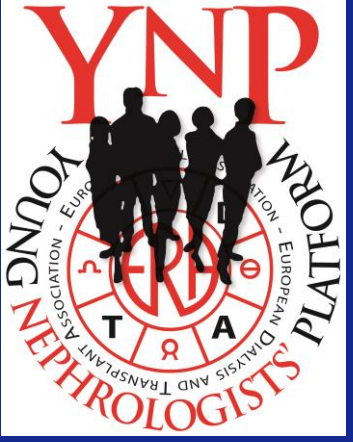


University Health Network

Predictors of Transplant Outcomes in Wait-Listed Dialysis Patients

Miklos Z Molnar, MD, PhD

Chair of Young Nephrologists' Platform of ERA-EDTA

Nephrology Fellow

University of Toronto, University Health Network, Toronto, ON, Canada

BNS, 08/30/2013, Budapest, Hungary

Financial Disclosure Statement

- None

Q1: The pre-transplant obesity/higher weight is associated with worse post-transplant mortality.

- A) True
- B) False

Q2: Waitlisted hemodialysis patient with BMI=32 kg/m^2 should lose weight while he/she is on hemodialysis to get transplanted.

- A) True
- B) False

Q3: Which dialysis patients have the best survival chance after transplantation?

- A) Patient with serum albumin= 3.5 mg/dL
- B) Patient with serum albumin= 3.2 mg/dL
- C) Patient with serum albumin= 4.2 mg/dL
- D) Patient with serum albumin= 2.5 mg/dL

Q4: High PTH level before transplantation is increased the risk of post-transplant mortality.

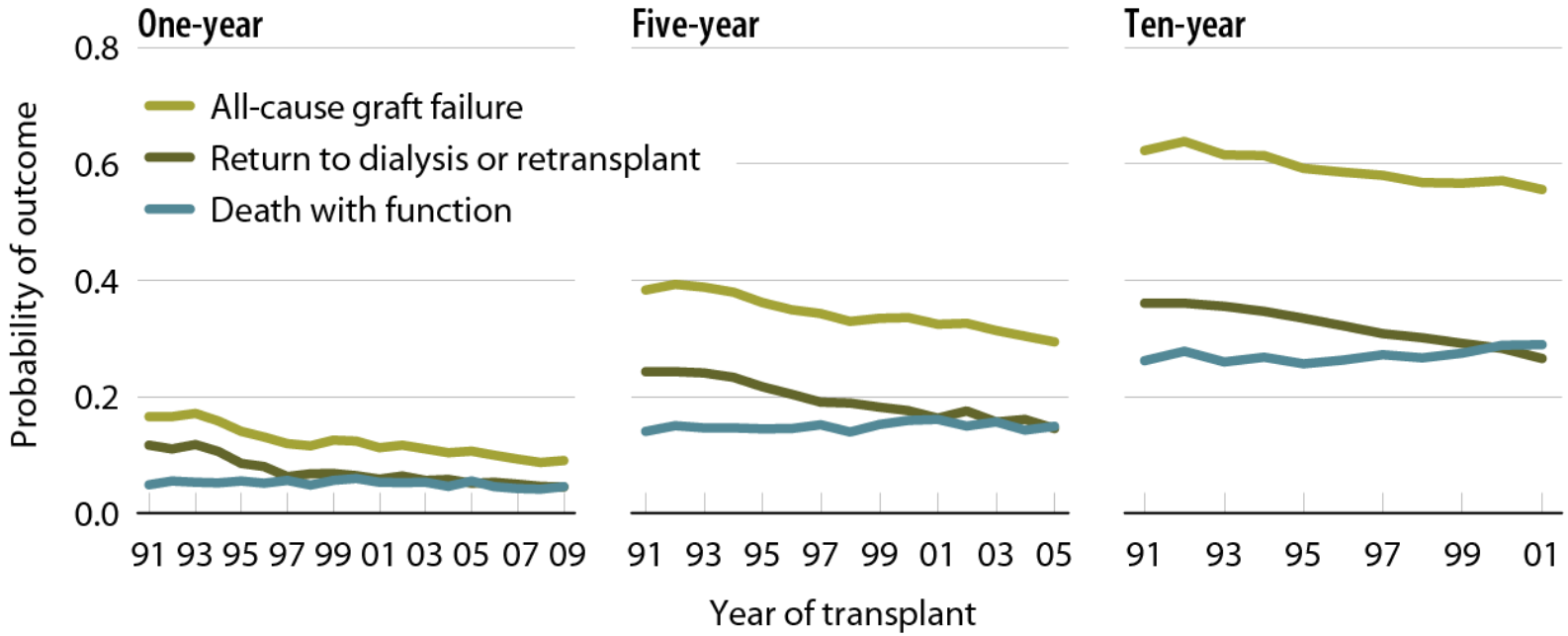
- A) True
- B) False

Q5: Patients on peritoneal dialysis is doing better after transplantation than hemodialysis counterparts.

- A) Likely true
- B) Likely false
- C) True because they usually have less severe comorbidities
- D) False because they are usually sicker than HD patients

Outcomes: deceased donor transplants

Figure 7.17 (Volume 2)



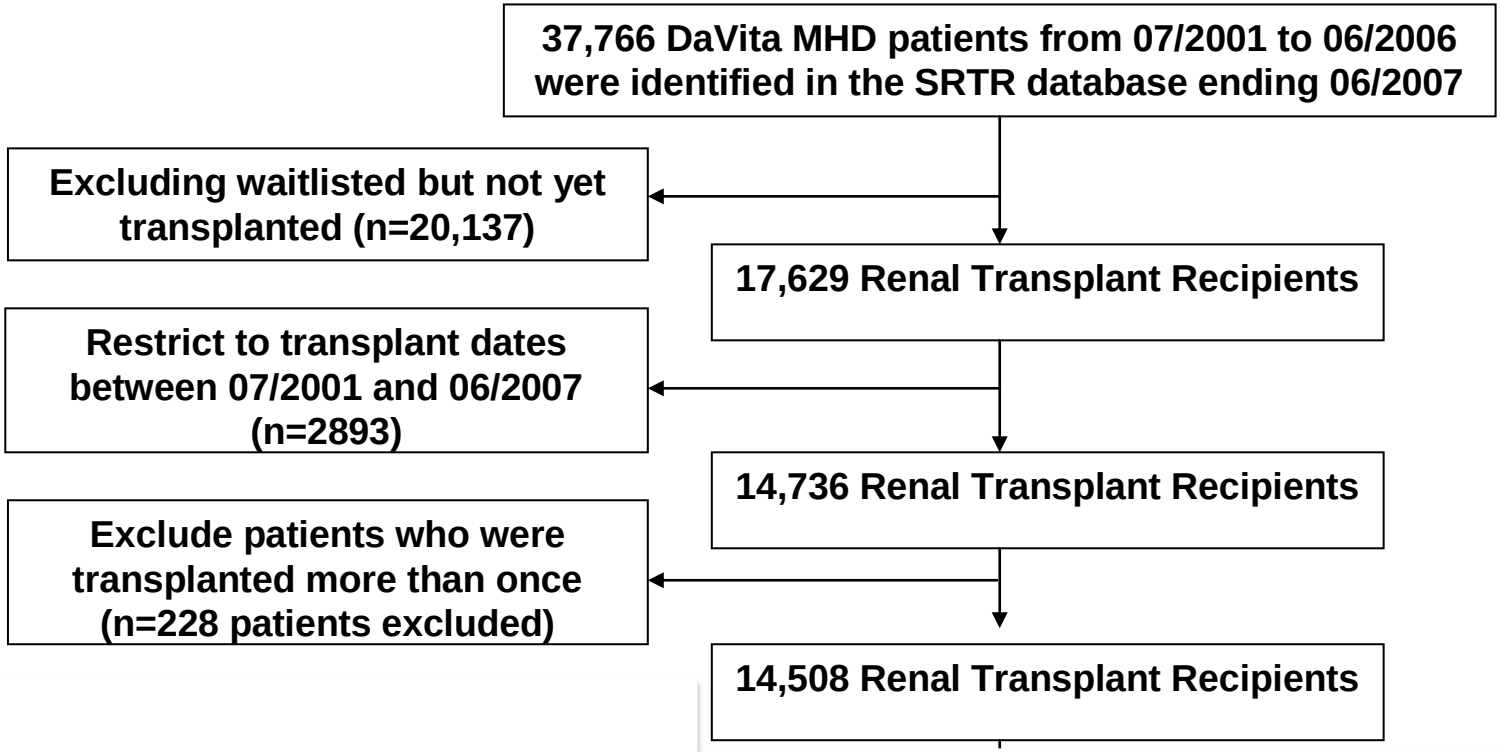
Patients age 18 & older receiving a first-time, kidney-only transplant; unadjusted.

Pre-Transplant Risk Stratification

Pre-Transplant Conditions → Post Transplant Outcomes

- In dialysis patients who are wait-listed for a kidney transplant, it is important to know what affects their post-transplant outcomes:
  (Transplant kidney survival? Recipient survival?)
  - **Pre-Transplant Weight and Body Composition**
  - **Pre-Transplant Albumin**
  - **Pre-Transplant Glycemic Control**
  - **Pre-Transplant Minerals & Bone Disorders**
  - **Pre-Transplant Dialysis Modality: HD vs. PD**
  - **Pre-Transplant ESA responsiveness**
  - **Pre-Transplant Blood Pressure**

The Dialysis→Transplant Cohort



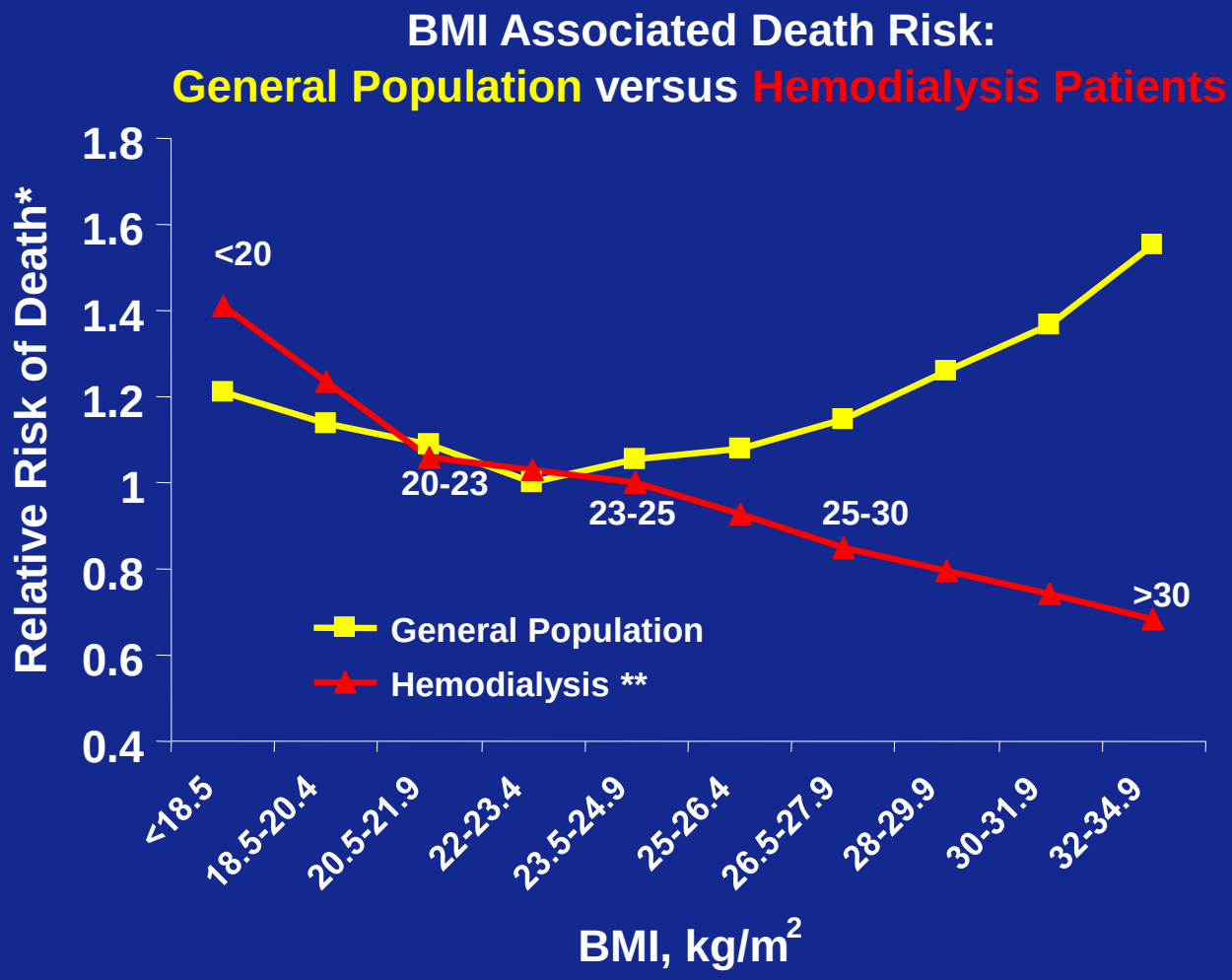
n=14,508 dialysis Patients

who received their first kidney transplant during 07/2001 – 06/2007

(A)

Pre-Transplant
Weight & Body Composition
and
Post-Transplant Outcomes

Obesity Paradox or Reverse Epidemiology in Dialysis Patients



Kalantar-Zadeh et al. *Kidney Int*. 2003;63:793-808.

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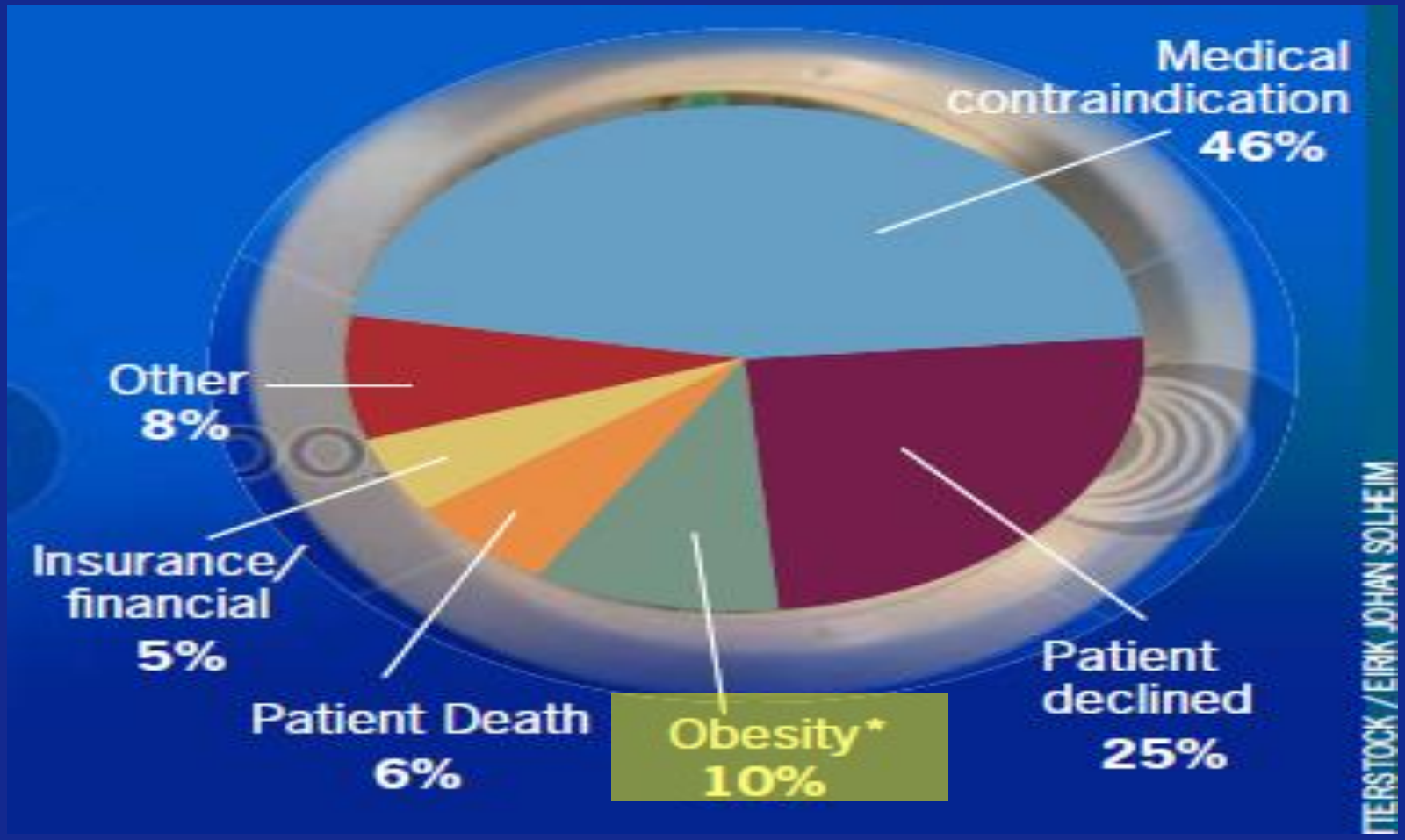
Obesity (BMI>35 kg/m2): A major cause of kidney transplant denial in dialysis patients



Holley … Bronsther. An examination of the renal transplant evaluation process focusing on cost and the reasons for patient exclusion. *Am J Kidney Dis*. 1998; 32:567-574

American Journal of Transplantation 2011; 11: 725–736
Wiley Periodicals Inc.

