The 21th Budapest Nephrology School
August, 29,2014

Online Haemodiafiltration

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CLINICAL RESEARCH www.jasn.org

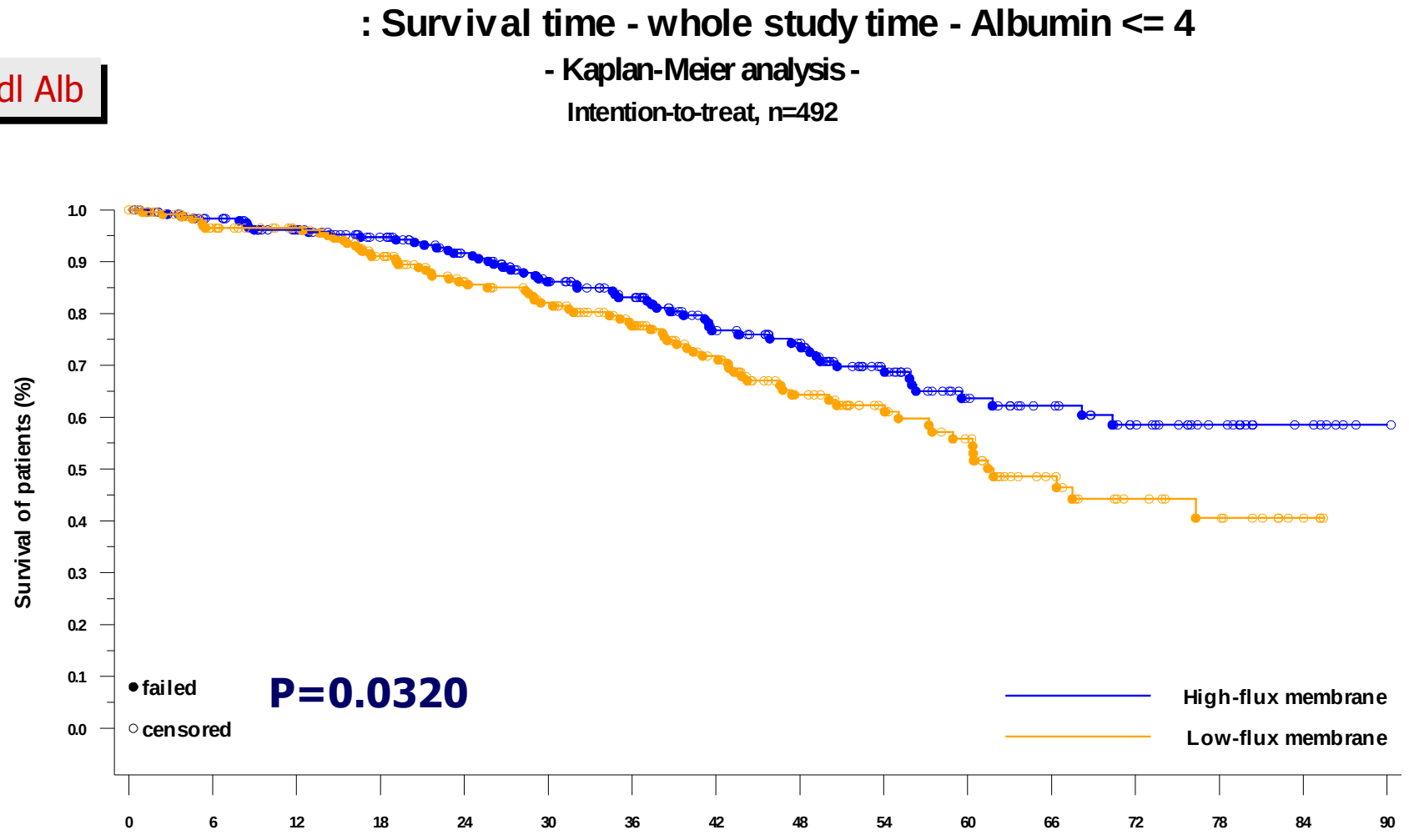
Effect of Membrane Permeability on Survival of Hemodialysis Patients

Francesco Locatelli,* Alejandro Martin-Malo,† Thierry Hannedouche,‡ Alfredo Loureiro,§ Menelaos Papadimitriou,‖ Volker Wizemann,¶ Stefan H. Jacobson,** Stanislaw Czekalski,†† Claudio Ronco,‡‡ and Raymond Vanholder,§§
for the Membrane Permeability Outcome (MPO) Study Group

J Am Soc Neprol 20: 645 – 654, 2009

MPO : Kaplan-Meier Survival Analysis

≤ 4g/dl Alb

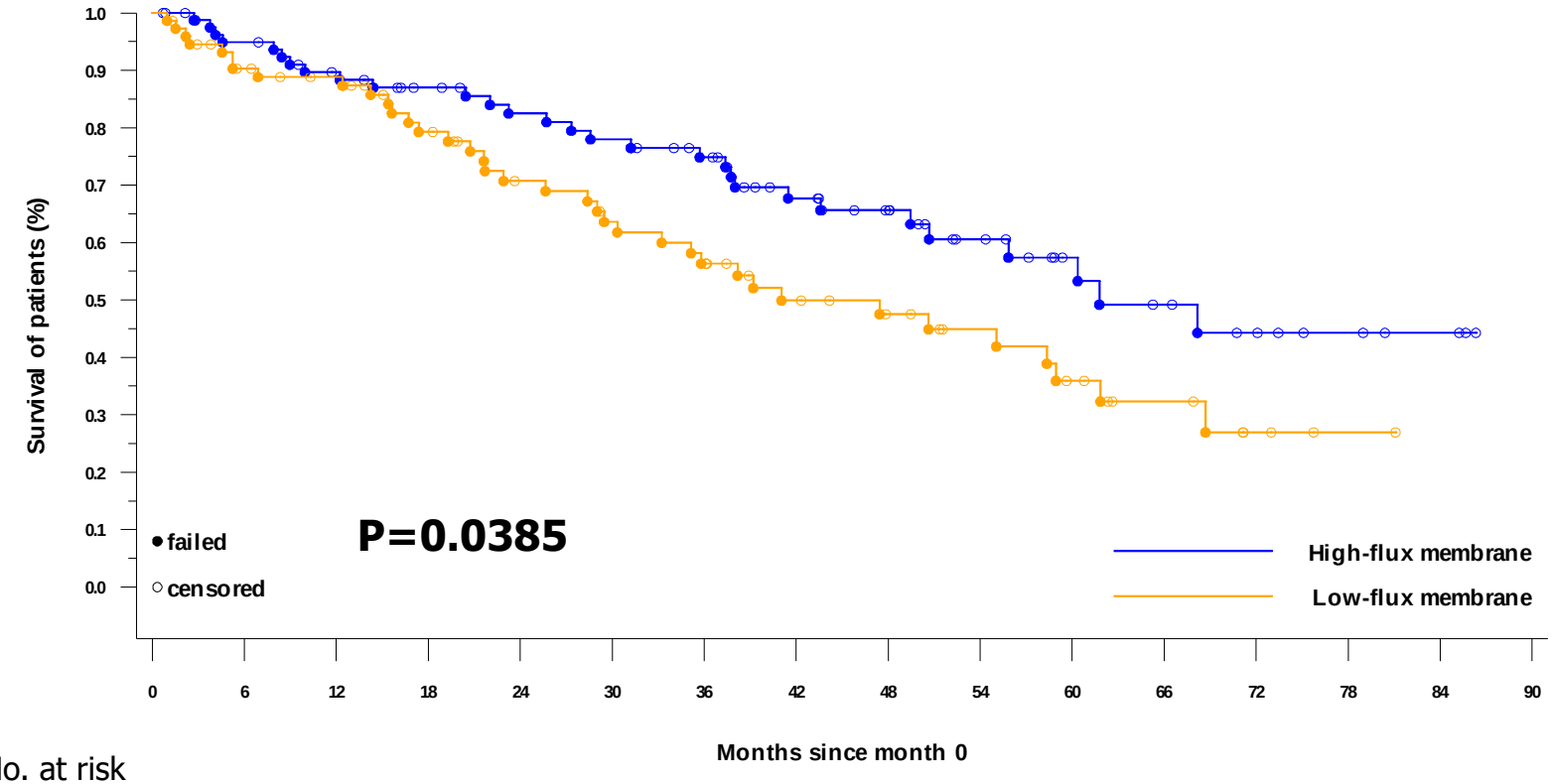


No. at risk								
High-flux	250	212	173	134	85	44	26	7
Low-flux	243	202	152	117	67	41	15	3

Locatelli F et al. J Am Soc Nephrol. 2009 Mar; 20 (3): 645-54

MPO : Kaplan-Meier Survival Analysis
Subgroup Analysis – Diabetics*

*Pts. with both serum albumin ≤ 4 and > 4 g/dl albumin



No. at risk								
High-flux	83	67	55	46	27	14	7	3
Low-flux	74	59	40	29	19	11	3	0

Locatelli F et al. J Am Soc Nephrol. 2009 Mar; 20 (3): 645-54

ERBP

European Renal Best Practice

High-flux or low-flux dialysis: a position statement following publication of the MPO study

- **MPO study provides sufficient evidence to upgrade the strength of guideline 2.1 to a level 1A (strong recommendation, based on high-quality evidence): high-flux HD should be used to delay long-term complications of hemodialysis in the case of high-risk patients (comparable to the low-albumin group of the MPO study)**

- **Because the substantial reduction of an intermediate marker (beta2-microglobulin) in the high-flux group of the MPO study, synthetic high-flux membranes should be recommended even in low-risk patients (level 2b: weak recommendation, low quality evidence)**

Tattersal J et al. Nephrol Dial Transplant 2010; 25(4):1230-1232

Quality of dialysis procedure

HDF

- Water quality and distribution system
- Dialysate
- Extracorporeal circuit
- Dialysis dose and frequency
- Membranes and convective treatments
- Online treatments

Observational studies on the effect of Haemofiltration and/or Haemodiafiltration on mortality risk

	Design	Treatments (patients)	Sample size	Relative risk reduction	P value
Locatelli et al. 1999	Historical, prospective	HDF or Haemofiltration (188) HD (6,256)	6,444	10%	NS
Canaud et al. 2006	Historical, prospective	LF-HD (1,366) HF-HD (546) Low-efficiency HDF (156) High-efficiency HDF (97)	2,165	35% (High-efficiency HDF vs LF-HD)	0.01
Panichi et al. 2008	Prospective	Bicarbonate-HD* (424) HDF (204) On-line HDF (129)	757	22% (HDF and On-line HDF vs Bicarbonate-HD)	0.01

LF-HD: low-flux haemodialysis; HF-HD: high-flux haemodialysis; HDF: haemodiafiltration; * Including LF-HD (403 patients) and HF-HD (21 patients)

Locatelli F et al. Contrib Nephrol. 2011

Randomised studies on the effect of Hemofiltration and/or Hemodiafiltration on mortality risk

	Design	Treatments (patients)	Sample size	Relative risk reduction	P value
Locatelli et al. 1996	Randomised, prospective	Cuprophan-HD (132) LF-HD (147) HF-HD (51) HDF (50)	**380**		**NS**
Wizemann et al. 2000	Randomised, prospective	HDF (23) LF-HD (21)	**44**		**NS**
Santoro et al. 2008	Randomised, prospective	On-line Hemofiltration (32) LF-HD (32)	**64**	**55%**	**0.05**
Locatelli et al. 2010	Randomised, prospective	LF-HD (70) On-line Hemofiltration (36) On-line HDF (40)	**146**		**NS**

LF-HD: low-flux hemodialysis; HF-HD: high-flux hemodialysis; HDF: hemodiafiltration

Locatelli F et al. Contrib Nephrol. 2011

Convective Therapies: Outcomes

- Intradialytic Cardiovascolar Stability
- Beta2 microglobulin
- Phosphataemia
- Anaemia and ESA Dose
- Inflammation

Mortality

CLINICAL RESEARCH www.jasn.org

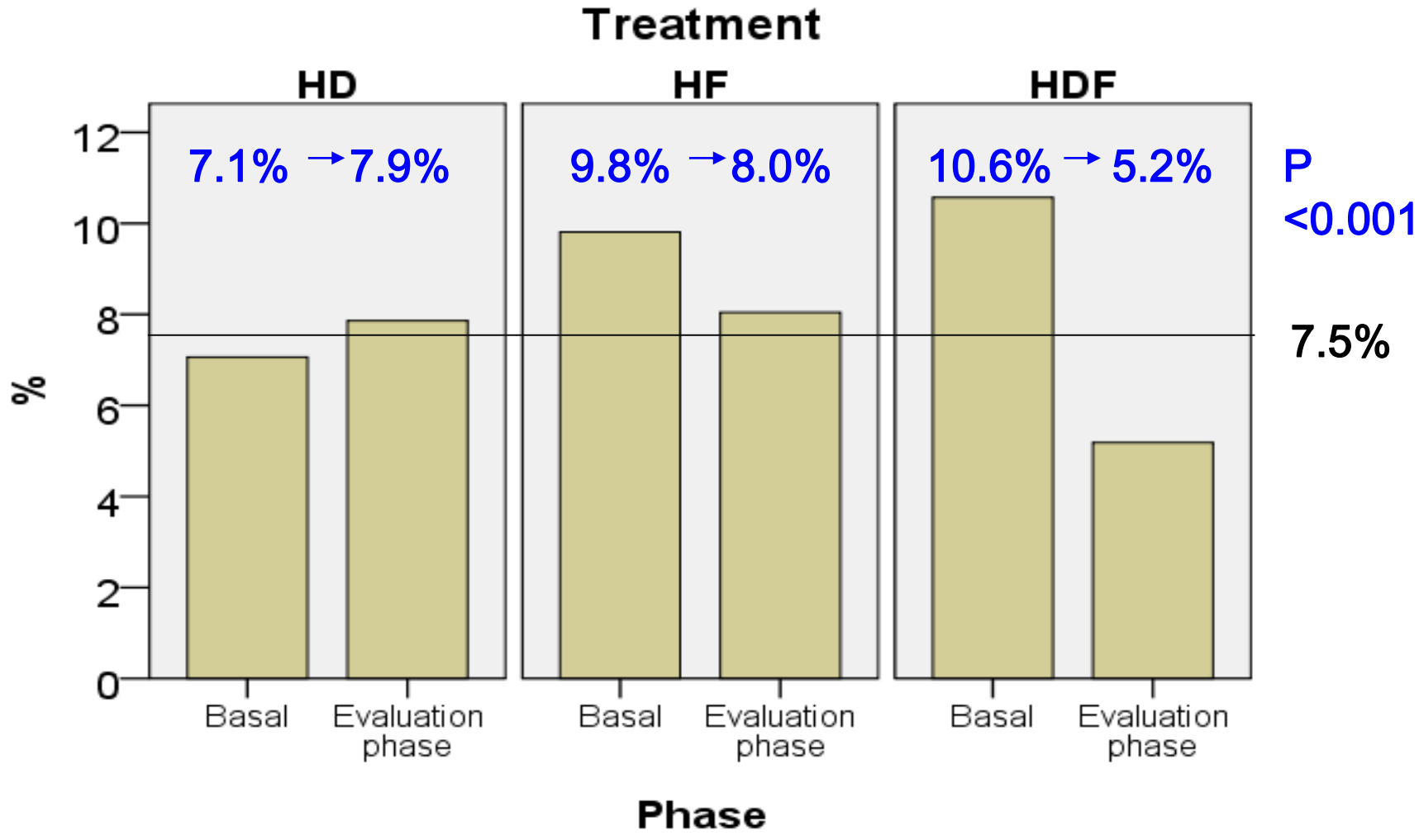
JASN® Journal of the American Society of Nephrology

