7.1	NS
% Unknown	24.4	21.4	NS
Severity of illness scores			
% Liver failure	29.3	42.9	<.05
APACHE II	23.7	25.5	NS
APACHE III	87.7	96.4	<.045
N organs systems failing	3	3.2	NS

Littérature: Méta-analyses

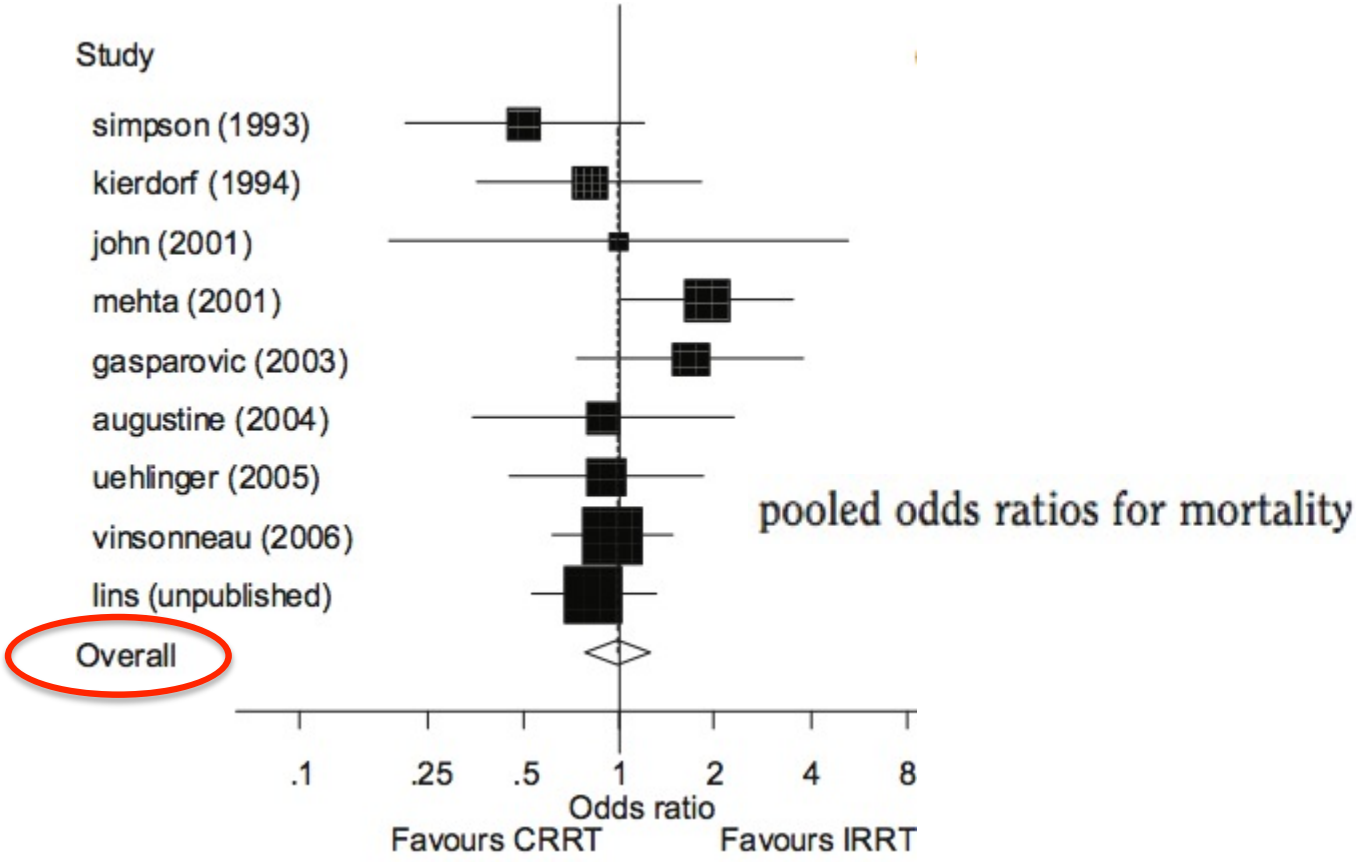
- **Articles**
  - Bagshaw et al. 2008
  - Pannu et al. 2008
  - Schneider et al. 2013

- **Conclusions**
  - CRRT et IRRT sont équivalentes
  - Qualité insuffisante des études incluse

Continuous versus intermittent renal replacement therapy for critically ill patients with acute kidney injury: A meta-analysis*

Sean M. Bagshaw, MD, MSc; Luc R. Berthiaume, MD; Anthony Delaney, MBBS, MSc; Rinaldo Bellomo, MD

Crit Care Med 2008 Vol. 36, No. 2



Renal Replacement Therapy in Patients With Acute Renal Failure

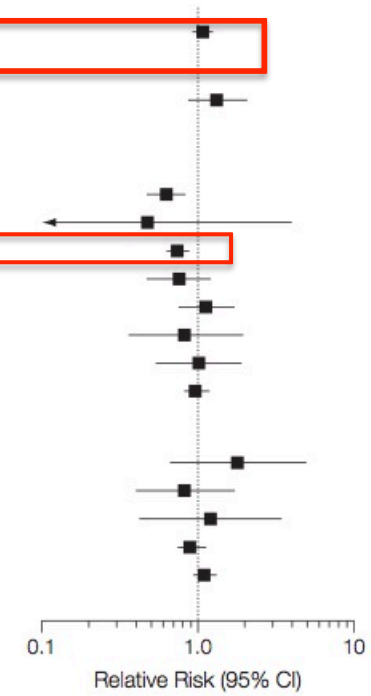
A Systematic Review

Neesh Pannu, MD, SM
Scott Klarenbach, MD, MSc
Natasha Wiebe, MMath, PStat
Braden Manns, MD, MSc
Marcello Tonelli, MD, SM
for the Alberta Kidney Disease Network