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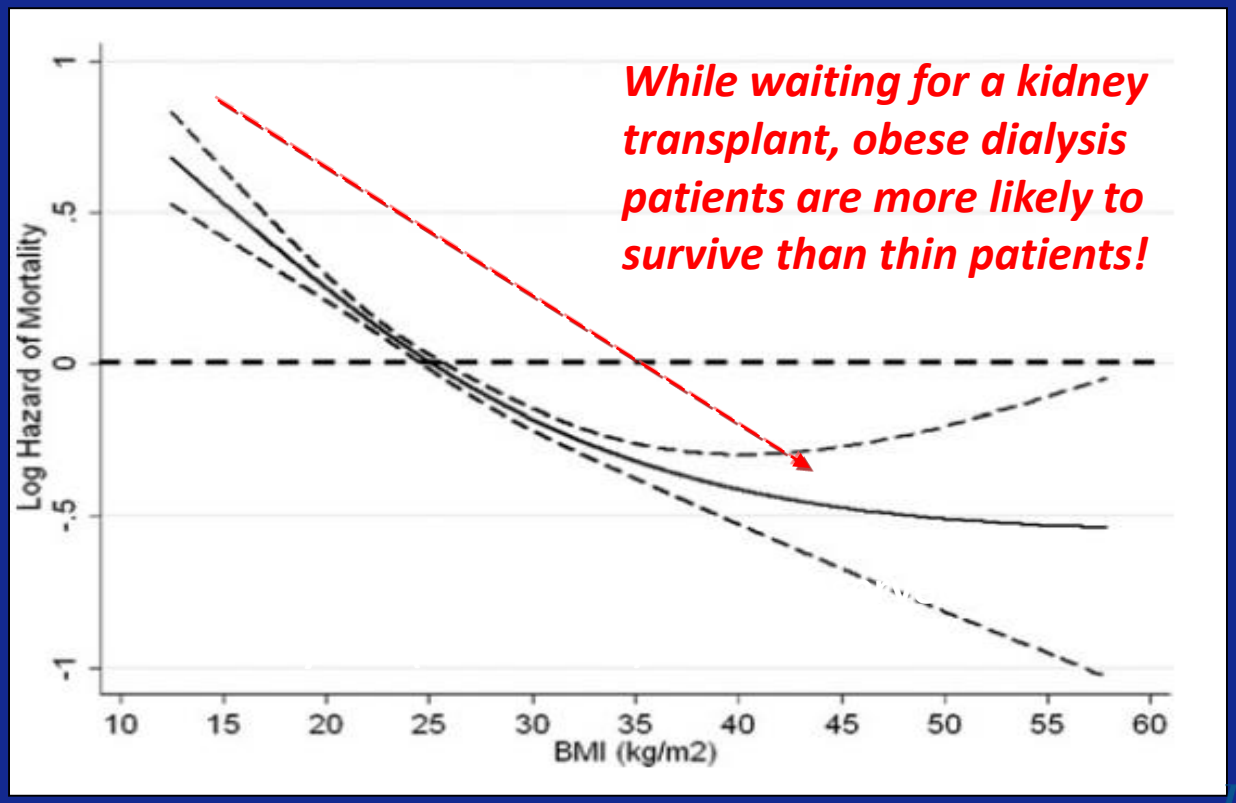
doi: 10.1111/j.1600-6143.2011.03468.x

Am J Transplant 2011

Associations of Body Mass Index and Weight Loss with Mortality in Transplant-Waitlisted Maintenance Hemodialysis Patients

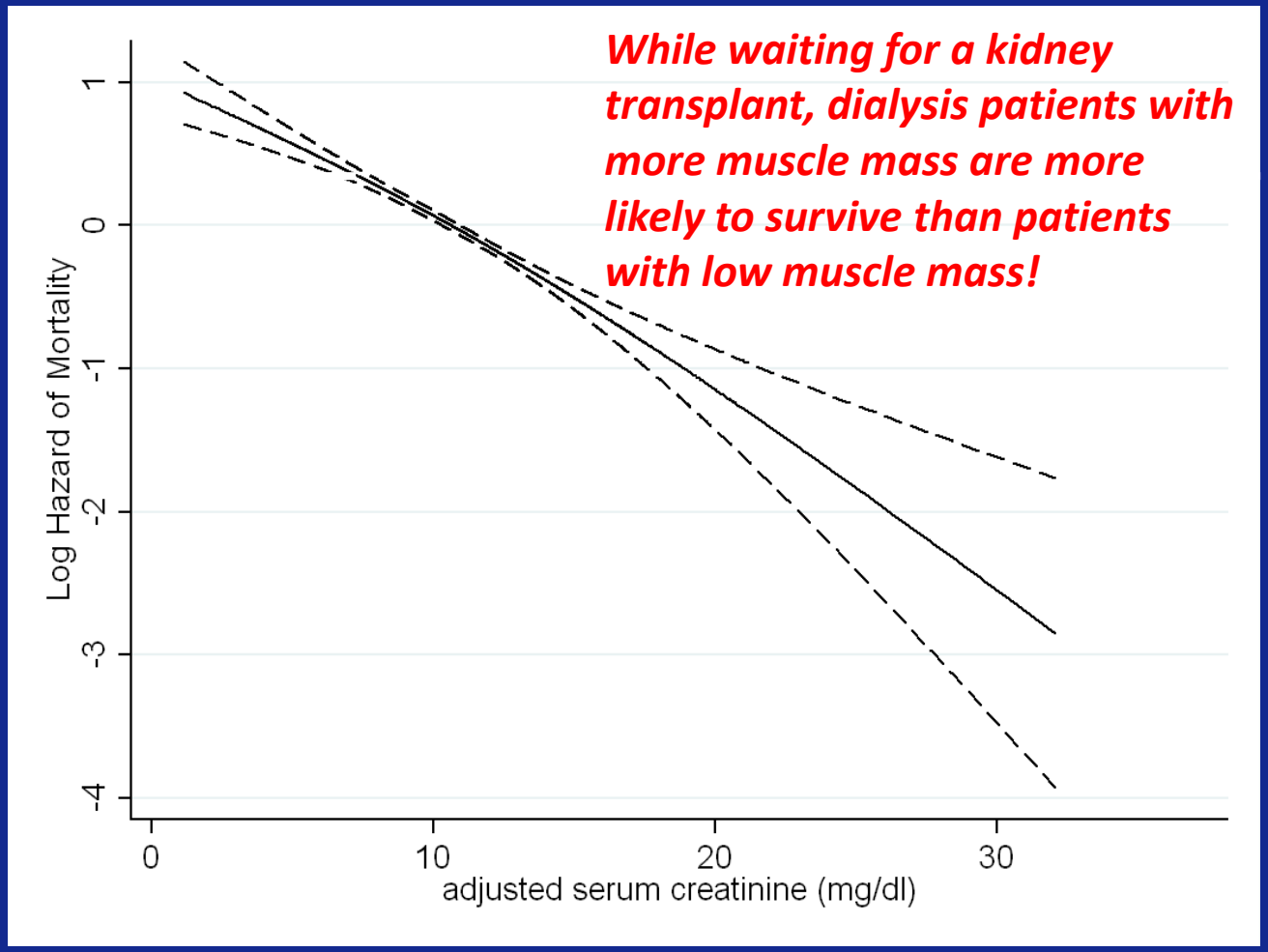
M. Z. Molnar[a,b], E. Streja[a,c], C. P. Kovesdy[d,e], S. Bunnapradist[f], M. S. Sampaio[f], J. Jing[a], M. Krishnan[g], A. R. Nissenson[g], G. M. Danovitch[g,h] and K. Kalantar-Zadeh[a,b,f,*]



Molnar … Kalantar-Zadeh, ***Am J Transplant.*** 2011

DaVita
DaVita Clinical Research

Serum Creatinine (Surrogate of MUSCLE) in Dialysis Patients: → Outcomes



Molnar … Kalantar-Zadeh, ***Am J Transplant.*** 2011

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doi: 10.1111/j.1600-6143.2011.034

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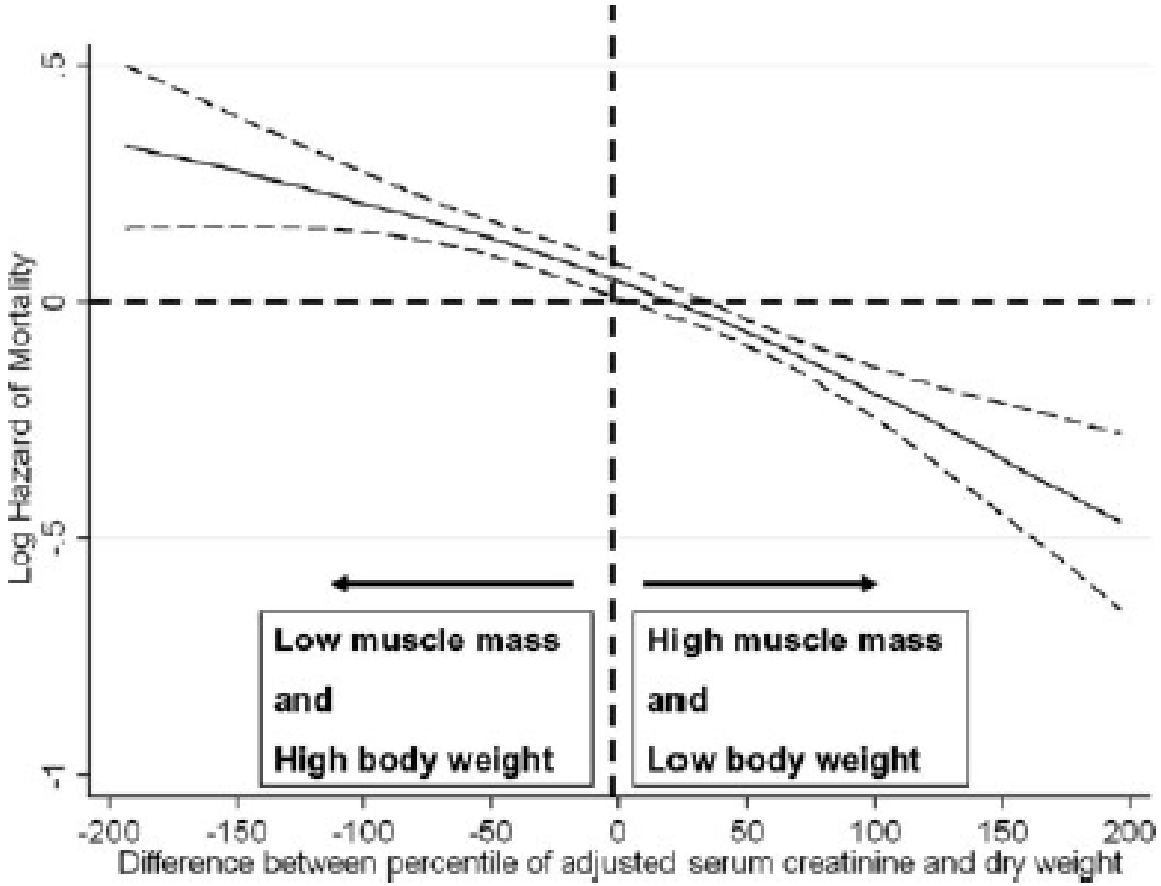

Figure 7: Cubic splines models of Cox proportional regression to examine the mortality predictability of the combinations of the dry weight and in adjusted serum creatinine levels over a 6-year observation period (7/2001–6/2007). The Y-axis shows the logarithm of the risk ratio of all-cause mortality over 6 years based on a multivariable Cox regression spline model, adjusted for case-mix. Dashed lines are 95% point wise confidence levels. Each patient received a percentile score between −100 and +100 according to the percentile rank of the change in dry weight or adjusted serum creatinine. The *difference* between adjusted serum creatinine concentration and dry weight in each patient also resulted in a number between −200 and +200.

DaVita Clinical Research

American Journal of Transplantation 2011; 11: 725–736
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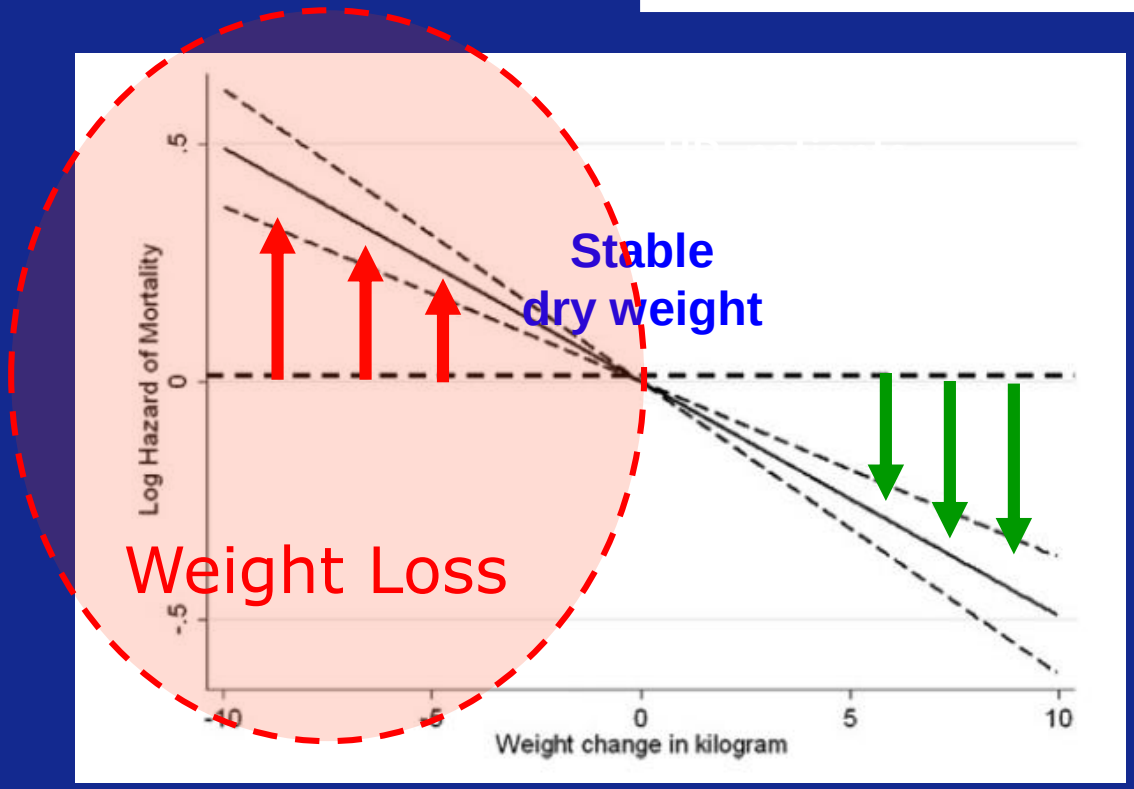

Molnar … Kalantar-Zadeh, ***Am J Transplant.*** 2011

American Journal of Transplantation 2011; 11: 725–736
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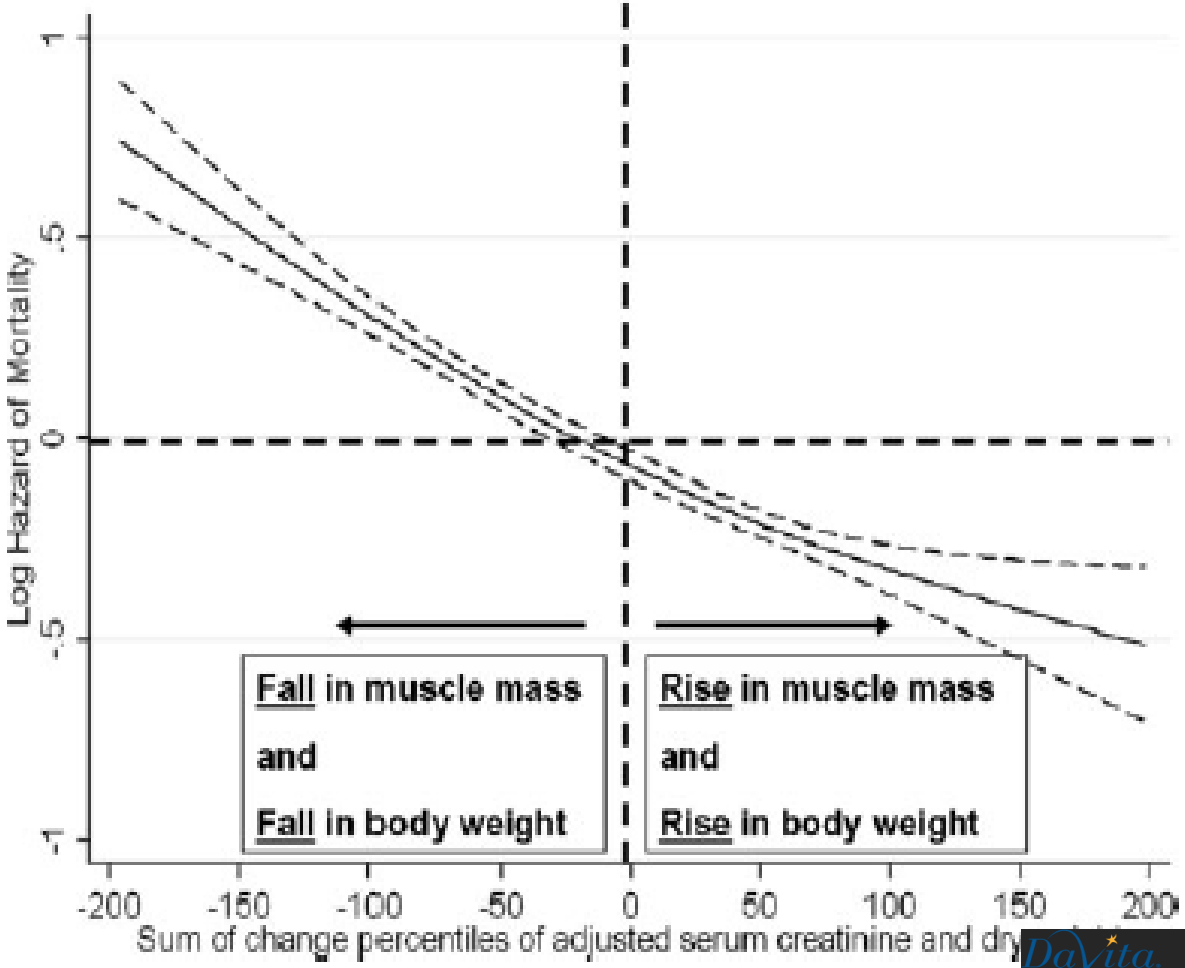


Figure 8: Cubic splines models of Cox proportional regression to examine the mortality predictability of the combinations of the changes in dry weight and in adjusted serum creatinine levels over a 6-year observation period (7/2001–6/2007). The Y-axis shows the logarithm of the risk ratio of all-cause mortality over 6 years based on a multivariable Cox regression spline model, adjusted for case-mix. Dashed lines are 95% point wise confidence levels. Each patient received a percentile score between −100 and +100 according to the percentile rank of the change in dry weight or adjusted serum creatinine. The *sum* of the two percentile scores for each patient resulted in a number between −200 and +200.

