Management of Co-morbidities in Heart Failure (COPD, Renal failure, Anemia)

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Prevalence of Non-cardiac Comorbidity In Chronic Heart Failure

Braunstein et al JACC 2003;42:1226

JACC Vol. 42, No. 7, 2003
October 1, 2003:1226–33

Table 2. Twenty Most Common Noncardiac Chronic Disease Conditions for Patients Age ≥65 Years With CHF (n = 122,630)

Chronic Disease Defined by CCS Code	% Prevalence (n)
Essential hypertension	55 (67,211)
Diabetes mellitus	31 (38,175)
COPD and bronchiectasis	26 (32,275)
Ocular disorders (retinopathy, macular disease, cataract, glaucoma)	24 (29,548)
Hypercholesterolemia	21 (25,219)
Peripheral and visceral atherosclerosis	16 (20,027)
Osteoarthritis	16 (19,929)
Chronic respiratory failure/insufficiency/ arrest or other lower respiratory disease excluding COPD/bronchiectasis	14 (17,610)
Thyroid disorders	14 (16,751)
Hypertension with complications and secondary hypertension	11 (13,732)
Alzheimer's disease/dementia	9 (10,839)
Depression/affective disorders	8 (9,371)
Chronic renal failure	7 (8,652)
Prostatic hyperplasia	7 (8,077)
Intravertebral injury, spondylosis, or other chronic back disorders	7 (8,469)
Asthma	5 (6,717)
Osteoporosis	5 (6,688)
Renal insufficiency (acute and unspecified renal failure)	4 (5,259)
Anxiety, somatoform disorders, and personality disorders	3 (3,978)
Cerebrovascular disease, late effects	3 (3,750)

CCS = Clinical Classification System; CHF = chronic heart failure; COPD = chronic obstructive pulmonary disease.

Hospitalizations for co-morbidities in CHF patients

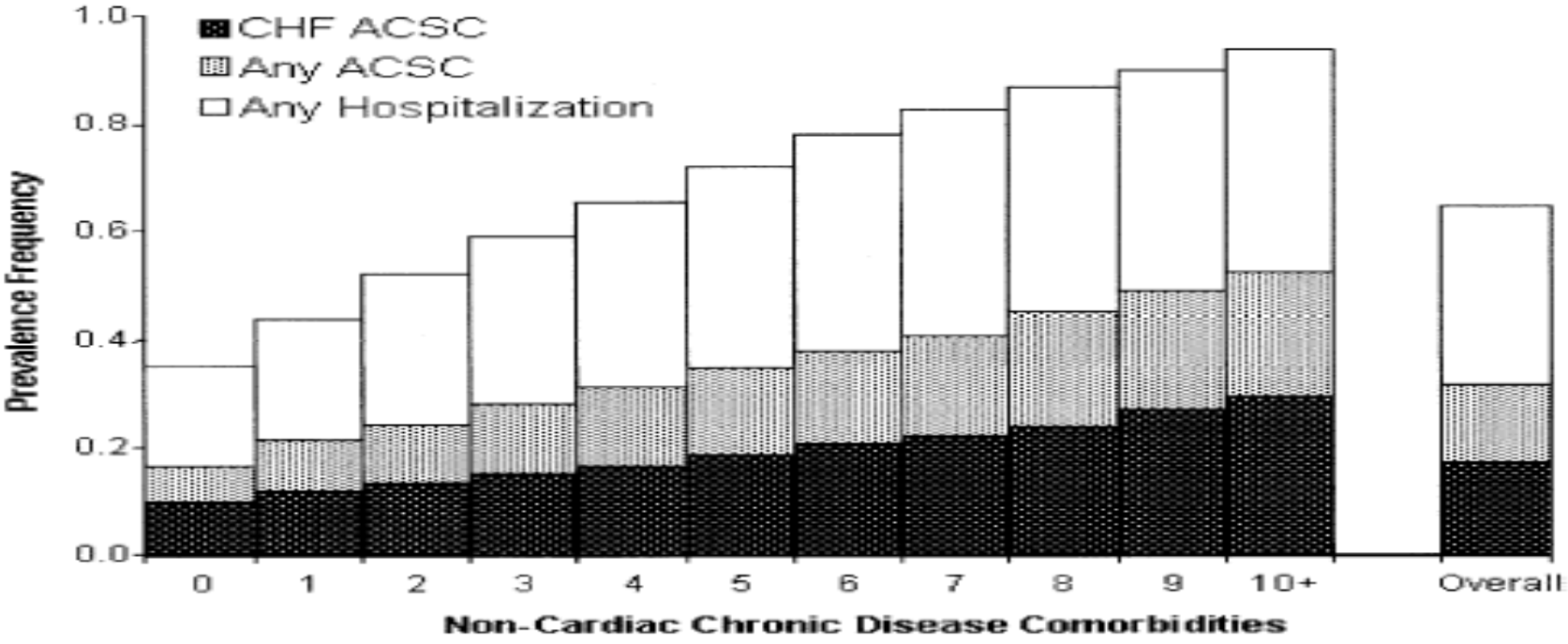


Figure 1. Impact of noncardiac comorbidity burden on the annual probability of a Medicare beneficiary with chronic heart failure (n = 122,630) experiencing a hospitalization due to any cause, a preventable hospitalization or a preventable hospitalization due to chronic heart failure (CHF). Data are represented as mean probabilities. $p < 0.0001$ for linear trend for all outcomes. ACSC = ambulatory care sensitive conditions.

CHF co-morbidities and prognosis

Table 5. Association of Noncardiac Comorbidity With Death Among Medicare Beneficiaries With CHF

Condition	Risk Ratio (95% CI) (n = 122,630) Unadjusted	Adjusted*
Lower respiratory disease, failure or insufficiency	2.56 (2.48–2.63)	2.34 (2.27–2.41)
Acute and unspecified renal failure	2.06 (1.96–2.16)	1.46 (1.38–1.54)
Chronic renal failure	1.92 (1.84–1.99)	1.65 (1.58–1.73)
Alzheimer's disease/dementia	1.64 (1.58–1.70)	1.24 (1.20–1.29)
Cerebrovascular disease, late effects	1.41 (1.32–1.51)	1.23 (1.15–1.31)
COPD/bronchiectasis	1.31 (1.27–1.34)	1.12 (1.09–1.16)
Depression/affective disorders	1.12 (1.07–1.18)	1.07 (1.02–1.13)
Peripheral or visceral atherosclerosis	1.03 (0.99–1.07)	0.95 (0.92–0.99)
Hypertension—with complications or secondary	0.97 (0.93–1.02)	0.94 (0.90–0.98)
Diabetes mellitus	0.94 (0.91–0.97)	1.11 (1.07–1.14)
Anxiety, somatoform disorders and personality disorders	0.89 (0.82–0.96)	0.89 (0.83–0.97)
Asthma	0.78 (0.73–0.83)	0.81 (0.75–0.86)
Osteoporosis	0.78 (0.73–0.83)	0.84 (0.79–0.90)
Thyroid disorder	0.73 (0.70–0.76)	0.81 (0.78–0.85)
Essential hypertension	0.61 (0.59–0.63)	0.70 (0.68–0.72)
Chronic back disorders†	0.60 (0.56–0.64)	0.78 (0.73–0.83)
Prostatic hyperplasia	0.59 (0.55–0.63)	0.63 (0.58–0.67)
Osteoarthritis	0.56 (0.54–0.59)	0.65 (0.62–0.68)
Ocular disorders	0.40 (0.39–0.42)	0.46 (0.44–0.48)
Hypercholesterolemia	0.33 (0.31–0.35)	0.47 (0.44–0.49)

*Adjusted for same variables as in Table 3; †Includes intravertebral injury, spondylosis, or other chronic back disorders. Abbreviations as in Table 2.

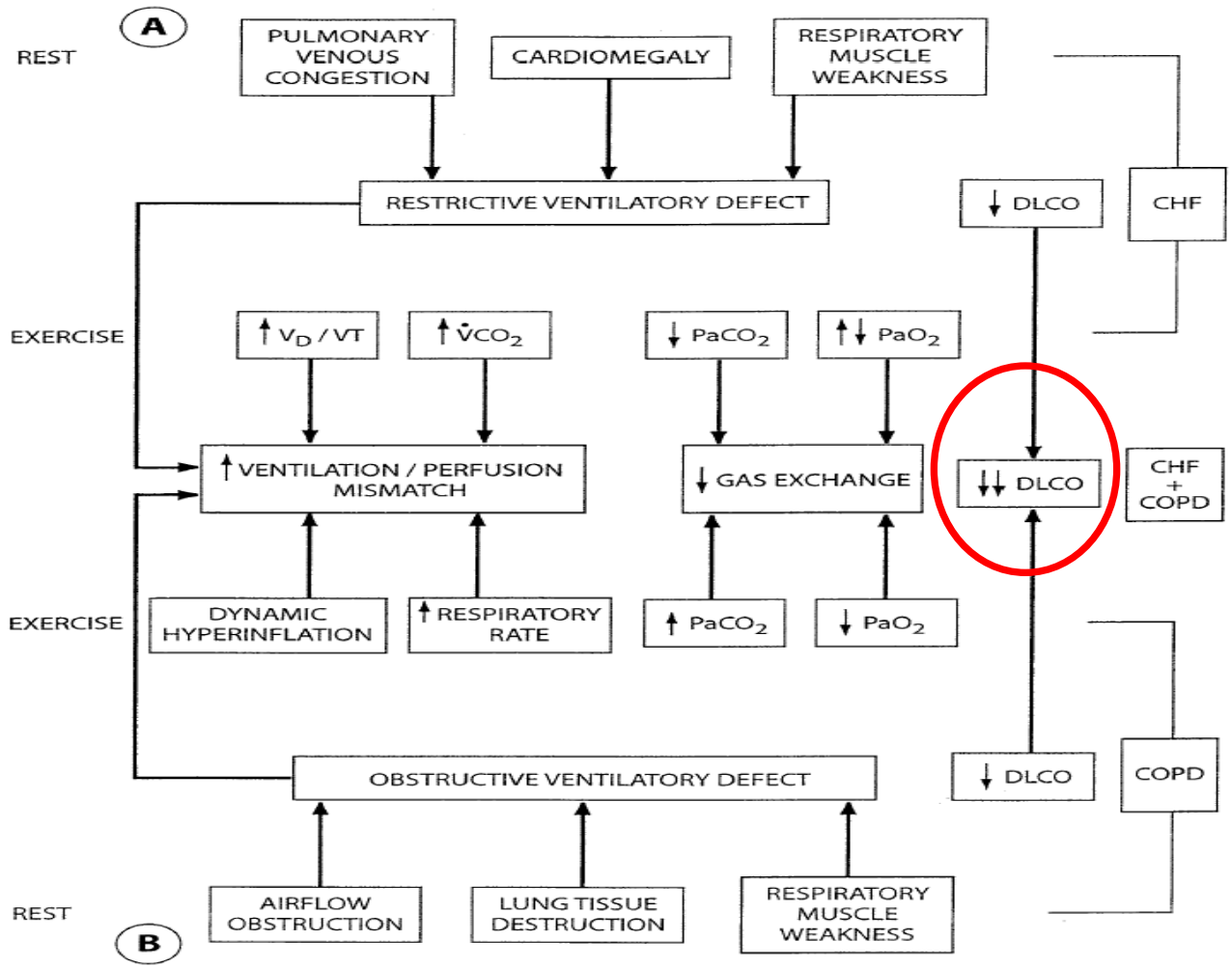
CHF AND COPD

EPIDEMIOLOGY-PATHOPHYSIOLOGY

- Prevalence o COPD in HF is 20-33% (Medicare, Danish Diamond studies)
- COPD and HF have similar symptoms: exercise intolerance/dyspnea
- Obstructive pattern: acute HF
- Restrictive pattern: chronic HF (reduced lung volume due to cardiomegaly and alveolar and interstitial fluid, development of interstitial fibrosis, changes of lung compliance, weakness of the respiratory muscles)

CHF and COPD: pathophysiologic links

JACC Vol. 44, No. 3, 2004
August 4, 2004:497–502



RESPIRATORY MEDICINE (1998) 92, 1321–1325

Effects of severity of long-standing congestive heart failure on pulmonary function

I. DIMOPOULOU, M. DAGANOU, O. K. TSINTZAS AND G. E. TZELEPIS

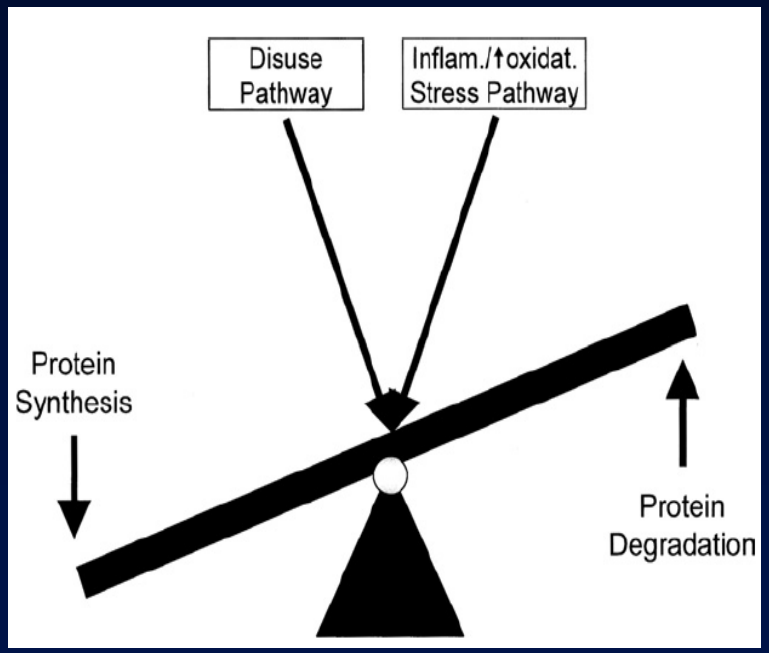
Pulmonary Function Laboratory, Onassis Cardiac Surgery Center, Athens, Greece

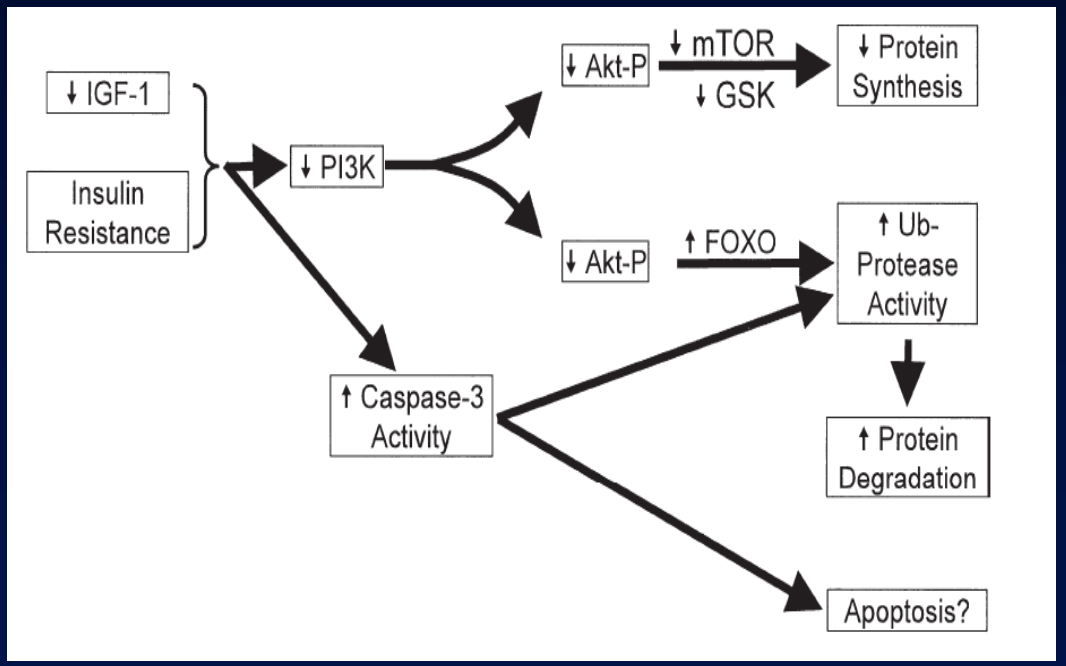
TABLE 3. Pulmonary function data according to severity of heart failure*

	Group 1 ($\dot{V}O_2$max >14 ml min^{-1} kg^{-1})	Group 2 ($\dot{V}O_2$max ≤14 ml min^{-1} kg^{-1})	*P*-value
FVC (%pred)	96 ± 17	86 ± 15	0·01
FEV_1 (%pred)	95 ± 16	79 ± 15	<0·001
FEV_1/FVC (%)	75 ± 7	70 ± 8	0·008
FEF_{25-75} (%pred)	70 ± 26	46 ± 21	<0·001
TLC (%pred)	85 ± 13	76 ± 15	0·02
FRC (%pred)	90 ± 20	83 ± 24	N.S.
IC (%pred)	83 ± 20	70 ± 19	0·03
RV (%pred)	96 ± 38	82 ± 31	N.S.
*D*LCO (%pred)	88 ± 20	84 ± 15	N.S.
*P*Imax (cmH_2O)	87 ± 22	68 ± 20	0·003
*P*Emax (cmH_2O)	96 ± 22	99 ± 25	N.S.

IC, inspiratory capacity.
*For remaining abbreviations see Table 1.

Mechanisms of Skeletal Muscle Atrophy in Patients With CHF or COPD

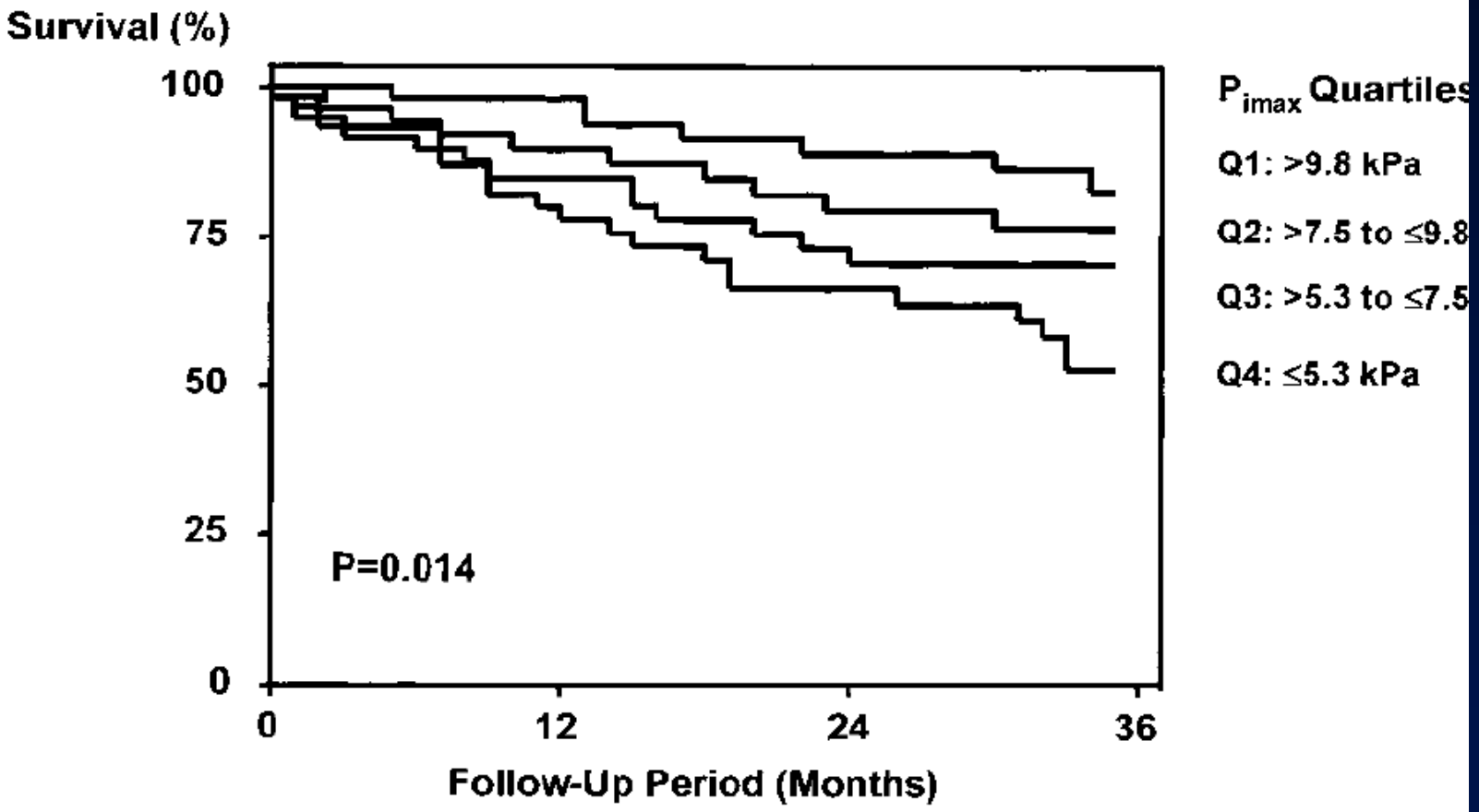




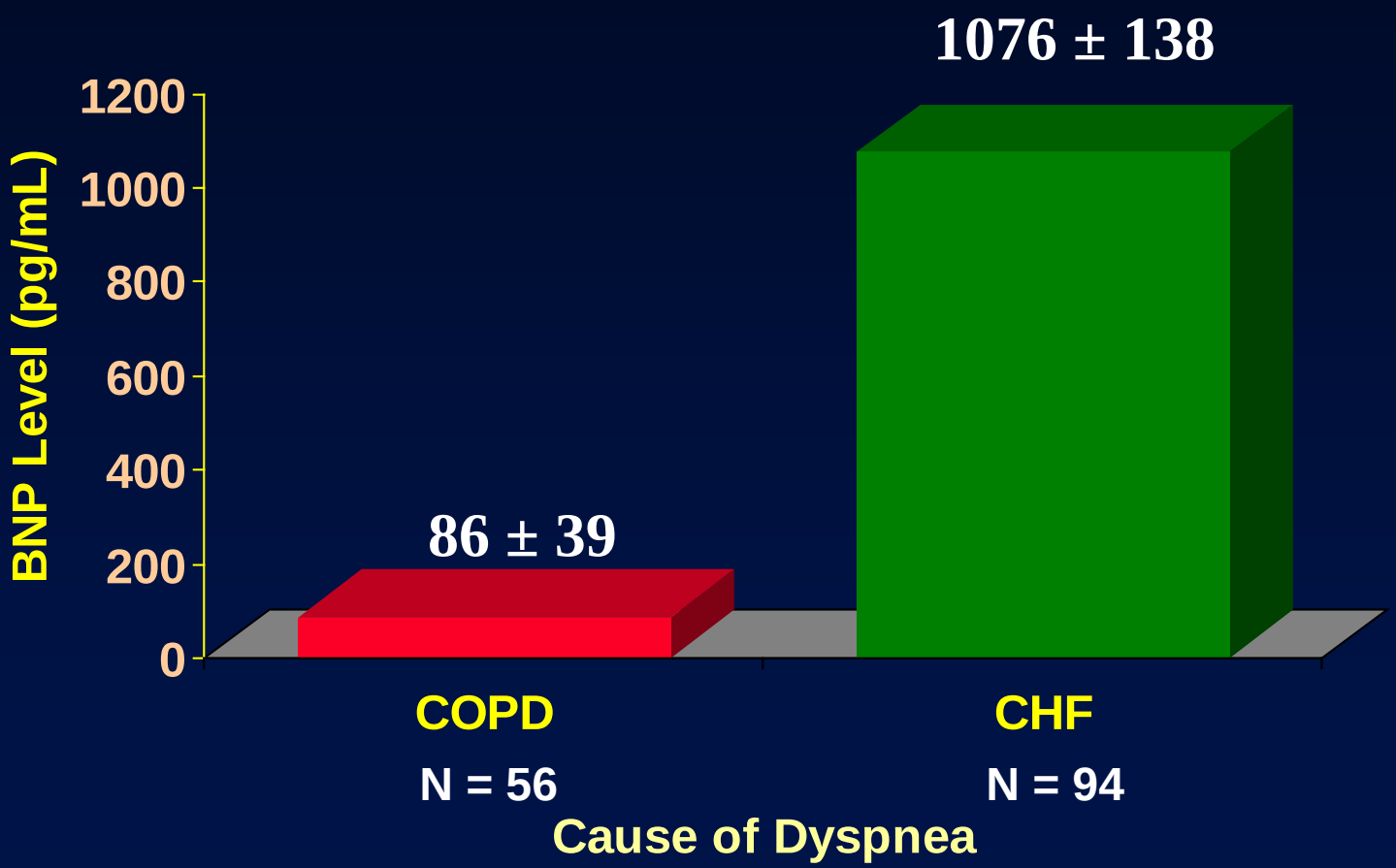
Le Jemtel T et al. 2007;49:171-180

RESPIRATORY MUSCLE DYSFUNCTION IN CHF: PROGNOSTIC VALUE

(Meyer et al. Circulation 2001)

