Centre universitaire de santé McGill
McGill University Health Centre

Les meilleurs soins pour la vie
The Best Care for Life

DIVISION DE NEPHROLOGIE
NEPHROLOGY DIVISION

Cardiovascular Risk Reduction in Kidney Transplant Recipients

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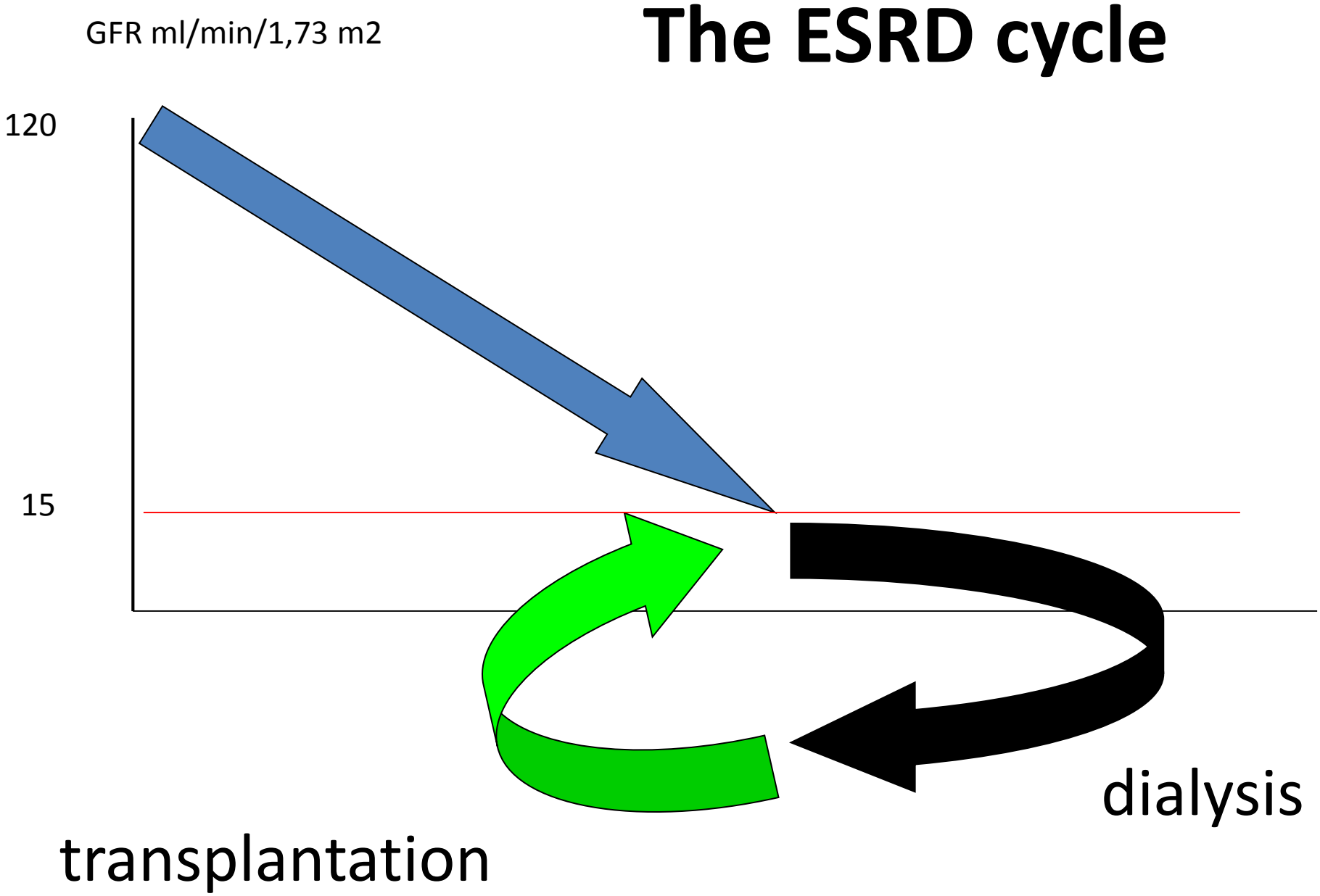
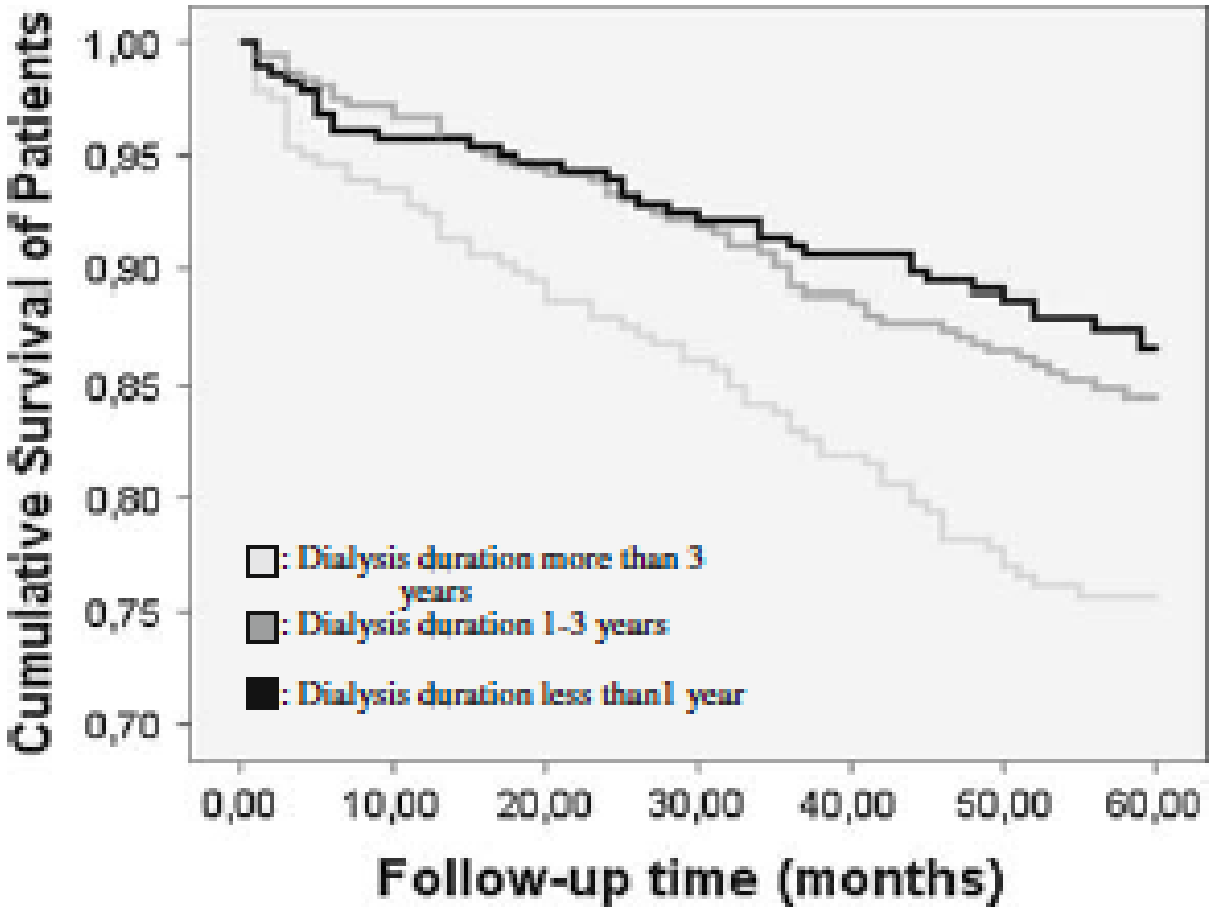
- CVD and CV risk factors in Tx
- Hypertension
- DM
- Lipids
- Obesity
- Bone – FGF23
- Psycho-social factors - depression
- Prediction, assessment, follow-up
- How to manage…

The ESRD cycle



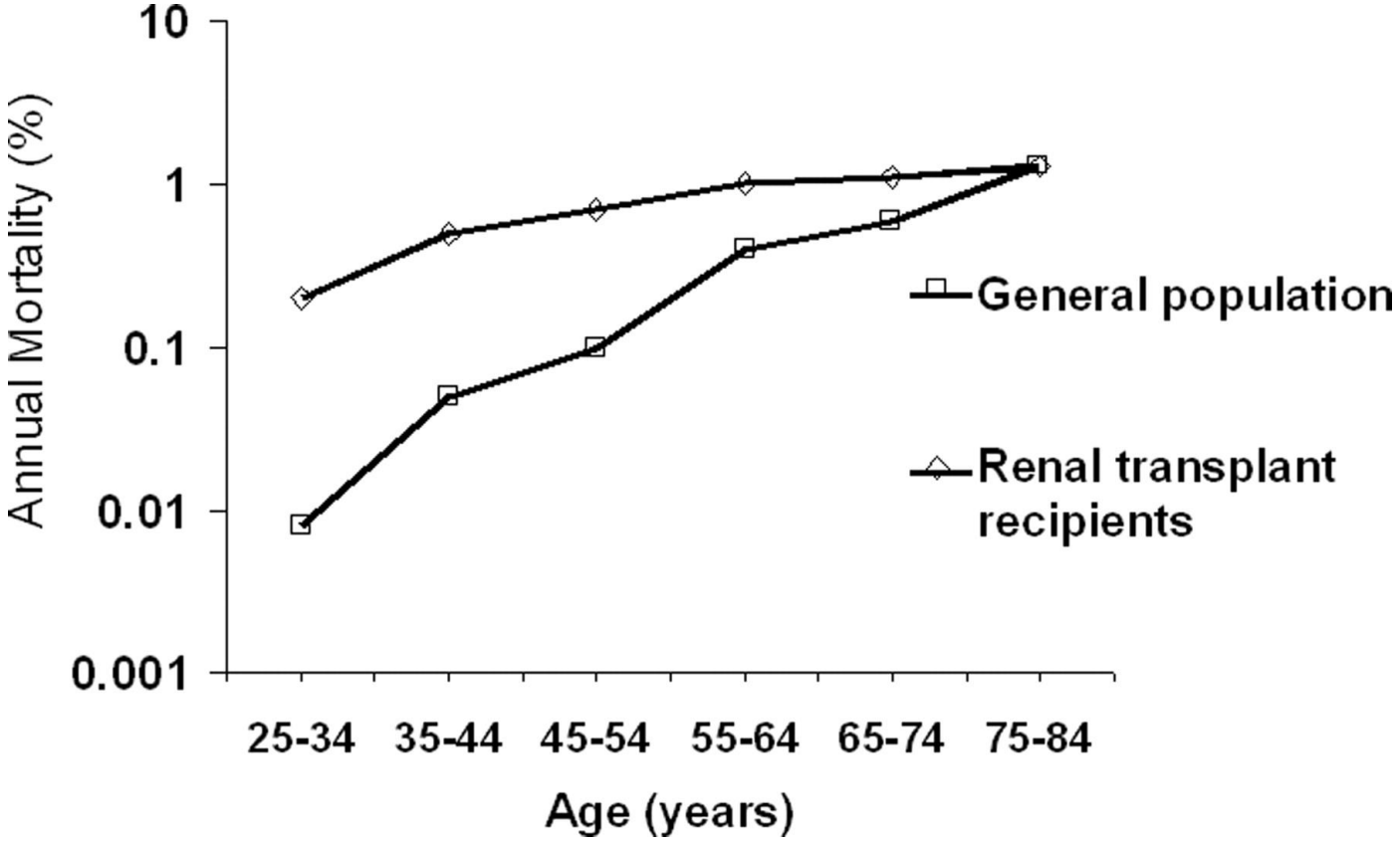
Association of pre-transplant dialysis duration with outcome in kidney transplant recipients: a prevalent cohort study

Adam Remport · Andras Keszei · Eszter Panna Vamos · Marta Novak · Jeno Jaray · Laszlo Rosivall · Istvan Mucsi · Miklos Zsolt Molnar



Int Urol Nephrol. 2011 Mar;43(1):215-24

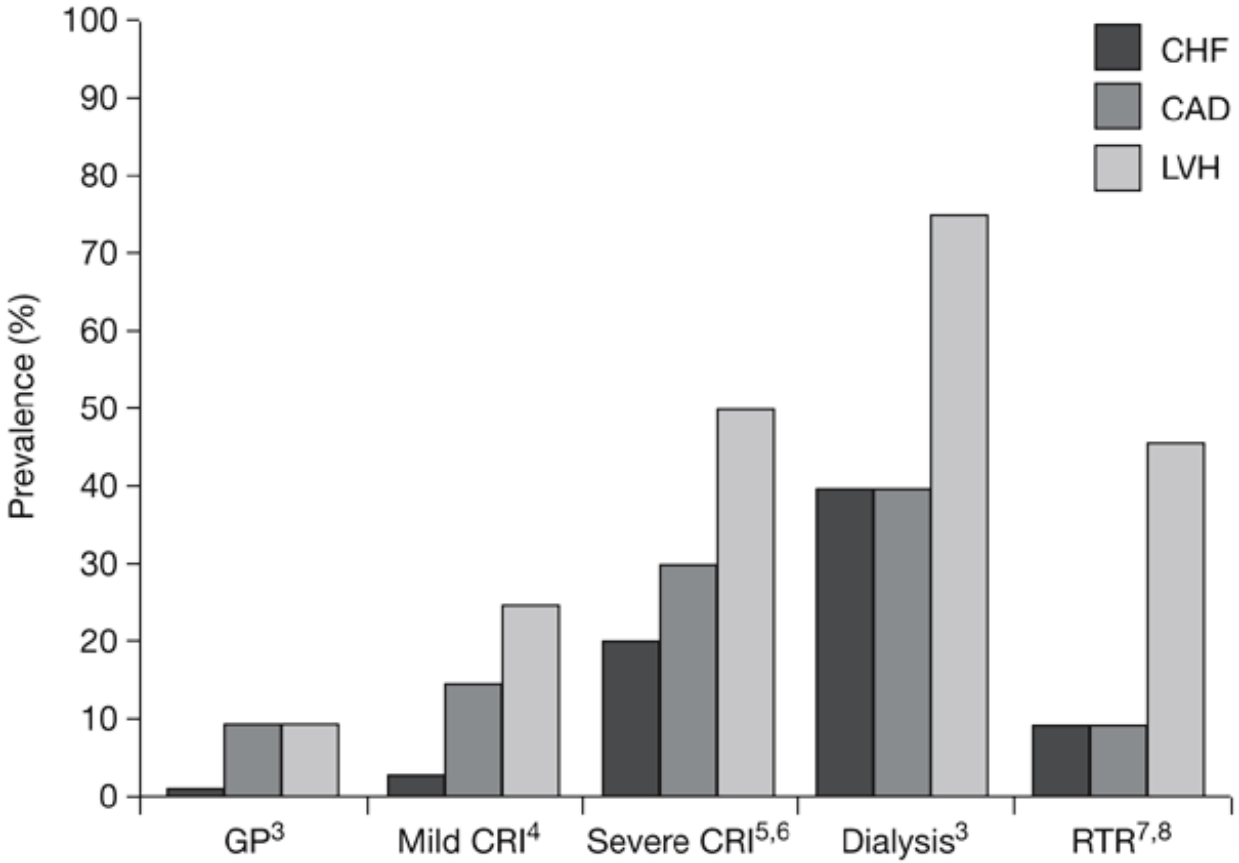
Figure 2. Cardiovascular mortality in kidney transplant recipients



Djamali, A. et al. Clin J Am Soc Nephrol 2006;1:623-640

CJASN

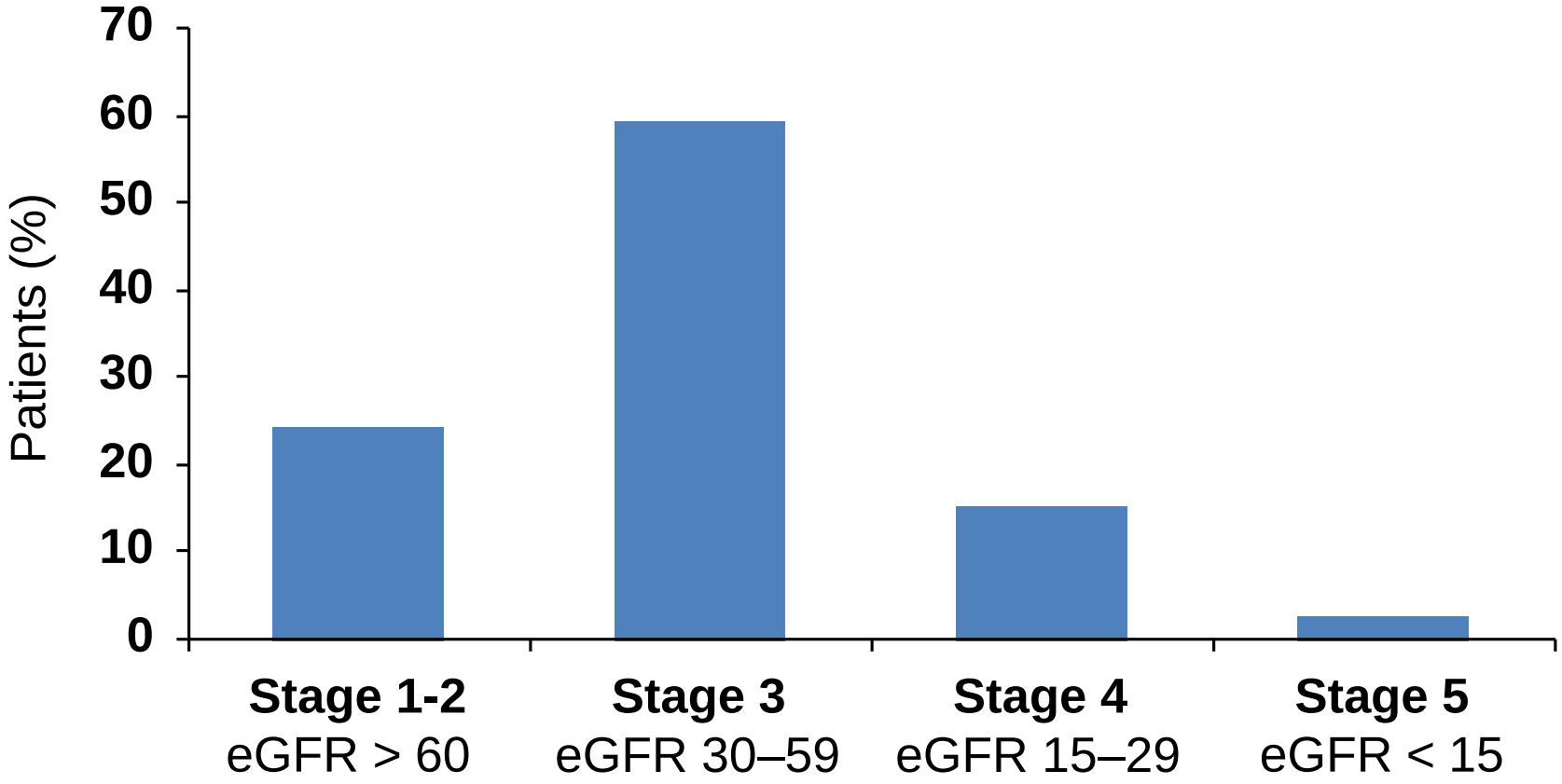
Figure 1 Prevalence of cardiovascular disease in patients with renal disease



Rigatto C and Parfrey P (2006) Therapy Insight: management of cardiovascular disease in the renal transplant recipient *Nat Clin Pract Neprol* **2:** 514–526 doi:10.1038/ncpneph0253

nature CLINICAL PRACTICE NEPHROLOGY

Majority of transplant recipients have kidney function equivalent to stage 3 CKD or worse (UK data)



19,074 adult patients with a functioning kidney transplant at the end of 2005

UK Renal Registry Report 2006. Chapter 1.