DaVita Clinical Research

The Survival Benefit of Kidney Transplantation in Obese Patients

J. S. Gill[1,2,3], J. Lan[1], J. Dong[1], C. Rose[1], E. Hendren[1], O. Johnston[1] and J. Gill[1,2,*]

American Journal of Transplantation 2013; 13: 2083–2090

- Comparing 208,498 waitlisted dialysis patients with 118,662 kidney transplant recipients from the same period (1995-2007)
- Source of data: USRDS
- Stratified by BMI and race

Table 3: Risk of death in transplant recipients compared to wait-listed patients with the same body mass index 1 year after transplantation

	SCD recipients	ECD recipients	LD recipient
BMI < 18.5	0.33 (0.26, 0.41)	0.30 (0.21, 0.42)	0.35 (0.24, 0.52)
BMI 18.5–24.9	0.34 (0.30, 0.39)	0.37 (0.32, 0.42)	0.20 (0.15, 0.26)
BMI 25.0–29.9	0.32 (0.28, 0.37)	0.43 (0.38, 0.50)	0.30 (0.22, 0.47)
BMI 30.0–34.9	0.32 (0.26, 0.39)	0.42 (0.35, 0.51)	0.23 (0.17, 0.32)
BMI 35.0–39.0	0.34 (0.26, 0.46)	0.39 (0.24, 0.52)	0.28 (0.14, 0.50)
BMI ≥ 40.0	0.52 (0.37, 0.72)	0.54 (0.33, 0.78)	0.34 (0.19, 0.59)

Separate multivariate nonproportional hazards analyses with transplantation treated as a time-dependent covariate to account for the fact that patients switched treatment from dialysis to transplantation at different times. Models adjusted for differences in patients characteristics including age, gender, cause of ESRD, history of comorbid conditions (ischemic heart disease, cerebrovascular disease, congestive heart failure, peripheral vascular disease, cancer), year of wait-listing and propensity score for transplantation.

The Survival Benefit of Kidney Transplantation in Obese Patients

J. S. Gill[1,2,3], J. Lan[1], J. Dong[1], C. Rose[1], *American Journal of Transplantation 2013; 13: 2083–2090*

Table 4: Risk of death in Black and White transplant recipients compared to wait-listed patients with the same body mass index 1 year after transplantation

	SCD recipients	ECD recipients	LD recipient
BMI < 18.5			
Black	0.40 (0.30, 0.60)	0.23 (0.11, 0.46)	0.43 (0.18, 1.00)
White	0.29 (0.21, 0.39)	0.29 (0.21, 0.42)	0.26 (0.21, 0.54)
BMI 18.5–24.9			
Black	0.35 (0.27, 0.59)	0.42 (0.31, 0.57)	0.26 (0.15, 0.35)
White	0.29 (0.25, 0.35)	0.35 (0.29, 0.41)	0.22 (0.17, 0.25)
BMI 25.0–29.9			
Black	0.30 (0.22, 0.41)	0.47 (0.35, 0.62)	0.28 (0.23, 0.76)
White	0.33 (0.28, 0.39)	0.35 (0.26, 0.40)	0.30 (0.20, 0.42)
BMI 30.0–34.9			
Black	0.34 (0.24, 0.49)	0.53 (0.37, 0.75)	0.30 (0.16, 0.32)
White	0.33 (0.24, 0.41)	0.36 (0.28, 0.41)	0.23 (0.16, 0.33)
BMI 35.0–39.9			
Black[1]	0.41 (0.24, 0.78)	0.77 (0.50, 1.22)	0.40 (0.27, 0.66)
White	0.35 (0.24, 0.49)	0.42 (0.29, 0.62)	0.32 (0.20, 0.52)
BMI ≥ 40.0			
Black[2]	0.56 (0.33, 1.08)	0.76 (0.08, 1.12)	0.75 (0.31, 1.80)
White	0.54 (0.33, 0.82)	0.44 (0.25, 0.76)	0.22 (0.07, 0.67)

Separate multivariate nonproportional hazards analyses with transplantation treated as a time-dependent covariate to account for the fact that patients switched treatment from dialysis to transplantation at different times. Models adjusted for differences in patients characteristics including age, gender, cause of ESRD, history of comorbid conditions (ischemic heart disease, cerebrovascular disease, congestive heart failure, peripheral vascular disease, cancer), year of wait-listing.

[1]There were n = 5785 Black patients with BMI 35.0–39.9 including n = 671 who received and ECD transplant during follow-up.

[2]There were n = 3832 Black patients with BMI ≥ 40 including n = 763, n = 335 and n = 350 who received and SCD, ECD and LD transplant during follow-up.

The Survival Benefit of Kidney Transplantation in Obese Patients

J. S. Gill[1,2,3], J. Lan[1], J. Dong[1], C. Rose[1], E. Hendren[1], O. Johnston[1] and J. Gill[1,2,*]

American Journal of Transplantation 2013; 13: 2083–2090

Table 5: Time (days) to equal risk of death and equal survival* in transplant recipients compared to wait-listed patients with the same body mass index

	<18.5 (n = 13 714)	18.5–24.9 (n = 67 260)	25–29.9 (n = 64 655)	30–34.9 (n = 37 453)	35–39.9 (n = 16 070)	≥40 (n = 9 346)
Death rate on waiting list per 100 patient years	5	5	6	6	6	6
Days to equal risk of death						
SCD	68	50	70	80	85	145
ECD	135	95	90	160	150	200
LD	55	Immediate	33	57	60	65
Days to equal survival						
SCD	118	100	137	210	179	245
ECD	216	226	210	331	257	387
LD	116	Immediate	75	121	135	157

*Calculated from separate multivariate nonproportional hazards regression models.

A 'Weight-Listing' Paradox for Candidates of Renal Transplantation?

American Journal of Transplantation 2007; 7: 550–559

J.D. Schold[a,c,*], T.R. Srinivas[a], G. Guerra[a], A.I. Reed[b], R.J. Johnson[a], I.D. Weiner[a,d], R. Oberbauer[e], J.S. Harman[c], A.W. Hemming[b] and H.U. Meier-Kriesche[a]

USRDS (1990-2003)
18-70 years old
124,713 patients received transplant

Table 5: Adjusted cox proportional hazard for overall graft loss associated with rate of BMI change during waitlisted period

	Waitlisted BMI								
	Underweight or normal weight (<25 kg/m^2)			Overweight (25–30 kg/m^2)			Obese (>30 kg/m^2)		
Rate of Change	n	Hazard ratio	95% CI	n	Hazard ratio	95% CI	n	Hazard ratio	95% CI
>12%	9153	1.13	1.09–1.18	4128	1.15	1.08–1.21	1945	1.07	0.96–1.16
+8 to 12%	2613	1.06	0.99–1.14	1405	1.06	0.97–1.16	702	1.04	0.92–1.19
+4 to 8%	4479	0.93	0.88–0.98	2515	1.02	0.95–1.10	1321	1.03	0.93–1.13
−4 to +4%	24 377	Ref	–	16 901	Ref	–	10 691	Ref	–
−8 to −4%	2523	1.07	1.00–1.14	2204	1.02	0.95–1.10	1858	1.04	0.95–1.13
−12 to −8%	1339	1.05	0.96–1.15	1222	1.04	0.95–1.15	985	1.01	0.90–1.13
<−12%	4707	1.07	1.02–1.13	3748	1.10	1.04–1.17	3167	1.00	0.93–1.08

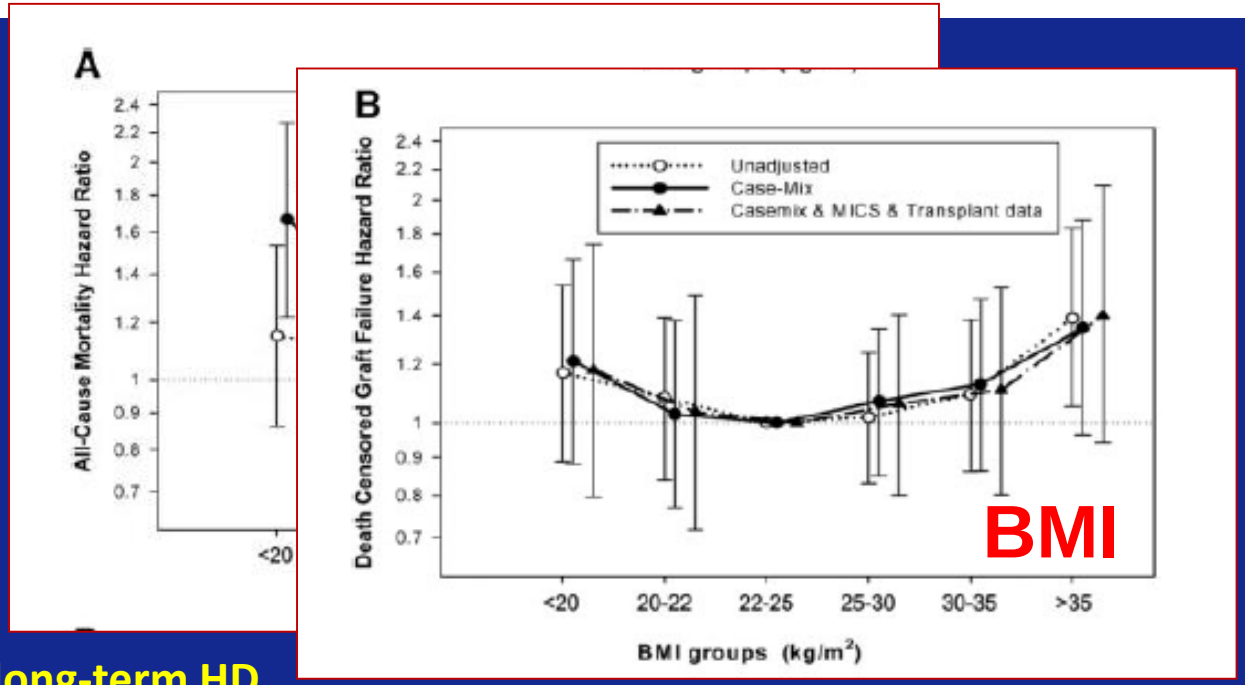
Rate of change calculated as percentage change divided by time to transplant (in years). Models adjusted for recipient primary diagnosis, gender, age, race, time of pretransplant dialysis, donor age, donor race and number of HLA-mismatches. Reference group is patients with −4 to +4% rate of change during listing.
BMI = body mass index.

CJASN ePress. Published on May 26, 2011

Associations of Pretransplant Weight and Muscle Mass with Mortality in Renal Transplant Recipients

CJASN 2011

Elani Streja,[†] *Miklos Z. Molnar,*[*‡] *Csaba P. Kovesdy*[§‖] *Suphamai Bunnapradist*[¶] *Jennie Jing,*[*] *Allen R. Nissenson,*[¶**] *Istvan Mucsi,*[††] *Gabriel M. Danovitch,*[¶] *and Kamyar Kalantar-Zadeh*[*†¶]



N= 10,090 long-term HD patients who underwent renal transplantation and were observed over a 6-year observation period (July 2001 to June 2007).

Streja, Molnar … Kalantar-Zadeh, ***CJASN.*** 2011

DaVita Clinical Research

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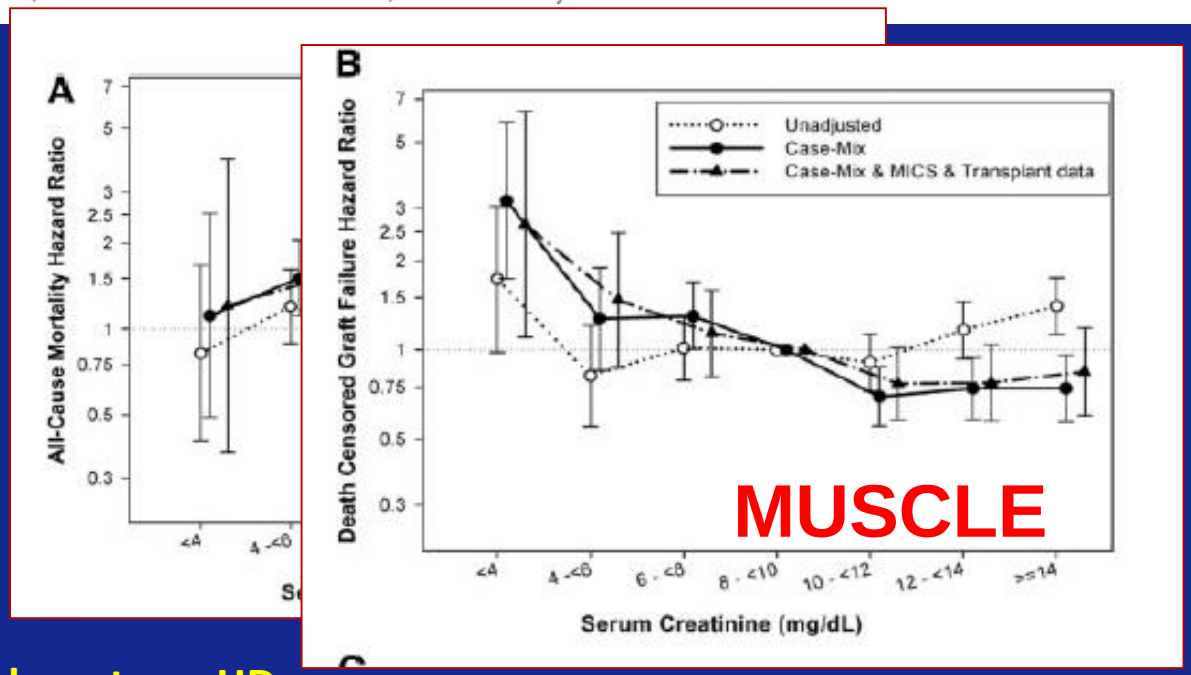

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CJASN 2011

Conclusions: *Pre*-transplant obesity does <u>not</u> appear to be associated with poor *post*-transplant outcomes.

Clin J Am Soc Nephrol 6: 1463–1473, 2011.