Hemofiltration and Hemodiafiltration Reduce Intradialytic Hypotension in ESRD

Francesco Locatelli,* Paolo Altieri,† Simeone Andrulli,* Piergiorgio Bolasco,‡ Giovanna Sau,† Luciano A. Pedrini,§ Carlo Basile,‖ Salvatore David,¶ Mariano Feriani,** Giovanni Montagna,†† Biagio Raffaele Di Iorio,‡‡ Bruno Memoli,§§ Raffaella Cravero,‖‖ Giovanni Battaglia,¶¶ and Carmine Zoccali***

J Am Soc Nephrol 2010 21:1798-807

Sessions with intradialytic hypotension (%)



Locatelli et al. J Am Soc Nephrol. 2010; 21(10):1798-807

Tolerance of CKD patients receiving HDF and HF versus HD

F.Locatelli B. Canaud, Nephrol Dial Transplant. 2012 Aug;27(8):3043-8

Author, Year	HDF vs Comp	Type of study	β2-M	Survival	Tolerance
Locatelli F et al, 1996	LF-HD vs cuprophan-HD vs HF-HD vs HDF	RCT	↓ (HF-HD and HDF)	=	=
Wizemann V et al, 2000	HDF vs LFHD	RCT	↓	=	=
Bosch JP et al, 2006	HDF vs LFHD vs HFHD	Historical prospective cohort	?	↑ 45%	↑
Canaud B et al 2006	HDF+/- vs LFHD vs HFHD	Historical prospective cohort	?	↑ 35%	=
Jirka et al, 2006	HDF vs LFHD vs HFHD	Historical prospective cohort	?	↑ 36%	=
Schiffl H et al, 2007	HDF vs HFHD + UPD	RCT	↓	=	=
Vinhas J et al, *2007*	HDF vs HFHD	Prospective controlled study	?	↑ 50%	↑
Panichi V et al. 2008	HDF+/- vs LFHD	Prospective controlled study	↓	↑ 15%	↑
Santoro A et al, 2008	HF vs HFHD	RCT	↓	↑ 18%	↑
Tiranathanagul K 2009	HDF vs HFHD	Prospective controlled study	↓	=	↑
Vilar E et al, 2009	HDF vs HFHD	Historical prospective cohort	↓	↑ 34%	↑
Locatelli F et al, 2010	HDF & HF vs LFHD	RCT	↓	=	↑ ↑

Convective Therapies: Outcomes

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Mortality

Long-term effects of high-efficiency on-line HDF on uraemic toxicity

Multicentre prospective randomized cross-over study

Laboratory values and dialysis adequacy parameters at the end of the 2 periods

6 months x 2	LF-HD (n=62)	OL-HDF (n=62)	P-value
eKt/V urea	**1.44±0.26**	**1.60±0.31**	**< 0.0001**
Urea, basal, mg/dL	143 ± 25	133 ± 23	0.004
End session, mg/dL	36 ± 12	29 ± 10	<0.0001
Beta2-m	**33.5±11.8**	**22.2±7.8**	**< 0.0001**
tHcy, µmol/L	18.7 ± 8.2	15.4 ± 5.0	0.003*
ADMA, µmol/L	0.97 ± 0.40	0.84 ± 0.37	0.2
P	**5.0±1.4**	**4.6±1.3**	**0.008**
iPTH	**228±177**	**203±154**	**0.03**
Triglycerides, mg/dL	167 ± 87	148 ± 77	0.008*
Total cholesterol, mg/dL	175 ± 45	176 ± 45	0.9
Albumin	**4041±391**	**3919±393**	**0.004**
Albumin, g/dL	4041 ± 391	3919 ± 393	0.004*
CRP	**6.65±6.07**	**5.49±5.46**	**0.03**
Potassium, mmol/L	5.2 ± 0.6	5.2 ± 0.7	0.8
Bicarbonate, mmol/L	21.8 ± 2.1	21.7 ± 1.9	0.6

Pedrini LA et al. Nephrol Dial Transplant. 2011 Apr;26(4):1445-6

β2-M of CKD patients receiving HDF and HF versus HD

F.Locatelli B. Canaud, Nephrol Dial Transplant. 2012 Aug;27(8):3043-8

Author, Year	HDF vs Comp	Type of study	β2-M	Survival	Tolerance
Locatelli F et al, 1996	LF-HD vs cuprophan-HD vs HF-HD vs HDF	RCT	↓ (HF-HD and HDF)	=	=
Wizemann V et al, 2000	HDF vs LFHD	RCT	↓	=	=
Bosch JP et al, 2006	HDF vs LFHD vs HFHD	Historical prospective cohort	?	↑ 45%	↑
Canaud B et al 2006	HDF+/- vs LFHD vs HFHD	Historical prospective cohort	?	↑ 35%	=
Jirka et al, 2006	HDF vs LFHD vs HFHD	Historical prospective cohort	?	↑ 36%	=
Schiffl H et al, 2007	HDF vs HFHD + UPD	RCT	↓	=	=
Vinhas J et al, *2007*	HDF vs HFHD	Prospective controlled study	?	↑ 50%	↑
Panichi V et al. 2008	HDF+/- vs LFHD	Prospective controlled study	↓	↑ 15%	↑
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Long-term effects of high-efficiency on-line HDF on uraemic toxicity

Multicentre prospective randomized cross-over study

Laboratory values and dialysis adequacy parameters at the end of the 2 periods

6 months x 2	LF-HD (n=62)	OL-HDF (n=62)	P-value
eKt/V urea	1.44±0.26	1.60±0.31	< 0.0001
End session, mg/dL	36 ± 12	29 ± 10	<0.0001
Creatinine, mg/dL	9.8 ± 2.2	9.1 ± 2.2	<0.0001
Beta2-m	33.5±11.8	22.2±7.8	< 0.0001
ADMA, µmol/L	0.97 ± 0.40	0.84 ± 0.37	0.2
Calcium, mg/dL	9.6 ± 0.8	9.7 ± 0.7	0.3
P	5.0±1.4	4.6±1.3	0.008
iPTH	228±177	203±154	0.03
Total cholesterol, mg/dL	175 ± 45	176 ± 45	0.9
HDL, mg/dL	44.7 ± 12.4	49.2 ± 12.7	<0.0001*
Albumin	4041±391	3919±393	0.004
CRP, mg/L	6.65 ± 6.07	5.49 ± 5.46	0.03*
CRP	6.65±6.07	5.49±5.46	0.03
Potassium, mmol/L	5.2 ± 0.8	5.2 ± 0.7	0.8
Bicarbonate, mmol/L	21.8 ± 2.1	21.7 ± 1.9	0.6

Pedrini LA et al. Nephrol Dial Transplant. 2011 Apr;26(4):1445-6

Long-term effects of high-efficiency on-line HDF on uraemic toxicity

Multicentre prospective randomized cross-over study

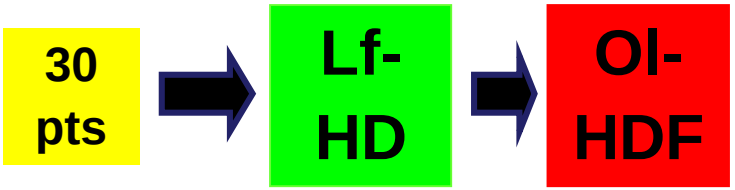
Phosphate binders and 1-25 OH Vit D

	Low Flux-HD	On line-HDF	P-value
Ca (acetate/carbonate), g/day	$n = 35$ 2.54 ± 1.36	$n = 34$ 2.67 ± 1.45	0.6
Al hydroxide, g/day	$n = 16$ 2.98 ± 1.99	$n = 16$ 3.10 ± 1.97	0.9
Sevelamer, mg/day	**5120±2001**	**3947±2016**	**0.04**
1-25 OH cholecalciferol, µg/week	$n = 38$ 2.25 ± 1.64	$n = 38$ 2.38 ± 1.83	0.8

Pedrini LA et al. Nephrol Dial Transplant. 2011 Apr;26(4):1445-6

Effect of post-dilutional on-line HDF on serum calcium, phosphate and PTH in uraemic patients

Prospective trial



				Period 1	Period 2
				P:Baseline versus 6 months	P:Baseline versus 12 months
Study group: *n*=30					
Calcium (mg/dl)	8.9 ± 0.8	9.1 ± 0.7	8.9 ± 0.6	NS	NS
Serum phosphate (mg/dL)	5.3 + 0.7	5.1 ± 1.0	4.0 ± 0.7	NS	<0.0001
PTHint (ng/mL)	319 ± 163	307 ± 167	194± 98	NS	<0.0001
Controls: *n*=35 (Lf-HD)					
Calcium (mg/dl)	9.1 ± 0.6	9.2 ± 0.6	9.2 ± 0.5	NS	NS
Serum phosphate (mg/dL)	5.0 ± 0.5	5.1 ± 0.4	5.2 ± 0.5	NS	NS
PTHint (ng/mL)	276 ± 182	242 ± 149	294 ± 189	NS	NS

Movilli E et al. Nephrol Dial Transplant. 2011 Dec;26(12):4032-7

Convective Therapies: Outcomes

- Intradialytic Cardiovascolar Stability
- Beta2 microglobulin
- Phosphataemia
- Anaemia and ESA Dose
- Inflammation

Mortality

Randomised studies on the effect of Convective Treatments on Anaemia correction

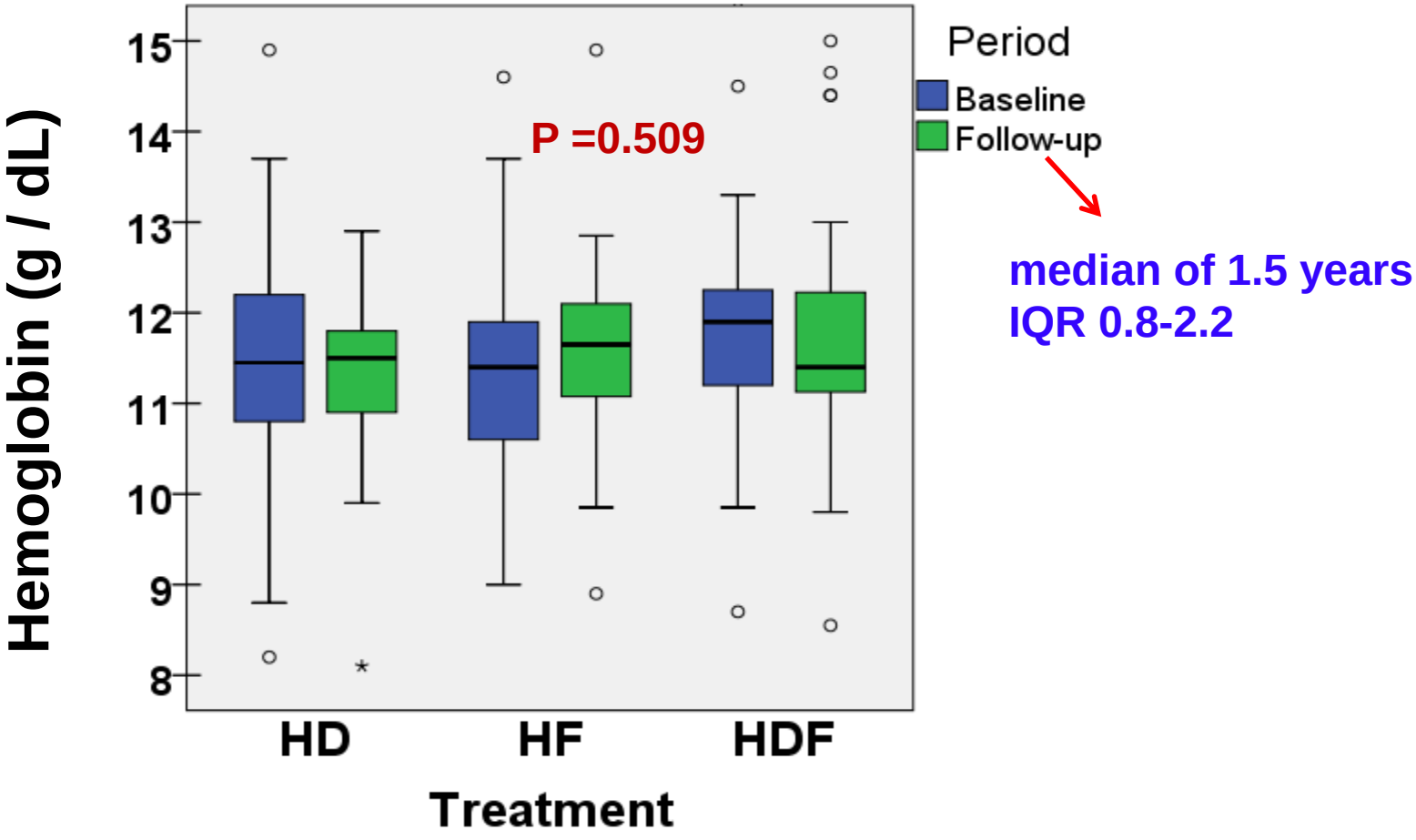
	Analysis	Treatments (patients)	Sample size	Haemoglobin Haematocrit	Epo dose
Locatelli et al. 1996	Secondary	Cuprophan-HD (132) LF – Ps HD (147) HF – Ps HD (51) HDF Ps (50)	380	(HF-HD vs LF-HD)	NA
Locatelli et al. 2000	Primary	HF-PMMA HD (42) Cellulose-HD (42)	84	=	=
Ward et al. 2000	Primary	On-line HDF vs HF-HD	44	=	
Wizemann et al. 2000	Primary	LF-HD (21) On-line HDF (23)	44	=	=
Ayli et al. 2004	Primary	HF-HD vs LF-HD	48		↓
Vaslaki et al. 2006	Primary (cross-over)	On-line HDF vs HD	70		↓
Locatelli et al. 2009	Secondary	LF–HD (375) HF–HD (363)	738	=	=
Andrulli.. and Locatelli 2010	Primary	HF-HD**+Vit. E coated membranes** vs HF-HD	20	=	=
	Secondary			=	↓