Metabolic effects of common immuno-suppressive agenst

	CSA	TAC	SRL	MMF	AZA	Steroid
Dyslipidaemia	++	+	+++	-	-	++
Hypertension	++	+	-	-	-	++
NODAT	+	+ (+)	-	-	-	++

Shirali, A. C. et al. Clin J Am Soc Nephrol 2008;3:491-504

CJASN

Table 4. Traditional and nontraditional risk factors for CVD in renal transplant recipients

Traditional Risk Factors	Nontraditional Risk Factors
Older age	Decreased kidney function
Male gender	CNI
Family history of CVD	Proteinuria
Diabetes	Anemia
Hypertension	C-reactive protein
Dyslipidemia	Oxidative stress
low HDL	Advanced glycation end products
high LDL	Inflammation
Physical inactivity	Homocysteine
Left ventricular	Uric acid
hypertrophy	Hyperparathyroidism
Menopause	Obesity
Tobacco use	Thrombogenic factors

Djamali, A. et al. Clin J Am Soc Nephrol 2006;1:623-640

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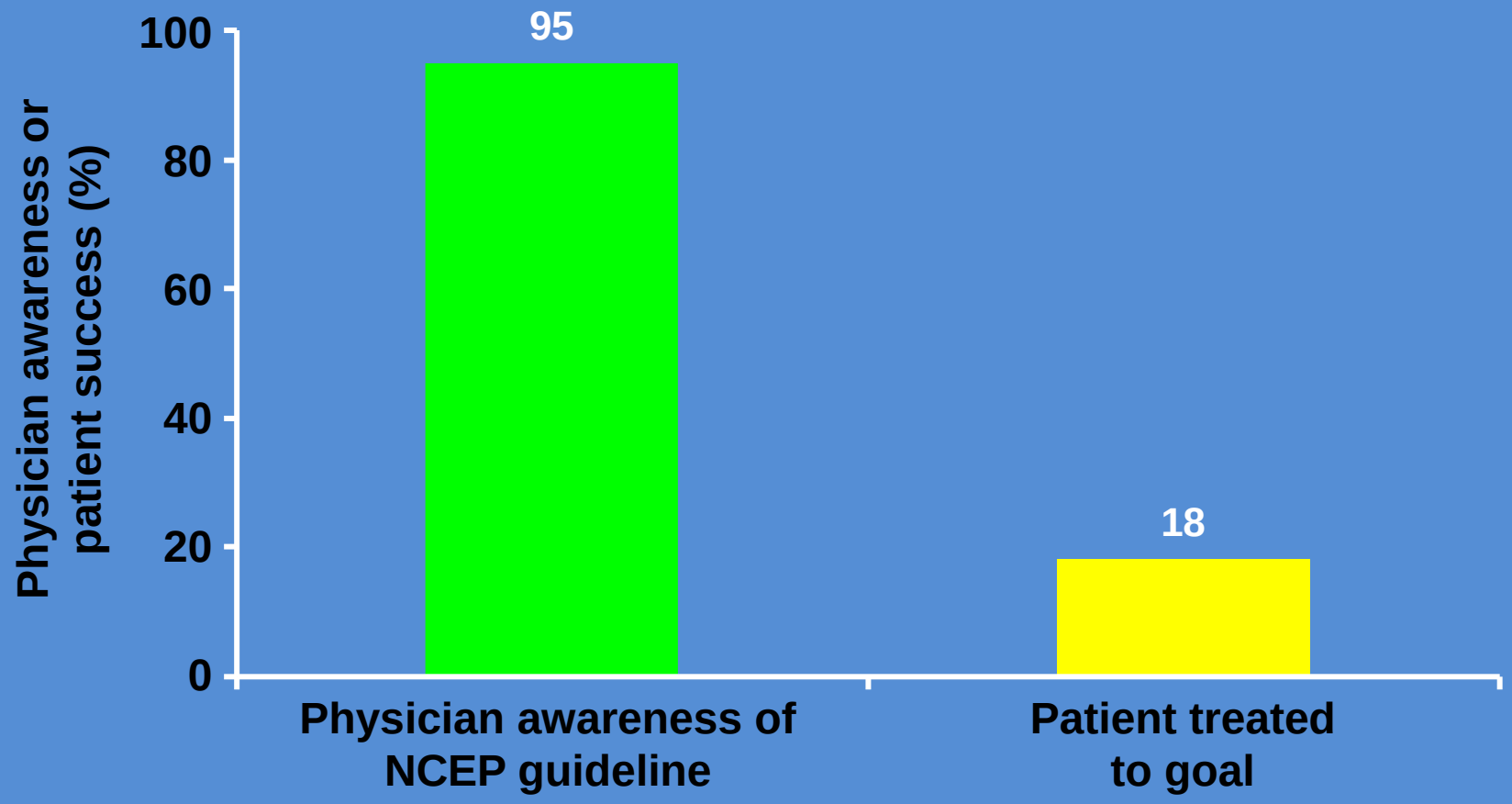
CAD treatment gap in the community

Provider awareness does not equal successful implementation



NCEP = National Cholesterol Education Program

Pearson TA, et al. Arch Intern Med 2000;160:459–67

The world would be a better place if we kept six of the ten commandments. Any six.

Hypertension

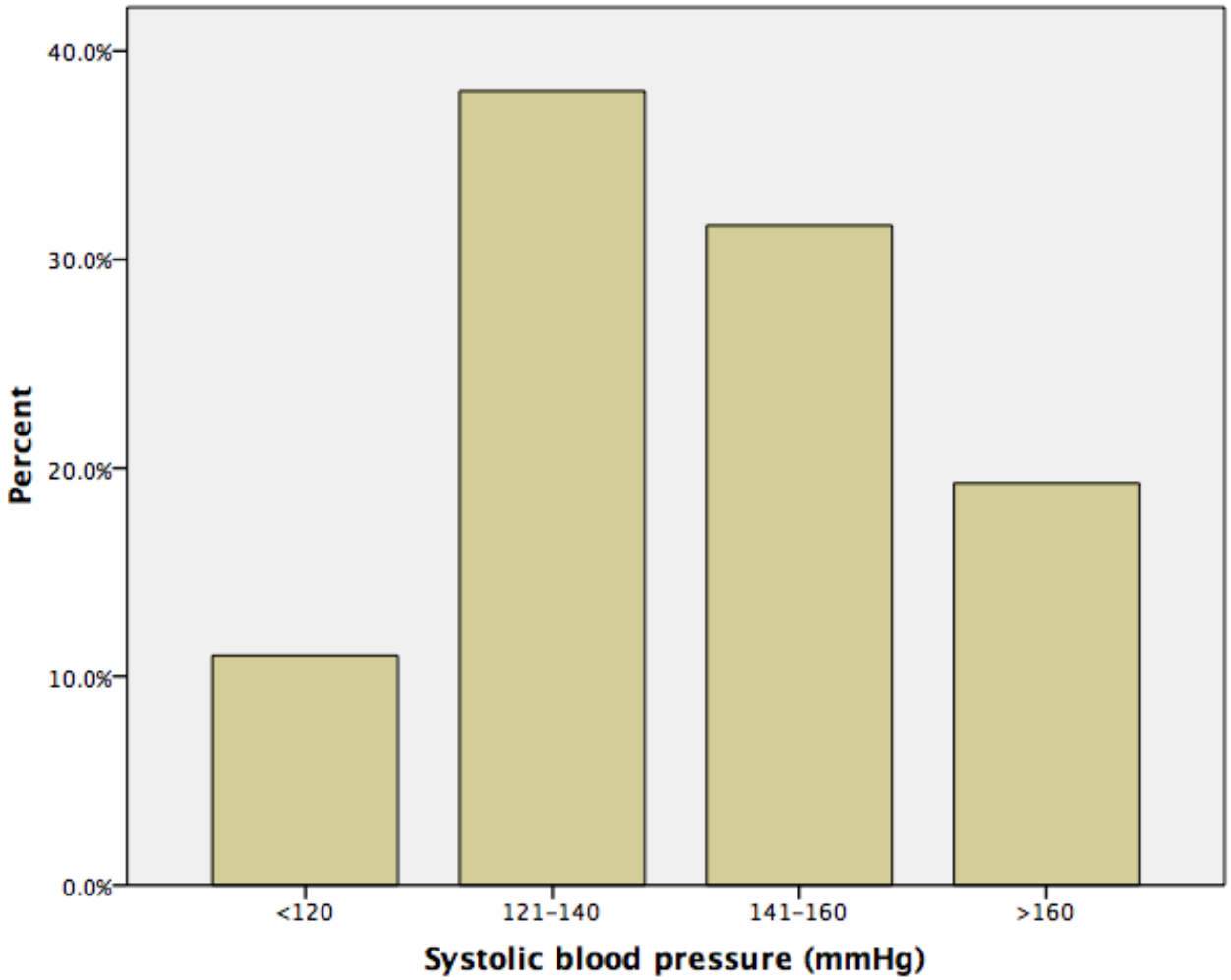
KDIGO clinical practice guideline for the care of kidney transplant recipients.

Table 22: Guideline definitions of hypertension

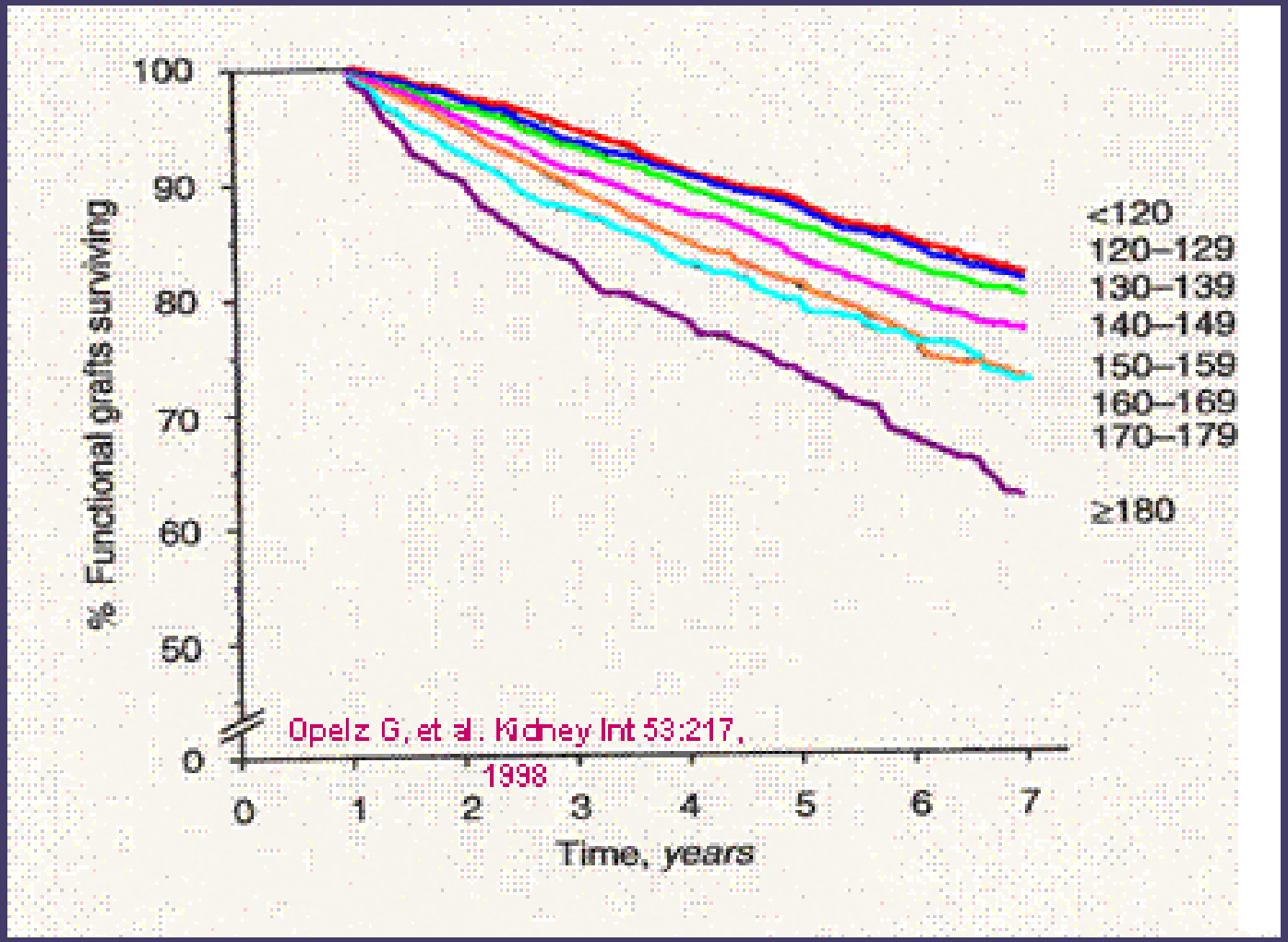
Guideline	Hypertension definition	Treatment goals (mm Hg)	
		All	In sub-populations
JNC 7 2003 (536)	≥140/90	<140/90	<130/80 in diabetes and CKD
WHO ISH 2003 (537)	≥140/90	<140/90	<130/80 in diabetes
KDOQI 2004 (538)		–	<130/80 in KTRs
NHBPEWG Children 2004 (539)	≥95th percentile[a]	<95th percentile[a]	<90th percentile[a] in concurrent conditions[b]
ESH ESC 2007 (540)	≥140/90	<140/90	<130/80 in diabetes and high risk[c]
USPSTF 2007 (541)	≥140/90	See JNC 7[d]	See JNC 7[d]

American Journal of Transplantation 2009; 9 (Suppl 3): S64–S64

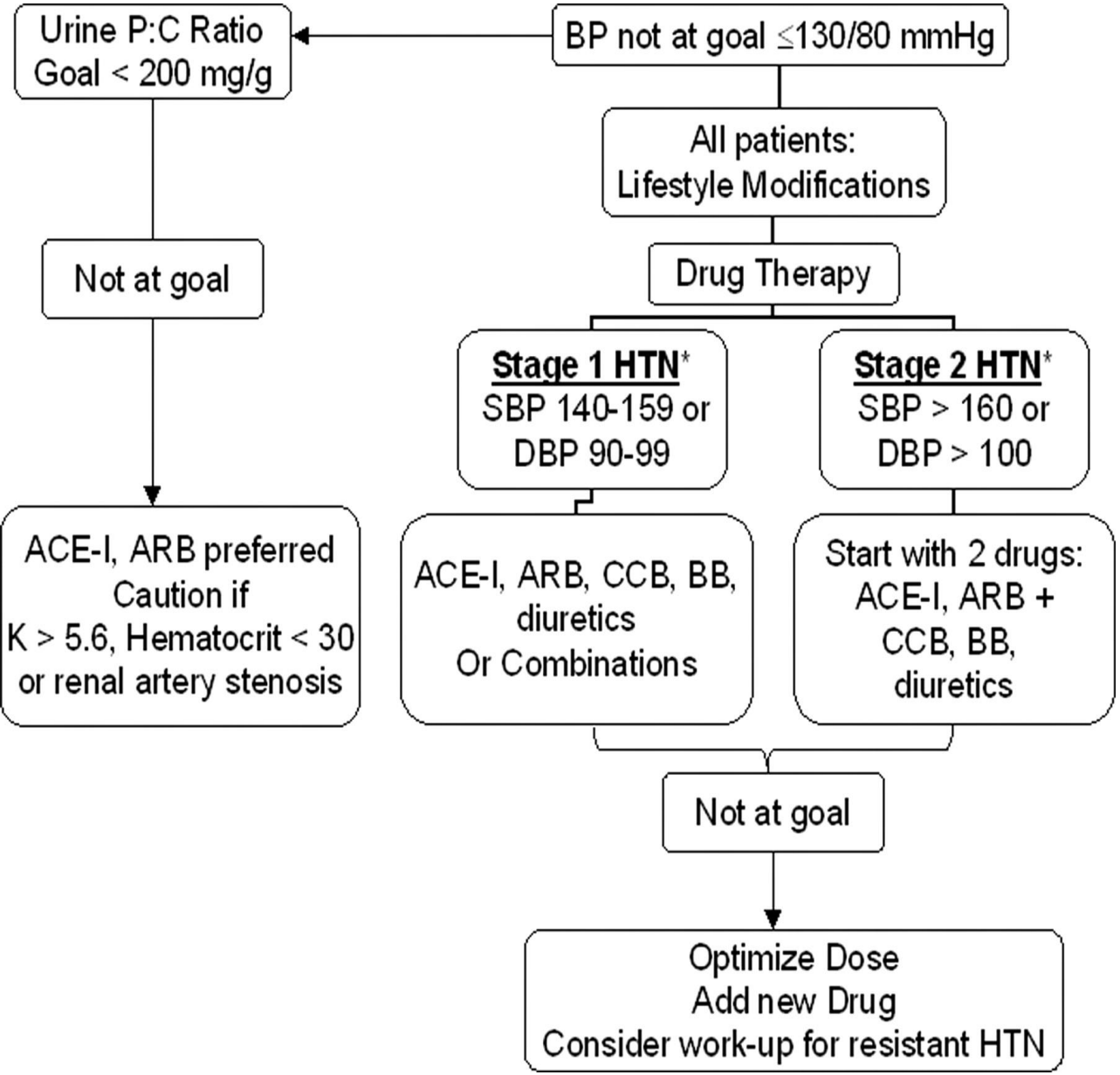
Systolic blood prerssure in the sample



Blood Pressure One Year after Kidney Transplantation and Graft Outcome



Opelz G et al. ***Kidney Int. 1998 Jan;53(1):217-22.***



BP management after the first posttransplant year

Djamali, A. et al. Clin J Am Soc Nephrol 2006;1:623-640

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Diabetes

Patient Survival and Cardiovascular Risk After Kidney Transplantation: The Challenge of Diabetes

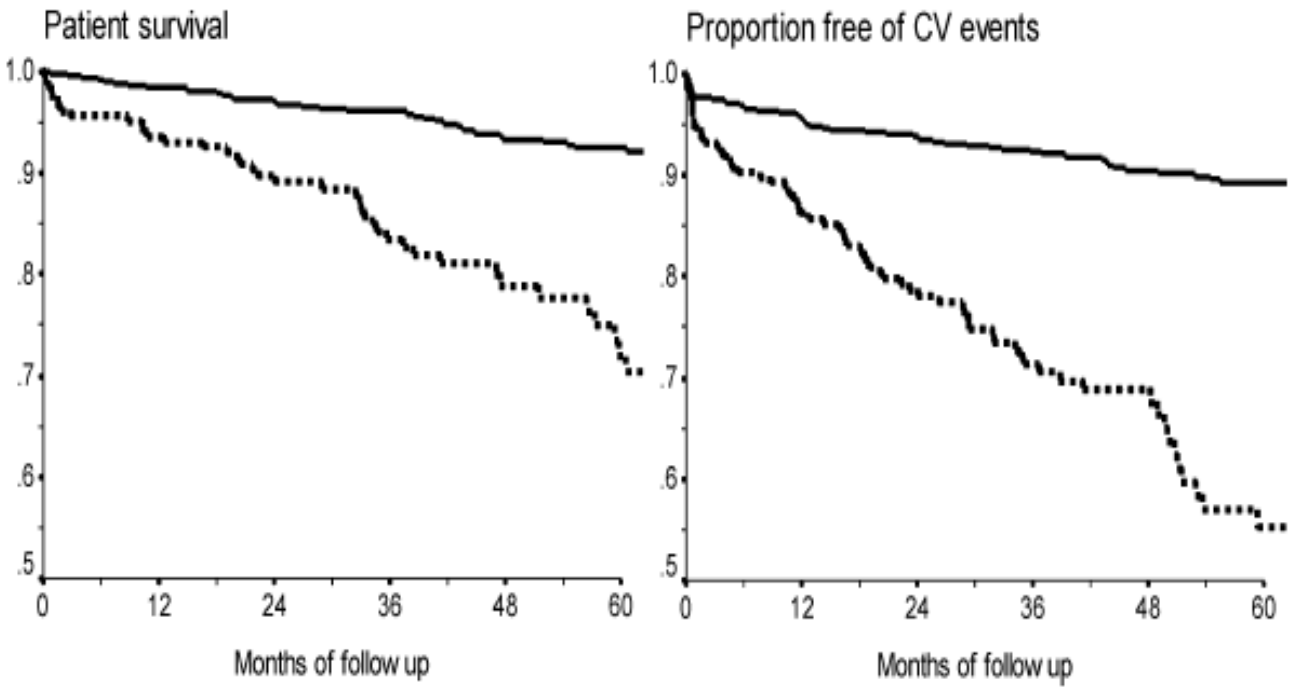

Figure 1: Left: Kaplan–Meier plots of patient survival after transplantation in recipients without DM (—) and those with DM (.....) (log-rank, $p < 0.0001$). Right: Kaplan–Meier plots of the incidence of fatal and nonfatal posttransplant CV events in recipients without DM (—) and those with DM (.....) (log-rank, $p < 0.0001$).