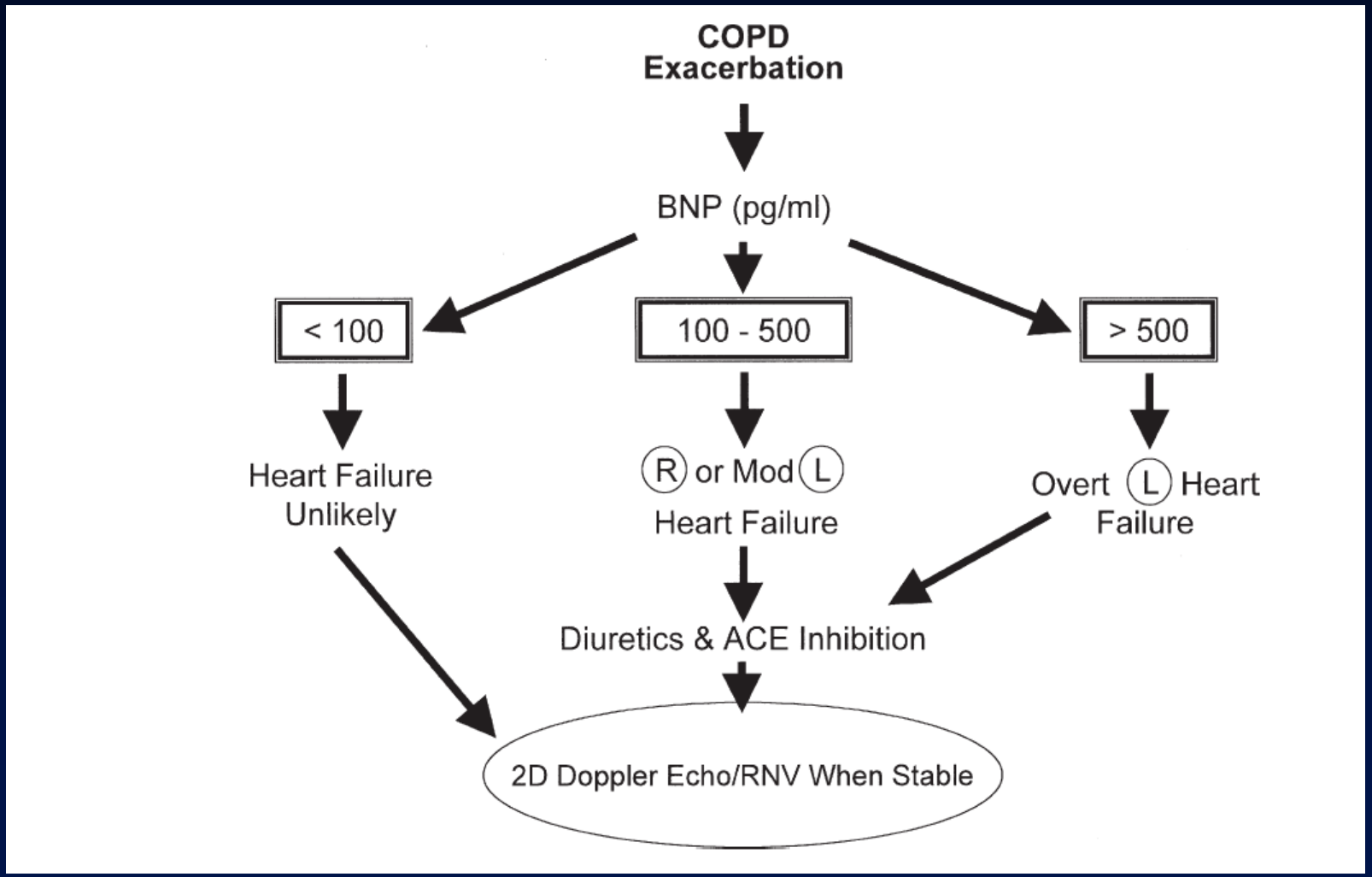


BNP Levels in Patients With Dyspnea Secondary to CHF or COPD



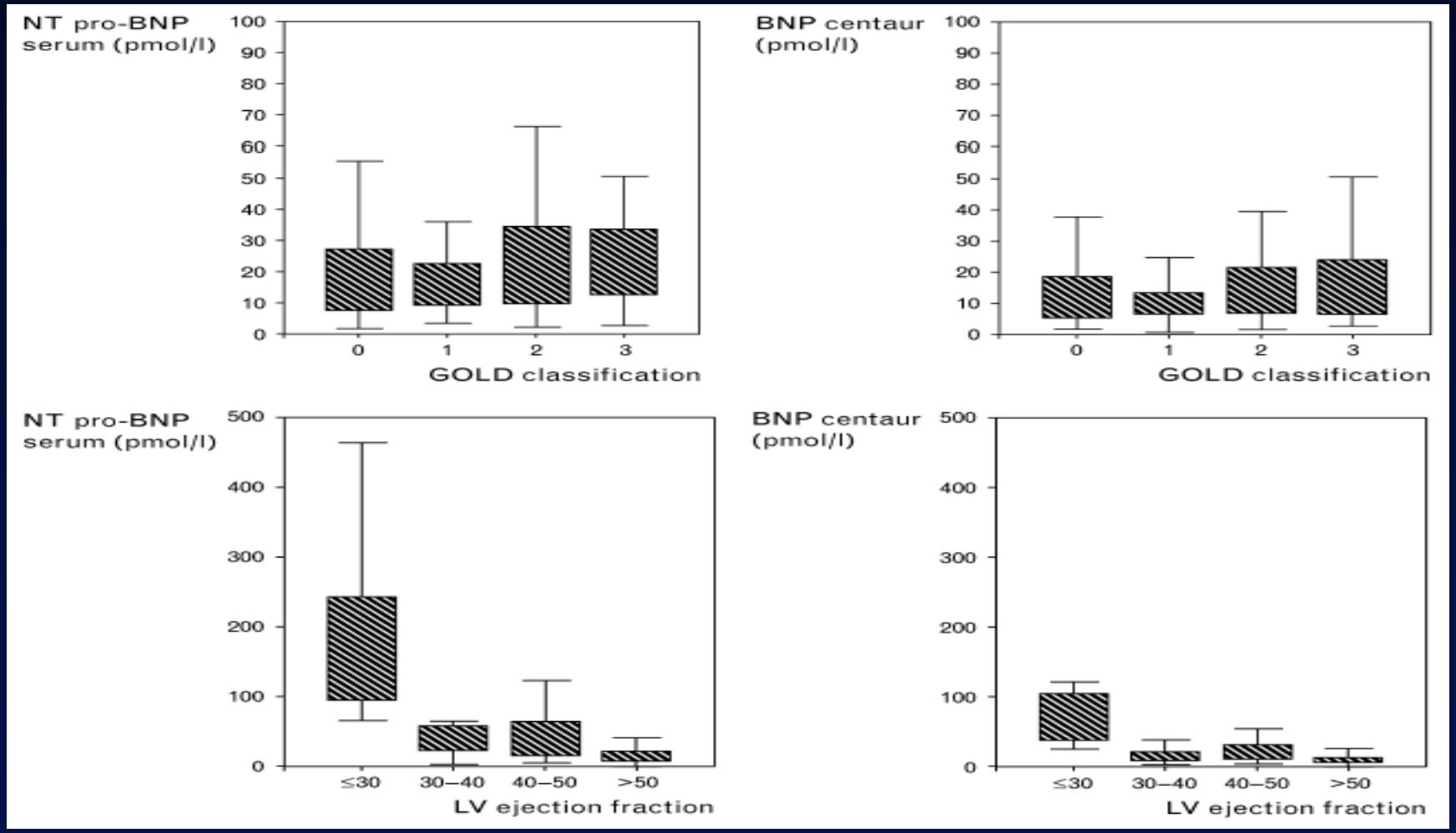
Dao Q, et al. *J Am Coll Cardiol.* 2001;37.

Evaluation of Heart Failure During COPD Exacerbation



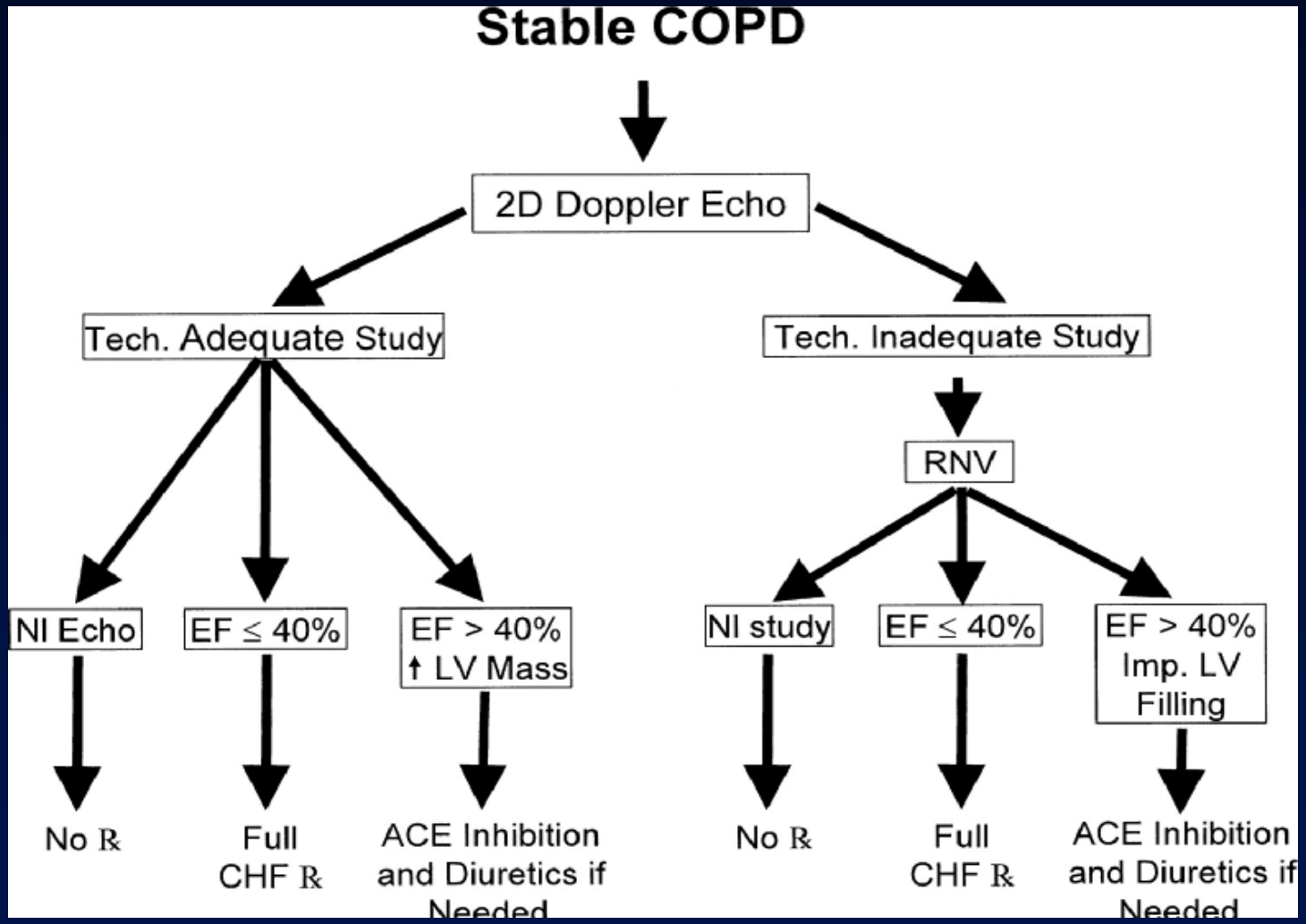
Le Jemtel T et al. 2007;49:171-180

Overlapping of B type natriuretic peptides in stable CHF and COPD



Current Opinion in Critical Care 2008, 14:340–347

Evaluation of Heart Failure in Stable COPD Patients



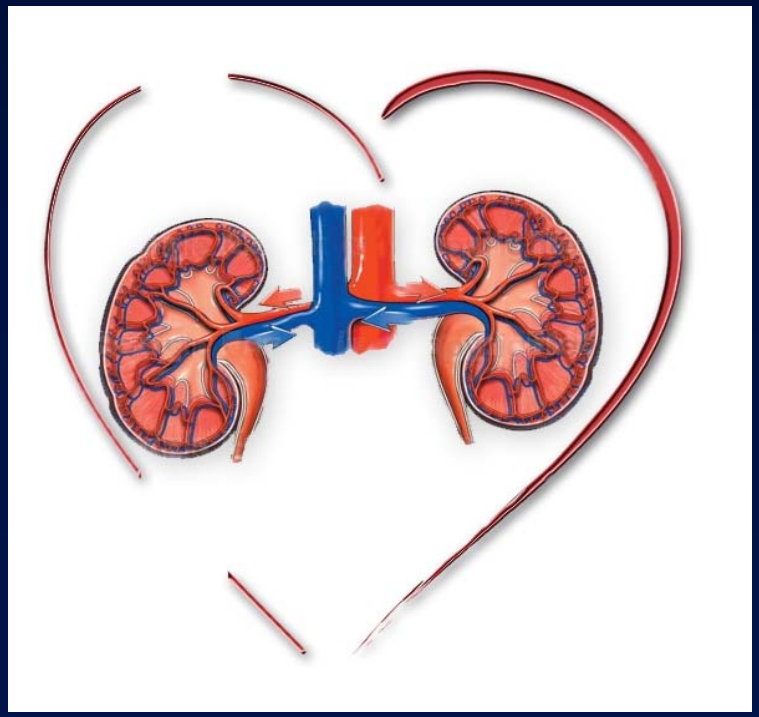
Le Jemtel T et al. 2007;49:171-180

MANAGEMENT OF PATIENTS WITH CHF AND COPD

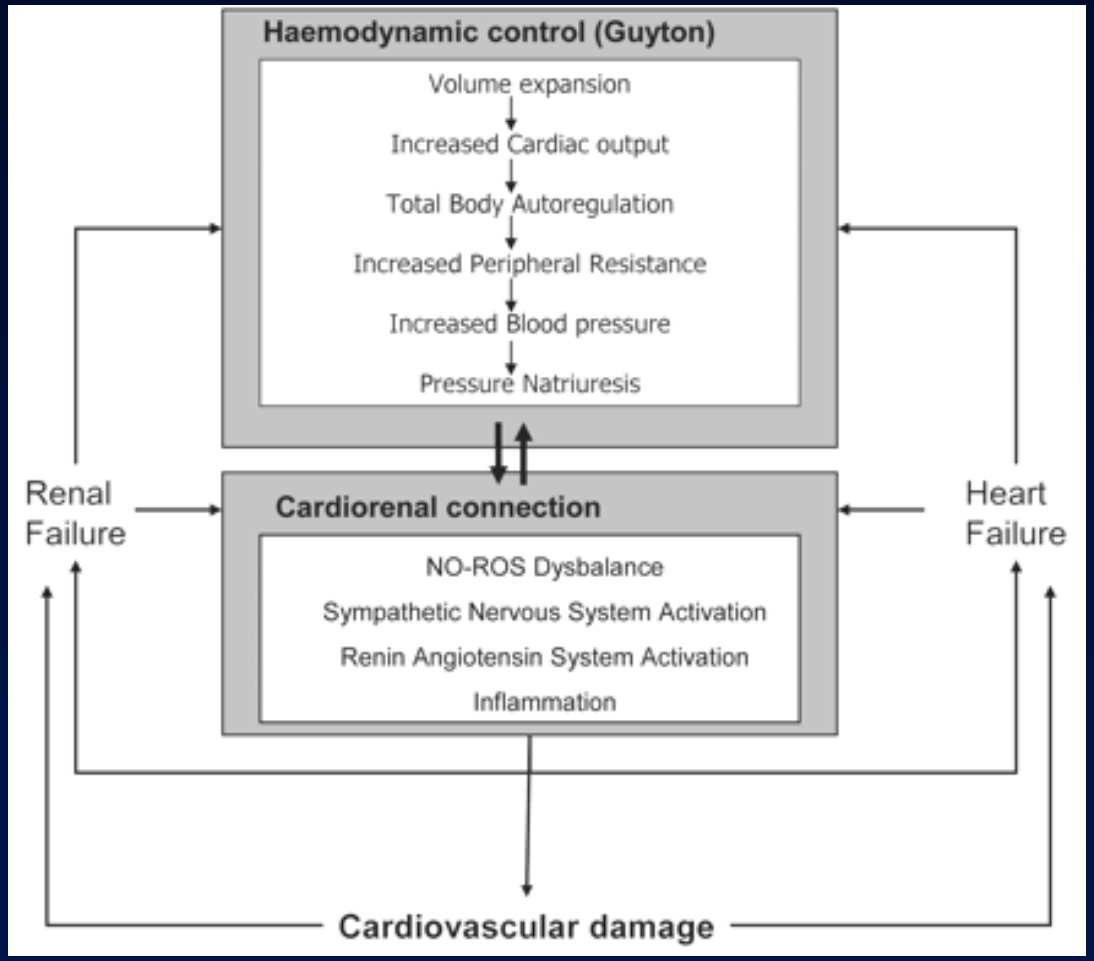
- Neurohormonal antagonists are recommended (ACEi, ARBS, Aldo antagonists)-Reduce congestion, interstitial fibrosis.
- Selective β1 blockers (especially nebivolol/SENIORS trial and bisoprolol/CIBIS II trial) are preferred
- Carvedilol is contra-indicated in severe COPD
- Avoid excessive reduction of preload.
- Respiratory muscle training may be useful.