LF-HD: low-flux haemodialysis; HF-HD: high-flux haemodialysis; HDF: haemodiafiltration; NA: not available; Ps: Polysulphone; BK-F polymethylmetacrylate

Locatelli F et al. Contrib Nephrol 2011; 168: 162-72

Baseline and follow-up haemoglobin values in online HF and online HDF vs low-flux HD

A total of 146 patients were centrally randomized to HD (70 patients), HF (36 patients) or HDF (40 patients)



median of 1.5 years
IQR 0.8-2.2

Locatelli F. et al - Nephrol Dial Transplant 2012 Sep 27 (9): 3594-600

Convective Therapies: Outcomes

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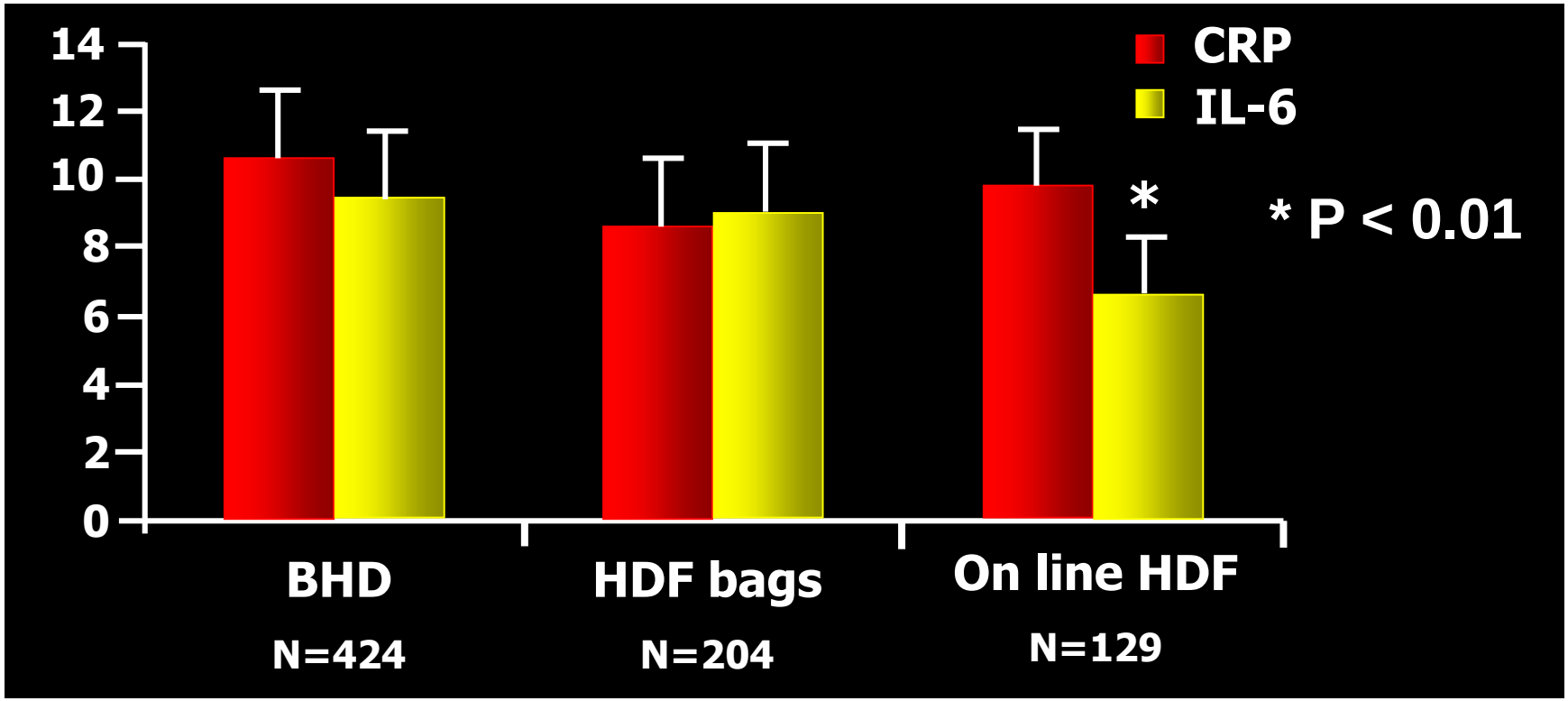
- Inflammation

  Mortality

Chronic inflammation and mortality in HD: effect of different renal replacement therapies. Results from the RISCAVID study

Prospective observational trial

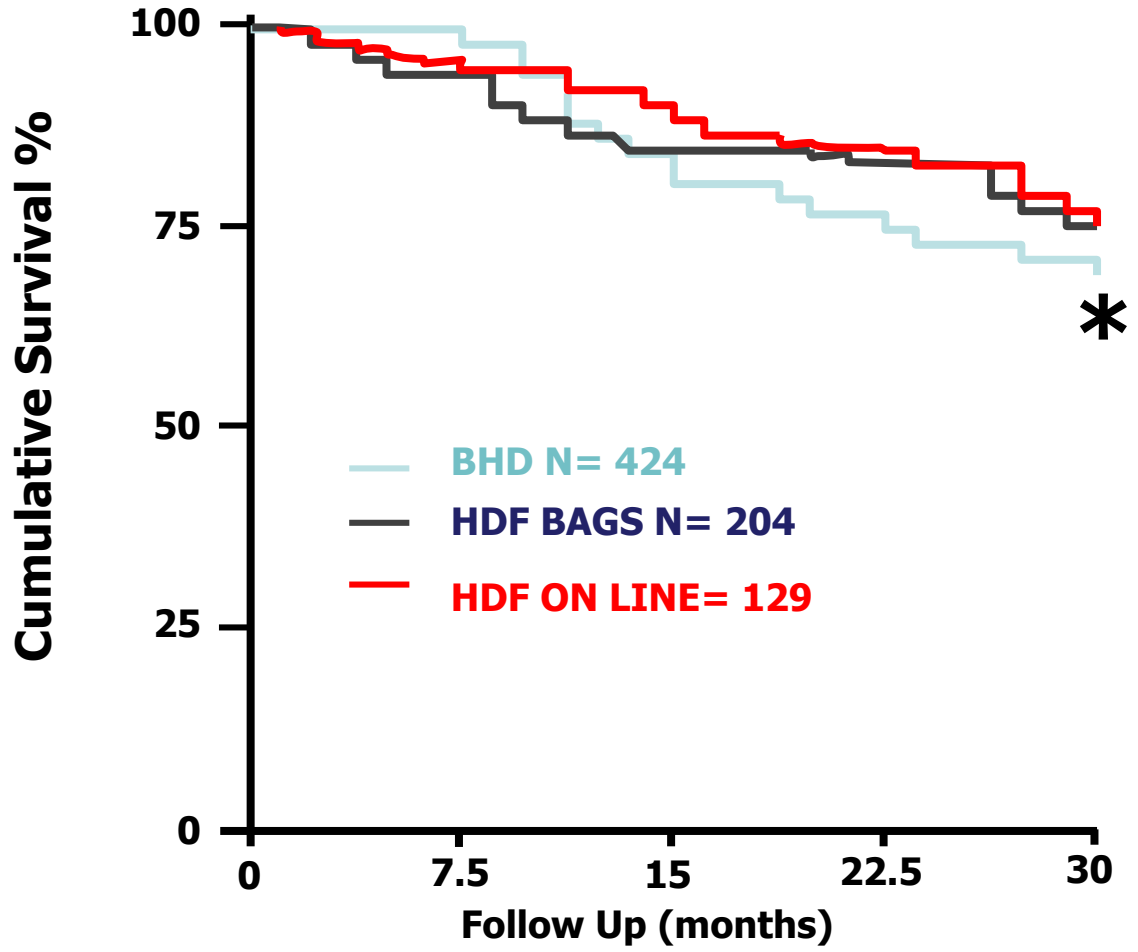
Inflammatory markers and dialytic techniques



Panichi V et al. Nephrol Dial Transplant 2008; 23: 2337-2343

Chronic inflammation and mortality in HD: effect of different renal replacement therapies. Results from the RISCAVID study

Prospective observational trial



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Convective Therapies: Outcomes

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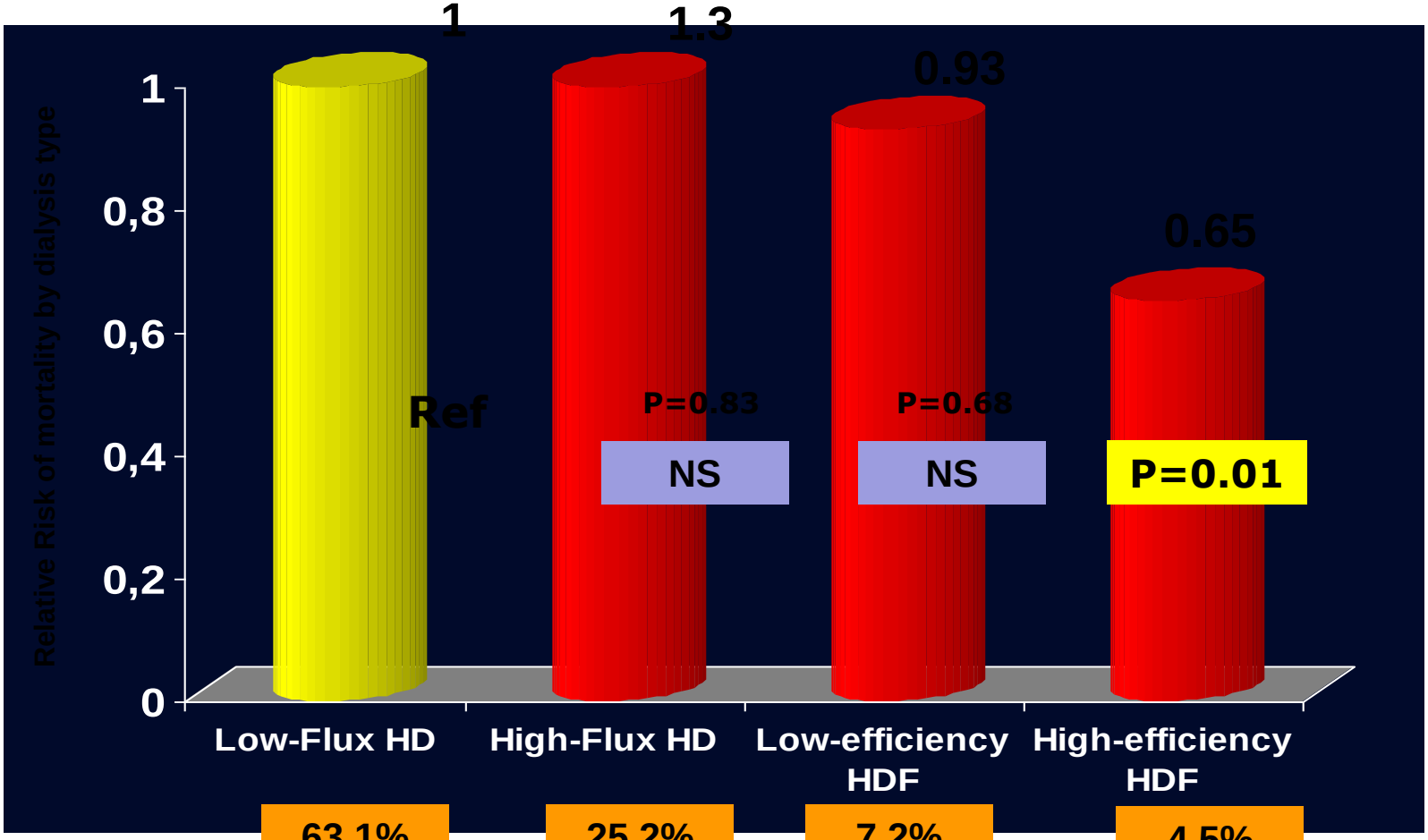
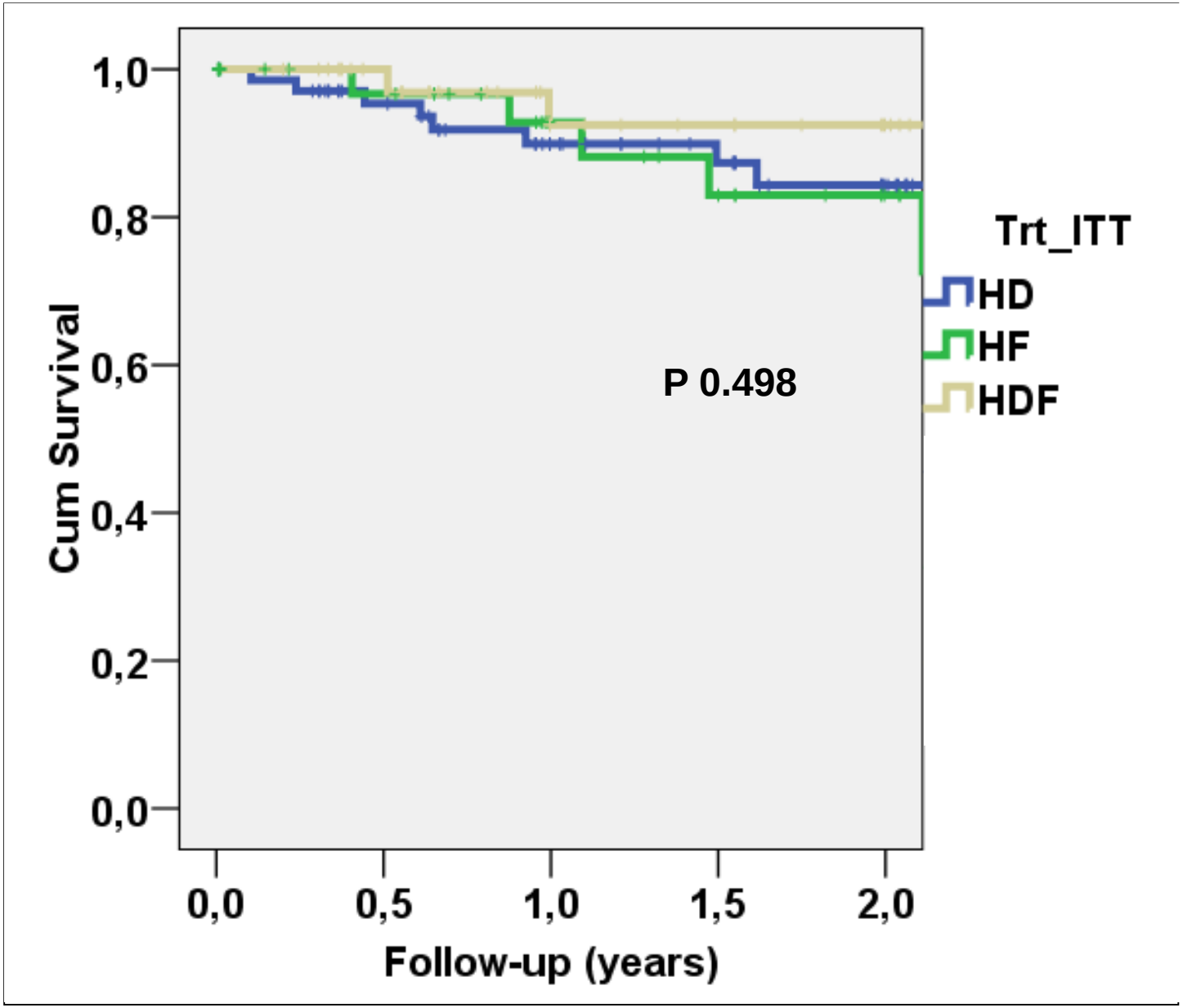
Mortality