American Journal of Transplantation 2008; 8: 593–599
Blackwell Munksgaard

Table 5. Risk factors for NODAT[a]

Recipient characteristics
older age (>45 yr)
higher body mass index (≥30)
black race
family history of diabetes
Hispanic ethnicity
education (no college degree)
Donor
deceased donor
male gender
Transplant era (after 1995)
Tacrolimus use
HLA mismatch
Acute rejection
HCV infection

[a]HCV, hepatitis C virus; NODAT, new-onset diabetes after transplantation.

NODAT risk factors

Djamali, A. et al. Clin J Am Soc Nephrol 2006;1:623-640

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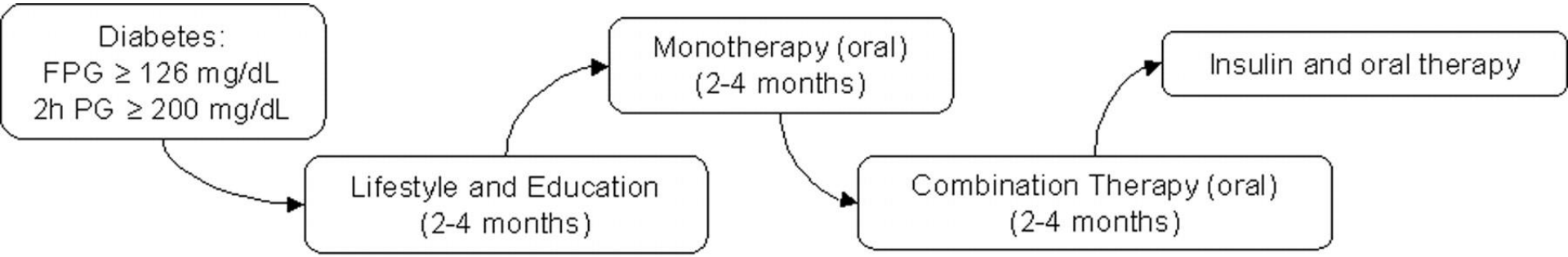
Diabetes management after the first posttransplant year



Oral Agent	Target Population	Advantage	Disadvantage
Sulfonylurea	DM2 < 5 year duration	↓ cost Rapid effect	↑ Weight ↑ hypoglycemia
Meglitinides	Recent DM2 ↑ PPG	↓ hypoglycemia short acting	↑ cost
Biguanides	Overweight/Obese Insulin resistance	No ↑ weight ↓ hypoglycemia	GI side-effects Lactic acidosis (rare)
Thiazolidinediones	Overweight/Obese Insulin resistance	↓ Insulin requirement ↓ hypoglycemia	↑Cost, weight ↑Liver toxicity Slow onset of action
α-glucosidase inhibitor	↑ PPG	↓ hypoglycemia	GI side-effects ↑ cost

Djamali, A. et al. Clin J Am Soc Nephrol 2006;1:623-640

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Dyslipidemia

Dyslipidemia Following Kidney Transplantation:
Diagnosis and Treatment

Table 2. Effect of immunosuppressive drugs on lipid parameters

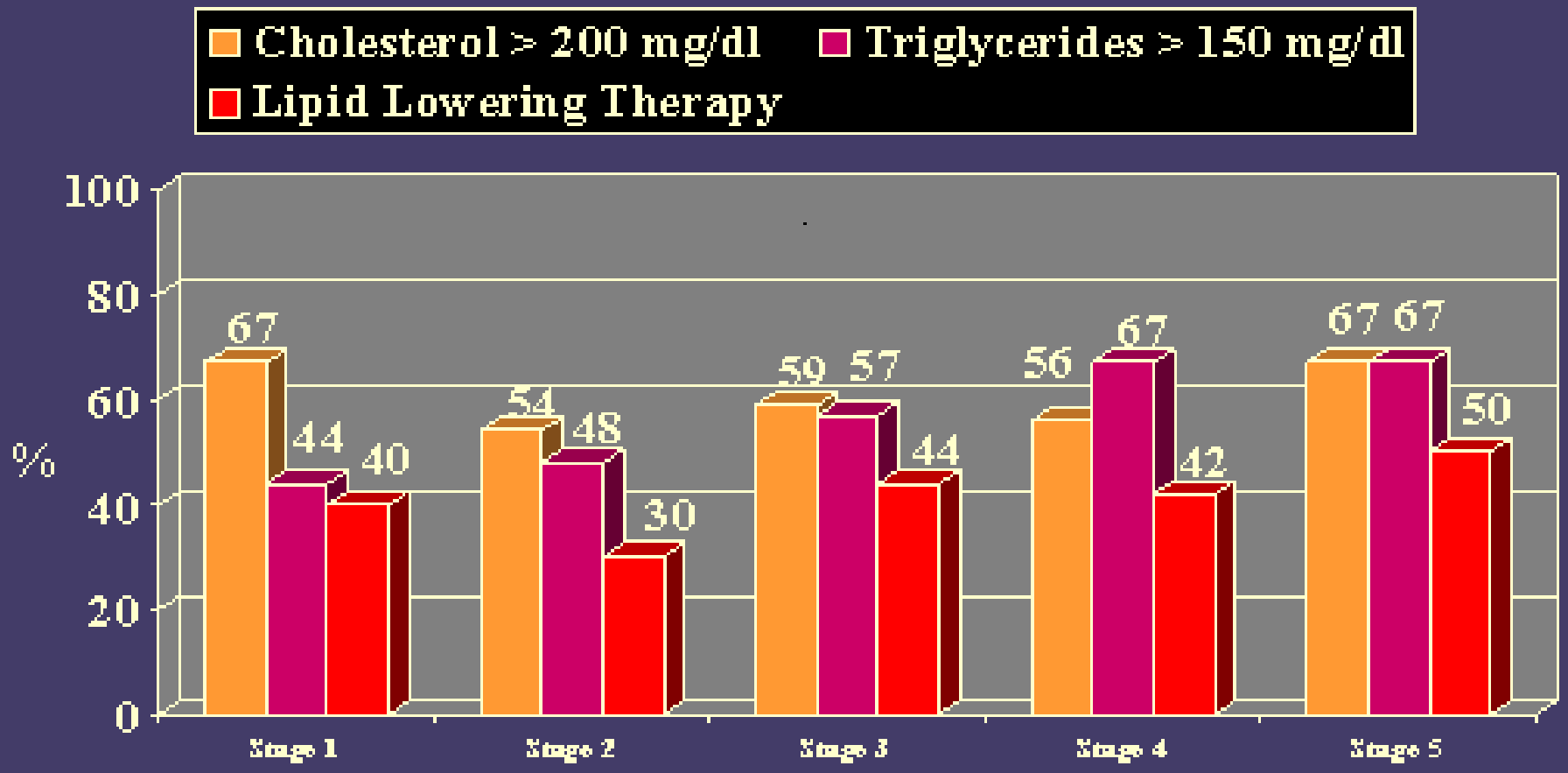
Drug	TC	LDL-C	HDL-C	TG
Cyclosporine	↑↑	↑↑	↓	↑↑
Tacrolimus	↑	↑	↓	↑
Sirolimus	↑↑	↑↑	↓	↑↑↑
Everolimus	↑↑	↑↑	↓	↑↑↑
Mycophenolate mofetil	–	–	–	–
Azathioprine	–	–	–	–
Prednisone	↑	↑	↑	↑
Deflazacort	↑	↑	↑↑	↑

HDL-C—high-density lipoprotein cholesterol; LDL-C—low-density lipoprotein cholesterol; TC—total cholesterol; TG—triglcyeride.

S. Badiou et al.: Current Diabetes Reports 2009, 9:305–311

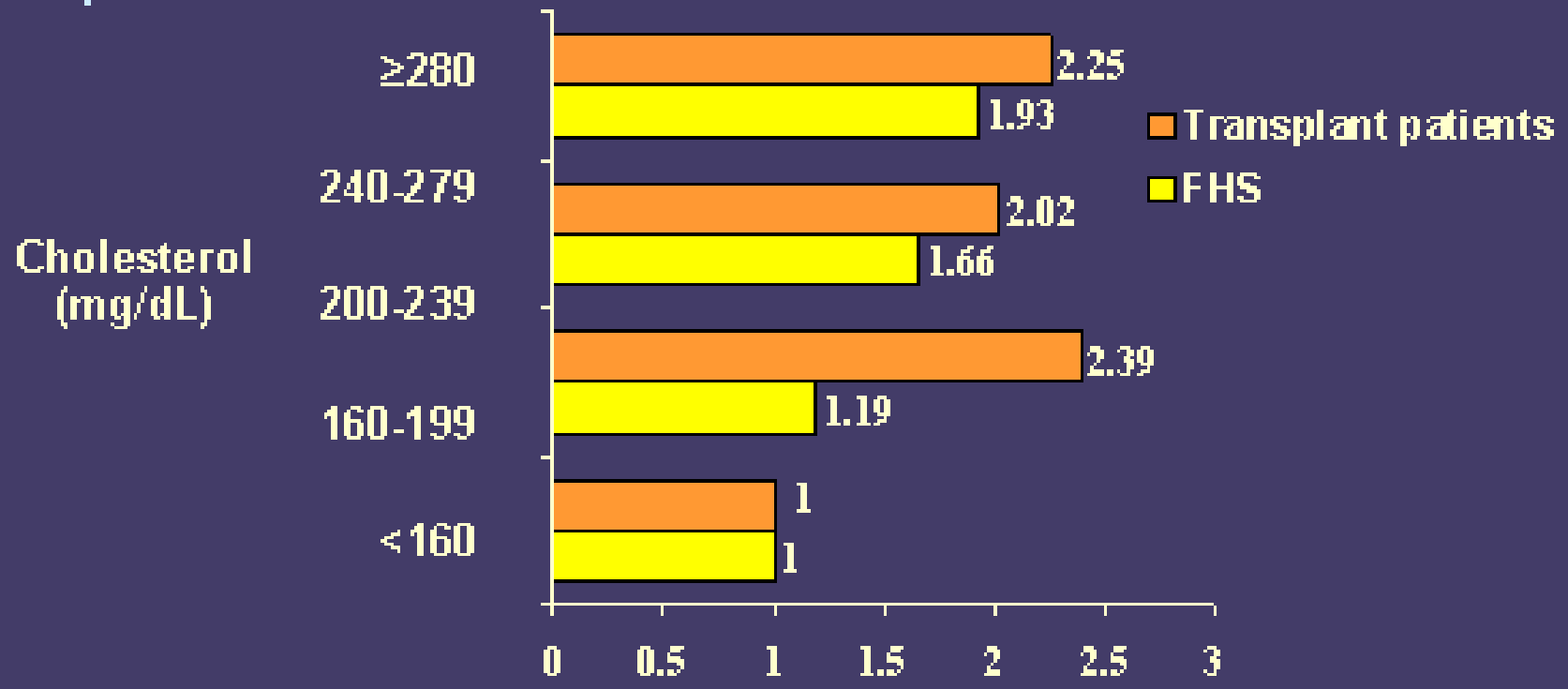
Prevalence of Hyperlipidemia in Renal Transplant Patients Based on CKD Stage

Karthikeyan V, Am J Transplant 4:262-269,2004



Hypercholesterolemia: Relative Risk for Ischemic Heart Disease in Patients More Than One Year After Renal Transplantation

Relative Risk of IHD in Males From the Framingham Heart Study (FHS) or Transplant Patients



Kasiske BL et al. *J Am Soc Nephrol.* 2000;65:1735-1743.
Wilson PWF et al. *Circulation.* 1998;97:1837-1847.

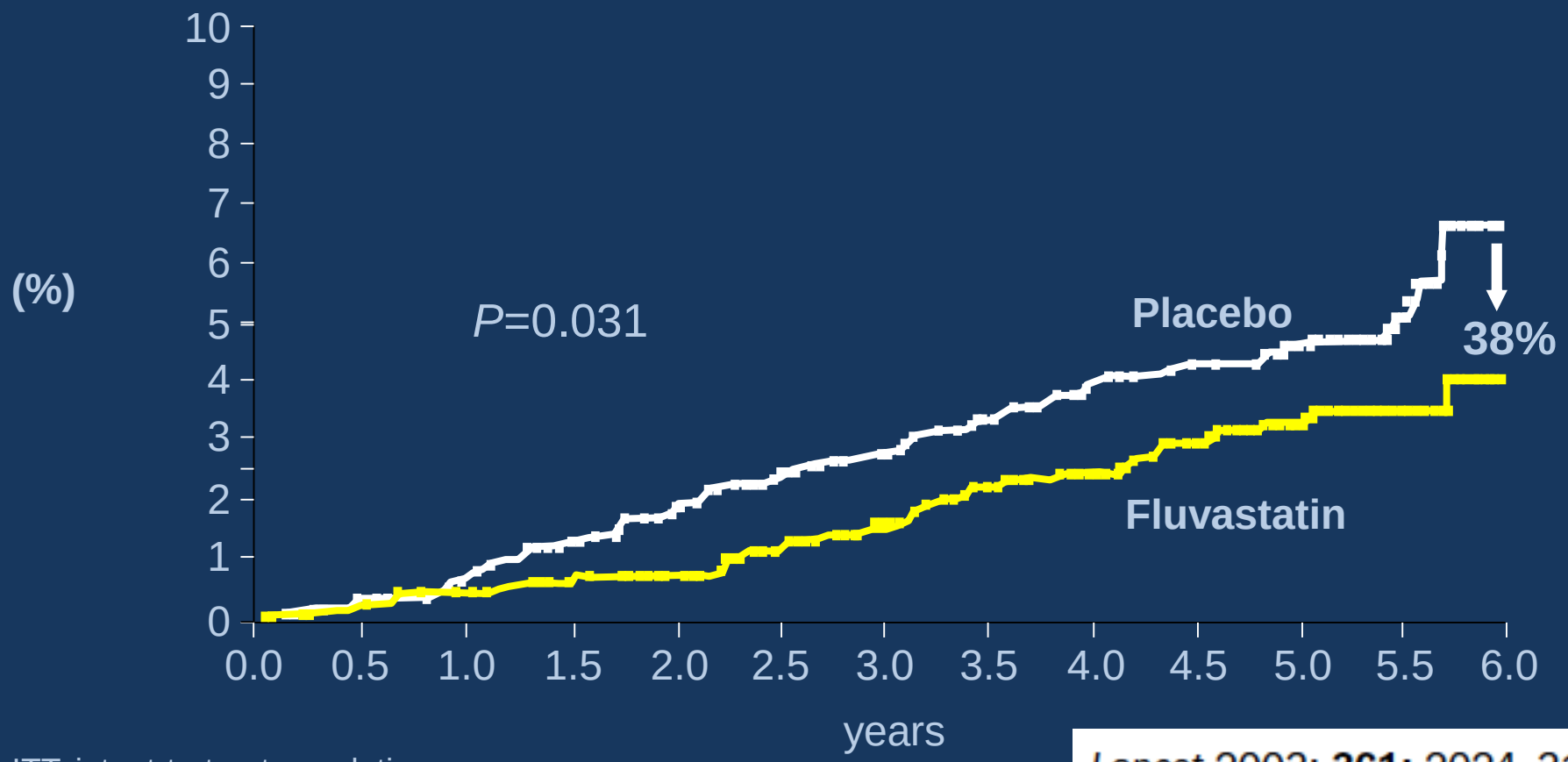
Lipid lowering strategies in transplant patients

- statins,
- fibrates,
- bile acid binding resins,
- cholesterol absorption inhibitors,
- nicotinic acid

- ??? Tx patients will have the same cardiovascular benefits from lipid lowering therapy achieving target or very low LDL-c levels (eg < 70 mg/dl) as non-transplant subjects

Effect of fluvastatin on cardiac outcomes in renal transplant recipients: a multicentre, randomised, placebo-controlled trial

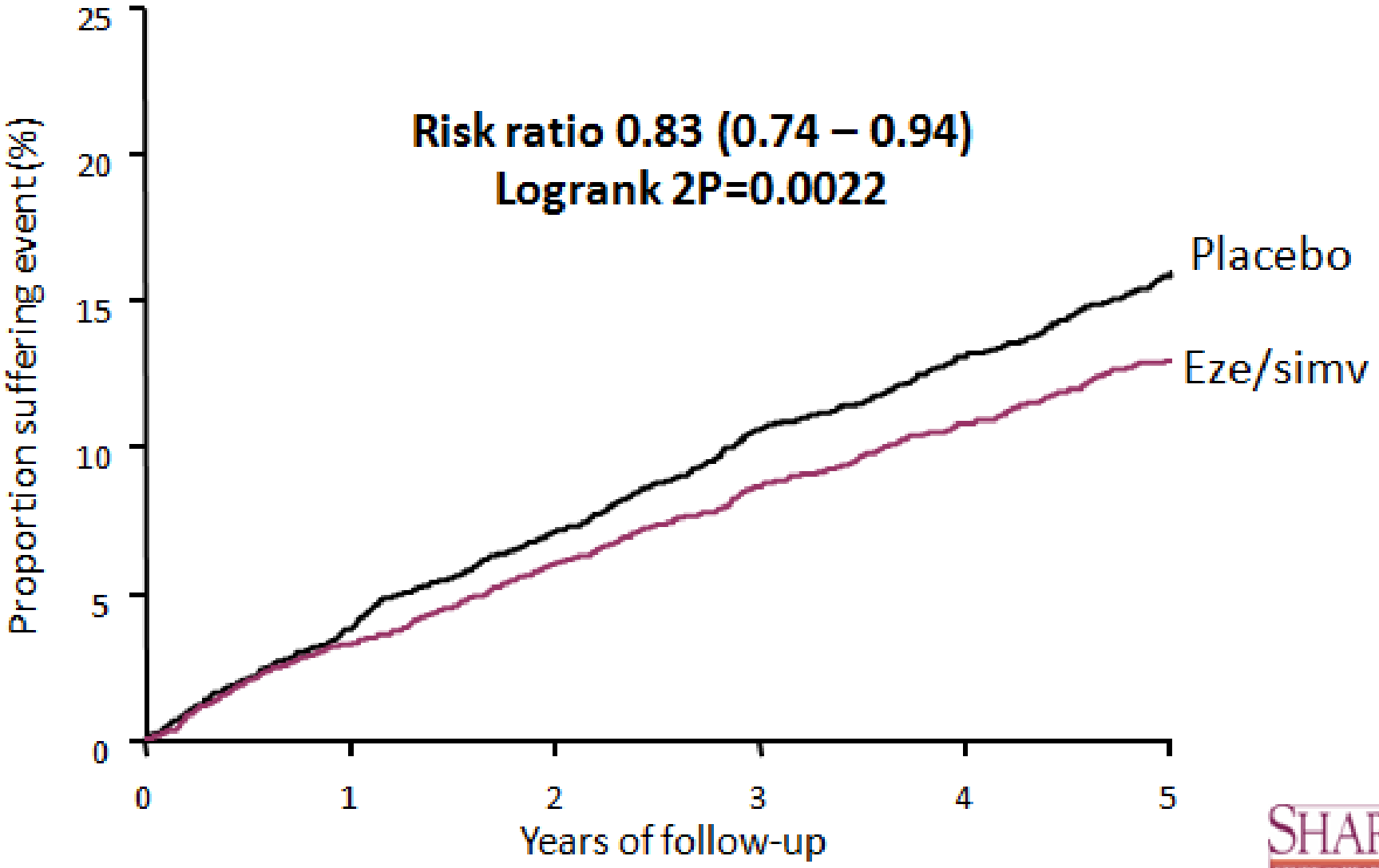
*Hallvard Holdaas, Bengt Fellström, Alan G Jardine, Ingar Holme, Gudrun Nyberg, Per Fauchald, Carola Grönhagen-Riska, Søren Madsen, Hans-Hellmut Neumayer, Edward Cole, Bart Maes, Patrice Ambühl, Anders G Olsson, Anders Hartmann, Dag O Solbu, Terje R Pedersen, on behalf of the Assessment of LEscol in Renal Transplantation (ALERT) Study Investigators**



ITT, intent-to-treat population.