JAMA, February 20, 2008—Vol 299, No. 7

Figure 2. Pooled Effects From Randomized Controlled Trials of Various Interventions on Mortality

Comparison	References	Mortality, No./Total No. Group 1	Mortality, No./Total No. Group 2	Relative Risk (95% CI)
Continuous renal replacement therapy vs intermittent hemodialysis	17, 19, 20, 23, 25, 28, 29	293/469	254/449	1.10 (0.99-1.23)
Continuous renal replacement therapy vs sustained low-efficiency dialysis	23	20/28	14/26	1.33 (0.87-2.03)
Continuous renal replacement therapy				
Hemodiafiltration vs hemofiltration	30	43/104	67/102	0.63 (0.48-0.82)
Early vs late initiation[a]	24, 26	25/49	32/50	0.48 (0.06-3.97)
Dialysis dose ≥35 vs 20 mL/kg per h	26, 35	138/314	109/181	0.74 (0.63-0.88)
Bicarbonate vs lactate	33	20/61	24/56	0.77 (0.48-1.22)
Trisodium citrate vs heparin	18	13/16	10/14	1.14 (0.76-1.71)
Hirudin vs heparin	21	5/12	7/14	0.83 (0.36-1.95)
P2SH vs polyamide[b]	15	11/18	6/10	1.02 (0.54-1.90)
Polyacrylonitril vs polysulfone	39	69/97	73/100	0.97 (0.82-1.16)
Intermittent hemodialysis				
Hemodiafiltration vs hemodialysis	30	9/21	4/17	1.82 (0.68-4.90)
Daily vs alternate days	27, 44	32/97	45/97	0.83 (0.40-1.72)
Acetate-free vs bicarbonate	37	6/16	4/13	1.22 (0.43-3.42)
High vs low membrane flux	31, 34, 40, 42	76/138	91/149	0.91 (0.74-1.11)
Bioincompatible membrane vs biocompatible membrane	32, 34, 36, 38, 40-42	161/336	173/383	1.11 (0.94-1.31)



Renal Replacement Therapy in Patients With Acute Renal Failure

A Systematic Review

JAMA, February 20, 2008—Vol 299, No. 7

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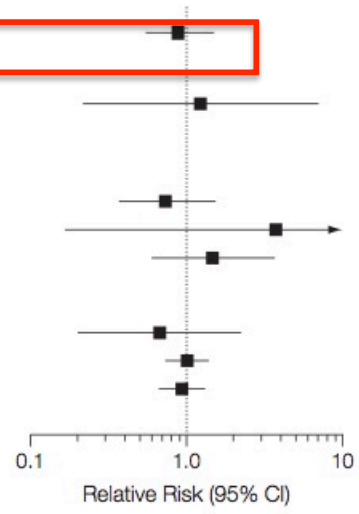
for the Alberta Kidney Disease Network

Figure 3. Pooled Effects From Randomized Controlled Trials of Various Interventions on Chronic Dialysis Dependence in Survivors