Mortality risk for patients receiving HDF versus HD European results from the DOPPS



Canaud B et al. Kidney Int 2006; 69: 2087-2093

Patient survival



Locatelli et al. J Am Soc Nephrol. 2010; 21(10):1798-807

Survival of CKD patients receiving HDF and HF versus HD

Locatelli F. and Canaud B. Nephrol.Dial Transpl. 2012

Author, Year	HDF vs Comp	Type of study	β2-M	Survival	Tolerance
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Outcomes of CKD patients receiving HDF versus HD

Locatelli F. and Canaud B. Nephrol.Dial Transpl. 2012

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KDIGO Controversies Conference

Novel techniques and innovation in blood purification:
How can we improve clinical outcomes in hemodialysis?

14-15 October, 2011
Paris, France

CONFERENCE LEADERS

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Is hemodiafiltration the future?

Barriers to its large use

Chan CT… Locatelli F. et al Kidney Int. 2013 Jan 16

Barriers to larger use of Hemodiafiltration

- Lack of convincing evidence of survival benefit
- Lack of convincing cost saving – varies from country to country
- Safety concerns using large volume of on-line prepared substitution fluid
- Regulatory issues regulation of on-line fluid preparation (cumbersome and costly)
- Inadequate vascular access for Qb requirements
- Education and training
- Cost of OL-HDF machine

Chan CT… Locatelli F. et al Kidney Int. 2013 Jan 16

Randomized clinical trials in Europe evaluating HDF vs HD

Dutch Trial
CONTRAST
LFHD vs HDF
350/350
CV events
Mortality
36 months

715 enrolled
JASN 2012

Italian Trial
CONVESTUDY
LFHD vs HF/HDF
150/75/75
Tolerance
Morbidity
Mortality
24 months

70 HD; 40 HDF
& 36 HF patients
JASN 2010

French Trial
HFHD vs HDF
> 65y
300/300
Tolerance
CV events
Mortality
24 months

410 patients;
enrollment closed
Dec 31, 2010;
Results by Dec ,
2014?

Catalonian Trial
ESHOL
HFHD vs HDF
300/300
CV events
Mortality
24 months

~900 patients;
JASN 2013

Turkish Trial
HFHD vs HDF
300/300
CV events
Mortality
24 months

~ 800 patients
NDT 2012

CLINICAL RESEARCH www.jasn.org

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Hemofiltration and Hemodiafiltration Reduce Intradialytic Hypotension in ESRD

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J Am Soc Nephrol 2010 21:1798-807

CONTRAST Study

JASN

CLINICAL RESEARCH www.jasn.org

Effect of Online Hemodiafiltration on All-Cause Mortality and Cardiovascular Outcomes

Muriel P.C. Grooteman,*† Marinus A. van den Dorpel,‡ Michiel L. Bots,§ E. Lars Penne,*‖ Neelke C. van der Weerd,* Albert H.A. Mazairac,‖ Claire H. den Hoedt,‡‖ Ingeborg van der Tweel,§ Renée Lévesque,¶ Menso J. Nubé,*† Piet M. ter Wee,*† and Peter J. Blankestijn,‖ for the CONTRAST Investigators

*Department of Nephrology, VU University Medical Center, Amsterdam, The Netherlands; †Institute for Cardiovascular Research, VU Medical Center, Amsterdam, The Netherlands; ‡Department of Internal Medicine, Maasstad Hospital, Rotterdam, The Netherlands; §Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht, The Netherlands; ‖Department of Nephrology, University Medical Center Utrecht, Utrecht, The Netherlands; and ¶Department of Nephrology, Centre Hospitalier de l'Université de Montréal, St. Luc Hospital, Montréal, Canada

Grooteman MPC et al J Am Soc Nephrol 23: 1087–1096, 2012

CONTRAST

JASN

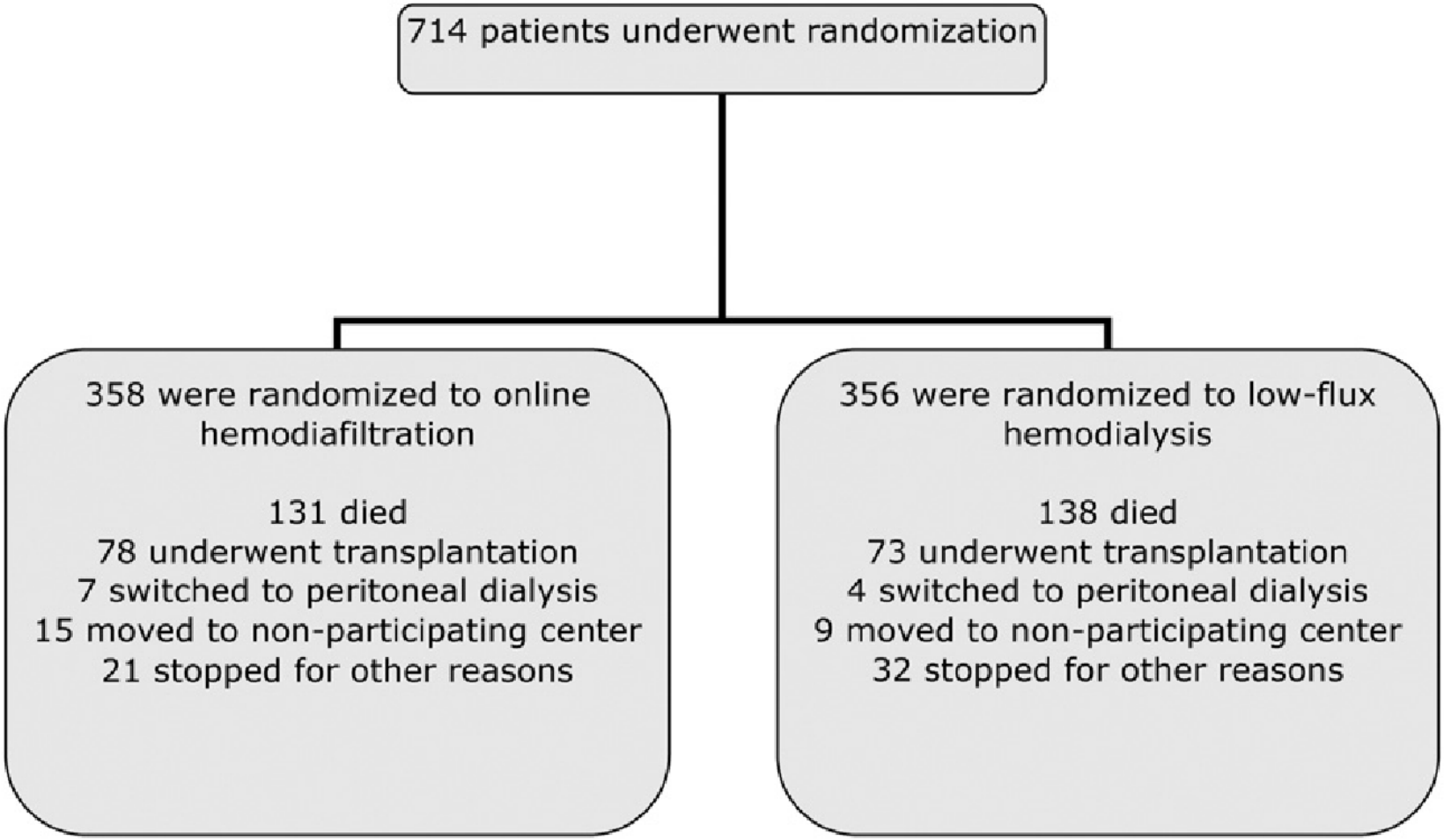


Figure 1. Enrollment, randomization, and follow-up of study participants. For mortality and cardiovascular events, all patients were followed until the end of the study.

Grooteman MPC et al J Am Soc Nephrol 23: 1087–1096, 2012

Primary outcome

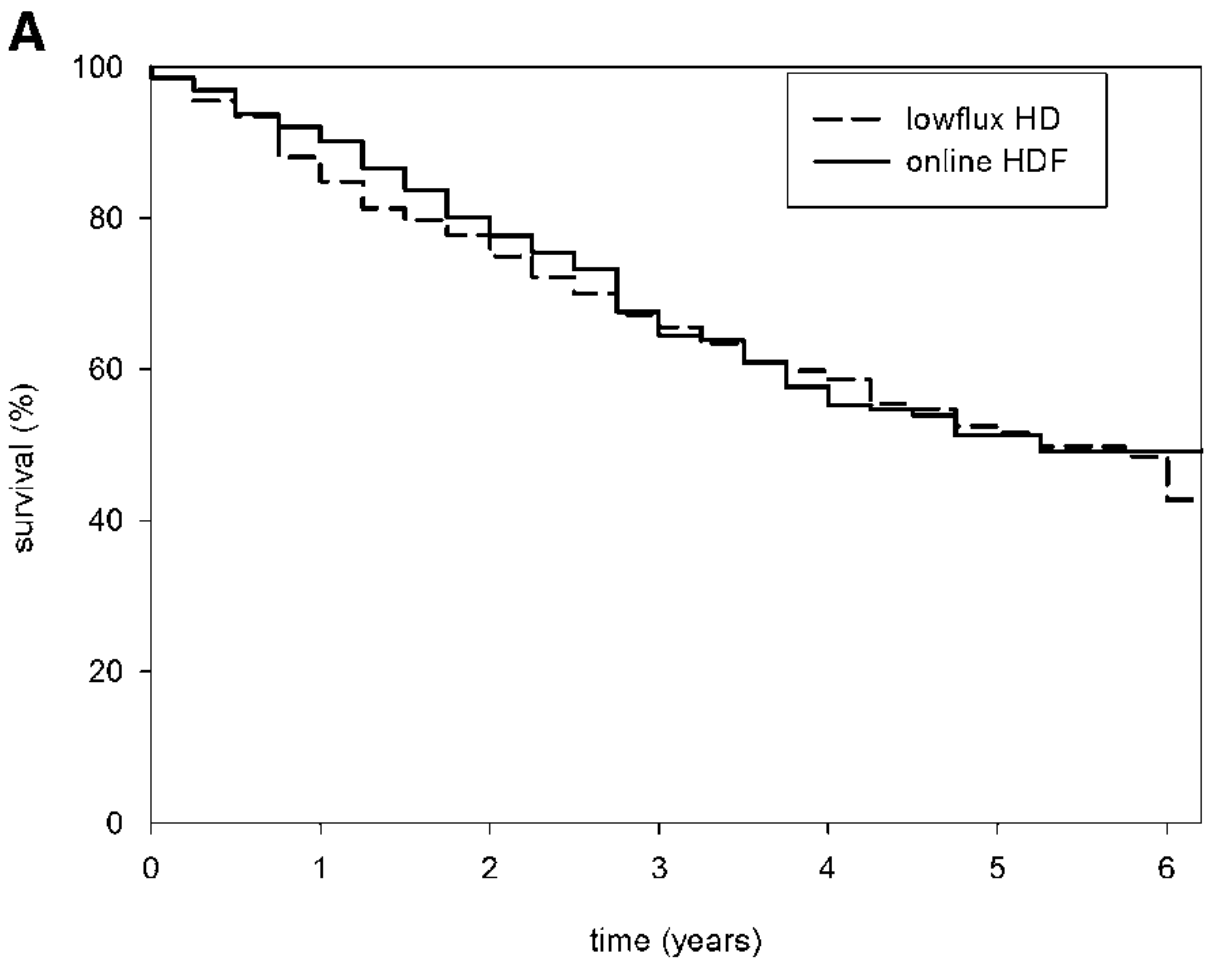
	Online Hemodiafiltration		Low-Flux Hemodialysis		HR (95% CI)[a]
	Number of Events	Person-Years of Follow-Up	Number of Events	Person-Years of Follow-Up	
Primary out-come: all-cause mortality	131	1085	138	1085	0.95 (0.75–1.20)

[a] Obtained through unadjusted Cox proportional hazards models

Grooteman MPC et al J Am Soc Nephrol 23: 1087–1096, 2012

All-cause mortality was not affected by treatment

Survival curves for time to death from any cause based on life table analyses using 3-month time periods



Grooteman M P et al. JASN 2012;23:1087-1096

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Risk of all-cause mortality by achieved convection volume

82 missing and 206 deaths instead of 269

	HD	Online Hemodiafiltration Convection Volume Tertiles			*P* for Trend
		<18.17 L	18.18–21.95 L	>21.95 L	
Total mortality					
crude	1.0	0.95 (0.66–1.38)	0.83 (0.57–1.22)	0.62 (0.41–0.93)	0.010
adjusted [a]	1.0	0.79 (0.53–1.14)	0.77 (0.51–1.14)	0.65 (0.42–0.99)	0.012
adjusted [b]	1.0	0.80 (0.52–1.24)	0.84 (0.54–1.29)	0.61 (0.38–0.98)	0.015

[a] Adjusted for age, sex, previous vascular disease, diabetes, previous transplantation, spKt/V, baseline eGFR, baseline albumin, baseline creatinine, baseline hematocrit, and use of α- and β-blockers, calcium antagonists, and angiotensin converting inhibitors at baseline

[b] Adjusted for the above-mentioned determinates as well as for center differences

Grooteman MPC et al J Am Soc Nephrol 23: 1087–1096, 2012

NDT
Nephrology Dialysis Transplantation

http://ndt.oxfordjournals.org/

Nephrol Dial Transplant (2013) 28: 192–202
doi: 10.1093/ndt/gfs407
Advance Access publication 9 December 2012

Mortality and cardiovascular events in online haemodiafiltration (OL-HDF) compared with high-flux dialysis: results from the Turkish OL-HDF Study

Ercan Ok[1], Gulay Asci[1], Huseyin Toz[1], Ebru Sevinc Ok[1], Fatih Kircelli[1], Mumtaz Yilmaz[1], Ender Hur[1], Meltem Sezis Demirci[1], Cenk Demirci[1], Soner Duman[1], Ali Basci[1], Siddig Momin Adam[2], Ismet Onder Isik[2], Murat Zengin[2], Gultekin Suleymanlar[3], Mehmet Emin Yilmaz[4] and Mehmet Ozkahya[1] and On behalf of the 'Turkish Online Haemodiafiltration Study'

[1]Division of Nephrology, Ege University School of Medicine, Izmir, Turkey, [2]Fresenius Medical Care Dialysis Clinics, Turkey, [3]Division of Nephrology, Akdeniz University School of Medicine, Antalya, Turkey and [4]Division of Nephrology, Dicle University School of Medicine, Diyarbakir, Turkey

Correspondence and offprint requests to: Ercan Ok; E-mail: ercan.ok@ege.edu.tr

Flow chart of study participation.