Lancet 2003; **361:** 2024–31.

SHARP: Major Atherosclerotic Events



SHARP
STUDY OF HEART AND RENAL PROTECTION

Endorsement of the Kidney Disease Improving Global Outcomes (KDIGO) guidelines on kidney transplantation: a European Renal Best Practice (ERBP) position statement

Uwe Heemann[1], Daniel Abramowicz[2], Goce Spasovski[3] and Raymond Vanholder[4]
for the European Renal Best Practice (ERBP) Work Group on kidney transplantation

16.2.1: Measure a complete lipid profile in all adult (≥18 years old) and adolescent (puberty to 18 years old) KTRs (based on KDOQI Dyslipidemia Recommendation 1):

- 2–3 months after transplantation;
- 2–3 months after a change in treatment or other conditions known to cause dyslipidaemias;
- at least annually, thereafter.

Nephrol Dial Transplant (2011) 26: 2099–2106
doi: 10.1093/ndt/gfr169
Advance Access publication 9 May 2011

Endorsement of the Kidney Disease Improving Global Outcomes (KDIGO) guidelines on kidney transplantation: a European Renal Best Practice (ERBP) position statement

Uwe Heemann[1], Daniel Abramowicz[2], Goce Spasovski[3] and Raymond Vanholder[4]
for the European Renal Best Practice (ERBP) Work Group on kidney transplantation

16.2.2.1: For KTRs with fasting triglycerides ≥500 mg/dL (≥5.65 mmol/L) that cannot be corrected by removing an underlying cause, treat with:

- Adults: therapeutic lifestyle changes and a triglyceride-lowering agent (based on KDOQI Recommendation 4.1);
- Adolescents: therapeutic lifestyle changes (based on KDOQI Recommendation 5.1).

Nephrol Dial Transplant (2011) 26: 2099–2106
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Advance Access publication 9 May 2011

Endorsement of the Kidney Disease Improving Global Outcomes (KDIGO) guidelines on kidney transplantation: a European Renal Best Practice (ERBP) position statement

Uwe Heemann[1], Daniel Abramowicz[2], Goce Spasovski[3] and Raymond Vanholder[4]
for the European Renal Best Practice (ERBP) Work Group on kidney transplantation

- Adults: If low density lipoprotein cholesterol (LDL)-C ≥100 mg/dL (≥2.59 mmol/L), treat to reduce LDL-C to <100 mg/dL (<2.59 mmol/L) (based on KDOQI Guideline 4.2);
- Adolescents: If LDL-C ≥130 mg/dL (≥3.36 mmol/L), treat to reduce LDL-C to <130 mg/dL (<3.36 mmol/L) (based on KDOQI Guideline 5.2).

Nephrol Dial Transplant (2011) 26: 2099–2106
doi: 10.1093/ndt/gfr169
Advance Access publication 9 May 2011

Immunosuppressive protocols and CV risk

MINIMIZING GLUCOCORTICOID USE

- Lower doses administered earlier after transplantation
- Complete withdrawal, which can either be performed early after transplantation (approximately three to six months post-surgery) or at a later time (after one year)
- Complete avoidance, which most frequently has been utilized with a calcineurin inhibitor-based immunosuppressive regimen and polyclonal antibody induction therapy

Steroid Avoidance or Withdrawal After Renal Transplantation Increases the Risk of Acute Rejection but Decreases Cardiovascular Risk. A Meta-Analysis

Simon R. Knight[1,2] *and Peter J. Morris*[1,3]

TABLE 2. Meta-analysis of cardiovascular risk factors in all studies and studies reporting intention-to-treat analysis only

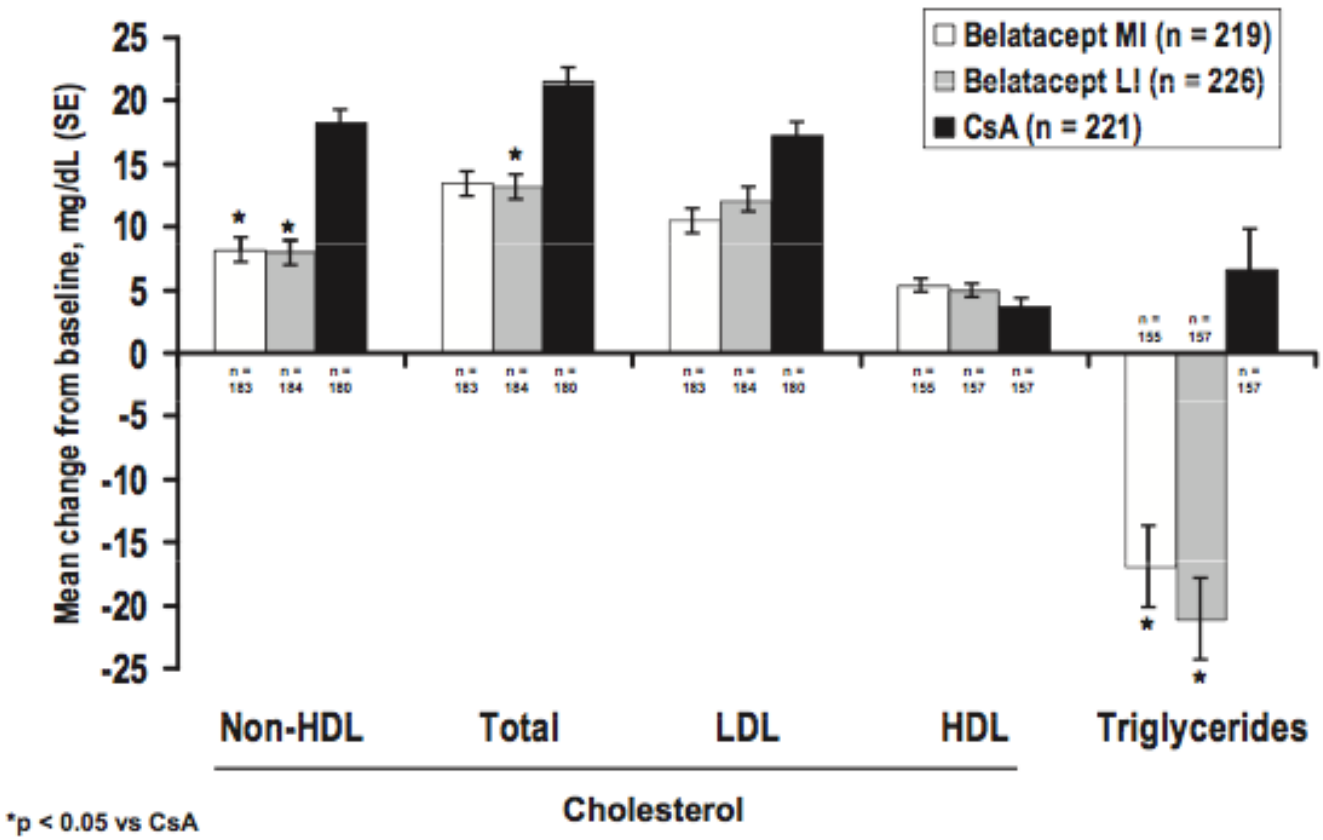
	Studies reporting outcome		Meta-analysis				
Outcome	Studies	Patients	Type	Relative risk	95% CI	*P*	I^2 (%)
All studies							
Hypertension	15	2,833	Fixed	0.90	0.85–0.94	<0.0001	16.2
Hypercholesterolemia	13	2,283	Random	0.76	0.67–0.87	<0.0001	47.8
New-onset diabetes	16	2,849	Fixed	0.64	0.50–0.83	0.0006	22.3
Intention-to-treat analysis only							
Hypertension	9	2,173	Fixed	0.92	0.86–0.97	0.005	10.5
Hypercholesterolemia	9	2,055	Random	0.80	0.70–0.90	0.0005	48.9
New-onset diabetes	10	2,346	Fixed	0.74	0.56–0.96	0.02	11.0

CI, confidence interval; Random, random-effects analysis; Fixed, fixed-effects analysis; I^2, *I*-squared statistic (measure of heterogeneity, see text).

(Transplantation 2010;89: 1–14)

Belatacept-Based Regimens Are Associated With Improved Cardiovascular and Metabolic Risk Factors Compared With Cyclosporine in Kidney Transplant Recipients (BENEFIT and BENEFIT-EXT Studies)

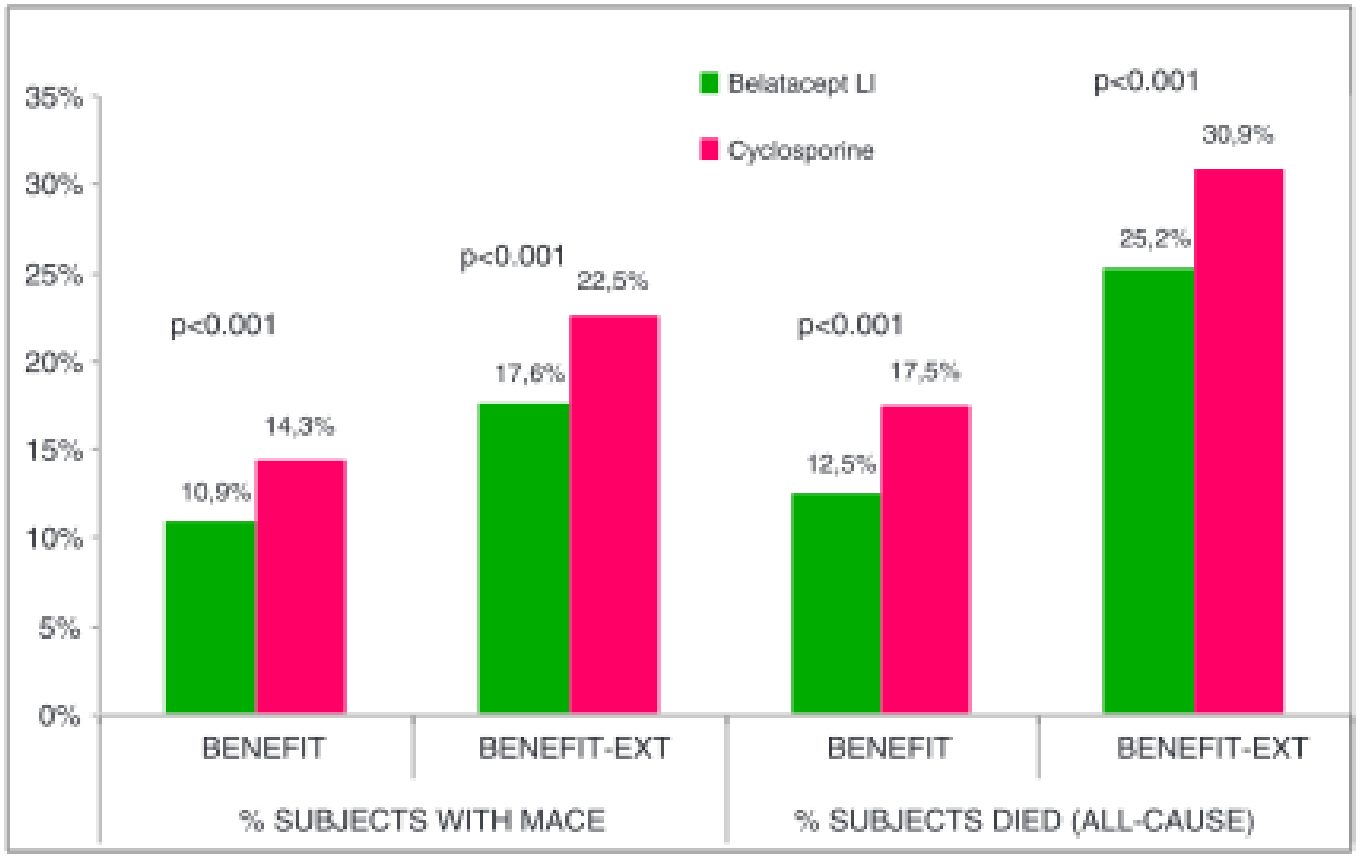
Yves Vanrenterghem,[1,13] Barbara Bresnahan,[2] Josep Campistol,[3] Antoine Durrbach,[4] Josep Grinyó,[5] Hans-Hellmut Neumayer,[6] Philippe Lang,[7] Christian P. Larsen,[8] Eduardo Mancilla-Urrea,[9] José Medina Pestana,[10] Alan Block,[11] Tao Duan,[11] Alan Glicklich,[11] Sheila Gujrathi,[11] and Flavio Vincenti[12]



(Transplantation 2011;91: 976–983)

The External Validation of the Cardiovascular Risk Equation for Renal Transplant Recipients: Applications to BENEFIT and BENEFIT-EXT Trials

Inga Soveri,[1,7] Jon Snyder,[2] Hallvard Holdaas,[3] Ingar Holme,[4] Alan G. Jardine,[5] Gilbert J. L'Italien,[6] and Bengt Fellström[1]



Transplantation
2013;95: 142-147

Obesity

Obesity is BAD!

- 1. Obesity is associated with increased morbidity and mortality, esp. Metabolic Syndrome and Diabetes mellitus, in the general population.
- 2. Obesity is a risk factor for the development of CKD and ESRD.
- 3. Obesity is a risk factor for CVD, CAD and CHF.
- 4. Obesity is associated with increased pro-inflammatory cytokines & oxidative stress.

BMI = Weight (kg) / height (m)^2

<20: Lean (<18.5: Malnourished?)

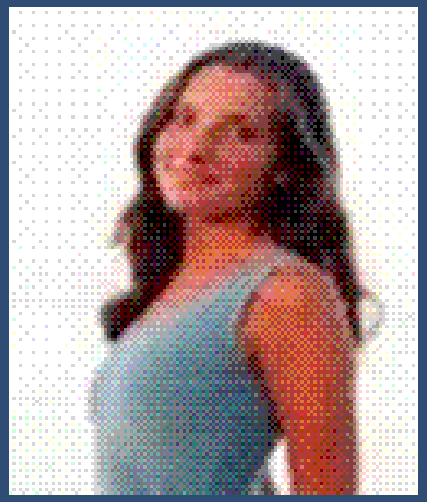
20-25: Healthy ?

25-30: Overweight

30-35: Obese

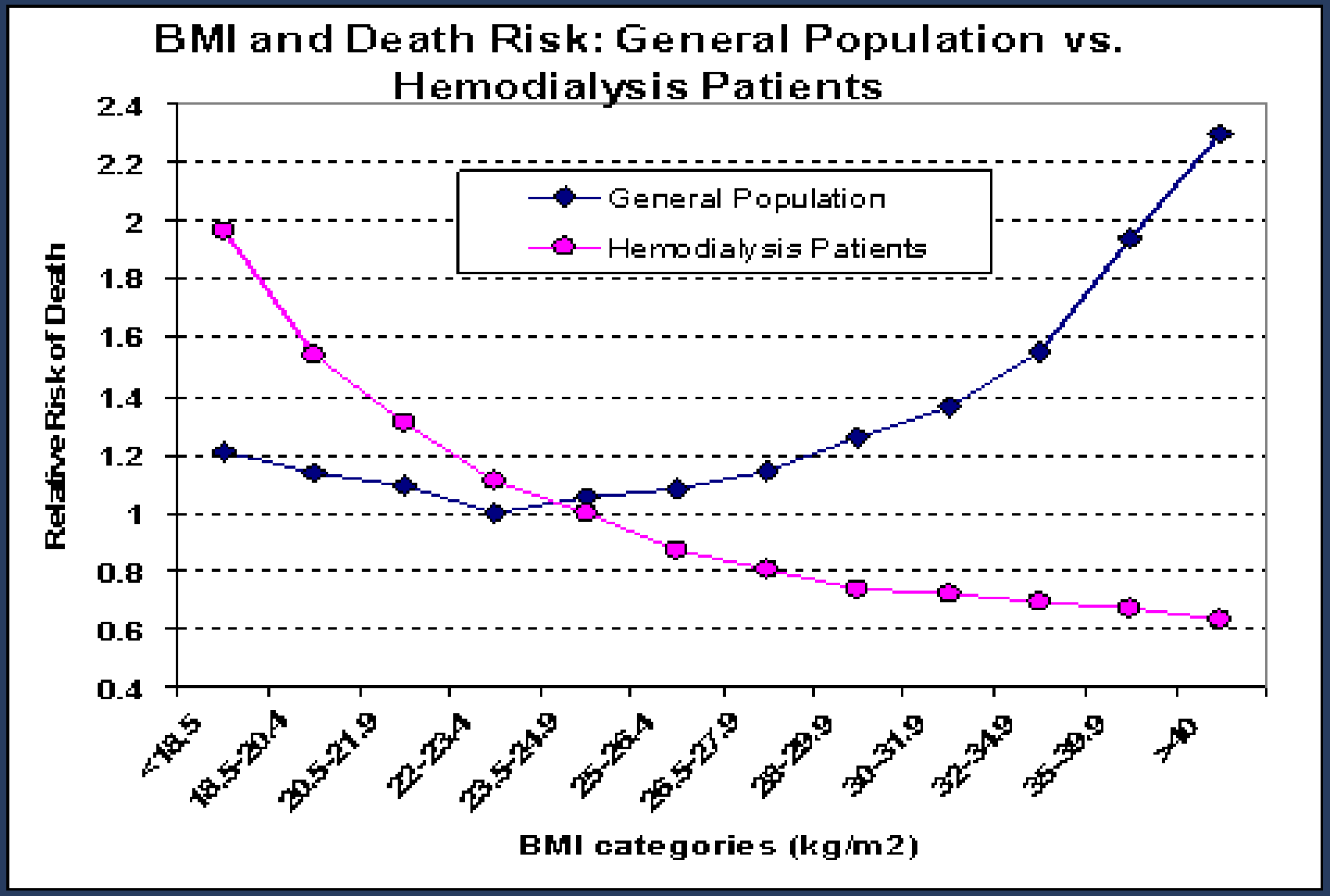
>35: Morbidly obese (>40 if no other risk)

Who will survive longer on dialysis?