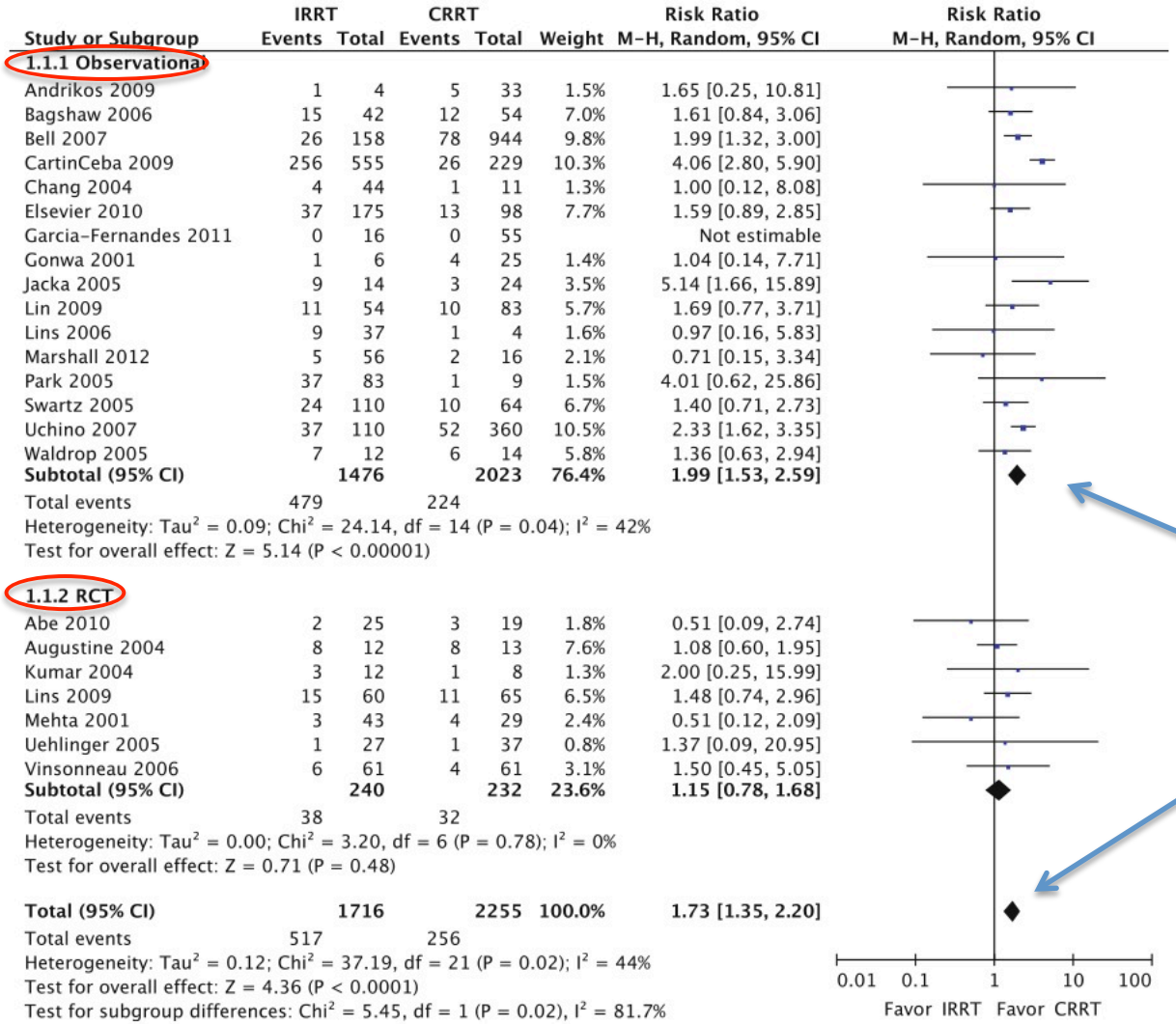
Comparison	References	Chronic Dialysis Dependence, No./No. Survived		Relative Risk (95% CI)
		Group 1	Group 2	
Continuous renal replacement therapy vs intermittent hemodialysis	17, 19, 20, 23, 28	19/155	20/153	0.91 (0.56-1.49)
Continuous renal replacement therapy vs sustained low-efficiency dialysis	23	2/8	2/10	1.25 (0.22-7.02)
Continuous renal replacement therapy				
Hemodiafiltration vs hemofiltration	16	3/61	10/35	0.75 (0.37-1.52)
Early vs late initiation	26	1/17	0/22	3.83 (0.17-88.62)
Dialysis dose ≥35 vs 20 mL/kg per h	26, 35	14/182	7/137	1.50 (0.61-3.64)
Intermittent hemodialysis				
Acetate-free vs bicarbonate	37	3/10	4/9	0.68 (0.20-2.23)
High vs low membrane flux	31, 34, 40	34/65	31/54	1.02 (0.75-1.39)
Bioincompatible membrane vs biocompatible membrane	32, 34, 36, 38, 40-42	43/175	57/210	0.94 (0.67-1.32)



Choice of renal replacement therapy modality and dialysis dependence after acute kidney injury: a systematic review and meta-analysis

Antoine G. Schneider
Rinaldo Bellomo
Sean M. Bagshaw
Neil J. Glassford
Serigne Lo
Min Jun
Alan Cass
Martin Gallagher

Intensive Care Med (2013) 39:987–997



Moins de dépendance à la dialyse

Forest plot for dialysis dependence among survivors. Stratified by study design. *M–H* Mantel–Haenszel

Conclusion

mortality or recovery to RRT independence. There is urgent need for additional high-quality and suitably powered trials to adequately address this issue. (Crit Care Med 2008; 36:610–617)

per hour should be provided. Given the paucity of good-quality evidence in this important area, additional large randomized trials are needed to evaluate clinically important outcomes.

JAMA. 2008;299(7):793-805 www.jama.com

Schefold *et al. Critical Care* 2014, **18**:R11
http://ccforum.com/content/18/1/R11

CRITICAL CARE

RESEARCH Open Access

The effect of continuous versus intermittent renal replacement therapy on the outcome of critically ill patients with acute renal failure (CONVINT): a prospective randomized controlled trial

Joerg C Schefold[1*], Stephan von Haehling[2], Rene Pschowski[1,3], Thorsten Onno Bender[1], Cathrin Berkmann[1], Sophie Briegel[1], Dietrich Hasper[1] and Achim Jörres[1]

Janvier 2014

ETUDE « CONVINT »

Méthodes: Design

- RCT unicentrique open-label de 2002 à 2007
- Hôpital universitaire, soins intensifs de médecine

- **Inclusion**
  - Tout adulte admis aux SI avec IRA nécessitant une RRT
    - ➔Urémie symptomatique, oligo-anurie, hypervolémie réfractaire, urée >36 mmol/l, GFR <0.1 ml/kg/min, pH <7.2 réfractaire, hyperK+ réfractaire

- **Exclusion**
  - IRC pré-existante (créat >264 umol/l)
  - Dialysés
  - Tranplantés

