Καρδιονεφρικό Σύνδρομο

Δημήτριος Β. Βλαχάκος

Καθηγητής Παθολογίας - Νεφρολογίας

Υπεύθυνος Νεφρολογικής Μονάδας

Β΄Προπαιδευτική Παθολογική Κλινική

Πανεπιστημιακό Νοσοκομείο «ΑΤΤΙΚΟΝ»

Χαϊδάρι

Richard Bright, M.D.F.R.S.
1789-1858
Father of Nephrology

‘When patients were dying with large hearts they had shrunken kidneys’

"Cardiorenal" for 100 Years

- Sir Thomas Lewis (1881-1945)

A Clinical Lecture

ON

PAROXYSMAL DYSPNOEA IN CARDIO-RENAL PATIENTS:

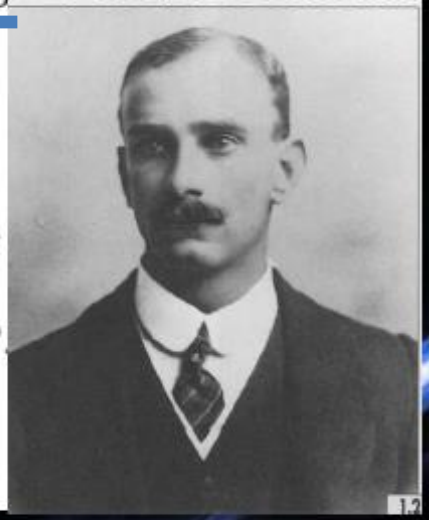
WITH SPECIAL REFERENCE TO "CARDIAC" AND "URAEMIC" ASTHMA.

DELIVERED AT UNIVERSITY COLLEGE HOSPITAL, LONDON, NOVEMBER 12TH, 1913.

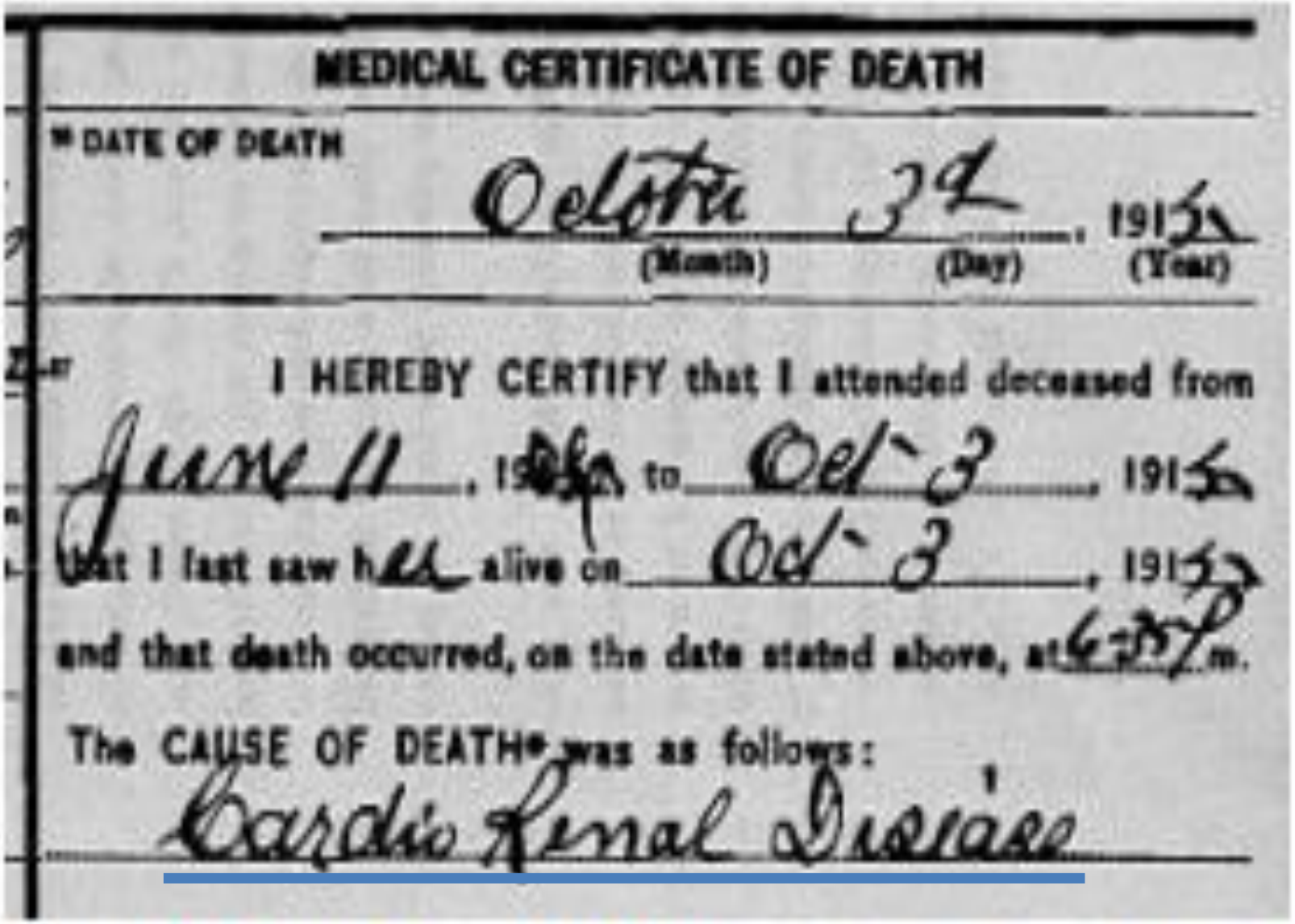
BY THOMAS LEWIS, M.D., D.Sc., F.R.C.P.