RENAL FAILURE IN CHF

The challenge of cardiorenal syndrome



CARDIORENAL SYNDROME IN CHF: PATHOPHYSIOLOGY



RENAL FAILURE LEADS TO CARDIAC FAILURE:

- Volume overloading (increased pre-load)

  fluid retention, anemia, A-V shunts

- Pressure overloading (increased after-load)

  hypertension, impaired vascular distensibility, endothelial dysfunction

- Suppression of cardiac function (impaired cardiac contractility –relaxation)

  ischemia, toxins, inflammatory mediators

CHF

IMPAIRED CARDIAC OUTPUT
HYPOPERFUSION

CONGESTION
ELEVATED VENOUS PRESSURE

DRUG TOXICITY

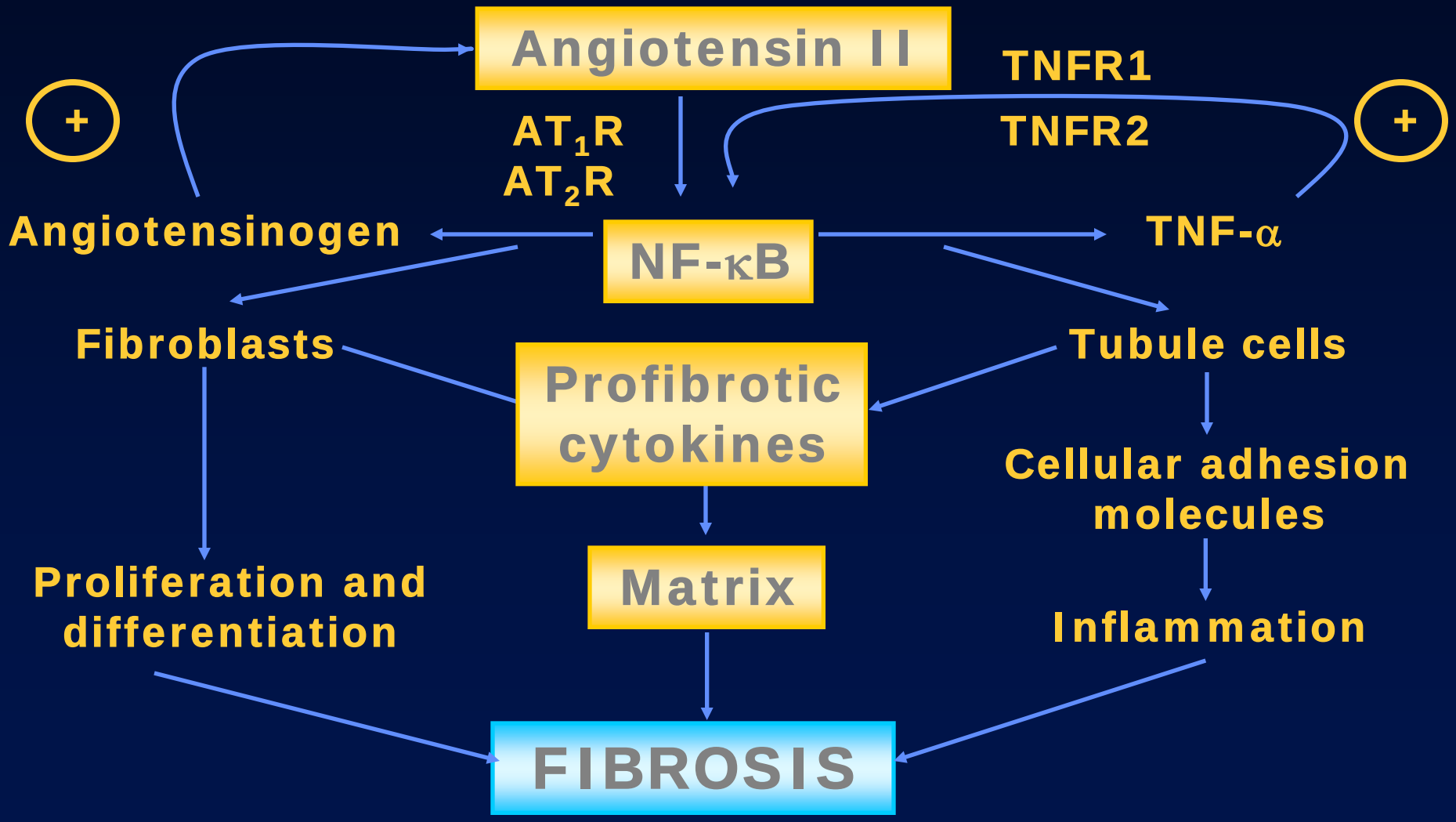
RENAL DISEASE

Angiotensin II in Failing Myocardium

EFFECTS	MECHANISMS
Oxidative stress	NADPH oxidase
Inflammation	NF-kB, MCP-1, VCAM, IL-6
Myocyte apoptosis	Caspases
Myocyte hypertrophy	MAPKs
Matrix remodeling	Collagen, MMPs
Thrombosis	PAI-1

Dzau VJ, Hypertension 2001

Angiotensin II: Role in Renal Injury



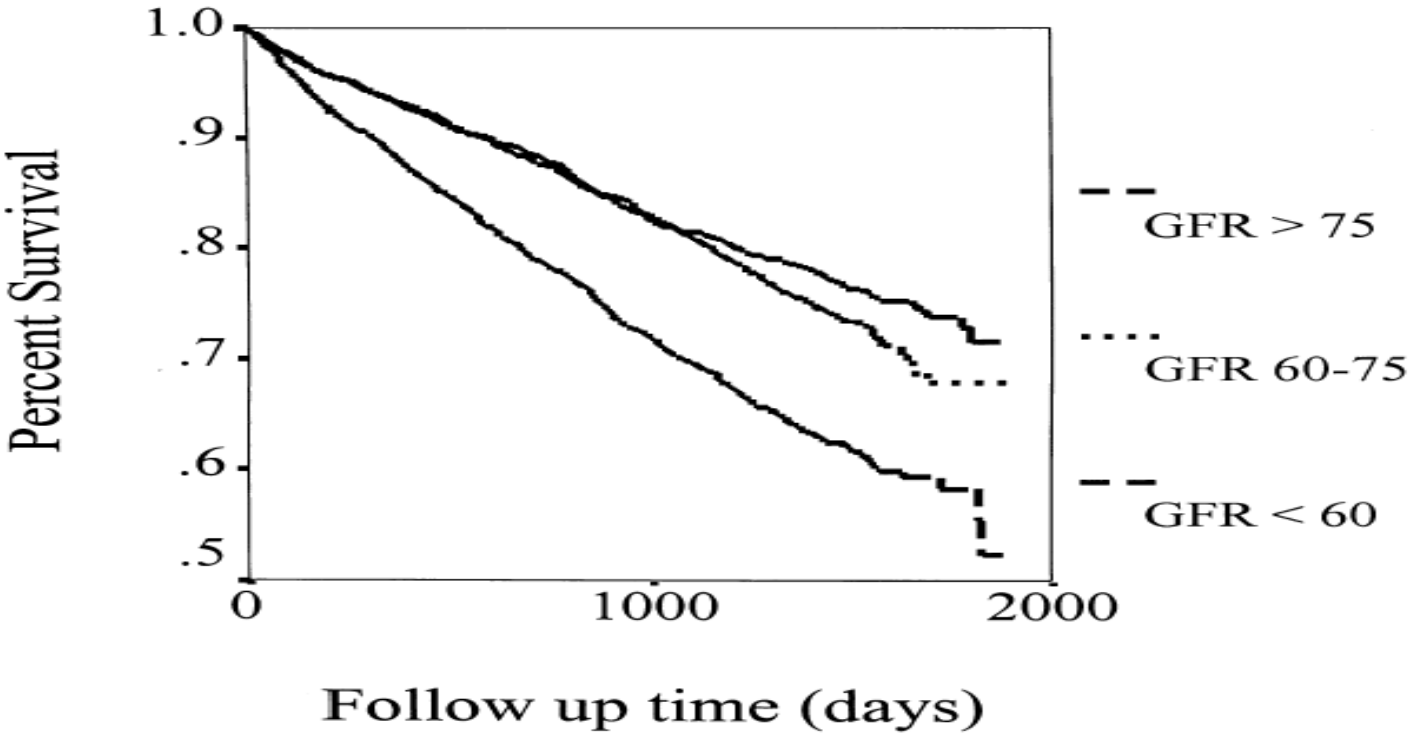
RENAL INSUFFICIENCY* IN CHF: IMPORTANT ISSUES

- Patients with CHF and renal dysfunction are underrepresented or excluded from clinical trials.
- Evidence has been inadequate to guide the management.
- SOLVD: 33% of patients had GFR< 60mL/min; 40% increased risk of death.
- PRIME-II: 50% had this degree of renal dysfunction; two-fold greater adjusted risk for the death compared with normal renal function.

- **** moderate 30<GFR<60; severe 15<GFR<30; kidney failure GFR15 mL/min per 1.73 m_2***

PROGNOSTIC ROLE OF RENAL DYSFUNCTION IN CHF

Ahmad et al. JACC 2001;38:991

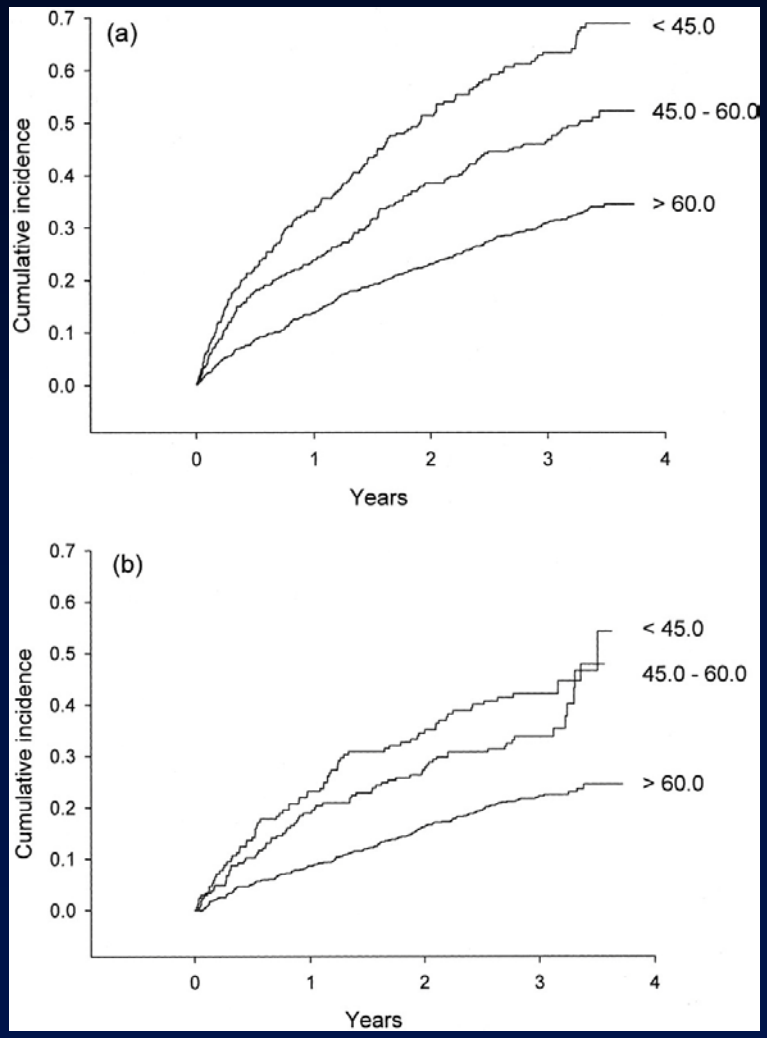


ure 2. Kaplan-Meier survival analysis by level of glomerular filtration e (GFR).

GFR and Prognosis in CHARM Trial

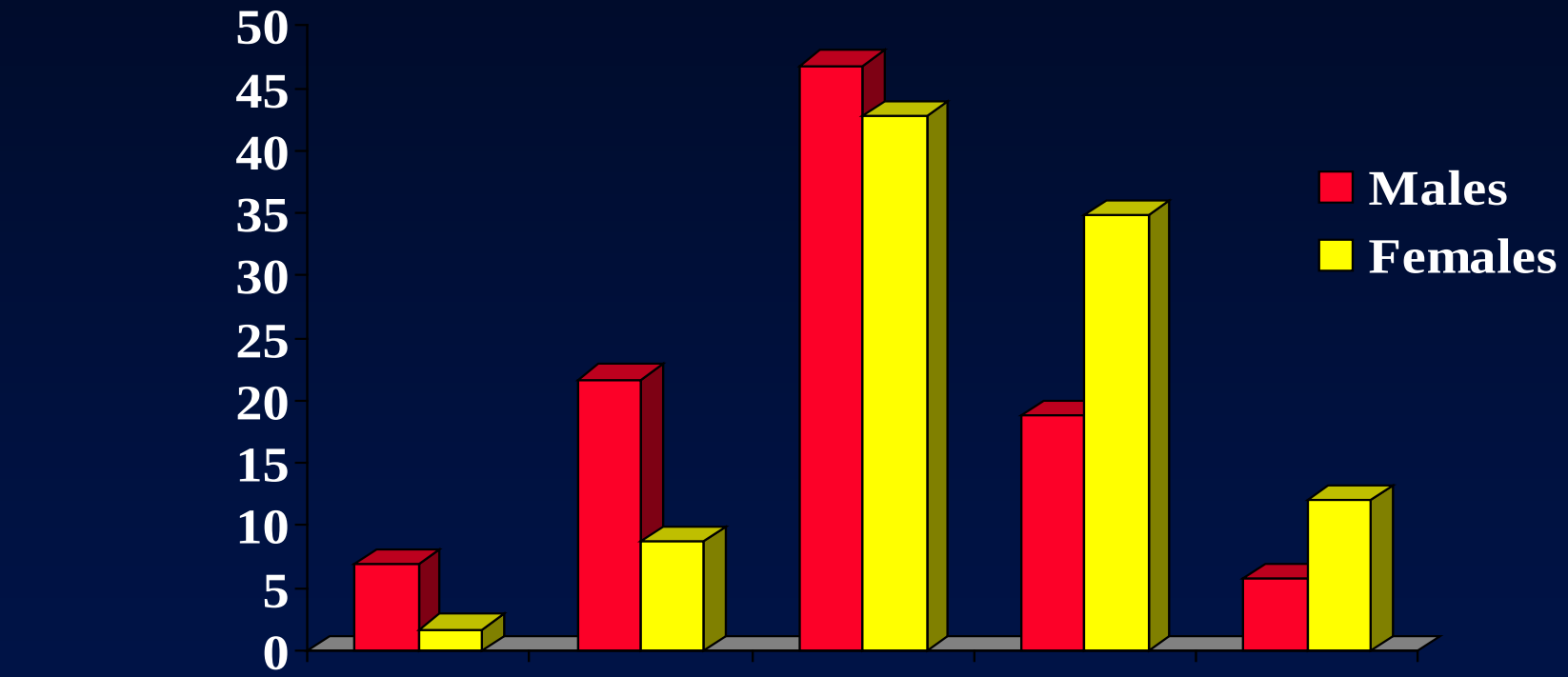
REDUCED EF

PRESERVED EF



Hillege, H. L. et al. Circulation 2006;113:671-678

Degree of Renal Damage in Patients Admitted for Decompensated HF



100,000 Admissions ADHERE

Predictors at admission for renal function worsening in CHF

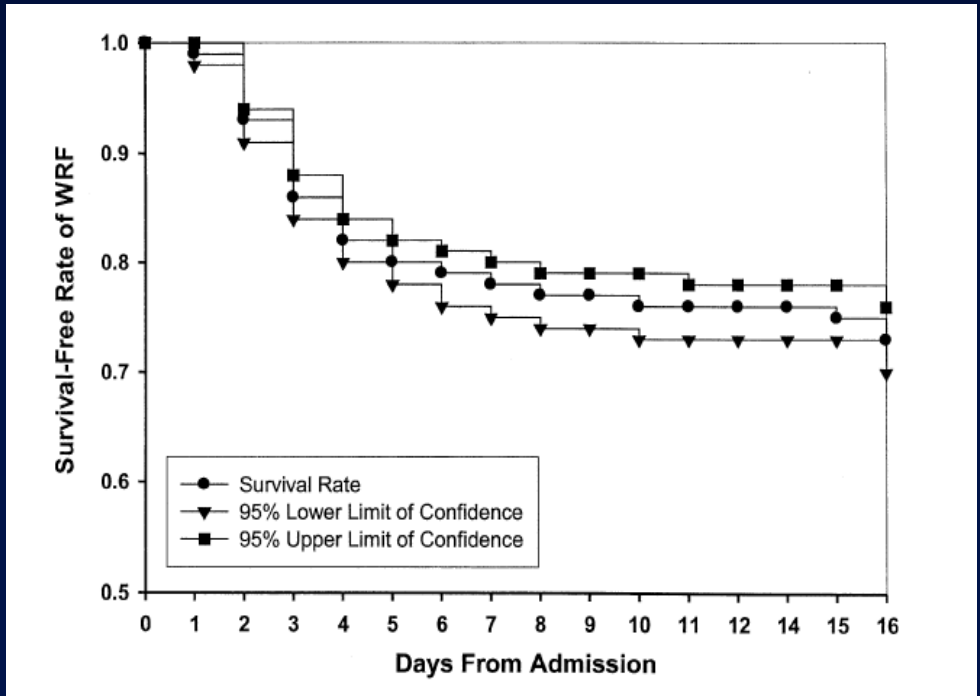
(JACC 2004;43:61)

Table 3. Risk Factors for WRF*

Description	Parameter Estimate	Hazard Ratio	Confidence Interval†		Weight	Bootstrap Results‡ (1,000 Replicas)		
			Lower	Upper		Bias	Lower	Upper
History of prior CHF	0.2715	1.312	1.008	1.707	1	0.0048	0.0061	0.5368
Diabetes	0.3375	1.401	1.102	1.783	1	−0.0022	0.1007	0.5744
SBP >160	0.3108	1.365	1.064	1.749	1	−0.0004	0.0624	0.5592
1.5 ≤ creatinine < 2.5	0.7408	2.098	1.595	2.760	2	−0.0029	0.4914	0.9903
Creatinine ≥2.5	1.2448	3.472	2.537	4.752	3	0.0047	0.9315	1.5581

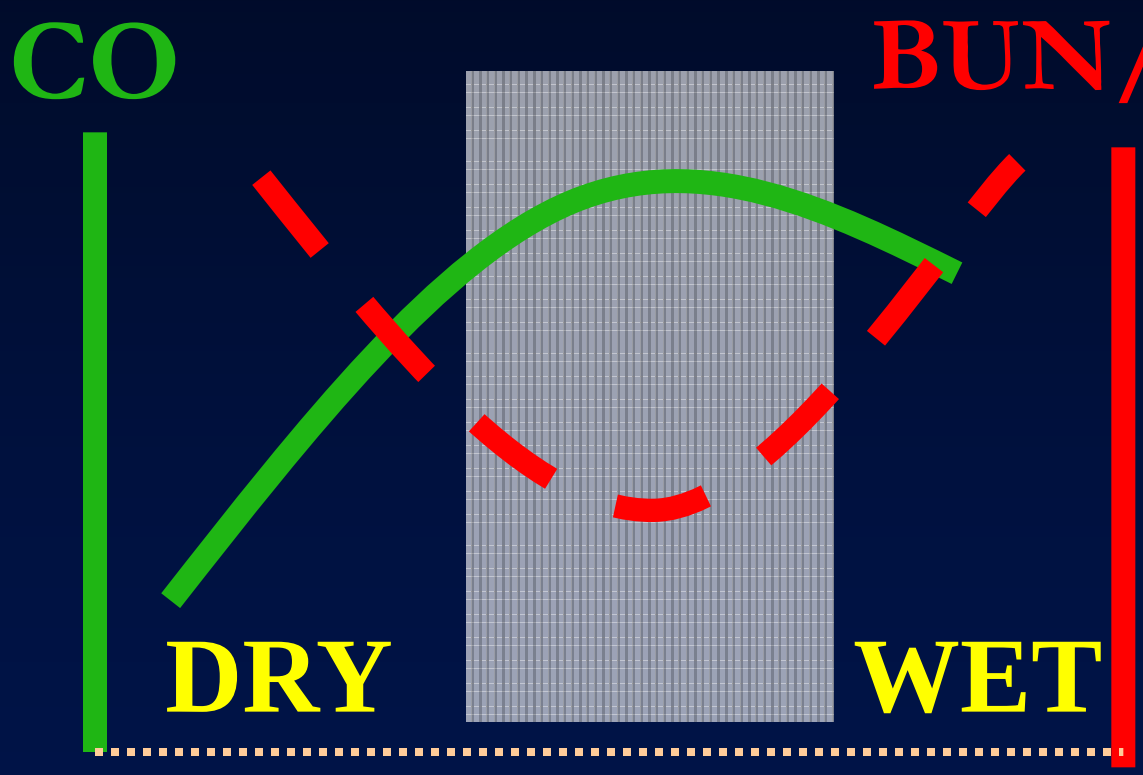
*Cox regression with stepwise method using baseline as candidate variables; †95% confidence interval of hazard ratio; ‡ Only bias from the original parameter estimate and 95% confidence interval of the original parameter estimates were reported.

CHF = congestive heart failure; SBP = systolic blood pressure; WRF = worsening renal failure.

