Prescription des ions en hémodialyse

La dialyse équilibre tout?

Recette unique ou individualisation?

Guillaume JEAN

Sainte-Foy-Lès-Lyon

2025

Biologie	Bilan pré- dialyse
Na mmol/L	135
K+	3,5
Ca++	2,5
Hco3+	25
PTH pg/ml	18

2) Dialyse à côté ou à la place de la diététique et des médications orales ?

Quelle composition du dialysat ?

Le même dialysat pour tous?

Menu fixe

Na mmol/L	140
K+	2
Ca++	1,5
Hco3+	35

A la carte

1) Individualisation ?

Le sodium

Nacl
Recommandation: 5g/j

Hyperhydratation extracellulaire: œdèmes, HTA, dyspnée

Hyperhydratation intracellulaire (Na bas): crampes, céphalées, nausées, vomissement

Prise de poids, isotonique

Isonatrique

Dialyse: correction des troubles de l'hydratation
Balance sodée: **convection++**

Liquides (eau)

Déshydratation intracellulaire (Na haut): soif

Déshydratation extracellulaire: hypotension

Prescription sodium : rétablir l'hydratation cellulaire optimale (natrémie) et assurer une balance sodée neutre

Na plasmatique évalué par la conductivité

Pas disponible sur tous les générateurs

Natrémie « vraie » du laboratoire

Urée	(mmol/l)		14.354
Urée (après)	(mmol/l)		3.29012
Créatinine	(µmol/l)		776.152
Créatinine (après)	(µmol/l)		273
Kt/V équilibré			1.45399
PCRn	(g/kg/jour)		0.826672
Protides	(g/dl)		6.6
Protides (après)	(g/dl)		6.9
Sodium	(mmol/l)		140
Sodium (après)	(mmol/l)		140
Potassium	(mmol/l)		4.7
Potassium (après)	(mmol/l)		3.4
Chlore	(mmol/l)		99
Chlore (après)	(mmol/l)		100
Calcium total	(mmol/l)		2.31
Calcium (après)	(mmol/l)		2.56
Phosphore	(mmol/l)		1.45476
Phosphore (après)	(mmol/l)		0.5508
Bicarbonates	(mmol/l)		23
Bicarbonates (après)	(mmol/l)		27
Vit D3 (25-OH)	(ng/ml)		
Vit D 25-OH (D2+D3)	(ng/ml)		
PTH	(ng/l)		348.11
BNP	(pg/ml)	812	893

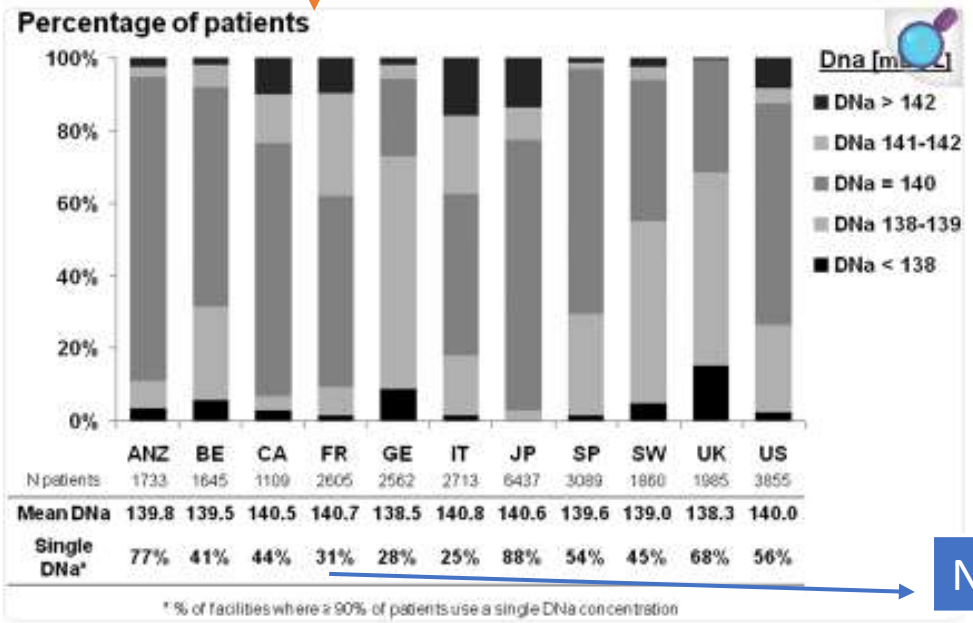
Grande stabilité de la natrémie des patients

Figure 1.

DOPPS

La prescription de conductivité dans le monde

France: Na ≥ 140 mmol/L
Très majoritaire
< 140: 8%



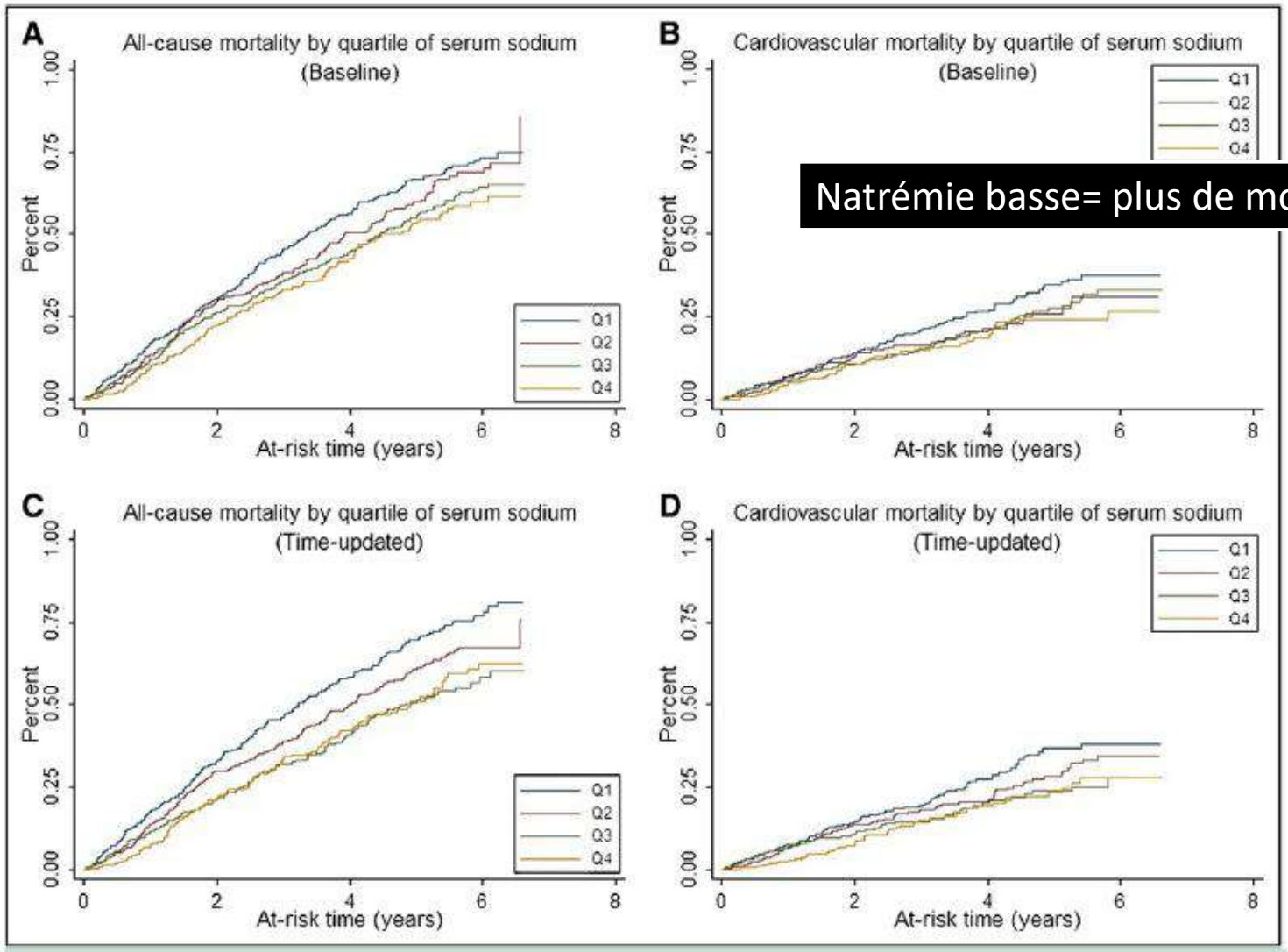
Na dialysat unique 31% en France

Dialysate sodium (DNa) prescription practice in the Dialysis Outcomes and Practice Patterns Study countries. ANZ, Australia/New Zealand; BE, Belgium; CA, Canada; FR, France; GE, Germany; IT, Italy; JP, Japan; SP, Spain; SW, Sweden; UK, United Kingdom; US, United States.

Clin J Am Soc Nephrol. 2011 Nov 2;7(1):92–100. doi: 10.2215/CJN.05440611

Dialysate Sodium Concentration and the Association with Interdialytic Weight Gain, Hospitalization, and Mortality

Manfred Hecking [*,†], Angelo Karaboyas [*], Rajiv Saran [‡], Ananda Sen [§], Masaaki Inaba [‖], Hugh Rayner [¶], Walter H



Natrémie basse= plus de mortalité

Figure 2 Kaplan-Meier cumulative failure curves. Panel **A** demonstrates all-cause mortality by quartile of baseline serum sodium concentration. Panel **B** demonstrates cardiovascular mortality by quartile of baseline serum sodium. Panels **C** and **D** demonstrate all-cause and cardiovascular mortality, respectively, based on quartile of serum on time-updated analysis. Quartiles of serum sodium concentration were ≤136, 137-138, 139-141, >141 mEq/L in baseline analyses, and ≤136, 137-139, 140-141, >141 mEq/L in time-updated analyses.

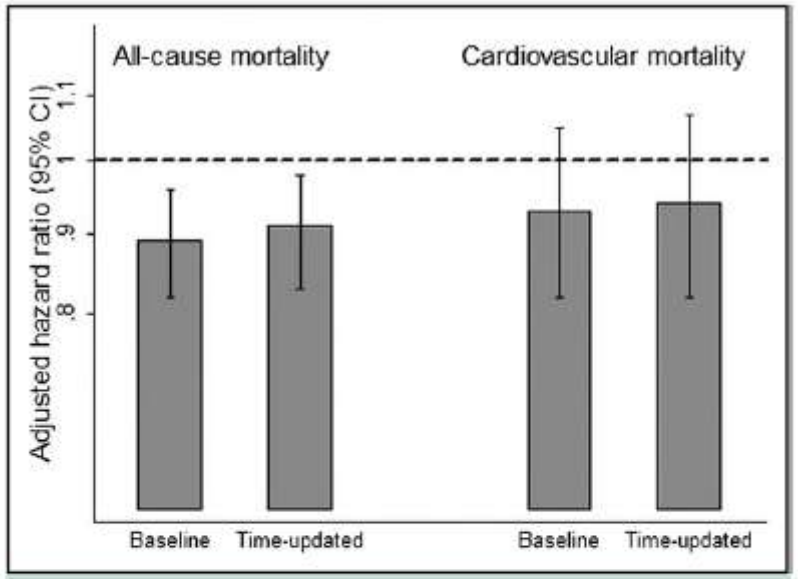


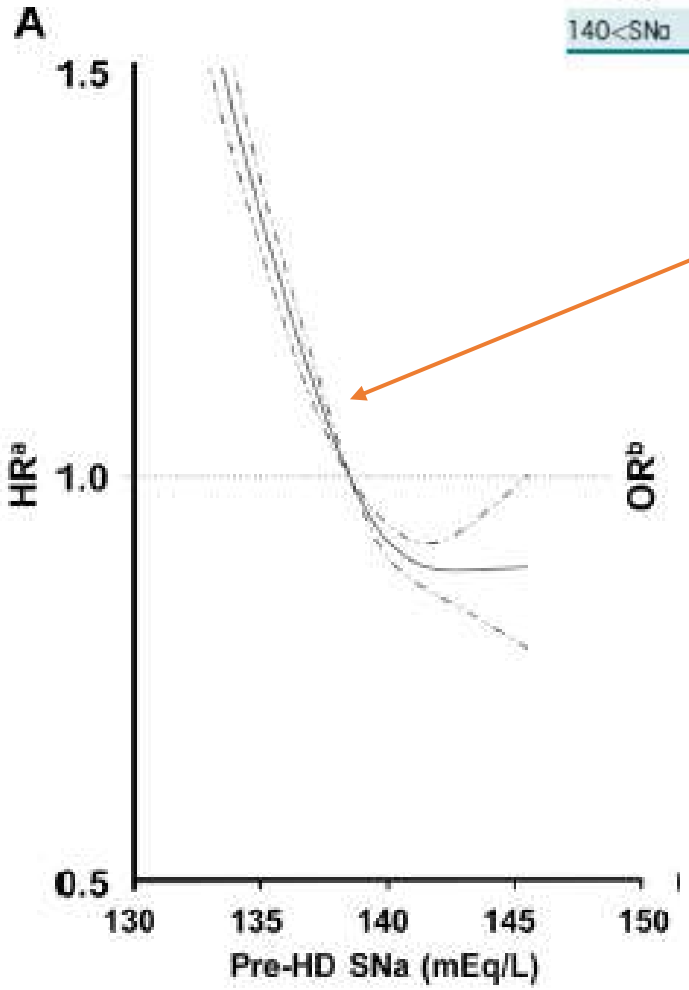
Figure 3 Adjusted hazard ratios (95% confidence intervals) for all-cause and cardiovascular mortality per 4-mEq/L increment in serum sodium concentration. All models were stratified on clinical center and adjusted for age, sex, race, dialysis vintage, height, estimated dry weight, ultrafiltration, access type (graft, fistula, catheter), congestive heart failure, diabetes, serum albumin, creatinine, phosphate, hematocrit, and dietary intake of sodium, protein, and calories. The baseline models included 2-way cross-product terms with time for serum albumin due to nonproportional hazards. CI = confidence interval.

1549 HD HEMO study
Natrémie > 4 mEq/l associé à une baisse de la mortalité de 16%

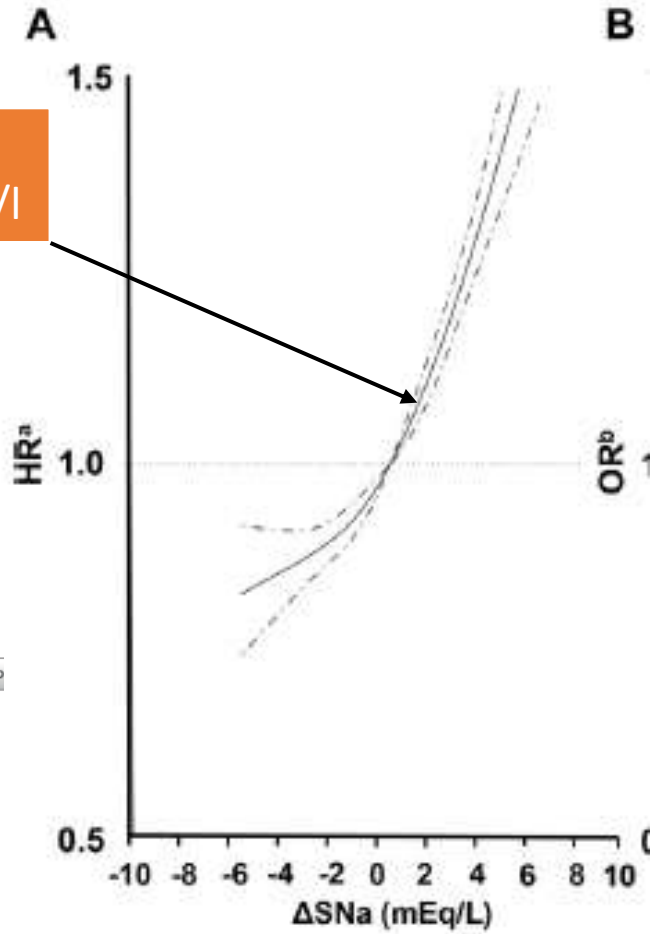
Kidney International Reports (2021) 6, 342–350

ed mortality risk associated with pre-HD SNa by ΔSNa level

	ΔSNa category		
	0<ΔSNa≤2	2<ΔSNa≤4	4<ΔSNa
Serum sodium category	HR (95% CI)	HR (95% CI)	HR (95% CI)
SNa≤136	- (N = 0)	1.046 (0.998–1.096)	1.089[a] (1.053–1.126)
136<SNa ≤140	1 (reference)	1.007 (0.975–1.040)	1.014 (0.981–1.048)
140<SNa	0.987 (0.954–1.021)	0.995 (0.962–1.030)	0.991 (0.939–1.046)



- Mortalité en cas de natrémie < 136 mmol/l
- Aggravée par le transfert de Na > + 4 mmol/l



Pre-dialysis Hyponatremia and Change in Serum Sodium Concentration During a Dialysis Session Are Significant Predictors of Mortality in Patients Undergoing Hemodialysis

Kiichiro Fujisaki[1], Nobuhiko Joki[2], Shigeru Tanaka[1], Eiichiro Kanda[3], Takayuki Hamano[4], Ikuto Masakane[5] and Kazuhiko Tsuruya[6]

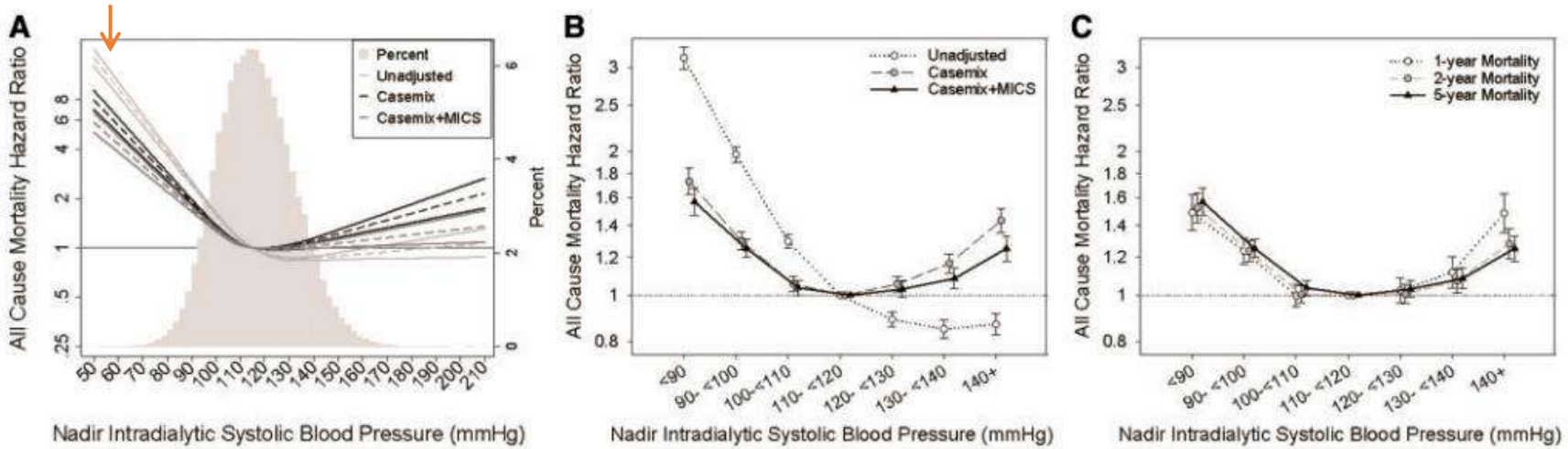


FIGURE 2: Association of niSBP with all-cause mortality. (**A**) Restricted cubic splines showing 5-year mortality for unadjusted, case-mix and case-mix + MICS adjustments. (**B**) Five-year mortality for unadjusted, case-mix and case-mix + MICS. (**C**) One-, 2- and 5-year mortality for case-mix + MICS. In splines, dashed lines represent HR and solid lines and error bars represent 95% CI.

Cohorte 112 000 HD incidents aux USA
Effet d'une PAS basse et des baisses de PA au cours de la séance

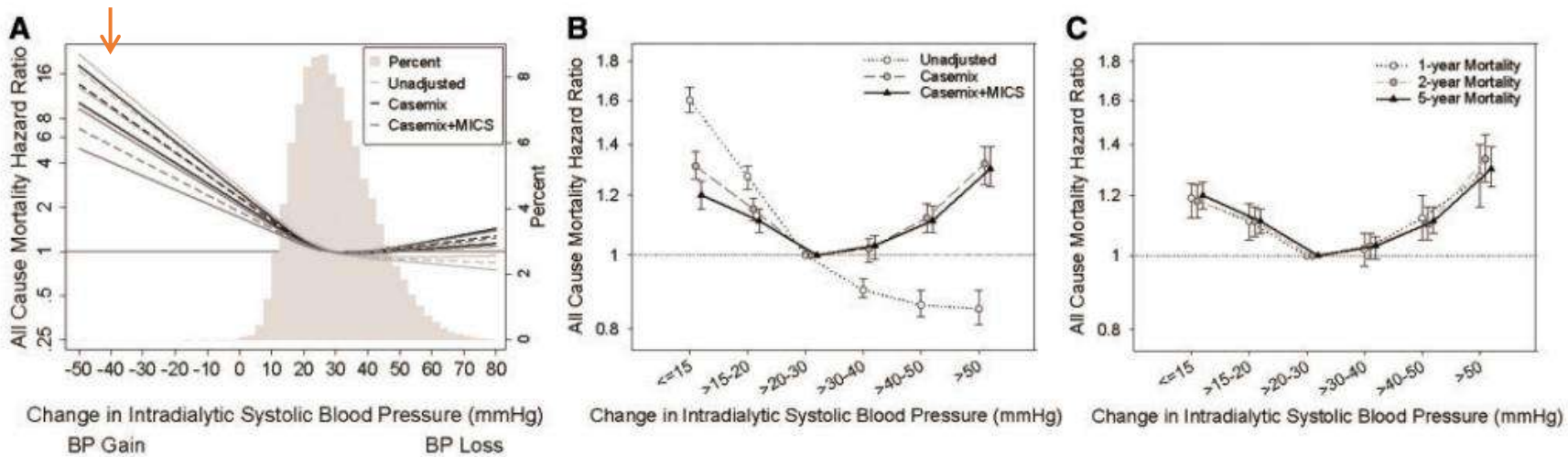


FIGURE 3: Association of ΔiSBP with all-cause mortality. (A) Restricted cubic splines showing 5-year mortality for unadjusted, case-mix, and case-mix+MICS adjustments. (B) Five-year mortality for unadjusted, case-mix and case-mix+MICS. (C) One-, 2- and 5-year mortality for case-mix+MICS. In splines, dashed lines represent HR and solid lines and error bars represent 95% CI.

Les chutes de PA per-dialytiques sont associées à la mortalité. D'avantage que l'aggravation de l'HTA

Nephrol Dial Transplant (2018) 33: 149–159
doi: 10.1093/ndt/gfx037

Unlocking Vital Insights: The Nexus Between Dialysate Sodium, Plasma Sodium, and Mortality in a Global Hemodialysis Cohort

JASN
JOURNAL OF THE AMERICAN SOCIETY OF NEPHROLOGY

METHODS

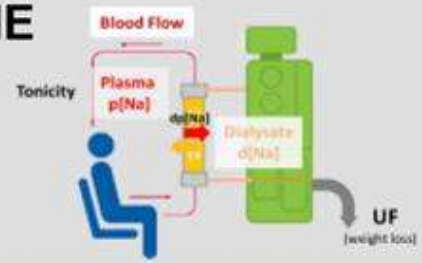
International Retrospective Study

875 clinics
25 countries

68196 incident HD pts
Body Composition Monitoring for Fluid Status
Plasma sodium (<135, 135-142, >142 mmol/l)
Assessment with 10 years of follow-up

Cox Proportional Hazard Model
Adjusted for Covariables & Time Varying Exposure

OUTCOME



Dialysate sodium prescription:
138 mmol/l 63.2%
139 mmol/l 15.8%
140 mmol/l 20.7%
other concentrations 0.4%

21,416,647 hemodialysis sessions
2,123,957 patient-months of exposure

Hazard ratio 95% CI
compared to group of lowest risk estimate

Dialysate sodium ≤138 mmol/l was associated with higher mortality (HR 1.57, 95% CI,1.25-1.98) adjusted for plasma sodium and its potential interactions.