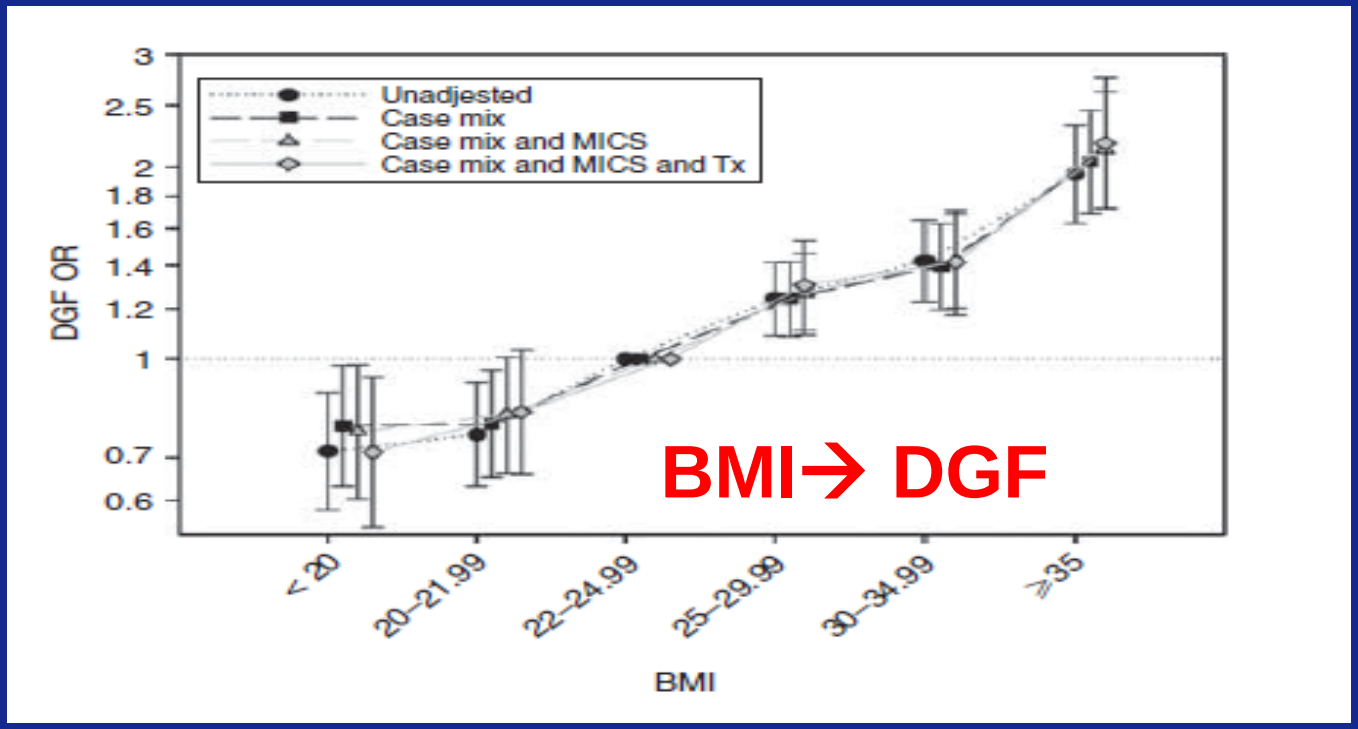
Streja , Molnar… Kalantar-Zadeh, ***CJASN.*** 2011

http://www.kidney-international.org
original article
© 2011 International Society of Nephrology

Kidney Int 2011

Higher recipient body mass index is associated with post-transplant delayed kidney graft function

Miklos Z. Molnar[1,2], Csaba P. Kovesdy[3,4], Istvan Mucsi[2,5,6], Suphamai Bunnapradist[7], Elani Streja[1], Mahesh Krishnan[8] and Kamyar Kalantar-Zadeh[1,7,9]



Molnar … Kalantar-Zadeh, ***Kidney Int.*** 2011

DaVita Clinical Research

Editorial

Interpreting Body Composition in Kidney Transplantation: Weighing Candidate Selection, Prognostication, and Interventional Strategies to Optimize Health

Krista L. Lentine,† David Axelrod,‡ and Kevin C. Abbott§*

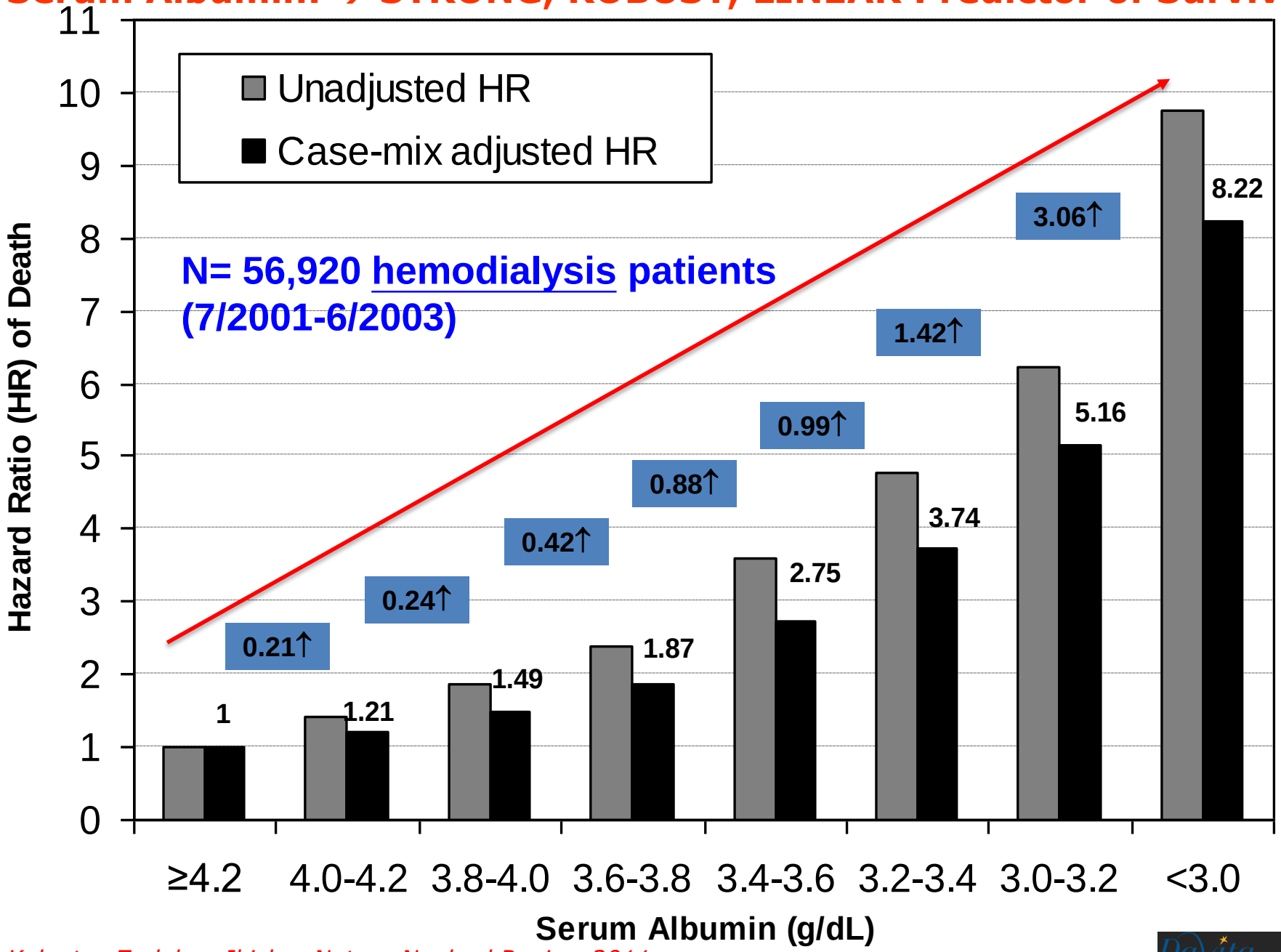
Clin J Am Soc Nephrol 6: 1238–1240, 2011. doi: 10.2215/CJN.02510311

Although current data have not defined limits of body composition that preclude clinical benefit from transplantation …, work such as the study by Streja *et al.* should be pursued to help define **accurate, practical measures of body composition** that predict clinical outcomes.

(B)

Pre-Transplant
Nutritional/Inflammatory Status
(Serum ALBUMIN)
and
Post-Transplant Outcomes

Serum Albumin: → STRONG, ROBUST, LINEAR Predictor of Survival



Kalantar-Zadeh … Ikizler, Nature Nephrol Review 2011

DaVita Clinical Research

American Journal of Transplantation 2011; 11: 1–10
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doi: 10.1111/j.1600-6143.2011.03480.x

Associations of Pretransplant Serum Albumin with Post-Transplant Outcomes in Kidney Transplant Recipients

Am J Transplant 2011

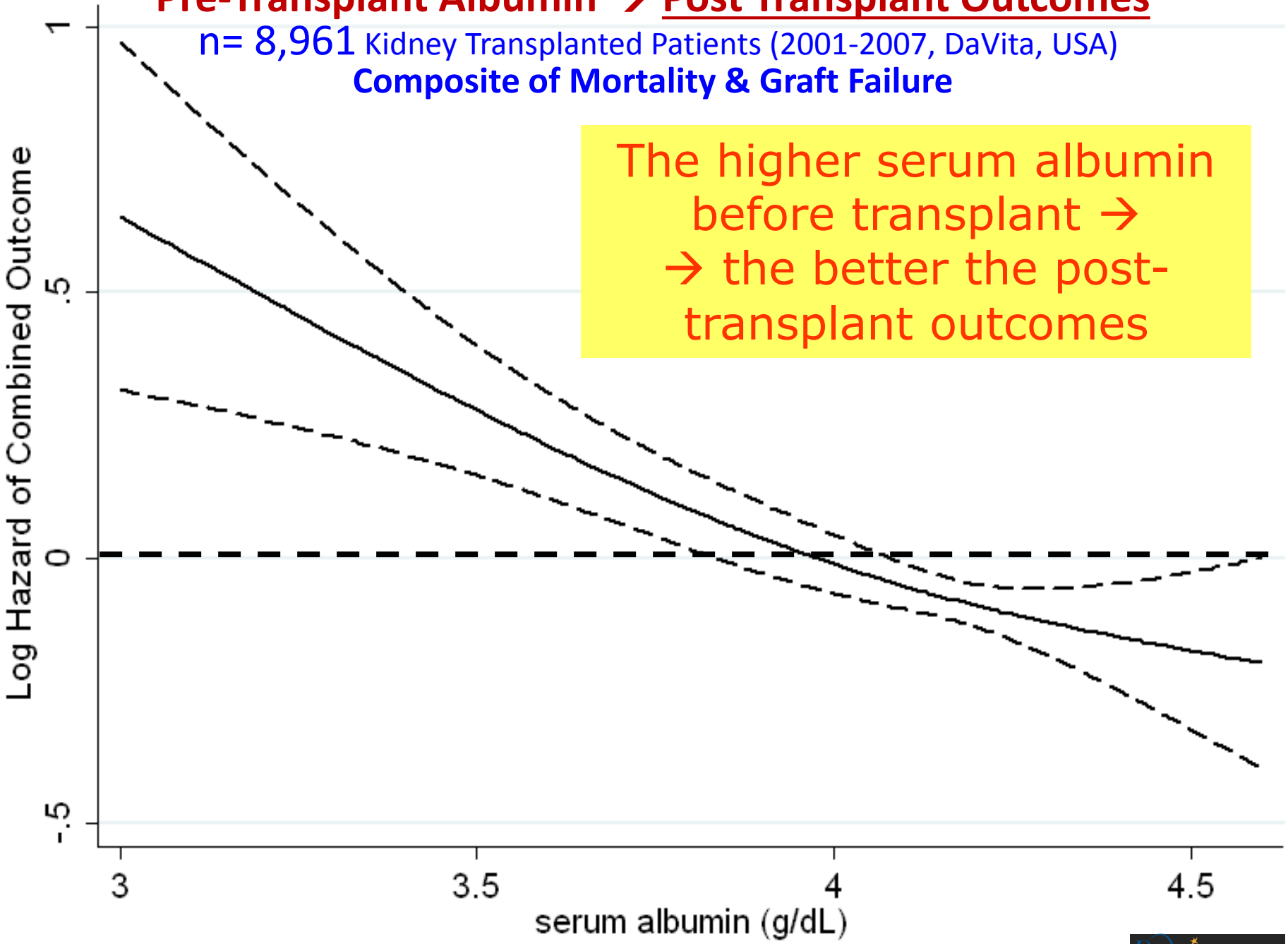
M. Z. Molnar[a,b], C. P. Kovesdy[c,d], S. Bunnapradist[e], E. Streja[a,f], R. Mehrotra[a,e], M. Krishnan[g], A. R. Nissenson[g] and K. Kalantar-Zadeh[a,e,f,*]

Molnar … Kalantar-Zadeh, ***Am J Transplant.*** 2011

Pre-Transplant Albumin → Post Transplant Outcomes

n= 8,961 Kidney Transplanted Patients (2001-2007, DaVita, USA)

Composite of Mortality & Graft Failure



The higher serum albumin before transplant → → the better the post-transplant outcomes

Molnar … Kalantar-Zadeh, ***Am J Transplant,*** 2011

(C)

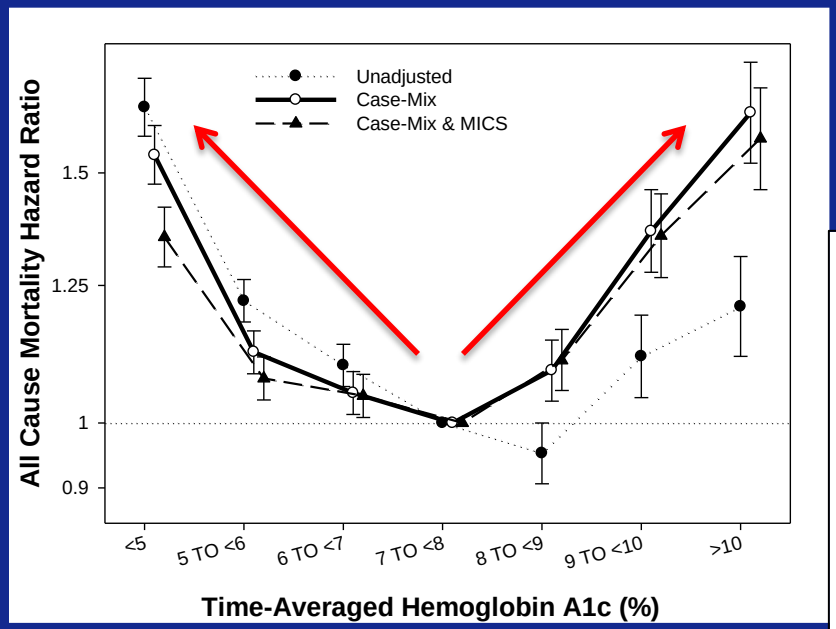
Pre-Transplant
Glycemic Control
(Hb A1c)
and
Post-Transplant Outcomes

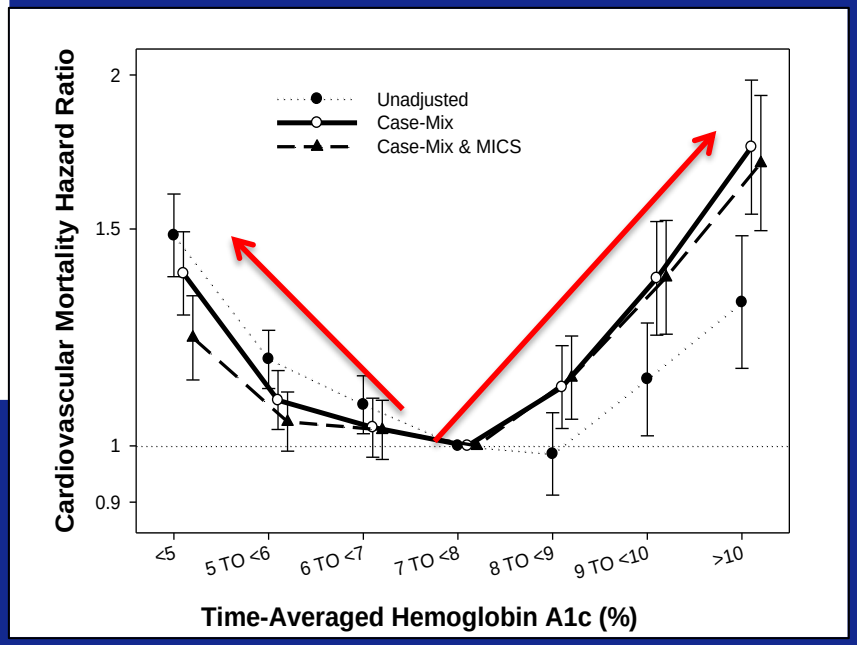
Glycemic Control and Cardiovascular Mortality in Hemodialysis Patients With Diabetes

A 6-Year Cohort Study

Joni Ricks,[1] Miklos Z. Molnar,[1,2] Csaba P. Kovesdy,[3,4] Anuja Shah,[5] Allen R. Nissenson,[6,7] Mark Williams,[8] and Kamyar Kalantar-Zadeh[1,7,8,9]

Diabetes 2012





N= 54,757 long-term HD patients observed over a 5-year observation period (July 2001 to June 2006).

Ricks, Molnar…..Kalantar-Zadeh, ***Diabetes*** 2012

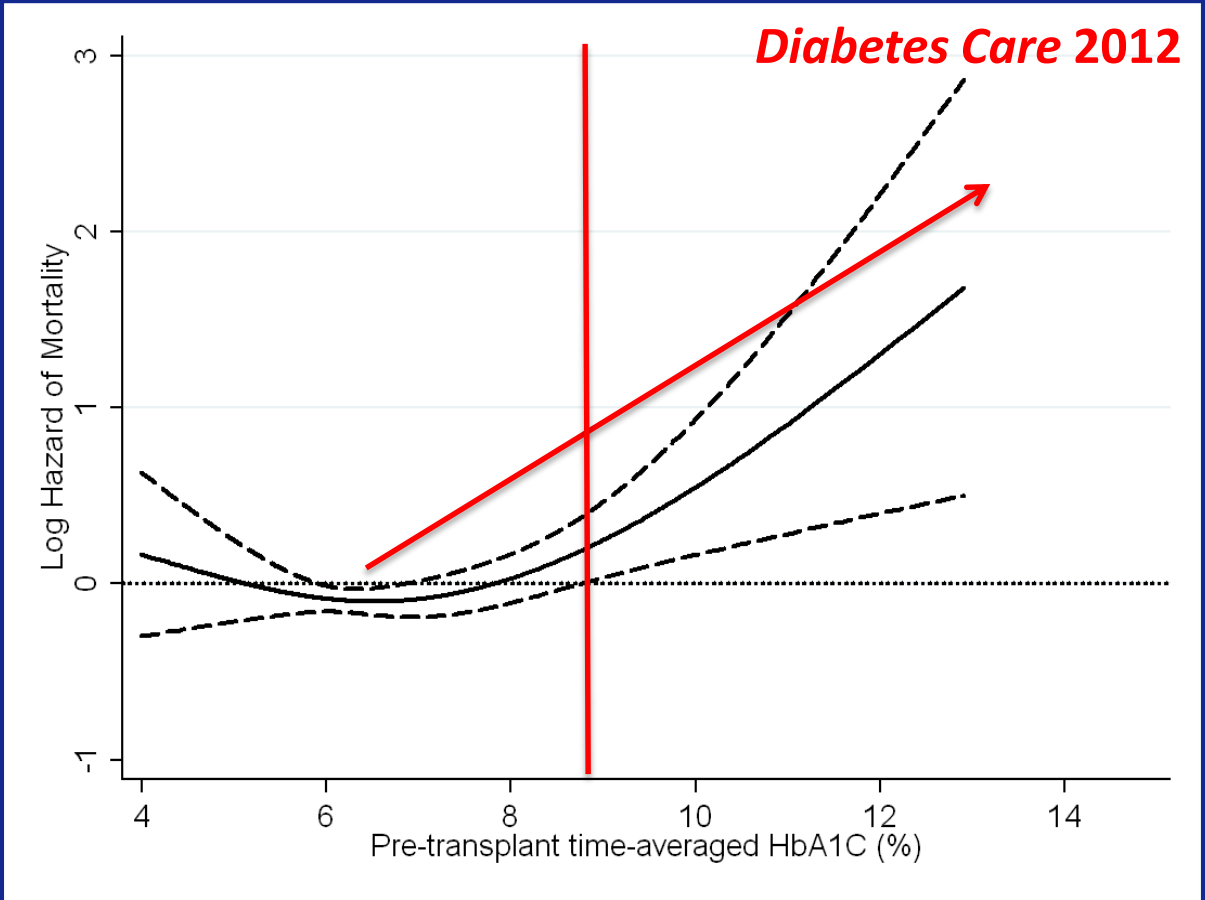
DaVita Clinical Research

Association of Pretransplant Glycemic Control With Posttransplant Outcomes in Diabetic Kidney Transplant Recipients

Molnar….Kalantar-Zadeh, Diab Care, 2012

Miklos Z. Molnar, MD, PhD[1,2]
Edmund Huang, MD[3]
Junichi Hoshino, MD[1,4]
Mahesh Krishnan, MD, MPH, MBA[5]
Allen R. Nissenson, MD[3,5]
Csaba P. Kovesdy, MD[6,7]
Kamyar Kalantar-Zadeh, MD, MPH, PhD[1,3,4]

N= 2,872 long-term dialysis patients who underwent renal transplantation and were observed over a 6-year observation period (July 2001 to June 2007).