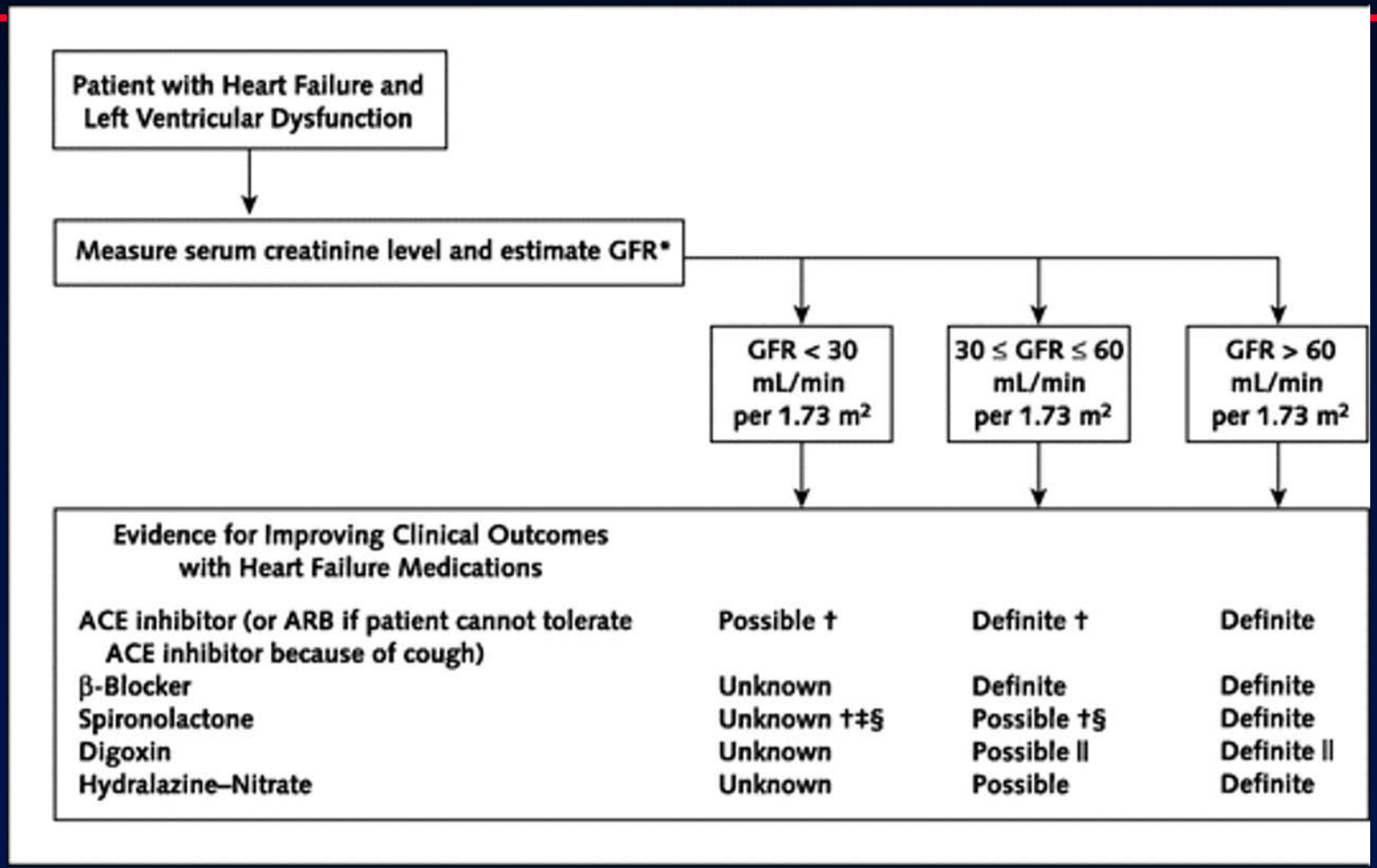


"HOT" POINTS INDICATE A RISK FOR ACUTE RENAL FAILURE IN CHF

- Persistently low urinary sodium
- Increased plasma urea/creatinine ratio and uric acid (discontinuation of ACEi?)
- Mean arterial pressure <80 mmHg
- Hyponatremia (max neurohormonal activation)
- Changes in effective circulating volume (fever, blood loss, decrease in dietary salt, etc.)
- Other: angiogaphic contrast, older age, diabetes, major surgery, use of NSADs

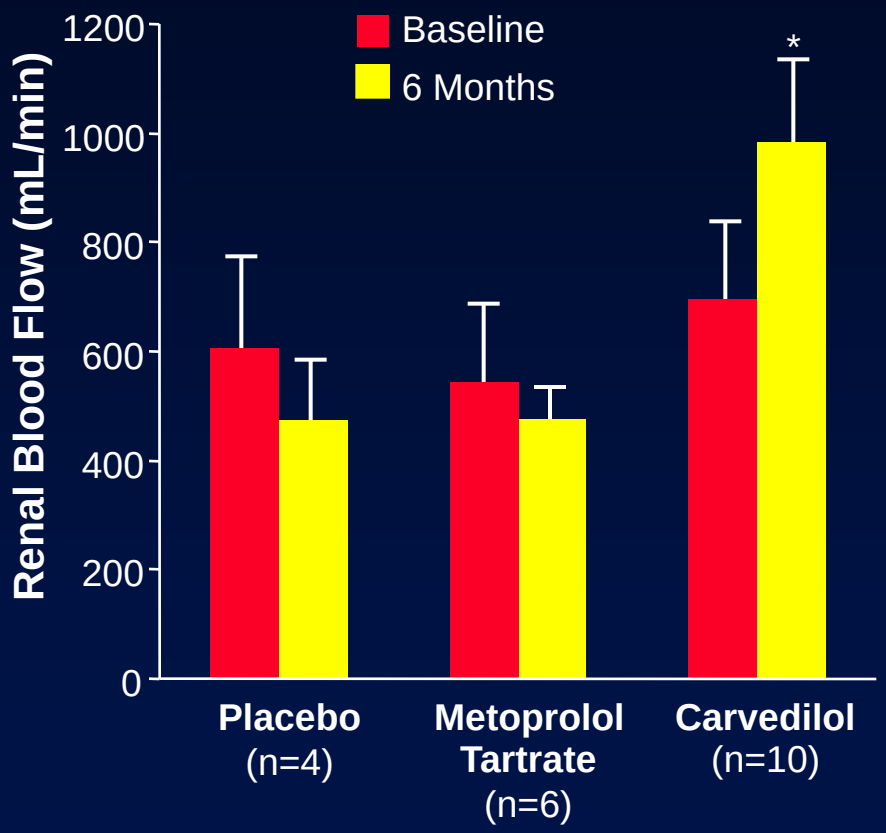

CO
BUN/CRE
DRY
WET
PCWP
Wt (kg)

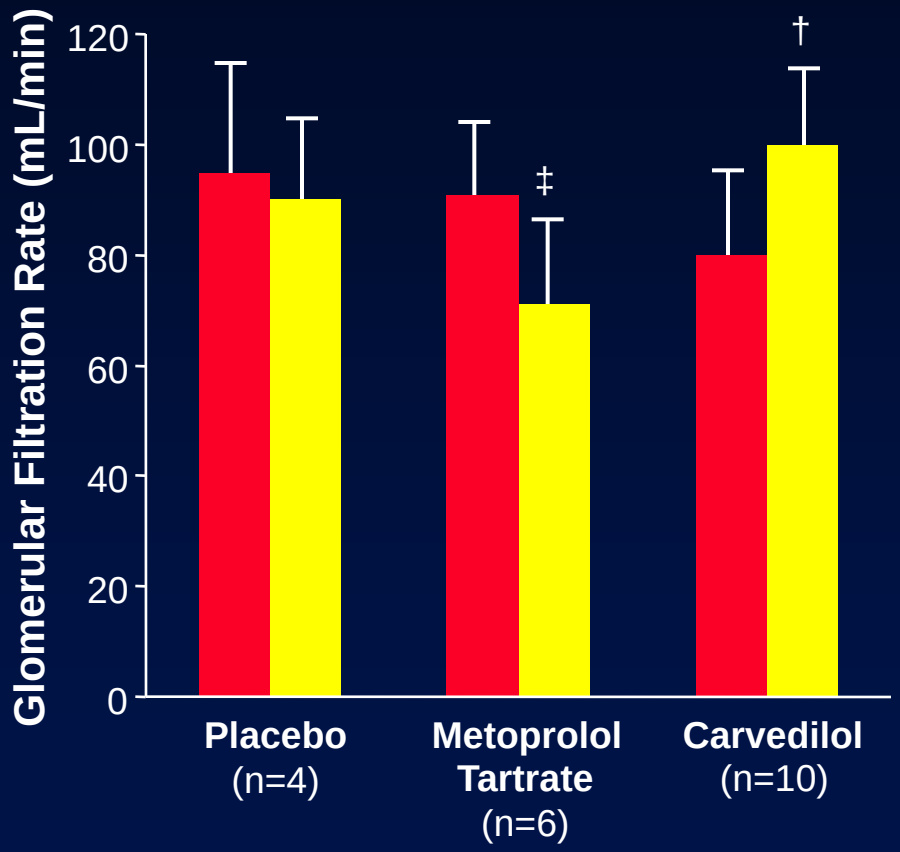
Treatment algorithm for patients with systolic heart failure, based on renal function



Shlipak, M. G. Ann Intern Med 2003;138:917-924

Renal Effects of Carvedilol in HF

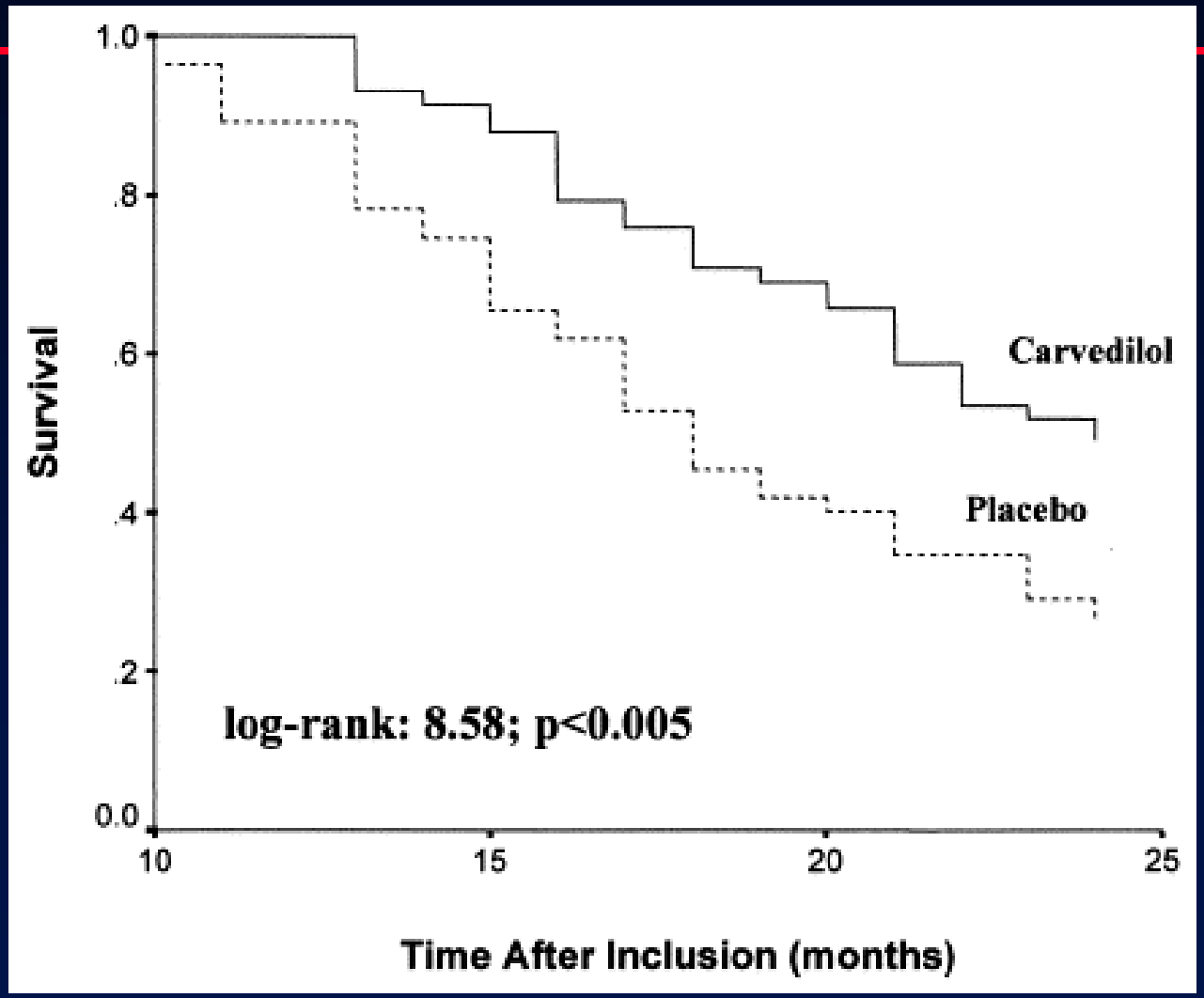




Carvedilol titrated from 3.125 mg bid to 25 mg bid (<85 kg) or 50 mg bid (>85 kg).
Metoprolol tartrate titrated from 6.25 mg bid to 50 mg bid (<85 kg) or 100 mg bid (>85 kg).
*P=.01 vs baseline; †P=.04 vs baseline; ‡P=.03 vs baseline.

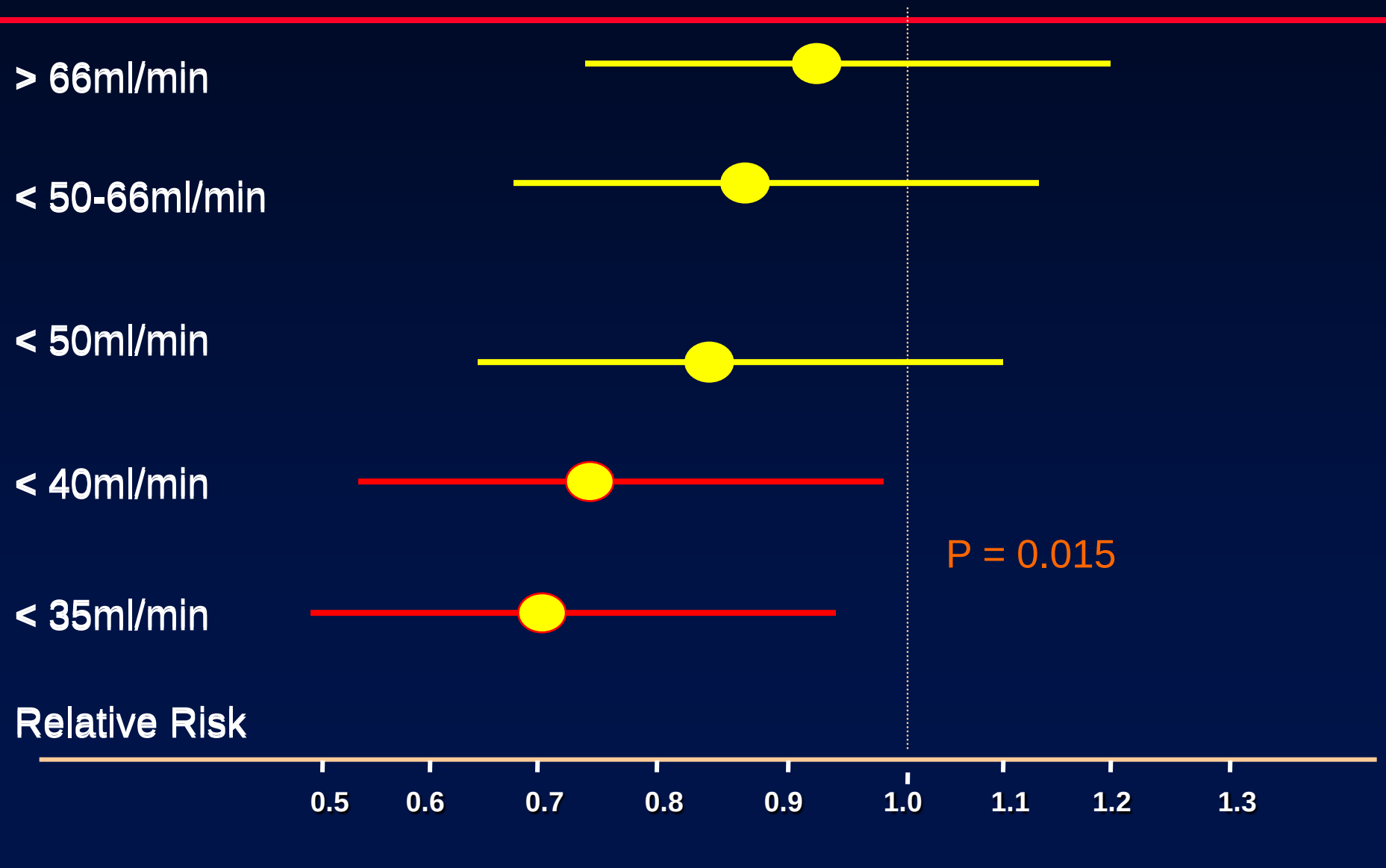
1. Updated from Abraham WT et al. *Circulation*. 1998;98:I-378–I-379.
2. Data on file. GlaxoSmithKline.

Carvedilol increases two-year survival in dialysis patients with dilated cardiomyopathy

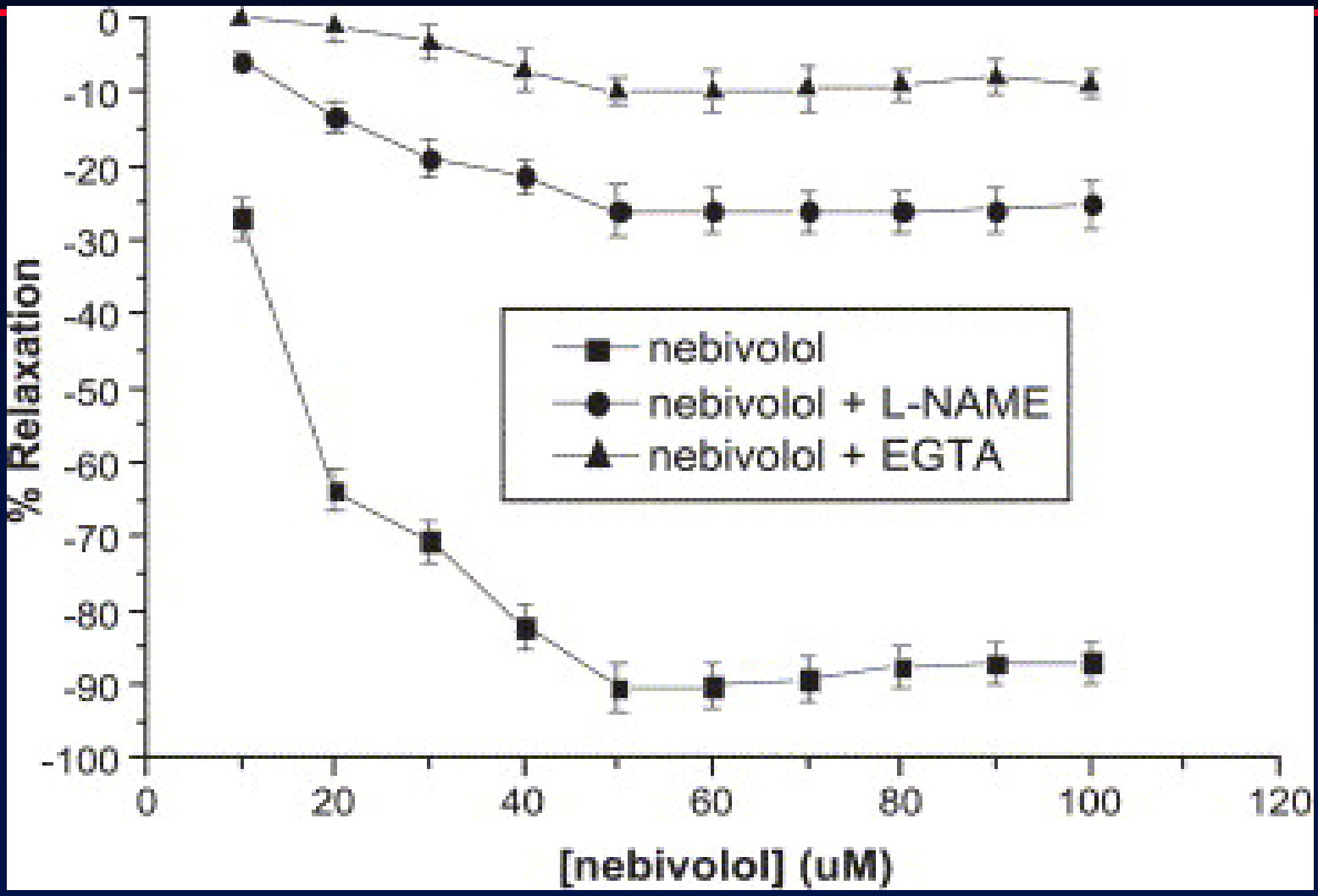


Cice et al. JACC 2003;41:1438

Effect of Nebivolol on the primary end-point by levels of baseline creat clear (SENIORS)



The vasodilator effect of nebivolol on the renal artery

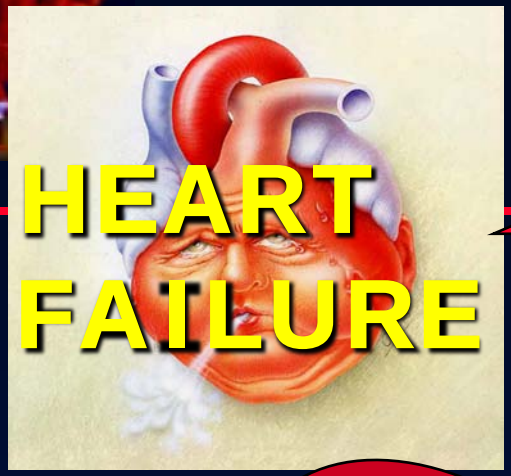


Georgeskou et al. Eur J Pharmacol 2005:508:159

CARDIO-RENAL INSUFFICIENCY: NEWER THERAPIES

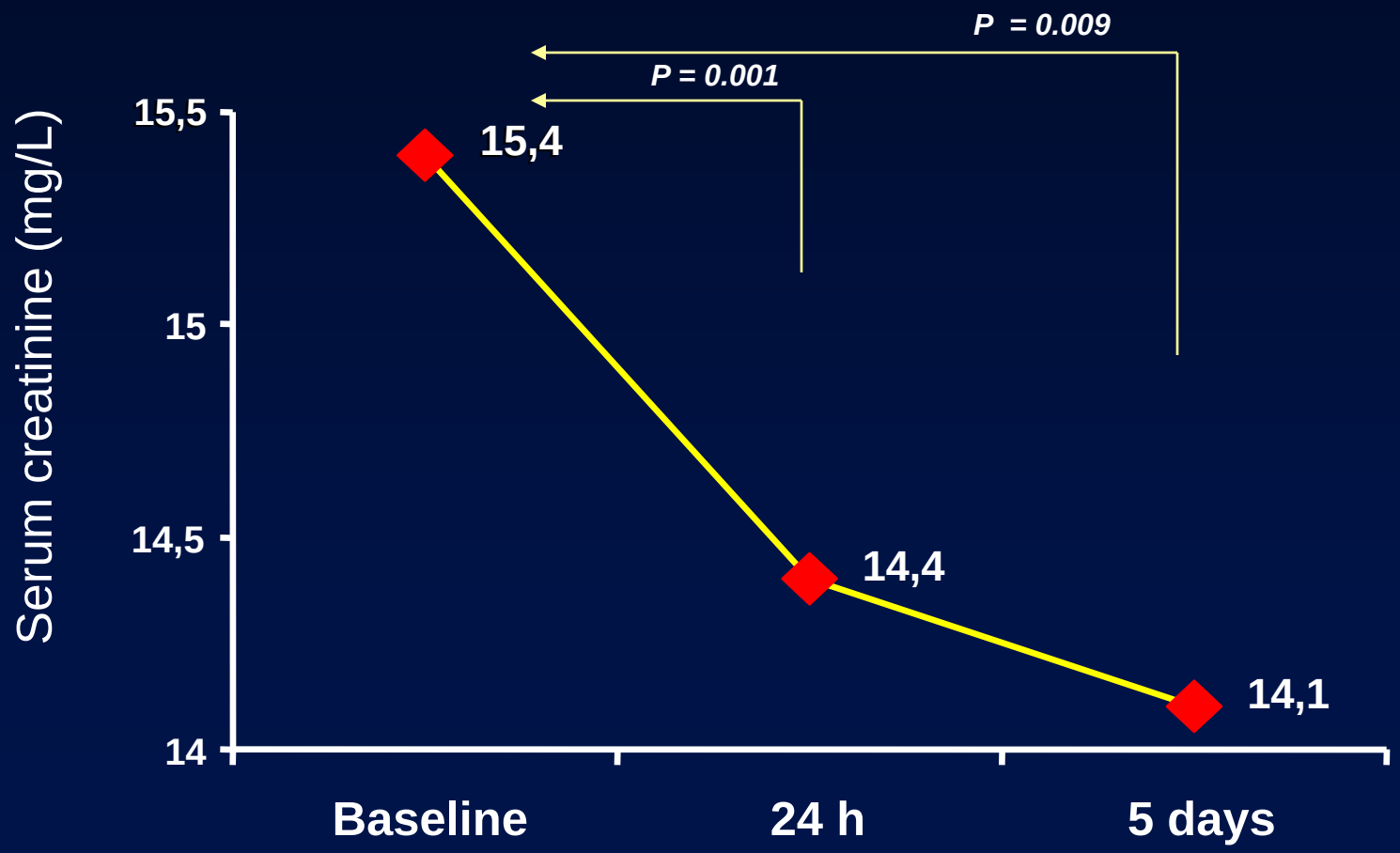
- Erythropoietin
- Vasopressin V2 antagonists
- Adenosine antagonists
- Levosimendan
- Ultrafiltration (when diuretics are associated with deterioration of renal failure)
- Renal transplantation
- Cardiac and kidney repair (cell therapies)