ASSISTANT PHYSICIAN AND LECTURER IN CARDIAC PATHOLOGY, UNIVERSITY COLLEGE HOSPITAL; PHYSICIAN TO OUT-PATIENTS, CITY OF LONDON HOSPITAL.

those of a child; fingers, was ther further examinatio the pulse was at t systoles interrupted the pulse beats was



Lewis T., Br Med J 1913;2:1417-



MEDICAL CERTIFICATE OF DEATH

DATE OF DEATH October 3rd (Month) (Day) 1915 (Year)

I HEREBY CERTIFY that I attended deceased from June 11, 1915 to Oct 3, 1915

that I last saw her alive on Oct 3, 1915

and that death occurred, on the date stated above, at 6:35 P.M.

The CAUSE OF DEATH was as follows:

Cardio Renal Disease

from a 1915 Death Certificate from Massachusetts. From Ru

Cardiorenal Syndrome in PubMed

2004

Year
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009

ΤΙ ΕΙΝΑΙ «ΣΥΝΔΡΟΜΟ»

Ορολογία - Ετυμολογία

- Σύνδρομο (το) ουσ. [<αρχ. Σύνδρομον, ουδ του επιθέτου σύνδρομος < συν + δρόμος] (Κ σύνδρομον) σύνολο συμπτωμάτων που καθορίζουν μια αρρώστια

Τεγόπουλος-Φυτράκης, ΕΛΛΗΝΙΚΟ ΛΕΞΙΚΟ, 1993

- Syndrome = σύνδρομο, **ένα σύνολο συμπτωμάτων ή σημείων που παρατηρούνται από κοινού** / το σύνολο των συμπτωμάτων και σημείων οποιασδήποτε παθολογικής καταστάσεως/ένα σύμπλεγμα συμπτωμάτων

Dorland's ΙΑΤΡΙΚΟ ΛΕΞΙΚΟ 1997 (Μτφ. Α. Κατούλης)

- Syndrome = The group or recognizable pattern of symptoms or abnormalities **that indicate a particular trait or disease**