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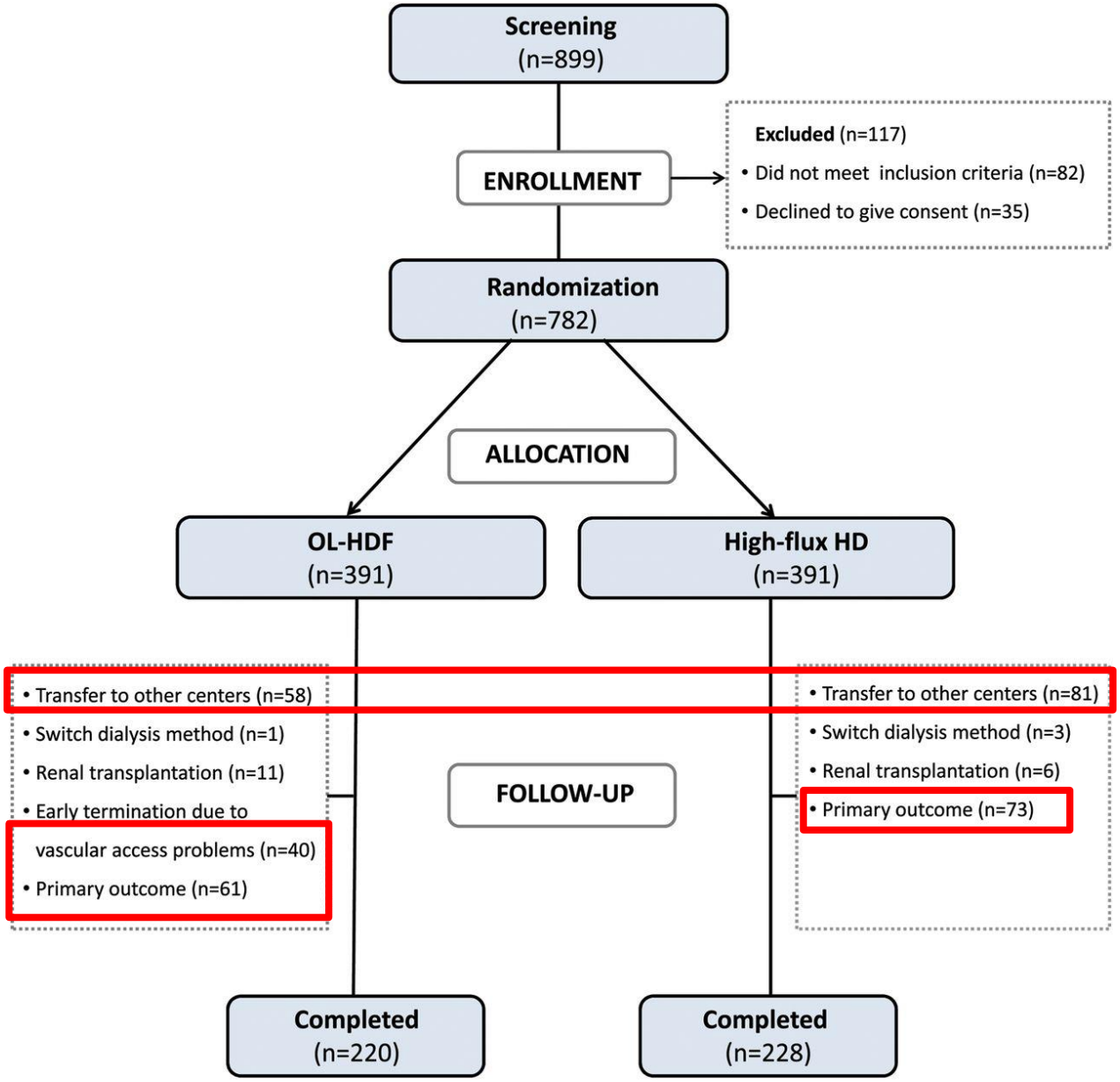


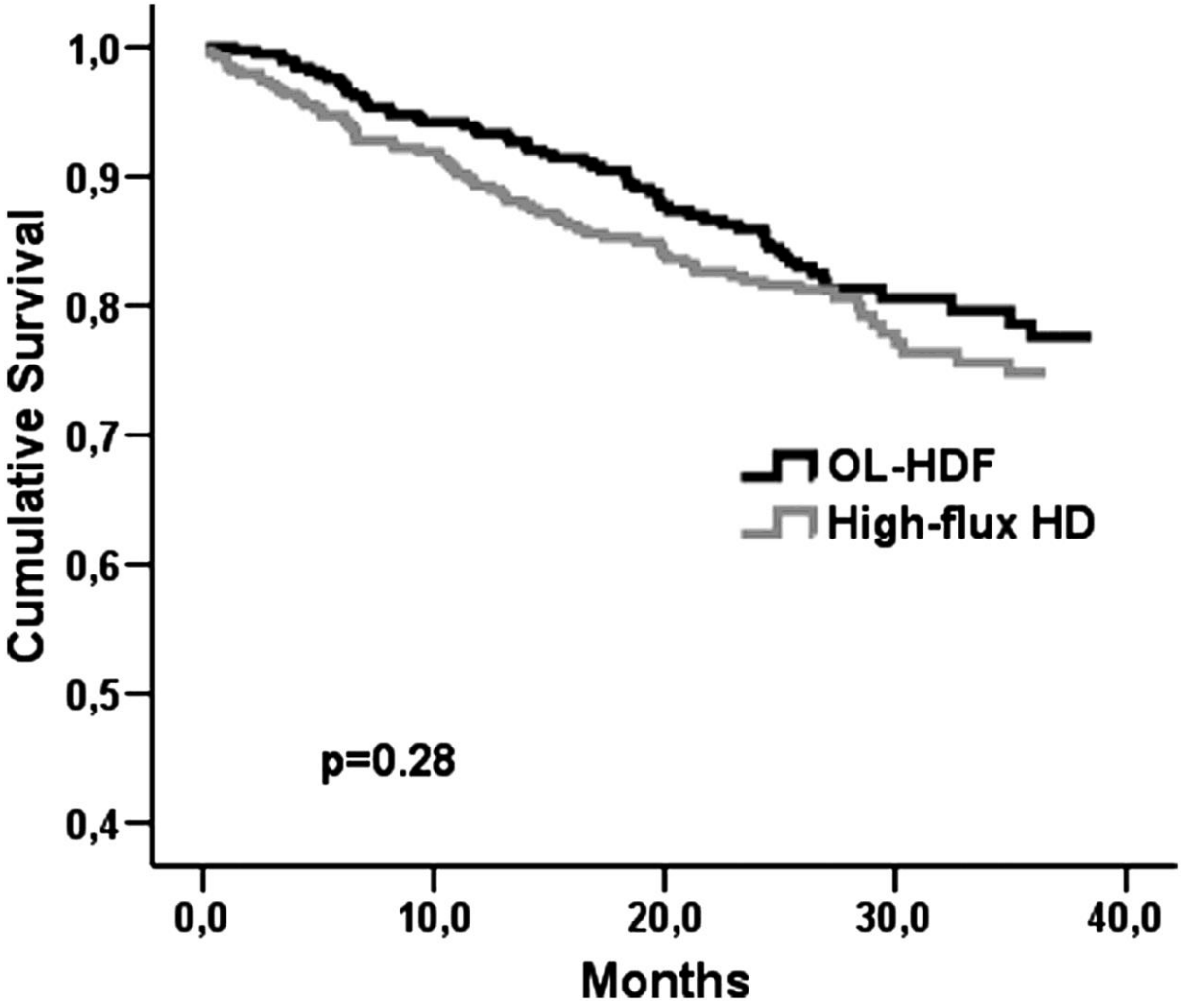
Ok E et al. Nephrol. Dial. Transplant. 2013;28:192-202

Mortality

	All patients ($n = 782$)	OL-HDF ($n = 391$)	High-flux HD ($n = 391$)
Overall mortality (n, %)	117 (15.0)	52 (13.3)	65 (16.6)
Cardiovascular mortality (n, %)	76 (9.7)	32 (8.1)	44 (11.2)
Noncardiovascular mortality (n, %)	41 (5.2)	20 (5.1)	21 (5.3)

Ok E et al: NDT 2013 28: 192-202

Composite event-free survival in patients treated with OL-HDF and high-flux HD



Ok E et al. Nephrol. Dial. Transplant. 2013;28:192-202

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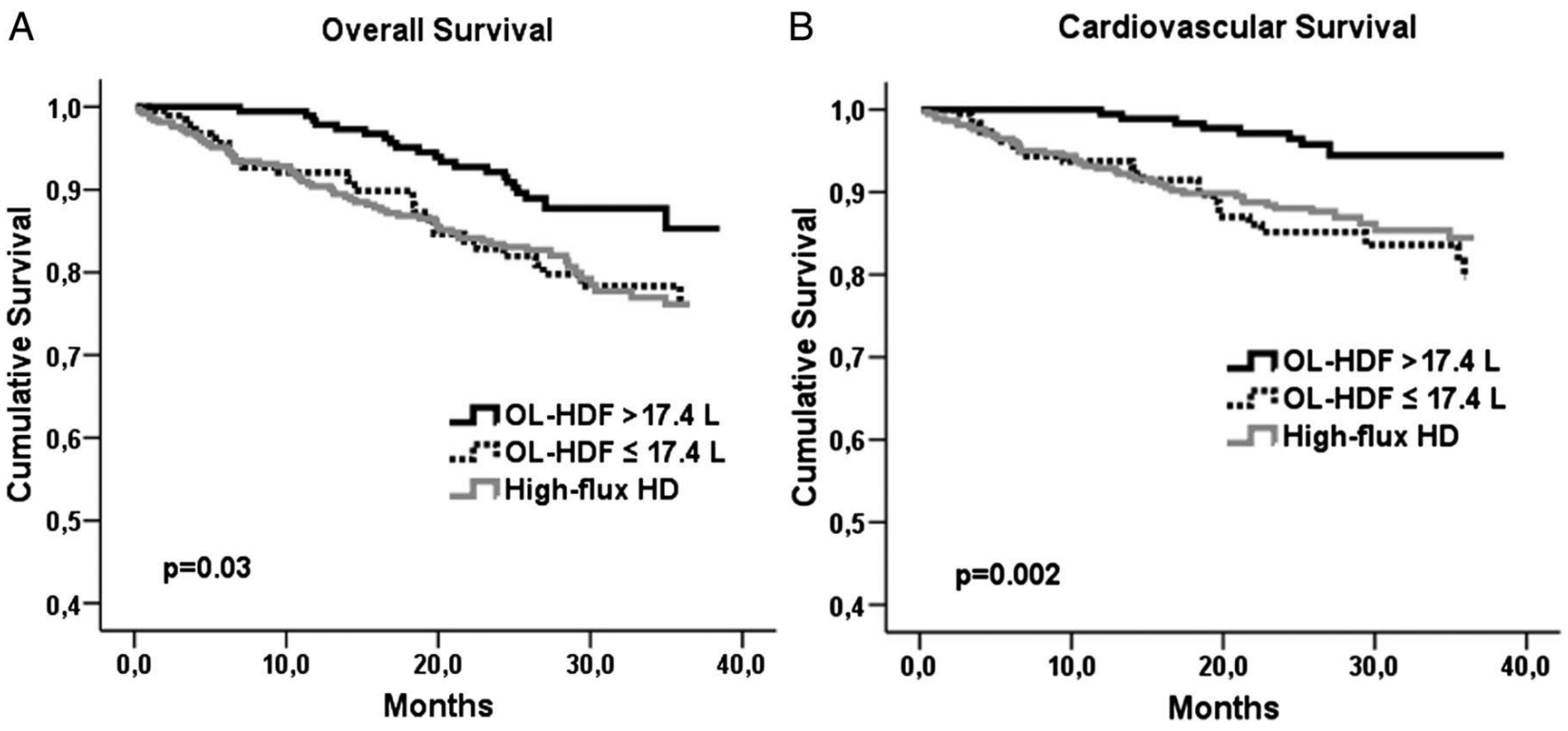
Overall (A) and cardiovascular survival (B) among the treatment groups