Female: 28 y/o
weight 123 lbs
BMI 21 kg/m^2
BP 110/65
Cholesterol 141 mg/dL

Female: 26 y/o
weight 241 lbs
BMI 43 kg/m^2
BP 165/105
Cholesterol 220 mg/dL


BMI and Death Risk: General Population vs. Hemodialysis Patients
General Population
Hemodialysis Patients
Relative Risk of Death
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
<18.5
18.5-20.4
20.5-21.9
22-23.4
23.5-24.9
25-26.4
26.5-27.9
28-29.9
30-31.9
32-34.9
35-39.9
>40
BMI categories (kg/m2)

Arnold's BMI: 37 kg/m2 (1995)

Actor or Athlete	Height	Weight in lbs. *(in 2003)*	BMI
Sylvester Stallone	5'9"	228	34
Arnold Schwarzenegger	6'2"	257	33
Sammy Sosa	6'0"	220	30
Harrison Ford	6'1"	218	29
George Clooney	5'11"	211	29
Bruce Willis	6'0"	211	29
Mike Piazza	6'3"	215	27
Brad Pitt	6'0"	203	27
Michael Jordan	6'6"	216	25

From: "Celebrity Height Weight Chart"

KDIGO clinical practice guideline for the care of kidney transplant recipients

16.4: OBESITY

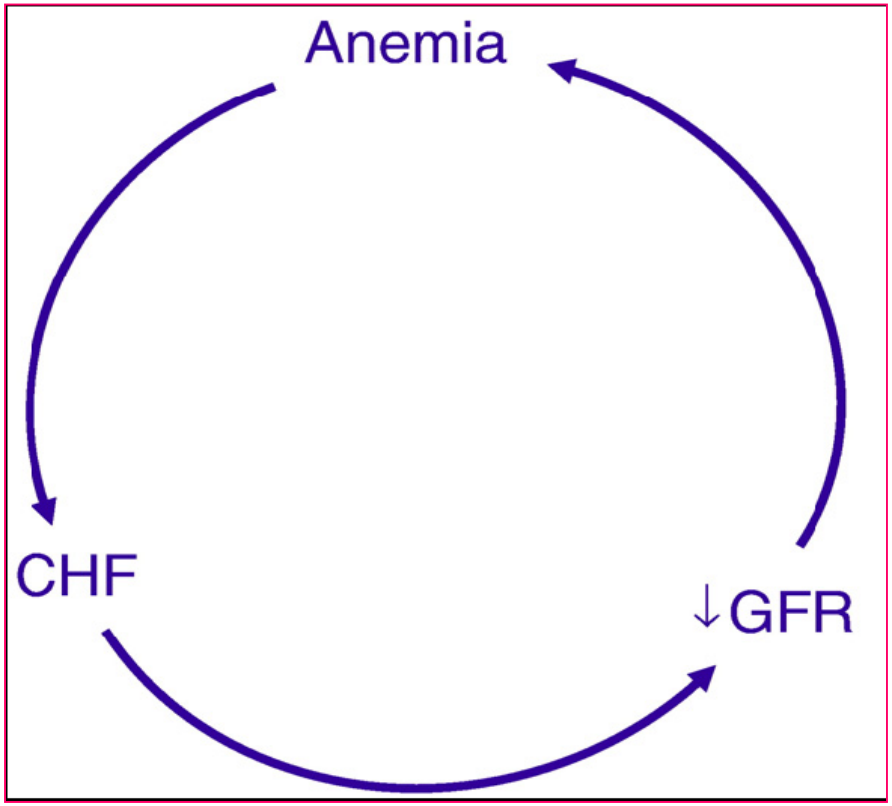
16.4.1: Assess obesity at each visit. *(Not Graded)*

- **Measure height and weight at each visit, in adults and children.**
- **Calculate BMI at each visit.**
- **Measure waist circumference when weight and physical appearance suggest obesity, but BMI is <35 kg/m^2.**

16.4.2: Offer a weight-reduction program to all obese KTRs. *(Not Graded)*

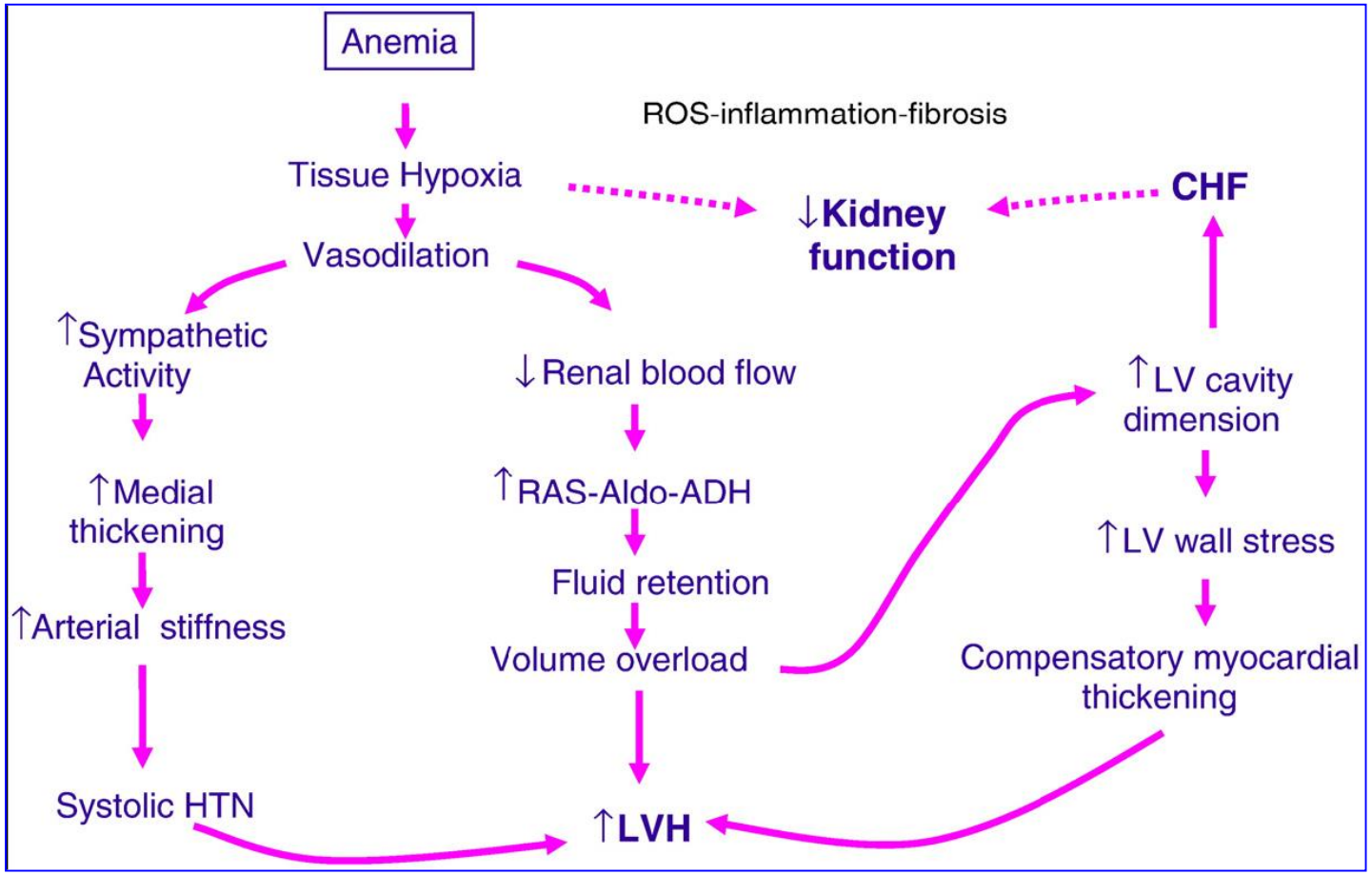
American Journal of Transplantation 2009; 9 (Suppl 3): S1–S157

Anemia



Cardio-renal-anemia: a vicious cycle.

CHF indicates congestive heart failure.

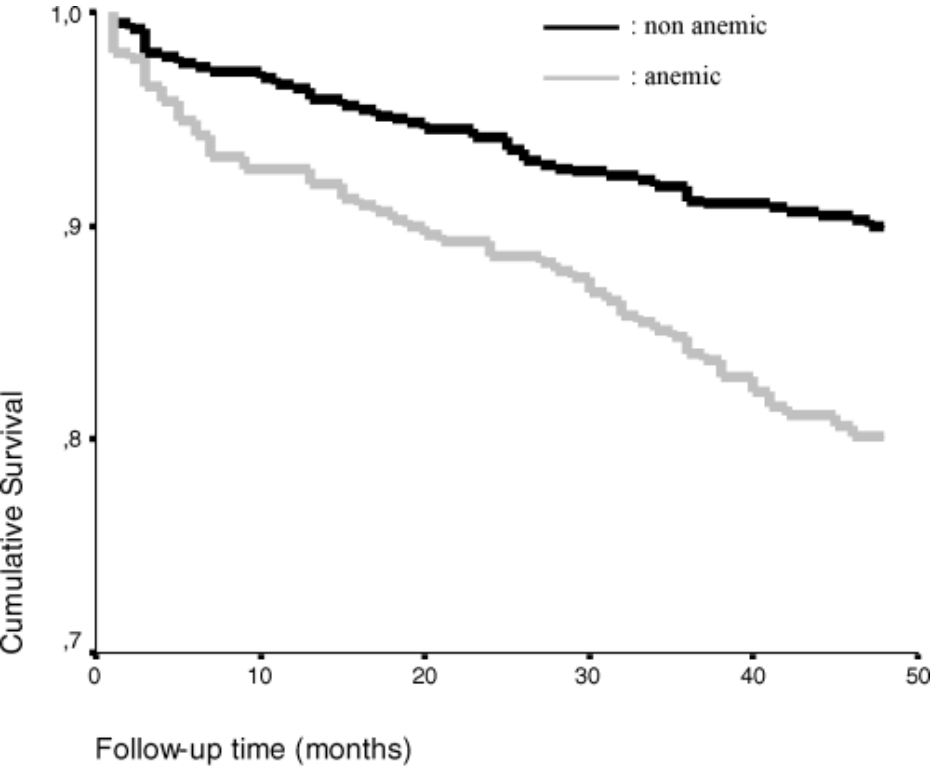


Mechanisms linking anemia to LV hypertrophy

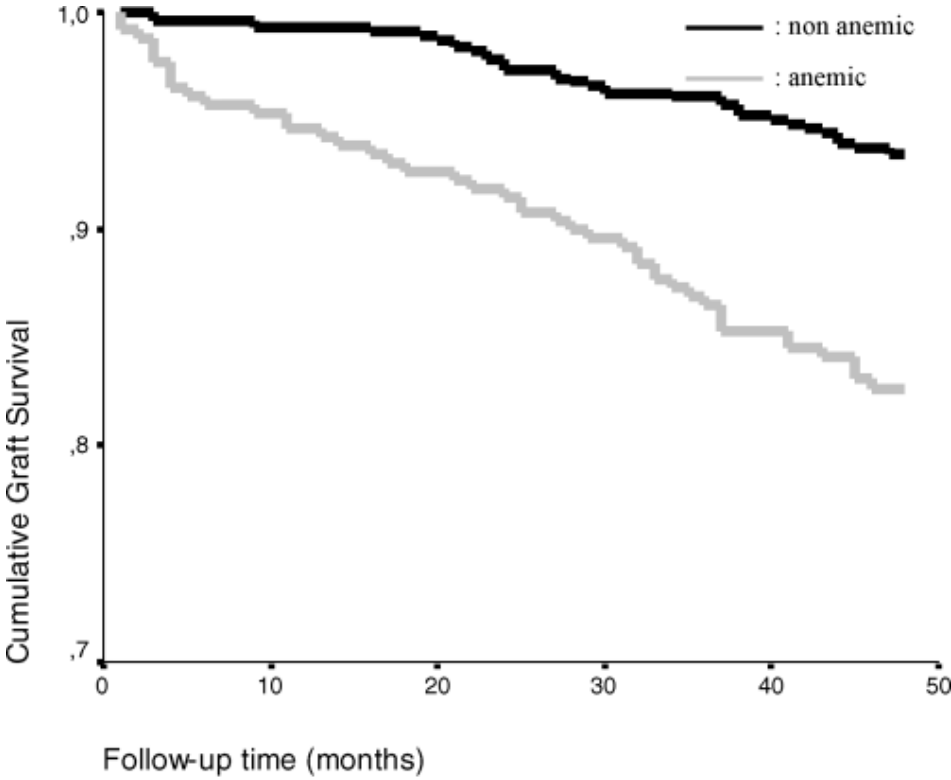
RAS indicates renin-angiotensin system; Aldo, aldosterone; ADH, antidiuretic hormone; HTN, hypertension; LV, left ventricular; LVH, left ventricular hypertrophy; CHF, congestive heart failure

Anemia Is Associated with Mortality in Kidney-Transplanted Patients—A Prospective Cohort Study

M. Z. Molnar[a,b,c], M. Czira[a], C. Ambrus[b,c], L. Szeifert[a], A. Szentkiralyi[a], G. Beko[d], L. Rosivall[e], A. Remport[f], M. Novak[a,g] and I. Mucsi[a,b,e,*]