Genome glossary 2005

- Syndrome **= group of signs or symptoms that commonly group together**

Cheng & Leiter Can J Cardiol 2006

Claudio Ronco,
San Bortolo Hospital, Vicenza, Italy

European Heart Journal (2010) **31**, 703–711
doi:10.1093/eurheartj/ehp507

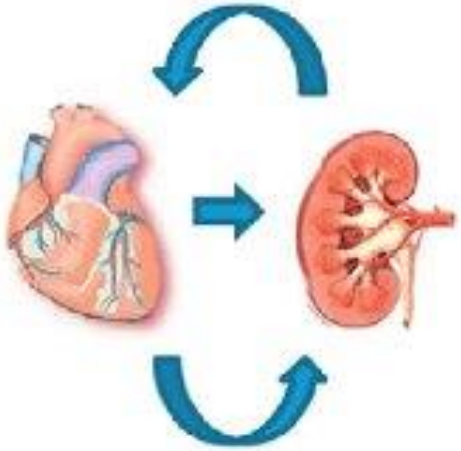
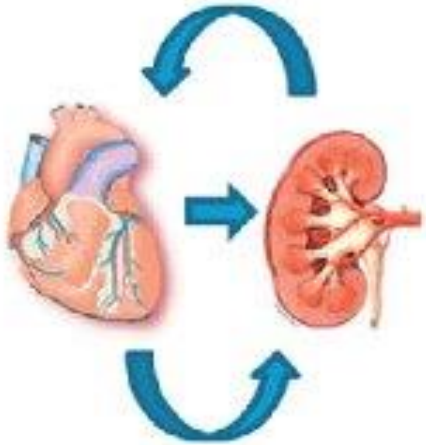
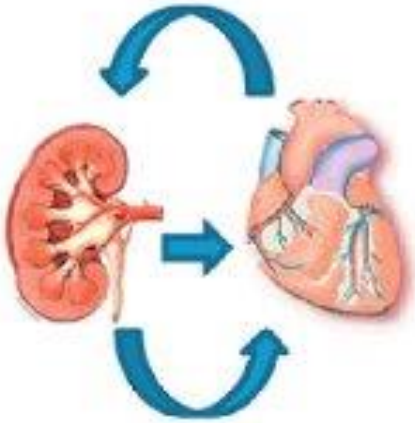
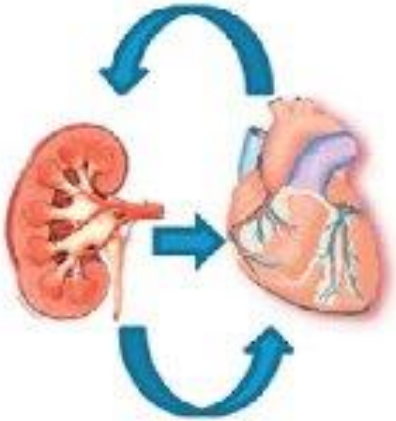
CLINICAL RESEARCH
Heart failure/cardiomyopathy

Cardio-renal syndromes: report from the consensus conference of the Acute Dialysis Quality Initiative