DaVita Clinical Research

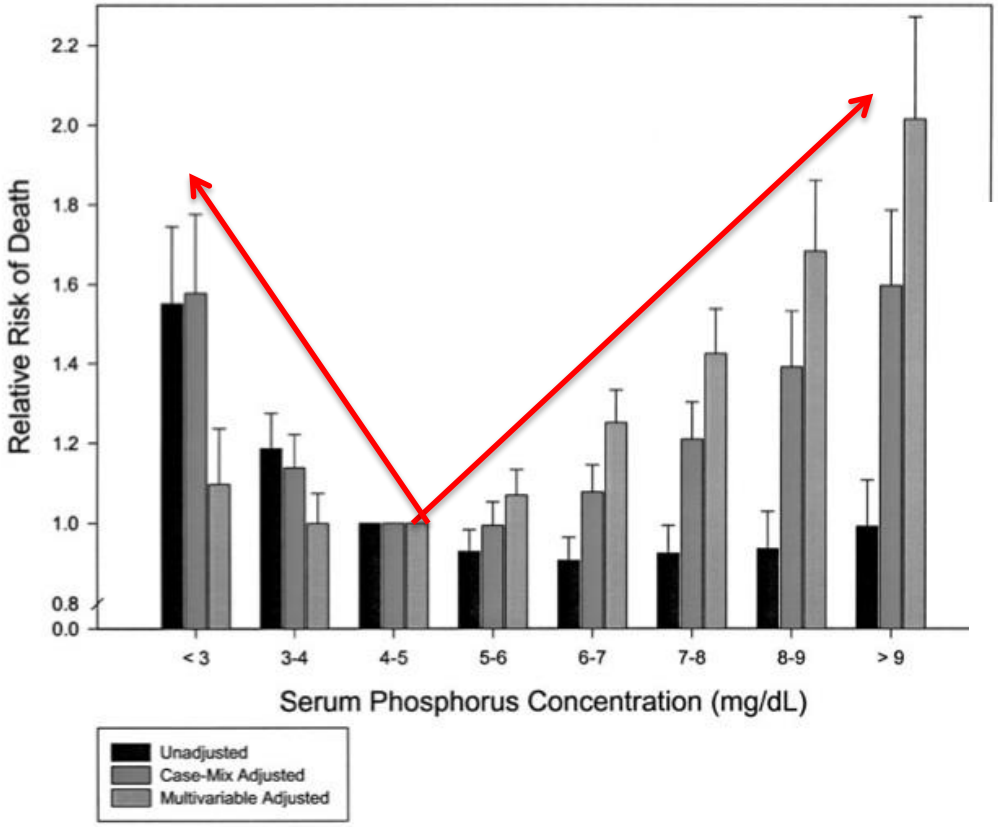
(D)

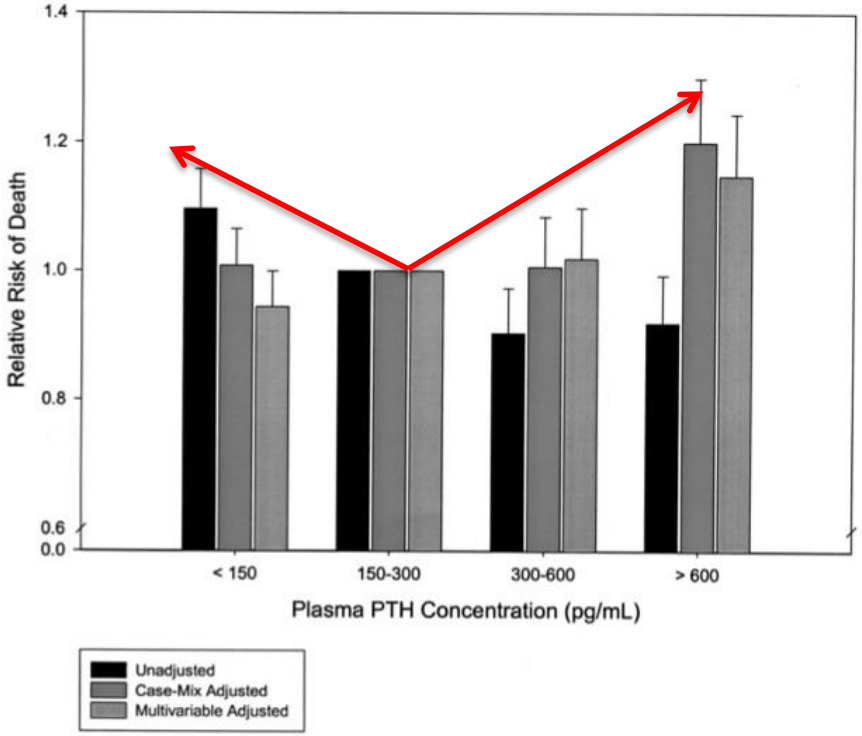
Pre-Transplant
Mineral and Bone Disorders
(Phos, Ca, PTH, Alk.Phos.)
and
Post-Transplant Outcomes

J Am Soc Nephrol 15: 2208–2218, 2004

Mineral Metabolism, Mortality, and Morbidity in Maintenance Hemodialysis

GEOFFREY A. BLOCK,* PRESTON S. KLASSEN,† J. MICHAEL LAZARUS,‡ NORMA OFSTHUN,‡ EDMUND G. LOWRIE,‡ and GLENN M. CHERTOW§





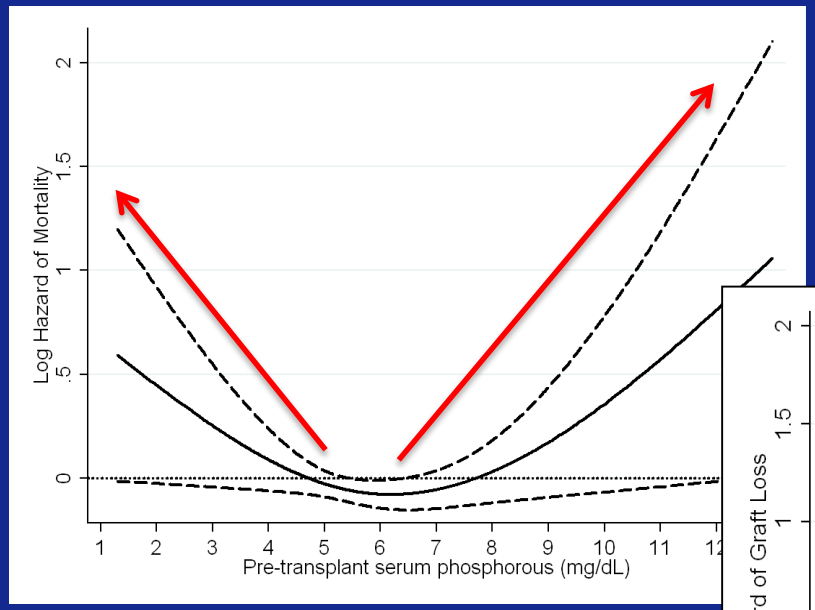
40,538 maintenance HD patient

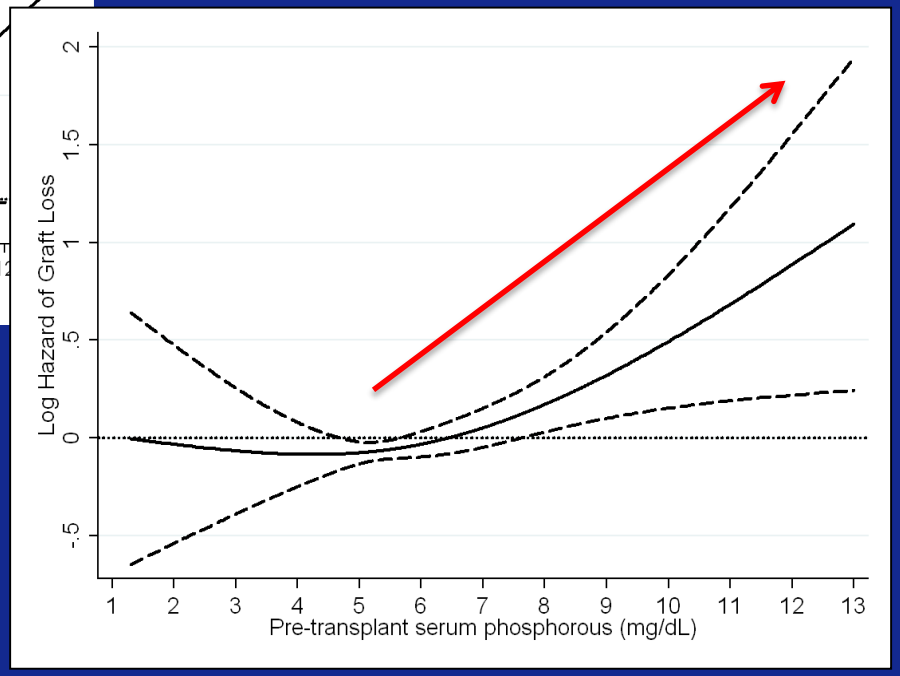
Association of Pretransplant Serum Phosphorus with Posttransplant Outcomes

CJASN 2011

Marcelo S. Sampaio,* Miklos Z. Molnar,*† Csaba P. Kovesdy,‡§ Rajnish Mehrotra,‖ Istvan Mucsi,¶** John J. Sim,†† Mahesh Krishnan,‡‡ Allen R. Nissenson,‡‡ and Kamyar Kalantar-Zadeh*‖§§

Clin J Am Soc Nephrol 6: 2712–2721, 2011.





N= 9,384 long-term dialysis patients who underwent renal transplantation and were observed over a 6-years (2001-2007)

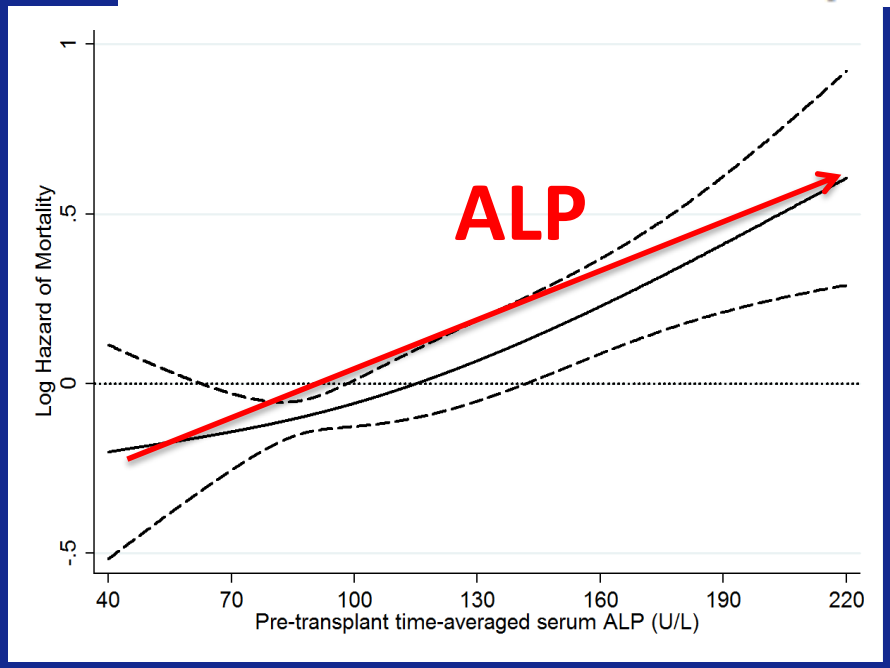
DaVita Clinical Research

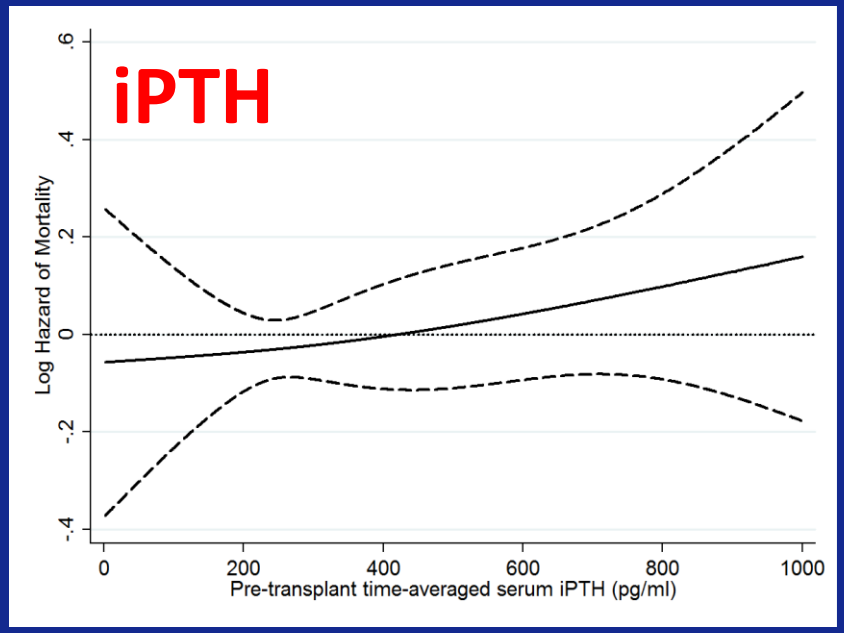
Association of Pre–Kidney Transplant Markers of Mineral and Bone Disorder with Post-Transplant Outcomes

CJASN 2012

Miklos Z. Molnar, Csaba P. Kovesdy, Istvan Mucsi, Isidro B. Salusky, and Kamyar Kalantar-Zadeh

***CJASN ePress*. Published on September 6, 2012 as doi: 10.2215/CJN.01910212**





N= 11,776 long-term dialysis patients who underwent renal transplantation and were observed over a 6-year observation period (July 2001 to June 2007).

DaVita Clinical Research

Associations of Serum Skeletal Alkaline Phosphatase with Elevated C-Reactive Protein and Mortality

Rebecca Filipowicz, Tom Greene,* Guo Wei,* Alfred K. Cheung,*† Kalani L. Raphael,*† Bradley C. Baird,* and Srinivasan Beddhu*†*

Clin J Am Soc Nephrol 8: 26–32, 2013. doi: 10.2215/CJN.12031111

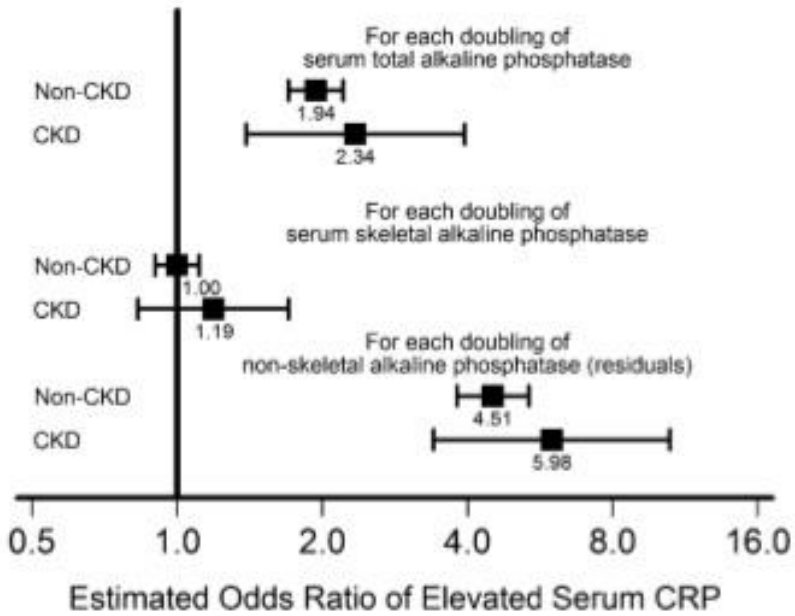


Figure 2. | Associations of serum total, skeletal, and nonskeletal alkaline phosphatase (residuals) levels with elevated serum CRP in non-CKD (*n*=936) and CKD (*n*=9771) subpopulations in the 1999–2004 National Health and Nutrition Examination Survey (*n*=10,707). Adjusted for demographics (age, sex, and race), systolic and diastolic BP, waist circumference, estimated GFR, liver disease, serum calcium, serum phosphorus, serum aspartate transaminase, alanine transaminase, γ-glutamyl transpeptidase, bilirubin, albumin, and hemoglobin. CRP, C-reactive protein.