Etude observationnelle sur 10 ans: conductivité basse ≤ 138 mmol/l: associée à la mortalité

Effect of Dialysate and Plasma Sodium on Mortality in a Global Historical Hemodialysis Cohort

Pinter, Jule[1]; Smyth, Brendan[2,3]; Stuard, Stefano[4]; Jardine, Meg[2,5]; Wanner, Christoph[1,6]; Rossignol, Patrick[7,8]; Wheeler, David C.[9]; Marshall, Mark R.[10]; Canaud, Bernard[11]; Genser, Bernd[12,13]

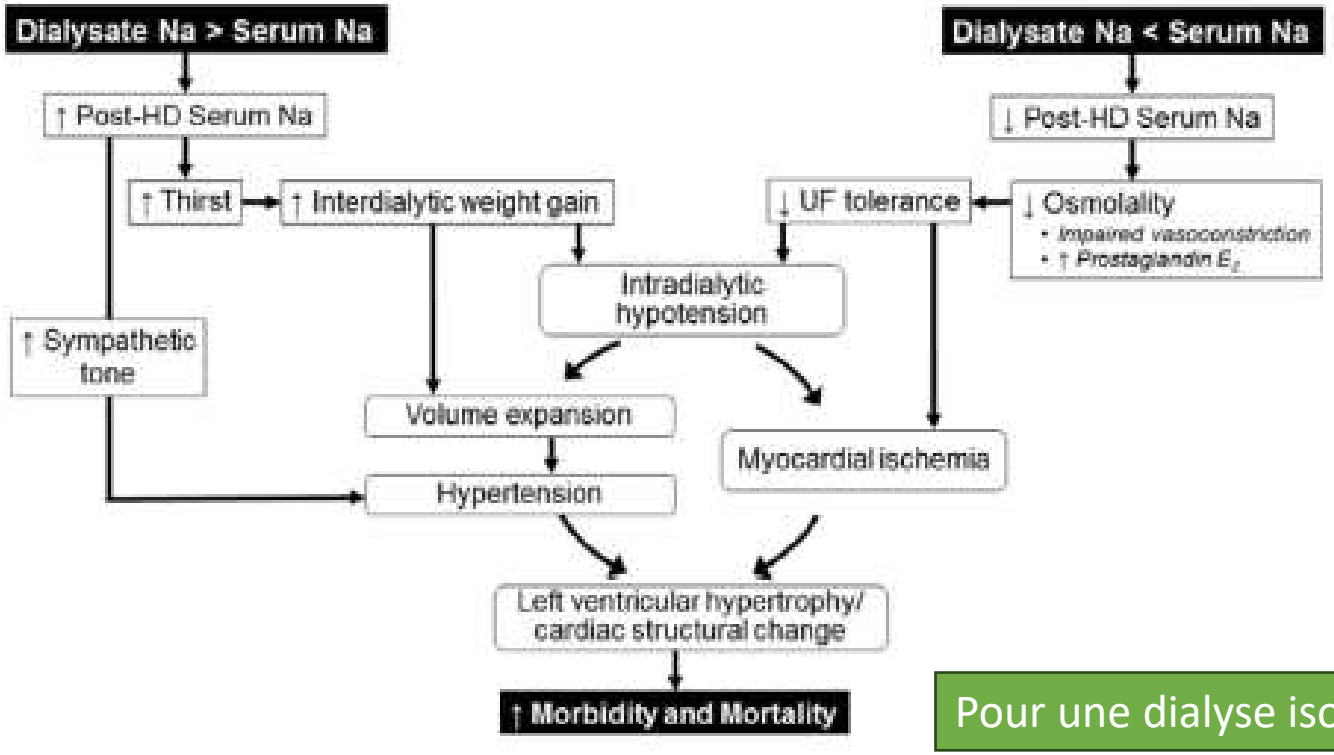
Author Information

Journal of the American Society of Nephrology 35(2):p 167-176, February 2024. | **DOI:**

Dialysate Sodium: Rationale for Evolution over Time

Jennifer E. Flythe[1,2] and Finnian R. Mc Causland[3,4]

Na dialysat > ou < natrémie sont potentiellement délétères.



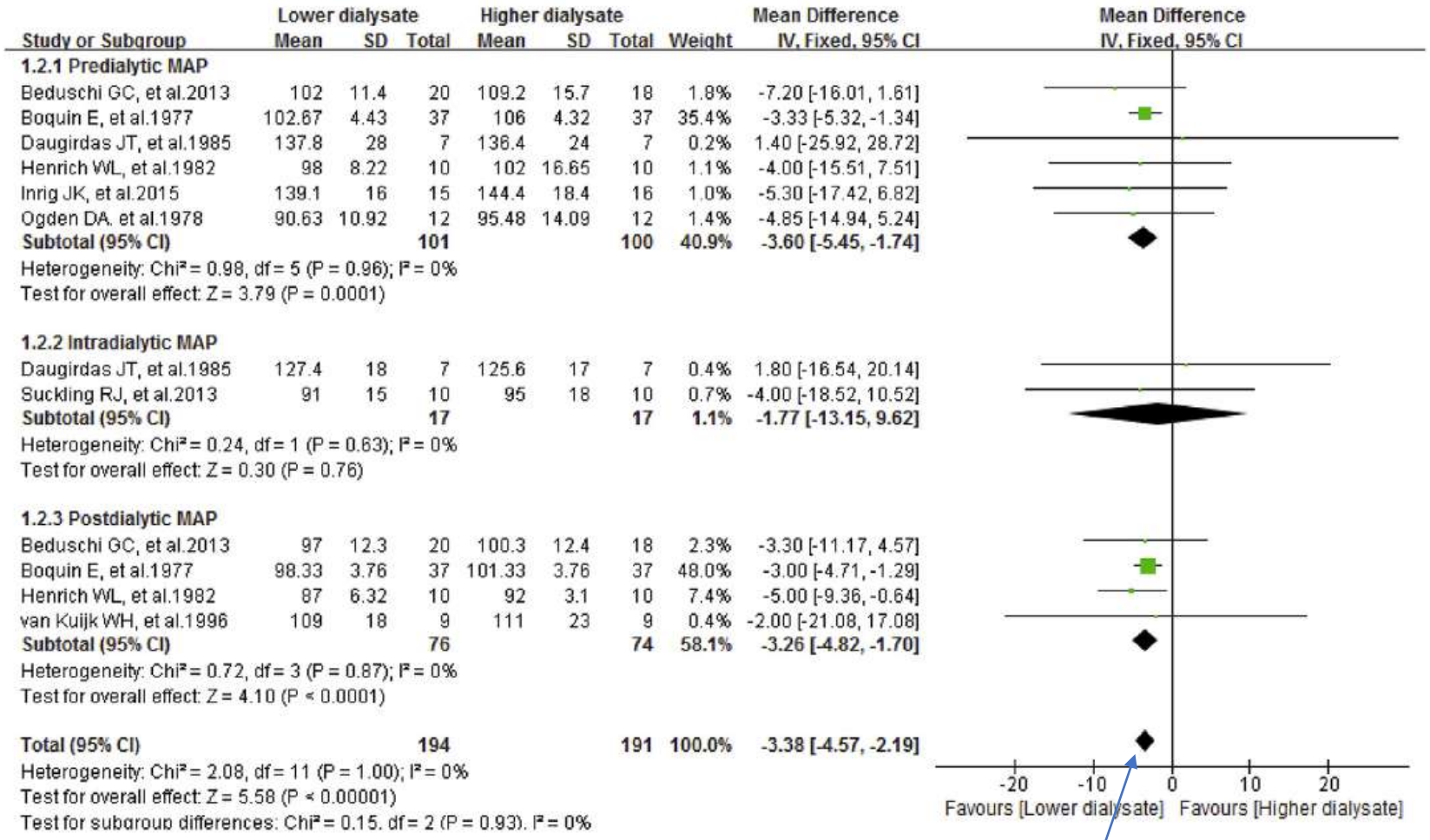
Pour une dialyse isonatrique?

Figure 2.
Proposed pathophysiology underlying dialysate sodium and outcome associations.

Semin Dial. 2017 March ; 30(2): 99–111.

International Journal of Surgery 79 (2020) 332–339

Méta-analyse
Comparaisons dialysats:
Low: < 138mmol/L
Neutre: 138-140
High: > 140 mmol/l



Study or Subgroup	Lower dialysate Mean	SD	Total	Higher dialysate Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
1.2.1 Predialytic MAP								
Beduschi GC, et al.2013	102	11.4	20	109.2	15.7	18	1.8%	-7.20 [-16.01, 1.61]
Boquin E, et al.1977	102.67	4.43	37	106	4.32	37	35.4%	-3.33 [-5.32, -1.34]
Daugirdas JT, et al.1985	137.8	28	7	136.4	24	7	0.2%	1.40 [-25.92, 28.72]
Henrich WL, et al.1982	98	8.22	10	102	16.65	10	1.1%	-4.00 [-15.51, 7.51]
Inrig JK, et al.2015	139.1	16	15	144.4	18.4	16	1.0%	-5.30 [-17.42, 6.82]
Ogden DA, et al.1978	90.63	10.92	12	95.48	14.09	12	1.4%	-4.85 [-14.94, 5.24]
Subtotal (95% CI)			**101**			**100**	**40.9%**	**-3.60 [-5.45, -1.74]**
Heterogeneity: Chi² = 0.98, df = 5 (P = 0.96); I² = 0%								
Test for overall effect: Z = 3.79 (P = 0.0001)								
1.2.2 Intradialytic MAP								
Daugirdas JT, et al.1985	127.4	18	7	125.6	17	7	0.4%	1.80 [-16.54, 20.14]
Suckling RJ, et al.2013	91	15	10	95	18	10	0.7%	-4.00 [-18.52, 10.52]
Subtotal (95% CI)			**17**			**17**	**1.1%**	**-1.77 [-13.15, 9.62]**
Heterogeneity: Chi² = 0.24, df = 1 (P = 0.63); I² = 0%								
Test for overall effect: Z = 0.30 (P = 0.76)								
1.2.3 Postdialytic MAP								
Beduschi GC, et al.2013	97	12.3	20	100.3	12.4	18	2.3%	-3.30 [-11.17, 4.57]
Boquin E, et al.1977	98.33	3.76	37	101.33	3.76	37	48.0%	-3.00 [-4.71, -1.29]
Henrich WL, et al.1982	87	6.32	10	92	3.1	10	7.4%	-5.00 [-9.36, -0.64]
van Kuijk WH, et al.1996	109	18	9	111	23	9	0.4%	-2.00 [-21.08, 17.08]
Subtotal (95% CI)			**76**			**74**	**58.1%**	**-3.26 [-4.82, -1.70]**
Heterogeneity: Chi² = 0.72, df = 3 (P = 0.87); I² = 0%								
Test for overall effect: Z = 4.10 (P < 0.0001)								
Total (95% CI)			**194**			**191**	**100.0%**	**-3.38 [-4.57, -2.19]**
Heterogeneity: Chi² = 2.08, df = 11 (P = 1.00); I² = 0%								
Test for overall effect: Z = 5.58 (P < 0.00001)								
Test for subgroup differences: Chi² = 0.15, df = 2 (P = 0.93), I² = 0%								

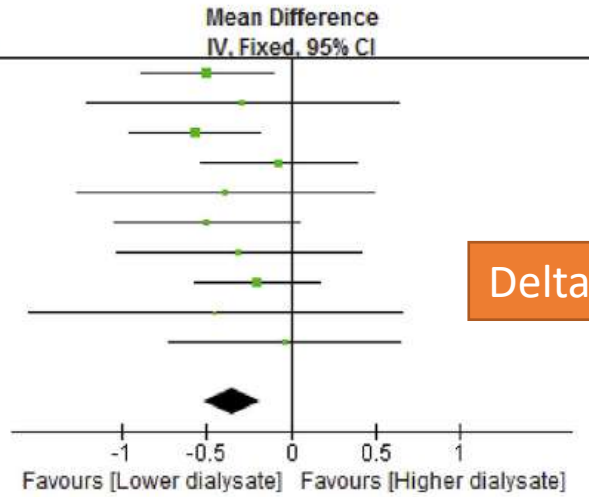
Fig. 2. Forest plot of comparison between lower dialysate and higher dialysate with regard to MAP.

Conductivité basse: réduction de la PA avant et après la dialyse

Conductivité basse: < 138 réduction de la natrémie et de la prise de poids

Study or Subgroup	Lower dialysate Mean	SD	Total	Higher dialysate Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
Akdag S, et al.2015	1.65	0.59	22	2.15	0.76	24	18.2%	-0.50 [-0.89, -0.11]
Beduschi GC, et al.2013	2.5	0.63	20	2.79	1.92	18	3.2%	-0.29 [-1.22, 0.64]
Boquin E, et al.1977	1.95	0.85	37	2.52	0.85	37	18.6%	-0.57 [-0.96, -0.18]
Chambers G, et al.2002	2.35	0.65	16	2.42	0.7	16	12.8%	-0.07 [-0.54, 0.40]
Daugirdas JT, et al.1985	2.22	0.81	7	2.61	0.87	7	3.6%	-0.39 [-1.27, 0.49]
Henrich WL, et al.1982	1.8	0.63	10	2.3	0.63	10	9.2%	-0.50 [-1.05, 0.05]
Inrig JK, et al.2015	2.26	1.12	15	2.57	0.91	16	5.4%	-0.31 [-1.03, 0.41]
Liu J, et al.2016	2.8	0.6	28	3	0.8	29	20.8%	-0.20 [-0.57, 0.17]
Ogden DA. et al.1978	2.23	1.14	12	2.68	1.6	12	2.3%	-0.45 [-1.56, 0.66]
Quereda C, et al.1988	1.98	0.69	8	2.02	0.71	8	5.9%	-0.04 [-0.73, 0.65]
Total (95% CI)			**175**			**177**	**100.0%**	**-0.35 [-0.51, -0.18]**

Heterogeneity: Chi² = 4.96, df = 9 (P = 0.84); I² = 0%
Test for overall effect: Z = 4.06 (P < 0.0001)

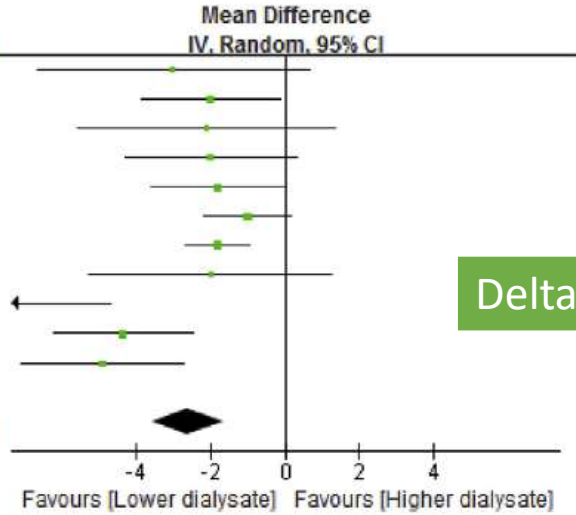


Delta Poids

Fig. 3. Forest plot of comparison between lower dialysate and higher dialysate with regard to interdialytic weight gain.

Study or Subgroup	Lower dialysate Mean	SD	Total	Higher dialysate Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Beduschi GC, et al.2013	136.3	7.3	20	139.3	3.9	18	5.0%	-3.00 [-6.67, 0.67]
Boquin E, et al.1977	135.1	2.51	37	137.1	5.21	37	10.8%	-2.00 [-3.86, -0.14]
Daugirdas JT, et al.1985	137.7	3.2	7	139.8	3.4	7	5.4%	-2.10 [-5.56, 1.36]
Henrich WL, et al.1982	140	3.2	10	142	1.9	10	8.9%	-2.00 [-4.31, 0.31]
Inrig JK, et al.2015	136	2.9	15	137.8	2.2	16	11.0%	-1.80 [-3.62, 0.02]
Liu J, et al.2016	138.1	1.8	28	139.1	2.7	29	14.2%	-1.00 [-2.19, 0.19]
Liu J, et al.2016a	136.1	1.6	28	137.9	1.7	29	15.8%	-1.80 [-2.66, -0.94]
Ogden DA. et al.1978	133	3.81	12	135	4.33	12	5.9%	-2.00 [-5.26, 1.26]
Ogden DA. et al.1978a	132.31	7.24	12	142	5.04	12	3.1%	-9.69 [-14.68, -4.70]
Suckling RJ, et al.2013	135.9	2.33	10	140.27	1.92	10	10.7%	-4.37 [-6.24, -2.50]
van Kuijk WH, et al.1996	135	2.7	9	139.9	2	9	9.3%	-4.90 [-7.10, -2.70]
Total (95% CI)			**188**			**189**	**100.0%**	**-2.62 [-3.59, -1.66]**

Heterogeneity: Tau² = 1.34; Chi² = 24.84, df = 10 (P = 0.006); I² = 60%
Test for overall effect: Z = 5.34 (P < 0.00001)



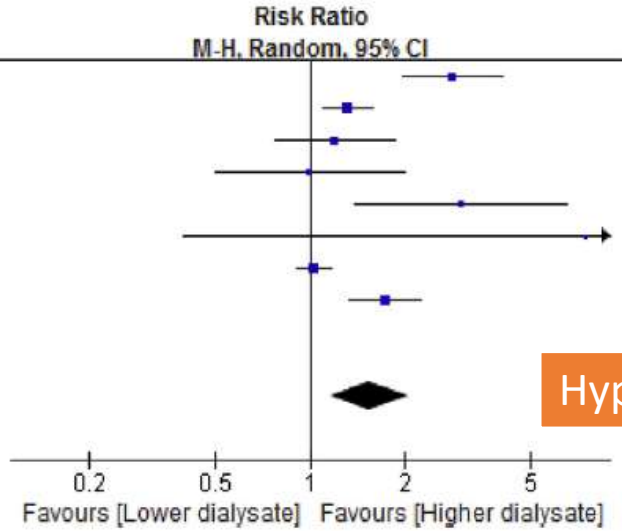
Delta Na

Fig. 4. Forest plot of comparison between lower dialysate and higher dialysate with regard to predialysis serum [Na^+].

Conductivité > 140: réduction des chutes de tension et des crampes

Study or Subgroup	Lower dialysate Events	Total	Higher dialysate Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Beduschi GC, et al.2013	113	960	36	864	14.8%	2.83 [1.96, 4.06]
Boquin E, et al.1977	174	444	132	444	18.1%	1.32 [1.10, 1.58]
Chambers G, et al.2002	24	48	20	48	13.4%	1.20 [0.77, 1.86]
Daugirdas JT, et al.1985	13	63	13	63	9.2%	1.00 [0.50, 1.98]
Henrich WL, et al.1982	24	180	8	180	8.0%	3.00 [1.38, 6.50]
Inrig JK, et al.2015	3	45	0	48	0.9%	7.46 [0.40, 140.45]
Liu J, et al.2016	428	4368	430	4524	18.8%	1.03 [0.91, 1.17]
Quereda C, et al.1988	97	192	56	192	16.8%	1.73 [1.33, 2.25]
van Kuijk WH, et al.1996	2	9	0	0		Not estimable
Total (95% CI)		**6309**		**6363**	**100.0%**	**1.54 [1.16, 2.05]**
Total events	878		695			

Heterogeneity: Tau² = 0.11; Chi² = 41.17, df = 7 (P < 0.00001); I² = 83%
Test for overall effect: Z = 2.97 (P = 0.003)



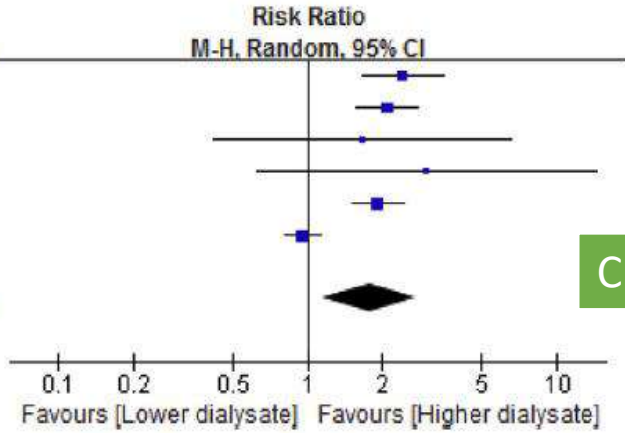
Hypo TA

Fig. 5. Forest plot of comparison between lower dialysate and higher dialysate with regard to intradialytic hypotension.

International Journal of Surgery 79 (2020) 332–339

Study or Subgroup	Lower dialysate Events	Total	Higher dialysate Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Beduschi GC, et al.2013	91	960	34	864	20.1%	2.41 [1.64, 3.53]
Boquin E, et al.1977	121	444	58	444	21.6%	2.09 [1.57, 2.77]
Chambers G, et al.2002	5	48	3	48	7.1%	1.67 [0.42, 6.59]
Daugirdas JT, et al.1985	6	63	2	63	5.9%	3.00 [0.63, 14.30]
Henrich WL, et al.1982	115	180	60	180	22.3%	1.92 [1.52, 2.42]
Liu J, et al.2016	271	4368	294	4524	23.1%	0.95 [0.81, 1.12]
Total (95% CI)		**6063**		**6123**	**100.0%**	**1.77 [1.15, 2.73]**
Total events	609		451			

Heterogeneity: Tau² = 0.21; Chi² = 45.45, df = 5 (P < 0.00001); I² = 89%
Test for overall effect: Z = 2.57 (P = 0.01)



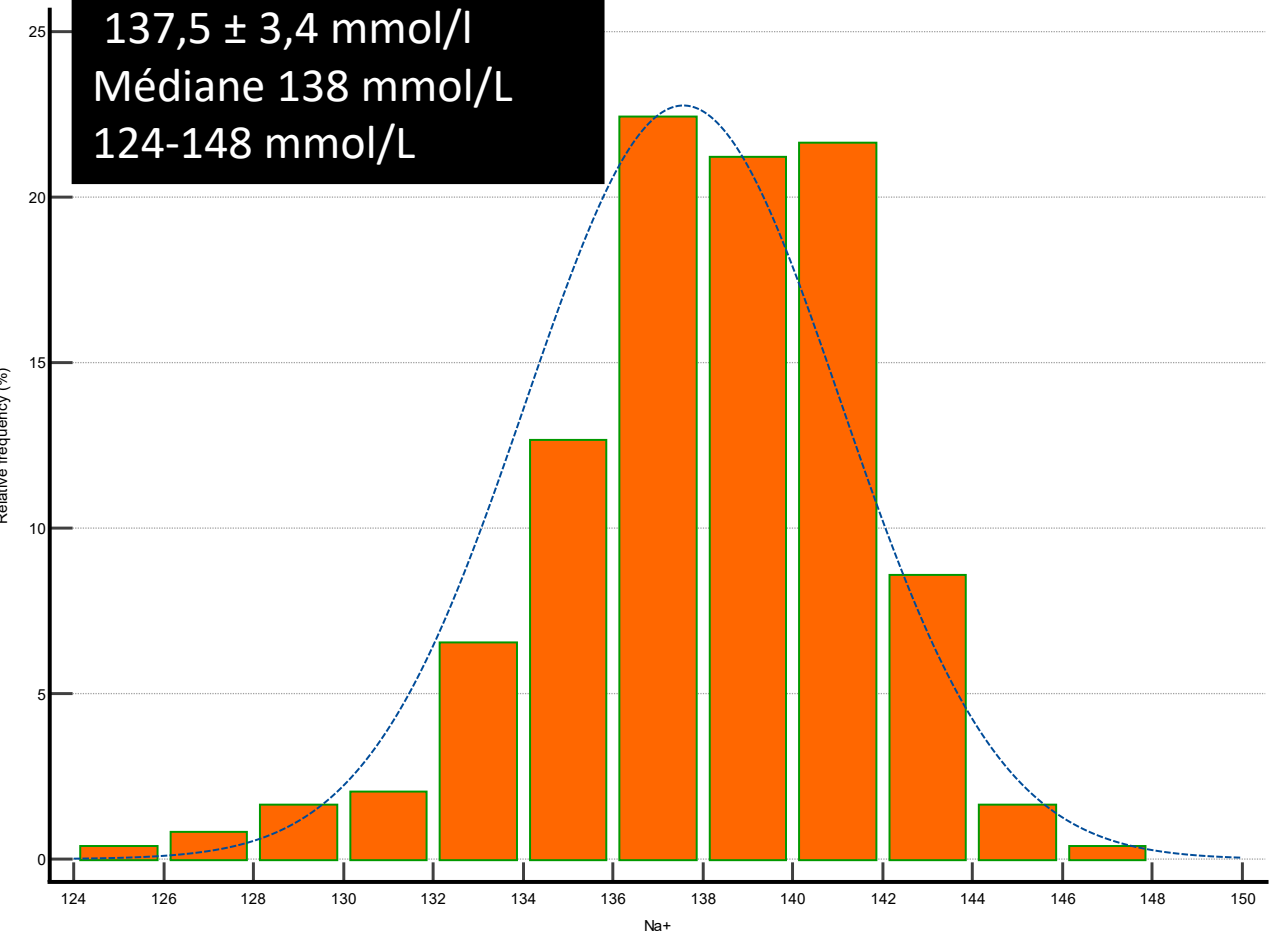
Crampes

Fig. 6. Forest plot of comparison between lower dialysate and higher dialysate with regard to intradialytic cramps.