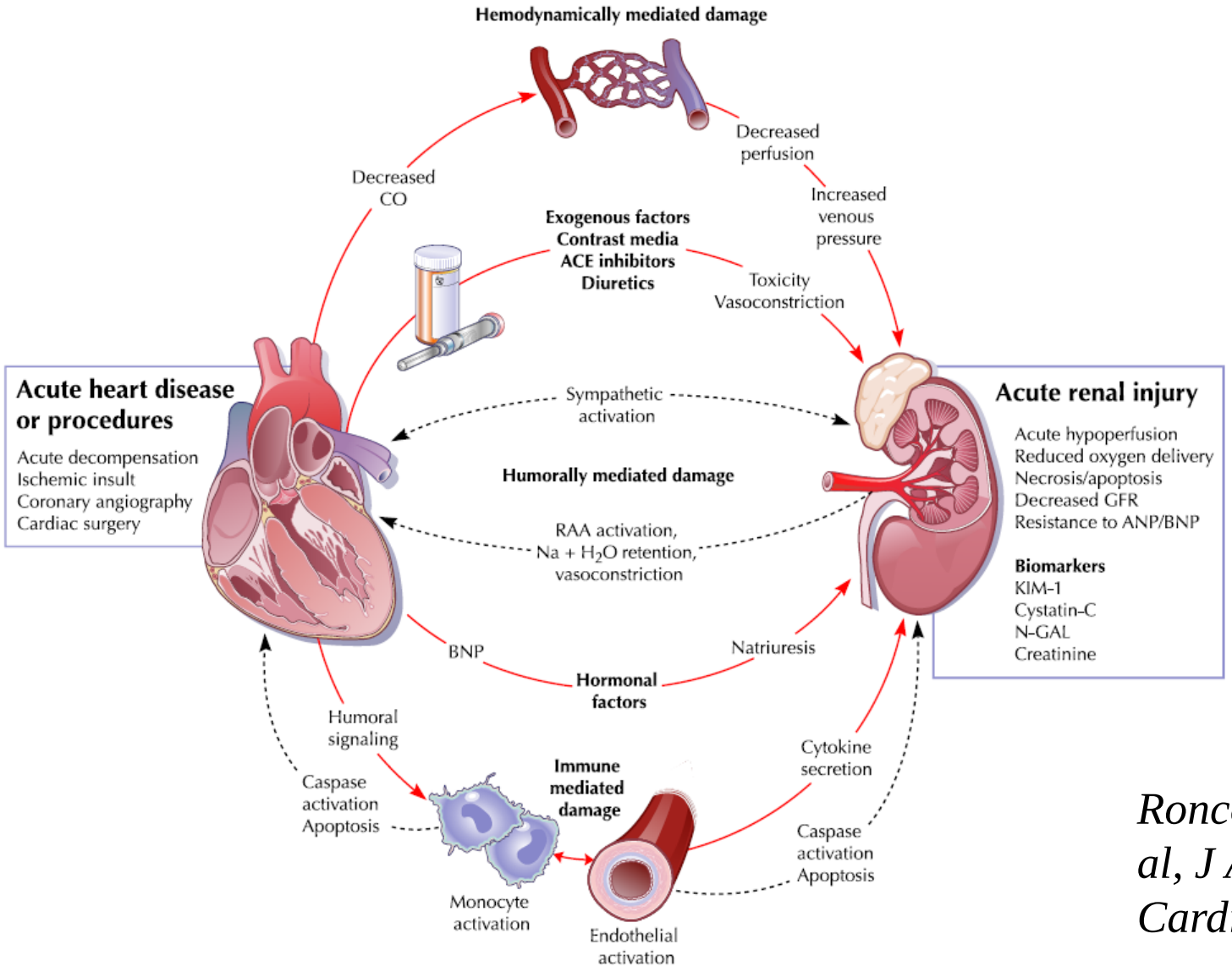
Claudio Ronco[1,2*], Peter McCullough[3], Stefan D. Anker[4,5], Inder Anand[6], Nadia Aspromonte[7], Sean M. Bagshaw[8], Rinaldo Bellomo[9], Tomas Berl[10],

Καρδιονεφρικό Σύνδρομο μπορεί γενικά να οριστεί ως η παθοφυσιολογική διαταραχή της καρδιάς και των νεφρών, όπου οξεία ή χρόνια δυσλειτουργία του ενός οργάνου μπορεί να προκαλέσει οξεία ή χρόνια δυσλειτουργία του άλλου.