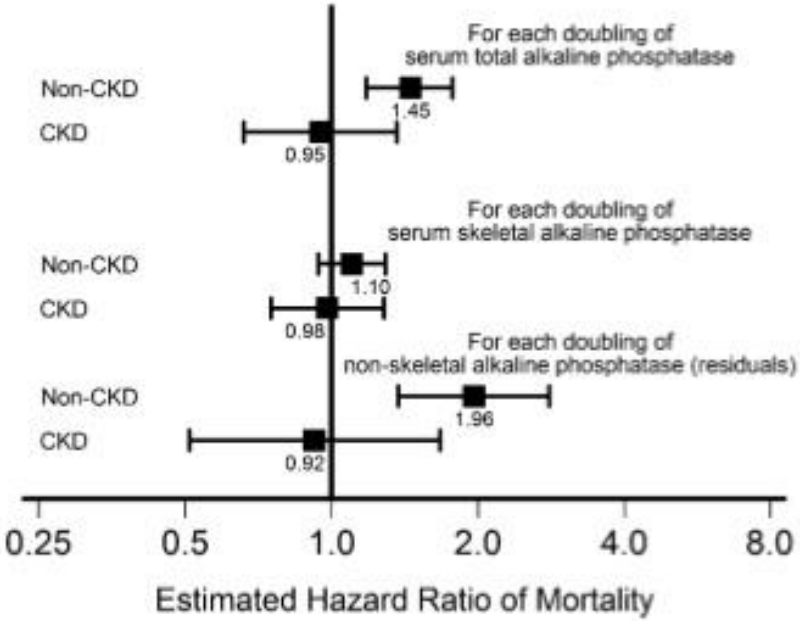


Figure 3. | Associations of serum total, skeletal, and nonskeletal alkaline phosphatase (residuals) levels with mortality in non-CKD (*n*=936) and CKD (*n*=9771) subpopulations in the 1999–2004 National Health and Nutrition Examination Survey (*n*=10707). Adjusted for demographics (age, sex, and race), systolic and diastolic BP, waist circumference, estimated GFR, liver disease, serum calcium, serum phosphorus, serum aspartate transaminase, alanine transaminase, γ-glutamyl transpeptidase, bilirubin, albumin, and hemoglobin.

(E)

Pre-Transplant
Dialysis Modality
(HD vs. PD)
and
Post-Transplant Outcomes

Dialysis Modality (HD vs. PD) and Post-Transplant Outcomes

Who has better post-transplant outcomes (longer kidney and patient survival)?

A. Hemodialysis (HD)?

B. Peritoneal Dialysis (PD)?

A comparison of transplant outcomes in peritoneal and hemodialysis patients

Kidney International, Vol. 62 (2002), pp. 1423–1430

JON J. SNYDER, BERTRAM L. KASISKE, DAVID T. GILBERTSON, and ALLAN J. COLLINS

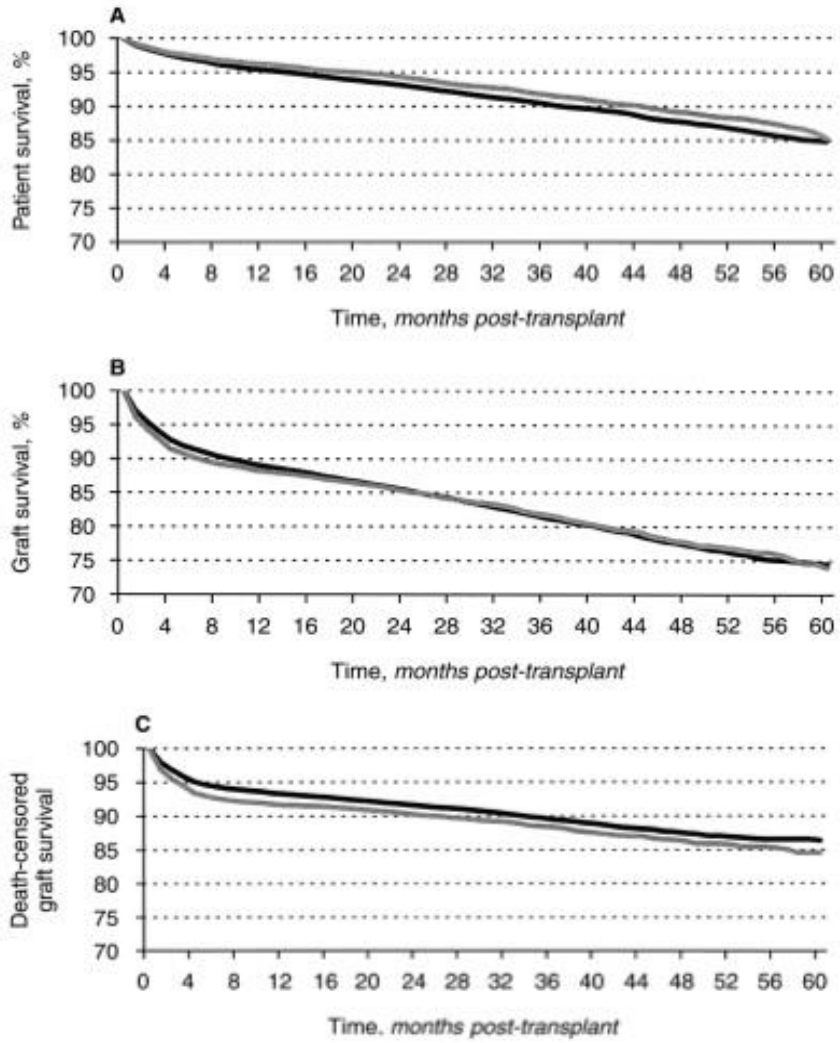


Fig. 2. Unadjusted (Kaplan-Meier) outcomes comparing transplant recipients treated with either peritoneal dialysis (PD, gray line) or hemodialysis (HD, black line) pre-transplant. Shown are mortality (*A*), graft failure due to death, return to dialysis or re-transplantation (*B*), or death-censored graft failure due to dialysis or re-transplantation (*C*). Log rank, $P = 0.001$; Wilcoxon, $P = 0.0002$.

252,402 US patients from Centers for Medicare and Medicaid Service between 1995-1998

Outcome (PD vs HD)

RR of Graft failure

1.05 (0.97-1.13)

RR of Death-Censored Graft failure

1.15 (1.04-1.26)

RR of Death

0.95 (0.85-1.06)

The Role of Pretransplantation Renal Replacement Therapy Modality in Kidney Allograft and Recipient Survival

Alexander S. Goldfarb-Rumyantzev, MD, PhD, John F. Hurdle, MD, PhD, John D. Scandling, MD, Bradley C. Baird, MS, MStat, and Alfred K. Cheung, MD

American Journal of Kidney Diseases, Vol 46, No 3 (September), 2005: pp 537-549

92,844 US patients from USRDS between 1990-2000

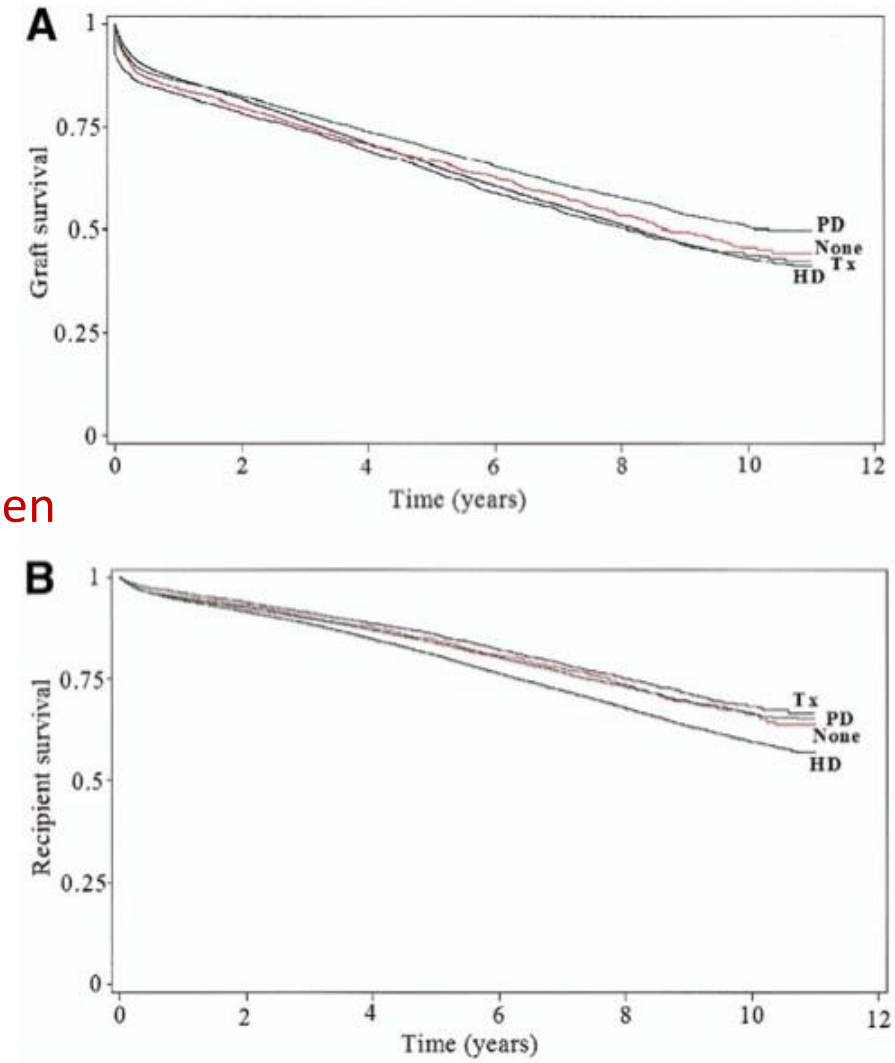


Fig 1. Predominant RRT modality and (A) graft and (B) recipient survival. The worst graft and recipient outcome is associated with HD.

Outcome (PD vs HD)

HR of Graft Survival

0.97 (0.94-1.00)

HR of Recipient Survival

0.94 (0.91-0.97)

The role of pretransplant dialysis modality on renal allograft outcome

Nephrol Dial Transplant (2011) 26: 3761–3766

Vedat Schwenger[1], Bernd Döhler[2], Christian Morath[1], Martin Zeier[1] and Gerhard Opelz[2]

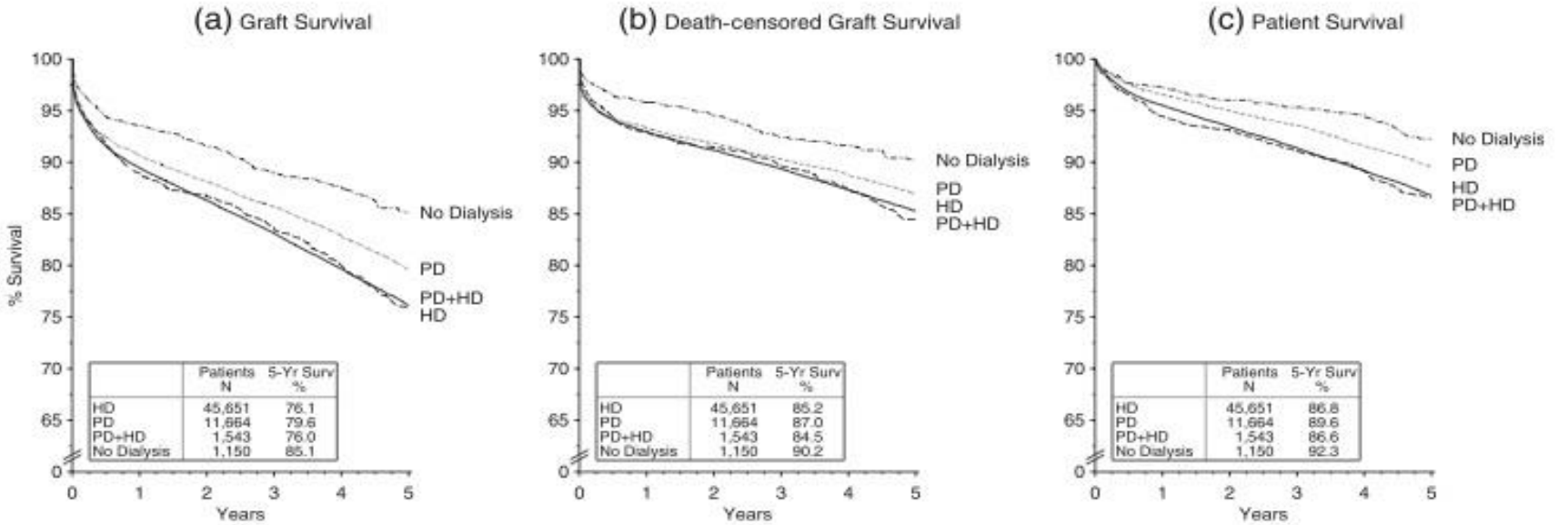


Fig. 1. Unadjusted graft (**a**), death-censored graft (**b**) and patient (**c**) survival rates for the first 5 posttransplant years according to pretransplant dialysis modality. In total, 60 008 deceased-donor kidney transplants were analysed.

Outcome (PD vs HD)

HR of Graft Survival

1.06 (1.00-1.11)

HR of Death-censored Graft Survival

1.03 (0.97-1.10)

HR of Survival

1.10 (1.02-1.18)

Association between initial and pretransplant dialysis modality and graft and patient outcomes in live- and deceased-donor renal transplant recipients

Wai H. Lim,[1,2] Philip Clayton,[2,3] Germaine Wong,[2,4] Gursharan Dogra,[1] Charley A. Budgeon,[5] Kevin Murray,[5] Scott B. Campbell,[2,6] Solomon Cohney,[2,7] Graeme R. Russ,[2,8] Kevan R. Polkinghorne,[2,9] Steve J. Chadban[2,4] and Stephen P. McDonald[2,8]

Transplant International © 2012 European Society for Organ Transplantation **25** (2012) 1032–1040

	Overall graft failure (HR, 95% CI)	Death-censored graft failure (HR, 95% CI)	Death (HR, 95% CI)
Unadjusted model			
PD-PD	0.83 (0.74, 0.92)*	0.85 (0.71, 0.99)*	0.81 (0.70, 0.94)*
PD-HD	1.14 (1.01, 1.30)*	1.25 (1.03, 1.52)*	1.07 (0.90, 1.28)
HD-HD	0.90 (0.83, 0.98)*	0.90 (0.79, 1.02)	0.91 (0.81, 1.01)
HD-PD	1.17 (1.03, 1.33)*	1.05 (0.86, 1.29)	1.28 (1.08, 1.50)*
Adjusted model			
Dialysis modality			
PD-PD	0.89 (0.79, 0.99)*	0.84 (0.71, 1.01)	0.91 (0.78, 1.06)
PD-HD	0.99 (0.86, 1.14)	1.15 (0.94, 1.42)	0.89 (0.73, 1.07)
HD-HD	0.96 (0.88, 1.04)	0.99 (0.87, 1.12)	0.93 (0.83, 1.04)
HD-PD	1.19 (1.04, 1.36)*	1.04 (0.85, 1.29)	1.34 (1.13, 1.59)*

ANZDATA between 1997-2009, 6,701 renal transplant recipients

Is PD better or HD for the best post-transplant outcomes?

Major Limitations of Prior Studies:

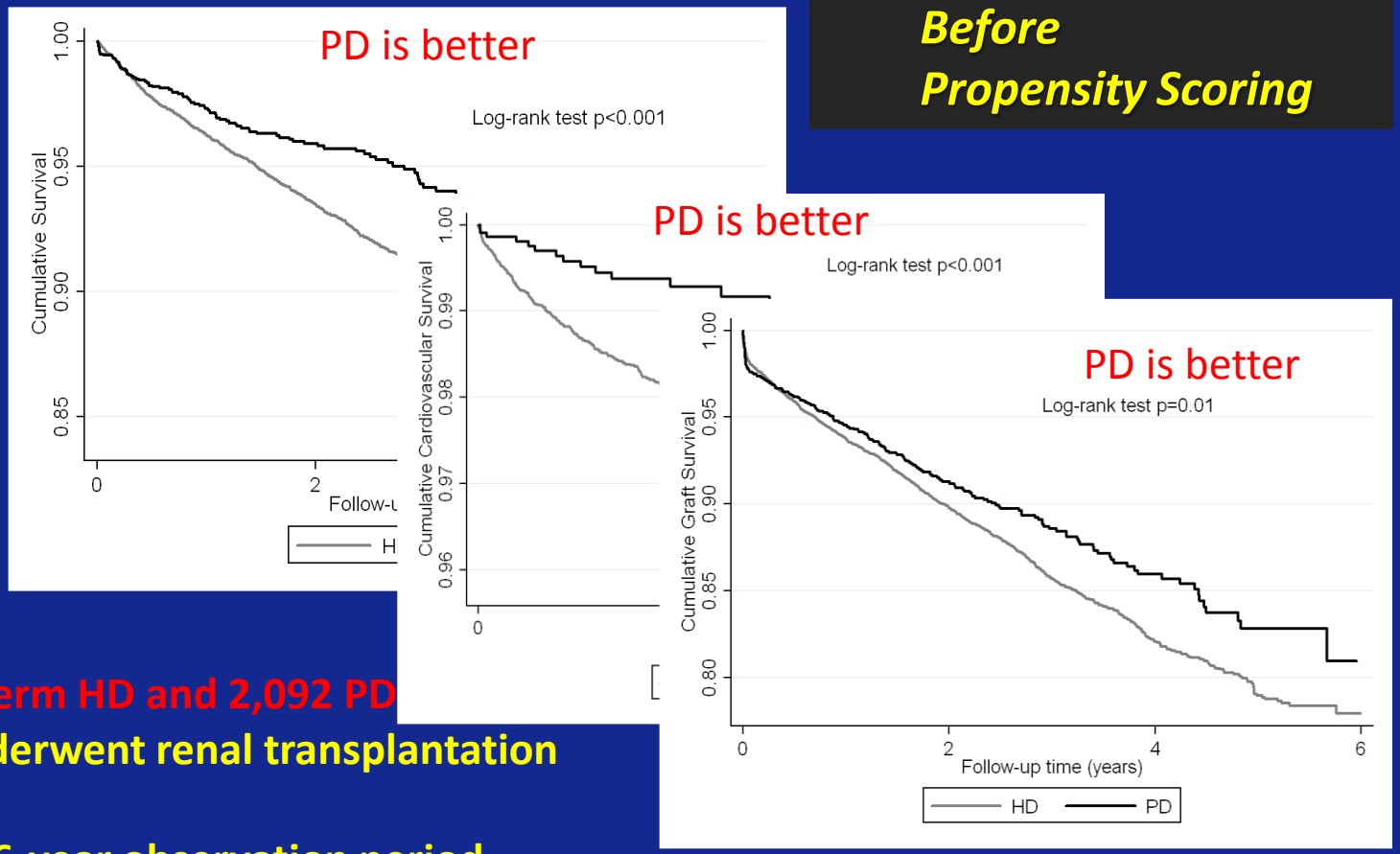
- All of them observational (unknown confounders)
- Inconclusive results
- Most of them included few patients
- NOT adjusting for important confounders
- NOT balancing for MEASURED confounders
- NOT used novel statistical techniques:
  - *Patients who are selected on PD are already healthier people!*
  - ***→ Propensity Scoring → match → re-analyze***

Dialysis Modality and Outcomes in Kidney Transplant Recipients

Miklos Z. Molnar,† Rajnish Mehrotra,†§ Uyen Duong,* Suphamai Bunnapradist,§ Lilia R. Lukowsky,* Mahesh Krishnan,‖ Csaba P. Kovesdy,¶** and Kamyar Kalantar-Zadeh*†§††*

CJASN 2012

Before Propensity Scoring



N= 12,416 long-term HD and 2,092 PD patients who underwent renal transplantation and were observed over a 6-year observation period (July 2001 to June 2007).