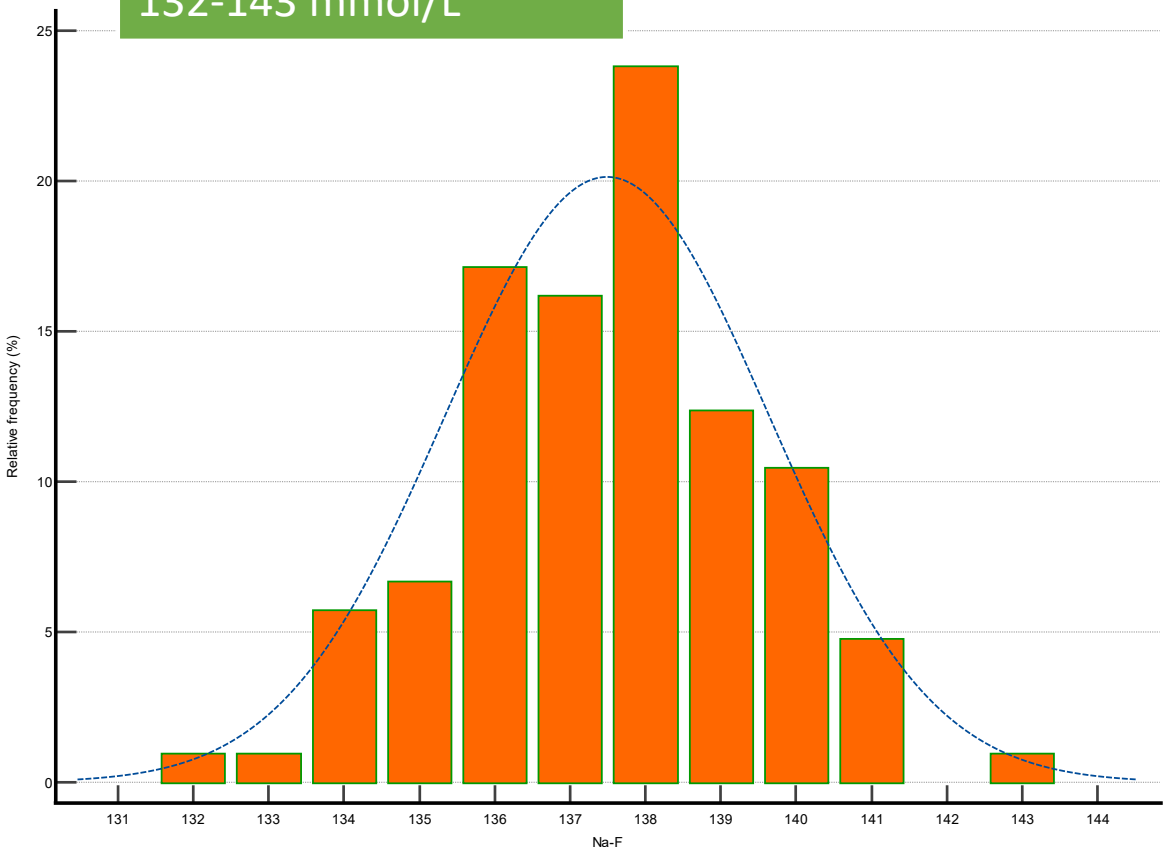
Répartition des natrémies début et fin de séance

2025
Tassin Personal data

Natrémies début dialyse:
137,5 ± 3,4 mmol/l
Médiane 138 mmol/L
124-148 mmol/L

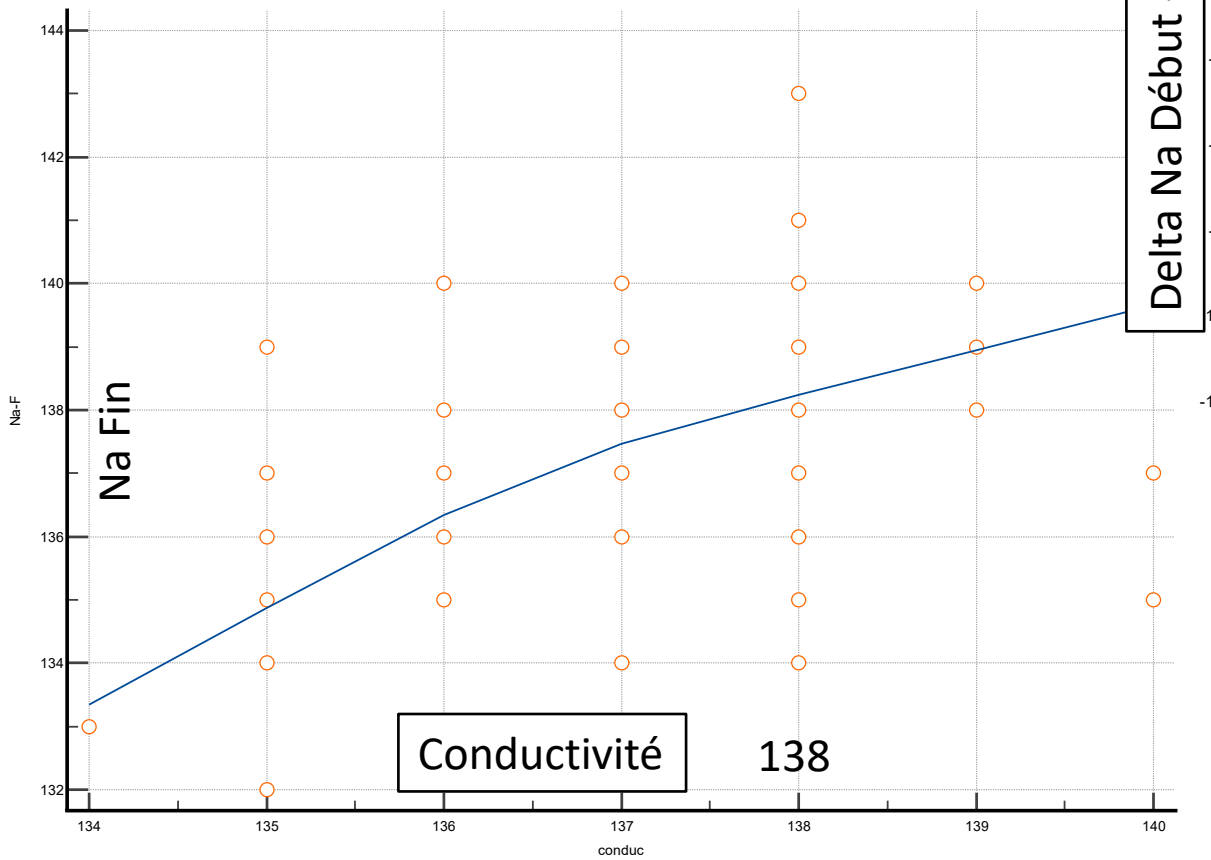


Natrémie fin de dialyse:
137,5 ± 2 mmol/L
Médiane 138
132-143 mmol/L

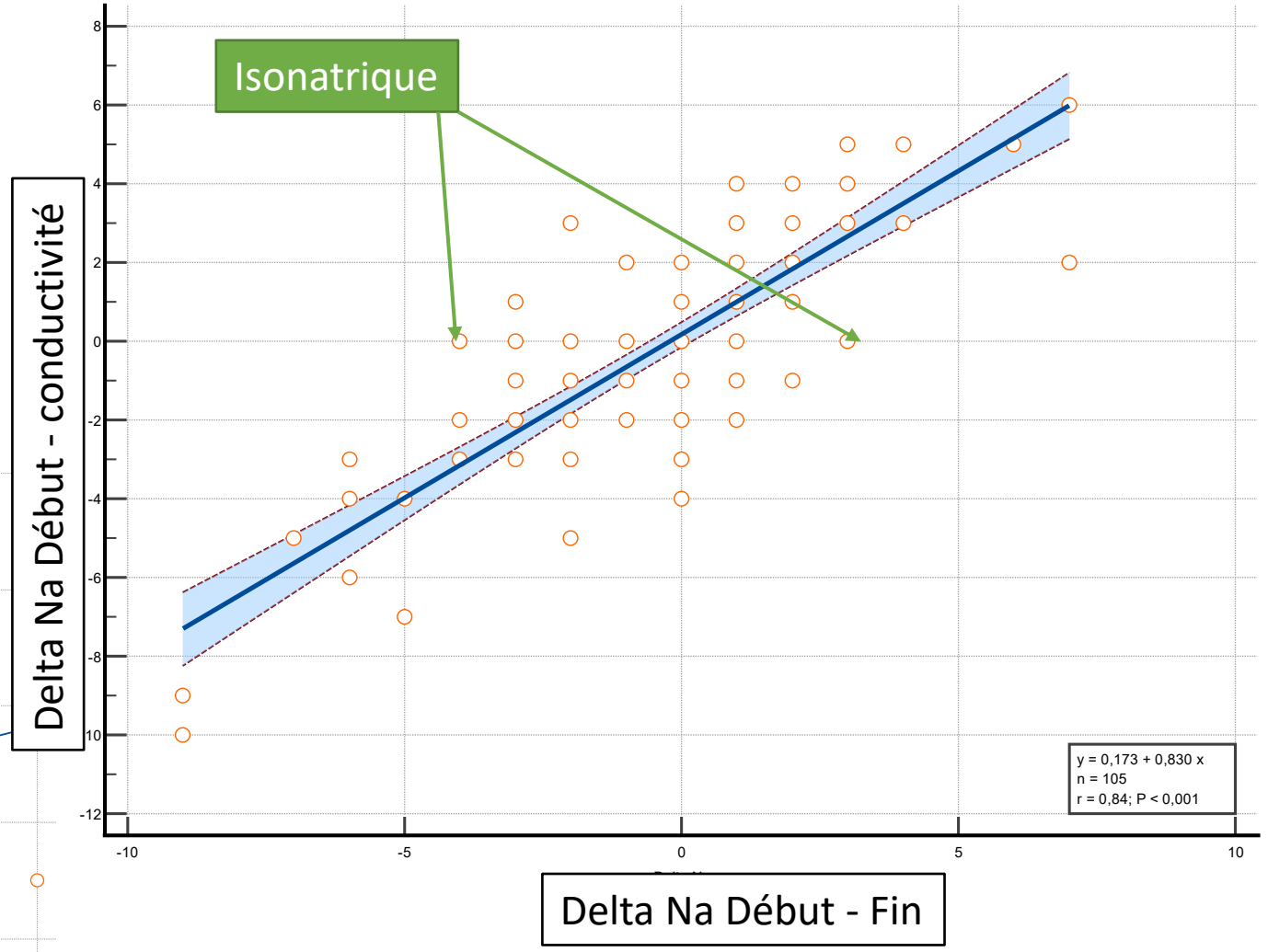


Grande variabilité

Régression conductivité vs Na fin

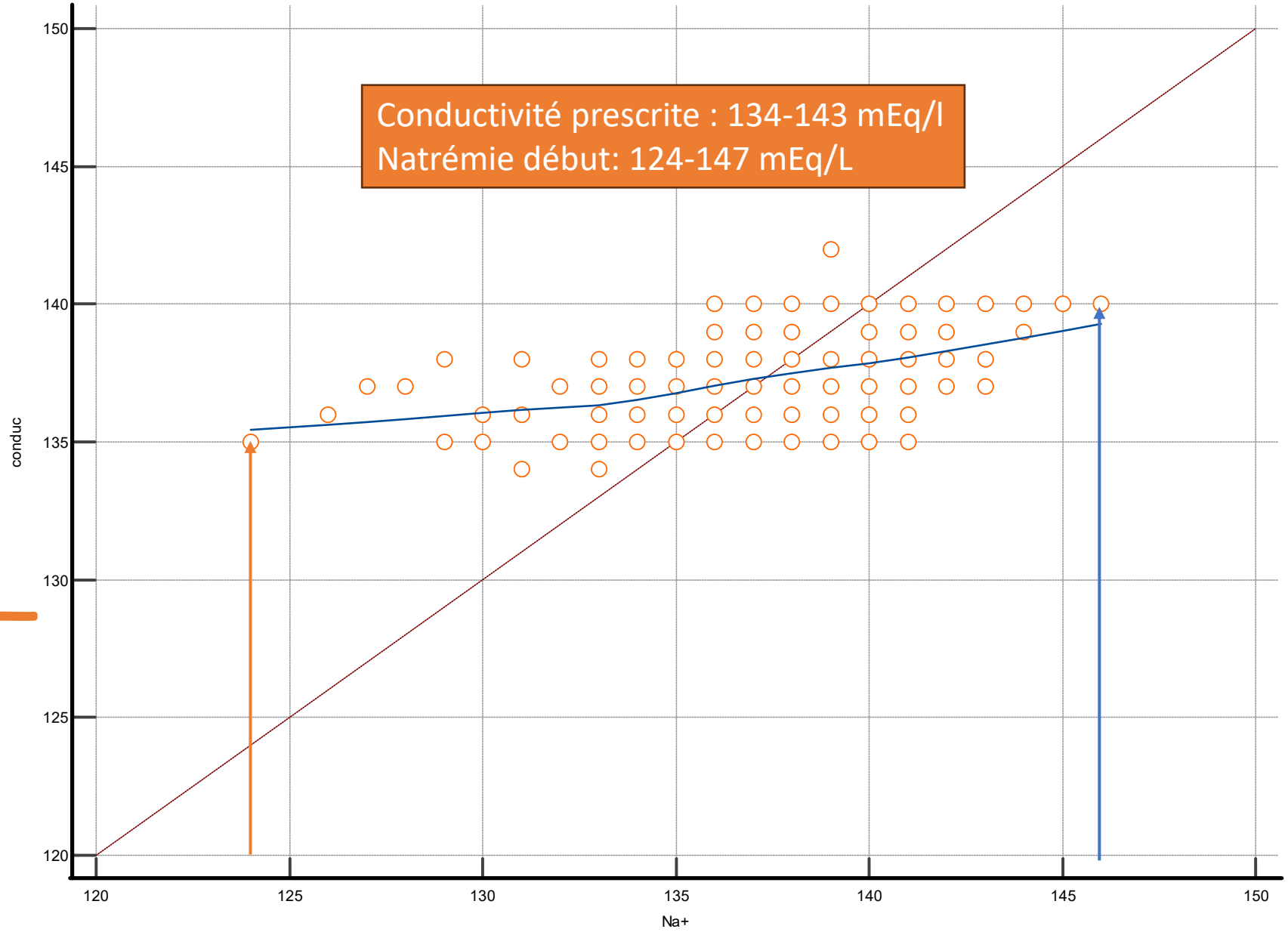


Conductivité 138



Une prescription Na Isonatrique : variation de + à – 4mEq/l de Na

Pas de prescription Isonatrique pour les extrêmes



Le contrôle automatique de Na permet d'ajuster la conductivité au sodium serique

Table 1:. Comparison of conductivity, ultrafiltrate volume, replacement volume and pre/postdialysis blood pressure in the five study phases.

	Phase 0 5008 machine	Phase 1 6008 machine	Phase 2 6008 machine	Phase 3 6008 machine	Phase 4 6008 machine
Prescribed dialysate Na (mmol/L)	139.1 ± 0.52	139.1 ± 0.52	137.1 ± 0.45[b]	Automatic Na control (range 135–141)	Automatic Na control (range 134–142)
Conductivity (mS/cm)	13.95 ± 0.09	14.08 ± 0.08[a]	13.88 ± 0.08[b]	13.74 ± 0.11[c]	13.70 ± 0.13[c,d]
Interdialytic weight gain (mL)	2564 ± 796	2626 ± 828	2527 ± 714	2428 ± 732	2364 ± 824[e]
Dry body weight (kg)	68.95 ± 17.56	68.93 ± 17.58	68.86 ± 17.55	68.79 ± 17.58	68.78 ± 17.61
HDF replacement volume (L)	30.7 ± 12.1	33.9 ± 15.2	31.36 ± 12.5	31.0 ± 11.9	30.73 ± 12.8
Predialysis Na (mmol/L)	137.97 ± 1.81	138.49 ± 2.58[f]	137.93 ± 2.41	137.63 ± 2.62	137.93 ± 2.51
Postdialysis Na (mmol/L)	139.72 ± 1.11	140.35 ± 1.23[a]	138.91 ± 0.91[b]	137.81 ± 1.18[c]	137.58 ± 1.62[c]
Predialysis SBP (mmHg)	135.95 ± 24.0	136.58 ± 24.1	134.19 ± 22.0	133.53 ± 22.9	130.70 ± 21.5[e,g]
Predialysis DBP (mmHg)	65.14 ± 15.3	69.28 ± 13.5[h]	67.78 ± 13.2	66.78 ± 12.9	66.99 ± 13.0
Postdialysis SBP (mmHg)	138.91 ± 27.2	137.51 ± 25.6	135.29 ± 24.4	134.60 ± 23.9	135.00 ± 22.9
Postdialysis DBP (mmHg)	65.28 ± 15.1	69.33 ± 16.4	67.08 ± 13.8	66.83 ± 13.3	66.81 ± 13.0

Clinical Kidney Journal, 2023, vol. 16, no. 5, 859–867

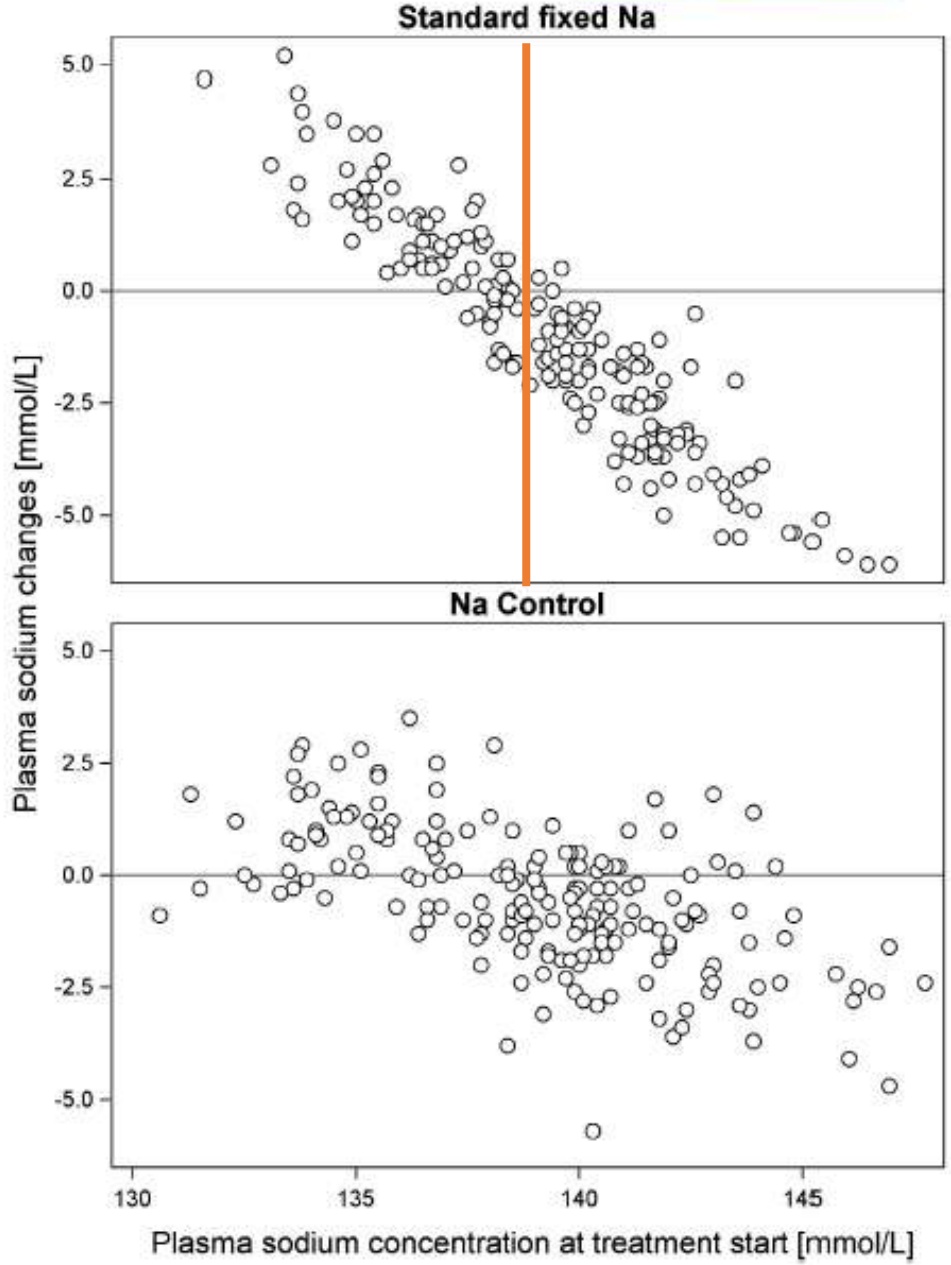


FIGURE 1 Change of plasma sodium concentration during treatment versus plasma sodium concentration at the start of treatment [mmol/L]

Received: 16 November 2018 | Revised: 20 March 2019 | Accepted: 22 March 2019
DOI: 10.1111/aor.13463

MAIN TEXT ARTICLE

Artificial Organs WILEY

Automated individualization of dialysate sodium concentration reduces intradialytic plasma sodium changes in hemodialysis

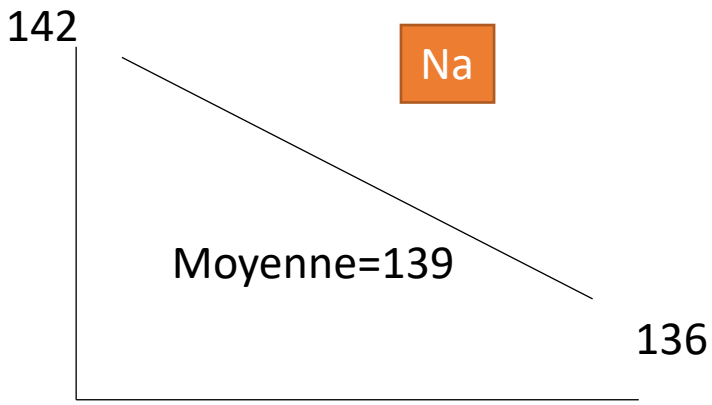
Michaela Ságová[1] | Ralf Wojke[2] | Andreas Maierhofer[2] | Malte Gross[3] | Bernard Canaud[2] | Adelheid Gauly[2]

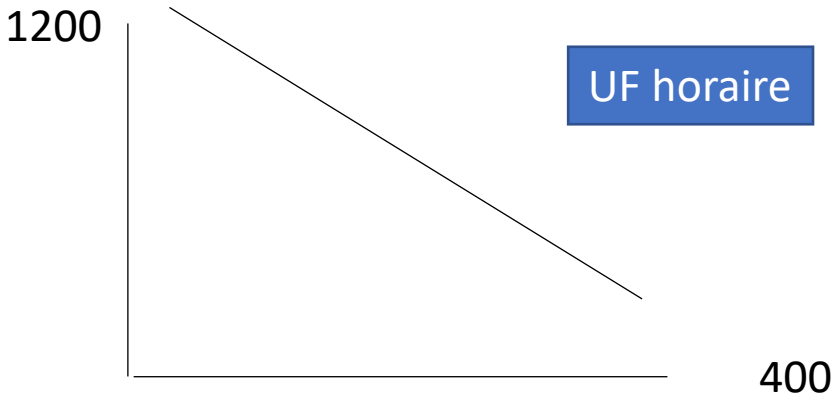
32 patients en HDF
Mesures des transferts de Na+
Cross-over: Na fixe (139) – Na control
Diminution des échanges par le Na control

Mieux que manuellement ?

Intérêt des profils ?