Ronco C et al, J Am Coll Cardiol 2008

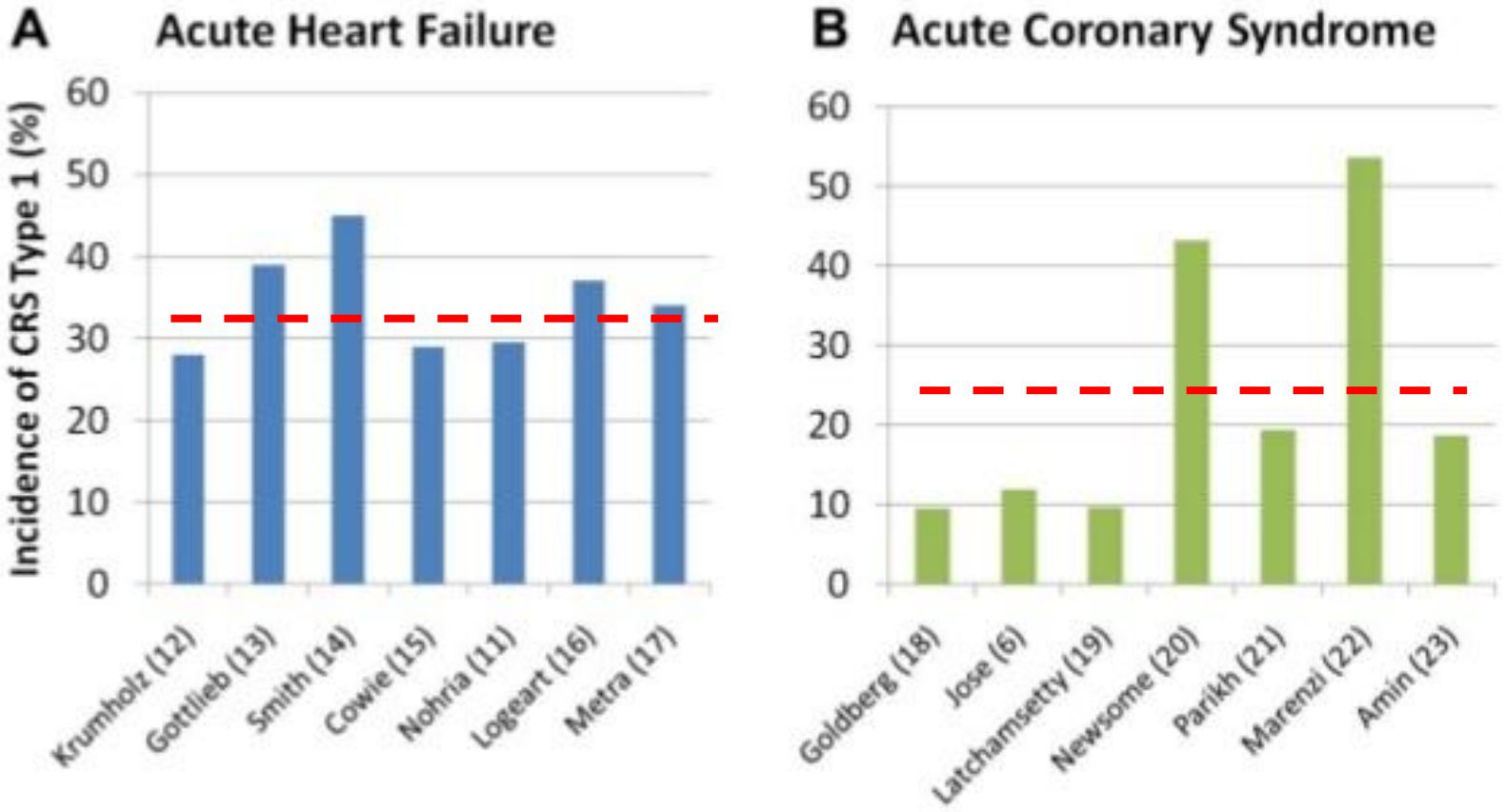
	Chronic	Acute
Cardiorenal	 Type II CRS	 Type I CRS
Renocardiac	 Type IV CRS	 Type III CRS