Gil et al. Curr Opin Nephrol Hypertens 2005;14:1442



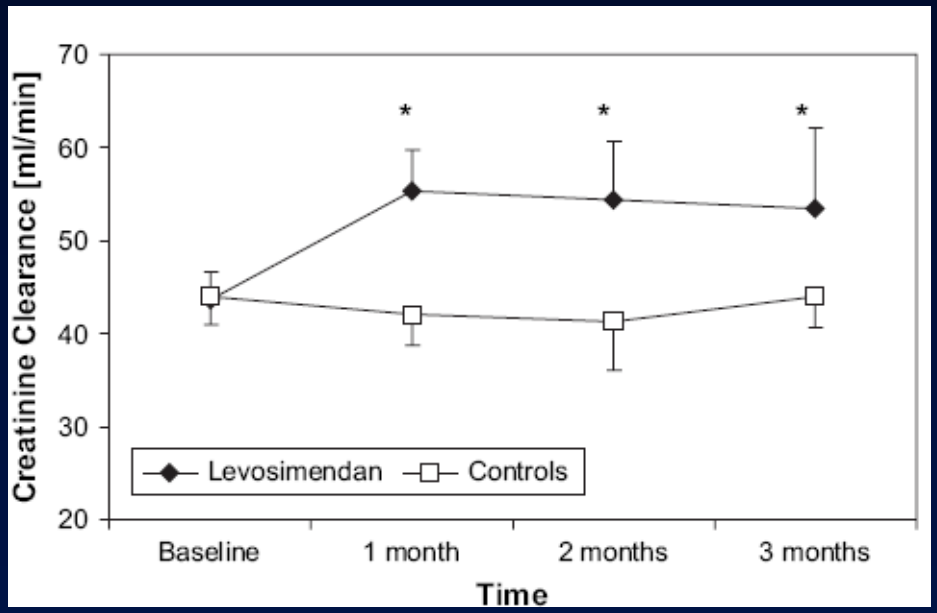
RAAS
inactivation

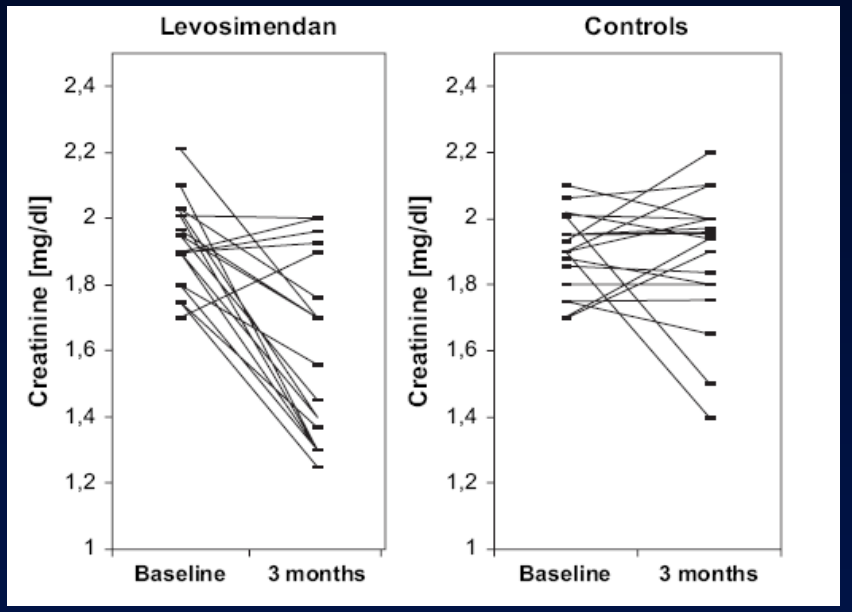
PORTLAND: Impact of Levosimendan on Renal Function



Silva Cardoso J, and the PORTLAND investigators. J Cardiac Fail 2004;10(suppl.4):131.

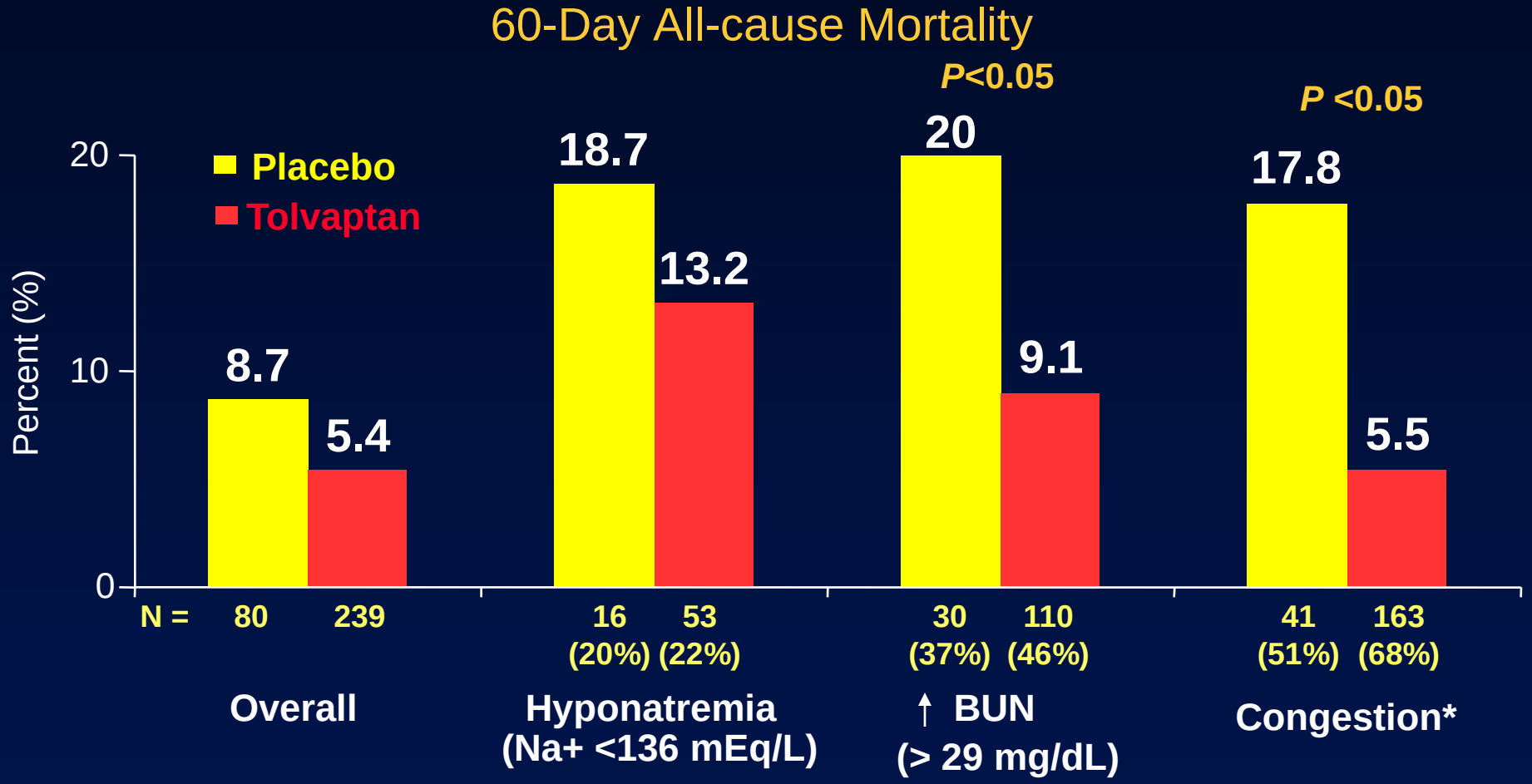
Levosimendan Improves Renal Function in Patients With Advanced CHF Awaiting Cardiac Transplantation





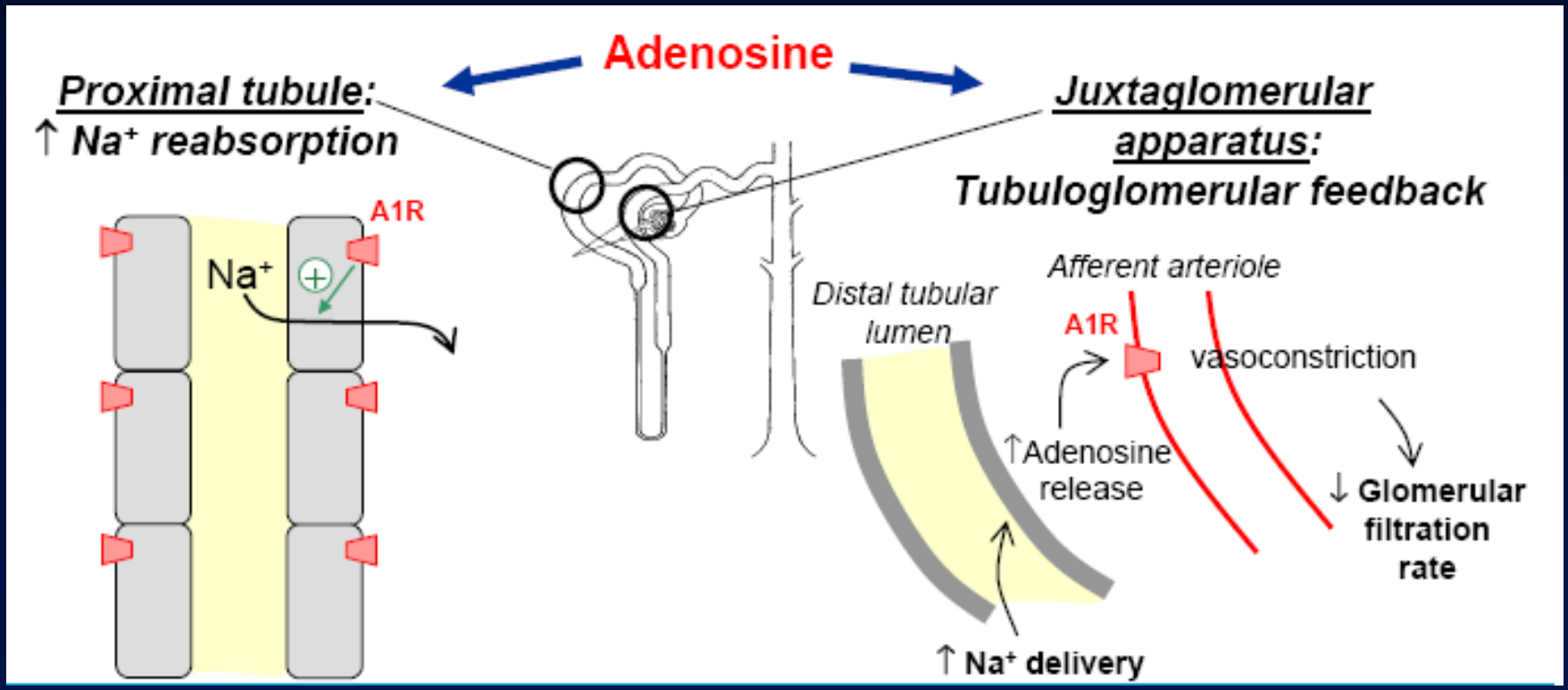
Zemijic et al. J Card Fail 2007;13:417

Vasopressin Antagonist for Heart Failure: ACTIV in CHF Trial

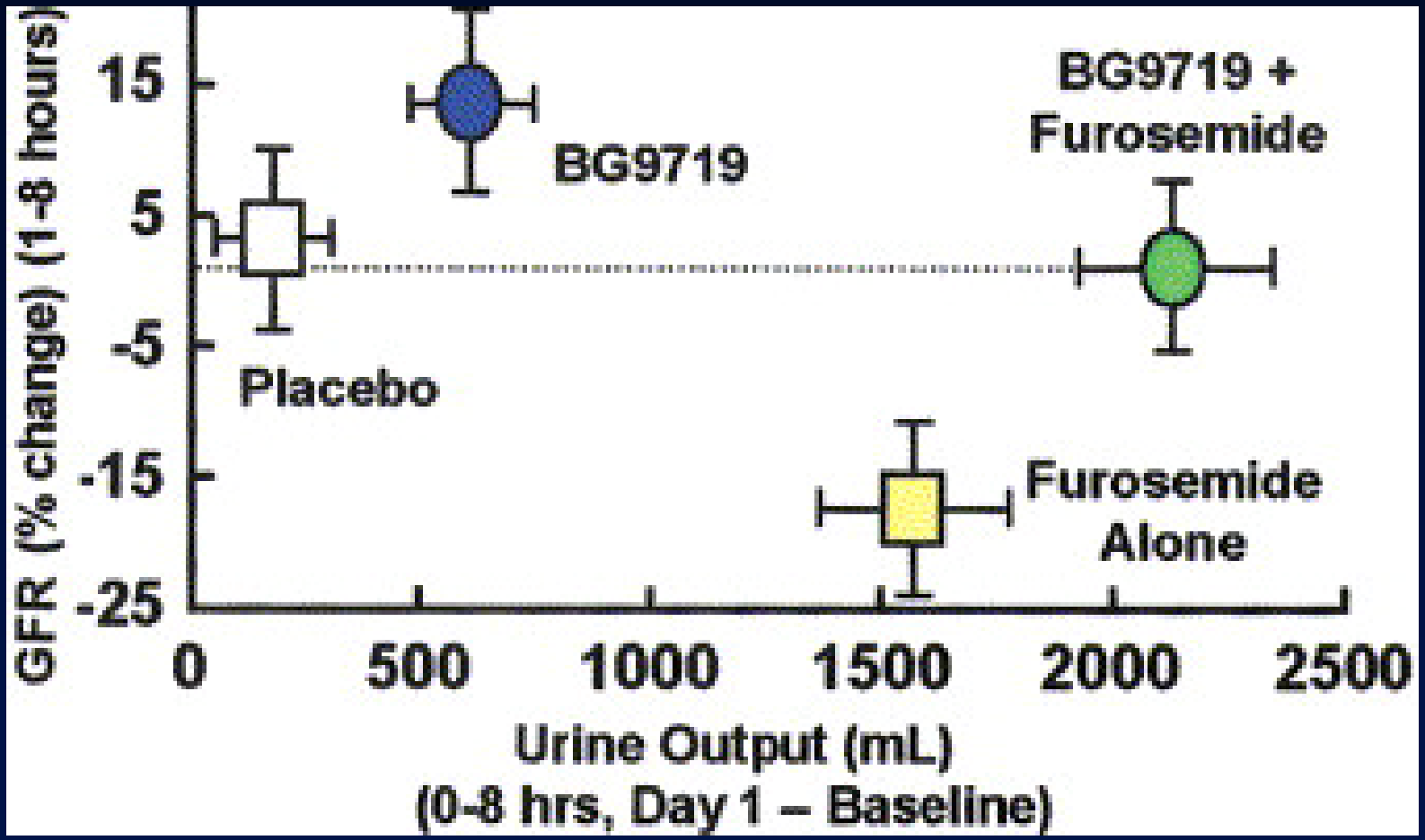


Gheorghiade M. JAMA. 2004;291:1963-1971. * Edema, Dyspnea, and JVD at baseline

A1-receptors in the afferent arteriole and proximal tubule in kidneys.



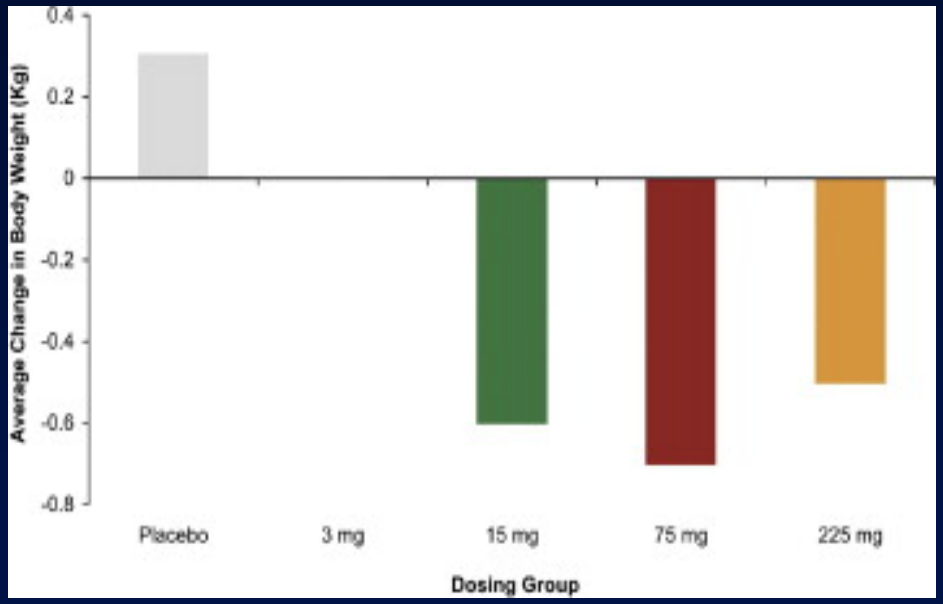
Effects of adenosine antagonists on GFR and diuresis in ADHF

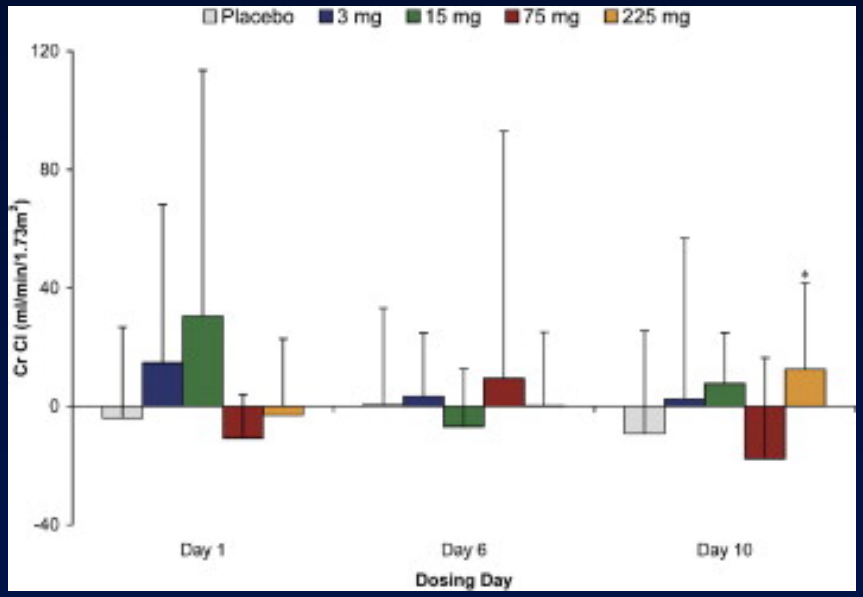


Gottlieb et al. Circulation 2002;105:1348

Effects of A1 Adenosine Antagonist, BG9928, in Patients With HF: Results of a Placebo-Controlled, Dose-Escalation Study

50 pts with systolic HF,
BG9928 (3, 15, 75, or 225 mg) or placebo orally for 10 days,
primary end point: change in sodium excretion



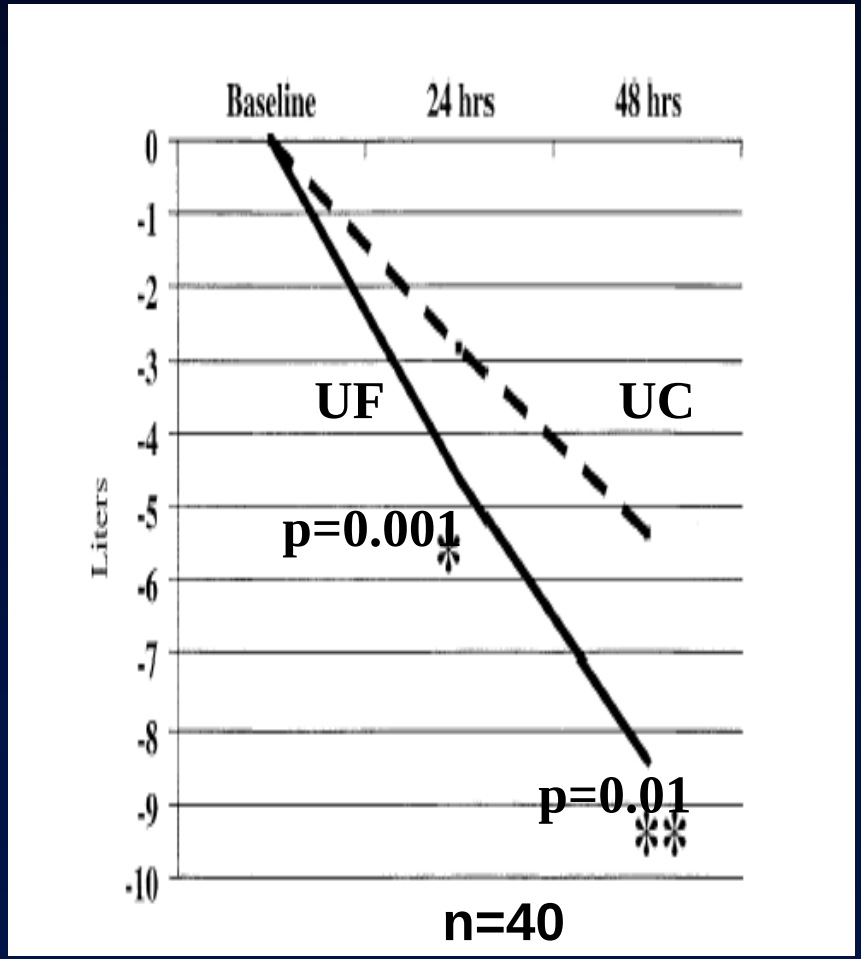


REACH UP ongoing trial with KW3902 in CHF pts with worsening renal function

Greenberg et al. JACC 2007;50:600

Ultrafiltration (UF) Versus Usual Care (UC) for Patients with AHF: RAPID-CHF Trial