Méthodes: Protocole

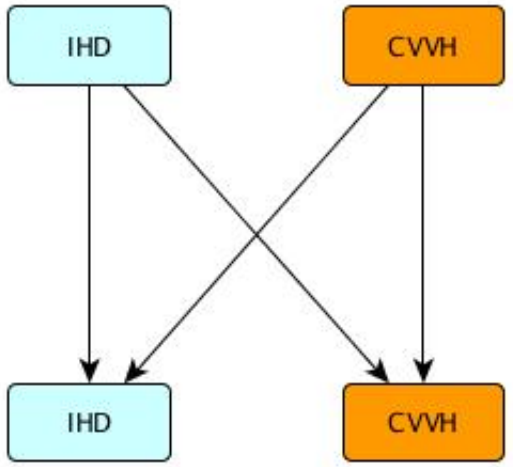
- **Groupe 1: IHD**
  - HD seule 4 heures par jour
  - Débit sang 200 – 250 ml/min
  - Débit dialysat 500 ml/min
  - Filtre??
- **Groupe 2: CVVH**
  - Hémofiltration seule en post-dilution
  - Débit sang 200 ml/min
  - Dose 35 ml/kg/h
  - Filtre??

Méthodes: Protocole

- Crossover autorisé (par le médecin en charge)

- **IHD → CVVH**
  - Instabilité HD

- **CVVH → IHD**
  - Electrolytes, acide-base
  - Dose de dialyse
  - Anticoagulation
  - Mobilisation



Méthodes: Outcome

- **Outcome primaire**
  - Survie à 14 jours après la fin de la RRT
- **Outcome secondaire**
  - Mortalité de toute cause à 14 et 30 jours
  - Nb de jours aux SI/hôpital
  - Nb de jours avec/sans RRT
  - Etc.

Méthodes: Analyses statistiques

- **Puissance** estimée: 200 patients par groupe
  - ➔ Interruption prématurée après inclusion de 252 patients
- Analyse en **ITT**
  - ➔ En fonction du groupe initial
- Analyse de **sous-groupe**
  - ➔ Patients dépendants des amines
  - ➔ Patients crossover

Résultats: Flowchart

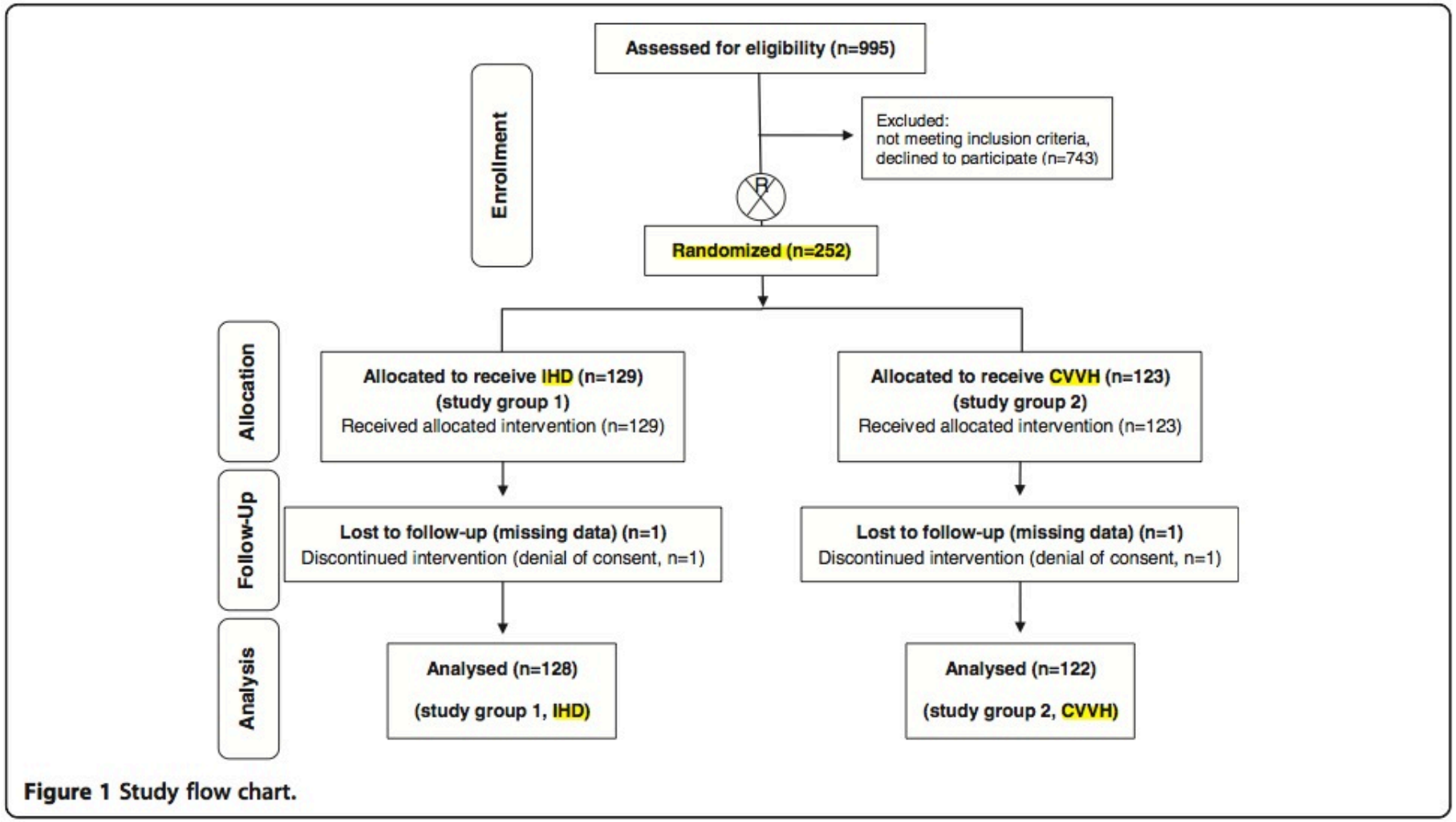


Figure 1 Study flow chart.