Καρδιονεφρικό Σύνδρομο Τύπου Ι: Οξύ Καρδιονεφρικό Σύνδρομο



Ronco C et al, J Am Coll Cardiol 2008

Incidence of CRS

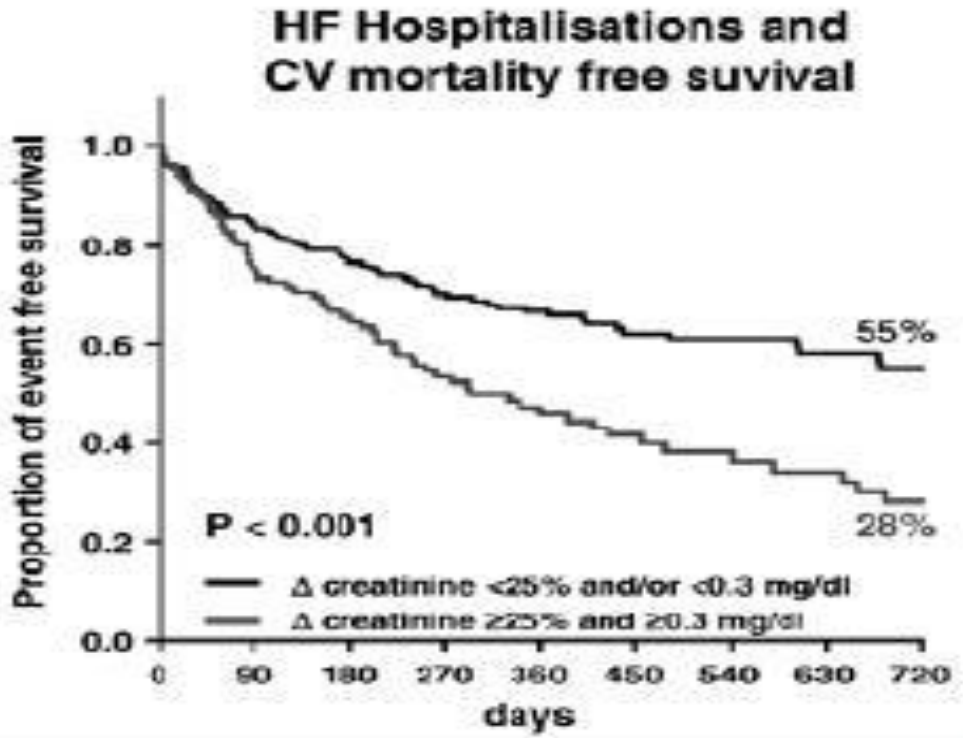


Advances in Chronic Kidney Disease 2013: 20:56-66

Καρδιονεφρικό Σύνδρομο Τύπου Ι: Οξύ Καρδιονεφρικό Σύνδρομο

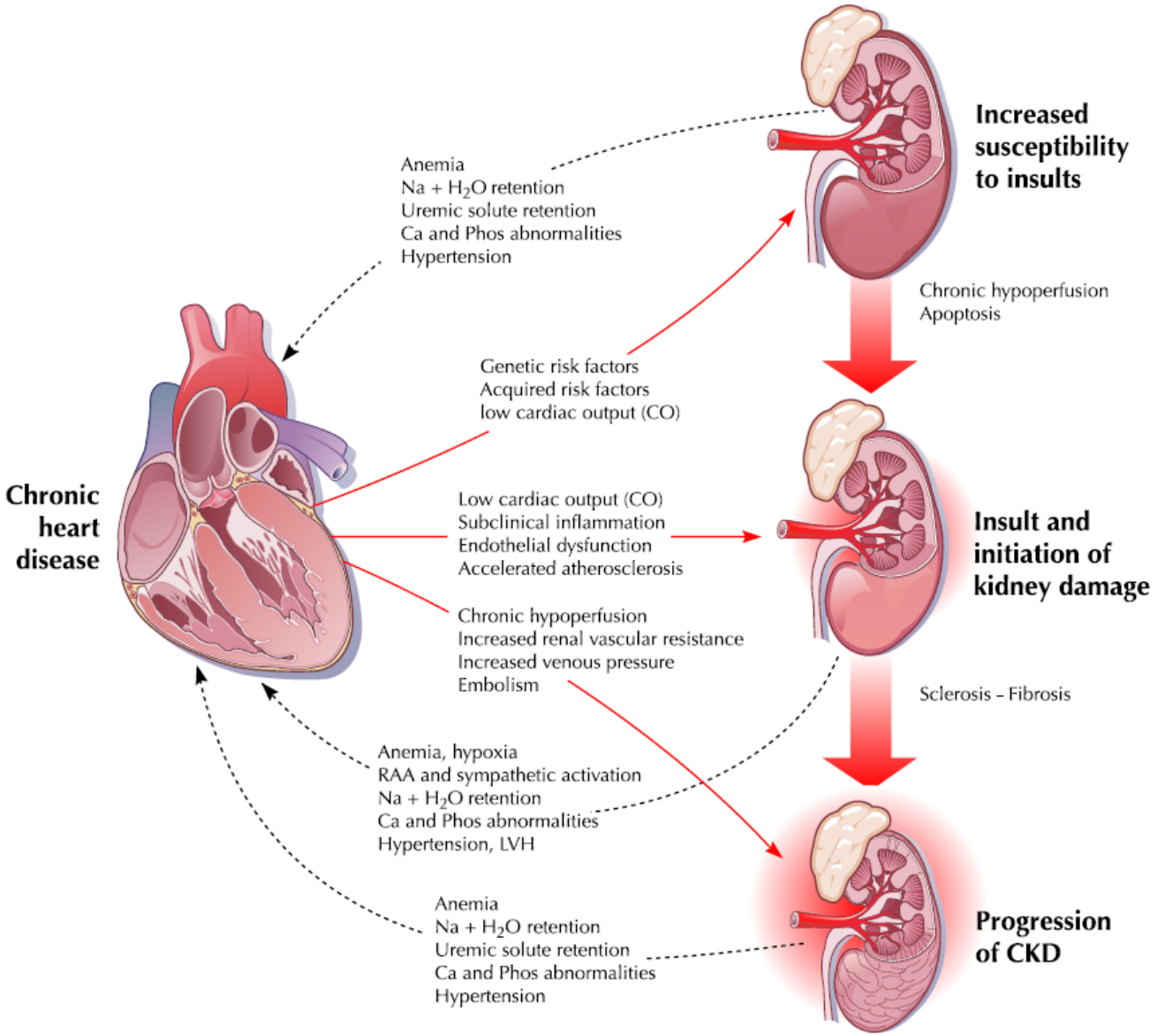
Worsening renal function in patients hospitalised for acute heart failure: Clinical implications and prognostic significance