Ok E et al. Nephrol. Dial. Transplant. 2013;28:192-202

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CLINICAL RESEARCH

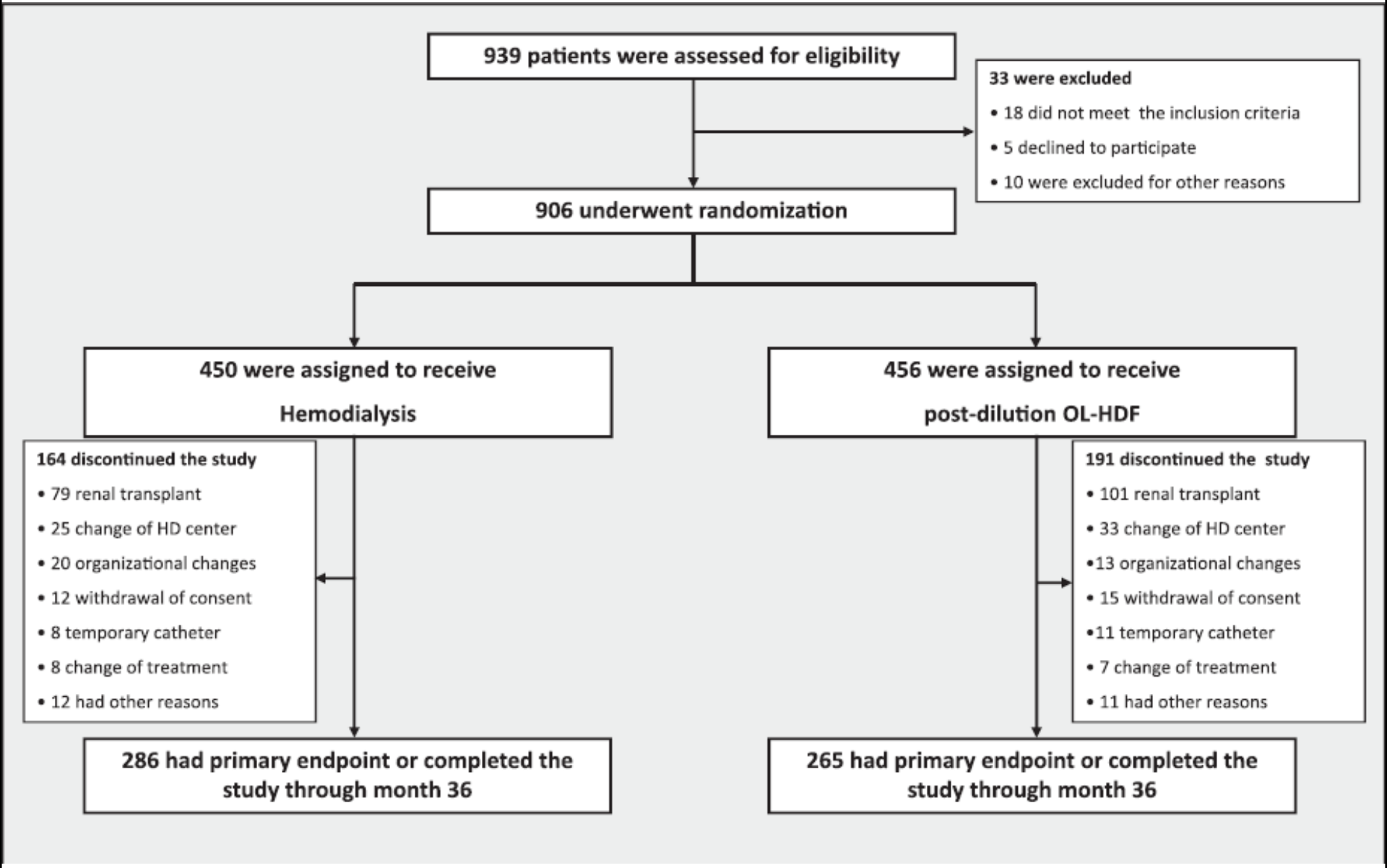
JASN® Journal of the American Society of Nephrology

High-Efficiency Postdilution Online Hemodiafiltration Reduces All-Cause Mortality in Hemodialysis Patients

Francisco Maduell,* Francesc Moreso,† Mercedes Pons,‡ Rosa Ramos,§ Josep Mora-Macià,‖ Jordi Carreras,¶ Jordi Soler,** Ferran Torres,†††‡‡‡ Josep M. Campistol,* and Alberto Martinez-Castelao,§§ for the ESHOL Study Group

J Am Soc Nephrol 24: ●●●–●●●, 2013. doi: 10.1681/ASN.2012080875

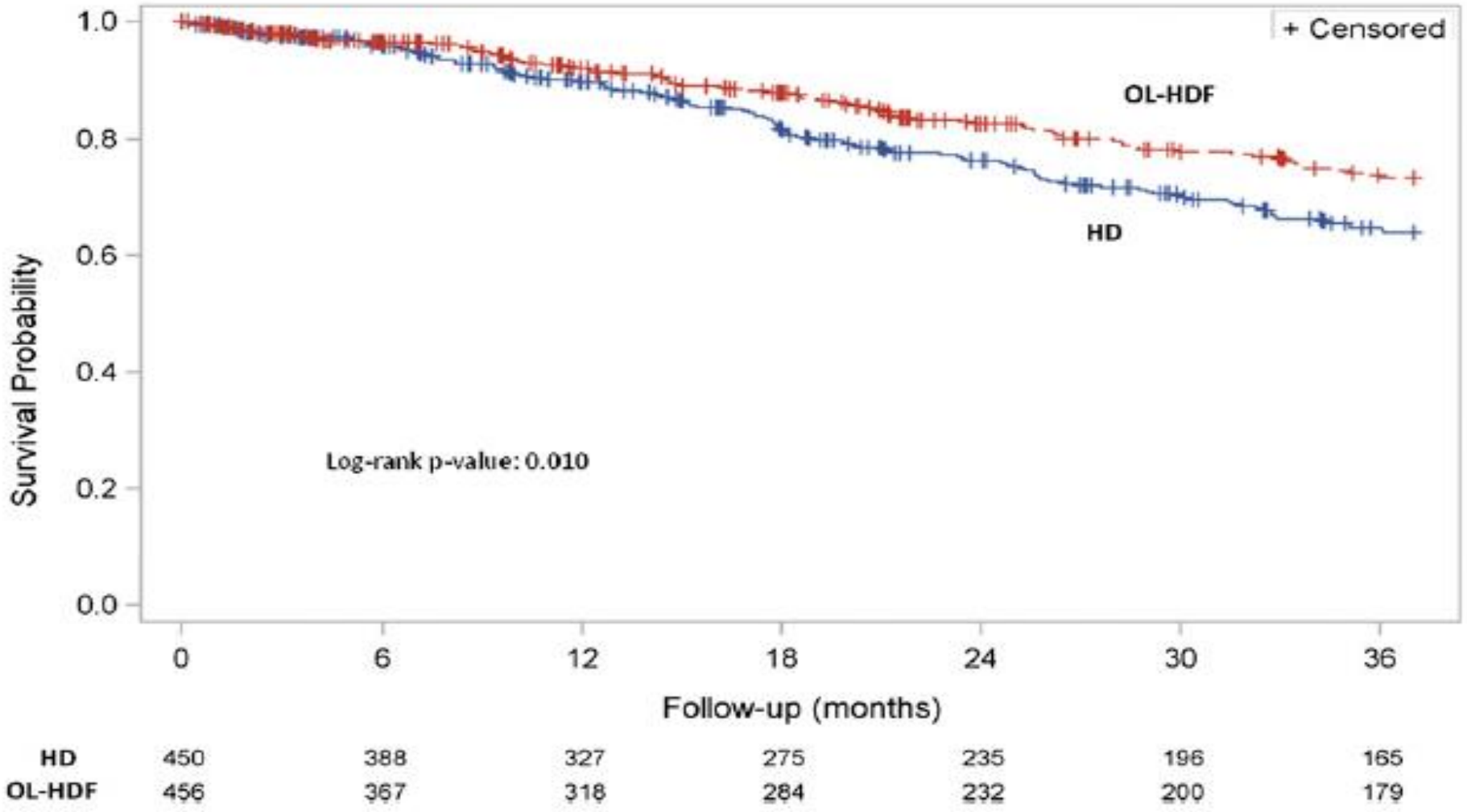
Study Populations



F. Maduell et al. J Am Soc Nephrol 24: 2013

36 months survival in the intention to treat population

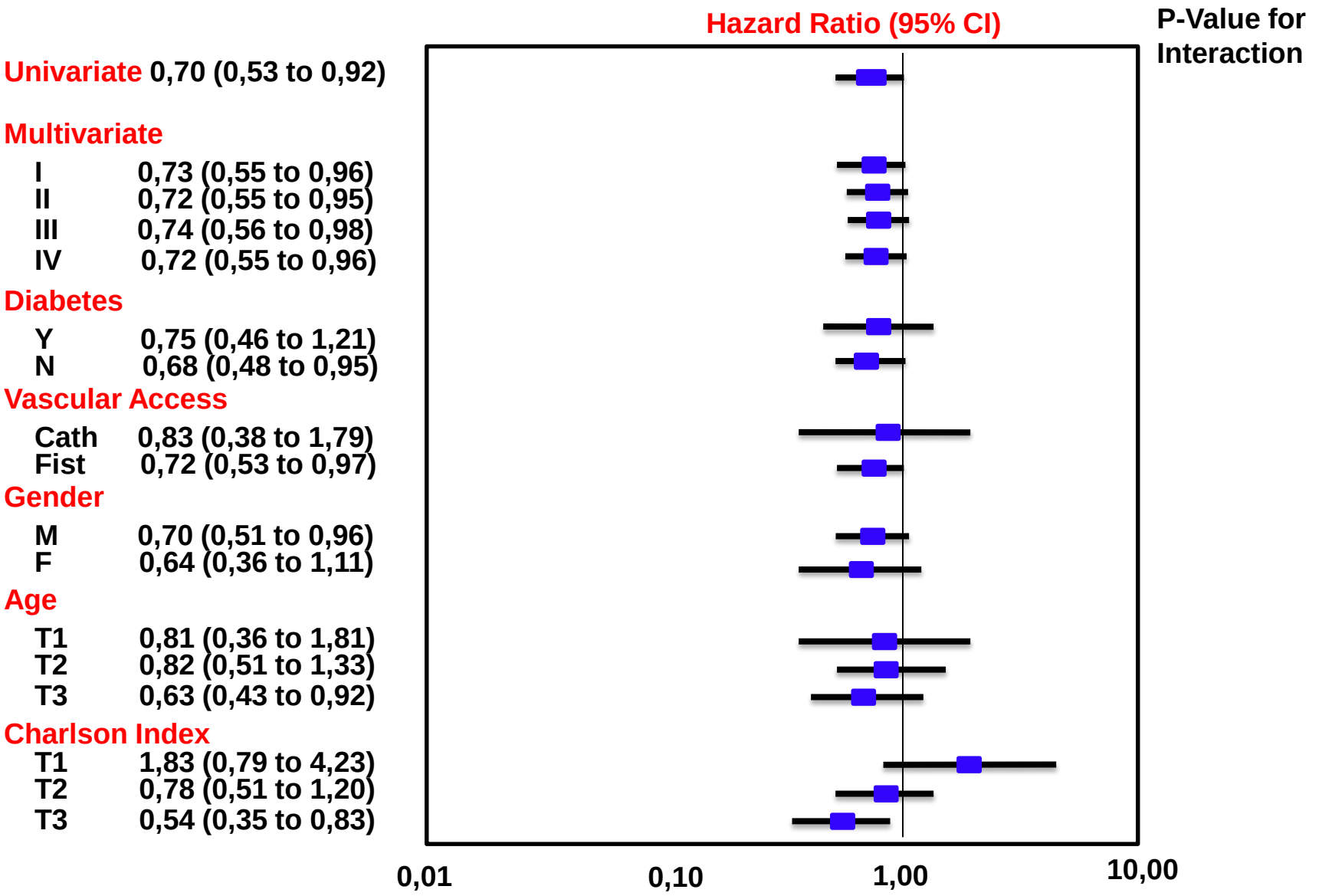
(p=0,001 by the long rank test)



HD	450	388	327	275	235	196	165
OL-HDF	456	367	318	284	232	200	179

F. Maduell et al. J Am Soc Nephrol 24: 2013

Analyses for the main outcome showing HRs (95%Cis) for the intervention based on relevant variable that were found to be indipendent predictors for all-cause mortality



F. Maduell et al. J Am Soc Nephrol 24: 2013

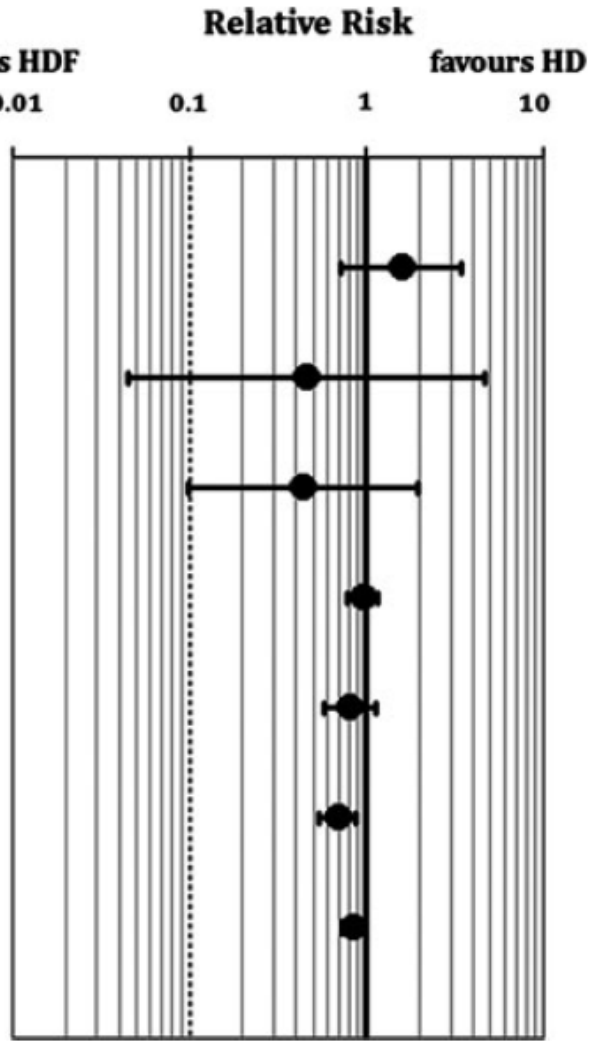
Seminars in Dialysis

Clinical Evidence on Hemodiafiltration: A Systematic Review and a Meta-analysis

Ira M. Mostovaya,* Peter J. Blankestijn,* Michiel L. Bots,† Adrian Covic,‡ Andrew Davenport,§ Muriel P.C. Grooteman,¶** Jörgen Hegbrant,†† Francesco Locatelli,‡‡ Raymond Vanholder,§§ Menso J. Nubé,¶** and on behalf of the EUDIAL[1] – an official ERA-EDTA Working Group

Meta-analysis of all RCTs comparing *MORTALITY* in patients treated with HD or HDF