- Profil d'UF descendant: enlever plus de liquide au début
- Associé à un profil de Na descendant: apporter du Nacl pour améliorer la tolérance à la déplétion volémique initiale et diminuer la soif après la séance
- Prescrire une conductivité moyenne proche de la natrémie initiale du patient





Effect of Sodium Balance and the Combination of Ultrafiltration Profile during Sodium Profiling Hemodialysis on the Maintenance of the Quality of Dialysis and Sodium and Fluid Balances

Song, Joon Ho[*,†]; Park, Geun Ho[*]; Lee, Sun Young[*]; Lee, Seung Won[*]; Lee, Seoung Woo[*,†]; Kim, Moon-Jae[*,†]

Author Information

Journal of the American Society of Nephrology 16(1):p 237-246, January 2005. | **DOI:** 10.1681/ASN.2004070581

Nephrol Dial Transplant. 2006 Nov;21(11):3231-7. doi: 10.1093/ndt/gfl375. Epub 2006 Sep 5.

Impact of sodium and ultrafiltration profiling on haemodialysis-related hypotension

Yi Lun Zhou [1], Hui Lan Liu, Xiao Feng Duan, Ying Yao, Yi Sun, Qun Liu

Profil neutre en Na + profil d'UF décroissants

- Poids sec plus souvent obtenu en fin de dialyse
- Diminution de la prise de poids inter dialytique
- Meilleure tolérance hémodynamique

Sodium

31% des centres en France prescrivent un sodium fixe pour tous (140-142 mmo/L)

Revue de la littérature: pas d'évidence sur la survie

Natrémie et conductivité basses sont associées à la mortalité (observatoires)

Isonatrique (manuelle ou automatique?), sauf dans les extrêmes ?

↑ Na prescrit si instabilité hémodynamique, crampes

↓ Na si prise de poids et/ou HTA, surcharge

Intérêts des profils Na (balance neutre) + UF décroissants (à tester)

Respect du régime à 5 g de sel par jour

Etude en vie réelle chez 50 000 dialysés: 140 vs 137 en cours

RESOLVE (2020-2024), résultats en attente (pas d'individualisation)

Le potassium

K+ dialysat:
1= hyperK+ > 8 mEq/l ?
2= standard
3 = hypoK (début < 4)

Objectif: < 6 mEq/l

Risque Tb rythme: garder un gradient sang-dialysat < 1,5 mEq/l (profils)

Diététique
Aldactone, IEC,ARA2

Kaliémie

98% K+ intracellulaire

Elimination digestive++
Diurèse
Résines échangeuses

↓ rapide/intense: troubles rythme

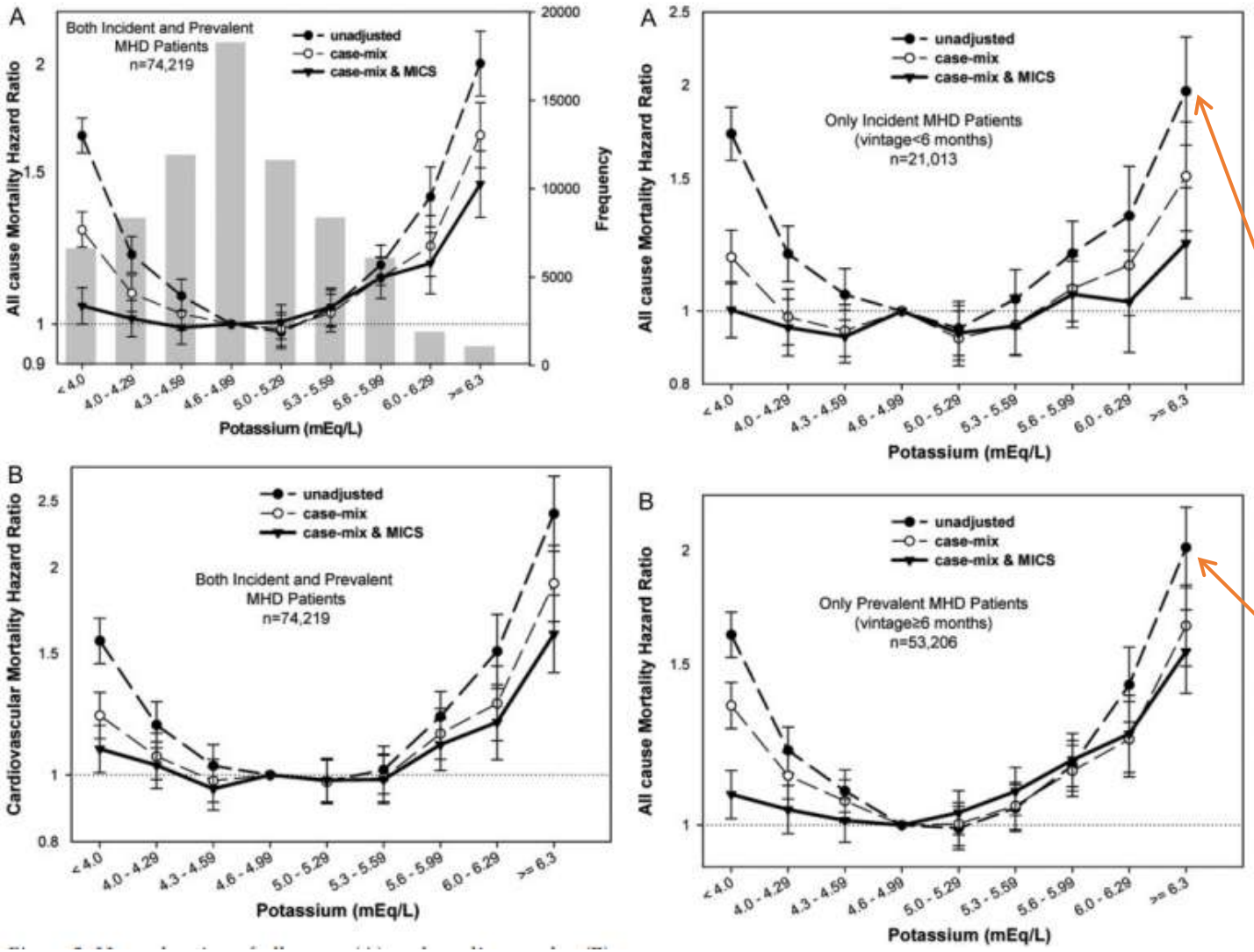
Dialyse

85% diffusion

Alcalinisation= transfert intracellulaire

Serum and Dialysate Potassium Concentrations and Survival in Hemodialysis Patients

Csaba P. Kovesdy,* Deborah L. Regidor,†‡§ Rajnish Mehrotra,‡ Jennie Jing,†



Grande étude observationnelle USA
L'hyperkaliémie est associée à la mortalité d'avantage que l'hypokaliémie

Clin J Am Soc Nephrol 2: 999-1007, 2007. doi: 10.2215/CJN.04451206

Dialysate Potassium, Serum Potassium, Mortality and Arrhythmia Events in Hemodialysis: Results from the Dialysis Outcomes and Practice Patterns Study

Angelo Karaboyas, MS[1], Jarcy Zee, PhD[1], Steven M Brunelli, MD, MSCE[2], Len A Usvyat,

DOPPS

Potassium du dialysat 1-1,5 mEq/L: augmente le risque d'arythmie

Dialysate K (mEq/L)	N patients (%)	HR (95% CI), All-cause mortality		HR (95% CI), Arrhythmia composite^	
		Unadjusted	Adjusted*	Unadjusted	Adjusted*
1.0 – 1.5	8114 (15%)	0.96 (0.90–1.03)	1.04 (0.97–1.11)	1.09 (0.95–1.24)	1.14 (1.00–1.30)
2.0 – 2.5	33017 (61%)	1 (Ref.)	1 (Ref.)	1 (Ref.)	1 (Ref.)
3.0 – 4.0	13405 (25%)	1.13 (1.07–1.18)	0.95 (0.90–1.00)	1.05 (0.96–1.15)	0.95 (0.86–1.04)

France

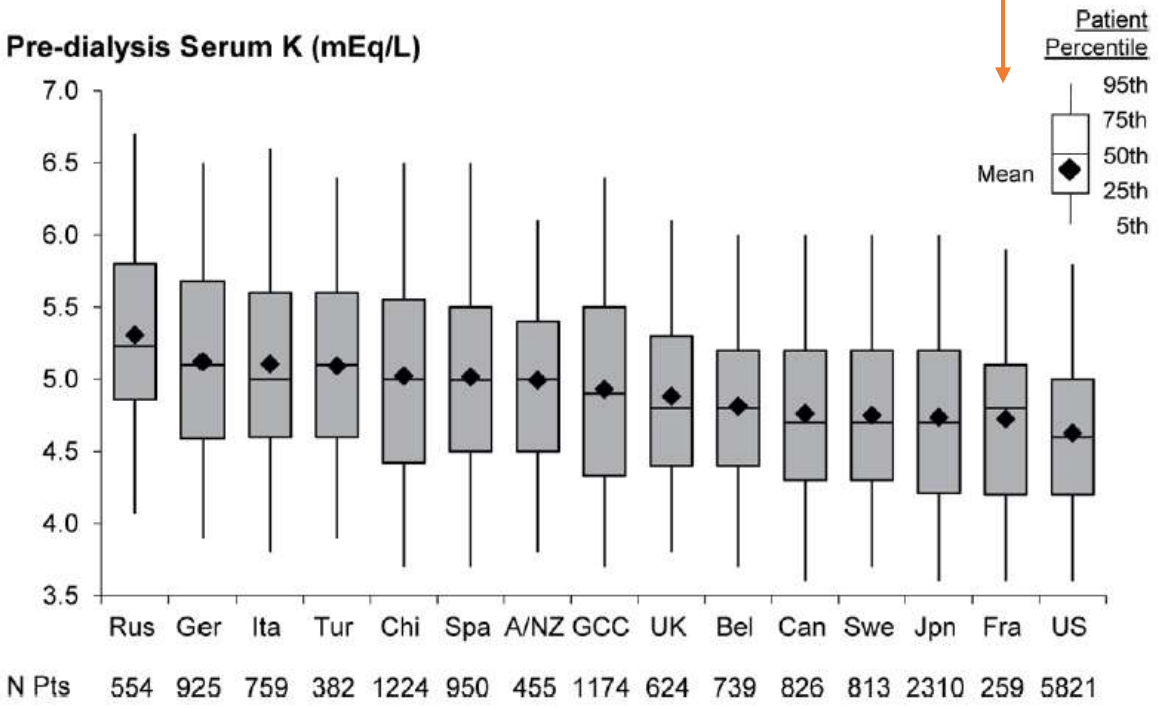
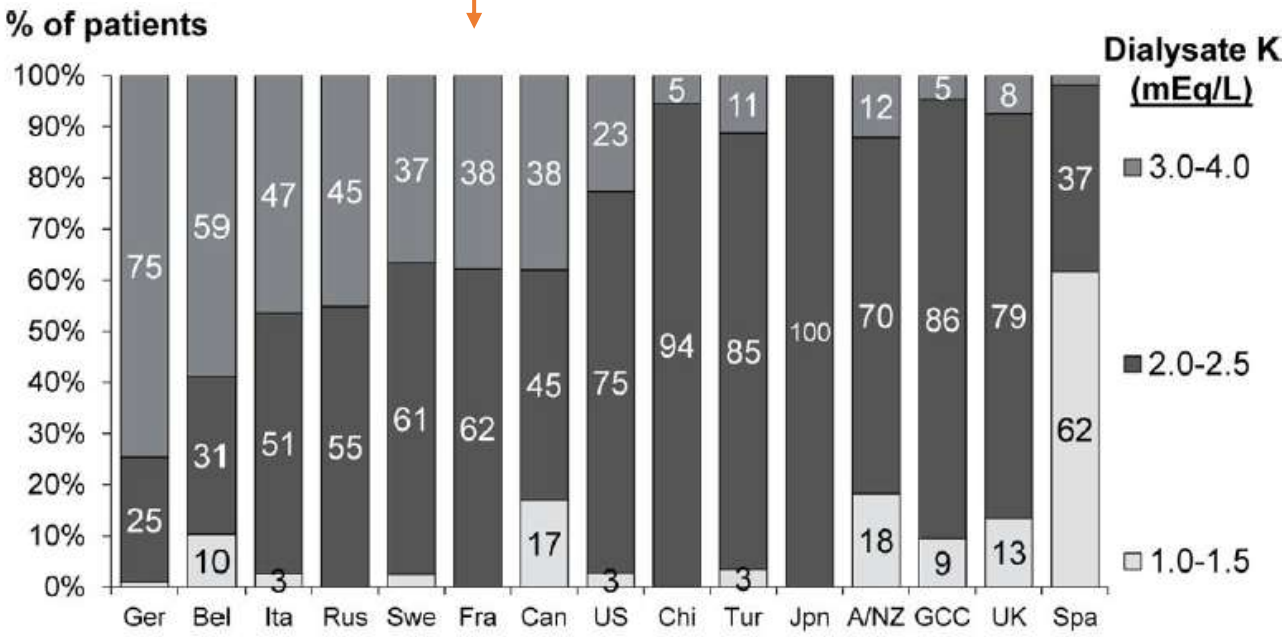


Figure 2a. Pre-dialysis serum K distribution by country in DOPPS phase 5 (2012–2015)

France K dialysat 2 et surtout 3 mEq/L majoritaire



Am J Kidney Dis. 2017 February ; 69(2): 266–277.

Attention au dialysat à 3 mEq/l en cas de kaliémie > 5 mEql/L

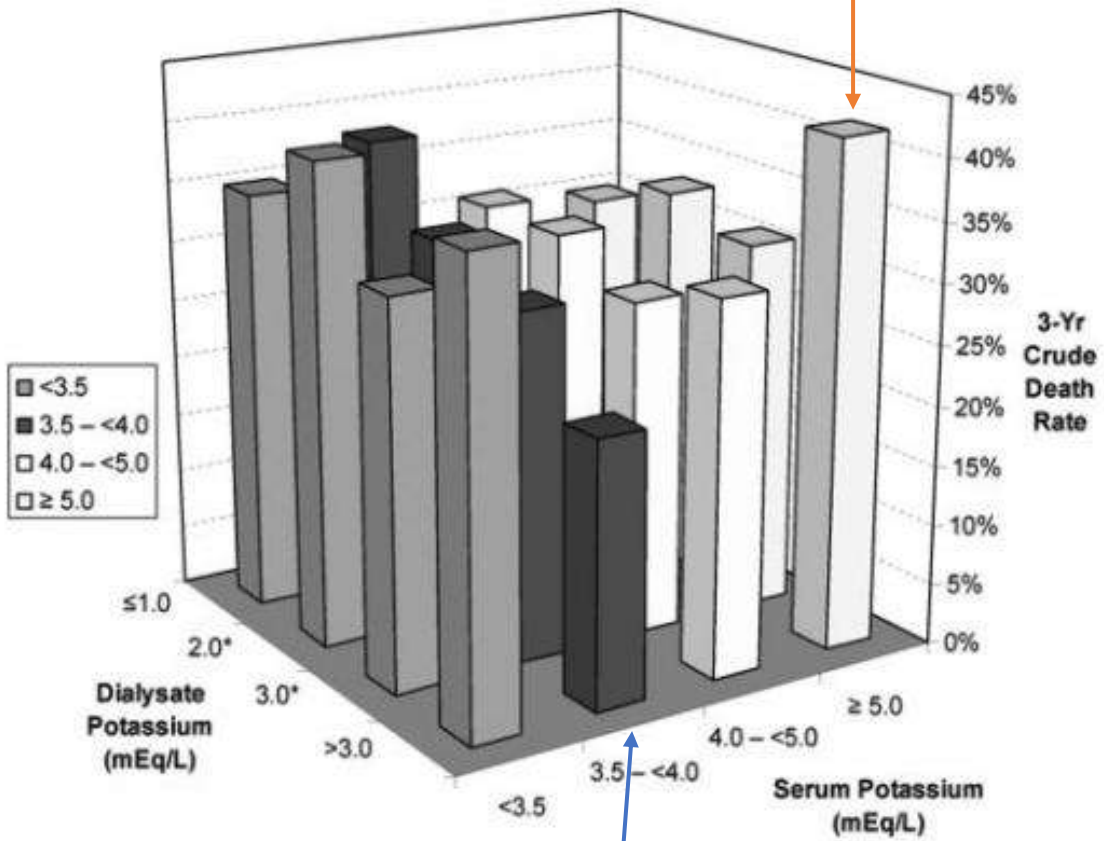


Figure 5. Three-year crude mortality rates in 16 groups of serum and dialysate K concentrations.

Meilleure survie: Kaliémie 3,5 -4 mEq/L
Et dialysat à 3 mEq/L

Clin J Am Soc Nephrol 2: 999-1007, 2007. doi: 10.2215/CJN.04451206

The modifying effect of the serum-to-dialysate potassium gradient on the cardiovascular safety of SSRIs in the hemodialysis population: a pharmacoepidemiologic study

Background

Larger serum-to-dialysate K^+ gradients during hemodialysis may augment proarrhythmic risks of higher QT-prolonging potential selective serotonin reuptake inhibitors (SSRIs). **Citalopram**

Methods

Retrospective cohort study
25 099 U.S. hemodialysis patients
2007–2017

Sudden cardiac death (SCD) risk
After new-use of a higher vs. lower QT-prolonging potential SSRI

Results

	K^+ gradient ≥ 4 mEq/L	K^+ gradient < 4 mEq/L
11 107 higher QT-prolonging potential SSRI new-users	N=951	N=10 156
13 992 lower QT-prolonging potential SSRI new-users	N=1293	N=12 699

Comparing higher vs. lower QT-prolonging potential SSRIs

K^+ gradient	HR (95% CI) for SCD
≥ 4 mEq/L	**2.17** (1.16–4.03)
< 4 mEq/L	**0.95** (0.78–1.16)

Conclusion

The risk of SCD associated with higher QT-prolonging SSRIs was elevated among patents with serum-to-dialysate K^+ gradients ≥ 4 mEq/L.

NEPHROLOGY DIALYSIS TRANSPLANTATION

Gradient Kaliémie-dialysat > 4: risque arythmie (> QT)

Assimon, M., et al. NDT (2022)
@NDTSocial

Dialysate Potassium and Mortality in a Prospective Hemodialysis Cohort

Antoney Ferrey[1], Amy S. You[1], Csaba P. Kovesdy[2,3], Tracy Nakata[1], Mary Veliz[1], Danh V. Nguyen[4], Kamyar Kalantar-Zadeh[1,5], and Connie M. Rhee[1]

Potassium du dialysat à 1 mEq/l est associé à la mortalité en cas d'hyperkaliémie

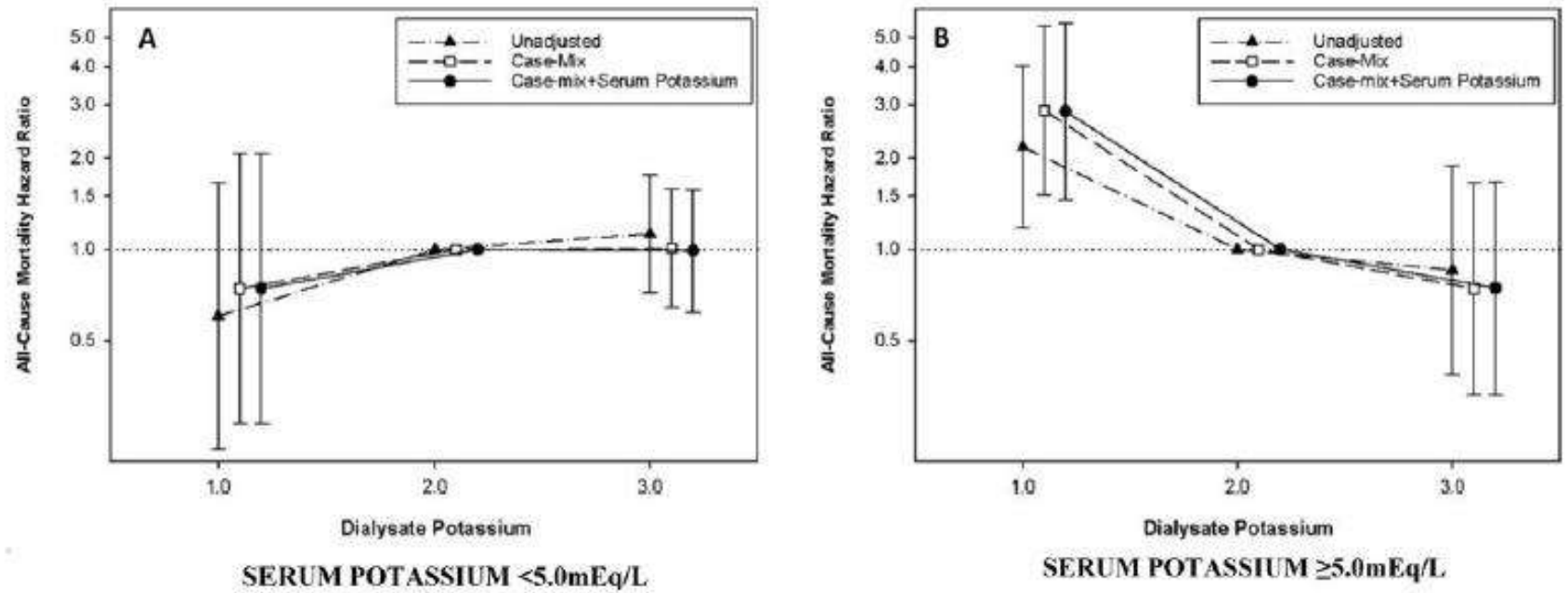


Figure 2.
Baseline dialysate potassium concentration and all-cause mortality, stratified according to pre-dialysis serum potassium level, using case-mix adjusted Cox models: Serum potassium <5mEq/L (Panel A) vs. serum potassium ≥ 5 mEq/L (Panel B).

Am J Nephrol. 2018 ; 47(6): 415–423. doi:10.1159/000489961.