Résultats: Baseline

Serum creatinine (mg/dl)		3.64 ± 2.3	3.57 ± 1.9	0.81
Serum urea (mg/dl)		159.7 ± 86.5	156.7 ± 77.1	0.77
Serum potassium (mM)		4.66 ± 0.8	4.65 ± 0.9	0.91
Baseline blood pH		7.32 ± 0.2	7.32 ± 0.1	0.82
Baseline HCO_3^-		22.6 ± 6.8	21.8 ± 5.4	0.34
Urine output (within 24 hours before randomization; ml)		927.1 ± 1318.4	708.5 ± 937.8	0.10
Days in ICU until randomization		1.0 [0–3.0][b]	1.0 [0–2.3][b]	0.82
Days from ICU admission until start of RRT		1.0 [0–4.0][b]	1.0 [0–3.0][b]	0.55
Need for mechanical ventilation (at study day 1)		113 (88.3%)	103 (84.4%)	0.88
paO_2/FiO_2 ratio (in all patients at study day 1)		197.3 ± 107.9	208.7 ± 106.8	0.45
Need for (any) vasopressor (at study day 1)		104 (81.2%)	106 (86.9%)	0.79[a]*
Key hemodynamic variables (at study day 1)	Heart rate (/min)	104.0 ± 26.1	104.7 ± 20.9	0.81
	Systolic blood pressure (mm Hg)	111.6 ± 22.5	109.8 ± 19.4	0.51
	Diastolic blood pressure (mm Hg)	56.4 ± 11.1	53.0 ± 13.6	0.04
	Central venous pressure (cmH_2O)	14.7 ± 5.3	14.2 ± 5.41	0.52
Reason for ARF/need for RRT (number of patients)	Cardiogenic failure/ shock	26 (20.3%)	20 (16.4%)	0.61[a]*
	Sepsis-induced	85 (66.4%)	85 (69.7%)	0.89*
	Hemorrhagic	2 (1.6%)	3 (2.5%)	0.96*
	No shock present	7 (5.5%)	5 (4.1%)	0.85*
	Obstruction-induced	0	3 (2.5%)	0.24*
	Unknown	8 (6.3%)	9 (7.4%)	0.94*
APACHE-II score		28.5 ± 7.9	28.8 ± 9.6	0.79
SAPS-II score		66.1 ± 18.1	63.8 ± 17.6	0.34
SOFA score		13.2 ± 3.9	13.0 ± 4.0	0.66

Résultats: Follow-Up

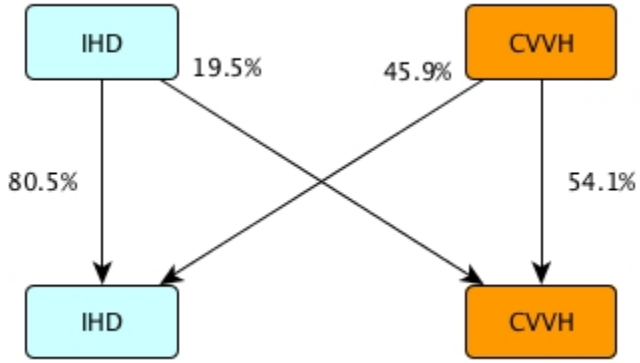
- Pas de différence des paramètres de suivi (clinique et biologique) entre les 2 groupes

- **Dose de dialyse (CVVH)**
  - 31 ml/kg/h (càd 88% de la dose prescrite)

- **Anticoagulation (IHD et CVVH)**
  - HNF >98%

Résultats: Crossover

- **IHD → CVVH**
  - Instabilité HD
  - Surcharge volémique
- **CVVH → IHD**
  - Coagulation/Anticoagulation
  - Electrolytes, acide-base
  - Mobilisation