Study name	Weight	HDF (Events/Pat)	HD (Events/Pat)	RR	95% CI
Locatelli 1996 et al. (9)	0.03	7/50	26/279	1.56	0.72 – 3.42
Wizemann et al. (11)	0.01	1/23	2/21	0.46	0.045 – 4.68
Locatelli 2010 et al. (10)	0.01	2/40	8/70	0.44	0.10 – 1.96
Grooteman et al. (12)	0.48	131/358	138/356	0.94	0.78 – 1.15
Ok et al. (13)	0.16	52/391	65/391	0.80	0.57. – 1.12
Maduell et al. (14)	0.31	85/456	122/450	0.69	0.54 – 0.88
Pooled	**1.00**	**278/1318**	**361/1567**	**0.84**	**0.73 – 0.96**



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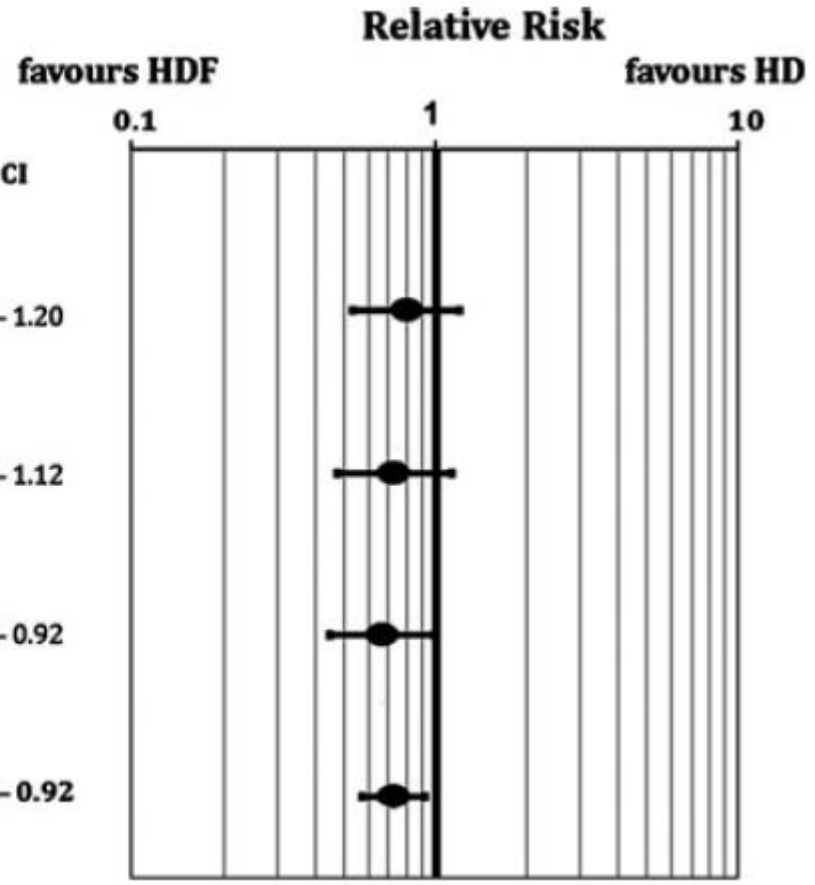
Meta-analysis of all RCTs comparing *CARDIOVASCULAR MORTALITY* in patients treated with HD or HDF

Study name	Weight	HDF (Events/Pat)	HD (Events/Pat)	RR	95% CI
Grooteman et al. (12)	0.30	37/358	46/356	0.80	0.53 – 1.20
Ok et al. (13)	0.26	32/391	44/391	0.73	0.47 – 1.12
Maduell et al. (14)	0.44	37/456	55/450	0.66	0.57 – 0.92
Pooled	1.00	106/1205	145/1197	0.73	0.57 – 0.92



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VOL 63, NO 6
JUNE 2014

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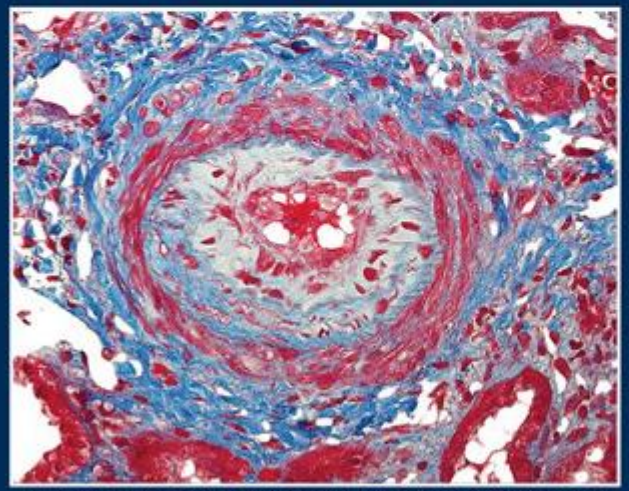

Thrombotic Microangiopathy Following IV Abuse of the Opioid Agonist Oxymorphone, p. 1022

In This Issue

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Convective Versus Diffusive Dialysis Therapies for Chronic Kidney Failure: An Updated Systematic Review of Randomized Controlled Trials

Ionut Nistor, MD,[1,2,] Suetonia C. Palmer, MBChB, PhD,[3,*] Jonathan C. Craig, MBChB, DCH, MM, PhD,[4] Valeria Saglimbene, MSc,[5] Mariacristina Vecchio, MSc,[6] Adrian Covic, MD, PhD,[1] and Giovanni F.M. Strippoli, MD, PhD, MM, MPH[4,5,6]*

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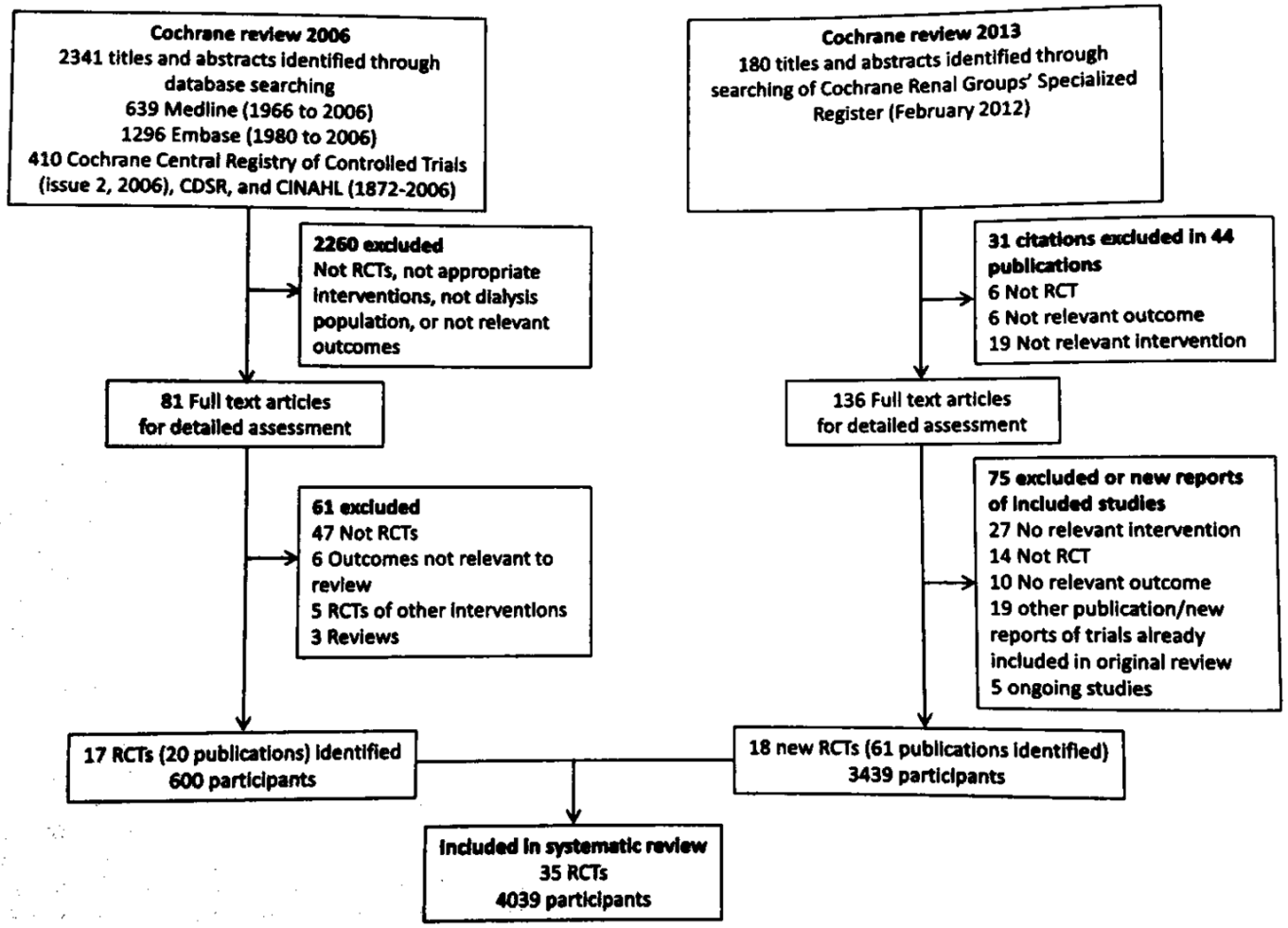

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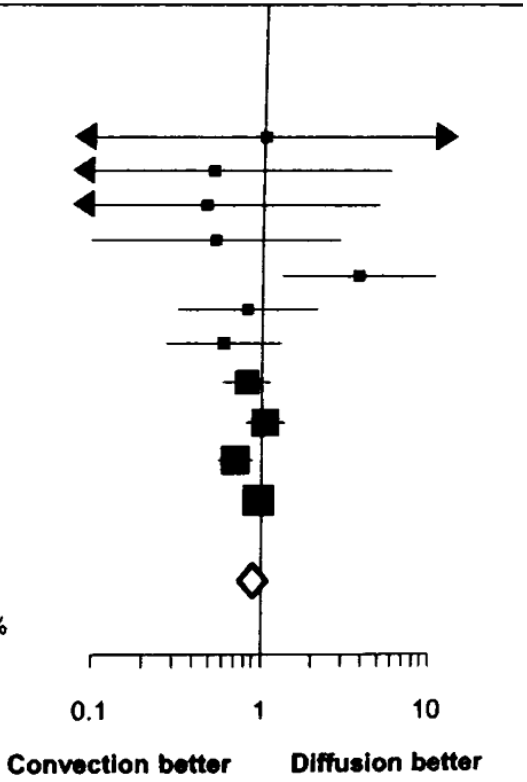
	No. of events/ No. of participants		Relative risk (95% CI) Random effects model	Weight
	Convection	Diffusion		
All-cause mortality				
Beerenhout et al, 2005	1/20	1/20	1.00 (0.07 to 14.9)	0.47%
Schiffl, 2007	1/38	2/38	0.50 (0.05 to 5.28)	0.62%
Wizemann et al, 2000	1/23	2/21	0.46 (0.04 to 4.68)	0.63%
PROFIL study, 2011	2/27	3/21	0.52 (0.10 to 2.83)	1.17%
Locatelli et al, 1996	7/50	6/155	3.62 (1.27 to 10.26)	2.94%
Locatelli et al, 2010	7/76	8/70	0.81 (0.31 to 2.11)	3.41%
Santoro et al, 2008	7/32	12/32	0.58 (0.26 to 1.29)	4.80%
TURKISH OL-HDF study, 2013	52/391	65/391	0.80 (0.57 to 1.12)	16.62%
Tessitore et al, 2012	65/177	69/194	1.03 (0.79 to 1.35)	20.56%
ESHOL study, 2013	85/456	122/450	0.69 (0.54 to 0.88)	22.34%
CONTRAST study, 2012	131/358	138/356	0.94 (0.78 to 1.14)	26.43%
Total	**359/1648**	**428/1748**	**0.87 (0.70 to 1.07)**	**100.0%**

Heterogeneity: $\chi^2_{10} = 15.1$; $P = 0.1$; $I^2 = 34\%$



Effect of Hemodiafiltration or Hemofiltration Compared With Hemodialysis on Mortality and Cardiovascular Disease in Chronic Kidney Failure: A Systematic Review and Meta-analysis of Randomized Trials

Amanda Y. Wang, MBBS, FRACP,[1] Toshiharu Ninomiya, MD, PhD,[1]
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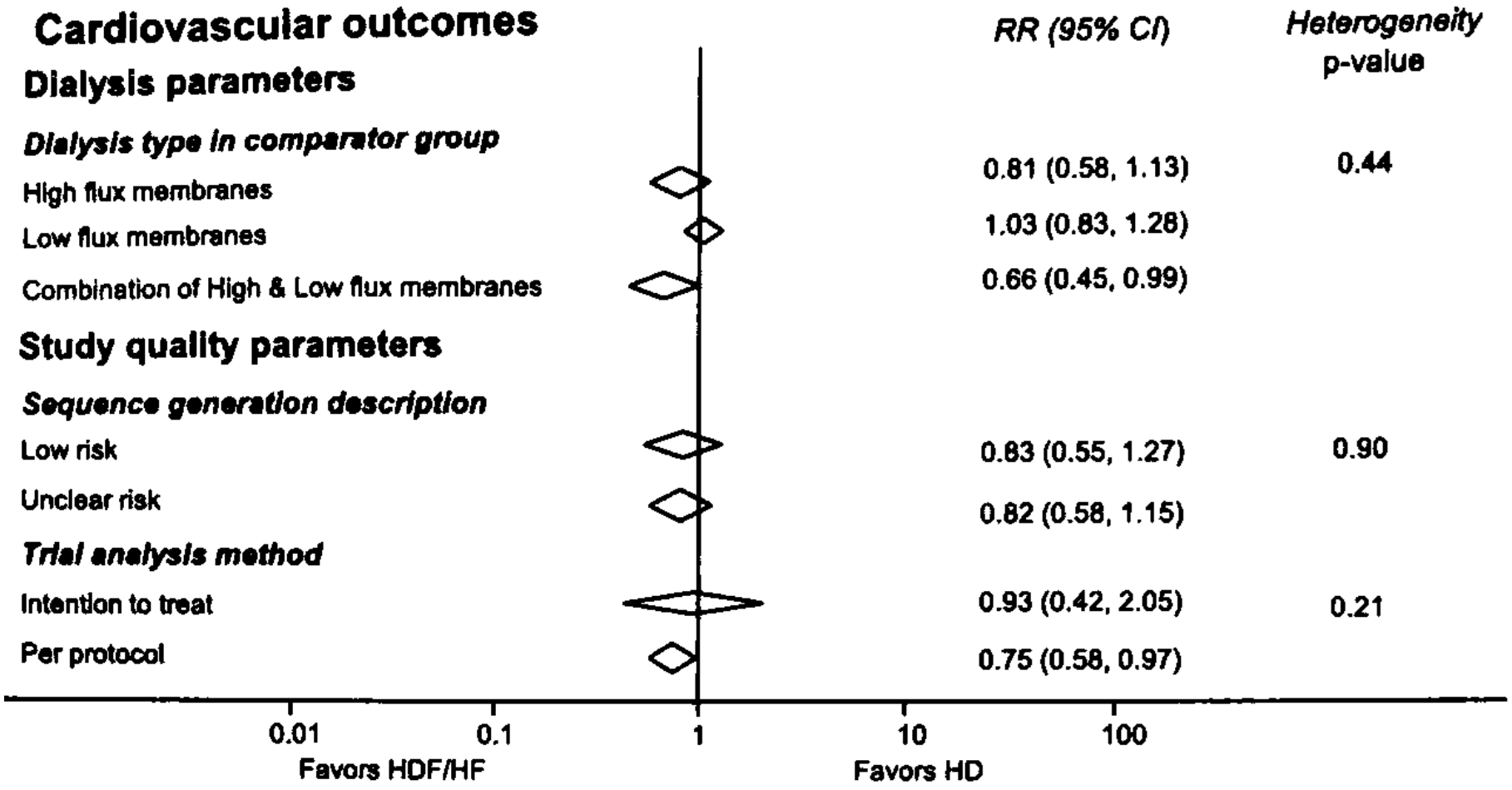