Log Rank: p<0.0001

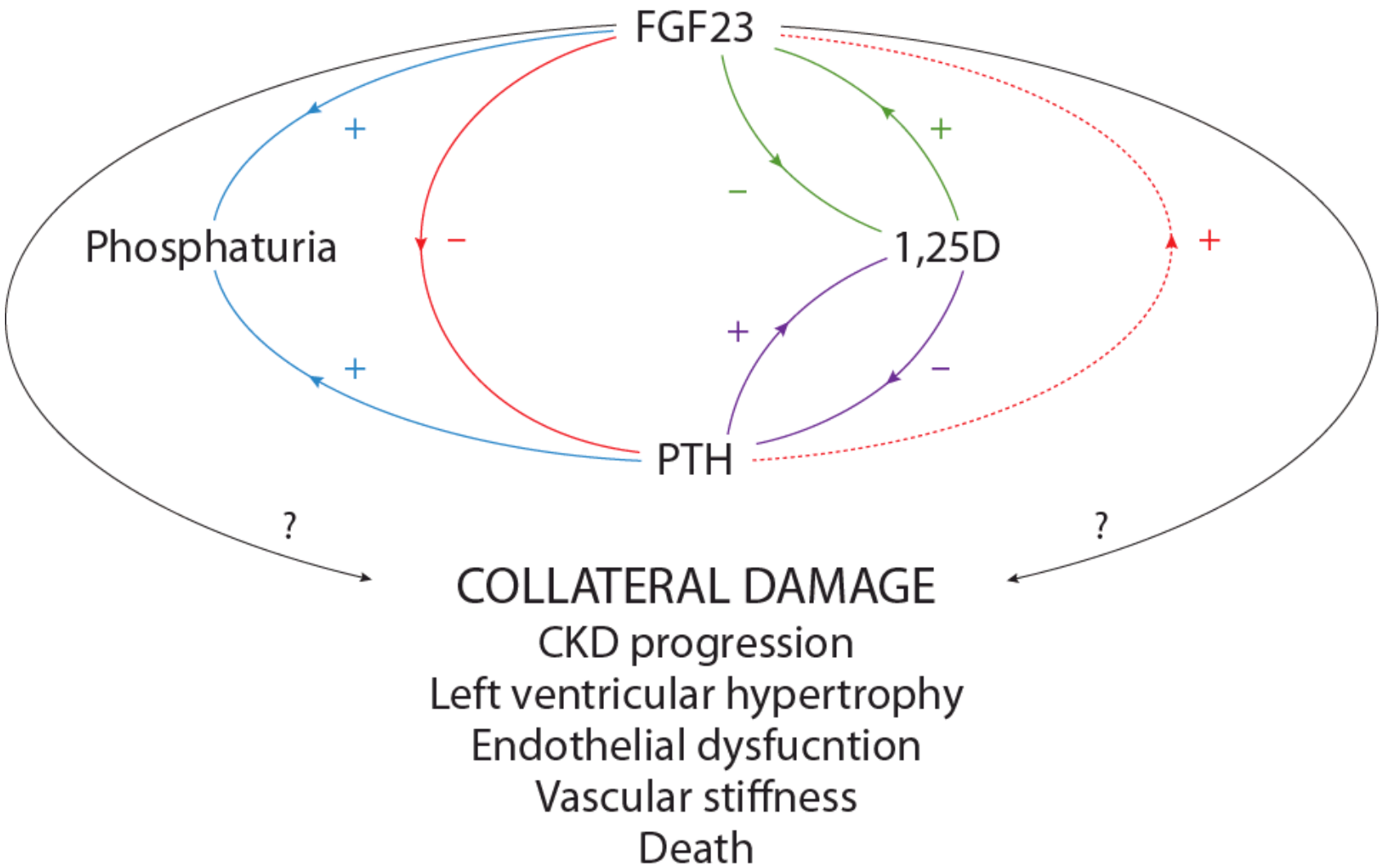


Log Rank: p<0.0001

American Journal of Transplantation 2007; 7: 818–824
Blackwell Munksgaard

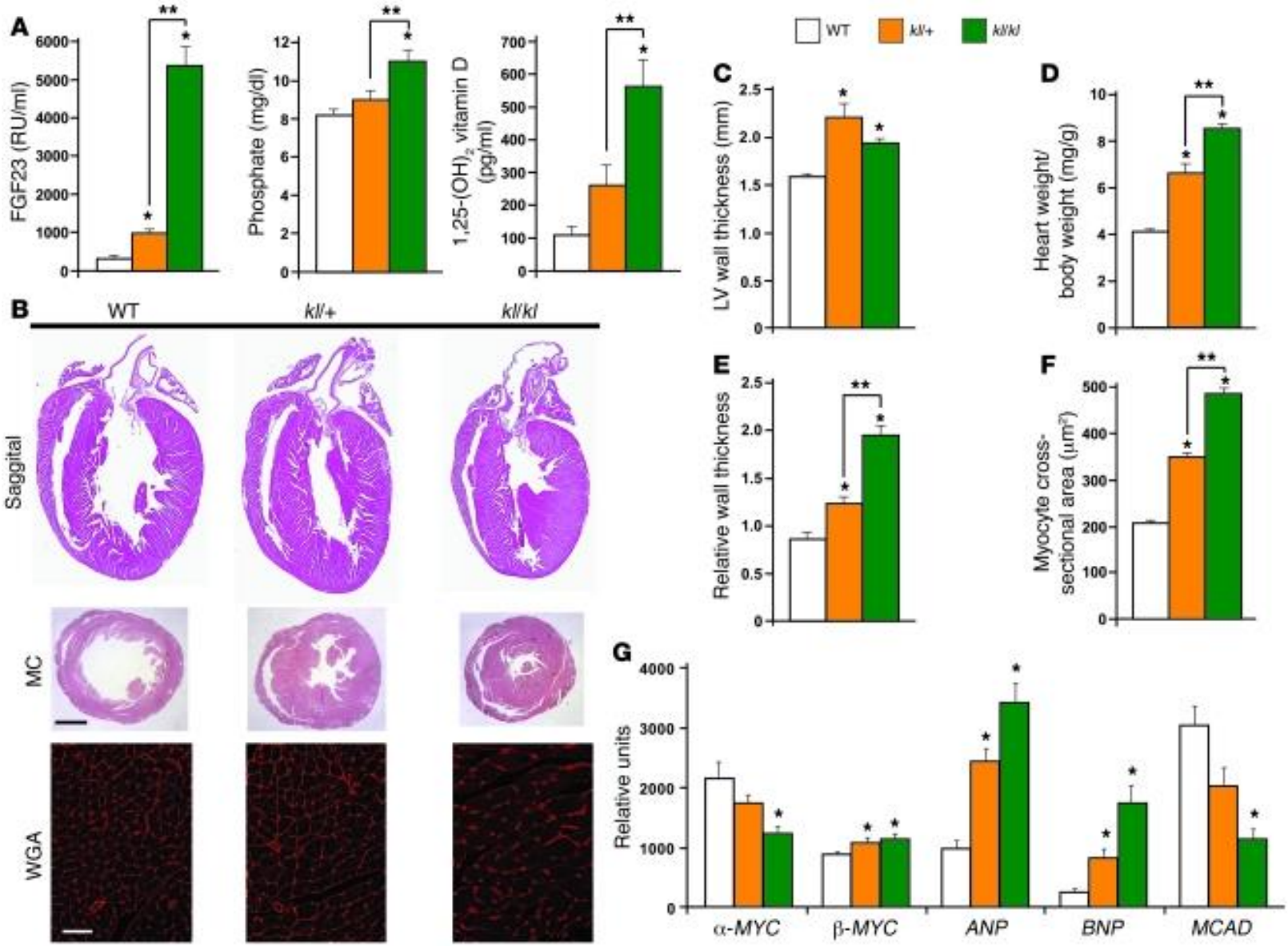
FGF23 in kidney transplant recipients

FGF23 Actions and Feedback Loops



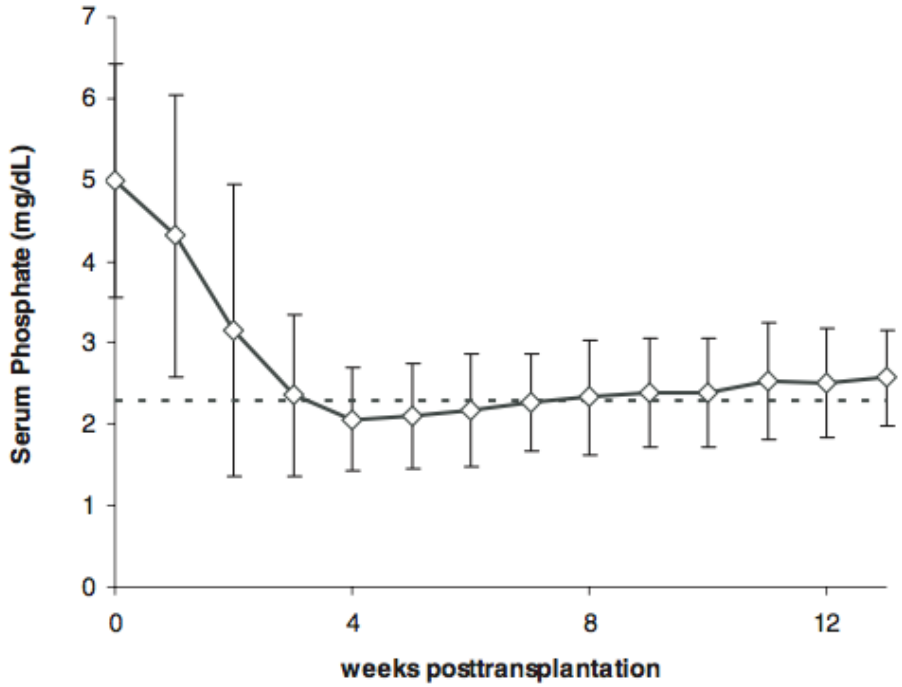
M Wolf, J Am Soc Nephrol 21: 1427–1435, 2010. d

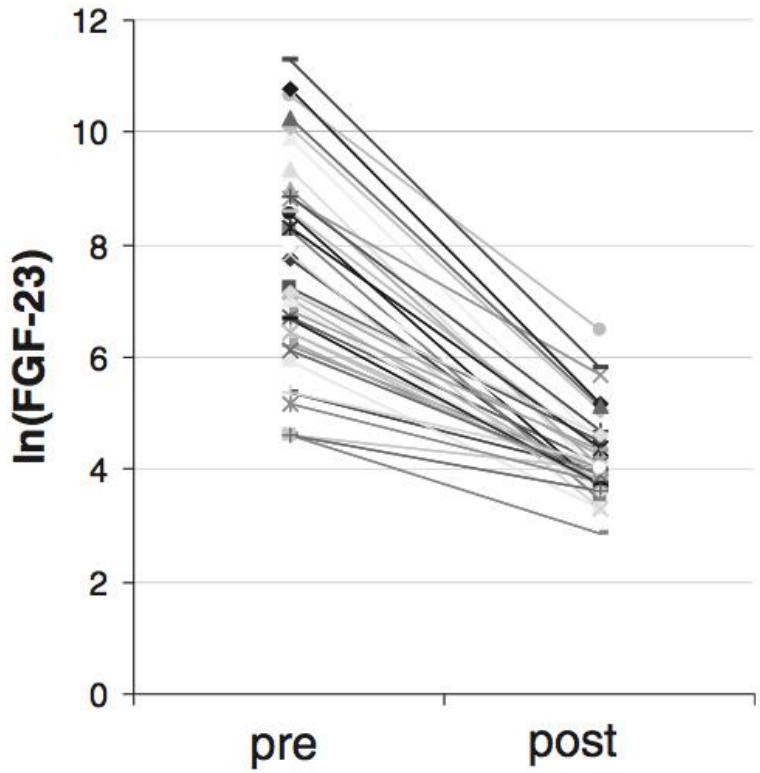
Klotho-deficient and klotho heterozygous mice develop LVH



J Clin Invest. 2011;121(11):4393–4408.

Tertiary 'Hyperphosphatoninism' Accentuates Hypophosphatemia and Suppresses Calcitriol Levels in Renal Transplant Recipients



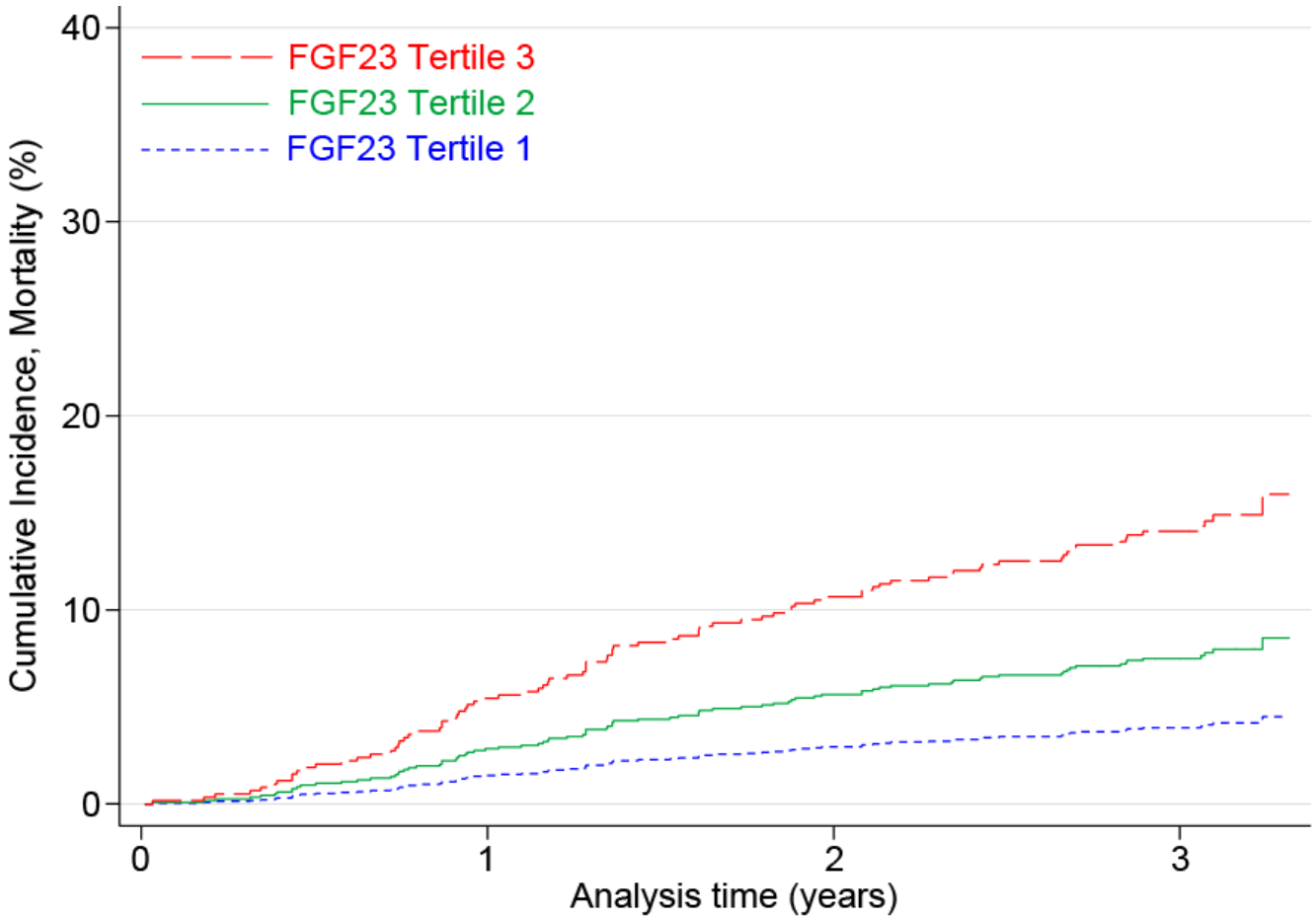


P. Evenepoel∗, M. Naesens, K. Claes, D. Kuypers and Y. Vanrenterghem

American Journal of Transplantation 2007; 7: 1193–1200

Elevated Fibroblast Growth Factor 23 is a Risk Factor for Kidney Transplant Loss and Mortality

Myles Wolf,* Miklos Z. Molnar,[†‡§] Ansel P. Amaral,* Maria E. Czira,[‡] Anna Rudas,[‡]
Akos Ujszaszi,[†] Istvan Kiss,[‖] Laszlo Rosivall,[†] Janos Kosa,[¶] Peter Lakatos,[¶]
Csaba P. Kovesdy,**[††] and Istvan Mucsi[†‡‡]

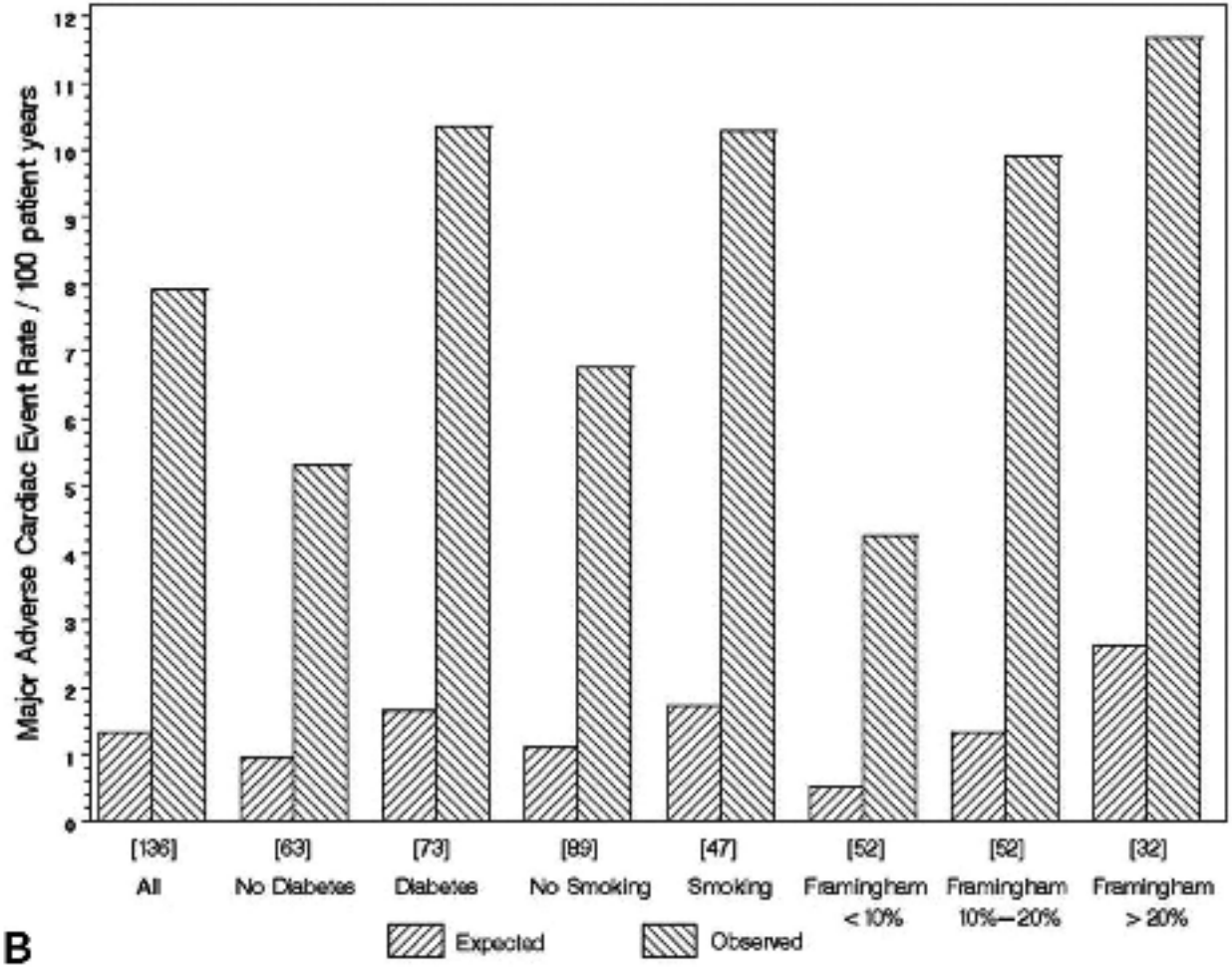


J Am Soc Nephrol 22: 956–966, 2011

Assessing CV risk

Framingham Risk Score and Novel Cardiovascular Risk Factors Underpredict Major Adverse Cardiac Events in Kidney Transplant Recipients

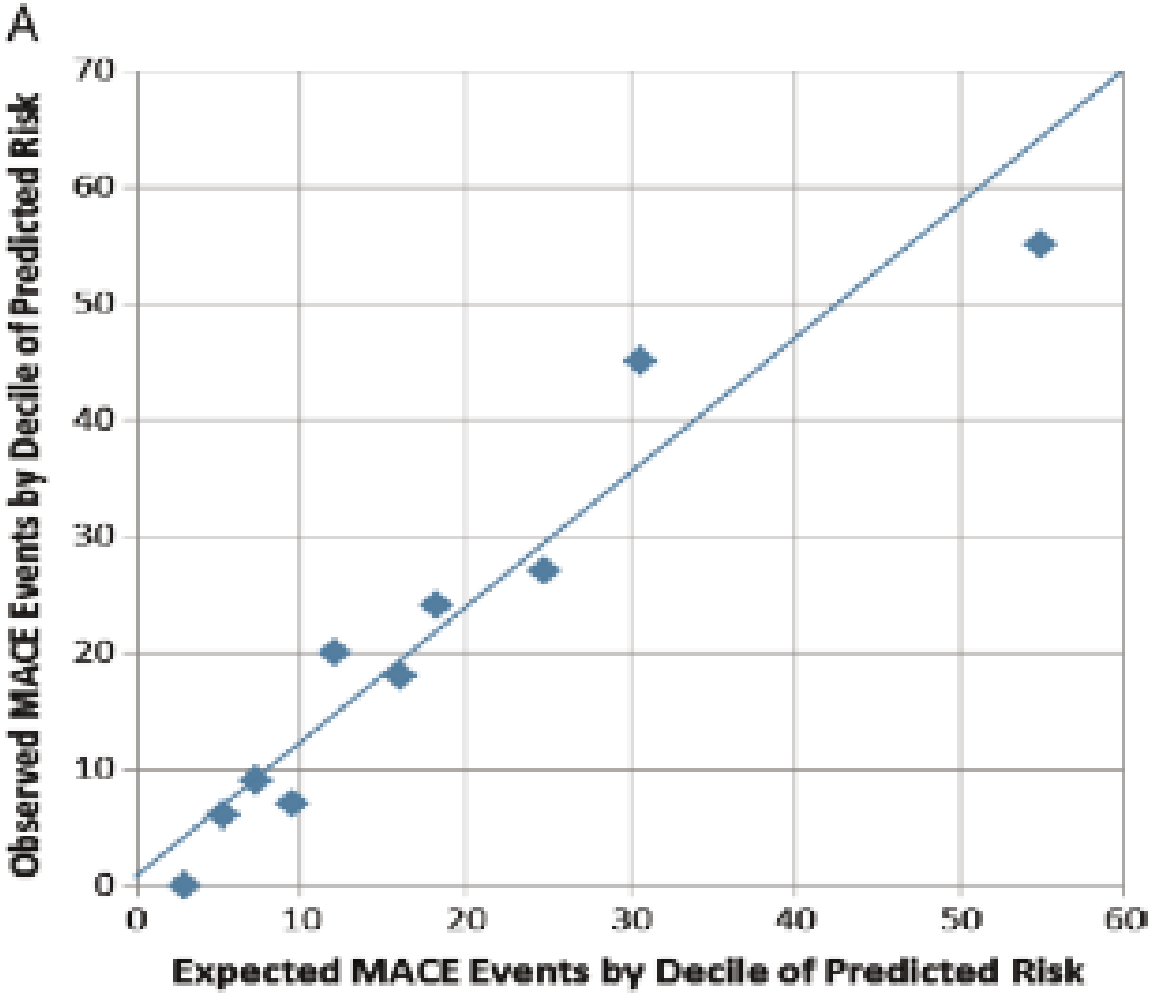
Samuel A. Silver,[1] Michael Huang,[2] Michelle M. Nash,[2] and G. V. Ramesh Prasad[1,2,3]



Transplantation 2011;92: 183–189

The External Validation of the Cardiovascular Risk Equation for Renal Transplant Recipients: Applications to BENEFIT and BENEFIT-EXT Trials

Inga Soveri,[1,7] Jon Snyder,[2] Hallvard Holdaas,[3] Ingar Holme,[4] Alan G. Jardine,[5] Gilbert J. L'Italien,[6] and Bengt Fellström[1]



- age,
- Previous coronary heart disease
- Smoking
- serum creatinine,
- diabetes mellitus,
- LDL-cholesterol (for MACE only),
- total time on renal replacement therapy (for MACE
- only),
- number of transplants