Résultats: Outcomes

Mortalité

Analyse ITT

Pronostic rénal

		iHD group (n = 128)	CVVH group (n = 122)	P value
Survival at 14 days after RRT		39.5%	43.9%	0.81[a]
14-day mortality rate		43.6%	37.8%	0.63[a]
30-day mortality rate		52.4%	45.4%	0.60[a]
All-cause intrahospital mortality rate (last contact)		60.3%	54.6%	0.72[a]
Days until death		15.6 ± 44.5	18.5 ± 48.9	0.71
Days until death on ICU		15.5 ± 45.9	18.4 ± 50.0	0.73
Days until hospital discharge (in survivors)		51.2 ± 47.1	48.7 ± 49.7	0.78
Days in ICU		25.2 ± 40.1	22.3 ± 26.1	0.50
Days in hospital		33.9 ± 49.3	32.4 ± 37.4	0.79
Suspected reason for death (multiple possible)	Cardiac failure	31	22	0.42[a]
	Pulmonary failure	39	31	0.59[a]
	Sepsis	56	45	0.55[a]
	CNS	7	6	0.92[a]
	Hemorrhagy	5	4	0.93[a]
	Withdrawal of therapy	4	2	0.74[a]
Days on RRT		17.2 ± 37.1	13.7 ± 17.9	0.35
Dialysis-free days		4.2 ± 9.6	3.1 ± 9.0	0.38
RRT switch (number of patients)		25 (19.5%)	56 (45.9%)	0.002[a]
Number of patients on RRT (% of survivors, days after ICU admission)	At 21 days	20 (32.3%)	20 (29.9%)	0.97[a]
	At 60 days	14 (26.4%)	13 (22.8%)	0.90[a]
Serum creatinine at hospital discharge/last contact (in survivors; mg/dl)		2.18 ± 1.8	2.12 ± 1.7	0.85
Total days on vasopressors		4.3 ± 3.7	4.5 ± 3.7	0.75
Cumulative vasopressor dose (g)	Epinephrine	0.70	0.64	0.96
	Norepinephrine	19.1	18.5	0.30
	Dobutamine	150.2	137.9	0.56
Total days on mechanical ventilation		8.1 ± 8.8	7.2 ± 6.5	0.34
Total fluid balance (L)		20.5 ± 23.2	24.9 ± 28.4	0.19

Résultat: Outcomes

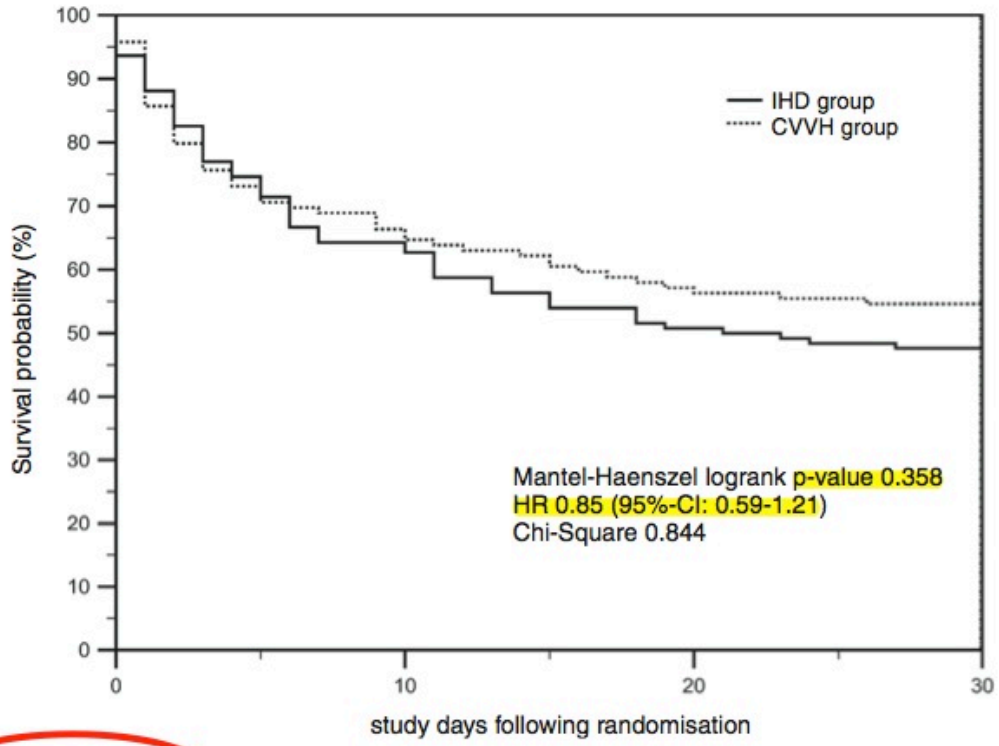
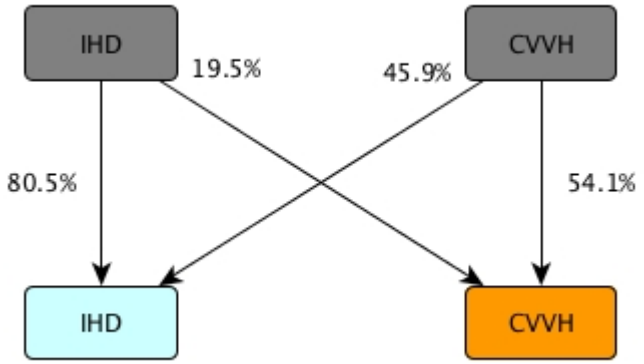


Figure 2 Kaplan-Meier survival estimates for patients randomized to IHD (full line, $n = 128$) and CVVH (dotted line, $n = 122$) are illustrated (total study population). Mantel-Haenszel log-rank *P* value, hazard ratio (HR) including 95% CI and χ^2 is given.