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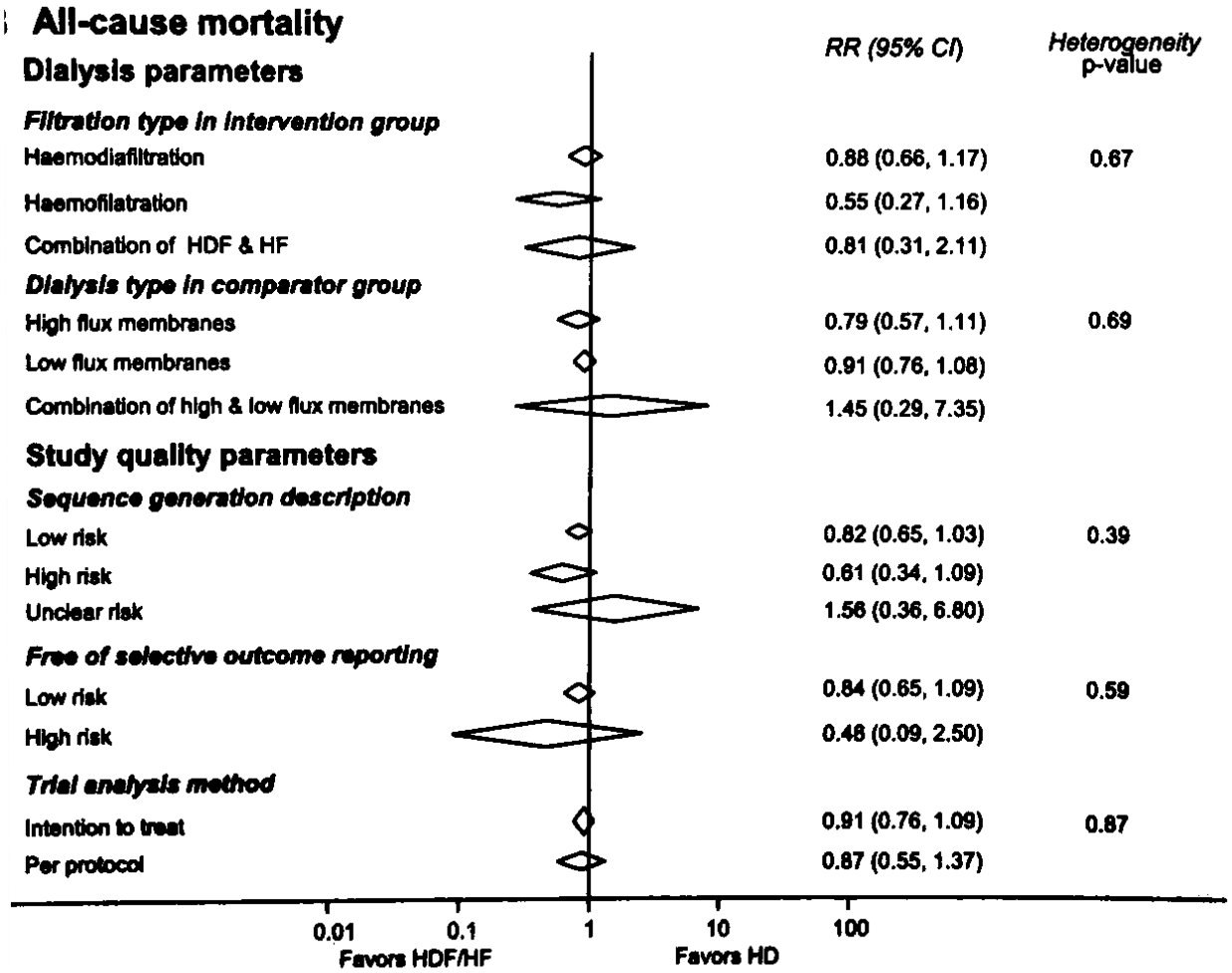

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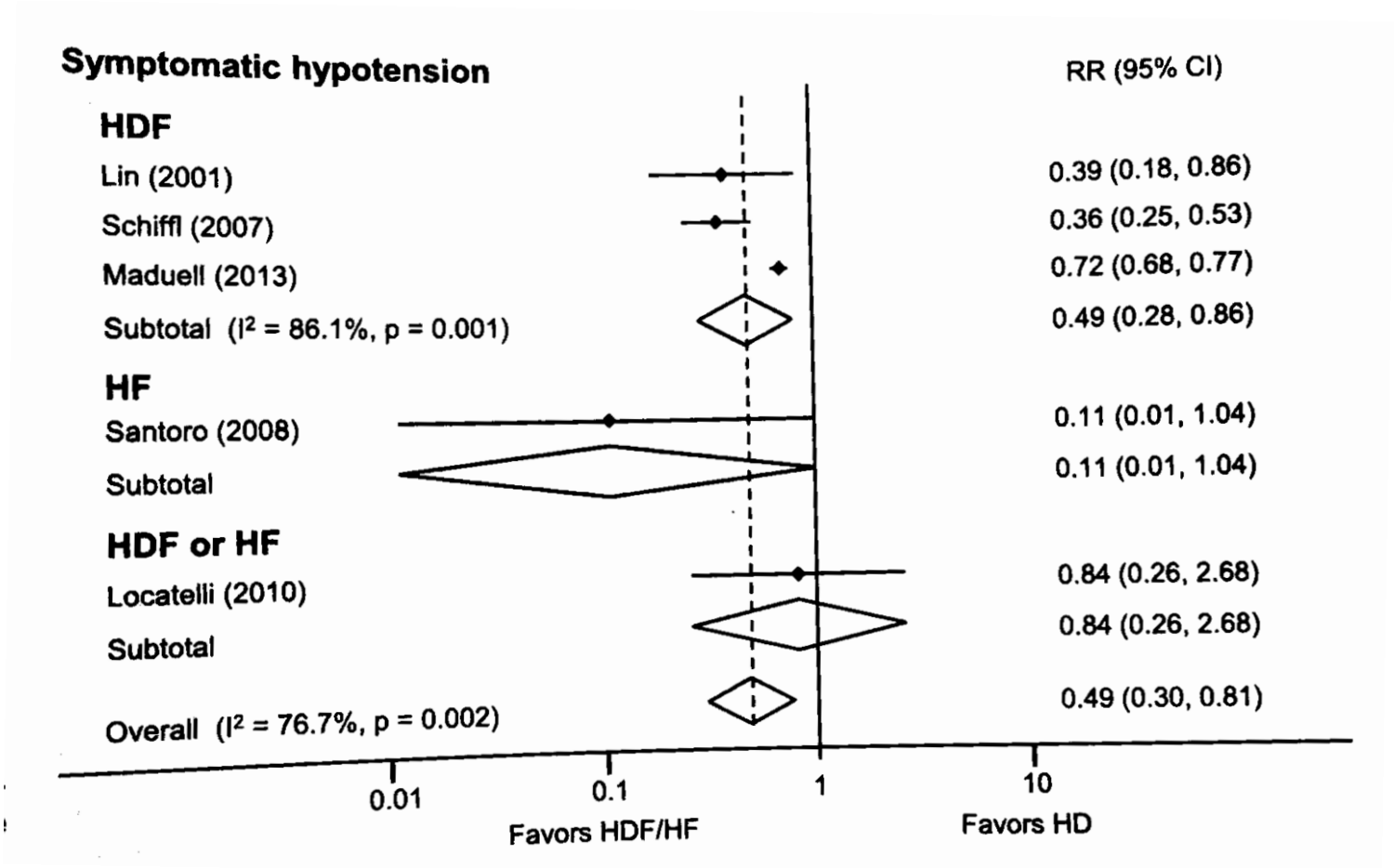


CONCLUSIONS

- Online Haemodiafiltration, is an established RRT modality in routine clinical practice for over two decades.

- Several clinical studies have reported upon the improved patient outcomes with Online Haemodiafiltration.

- Ever since the DOPPS data indicating that patient high-efficiency Online Haemodiafiltration improves outcomes, the focus has been on randomised controlled trials examining the impact of high convective volumes on patient survival.

CONCLUSIONS

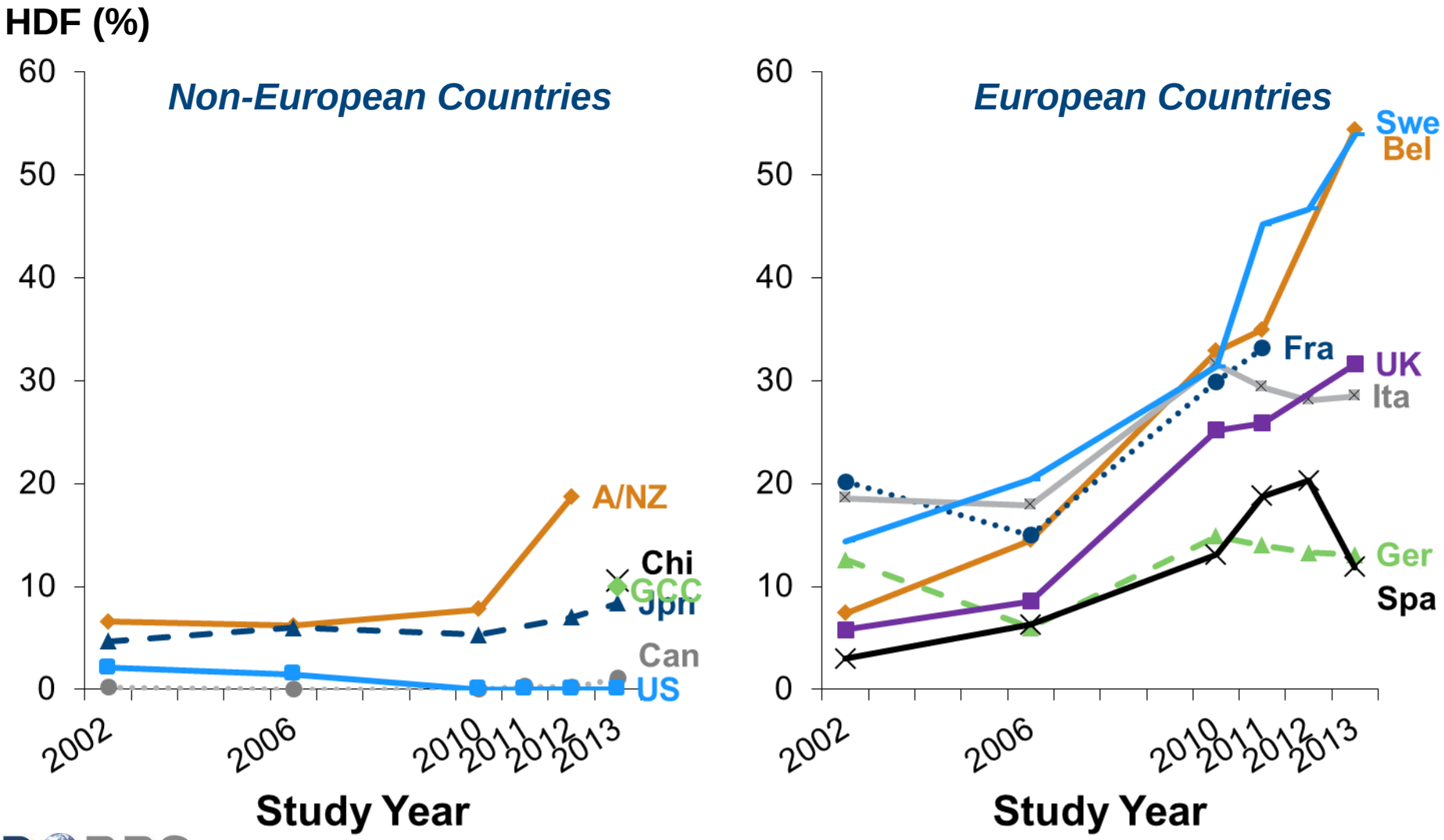
- OL-HDF currently represents the most technically advanced dialysis treatment available.
- Widespread clinical experience with this RRT modality for ~ 3 decades has confirmed its safety and efficacy.
- Widespread implementation of this technique has been delayed pending conclusive evidence of its benefits from randomized studies.

The results of the ESHOL Study should be considered as an important step towards making
OL-HDF a gold standard treatment for patients with CKD.

Locatelli, F. & Hörl, W. H. Nat. Rev. Nephrol. Advance online publication 16 April 2013

HDF Trends by Country

– DOPPS 2-5 (2002-2013) –



DOPPS

Frank Gotch

Blood Purif 2013;35:93–105

How Can We Improve the Solute and Fluid Transport Prescriptions in Hemodialysis to Improve Patient Outcomes?

there is no support for the recommendation of the routine use of hemodiafiltration

Francesco Pope

?

Francesco Locatelli

Nat Rev Nephrol 9:316-318, 2013

A step towards making online haemodiafiltration a gold standard

The results of the ESHOL study should be considered as an important step towards making OL-HDF a gold standard treatment for patients with chronic kidney disease.