- The early application of UF for patients with CHF was feasible, well-tolerated, and resulted in significant weight loss and fluid removal
- A larger trial is underway to determine the relative efficacy of UF versus standard care in ADHF



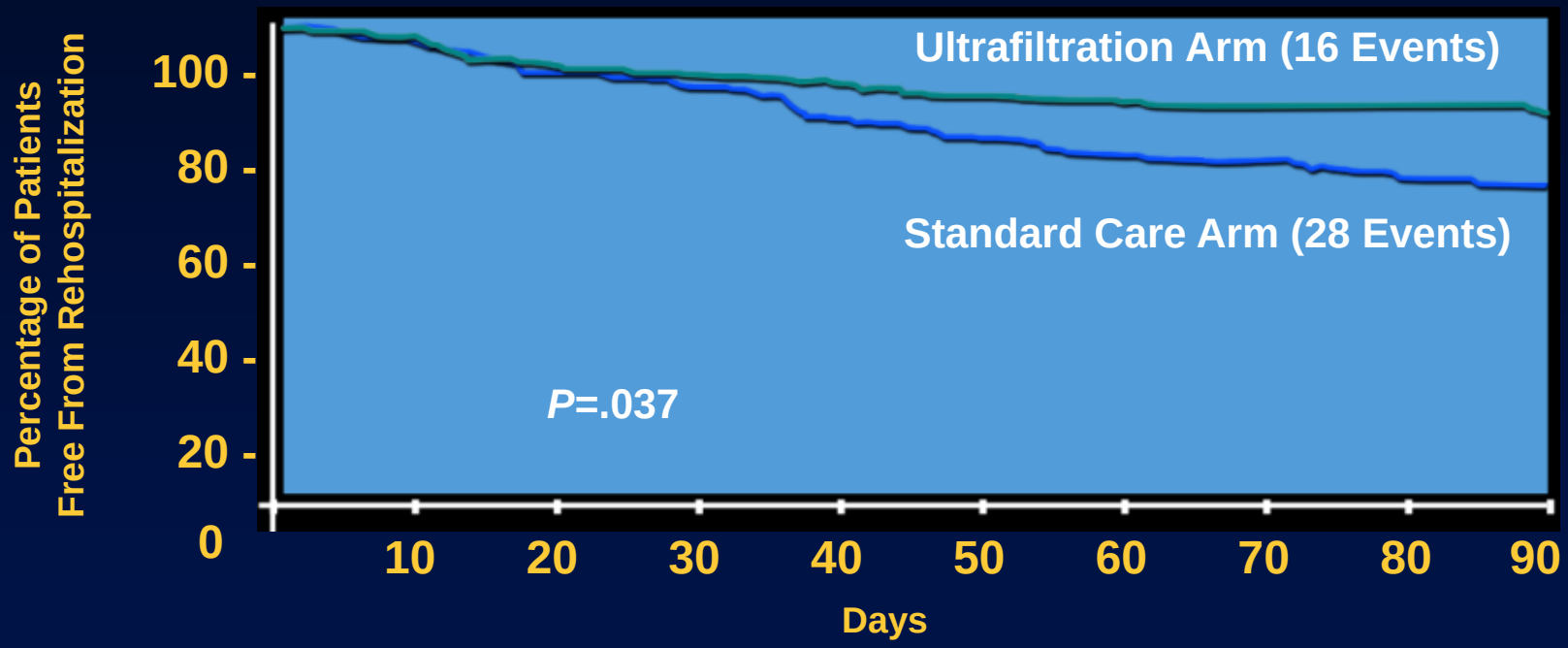
Bart et al. JACC 2005;46:2043

EUPHORIA Trial: Clinical and Laboratory Outcomes

Variable	Pre-UF	Disch.	30 Days	90 Days	*P* Value
Weight (kg)	87 ± 23	81 ± 22	84 ± 21	80 ± 18	.006
SBP (mmHg)	120 ± 17	114 ± 22	120 ± 26	116 ± 24	.306
Cr (mg/dL)	2.12 ± 0.6	2.20 ± 0.8	2.38 ± 1.1	2.18 ± 0.7	.532
BNP (pg/mL)	1236 ± 747	988 ± 847	816 ± 494	NA	.03
NYHA FC IV	39 %	37 %	5 %	11%	.063

Costanzo et al. *J Am Coll Cardiol*. 2005;46:2047-2051.

UNLOAD: Freedom From Rehospitalization for HF



No. Patients at Risk										
Ultrafiltration Arm	88	85	80	77	75	72	70	66	64	45
Standard Care Arm	86	83	77	74	66	63	59	58	52	41

Costanzo MR et al. J Am Coll Cardiol. 2007;49:675-683.

CONCLUSIONS

- Cadiorenal syndrome is frequent and related with impaired hemodynamics and neurohormonal activation in CHF.
- Diuretic treatment is ineffective to reduce congestion in about 30% of CHF patients.
- New diuretics is under investigation and may be promising in attenuating resistance to traditional diuretics (especially in patients with hyponatremia).
- Ultrafiltration is effective to reduce congestion and re-hospitalizations when there is resistance to diuretics.
- Persistent low urine sodium as well as concomitant increase of renal and hepatic biochemics are useful clinical markers of early ultrafiltration in CHF.

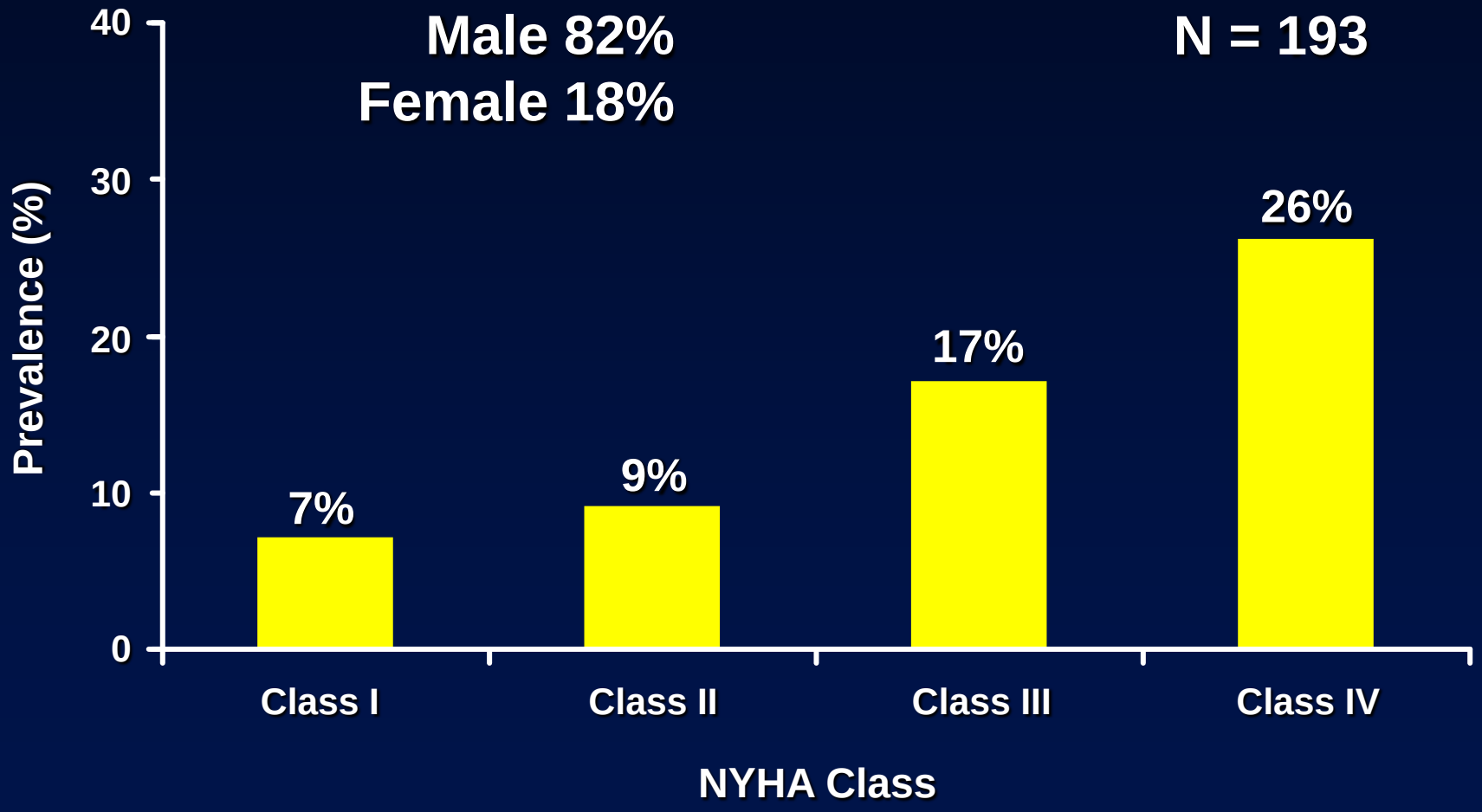
ANAEMIA IN CHF

The challenge of erythropoietic agents

Prevalence of Anaemia in Large-scale CHF Studies

Study	Gender	Definition (g/dL)	Prevalence (%)
COPERNICUS	M + F	<12.5	19
ELITE II	F	<12	16.6
	M	<12	7.2
IN CHF	F	<11	**15.6**
		<12	
Val-HeFT	F	<11	**9.0**
	M	<12	
HTx	F	<12	**30.0**
	M	<13	

Prevalence of Anaemia in a CHF Outpatient Clinic (Hgb < 12 g/dL)



Tanner H et al. Int J Cardiol 2002

Anaemia of Chronic Illness?
In severe CHF, Iron deficiency?

Mechanisms of Anaemia in CHF

Haemodilution
Plasma Volume ↑

Forward failure
Bone Marrow (BM)
- dysfunction

Iron deficiency
Fe^{++} uptake ↓
malabsorption
chron. bleeding (Aspirin)

Chronic immune activation
TNFα - production of Epo ↓
- Epo activity in BM ↓

Drugs
ACEi: Epo synthesis ↓
Epo activity in BM ↓

Chronic kidney failure
Production of Epo ↓
Loss in urine ↑

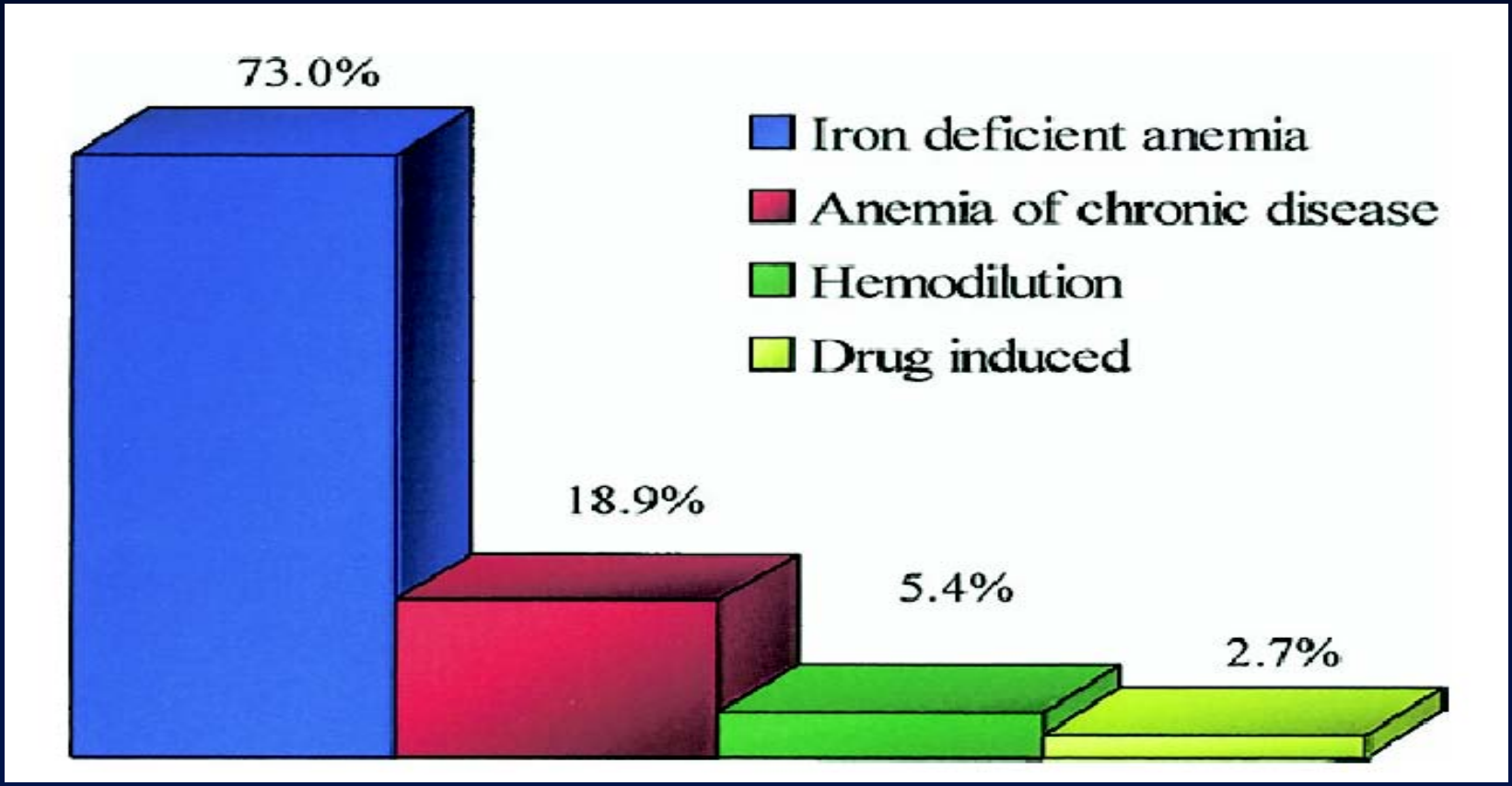
Silverberg DS et al. JACC 2000

Epo - Erythropoietin

Nanas J, et al. JACC 2007

Etiology of Anemia in Patients With Advanced Heart Failure

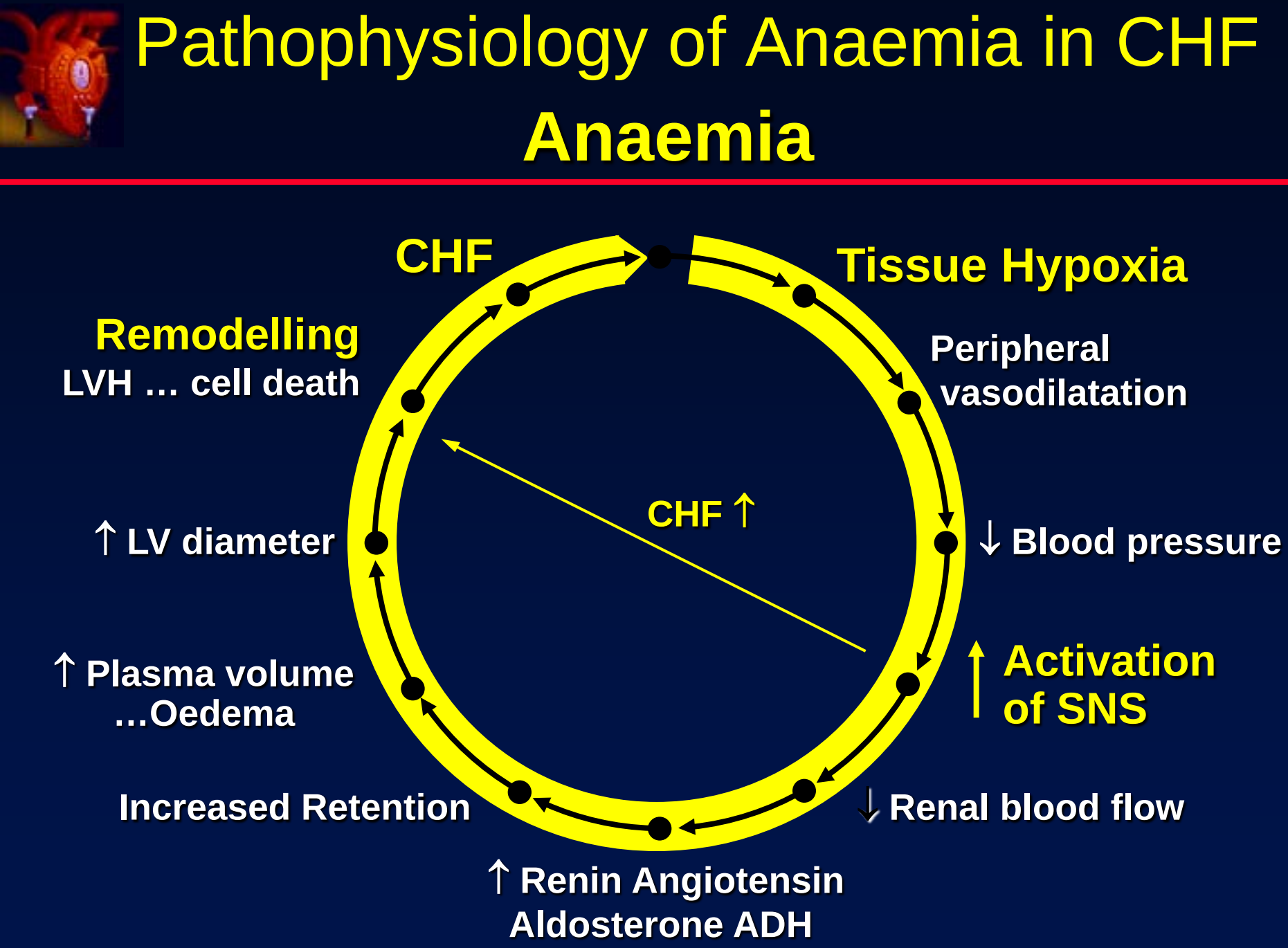
37 advanced CHF pts? NYHA IV; mean LVEF: 22%.



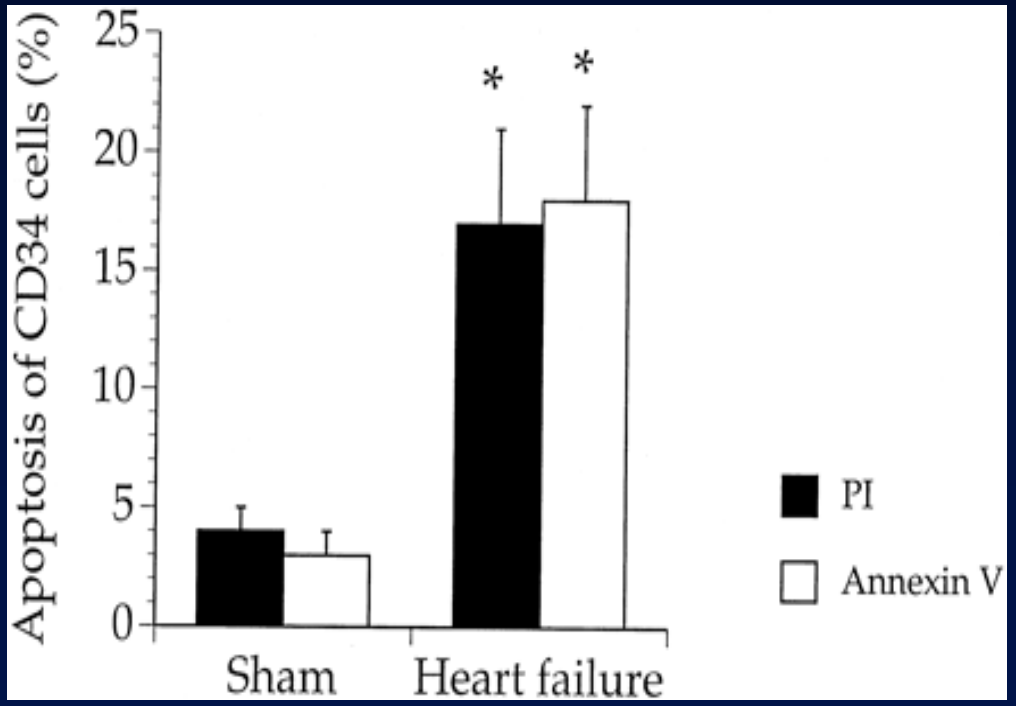
Nanas J et al. J Am Coll Cardiol 2006;48:2485–9