Molnar…..Kalantar-Zadeh, CJASN, 2012

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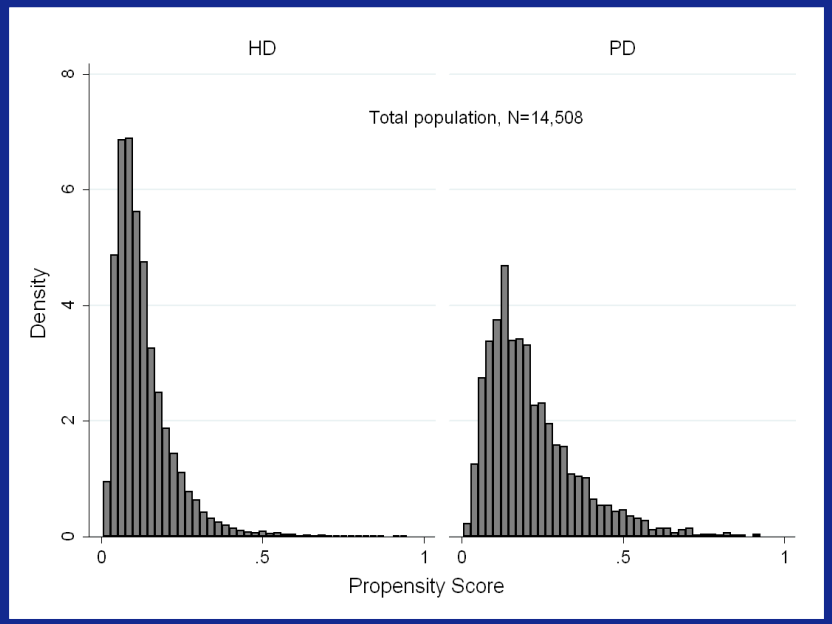
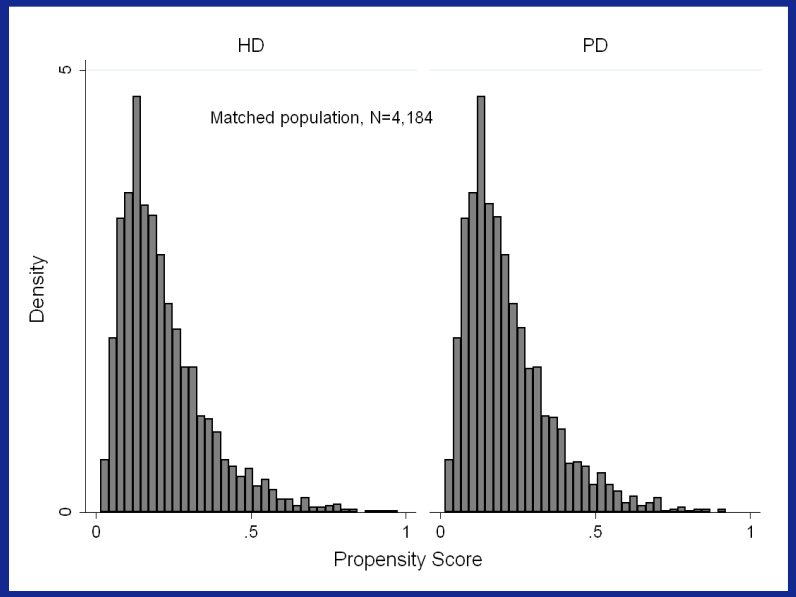
Propensity score of probability of being on PD



BEFORE matching



AFTER matching

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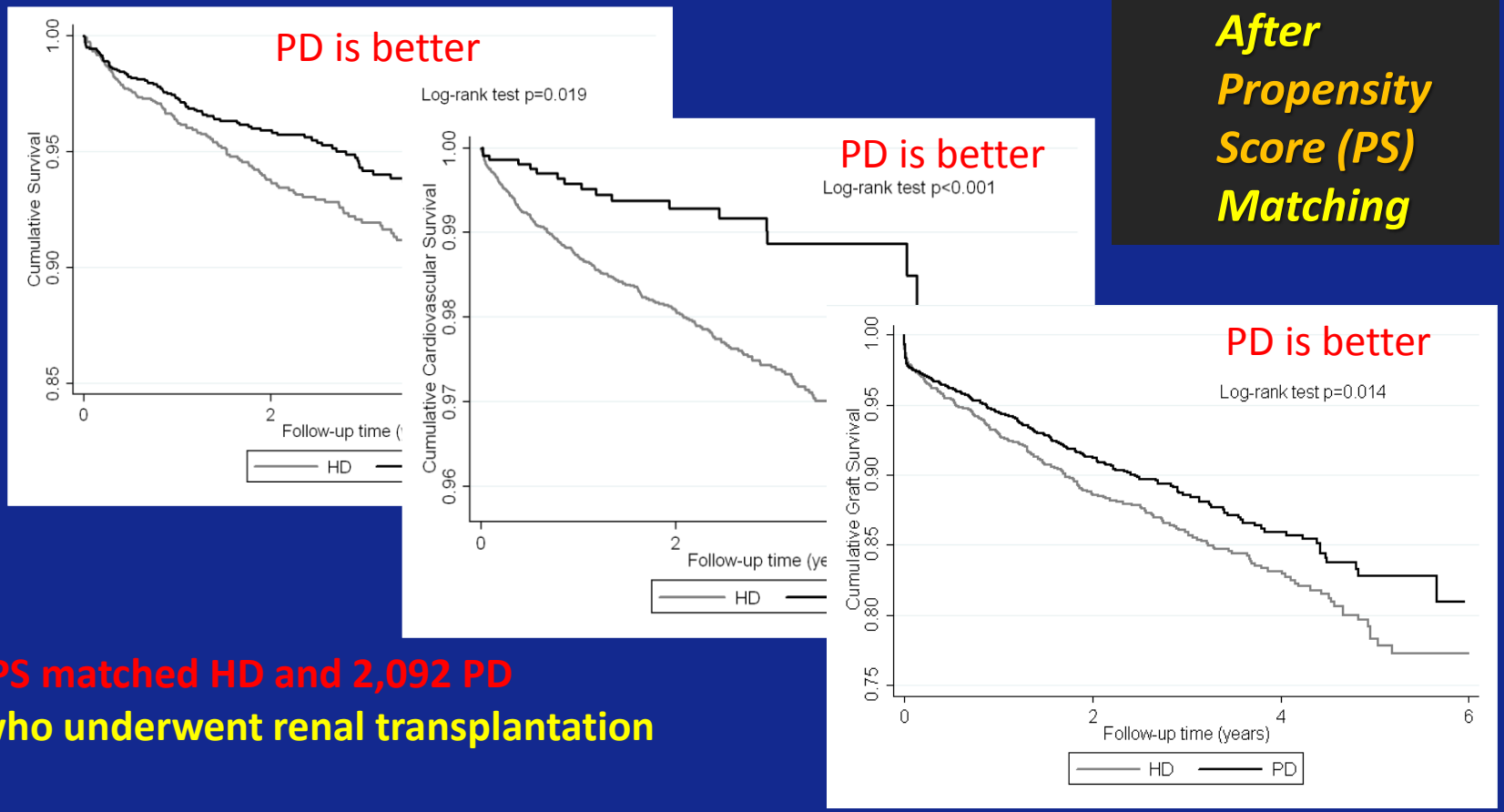
Dialysis Modality and Outcomes in Kidney Transplant Recipients

Miklos Z. Molnar,[†] Rajnish Mehrotra,[‡§] Uyen Duong,* Suphamai Bunnapradist,[§] Lilia R. Lukowsky,* Mahesh Krishnan,[‖] Csaba P. Kovesdy,[¶**] and Kamyar Kalantar-Zadeh*[‡§††]*

CJASN 2012

After Propensity Score (PS) Matching



N= 2,092 PS matched HD and 2,092 PD patients who underwent renal transplantation and were observed over a 6-year observation period (July 2001 to June 2007).

Molnar…..Kalantar-Zadeh, CJASN, 2012

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Hazard ratio (95% confidence intervals) of post-transplant death (all-cause or cardiovascular) or graft failure or delayed graft function for PD patients (n=2,092) compared to 1:1 propensity-score matched cohort of HD patients (n=2,092) (reference) who underwent renal transplantation and followed for up to 6 years (7/2001-6/2007)

	minimally adjusted		**+ case-mix adjusted***		**+ MICS adjusted****		**+ transplant data adjusted *****	
	HR (95% CI)	*P-value*	*HR (95% CI)*	*P-value*	*HR (95% CI)*	*P-value*	*HR (95% CI)*	*P-value*
Graft failure censored *all-cause* death	0.74 (0.58-0.95)	0.02	0.71 (0.54-0.92)	0.01	0.52 (0.33-0.84)	0.008	0.56 (0.33-0.94)	0.03
Graft failure censored *cardiovascular* death	0.37 (0.21-0.64)	<0.001	0.37 (0.21-0.65)	0.001	0.26 (0.09-0.75)	0.01	0.32 (0.11-0.95)	0.04
Death censored graft failure	0.79 (0.66-0.95)	0.01	0.81 (0.67-0.98)	0.03	1.18 (0.85-1.63)	0.32	0.98 (0.66-1.45)	0.90
Combined all-cause death or graft failure	0.79 (0.68-0.92)	0.003	0.80 (0.68-0.94)	0.008	1.05 (0.80-1.38)	0.73	0.91 (0.66-1.26)	0.58
	OR (95% CI)	*P-value*	*OR (95% CI)*	*P-value*	*OR (95% CI)*	*P-value*	*OR (95% CI)*	*P-value*
Delayed Graft Function	0.69 (0.58-0.81)	<0.001	0.66 (0.55-0.79)	<0.001	0.81 (0.61-1.07)	0.14	0.82 (0.60-1.13)	0.23

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Molnar…..Kalantar-Zadeh, CJASN, 2012

Conclusions

Compared to HEMODIALYSIS, pre-transplant treatment with **PERITONEAL DIALYSIS** appears to be associated with BETTER post-transplant PATIENT SURVIVAL:

Lower all-cause and cardiovascular → 44% better
Lower mortality post-transplantation. → 68% better

In our study, there was no robust association between pre-transplant dialysis modality and risk of graft failure or delayed graft function in multivariate adjusted models, *although a trend towards better graft survival was observed*.

Hence, all things equal, PD appears to lead to better post-transplant patient outcomes than HD

Thank you for your attention!

Harold Simmons Center for Kidney Disease Research & Epidemiology

(F)

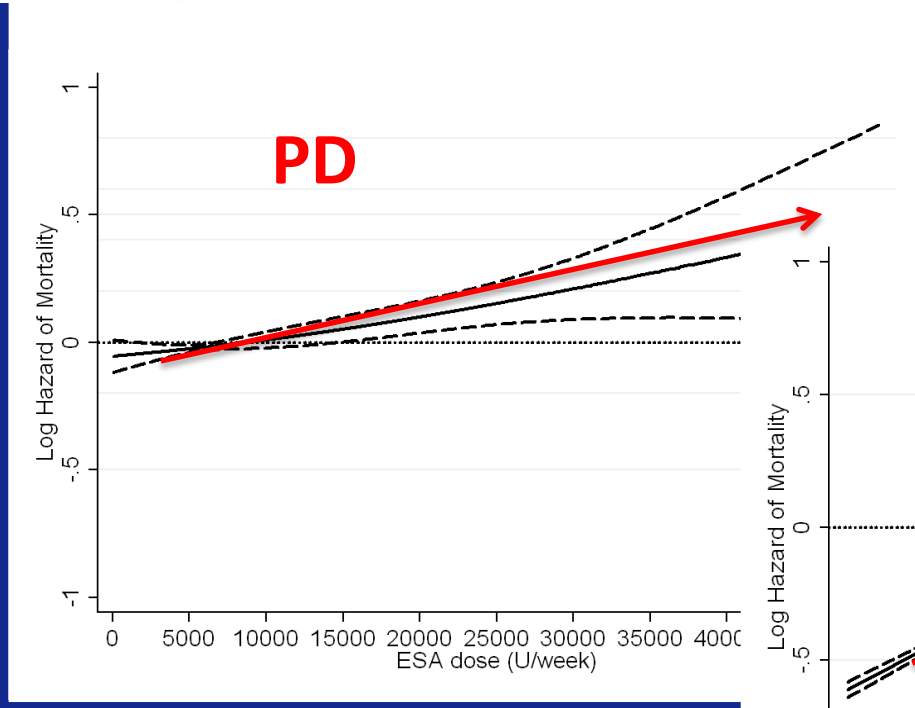
Pre-Transplant
ESA Responsiveness
and
Post-Transplant Outcomes

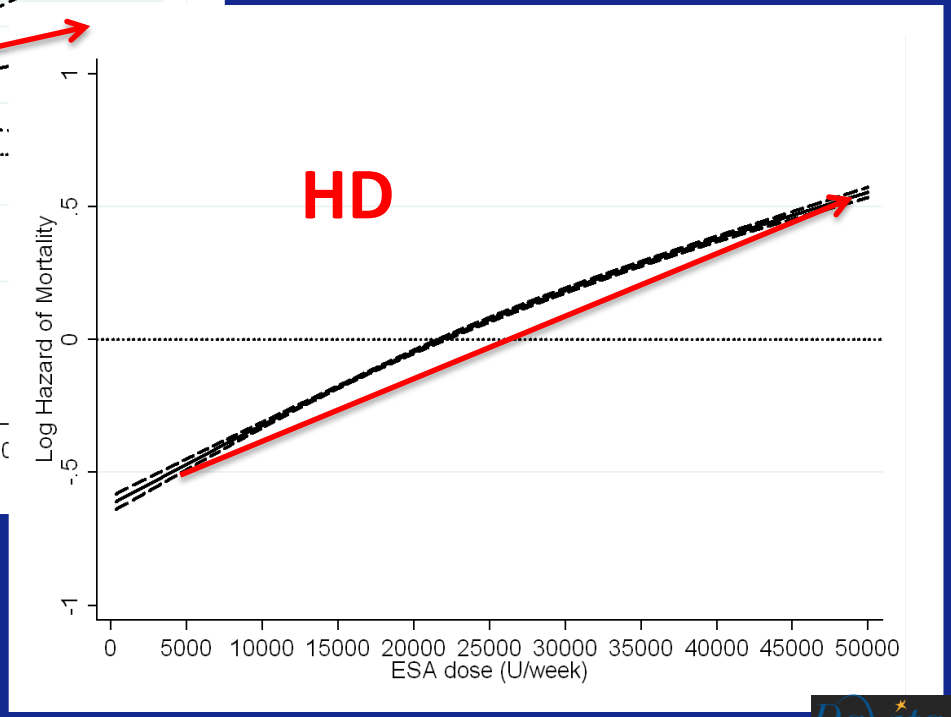
Mortality Associated with Dose Response of Erythropoiesis-Stimulating Agents in Hemodialysis versus Peritoneal Dialysis Patients

***AJN* 2012**

Uyen Duong[a] Kamyar Kalantar-Zadeh[a–d] Miklos Z. Molnar[a, h]
Joshua J. Zaritsky[c] Isaac Teitelbaum[e] Csaba P. Kovesdy[f, g] Rajnish Mehrotra[b, c]

Am J Nephrol 2012;35:198–208





139,103 HD and 10,527 PD were observed over a 5-year observation period (July 2001 to June 2006)