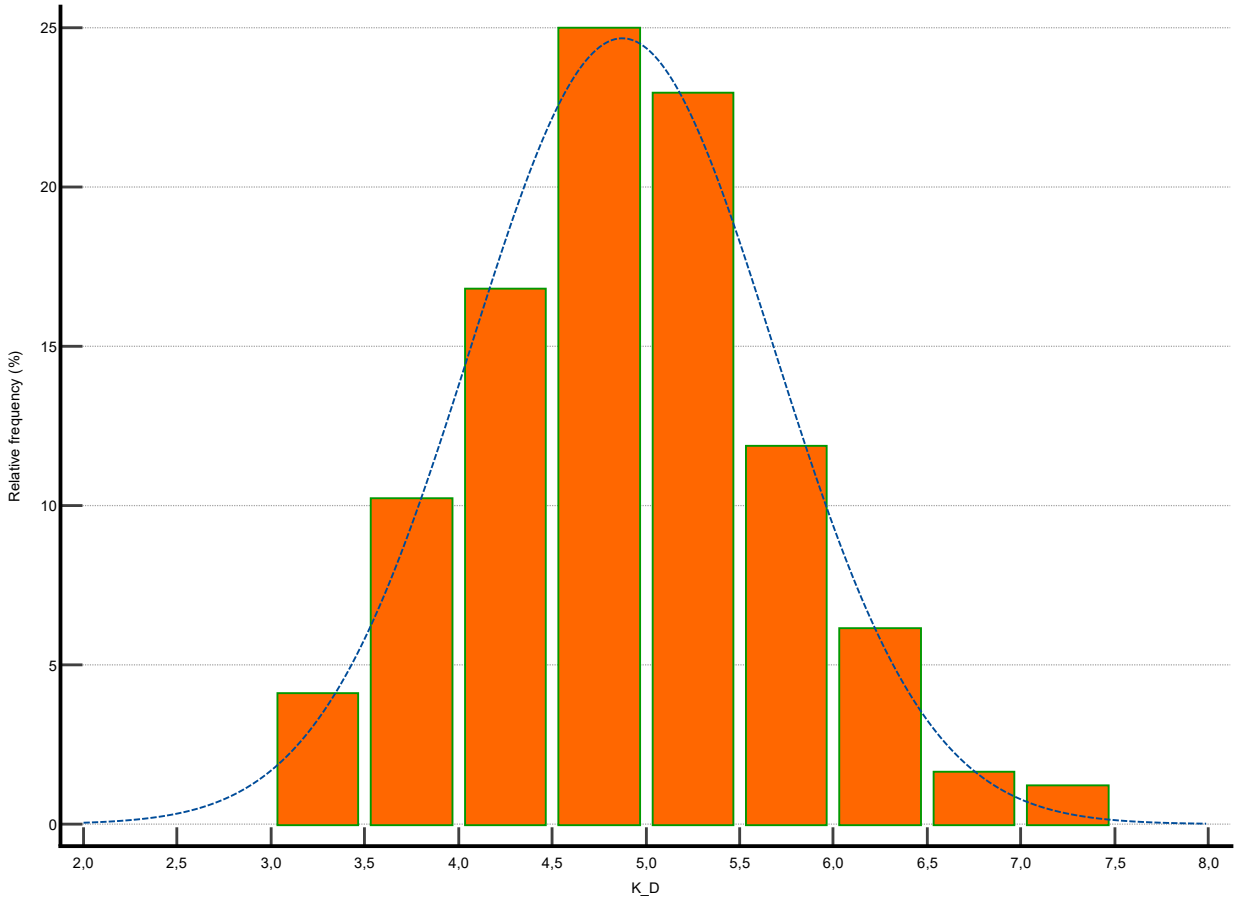
Données personnelles Tassin 2025

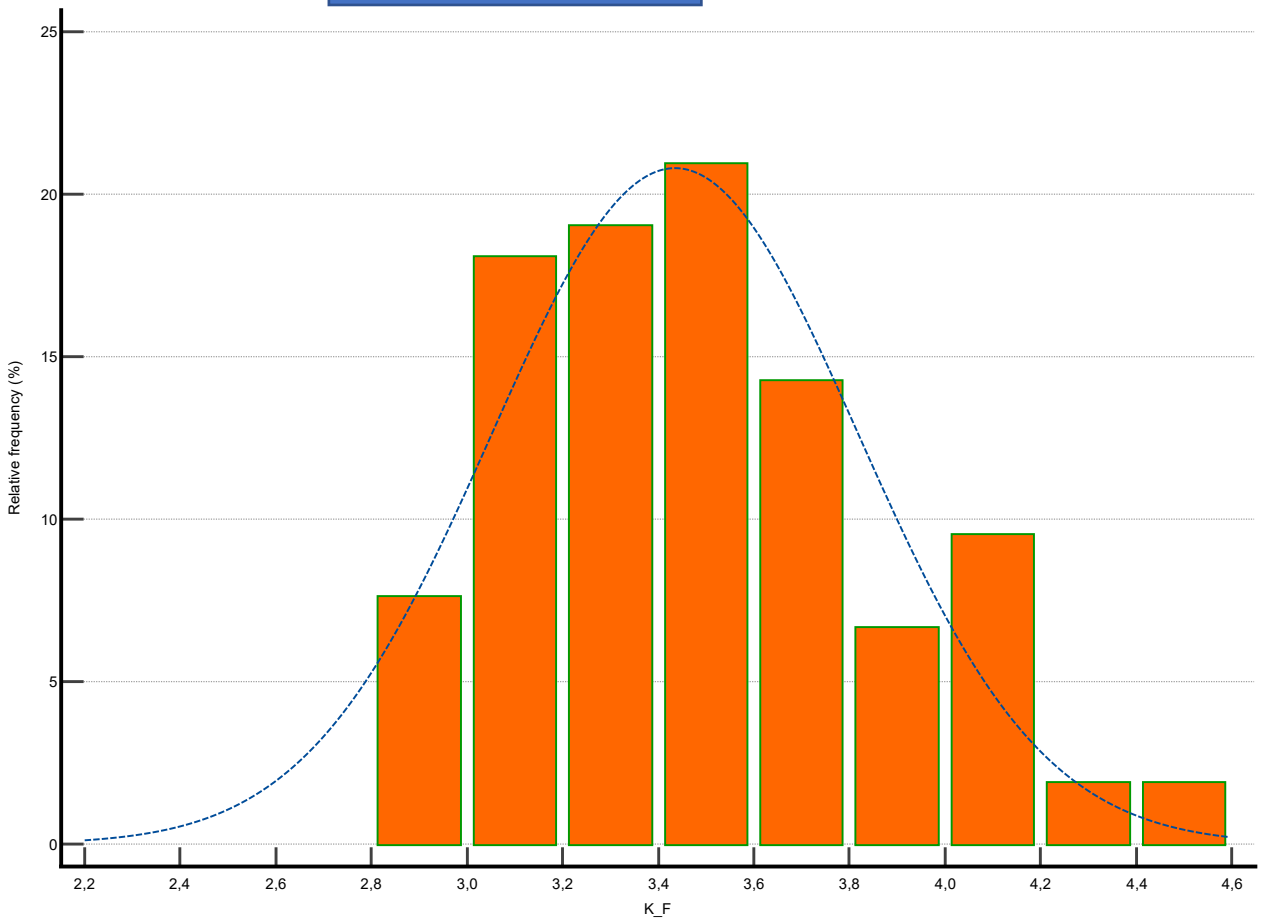
Kaliémies début:
4,8± 0,8 mmol/L
Med 4,8
3,2 à 7,4 mmol/L

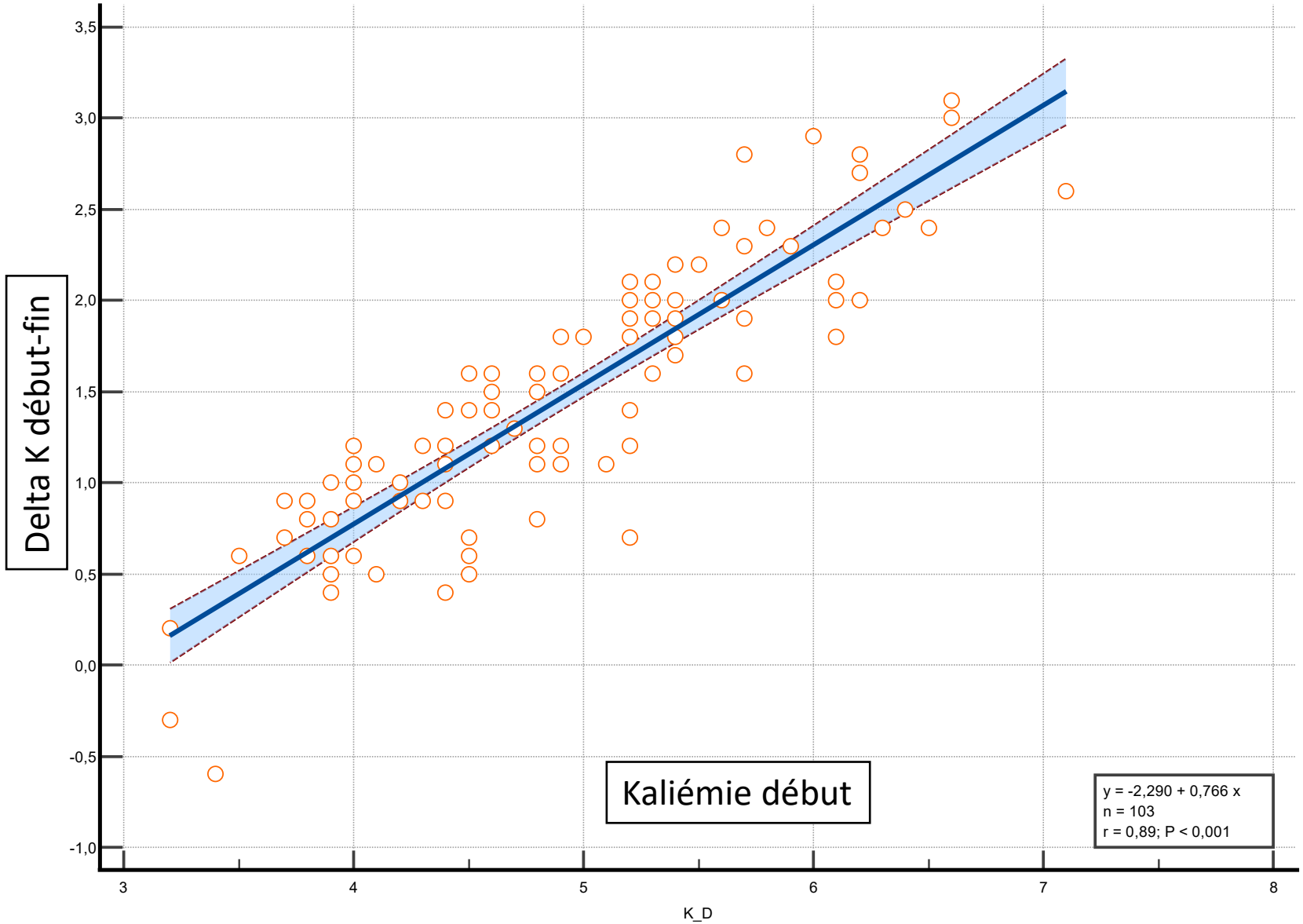
Delta kaliémie début –fin:
-1,4 ± 0,7 mmol/L à -3 à +0,6 mmol/L

Kaliémies fin:
3,4 ± 0,3 mmol/L
Médiane: 3,4
2,8 à 4,5 mmol/L

K+ dialysat
2 mEq/L : 90%







Avec un dialysat à 2 mEq/L de potassium, la baisse du la kaliémie dépend de la kaliémie de début

Potassium du dialysat?

- Hyperkaliémie plus dangereuse que l'hypokaliémie
- Un dialysat avec un potassium < 2 mEq/L:
  - plus d'arythmie
  - Plus de mortalité en cas d'hyperkaliémie
- Un gradient Kaliémie-potassium du dialysat > 4 mEq/L est associé au risque d'arythmie
- Potassium du dialysat à 3 mEq/L est dangereux si la kaliémie de début > 5,5 mEq/L
- Dialysat 2 mEq/L: standard si kaliémie début ≥ 4 mEq/L
- Dialysat 3 mEq/L si < 4 mEq/L ou en standard avec résines échangeuses adaptées

Le calcium

Objectifs

Ca début:
2,15-2,5 mmol/l

Ca fin:
2,15- 2,75 mmol/L ?

Calcémie totale (ou ionisée) pas corrigée

<u>Cinétique du calcium:</u>
Apports diététiques
Médicamenteux
Vitamines D
Renouvellement osseux

Dialysat
1 mmol/L: exceptionnel (hyperCa maligne)
1,25: hyperCa, PTH basse, calcifications cardiaques, CPX, Std US
1,5: standard (Europe)
1,65: parfois avec citrate
1,75: HypoCa, PTH haute, instabilité HD

Recommandations → KDOQI: 1,25 mmol/L
KDIGO: 1,25-1,5 mmol/L
EBPG: 1,5 mmol/L

Facility distribution* of practice patterns related to mineral metabolism (3)

Practice (n_1=patients; n_2=facilities)	% patients	Facility Distribution		
		25th %ile	50th %ile	75th %ile
Low (<2.5 mEq/l) Dialysate calcium (n=7,629; n=307)	40.5	0	24.3	96.3
Japan (n=2,123; n=4)	23.4	0	0	9.1
Europe (n=1,839; n=101)	18.5	0	4.5	42.3
US (n=3,667; n=142)	64.1	25.6	89.4	100

Dialysat 1,25 mmol/L

DOPPS

* Among initial cross section of patients at start of DOPPS I (1996 in US, 1998 in Europe, 1999 in Japan).

Young EW et al. *Kidney Int* 67:1179-1187, 2005.

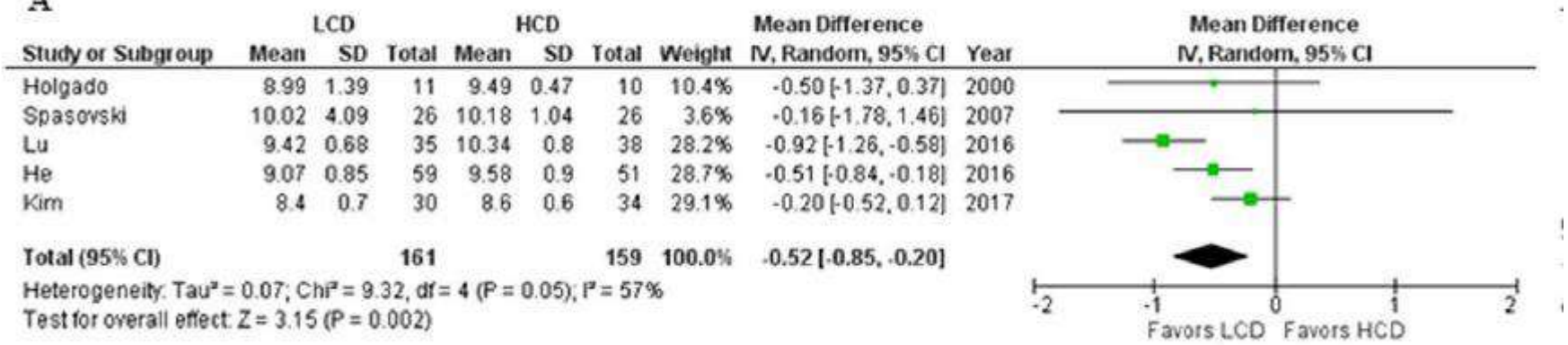
Effet au long terme d'une calcium du dialysat 1,25 mmol/L

SCIENTIFIC REPORTS | (2018) 8:5310 | DOI:10.1038/s41598-018-23658-y

Long-term effects of low calcium dialysates on the serum calcium levels during maintenance hemodialysis treatments: A systematic review and meta-analysis

Masahiro Yoshikawa[1,2], Osamu Takase[1,2], Taro Tsujimura[1,2], Etsuko Sano[1,2], Matsuhiko Hayashi[3], Tsuyoshi Takato[4] & Keiichi Hishikawa[1,2]

A

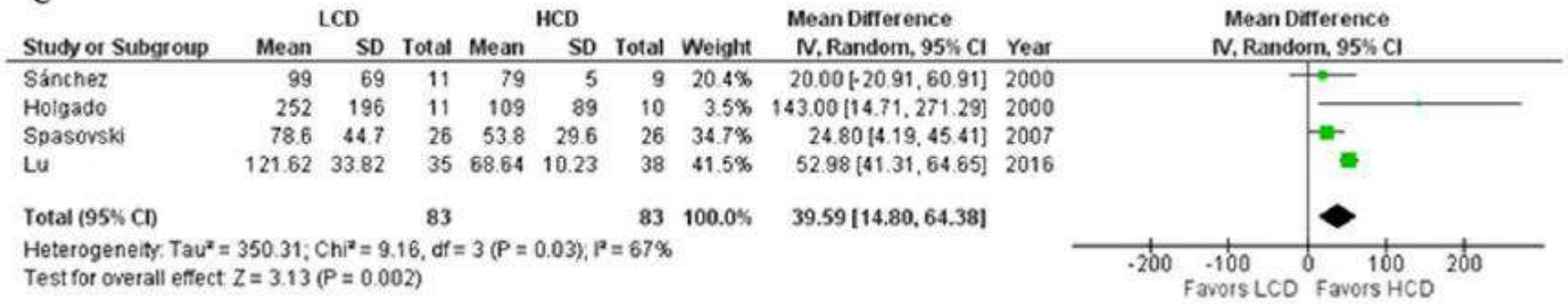


Study or Subgroup	LCD Mean	LCD SD	LCD Total	HCD Mean	HCD SD	HCD Total	Weight	Mean Difference IV, Random, 95% CI	Year
Holgado	8.99	1.39	11	9.49	0.47	10	10.4%	-0.50 [-1.37, 0.37]	2000
Spasovski	10.02	4.09	26	10.18	1.04	26	3.6%	-0.16 [-1.78, 1.46]	2007
Lu	9.42	0.68	35	10.34	0.8	38	28.2%	-0.92 [-1.26, -0.58]	2016
He	9.07	0.85	59	9.58	0.9	51	28.7%	-0.51 [-0.84, -0.18]	2016
Kim	8.4	0.7	30	8.6	0.6	34	29.1%	-0.20 [-0.52, 0.12]	2017
Total (95% CI)			**161**			**159**	**100.0%**	**-0.52 [-0.85, -0.20]**	

Heterogeneity: Tau² = 0.07; Chi² = 9.32, df = 4 (P = 0.05); I² = 57%
Test for overall effect: Z = 3.15 (P = 0.002)

↓ Calcémie début

C



Study or Subgroup	LCD Mean	LCD SD	LCD Total	HCD Mean	HCD SD	HCD Total	Weight	Mean Difference IV, Random, 95% CI	Year
Sánchez	99	69	11	79	5	9	20.4%	20.00 [-20.91, 60.91]	2000
Holgado	252	196	11	109	89	10	3.5%	143.00 [14.71, 271.29]	2000
Spasovski	78.6	44.7	26	53.8	29.6	26	34.7%	24.80 [4.19, 45.41]	2007
Lu	121.62	33.82	35	68.64	10.23	38	41.5%	52.98 [41.31, 64.65]	2016
Total (95% CI)			**83**			**83**	**100.0%**	**39.59 [14.80, 64.38]**	

Heterogeneity: Tau² = 350.31; Chi² = 9.16, df = 3 (P = 0.03); I² = 67%
Test for overall effect: Z = 3.13 (P = 0.002)

↑ PTH

Après 12 mois
Les calcifications coronaires augmentent plus avec CCD 1,25 vs 1,5 mmol/L
Rôle de l'HPT

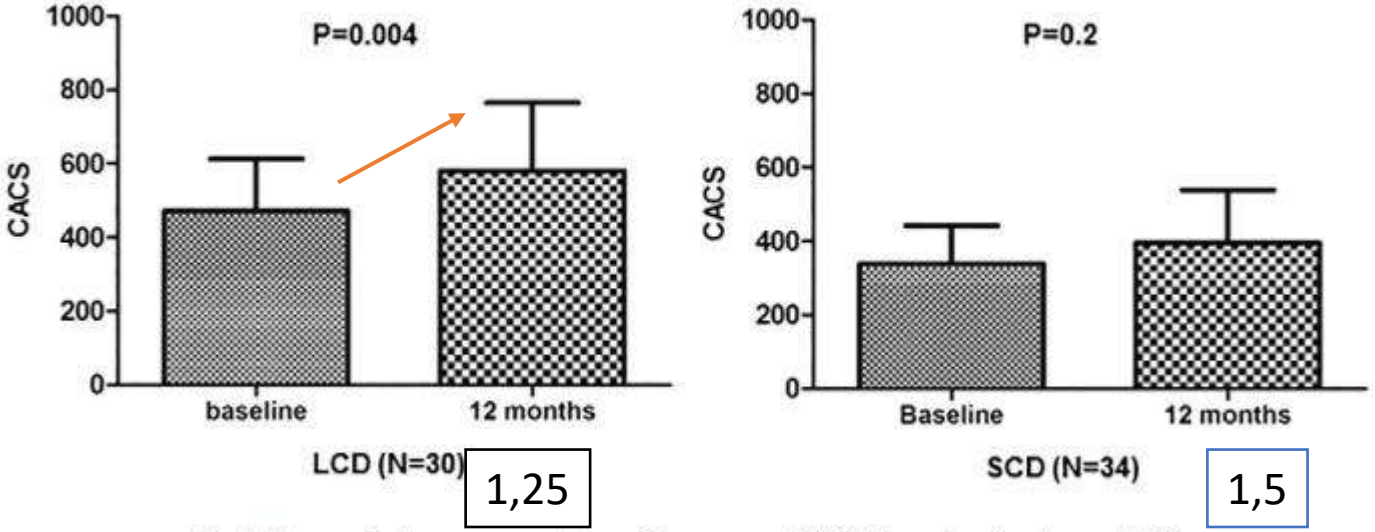


Fig. 2. Changes in the coronary artery calcium scores (CACS) from baseline to month 12.

Table 2
Laboratory values at baseline and at study completion.

Variable	LCD (1.25 mmol/L) Baseline ($n = 36$)	LCD (1.25 mmol/L) Final ($n = 30$)	LCD (1.25 mmol/L) *P* value*	SCD (1.5 mmol/L) Baseline ($n = 40$)	SCD (1.5 mmol/L) Final ($n = 34$)	SCD (1.5 mmol/L) *P* value*	LCD vs. SCD *P* value**
Calcium corrected (mg/dL)	8.6 ± 0.6	8.4 ± 0.7	0.1341	8.7 ± 0.6	8.6 ± 0.6	0.678	0.3812
Phosphorus (mg/dL)	5.1 ± 1.8	5.4 ± 1.8	0.4549	4.6 ± 1.5	4.4 ± 1.6	0.7301	0.411
Ca × P product (mg^2/dL^2)	43.8 ± 14.8	45.3 ± 14.0	0.768	40.4 ± 13.4	37.8 ± 13.1	0.5602	0.583
Intact PTH (pg/mL)[a]	81.5 (60.3 to 121.5)	151.0 (114.6 to 198.9)	0.0002	90.0 (66.7 to 121.5)	71.6 (52.2 to 98.1)	0.2033	0.0007
Cholesterol							
Total (mg/dL)	146.3 ± 33.6	139.4 ± 35.3	0.2613	147.3 ± 31.8	140.3 ± 25.8	0.4188	0.5776
HDL (mg/dL)	43.2 ± 12.9	42.6 ± 11.4	0.2344	43.6 ± 16.4	43.1 ± 16.6	0.9745	0.5067
LDL (mg/dL)	80.3 ± 26.2	83.6 ± 32.2	0.2644	80.4 ± 25.7	80.9 ± 27.8	0.4773	0.6702
Triglyceride (mg/dL)[a]	99.5 (81.5 to 121.5)	92 (79.5 to 106.4)	0.5601	99.5 (81.5 to 134.3)	97.2 (80.1 to 117.9)	0.6994	0.8431
Albumin (g/dL)	3.9 ± 0.3	4.0 ± 0.3	0.1804	3.7 ± 0.4	3.9 ± 0.4	0.0409	0.5653
ALP (U/L)	78.3 ± 34.9	90.4 ± 32.1	0.0002	74.4 ± 31.5	80.2 ± 33.0	0.1777	0.2217

nephron Clinical Practice

Nephron Clin Pract 2012;120:c132–c138
DOI: 10.1159/000334424

Received: July 15, 2011
Accepted: October 8, 2011
Published online: May 11, 2012

Increased Levels of Serum Parathyroid Hormone and Fibroblast Growth Factor-23 Are the Main Factors Associated with the Progression of Vascular Calcification in Long-Hour Hemodialysis Patients

Guillaume Jean[a] Eric Bresson[b] Christie Lorriaux[a] Brice Mayor[a]
Jean-Marc Hurot[a] Patrick Deleaval[a] Charles Chazot[a]

Table 2. Logistic regression of factors associated with progressors

	Odds ratio	95% CI	p
Age, years	1.039	0.9772–1.106	0.2
Dialysis vintage, months	1.003	0.998–1.009	0.3
Female gender	0.51	0.185–1.426	0.2
Diabetes	3.13	0.979–9.43	0.052
FGF-23, log RU/ml	1.0001	1.0000–1.0002	0.049
PTH, pg/ml	1.006	1.0017–1.012	0.009
Phosphorus, mmol/l	2.3	0.358–15.399	0.4

PTH > 191 pg/ml: > calcifications aortiques

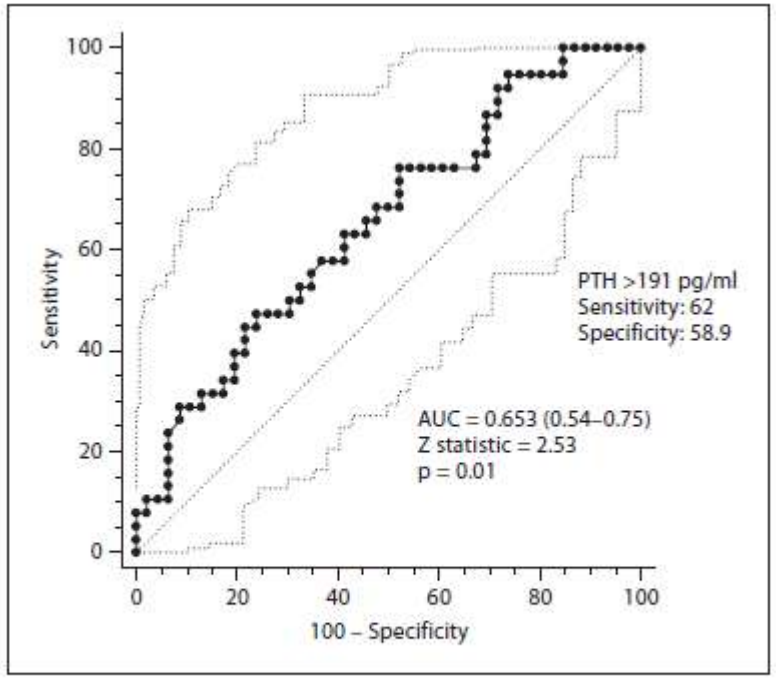


Fig. 2. ROC analysis of serum PTH levels for predicting VC outcome. AUC = Area under the curve.