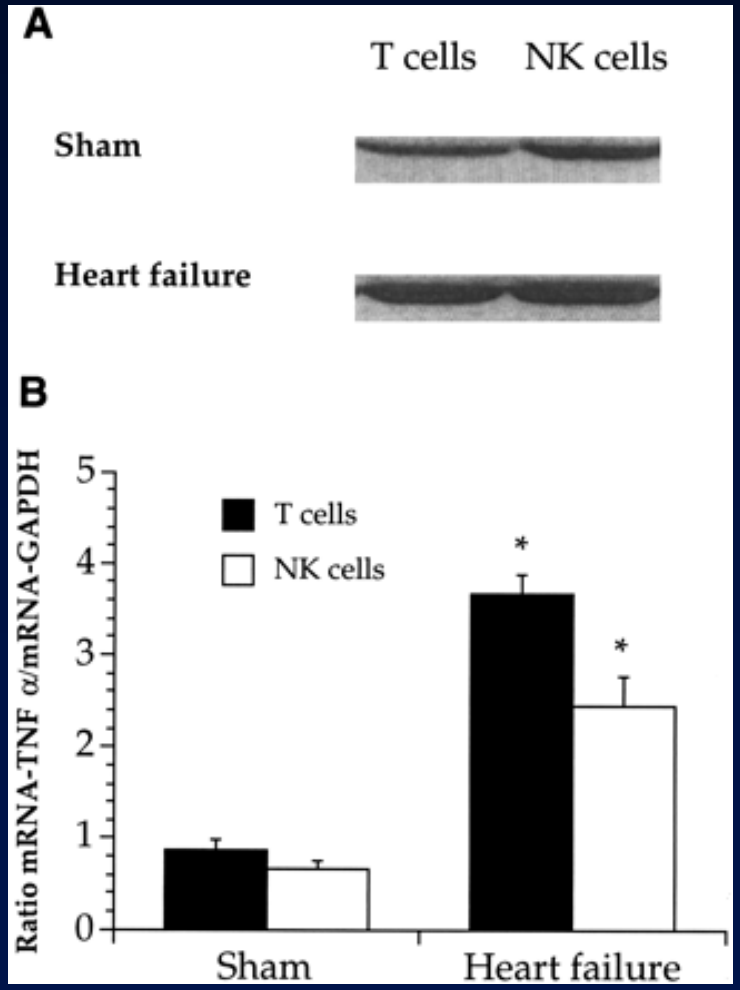
Pathophysiology of Anaemia in CHF

Anaemia

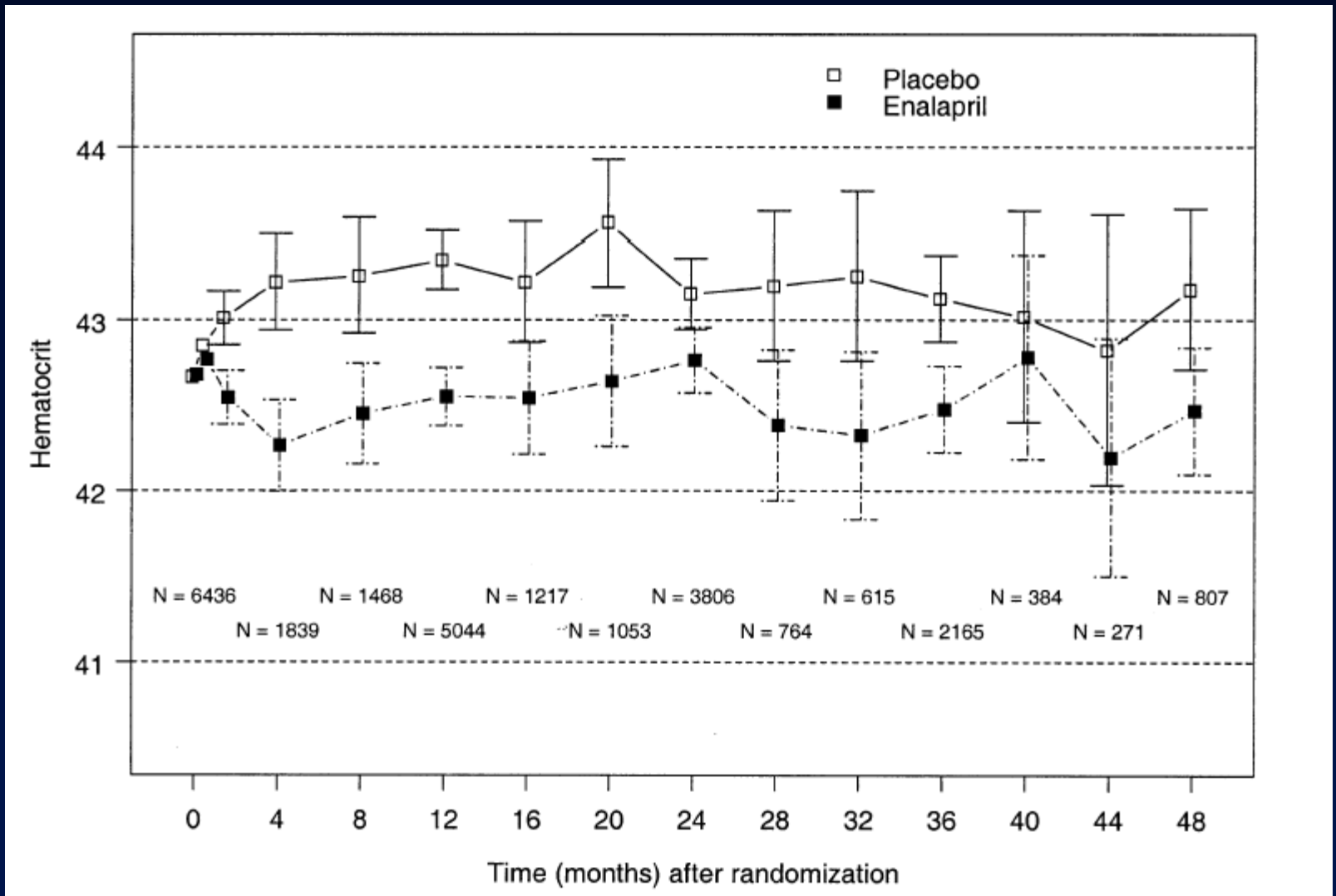


Decreased hematopoiesis in bone marrow of mice with congestive heat failure: a role of apoptosis and cytokines (Iversen et al. Am J Physiol 2002;282:R166)

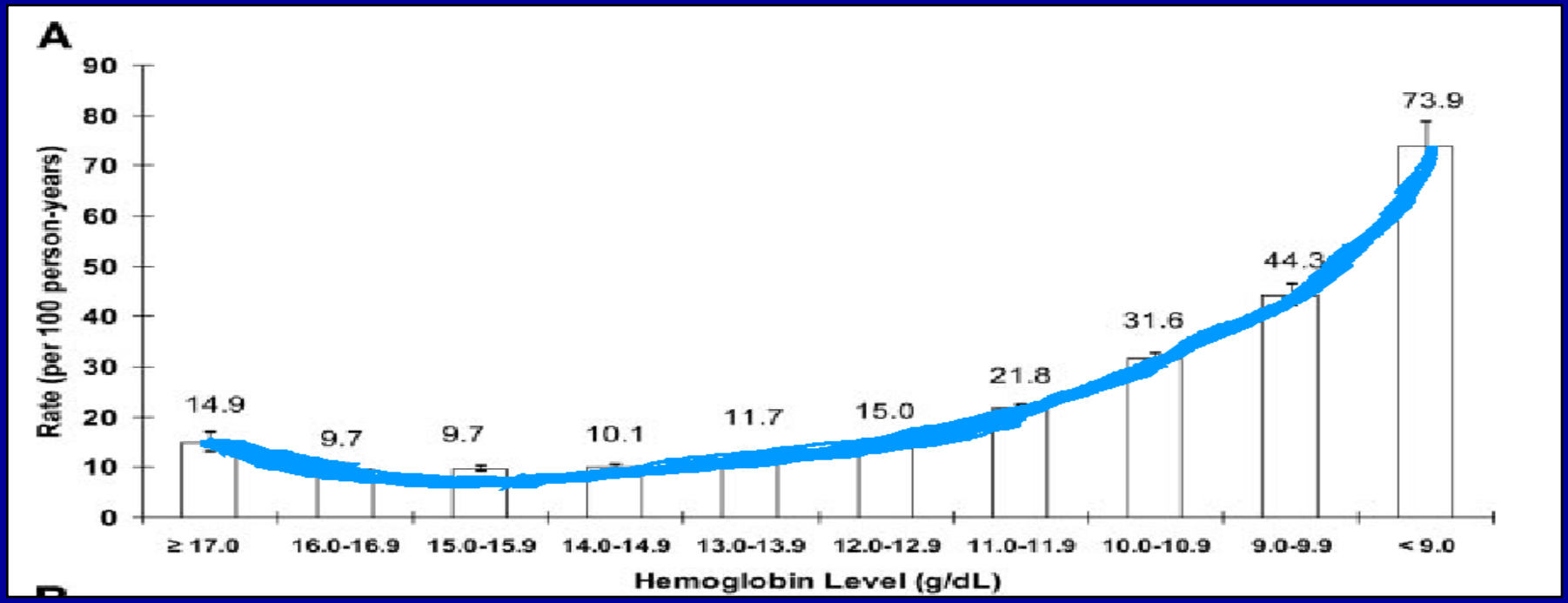




ACE inhibitor as a risk factor for the development of anaemia in patients with CHF
SOLVD
(JACC 2005;45:391)



Anaemia is a frequent comorbid condition in chronic heart failure (CHF) affecting adversely patient prognosis.

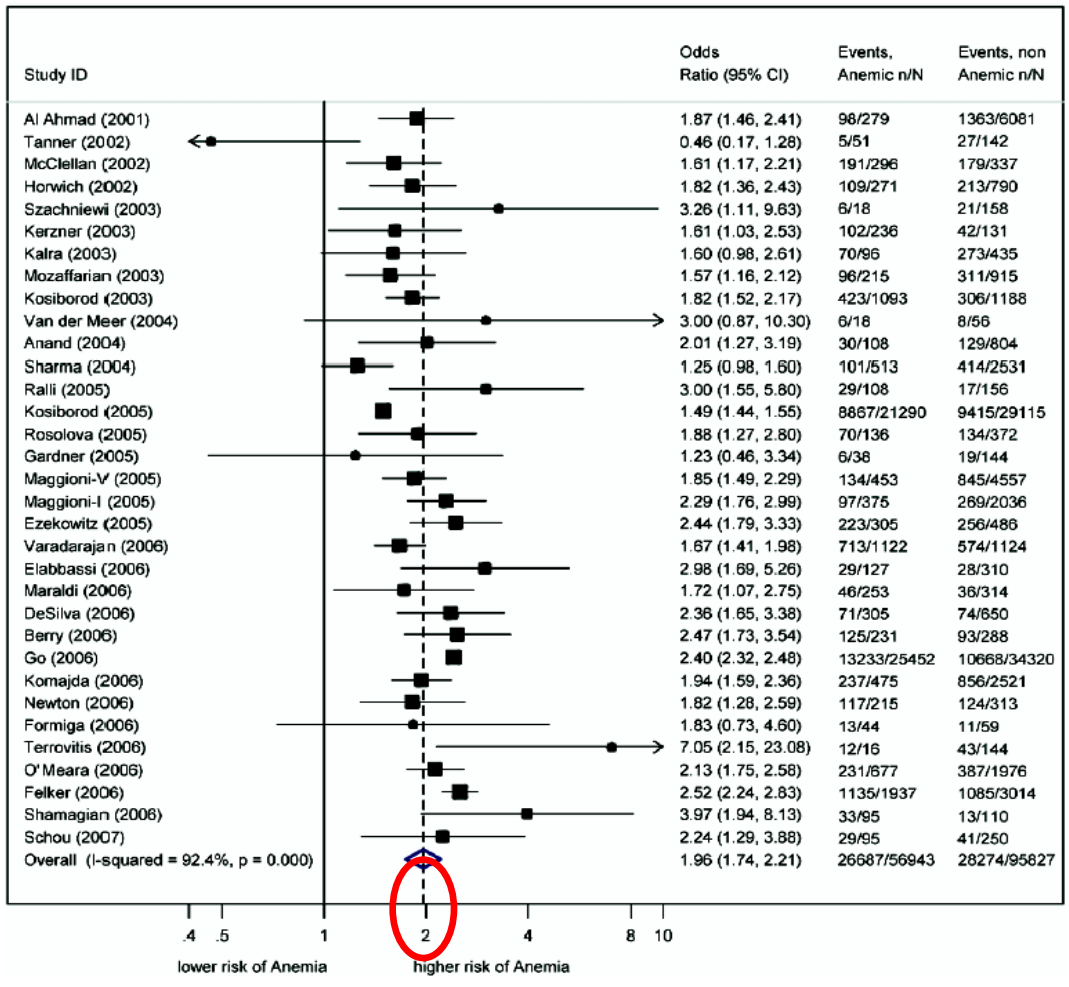


Crude rates of death from any cause by level of hemoglobin (g/dL)

Both high and lower hemoglobin levels were strong, graded, independent risk factors for adverse outcomes in the setting of chronic heart failure.

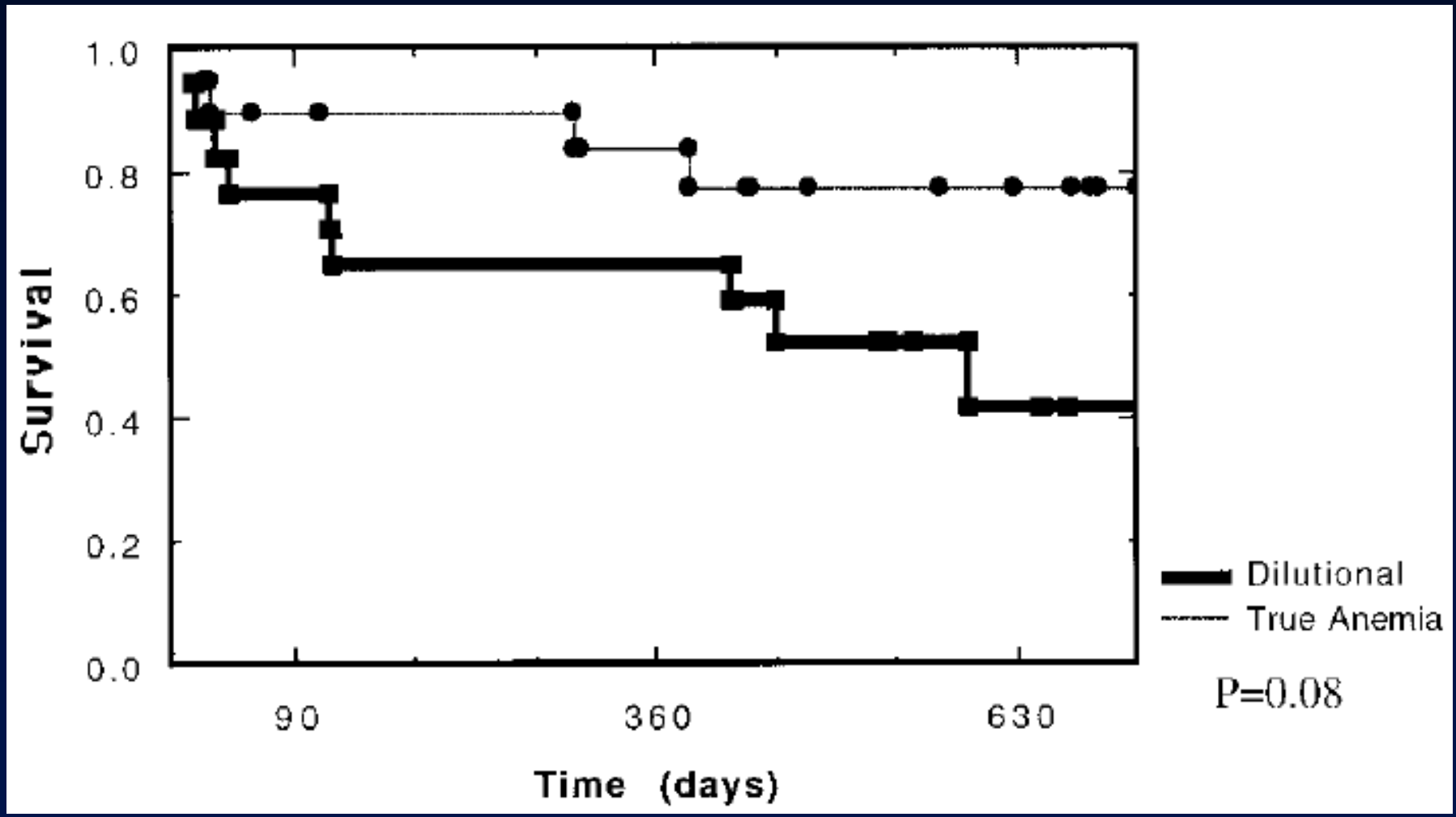
ANCHOR Study 2006;113;2713-2723; Circulation

Anemia as prognostic factor in CHF: a meta-analysis



Groenveld et al. JACC 2008;52:818

Survival curves of the patients with true anemia versus hemodilution.
Androne et al. Circulation 2003 (Jan)



Treatment Options for Anaemia

- Blood transfusions
- IV iron alone
- Erythropoietic agents alone
- Erythropoietic agents in combination with IV iron
- Erythropoietic agents in combination with oral iron

The role of blood tranfusions

- A “tranfusion threshold” of maintaining Ht >30% is empirical.

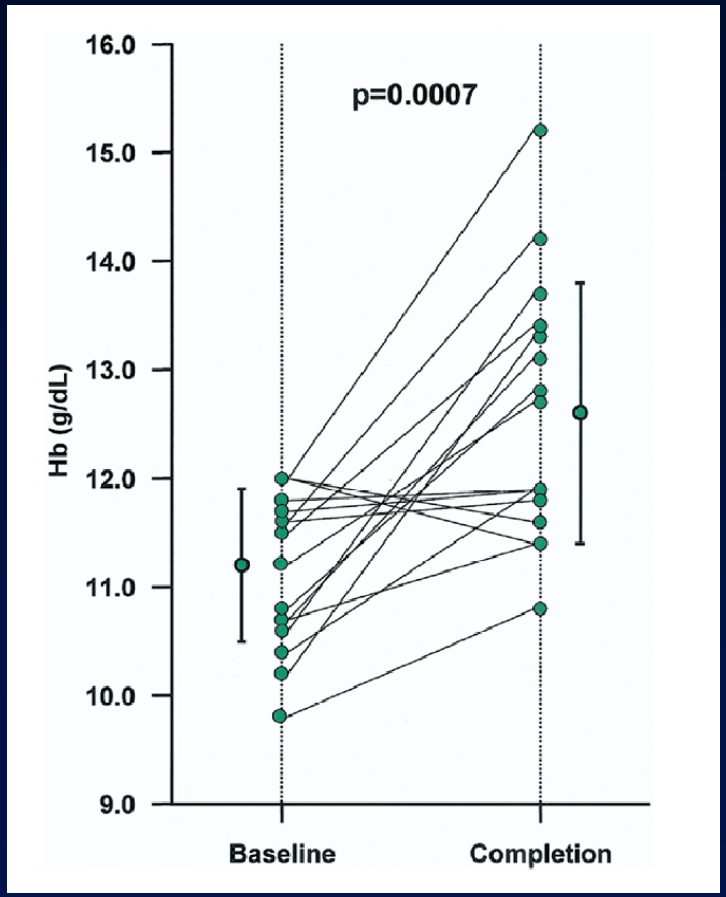
- In post-MI elderly patients, tranfusion in Ht<30% was associated with improved 30-day survival.

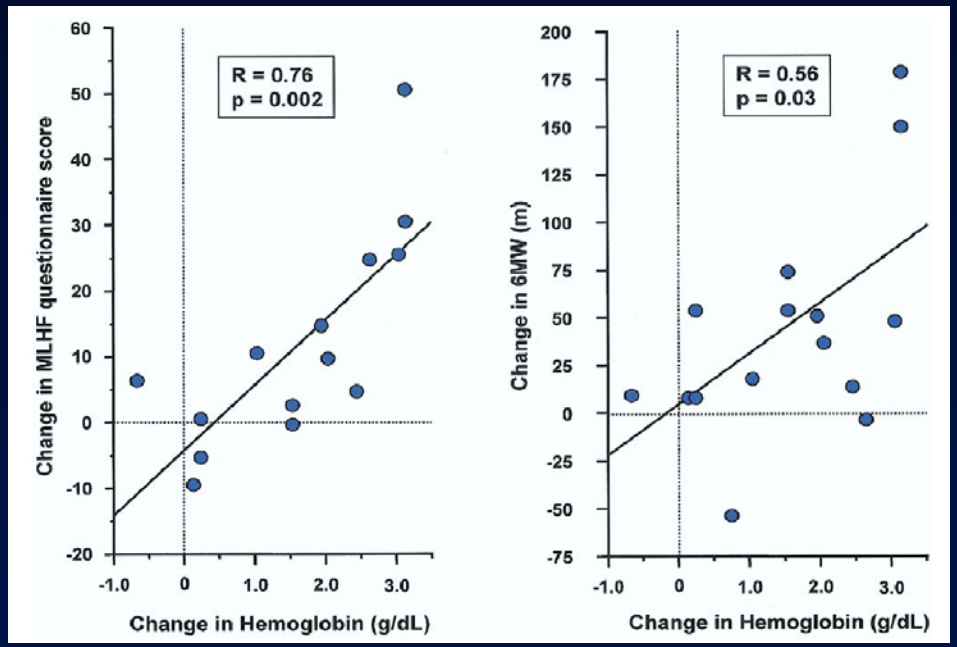
  N Eng J Med 2001;345:1230

- A randomized trial of a restrictive (Hb: 7 g/dl) vs liberal (Hb: 10 g/dl) tranfusion strategy in critically ill pts (26% with CHF) reported no significant difference in 30-day mortality.

  N Eng J Med 1999;340:409

Intravenous iron alone for the treatment of anaemia in patients with CHF





Bolger et al. JACC 2006;48:1225

Indications for Starting Treatment With Epoetin in Chronic Renal Failure Patients

European Best Practice Guidelines for the Management of Anaemia in Patients with Chronic Renal Failure

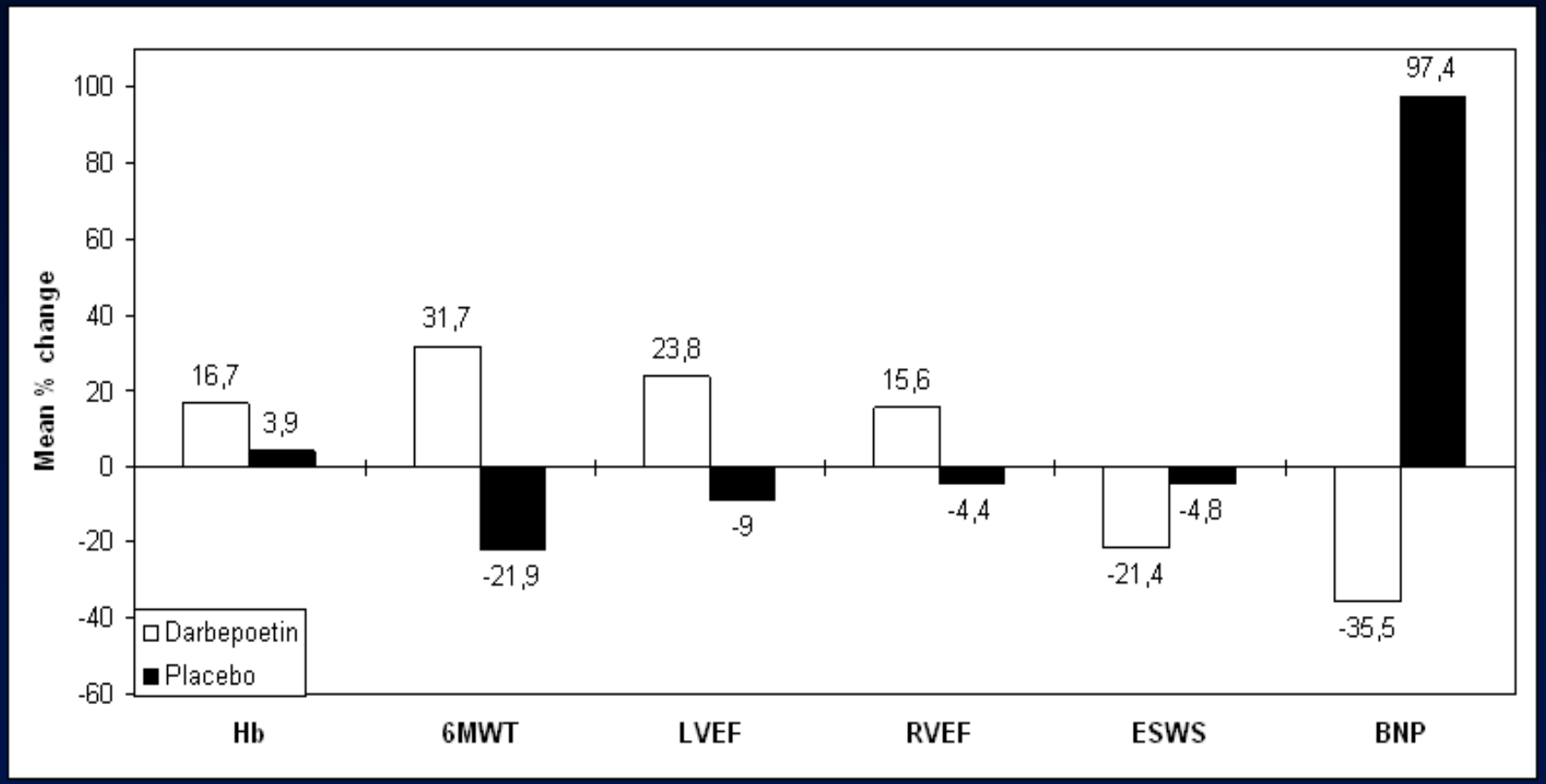
"Epoetin treatment should be considered when the haemoglobin concentration is consistently less than 11 g/dL (Hct < 33%) and when other possible causes of anaemia have been excluded."