Résultats: Sous-groupes

- **Crossover**
  - Pas de modification des outcomes principaux



- **Amines**
  - Pas de modification des outcomes principaux

Résultats: Sous-groupes

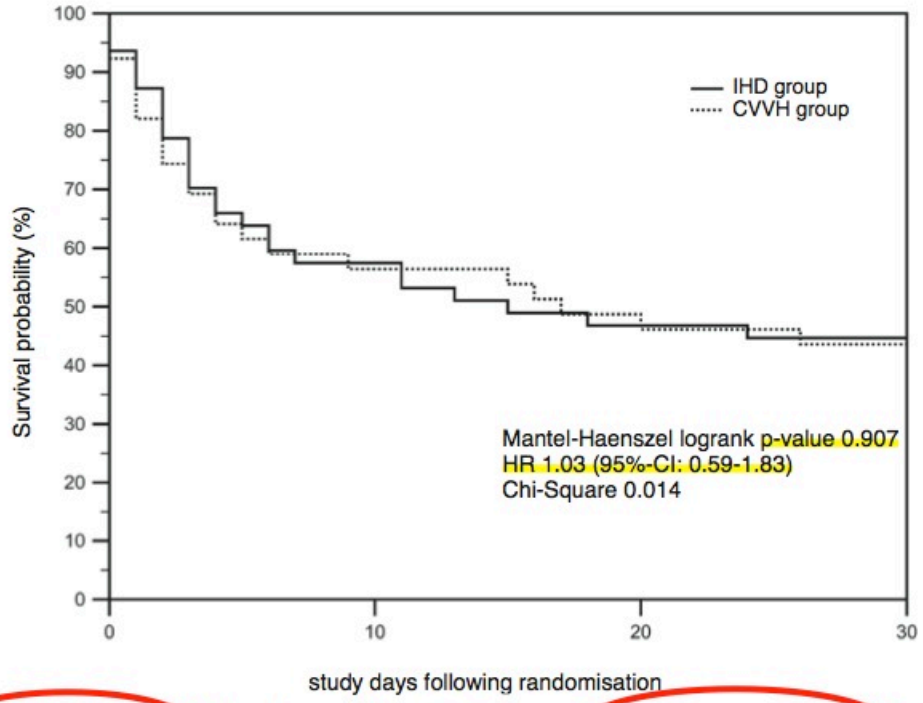


Figure 3 Kaplan-Meier survival estimates for the subpopulation of patients with high vasopressor need (overall sample; high vasopressor use defined as >0.3 μg/kg/min at any point in time during the study interval) in the IHD (full line, *n* = 47) versus CVVH (dotted line, *n* = 40) groups are illustrated. Mantel-Haenszel log-rank *P* value, hazard ratio (HR), including 95% CI and χ^2 is given.

Discussion

- **Population**
  - IRC (créatinine > 264 umol/l) exclus
  - Atteinte sévère

➔ *Reproductibilité?*

Need for (any) vasopressor (at study day 1)	104 (81.2%)	106 (86.9%)
Need for mechanical ventilation (at study day 1)	113 (88.3%)	103 (84.4%)
30-day mortality rate	52.4%	45.4%

- **Modalités**
  - IRRT: IHD 4h 1x/j
  - CRRT: CVVH 35 ml/kg/h

➔ *Reproductibilité?*

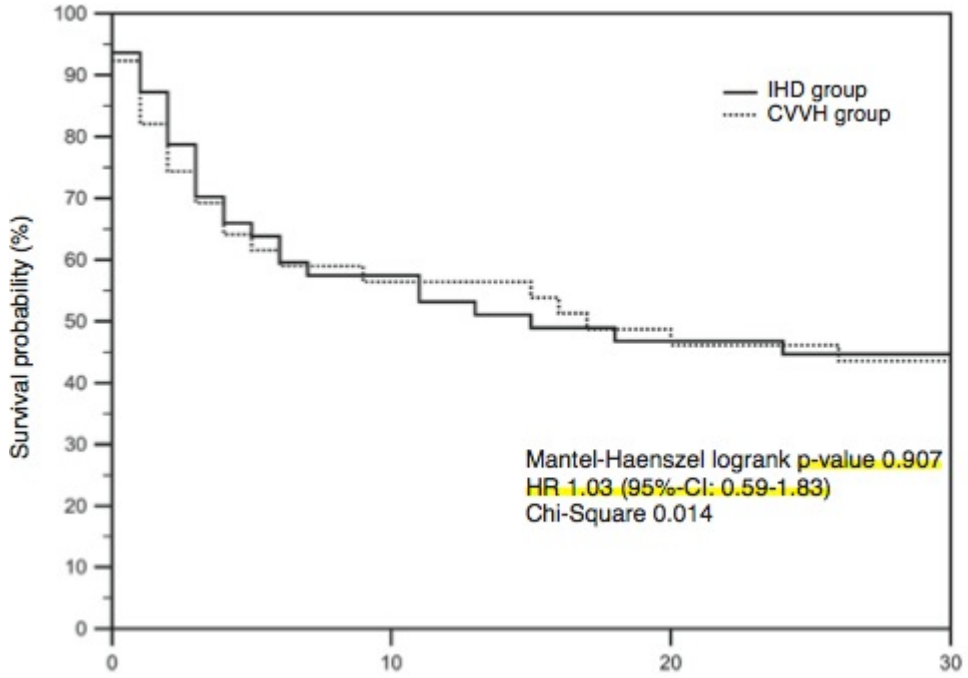
Discussion

- **Dose de dialyse**
  - Prescrite: 35 ml/kg/h
  - Délivrée: 31 ml/kg/h

In conclusion, there are now consistent data from two large multicenter trials showing no benefits of increasing CRRT doses in AKI patients above effluent flows of 20–25 ml/kg/h. In clinical practice, in order to achieve a delivered dose of 20–25 ml/kg/h, it is generally necessary to prescribe in the range of 25–30 ml/kg/h, and to minimize interruptions in CRRT.