Le calcium du dialysat n'est pas associé à la progression des CV

Table 1. Comparison of patients' characteristics, biological and treatment data between progressors and non-progressors

	Non-progressors (n = 47)	Progressors (n = 38)
Age, years	67.4 ± 8	66.6 ± 9
Female gender, %	52	44
Dialysis vintage, months	82 ± 95	76.8 ± 78
Body mass index	25.2 ± 5.5	26.5 ± 6
Diabetes, %	28.3	44.7
Stroke, %	17.4	5.2
Peripheral vascular disease, %	19.6	23.7
Cardiac disease, %	13	18.4
Liver disease, %	13	10.5
Cancer, %	8.8	13.2
Tobacco use, n	22	32
Parathyroidectomy, %	15.6	9.5
Warfarin, %	15.2	21.1
Statins, %	37	44.7
Native vitamin D, %	89	92
Alfacalcidol, %	39	36.8
Weekly dose, µg	3.4 ± 2	3 ± 1.6
$CaCO_3$, %	10	9.2
Daily dose mg	833 ± 450	777 ± 390
Sevelamer, %	32.6	38.2
Daily dose, mg	3,680 ± 1,440	4,160 ± 2,240
Cinacalcet, %	9.7	23.7
Daily dose, mg	52.5 ± 10.6	53.5 ± 8
25-Hydroxyvitamine D, nmol/l	105 ± 35.6	108.7 ± 36.5
Calcemia, mmol/l	2.22 ± 0.09	2.23 ± 0.1
Hypercalcemia episodes, n (%)	0	1 (2.6)
Phosphatemia, mmol/l	1.33 ± 0.2	1.41 ± 0.2
Phosphatemia >1.7 mmol/l, n (%)	3 (6.3)	4 (10.5)
PTH, pg/ml	179.6 ± 103	244.3 ± 114*
PTH >585 pg/ml, %	0	0
b-ALP, µg/l	22.3 ± 15	21 ± 11.5
t-ALP, U/l	279 ± 180	279.6 ± 151
CTX, µg/l	2 ± 0.9	2.1 ± 0.8
FGF-23, log RU/ml	2,640 ± 2,810	4,204 ± 4,110*
Albumin, g/l	36.1 ± 2.6	35.5 ± 3.7
CRP, mg/l	12 ± 10	14.1 ± 11.8
Hb, g/l	11.6 ± 0.9	11.7 ± 0.9
Dialysate calcium, mmol/l	1.48 ± 0.1	1.48 ± 0.1
Dialysis session time, min	390 ± 70	380 ± 70
Kt/V	2.5 ± 0.5	2.4 ± 0.4
nPCR, g/kg/day	1.32 ± 0.3	1.27 ± 0.2
Hip BMD, g/m^2	0.7 ± 0.14	0.72 ± 0.17
Wrist BMB, g/m^2	0.47 ± 0.1	0.5 ± 0.1

NDT Advance Access published July 3, 2012

Nephrol Dial Transplant (2012) 00: 1–7
doi: 10.1093/ndt/gfs119

NDT
Nephrology Dialysis Transplantation

Original Article

Rôle de la concentration en calcium du dialysat: CCD

Biological impact of targeted dialysate calcium changes in haemodialysis patients: the key role of parathyroid hormone

Guillaume Jean[1], Brice Mayor[1], Jean-Marc Hurot[1], Patrik Deleaval[1], Christie Lorriaux[1], Eric Zaoui[2] and Charles Chazot[1]

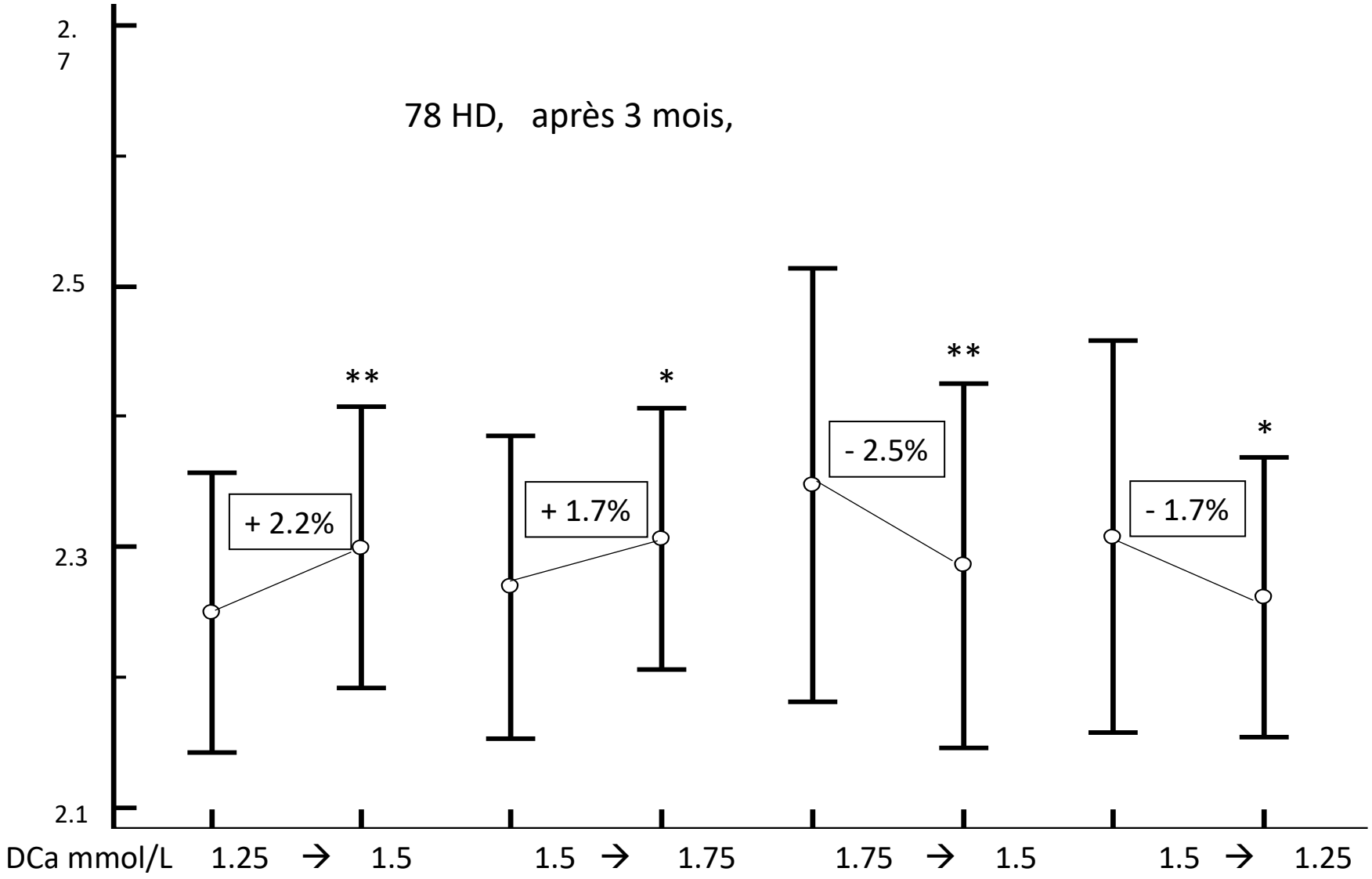
[1]NephroCare Tassin-Charcot, Sainte Foy-Les-Lyon, France and [2]Laboratoire du Grand Vallon, Sainte Foy-Les-Lyon, France

Correspondence and offprint requests to: Guillaume Jean; E-mail: guillaume-jean-crat@wanadoo.fr

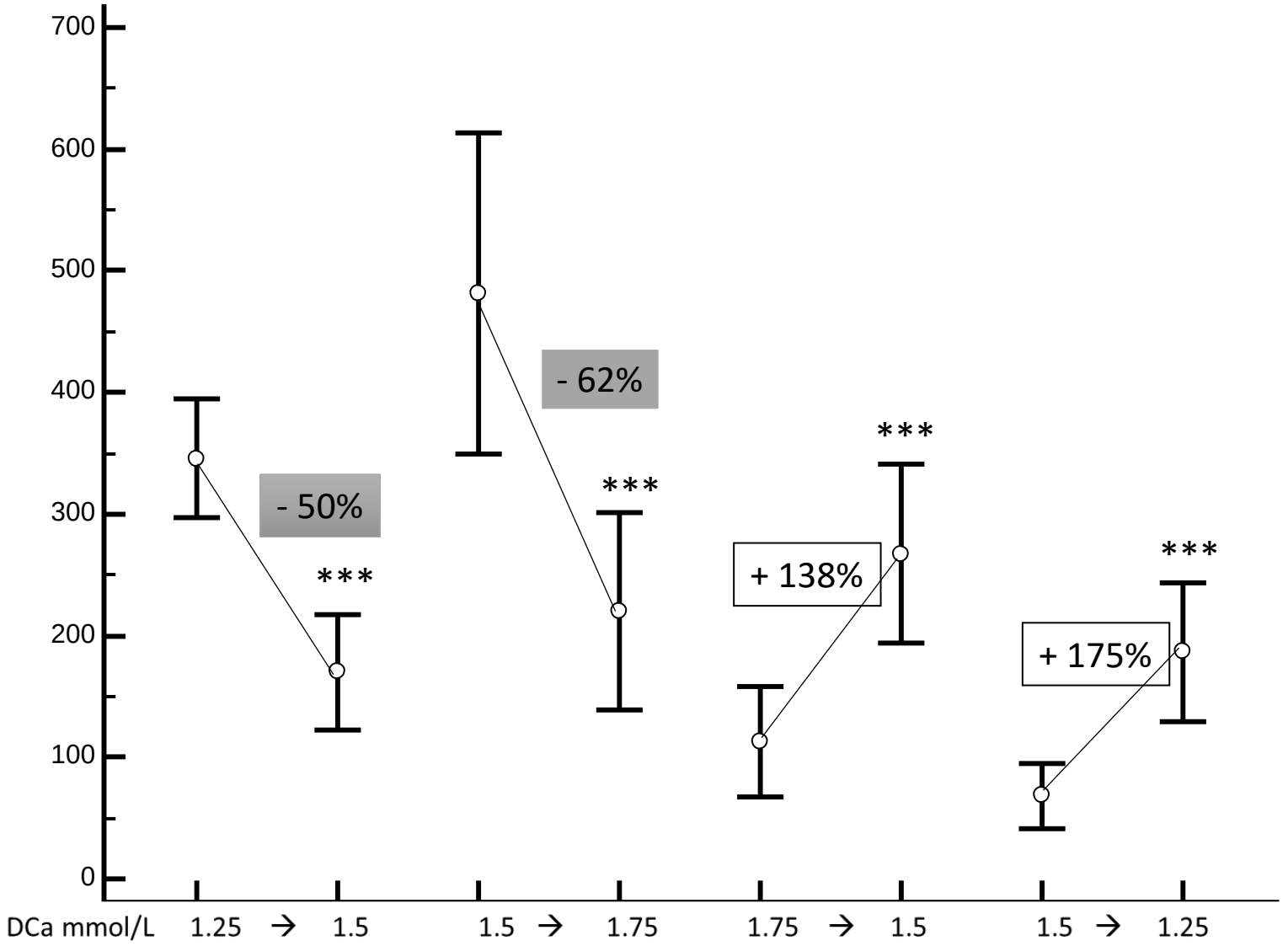
↑ CCD (0,25 mmol/L) si PTHi > 300 pg/ml et Ca < 2,45 mmol/L

↓ CCD (0,25 mmol/L) si PTH < 150 et Ca > 2,2 mmol/L

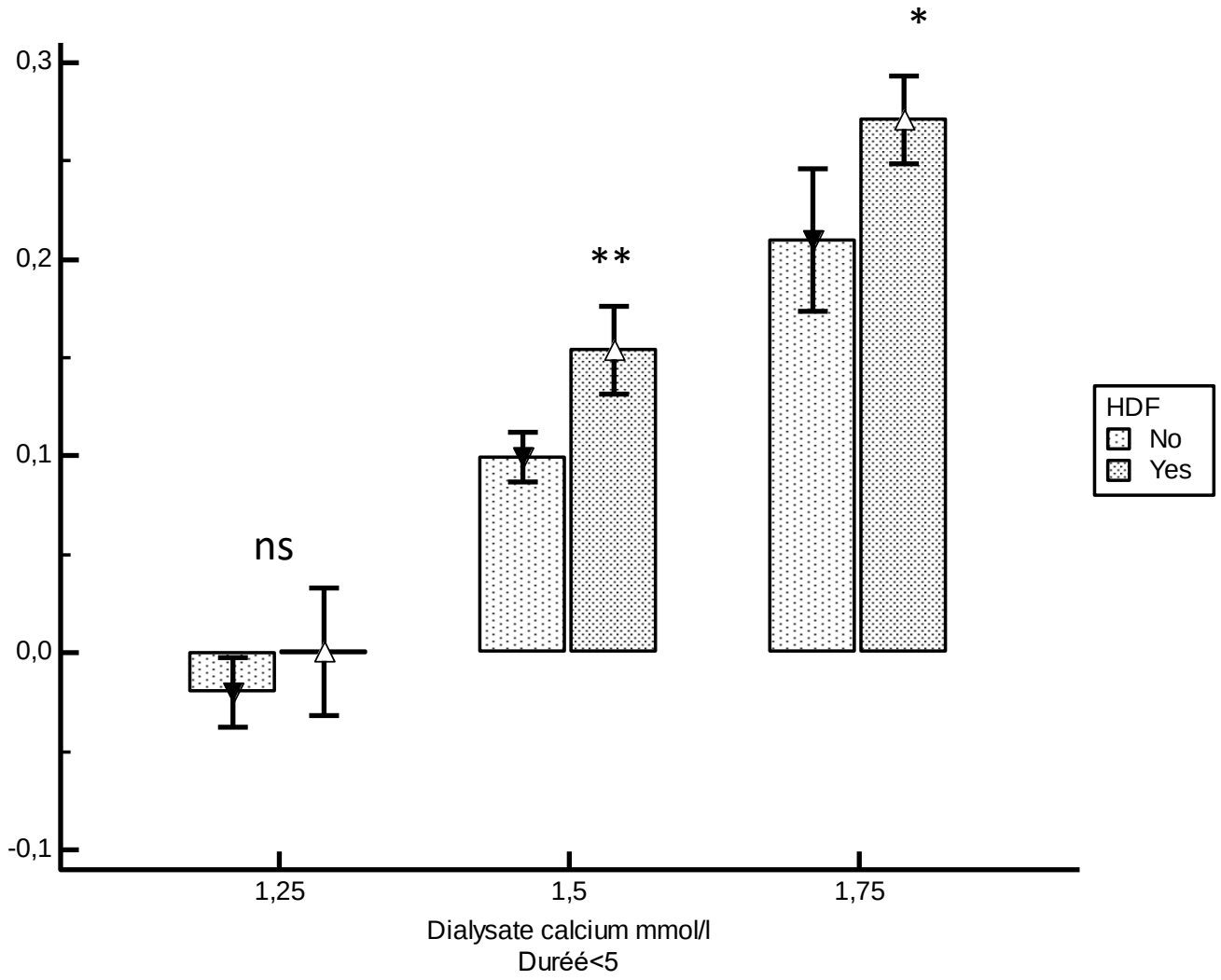
Effet du changement de calcium du dialysat sur la calcémie totale



Effet sur la PTH



Balance calcique et HDF

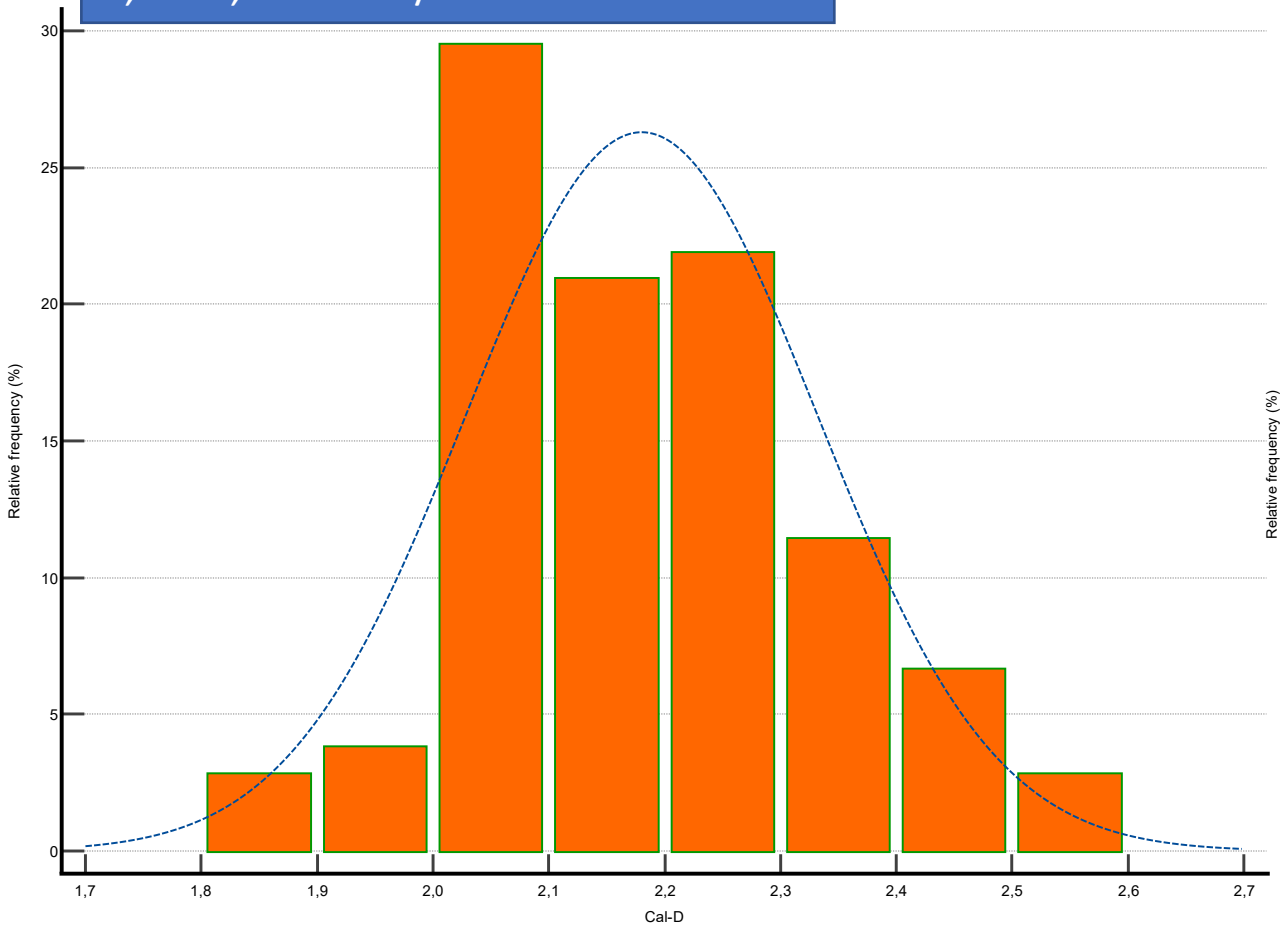


Jean et al EDTA 2013

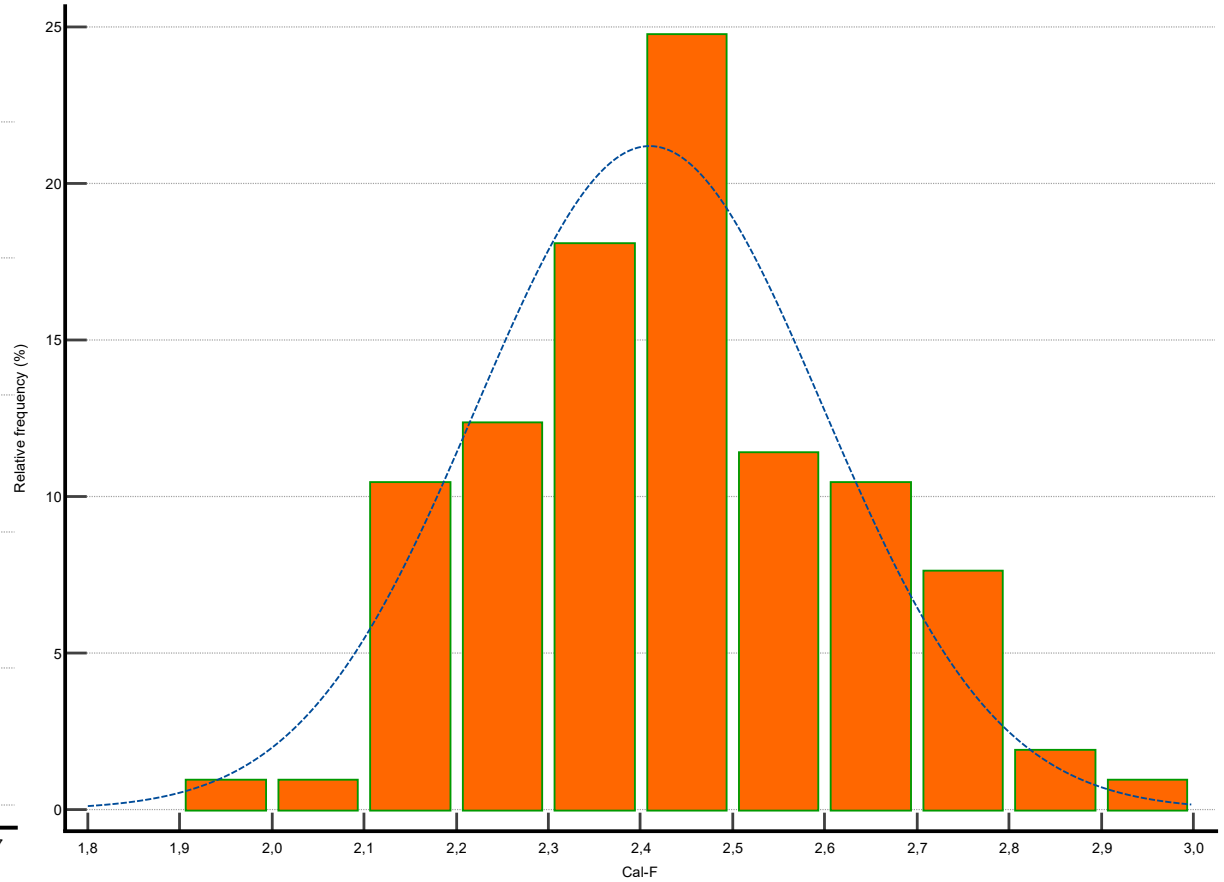
L'HDF online amplifie les échanges selon les delta iCa - DDC

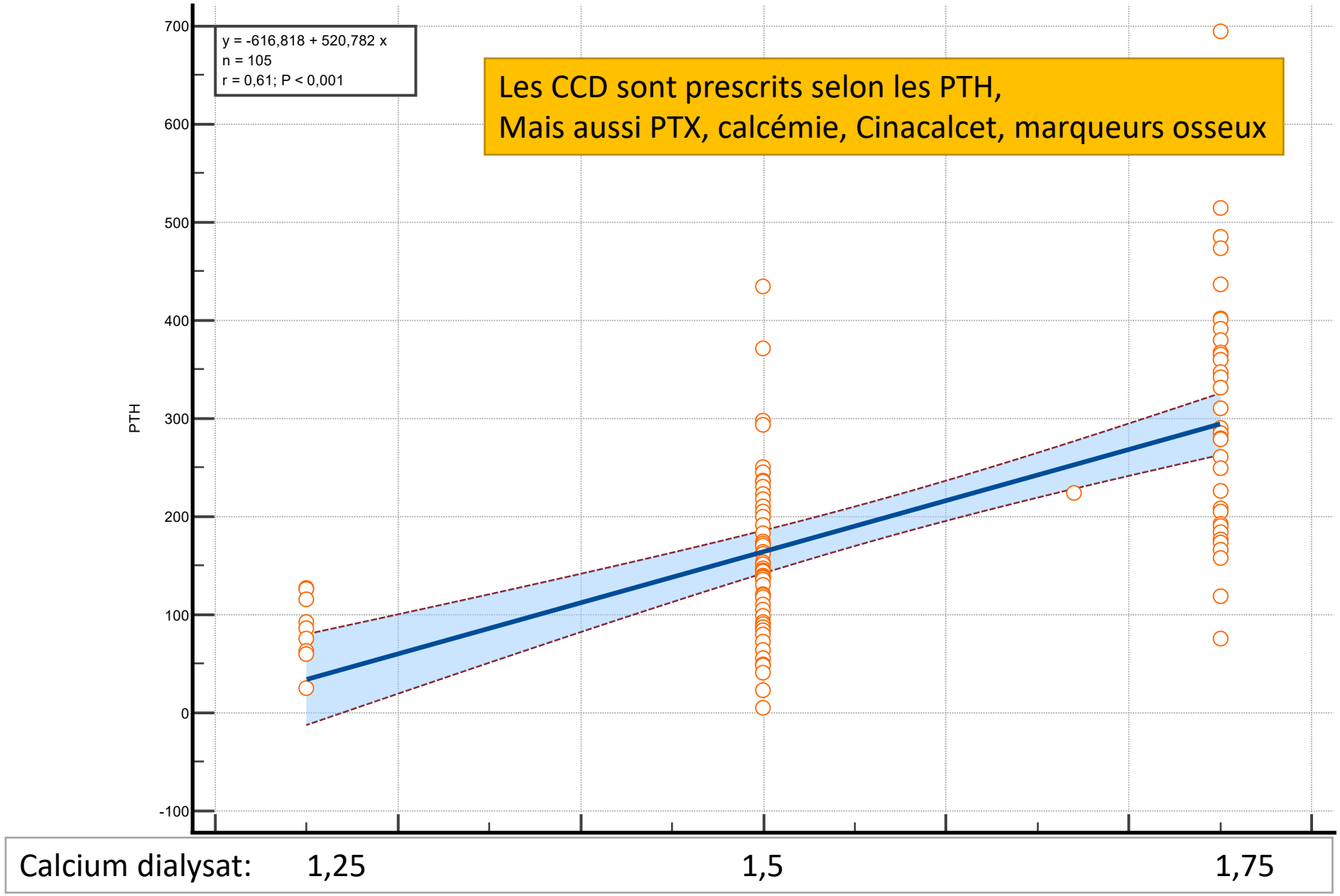
Données personnelles Tassin 2025

Calcémie début: 2,18 ± 0,15 mmol/L
Médiane: 2,15
1,8 à 2,57 mmol/L



Calcémie fin: 2,4 ± 0,18 mmol/L
Médiane 2,4
1,9 à 2,9 mmol/L




y = -616,818 + 520,782 x
n = 105
r = 0,61; P < 0,001
Les CCD sont prescrits selon les PTH,
Mais aussi PTX, calcémie, Cinacalcet, marqueurs osseux
PTH
700
600
500
400
300
200
100
0
-100
Calcium dialysat: 1,25 1,5 1,75

Pas d'impact du calcium du dialysat sur la survie (Etude ARNOS régionale observationnelle)

Tableau 2
Analyse selon le modèle de Cox et survie à 42 mois.