Neph Dial Trans 1999

Erythropoietin (EPO) administration in combination with iron therapy seems to restore hemoglobin (Hb) levels and improve exercise capacity of CHF patients.

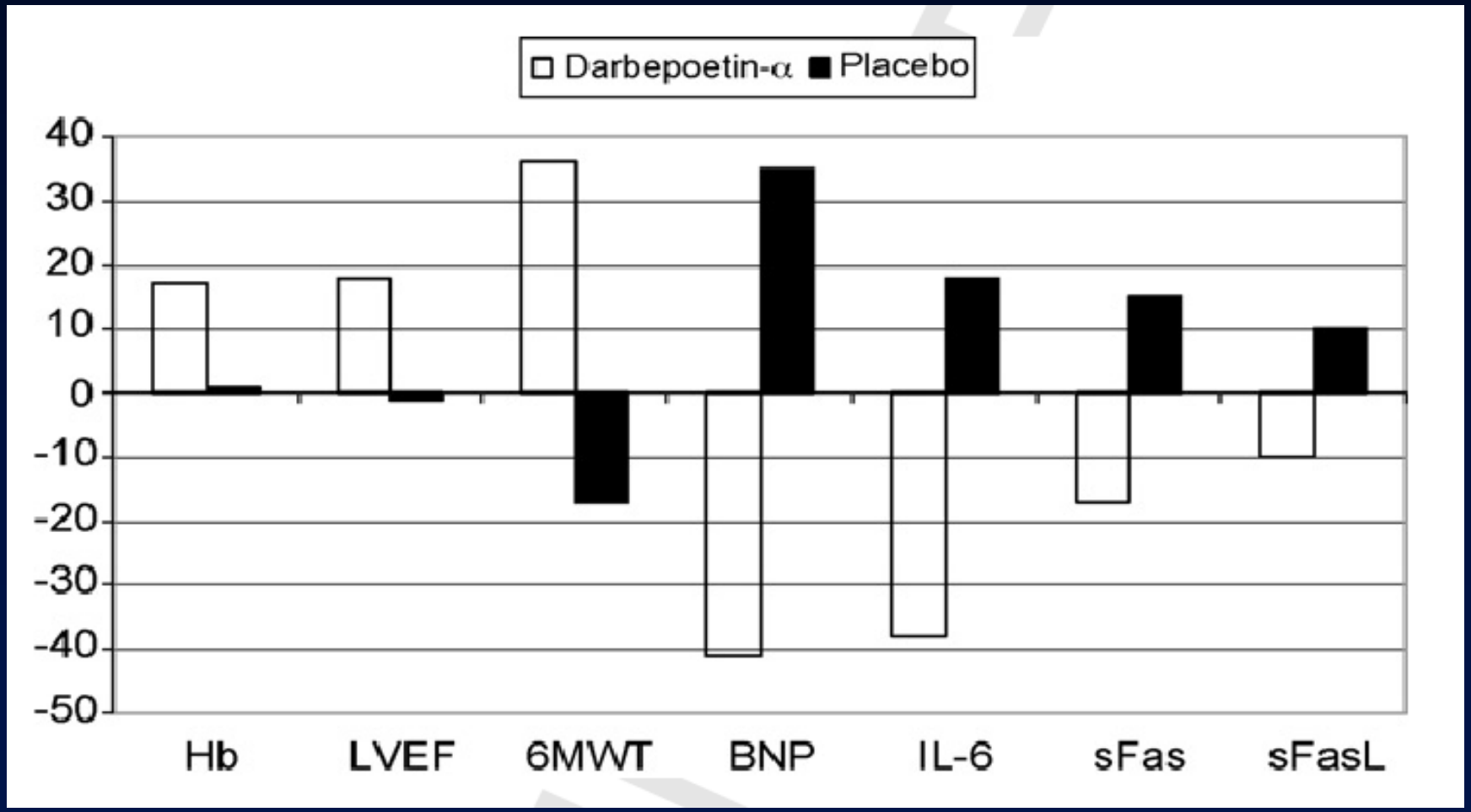
Silverberg et al. J. Am. Coll. Cardiol., 2000,	Rh-EPO + iv Fe	NYHA class improvement
Silverberg et al. J. Am. Coll. Cardiol., 2001	Rh-EPO + iv Fe	NYHA class improvement
Silverberg et al. Nephrol. Dial. Transplant., 2003	Rh-EPO + iv Fe	NYHA class improvement
Mancini et al. Circulation, 2003	Rh-EPO +oral Fe + folate	VO2 max,6min walk, exercise time improvement
Silverberg et al. Kidney. Blood. Press. Res., 2005,	Rh-EPO + iv Fe	NYHA class improvement

Effects of darbepoetin-alpha on right and left ventricular systolic and diastolic function in anemic patients with chronic heart failure



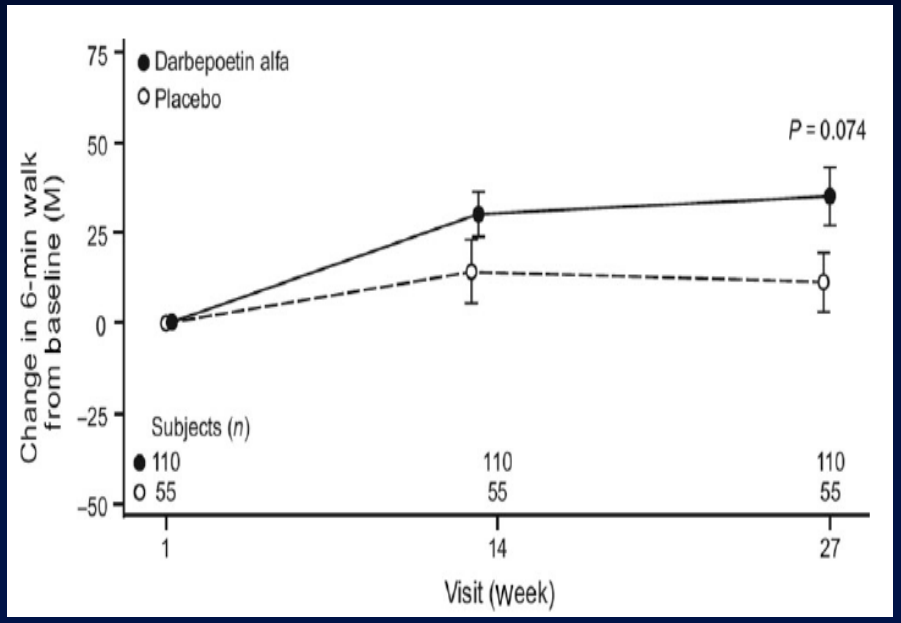
Parissis et al. Am Heart J 2008

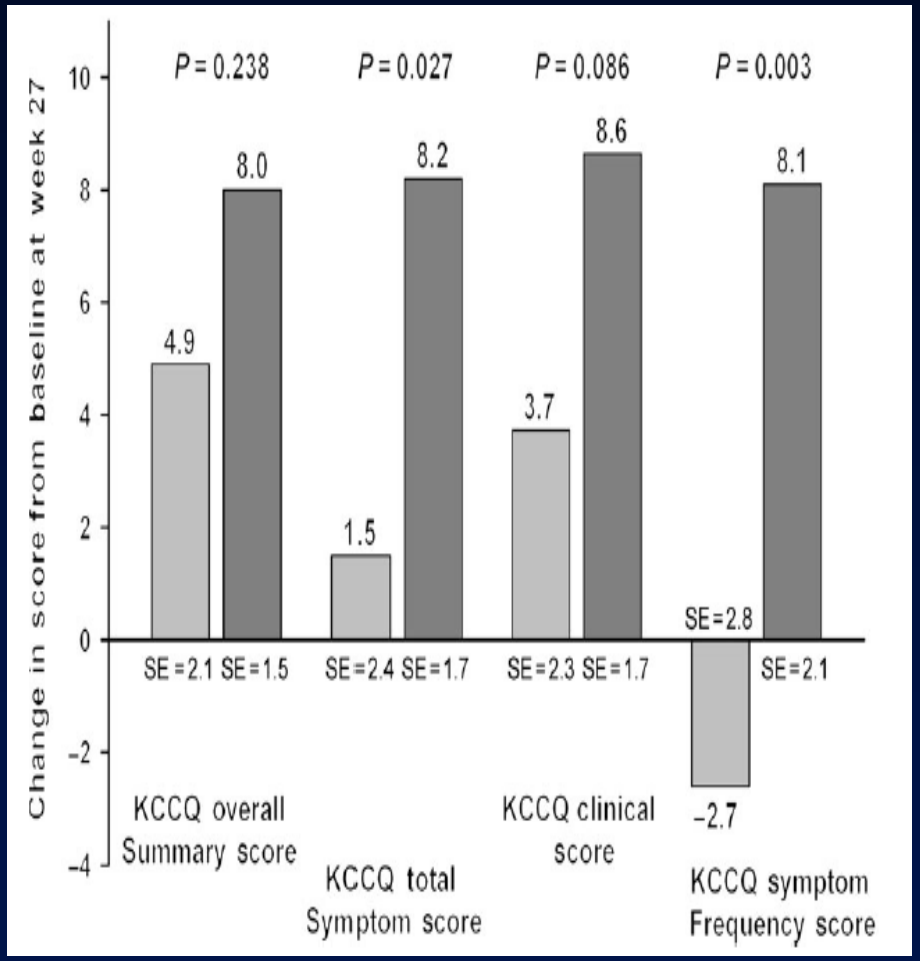
Effects of darbepoetin-a plus oral iron on pro-inflammatory cytokine activation and apoptosis mediators in CHF



Kourea K, Parissis J, Farmakis D, et al. Atherosclerosis 2007

study
to evaluate the effect of two dosing regimens of EPO in patients with CHF and anemia





Eur Heart J 2007;28:2208

in Patients With Symptomatic Heart Failure and Anemia (STAMINA HF)

Adverse Events

Category	Placebo (N=157), n (%)	Darbepoetin alfa (N=162), n (%)
Any adverse event	145 (92)	150 (93)
Serious adverse events	81 (52)	76 (47)
Treatment-related adverse events	16 (10)	21 (13)
Related serious adverse events	3 (2)	4 (2)
Related fatal adverse events	1 (1)	0 (0)
Adverse events of specific interest	58 (37)	55 (34)
Worsening heart failure	45 (29)	38 (23)
Hypertension	10 (6)	13 (8)
Myocardial infarction	5 (3)	4 (2)
Stroke	3 (2)	3 (2)
Transient ischemic attack	1 (1)	4 (2)
Subarachnoid hemorrhage	0 (0)	1 (1)
Intracranial hemorrhage	0 (0)	1 (1)
Deep vein thrombosis	2 (1)	0 (0)
Pulmonary embolus	0 (0)	0 (0)
Seizure	2 (1)	1 (1)
Discontinuation due to adverse events	8 (5)	7 (4)
Deaths on study	18 (11)	11 (7)

Conclusion

In this study of patients with symptomatic HF and anemia, treatment with darbepoetin alfa was not associated with significant clinical benefits. Darbepoetin alfa treatment was well tolerated and effectively raised hemoglobin. A trend of lower risk of morbidity and mortality was observed.

Ghali et al. Circulation. 2008;117:526-535

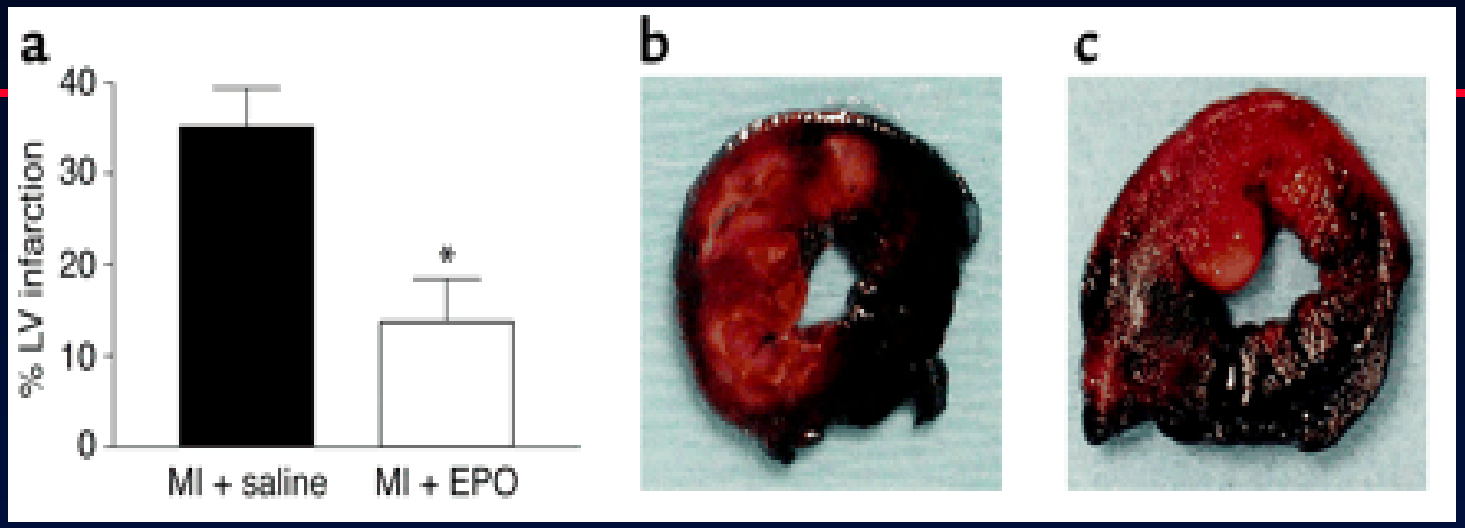
Potential Benefits and Risks of Treating Anaemia in Heart Failure

POTENTIAL BENEFITS	POTENTIAL RISKS
Improved oxygen delivery	Increased thrombosis
Improved exercise tolerance	Platelet activation
Attenuate adverse remodeling	Hypertension
Antiapoptotic	Endothelial activation
Improved QOL	Oncogenesis?
? Decrease in hospitalizations	Cost ?
? Improved prognosis	

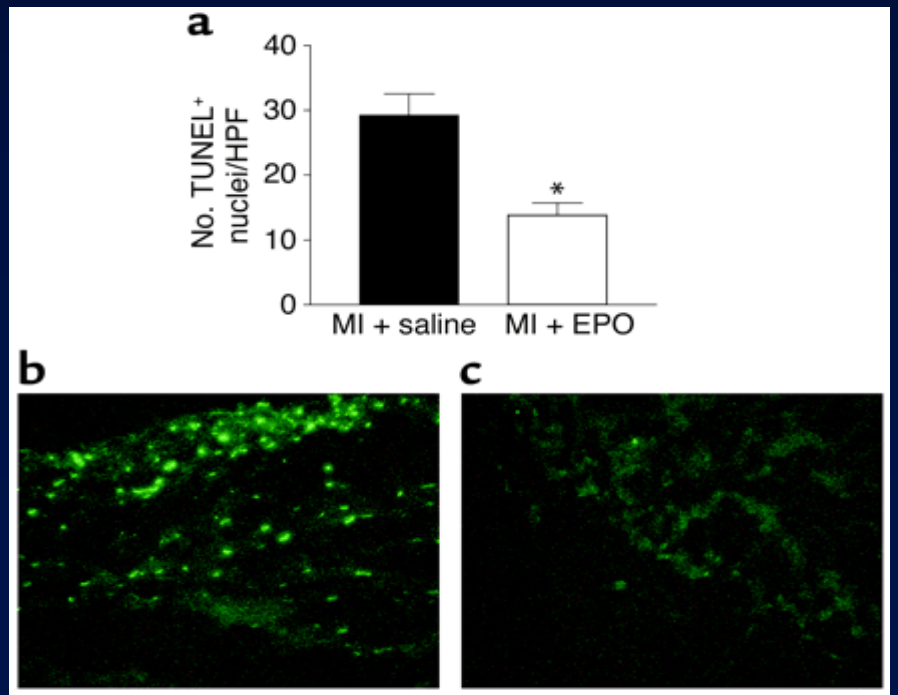
Smith et al. Cardiovasc Res 2003;59:538

Felker et al. JACC 2004;44:959

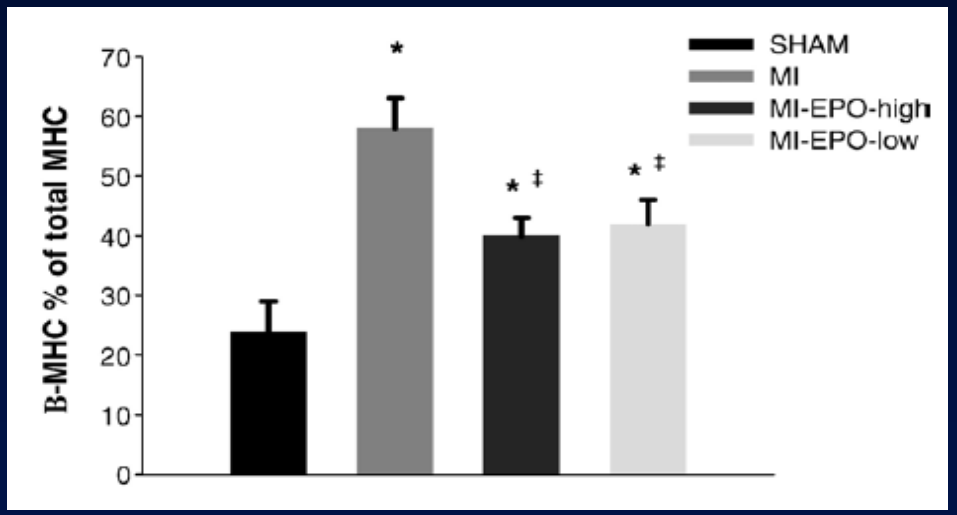
EPO PROTECTS ISCHEMIC HEART: ROLE OF APOPTOSIS

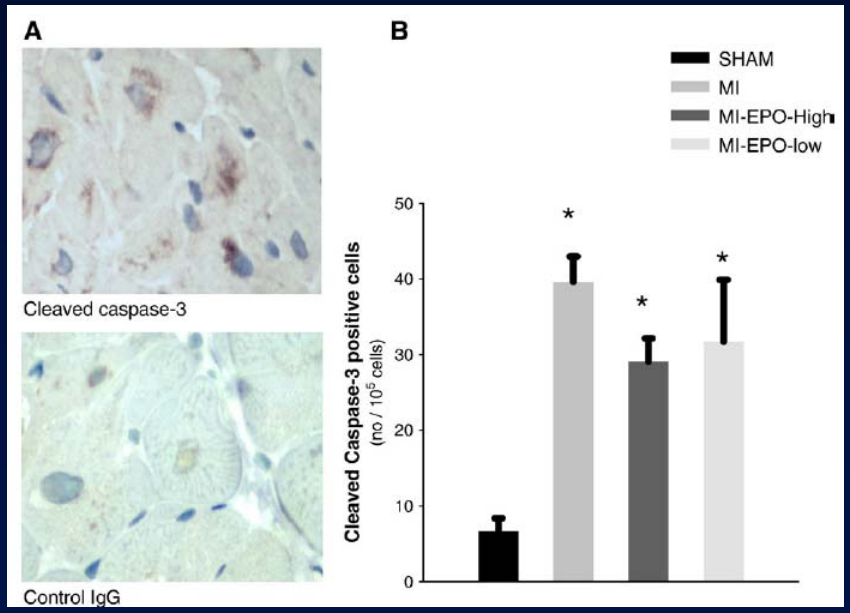


Parsa et al. JCI 2003



Low-dose erythropoietin improves cardiac function experimental CHF without increasing haematocrit





Lipsic E et al. Eur J Heart Fail 2008:10: 22–29

Conclusions

- Anaemia is common in CHF (prevalence 10 - 25%)
- Prevalence increases with severity of CHF
- Several mechanisms may be involved in causing anaemia in CHF – mostly: anaemia of chronic illness
- The identification of anemia cause may guide the treatment (iv iron or EPO)
- Treatment of anaemia with rhEPO:
  - may have benefits for symptoms and cardiac function
  - may have profound implications as CHF is a major cause of morbidity and mortality
- Recent randomised (small scale) clinical trials showed conflicting results regarding the safety (more clinical trials are needed)

“ There are, in truth, no specialties in medicine, since to know fully many of the most important diseases a man must be familiar with their manifestations in many organs.”

William Osler, The Army Surgeon,
Medical News, Philadelphia, 1894