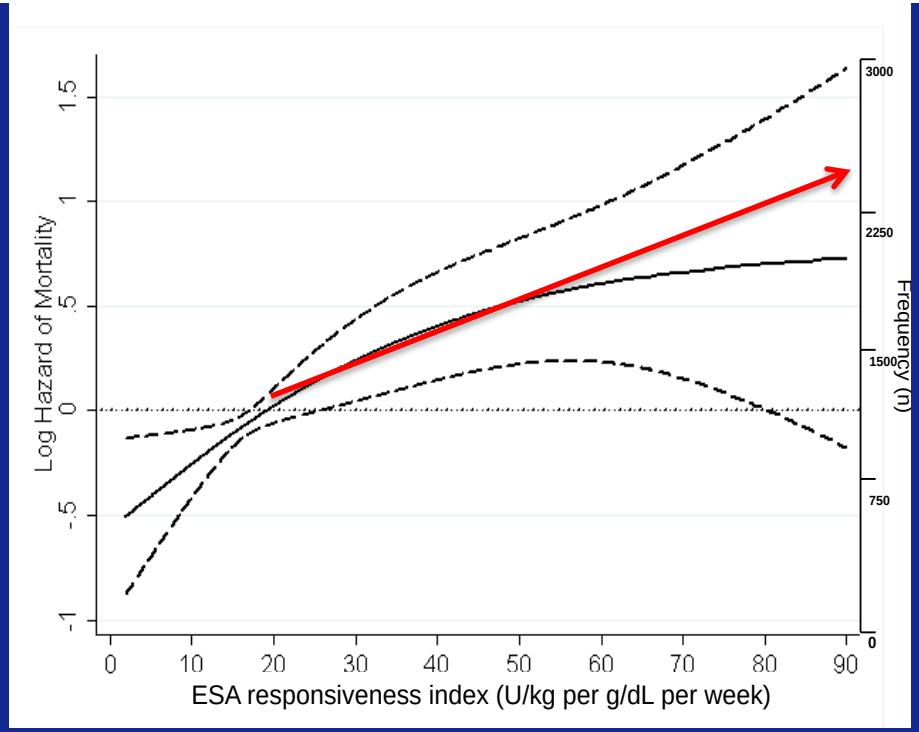
DaVita Clinical Research

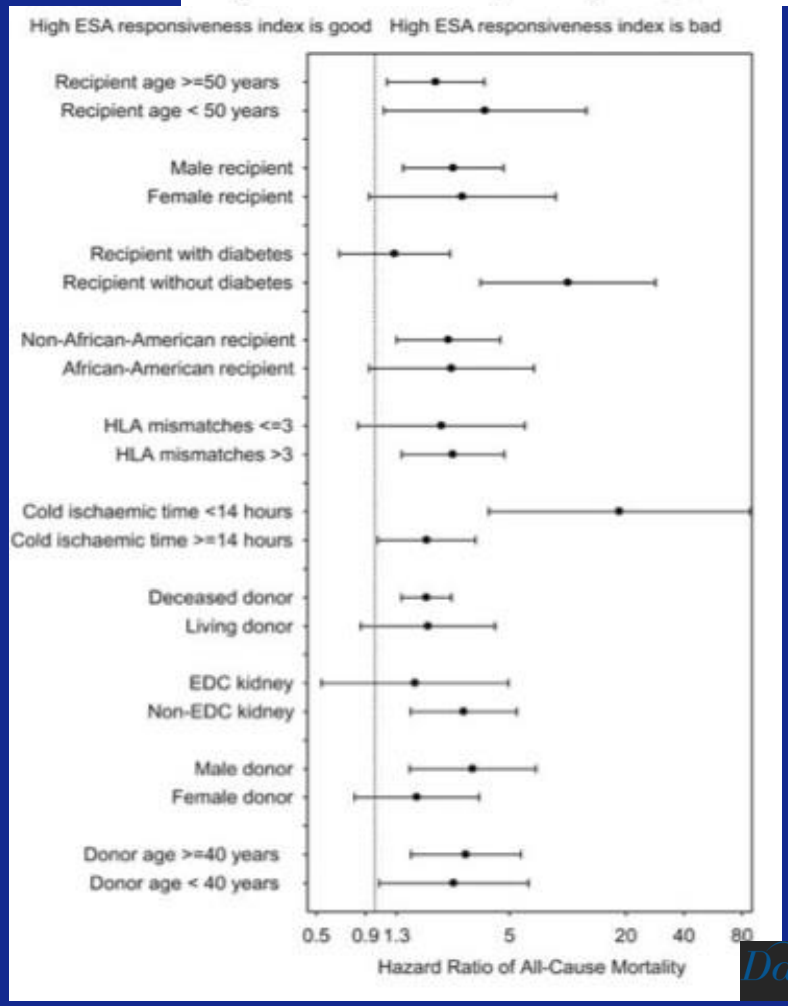
Association of pre-transplant erythropoiesis-stimulating agent responsiveness with post-transplant outcomes

***NDT* 2012**

Miklos Z. Molnar[1,2], Suphamai Bunnapradist[3], Edmund Huang[3], Mahesh Krishnan[4], Allen R. Nissenson[3,4], Csaba P. Kovesdy[5,6] and Kamyar Kalantar-Zadeh[1,3,7]

Nephrol Dial Transplant (2012) 27: 3345–3351





N= 8,795 long-term HD patients who underwent renal transplantation and were observed over a 6-year observation period (July 2001 to June 2007).

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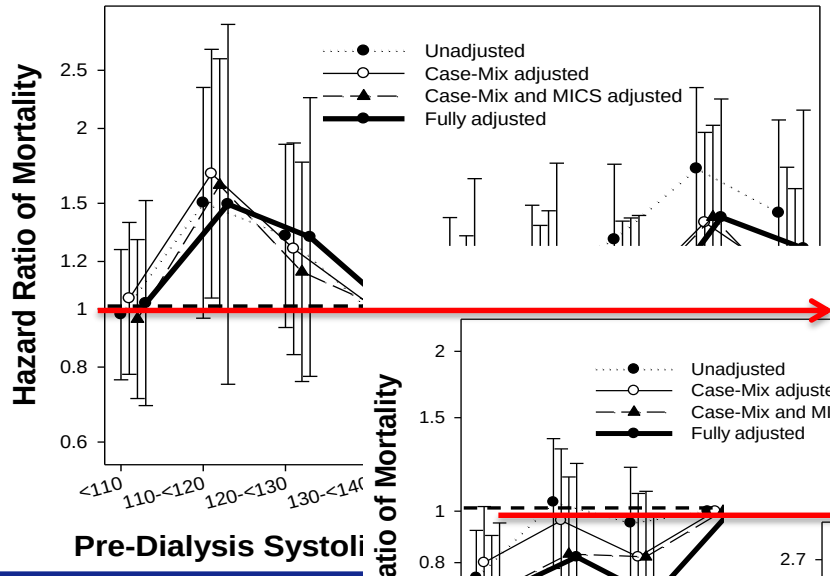
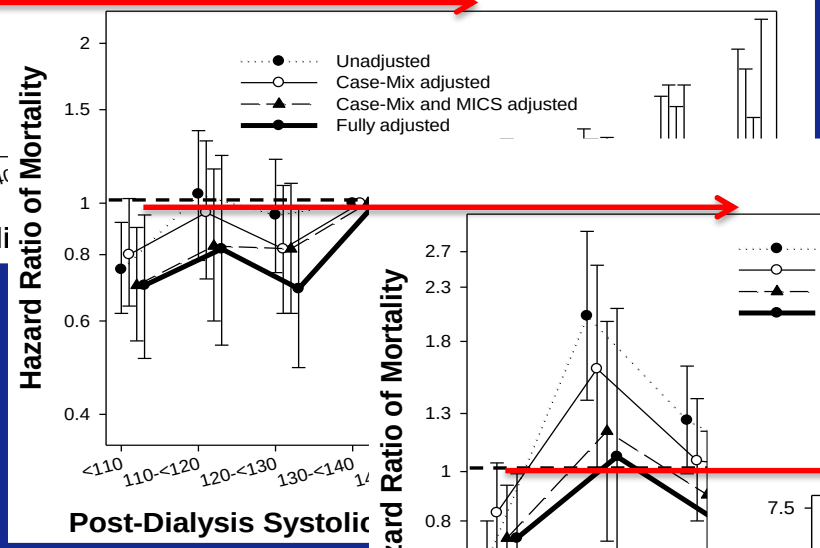
(G)

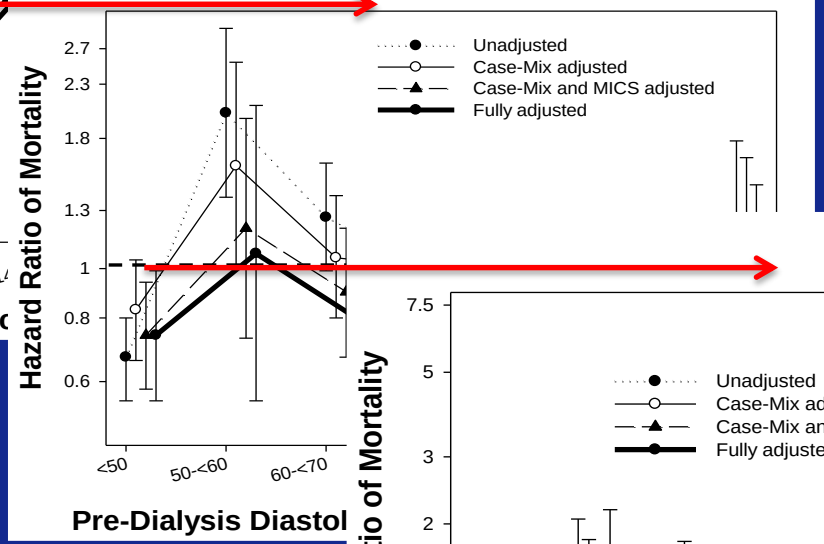
Pre-Transplant
Blood Pressure
and
Post-Transplant Outcomes

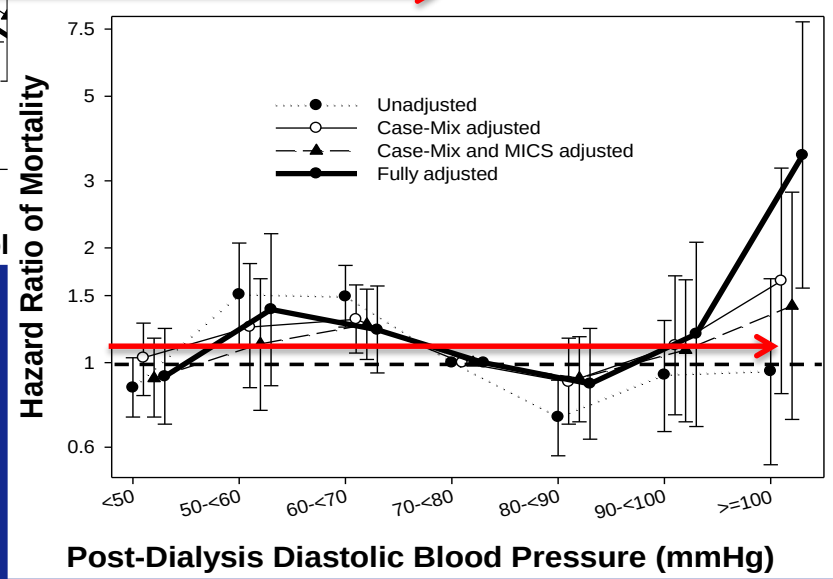
Under review, not published yet

No association between pre-transplant blood pressure and post-transplant mortality









N= 13,881 long-term dialysis patients who underwent renal transplantation and were observed over a 6-year observation period (July 2001 to June 2007).

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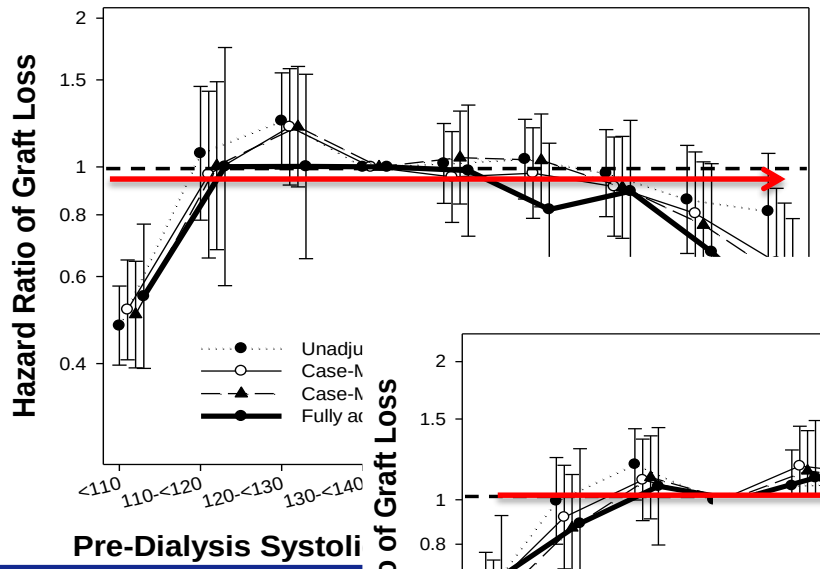
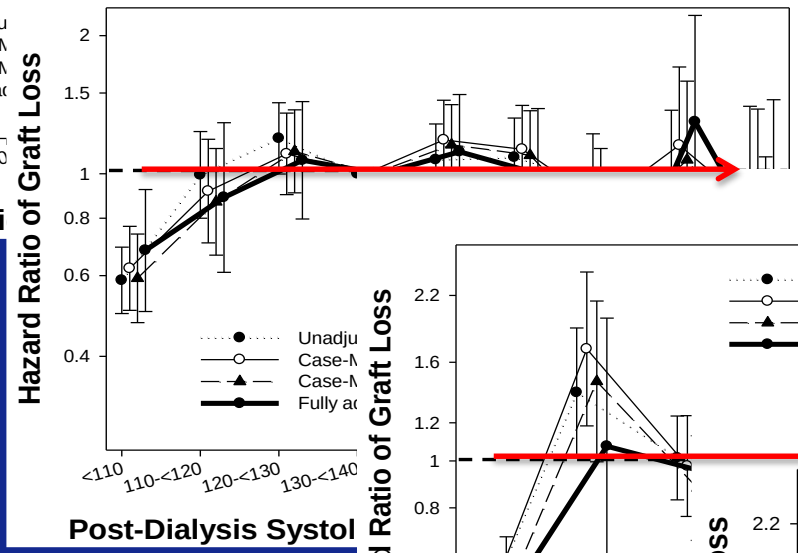
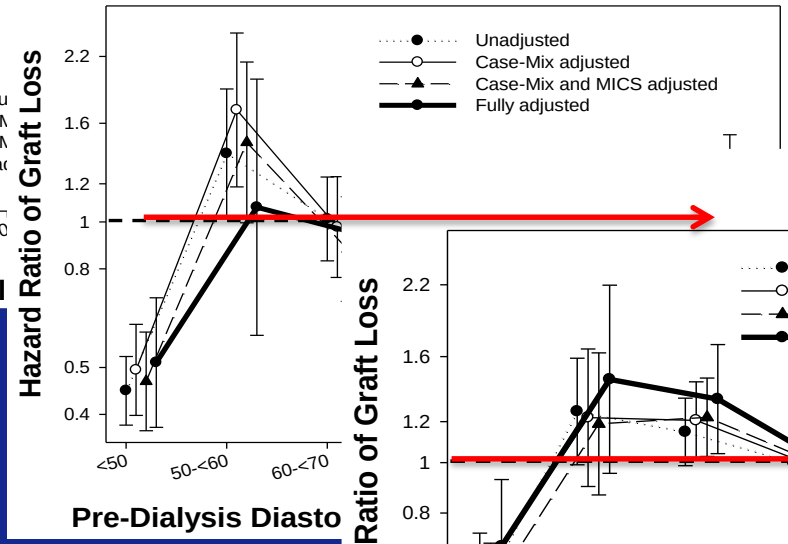
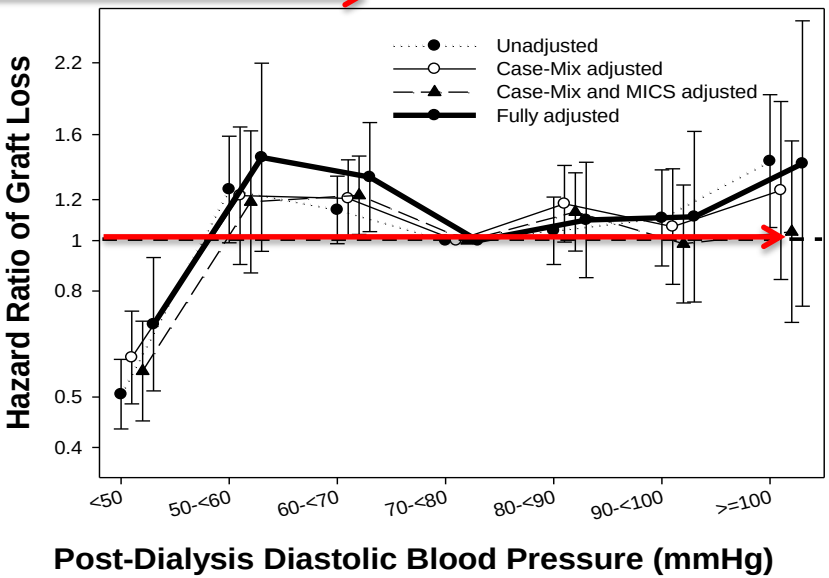
No association between pre-transplant blood pressure and post-transplant graft loss









N= 13,881 long-term dialysis patients who underwent renal transplantation and were observed over a 6-year observation period (July 2001 to June 2007).

DaVita Clinical Research