Covariables	b	SE	*p*	Exp(b)	95 % CI of Exp(b)
CCD 1,75 vs. 1,25 mmol/L	−0,210	0,3056	0,4	0,8045	0,4433–1,4599
Âge (an)	0,0462	0,0063	< 0,0001	1,0476	1,0347–1,0606
25-OH-D (ng/L)	−0,007	0,0036	0,049	0,9929	0,9859–0,9999
Diabète (%)	0,352	0,1526	0,020	1,4232	1,0570–1,9163
Sexe masculin (%)	0,0104	0,1440	0,94	1,0105	0,7631–1,3381
Cardiopathie (%)	0,582	0,1518	0,0001	1,7912	1,3322–2,4084
IMC (kg/m^2)	−0,044	0,0166	0,0084	0,9569	0,9263–0,9886
nPCR (g/kg/j)	−0,493	0,2489	0,045	0,6080	0,3742–0,9879

CDD : concentration en calcium du dialysat.

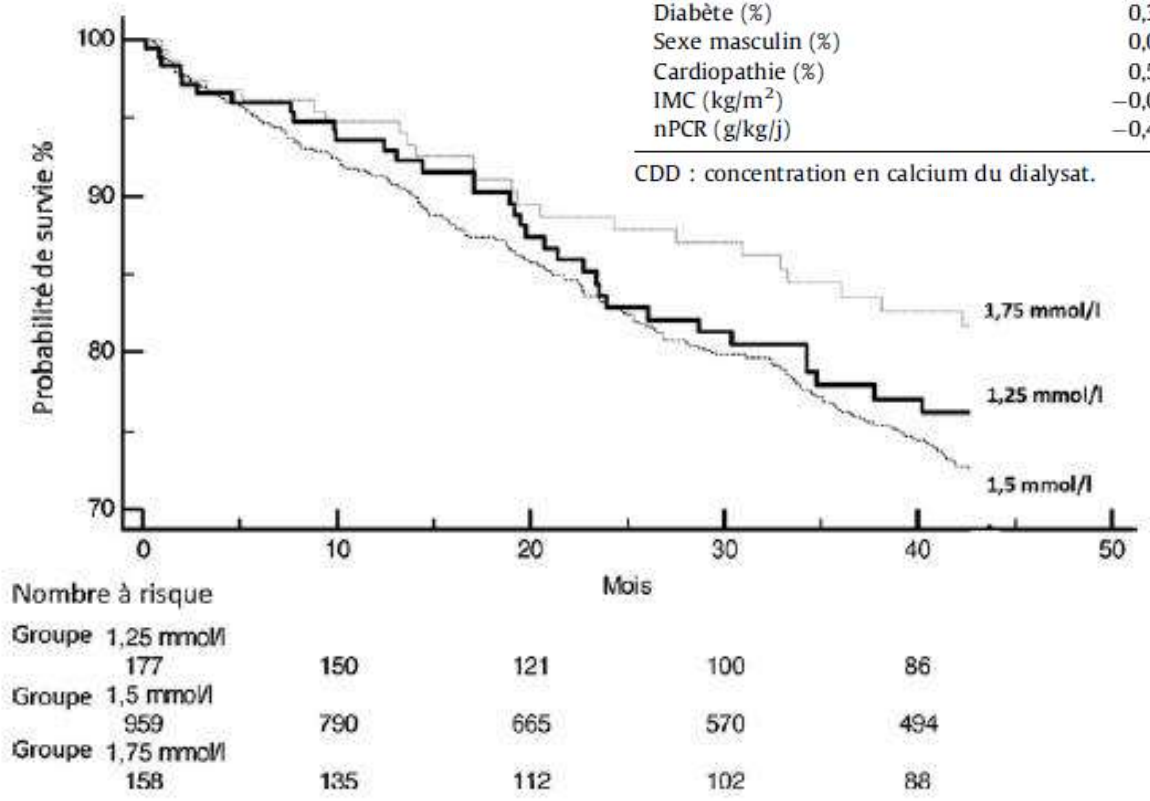
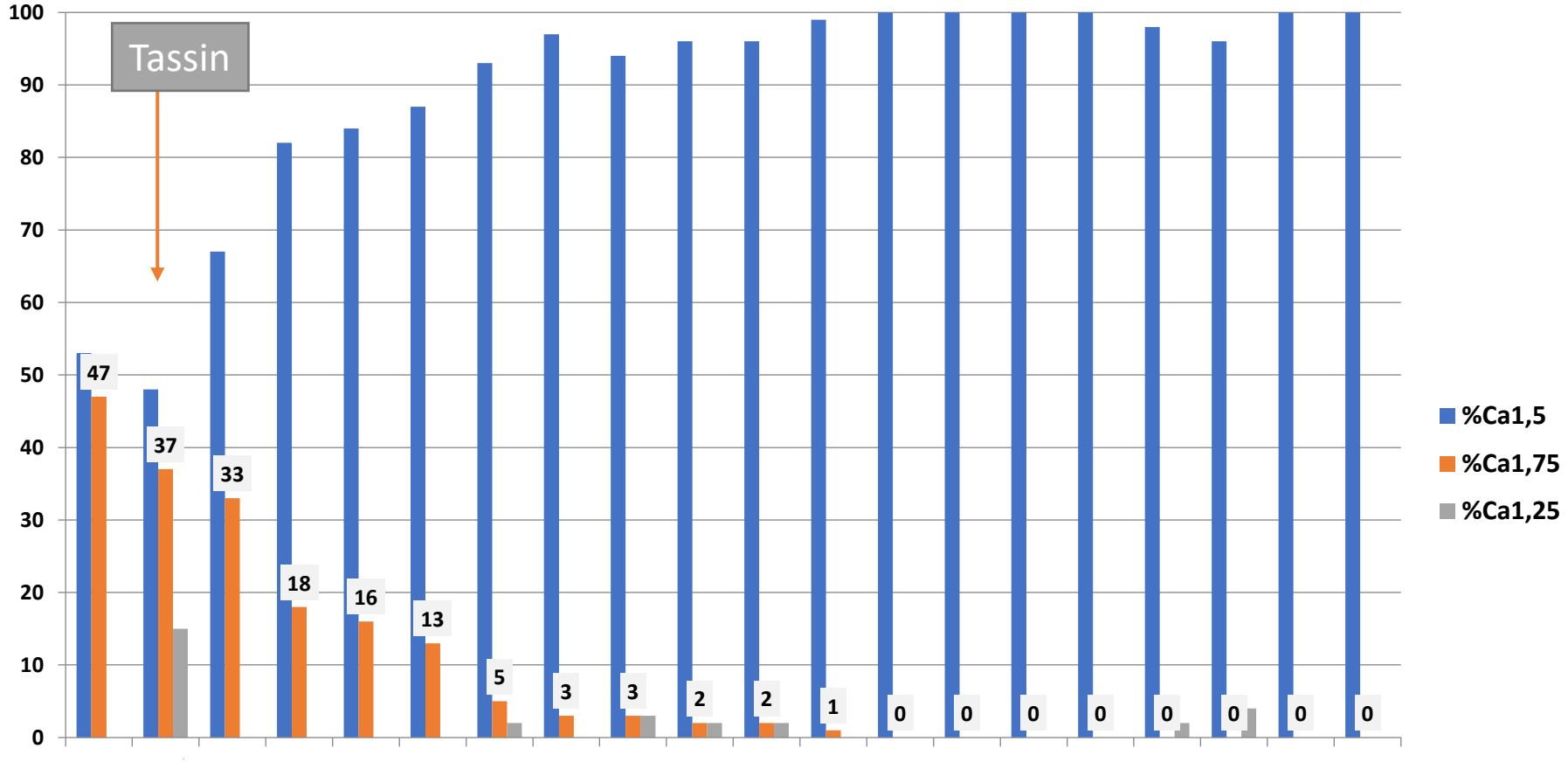


Fig. 1. Courbe de survie selon la concentration en calcium du dialysat (CCD) (Kaplan-Meyer). Comparaison de la survie entre une CCD de 1,25 et 1,75 mmol/L : 0,7 (0,52–1,09) $p = 0,1$.

Pas de différence de calcémie, de PTH , de traitements

Jean, G. et al. (2013). Nephrol Ther **9**(2): 103-107.

Calcium Dialysat: centres FMC France



Blood Purification

Blood Purif 2012;33:199–204
DOI: 10.1159/000334157

Effects of Citrate Acid Concentrate (Citrasate®) on Heparin N Requirements and Hemodialysis Adequacy: A Multicenter, Prospective Noninferiority Trial

Jeffrey J. Sands[a] Peter Kotanko[b, c] Jonathan H. Segal[d] Chiang-Hong Ho[a]

Passage du Bicarbonate au **Citrasate: baisse de la calcémie, début et fin, de 0,1 mmol/l** vs augmentation de 0,03 mmol/l avec dialysat bicarbonate

CDD 1,25 mmol/l

Table 2. Laboratory values

	B: standard dialysate + 100% HN	P1: CD + 100% HN	P2: CD + 80% HN	P3: CD + 67% HN
n	277	254	224	195
WBC, 100/μl	6.77 ± 2.13	6.80 ± 2.20	6.68 ± 2.00	6.85 ± 2.28
p value vs. B		0.761	0.912	0.314
Hgb, g/dl	11.81 ± 1.15	11.70 ± 1.08	11.65 ± 1.09	11.61 ± 1.12
p value vs. B		0.006	0.040	0.016
Pre-HD Ca, mg/dl	8.85 ± 0.74	8.78 ± 0.76	8.78 ± 0.70	8.77 ± 0.72
p value vs. B		<0.001	0.124	0.007
% change pre-HD Ca[1]		−1.18 ± 4.56	−0.87 ± 4.56	−1.03 ± 5.13
p value vs. B		<0.001	0.005	0.006
Post-HD Ca, mg/dl	8.99 ± 0.57	8.52 ± 0.45	8.55 ± 0.50	8.57 ± 0.47
p value vs. B		<0.001	<0.001	<0.001
% change post HD Ca[1]		−5.09 ± 4.71	−4.79 ± 5.75	−4.59 ± 5.39
p value vs. B		<0.001	<0.001	<0.001
Intradialytic change (post-/pre-HD) in Ca, mg/dl	0.14 ± 0.63	−0.25 ± 0.62	−0.23 ± 0.57	−0.20 ± 0.56
p value vs. B		<0.001	<0.001	<0.001
% intradialytic change in Ca	1.96 ± 7.39	−2.35 ± 7.41	−2.24 ± 6.56	−1.88 ± 6.43
p value vs. B		<0.001	<0.001	<0.001
Pre-HD iCa, mg/dl	4.71 ± 0.45	4.69 ± 0.43	4.68 ± 0.41	4.70 ± 0.42
p value vs. B		0.002	0.084	0.064
% change pre-HD iCa[1]		−0.73 ± 6.62	−0.51 ± 6.27	−0.35 ± 6.86
p value vs. B		0.088	0.234	0.482
Post-HD iCa, mg/dl	4.81 ± 0.34	4.35 ± 0.28	4.26 ± 0.26	4.28 ± 0.26
p value vs. B		<0.001	<0.001	<0.001
% change post-HD iCa[1]		−9.55 ± 4.93	−11.13 ± 5.43	−10.83 ± 5.13
p value vs. B		<0.001	<0.001	<0.001
Intradialytic change (post-/pre-HD) in iCa, mg/dl	0.09 ± 0.39	−0.34 ± 0.37	−0.41 ± 0.35	−0.41 ± 0.35
p value vs. B		<0.001	<0.001	<0.001
% intradialytic change in iCa	2.5 ± 9.0	−6.8 ± 7.5	−8.3 ± 7.3	−8.3 ± 6.9
p value vs. B		<0.001	<0.001	<0.001

Effet sur la PTH ?

Individualizing the dialysate calcium concentration

Curr Opin Nephrol Hypertens 2015, 24:000–000

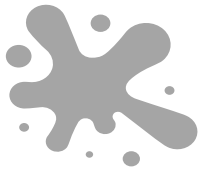
Guillaume Jean and Charles Chazot

	Calcémie	PTH	
Quand diminuer le CCD	↑ ou = et	↓	Excès apports vitamine D et calcium ou hypercalcémie osseuse
Quand augmenter le CCD	↓ ou =	↑ PTX Cinacalcet	HPT II

Pour l'individualisation de la CCD	Contre
Balance calcique adaptée	Demande du temps
Optimisation des cibles biologiques	Demande une stratégie définie
Compliance parfaite	Demande 3 différentes CCD
Réajustement aux événements médicaux/chirurgicaux	Demande une surveillance rapprochée (PTH, Ca)

Conclusion calcium dialysat

Pas de données de survie/calcifications interprétables en l'absence d'étude avec individualisation du CCD



Si une seule concentration à choisir: 1,5 mmol/L

Ajustement des apports vitamino-calciques

Si ajustement:

1,25 mmol/L : hypercalcémie, PTH basse (calcémie normale/haute)

1,5: standard

1,75: hypocalcémie, PTH haute (calcémie normale/basse)

1,75: attention à l'HDF, mesurer le calcium de fin de séance, attention aux valvulopathies calcifies

Mesure PTH rapprochées (mensuelle)

Les bicarbonates

HCO3 (Bicarbonates)

Apports de HCO3-Na
Per os

HCO3 dialysat:
28-40 mmol/L

HCO3 pré:
20 -26 mmol/L?

Production d'acides fixes
= consommation HCO3

HCO3 post:
< 28 mmol/l

Alcalose post: vomissements,
Céphalées, hypoTA,
arythmie (↓Ca++, ↓K+, ↓Mg)
Ischémie cérébrale,
hypoventilation

Apport d'HCO3 plutôt
qu'épuration des acides

Acidose:
- Ostéoporose (tampons osseux)
- Protéolyse musculaire
- Résistance insuline
- HyperK+
- Vasodilatation

Am J Kidney Dis. 2013 October ; 62(4): . doi:10.1053/j.ajkd.2013.03.035.

Association of Dialysate Bicarbonate Concentration With Mortality in the Dialysis Outcomes and Practice Patterns Study (DOPPS)

Francesca Tentori, MD[1,2], Angelo Karaboyas, MS[1], Bruce M. Robinson, MD, MS[1,3], Hal

France 33-37 mEq/L majoritaire

DOPPS

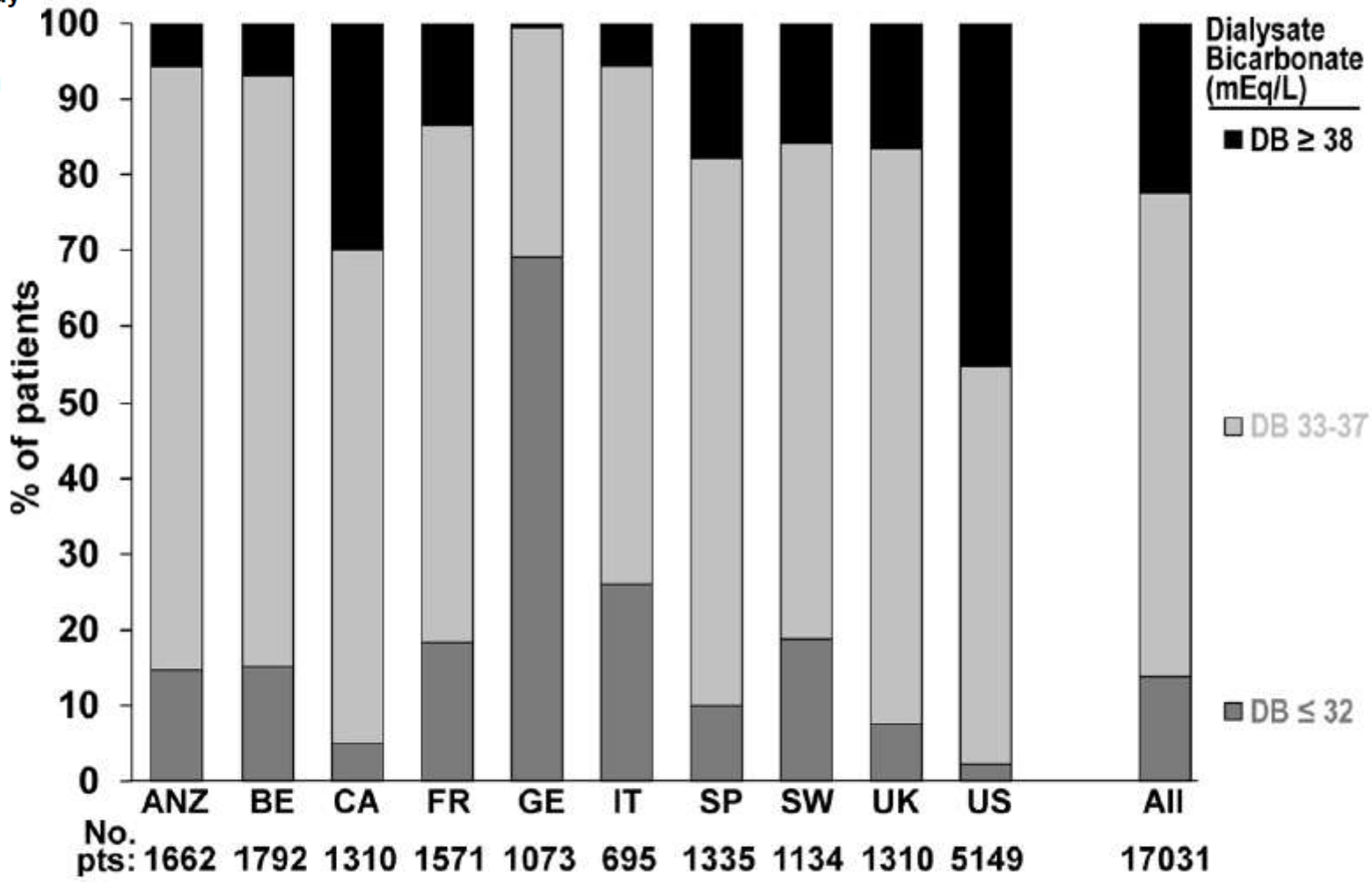


Figure 1. Distribution of dialysate bicarbonate prescription, by country
ANZ=Australia and New Zealand; BE= Belgium; CA= Canada; FR= France; GE= Germany; IT: Italy; SP= Spain; SW= Sweden; UK= United Kingdom; US= United States.