Transplantation 2013;95: 142-147

Risk prediction

- Framingham Risk Score

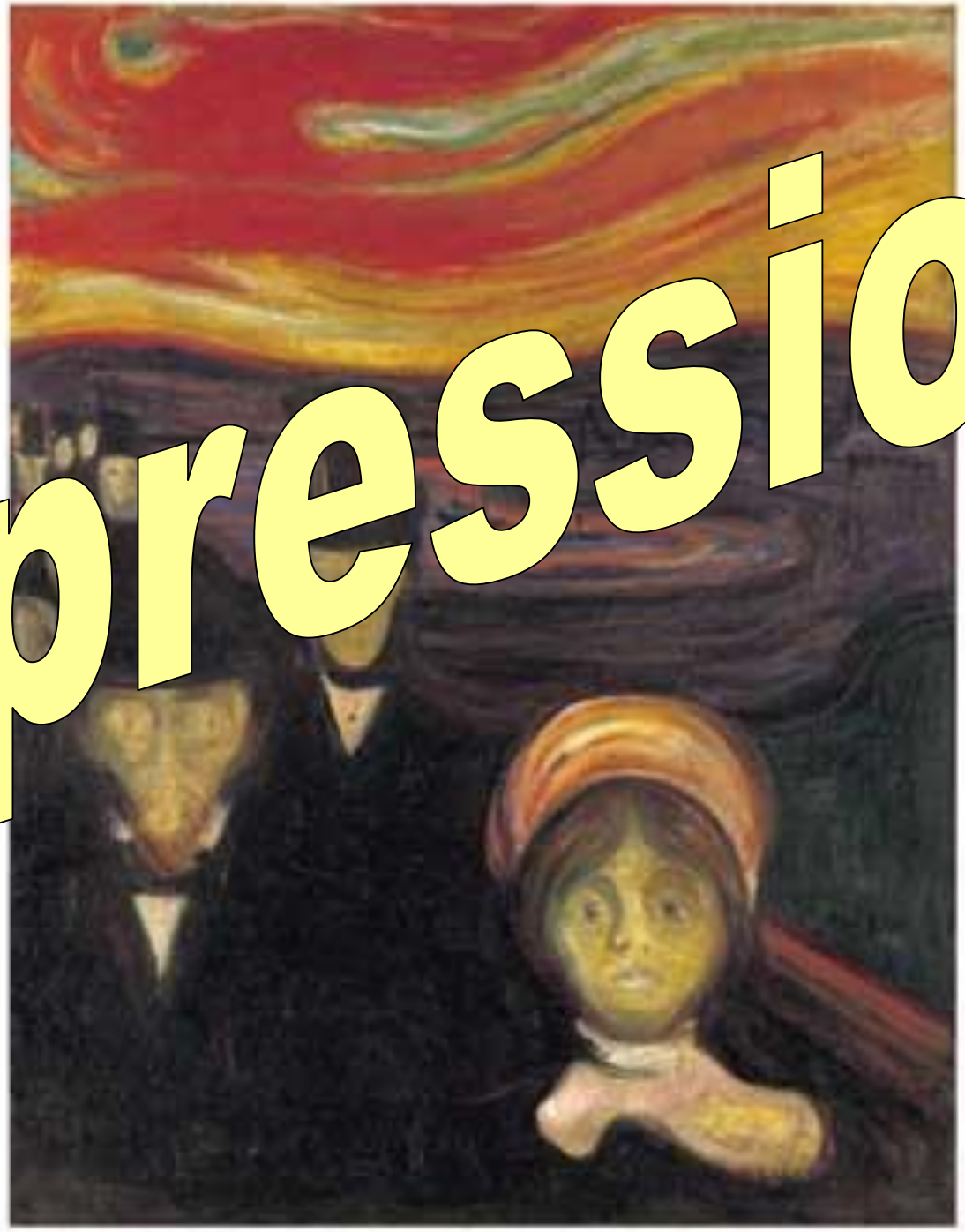
- Age
- LDL/total cholesterol
- HDL-cholesterol
- Blood pressure
- Presence of diabetes
- Smoker status

- Lisbon conference (2007)

- age 60 years
- dyslipidemia
- hypertension,
- diabetes mellitus,
- smoking,

- prior cardiovascular disease,
- years on dialysis,
- left ventricular hypertrophy

Depression



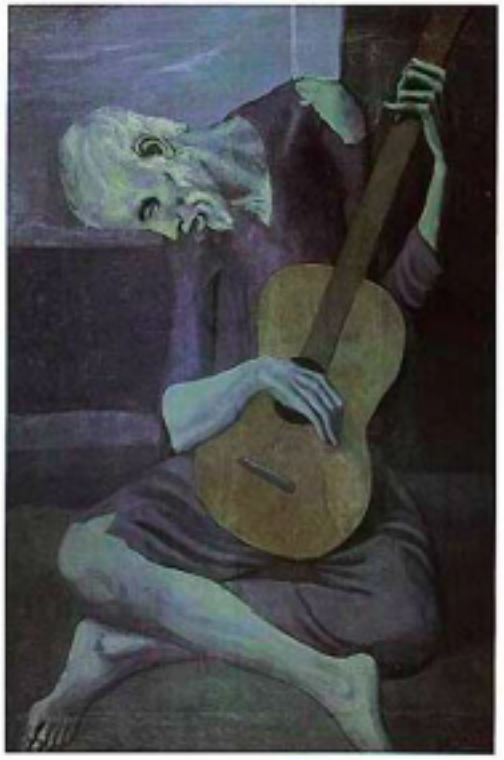
Depression

Common
10% in primary care, more common in patients with chronic medical illnesses

Disabling
#2 cause of disability (WHO)

Expensive
50-100% higher health care costs

Deadly
Over 30,000 suicides / year

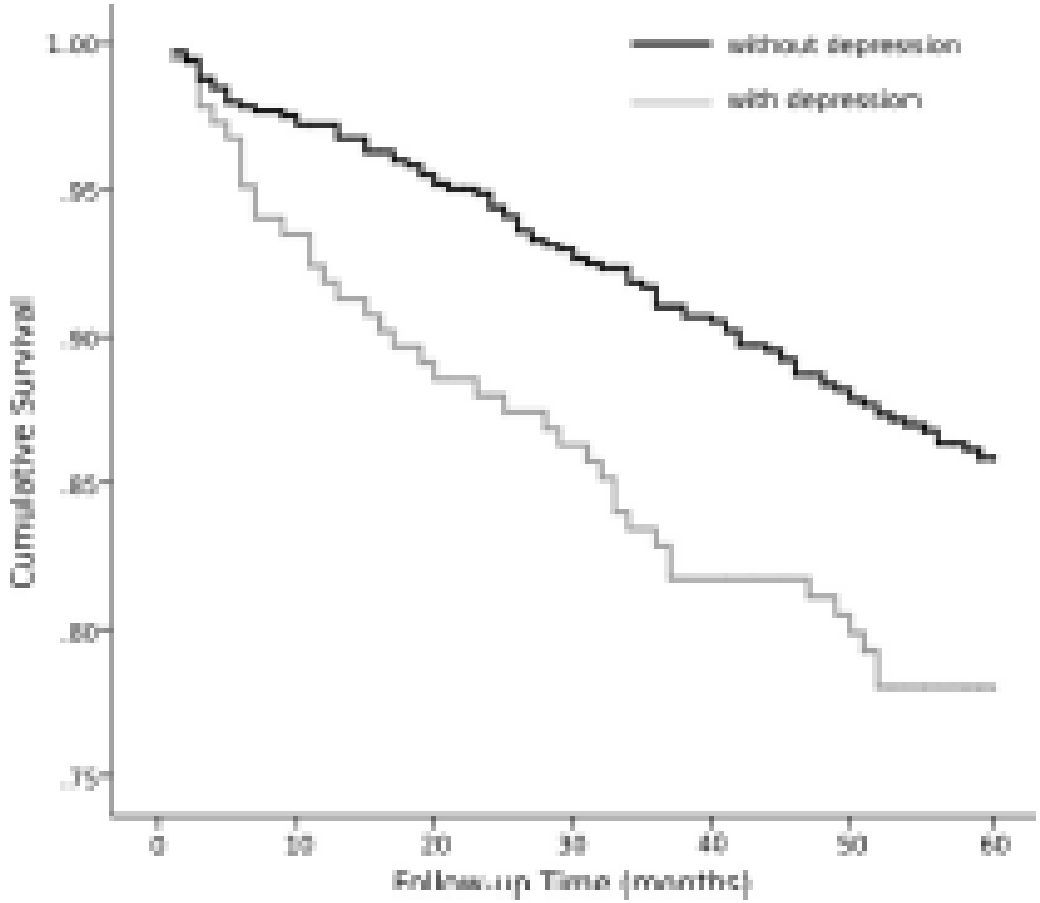


Significance of depression

- A major predictor of QoL in different Pt groups
- High prevalence, large social and economic burden
- Treatment adherence
- Rehabilitation
- Association with CV diseases, diabetes, outcome

Depressive Symptoms and Mortality in Patients After Kidney Transplantation: A Prospective Prevalent Cohort Study

Marta Novak, MD, PhD, Miklos Zsolt Molnar, MD, PhD, Lilla Szhifert, MD, Agnes Zsofia Kovacs, MD, Eszter Panna Vamos, MD, PhD, Rezso Zoller, MD, Andras Keszei, MD, PhD, and Istvan Mucsi, MD, PhD



Psychosomatic Medicine 72:527–534 (2010)

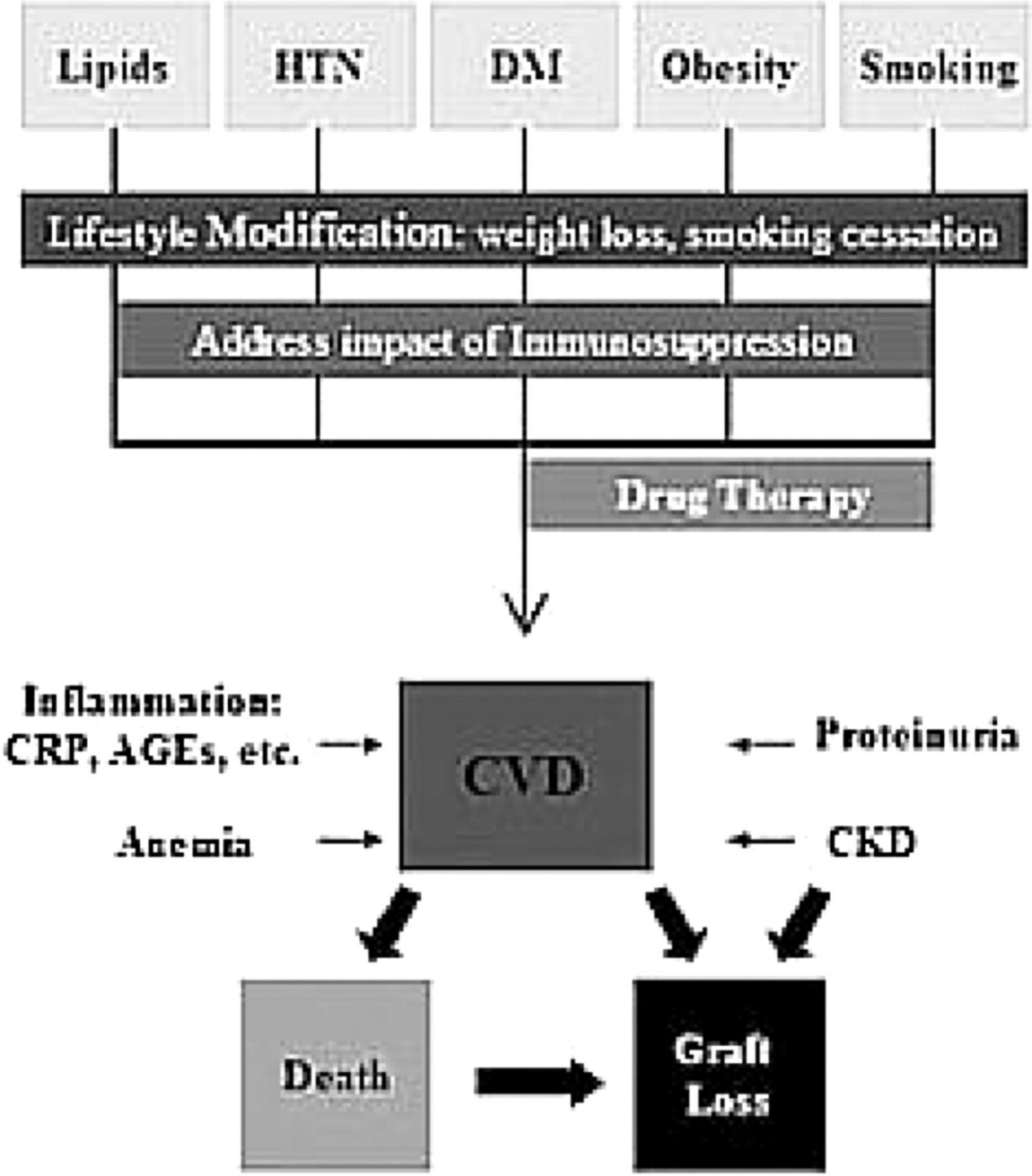
Multidisciplinary care

How to improve outcome in kidney transplanted patients?

An important issue for long term patient outcomes is to reduce ISU toxicity and to manage CV disease.

- Before Tx :
  - Dialysis vintage
  - CV management
  - CV interventions

- After Tx: medical management
  - HTN
  - DM
  - Dyslipidaemia
  - Obesity
  - Smoking
  - Inflammation
  - Anemia
  - Bone
  - …



cardiovascular disease management after renal transplantation

Shirali, A. C. et al. Clin J Am Soc Nephrol 2008;3:491-504

CJASN

Steno 2: Intensive Therapy

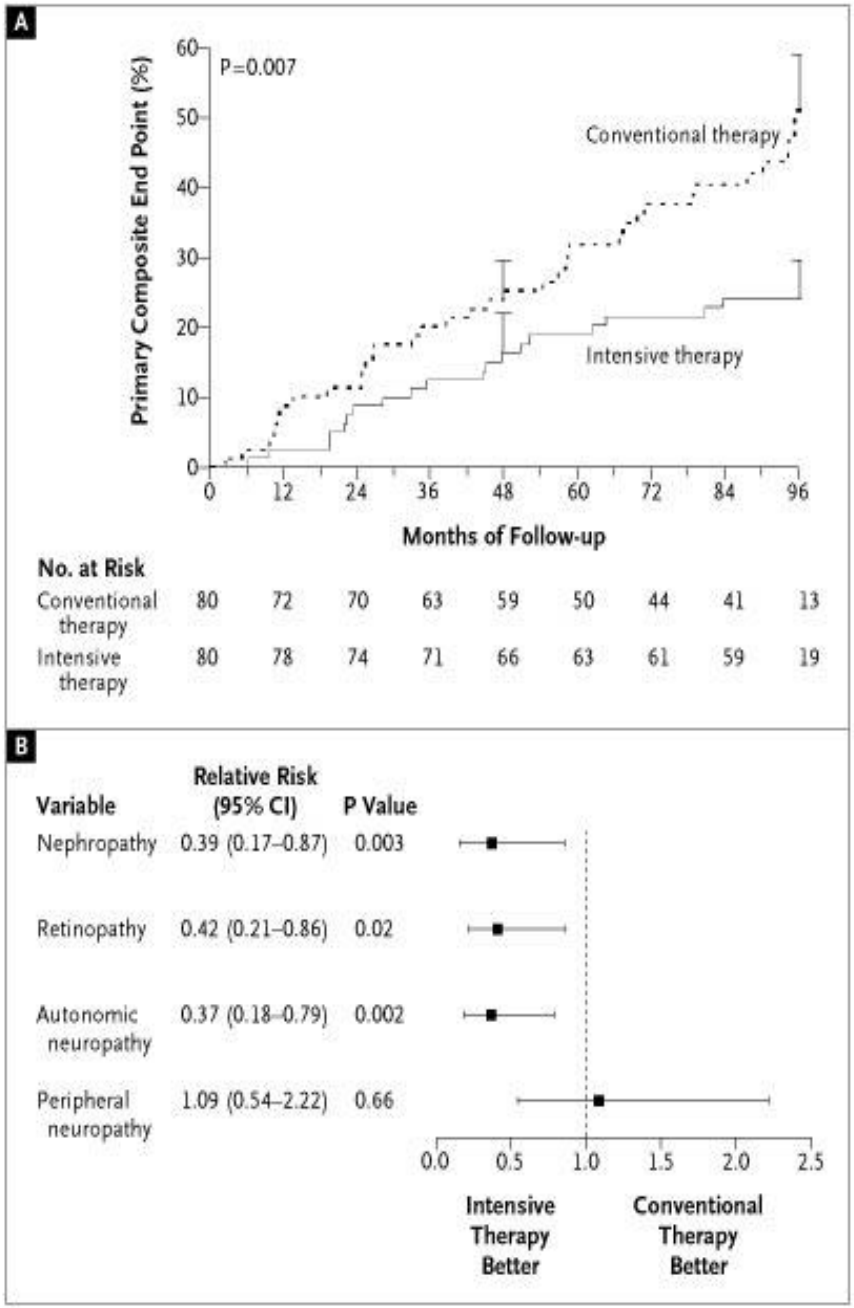
NB: combined cardio/renal protection

- Multidisciplinary team (MD, nurse, dietician)
- Diet
- Exercise 30 minutes 3 – 5x/wk
- Smoking cessation courses
- ACEI/ARB independent of BP
- Vitamin – mineral supplement
- ASA
- Glycemic control
- BP control
- Lipid control

Gaede P et al. NEJM 2003; 348: 383-393

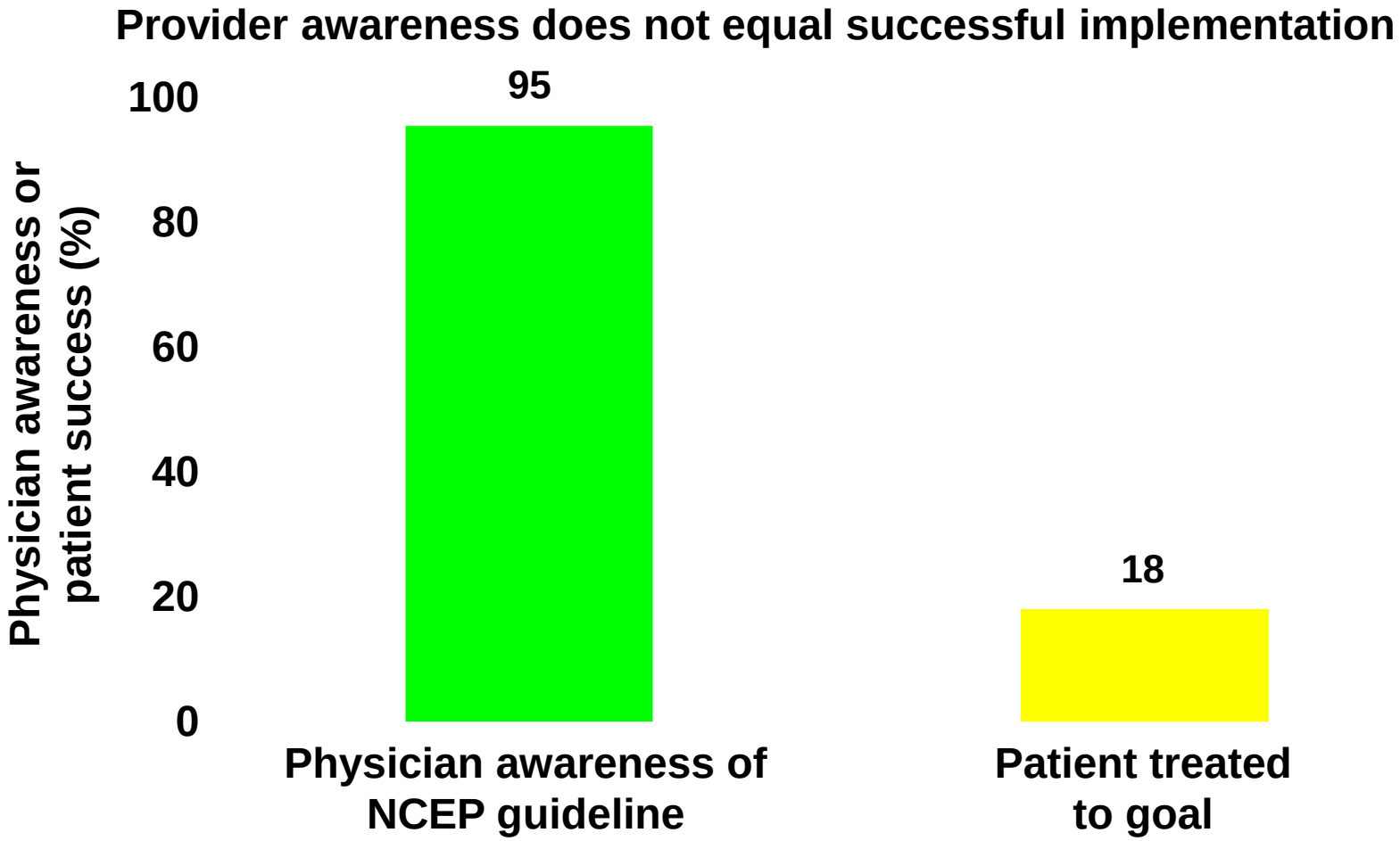
Steno 2: Outcomes

- Hazard ratio = 0.47 in favor of intensive group (.24 - .73, p=0.008)
- Absolute RR = 20%
- NNT 5 patients to prevent one CV event in 7.8 years