Discussion

- **Instabilité HD**



CAVE: Analyse de sous-groupe!

In conclusion, in the presence of hemodynamic instability in patients with AKI, CRRT is preferable to standard IHD.

Limitations

- **Puissance insuffisante**
  - Arrêt prématuré (équipement et protocoles)
  - Seulement 63% de la taille d'échantillon prévue
  - Analyse rétrospective hypothétique: Mêmes résultats

- **Crossover**
  - Biais possible en ITT
  - Sous-groupe crossover: Pas de modification des outcomes principaux

Dialyse aux soins intensifs

QUELQUES COMMENTAIRES GÉNÉRAUX

Modalités non standardisées

- CRRT: HD, HF, HDF, SLED, …?
- IRRT: 2h? 4h? 1x/j, 1x/2j, …?
- Dose de dialyse?
- Machines, filtres, …?

		Intervention					Control				
Source	Comparison	Technique (Device)	Membrane Material (Flux)	Buffer	Anti-coagulant	Dosage (Schedule)	Technique (Device)	Membrane Material (Flux)	Buffer	Anti-coagulant	Dosage (Schedule)
Uehlinger,[19] 2005	CRRT vs IHD	CVVHDF (Prisma)	PAN (high)	L	H/none	2 L/h or UCl ≈ 30 mL/min	IHD (MiroClav)	PS (high)	B	H/none	UCl ≈ 200 mL/min (3-4 h/session)
Augustine,[20] 2004	CRRT vs IHD	CVVHD (NA)	PS (low)	B	H/none	Kt/V 3.6/wk	IHD (NA)	PS (low)	B	H/none	Kt/V 3.6/wk (3 sessions/wk)

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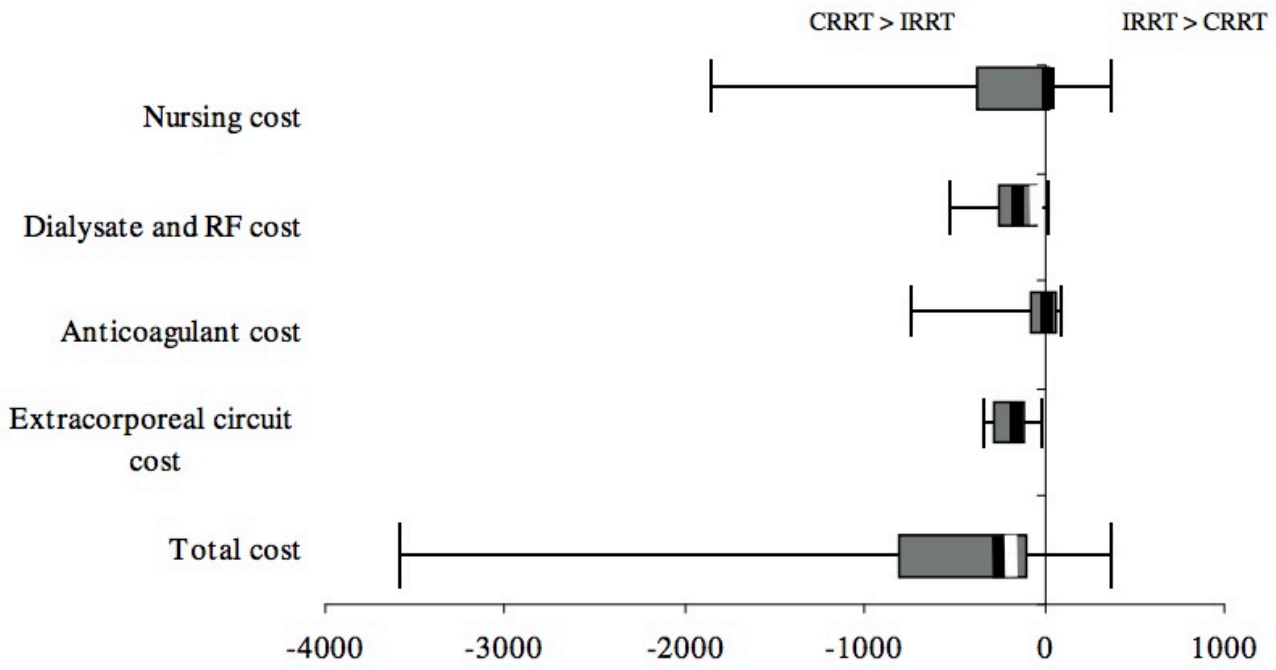
Coûts



- Cost differences are highly variable across centers and include scenarios in which either therapy is more or less expensive compared with the other.

Srisawat *et al. Critical Care* 2010, **14**:R46

Conclusion

Table 22 | Theoretical advantages and disadvantages of CRRT, IHD, SLED, and PD

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

Conclusion

In conclusion, no RRT is ideal for all patients with AKI. Clinicians should be aware of the pros and cons of different RRTs, and tailor RRT on the basis of the individual and potentially changing needs of their patients. Besides the individual patient's characteristics, the available expertise and resources may also be an important determinant of the ultimate choice.