USA: prescription de bicarbonates plus élevée

DOPPS: mortalité associée à la prescription d'un bicarbonate élevé

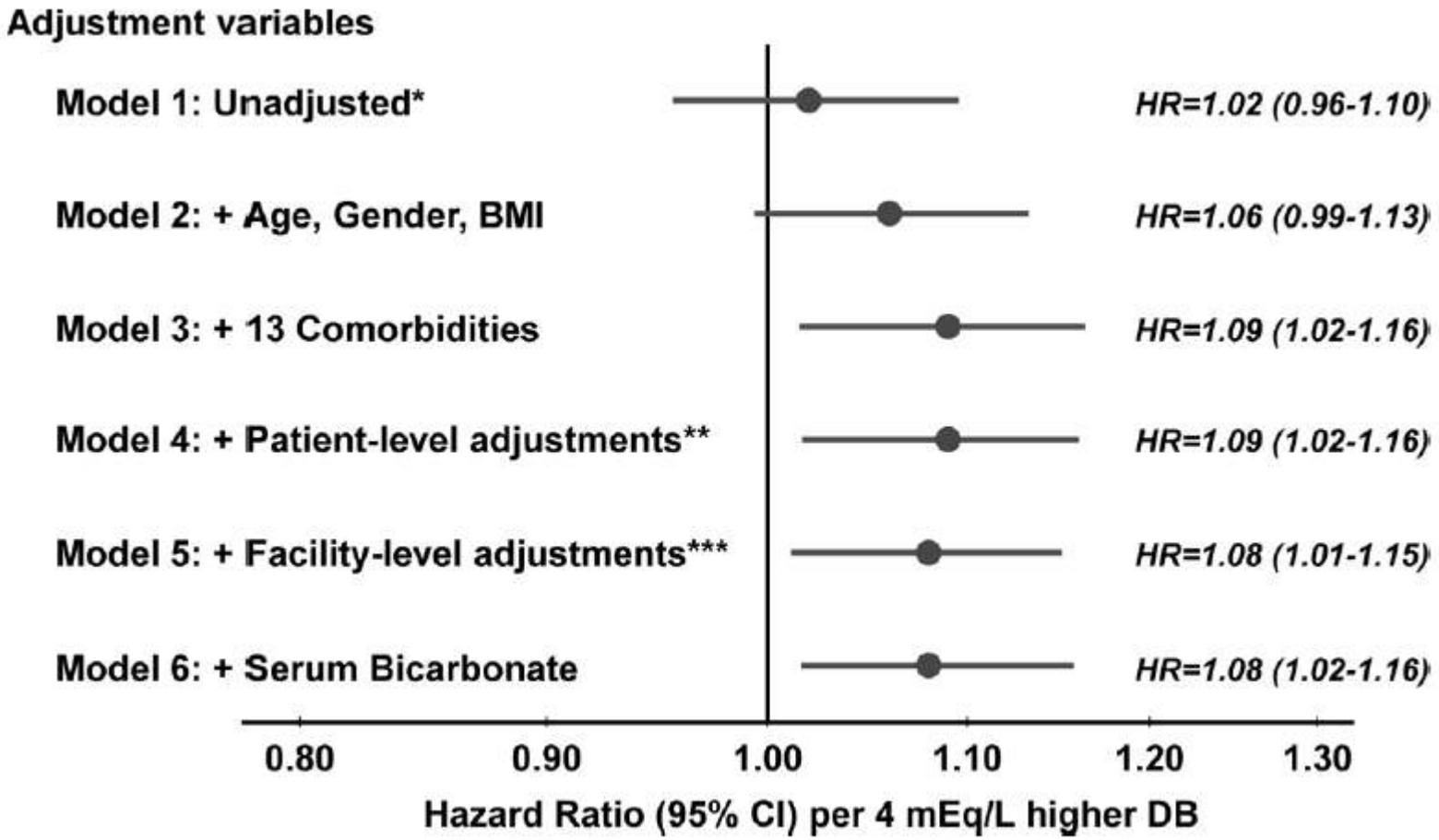


Figure 2. Association between prescribed dialysate bicarbonate (per 4 mEq/L higher) and all-cause mortality, by levels of adjustment

Bicarbonates prescrits sont associés à la mortalité infectieuse et aux hospitalisations cardio-vasculaires,

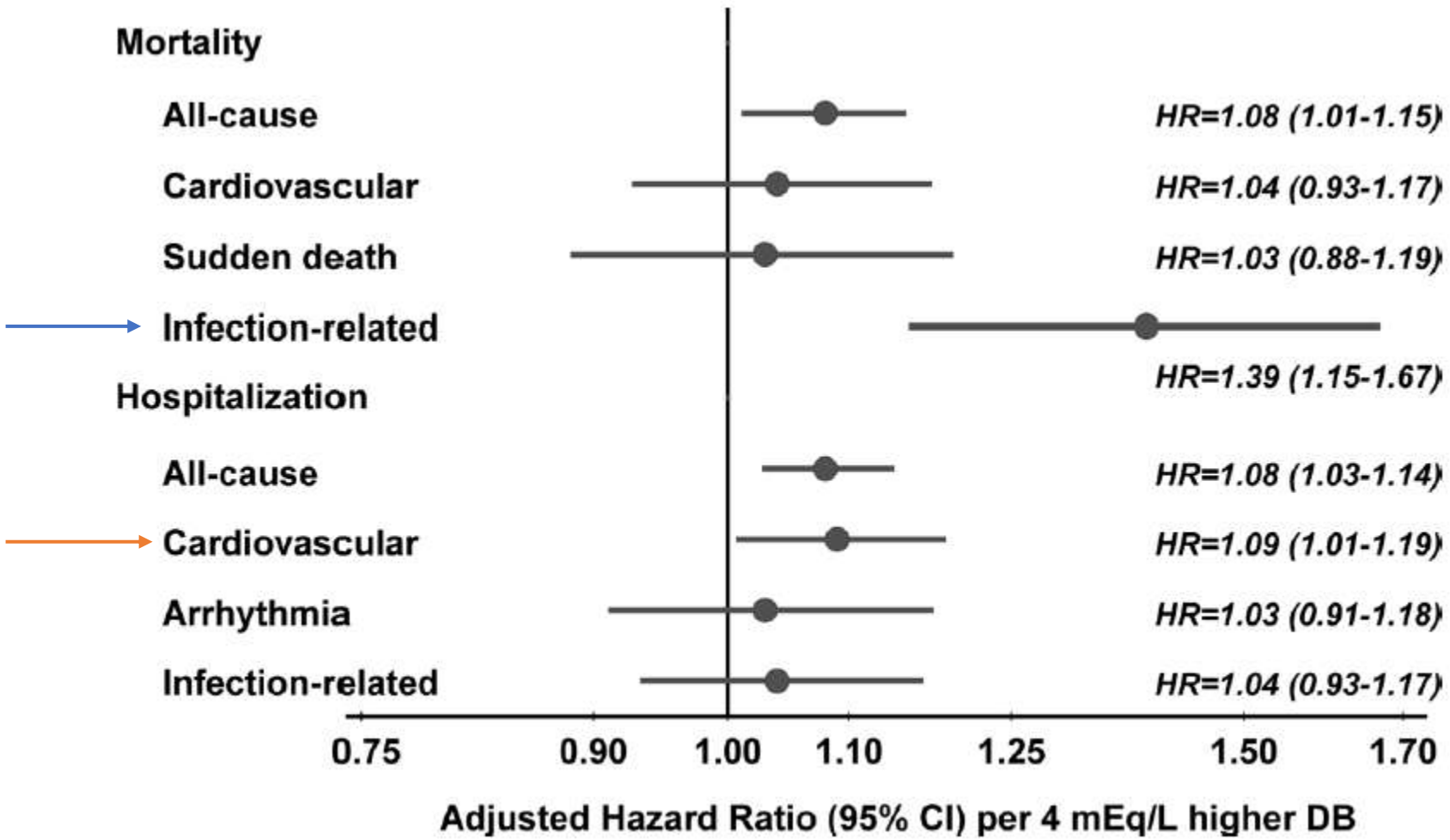


Figure 3. Association between prescribed dialysate bicarbonate (per 4 mEq/L higher) and various clinical outcomes

Published in final edited form as:
Am J Kidney Dis. 2013 October ; 62(4): . doi:10.1053/j.ajkd.2013.03.035.

Association of Dialysate Bicarbonate Concentration With Mortality in the Dialysis Outcomes and Practice Patterns Study (DOPPS)

Francesca Tentori, MD[1,2], Angelo Karaboyas, MS[1], Bruce M. Robinson, MD, MS[1,3], Hal

DOPPS: avantage de prescrire bicarbonates < 32 mmol/L pour la survie

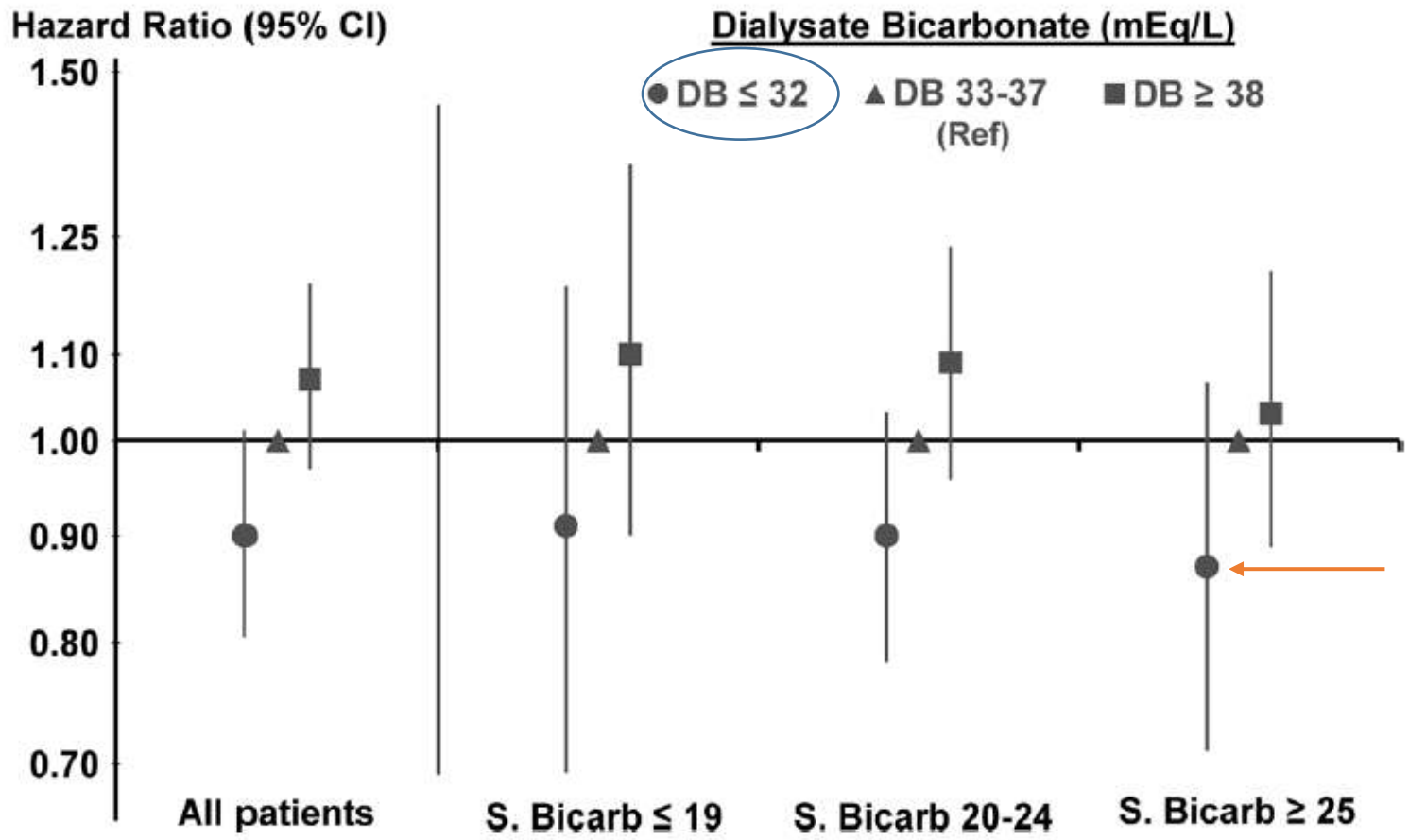


Figure 4. Association between 3 categories of prescribed dialysate bicarbonate and all-cause mortality, overall and by serum bicarbonate

Published in final edited form as:
Am J Kidney Dis. 2013 October ; 62(4): . doi:10.1053/j.ajkd.2013.03.035.

Association of Dialysate Bicarbonate Concentration With Mortality in the Dialysis Outcomes and Practice Patterns Study (DOPPS)

Francesca Tentori, MD[1,2], Angelo Karaboyas, MS[1], Bruce M. Robinson, MD, MS[1,3], Hal

C'est bien l'acidose qui est associée à la mortalité

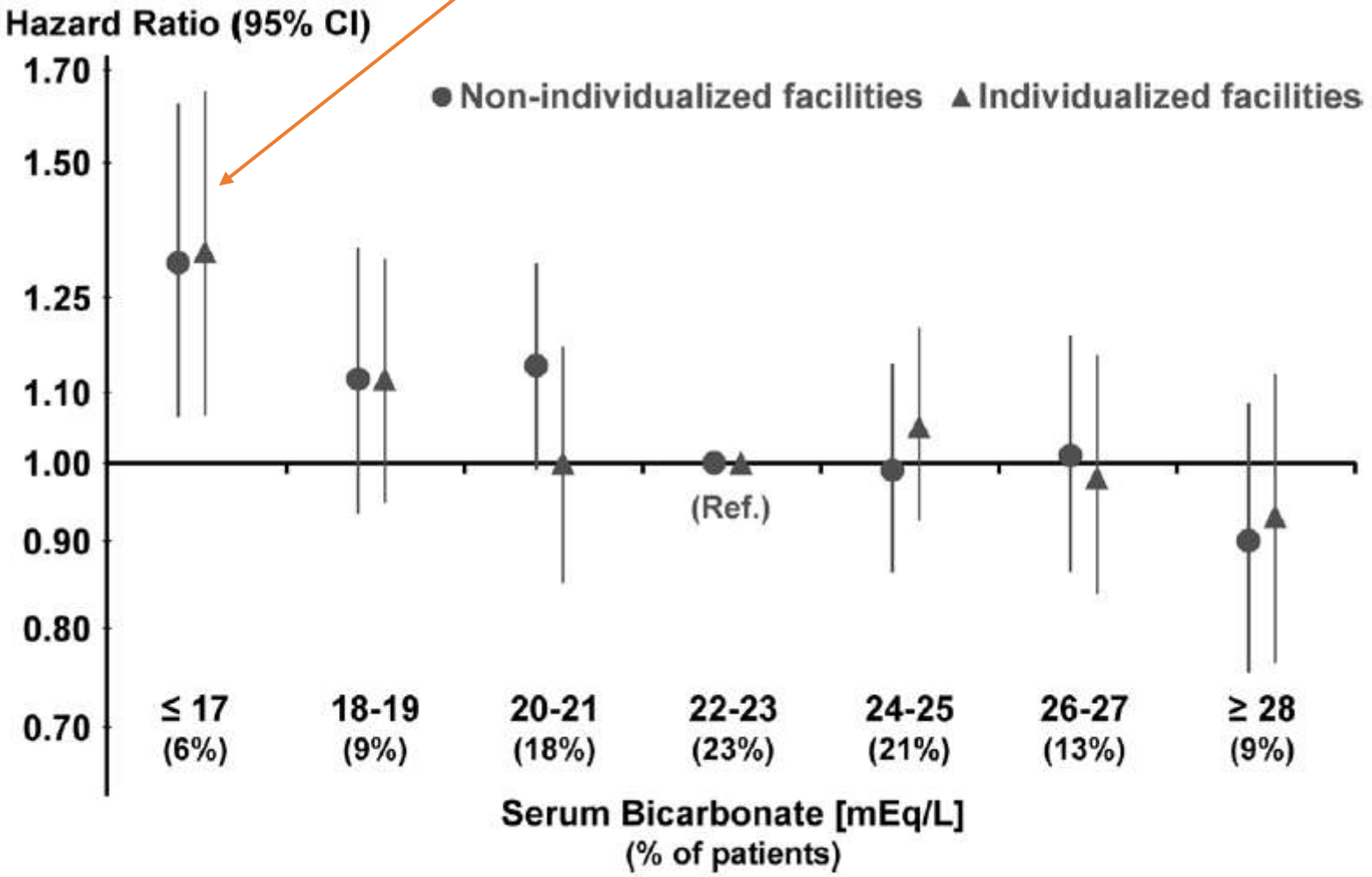
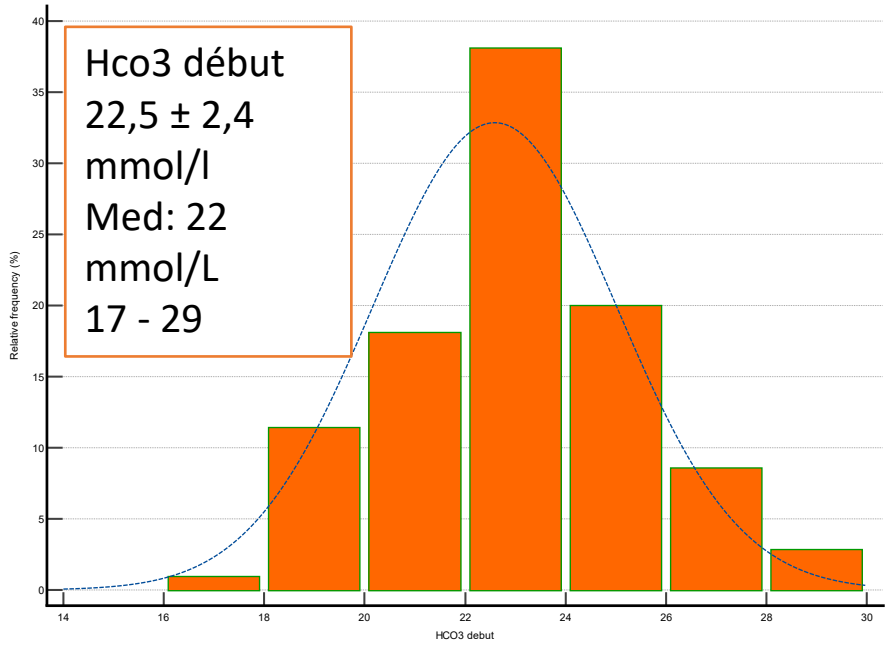


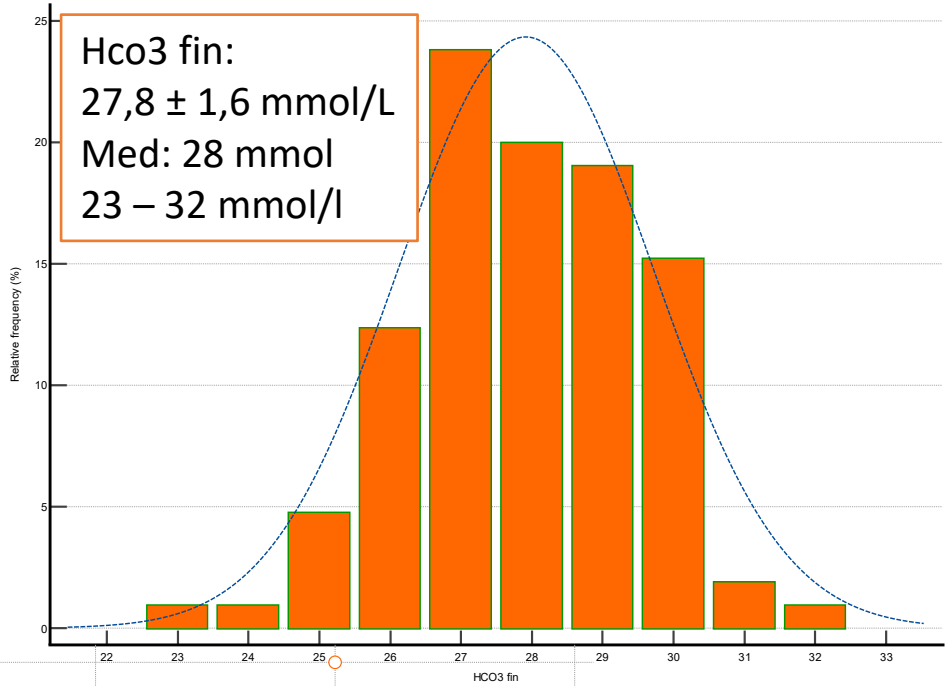
Figure 5. Association between categories of serum bicarbonate and all-cause mortality, in non-individualized and individualized facilities

Hco3 début
22,5 ± 2,4 mmol/l
Med: 22 mmol/L
17 - 29

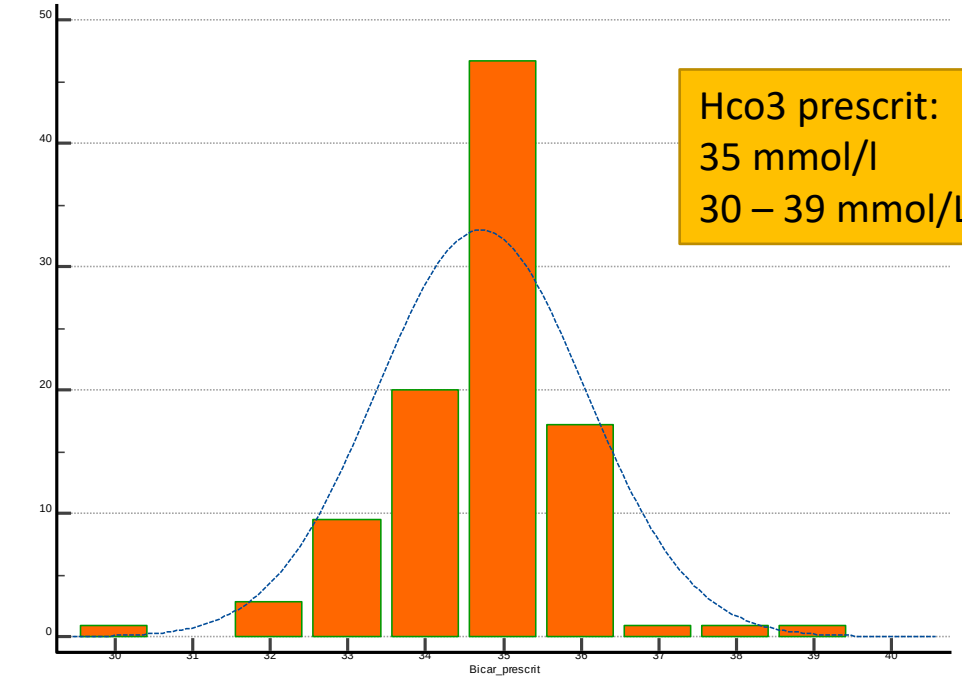


Tassin 2025
Personal data

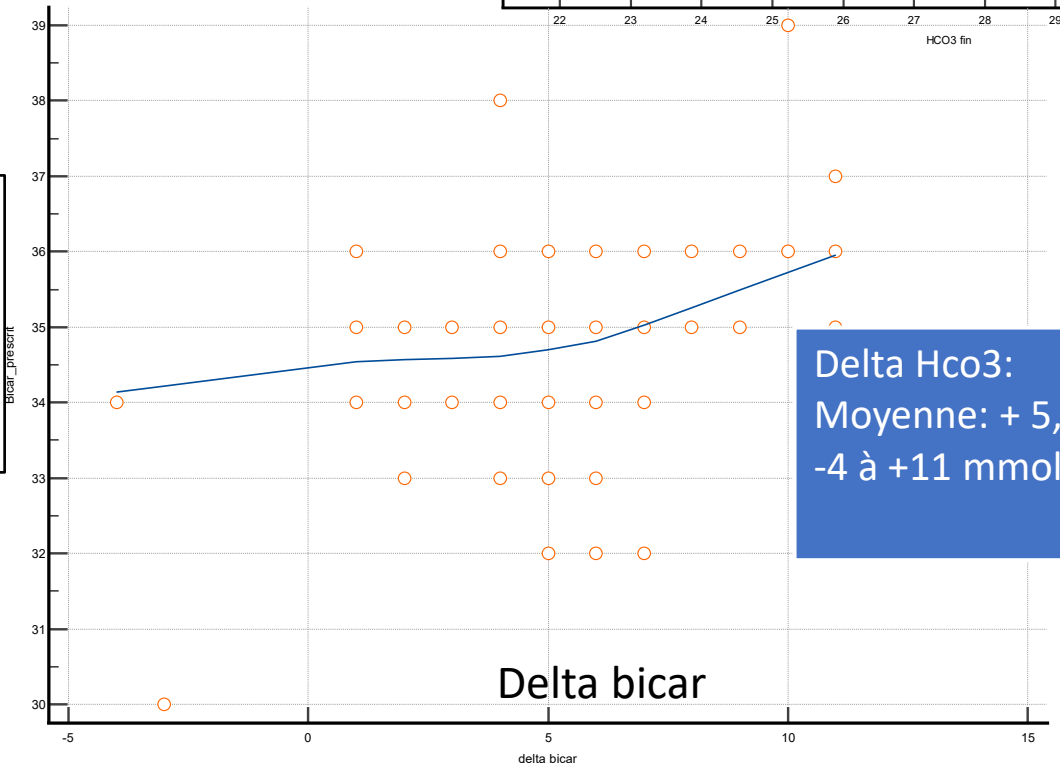
Hco3 fin:
27,8 ± 1,6 mmol/L
Med: 28 mmol
23 – 32 mmol/l



Hco3 prescrit:
35 mmol/l
30 – 39 mmol/L



Bicar prescrit



Delta Hco3:
Moyenne: + 5,2 ± 2,7 mmol/L
-4 à +11 mmol/L

Prescription bicarbonates

Les prescriptions de bicarbonates élevés sont associées à la mortalité et aux hospitalisations sans doute en rapport avec une acidose métabolique

En France et surtout aux USA les bicarbonates prescrits sont (trop?) élevés

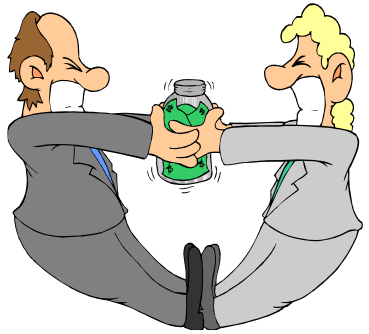
L'alcalose post dialyse est associées à une symptomatologie (Céphalées, hypotension, arythmie…)

Prescription initiale 32 mmol/L ?

Ajustement pour Hco3 post dialyse < 28 mmol/L

En cas d'acidose pré-dialyse: **penser à l'alcalinisation orale** (bicarbonate de sodium).

Biologie	Début dialyse
Na mmol/L	135
K+	3,5
Ca++	2,5
Hco3+	25
PTH pg/ml	18



?

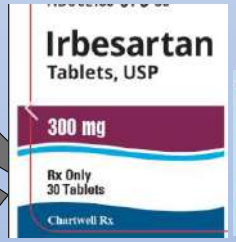
Menu

Na mmol/L	140
K+	2
Ca++	1,5
Hco3+	35

Carte

Na mmol/L	135
K+	3
Ca++	1,25
Hco3+	30

… mais la dialyse ne peut (doit) pas tout faire !



Conclusions: prescrire les ions de la dialyse

Manque d'étude clinique prospective: mortalité CV au long terme et mort subite en dialyse (**menu vs à la carte**)

Recommandations insuffisantes

L'individualisation de la prescription des ions en dialyse paraît raisonnable

avec la **prescription inter-dialytique** (Diététique, diurétiques, antihypertenseurs, résines, bicarbonate de Na, calcium, vitamines D, calcimimétiques…)