Gaede P et al. NEJM 2003; 348: 383-393

CAD treatment gap in the community

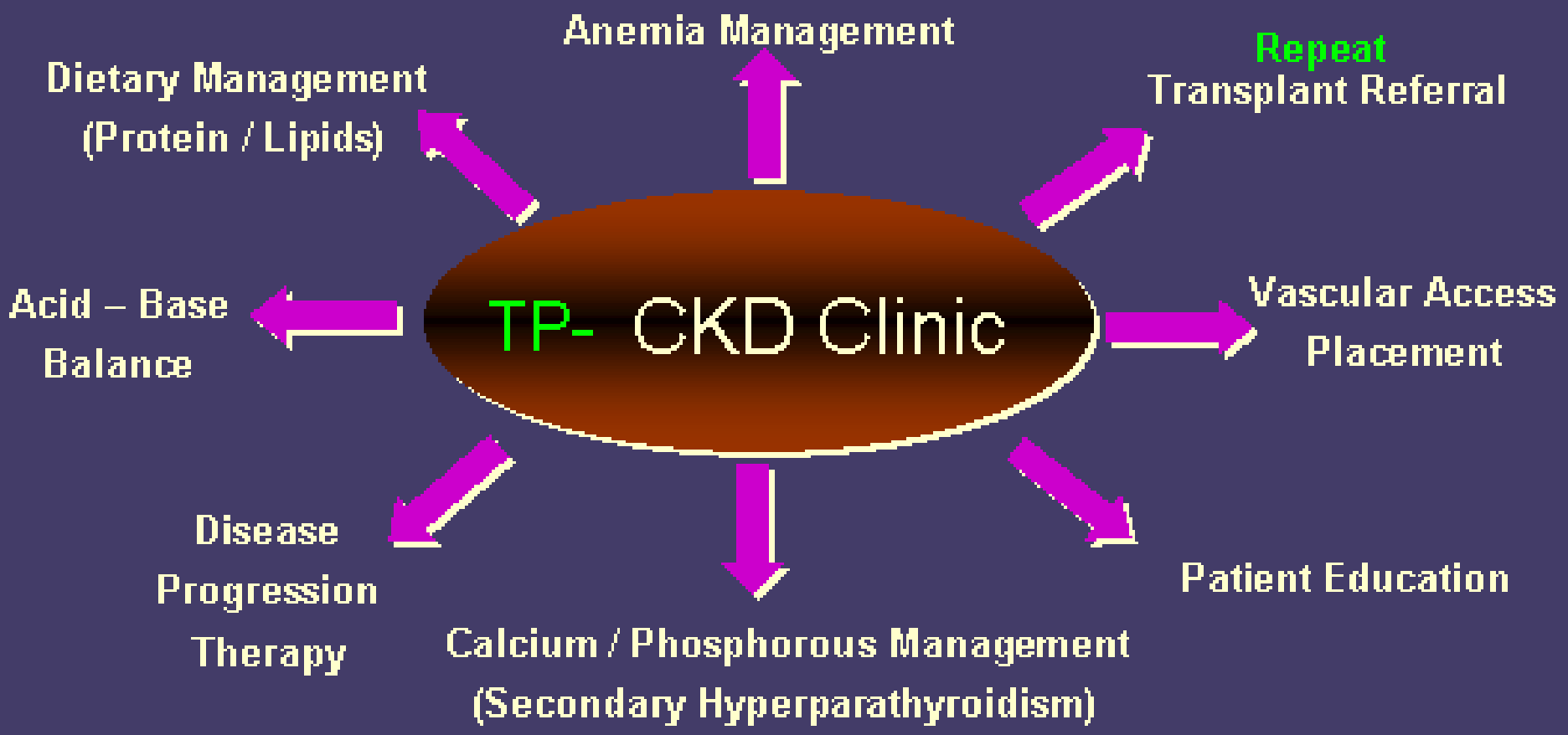


NCEP = National Cholesterol Education Program

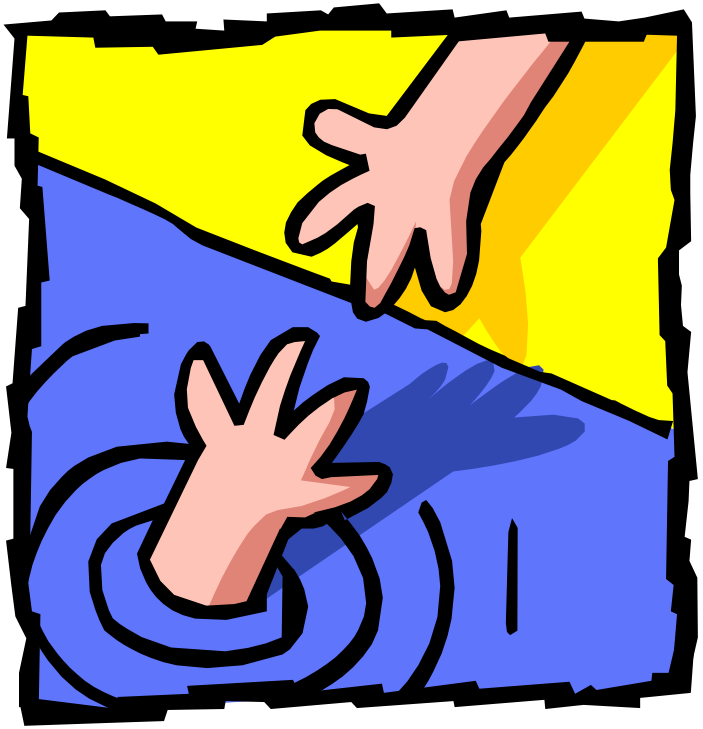
Pearson TA, et al. Arch Intern Med 2000;160:459–67

Chronic Kidney Disease (CKD)

After Organ Transplantation



We Cannot Do This Alone!



Multidisciplinary care

- Education program
- Protocollized clinic f/u
- Protocollized lab
- Regular audits/CQI

- Nephrologist
- Nurse practitioner
- Social worker/psychologist
- Dietician
- Pharmacist
- Physiotherapist

Un-managed

Fee for Service

- Fee For Service
  - Inpatient focus
  - O/P clinic care
  - Low Reimbursement
  - Poor Access and Quality
  - Little oversight
- No organized networks
- Focus on paying claims
- Little Medical Managemen

Coordinated Care

Accountable Care

- Organized care delivery
  - Aligned incentives
  - Linked by HIT
- Integrated Provider Networks
- Focus on cost avoidance and quality performance
  - PC Medical Home
  - Care management
  - Transparent Performance Management

Patient Centered

Integrated Health

- Patient Care Centered
  - Personalized Health Care
  - Productive and informed interactions between Patient and Provider
  - Cost and Quality Transparency
  - Accessible Health Care Choices
  - Aligned Incentives for wellness
- Multiple integrated network and community resources
- Aligned reimbursement/care management outcomes
- Rapid deployment of best practices
- Patient and provider interaction
  - Information focus
  - Aligned self care management
  - E-health capable

Paul McGann, MD. Acting CMO; CMS. 2/25/2011

Collaborative Care - I

Systematic collaboration of primary care providers and mental health providers to improve care for depression and other common mental disorders

Over 40 RCTs for depression

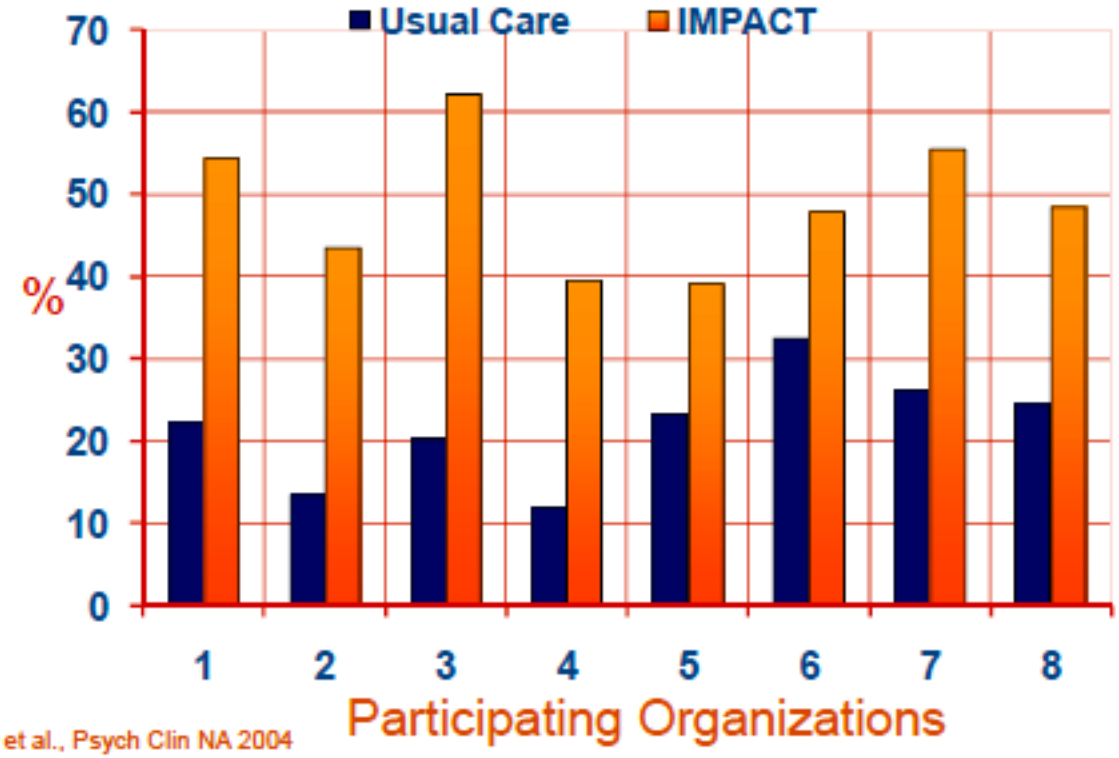
- Gilbody S. et al., *Arch Int Medicine*; Dec 2006

Several recent RCTs for anxiety disorders

- CALM Study (Roy Byrne et al); PTSD (Zatzick et al)

IMPACT Doubles Effectiveness of Care for Depression

50 % or greater improvement in depression at 12 months



Unützer et al., Psych Clin NA 2004

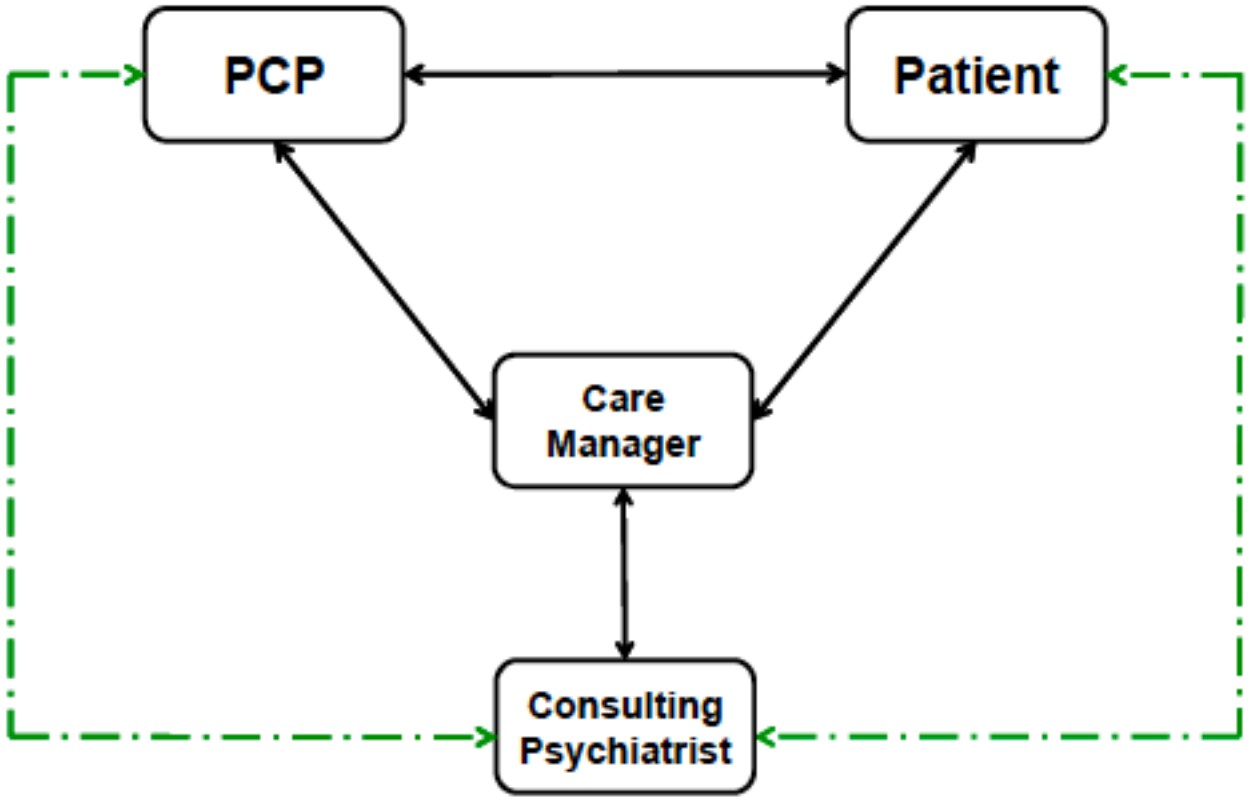
Collaborative Care for Patients with Depression and Chronic Illnesses

Wayne J. Katon, M.D., Elizabeth H.B. Lin, M.D., M.P.H., Michael Von Korff, Sc.D., Paul Ciechanowski, M.D., M.P.H., Evette J. Ludman, Ph.D., Bessie Young, M.D., M.P.H., Do Peterson, M.S., Carolyn M. Rutter, Ph.D., Mary McGregor, M.S.N., and David McCulloch, M.D.

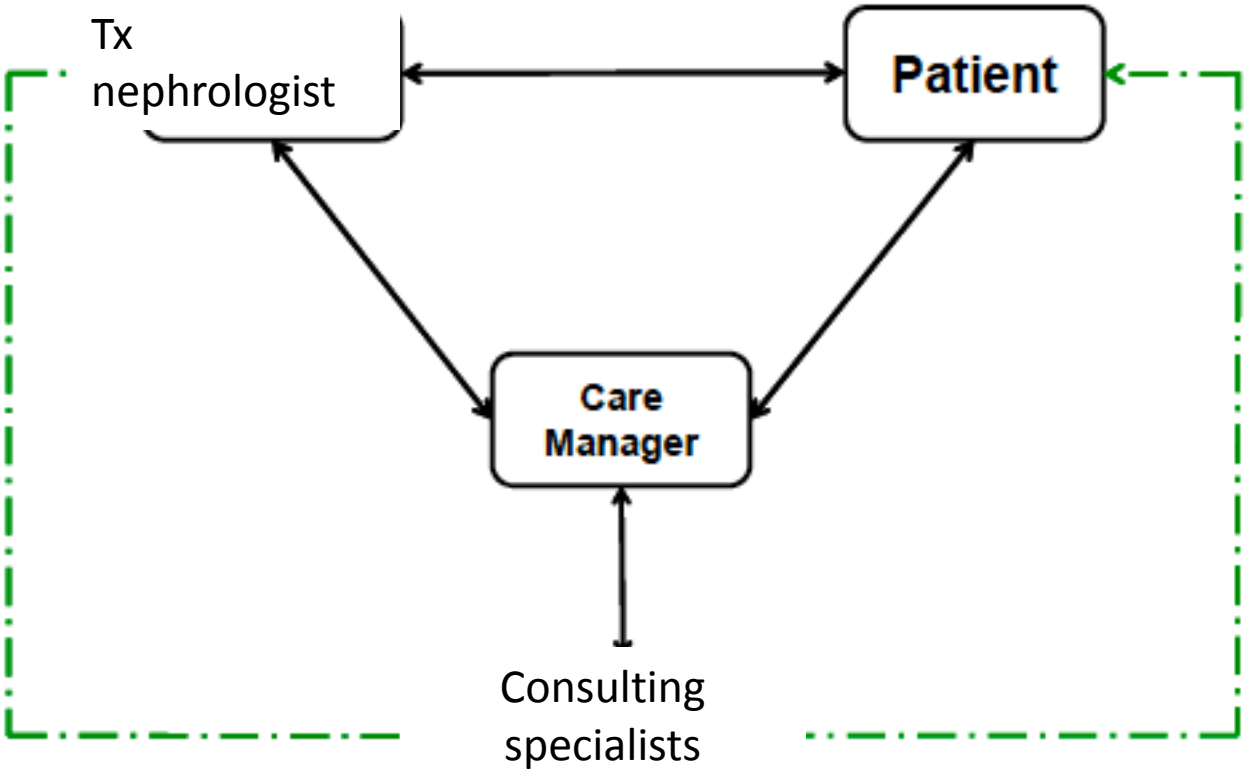
As compared with controls, patients in the intervention group had greater overall 12-month improvement across glycated hemoglobin levels (difference, 0.58%), LDL cholesterol levels (difference, 6.9 mg per deciliter [0.2 mmol per liter]), systolic blood pressure (difference, 5.1 mm Hg), and SCL-20 depression scores (difference, 0.40 points) ($P<0.001$). Patients in the intervention group also were more likely to have one or more adjustments of insulin ($P=0.006$), antihypertensive medications ($P<0.001$), and antidepressant medications ($P<0.001$), and they had better quality of life ($P<0.001$) and greater satisfaction with care for diabetes, coronary heart disease, or both ($P<0.001$) and with care for depression ($P<0.001$).

n engl j med 363;27 december 30, 2010

Team Approach



Team Approach



The world would be a better place if we kept six of the ten commandments. Any six.

Summary and conclusion

- Multiple traditional and novel/Tx specific risk factors are prevalent in KTx patients and are associated with increased mortality/CV events
- Assessing BP, glucose and lipid metabolism, BP and obesity is necessary
- Lifestyle modifications and medications are likely to improve outcomes
- The association between obesity and cardiovascular outcomes among kidney transplant recipients is controversial; however, physical activity, healthy diet are advisable to maintain a close to ideal body composition
- Tailoring immunosuppression to the metabolic characteristics of the individual patient is a potential consideration

Summary and conclusion

- Psycho-social factors contribute to increased CV risk and poor outcome

- Multidisciplinary “risk management clinics”,

providing complex bio-psycho-social care

- are necessary to target all the risk factors among kidney transplant recipients to improve patient outcomes

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