Marco Metra [a,*], Savina Nodari [a], Giovanni Parrinello [b], Tania Bordonali [a], Silvia Bugatti [a], Rossella Danesi [a], Benedetta Fontanella [a], Carlo Lombardi [a], Patrizia Milani [a], Giulia Verzura [a], Gadi Cotter [c], Howard Dittrich [d], Barry M. Massie [e], Livio Dei Cas [a]

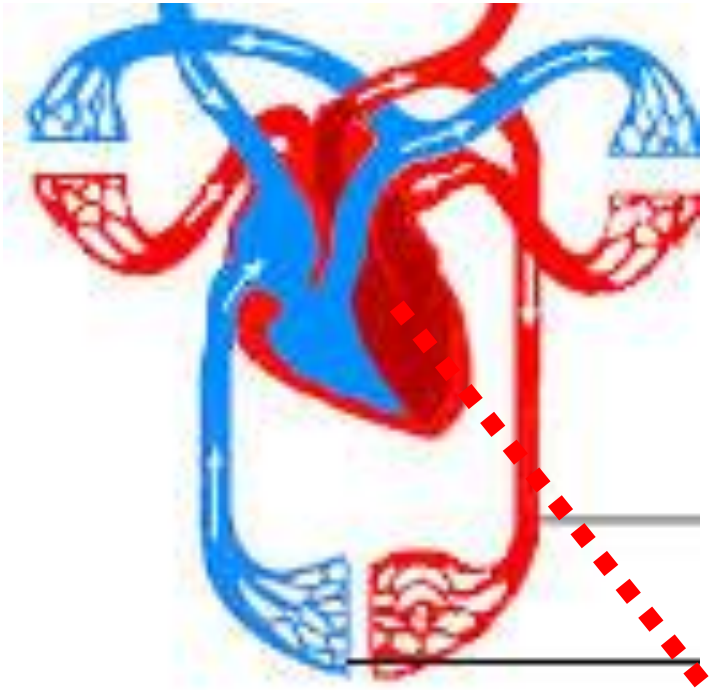


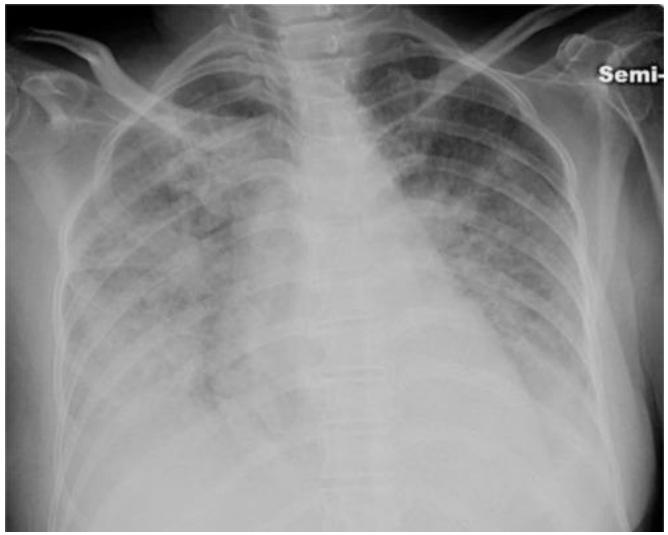
Metra et al. Eur J Heart Fail 200

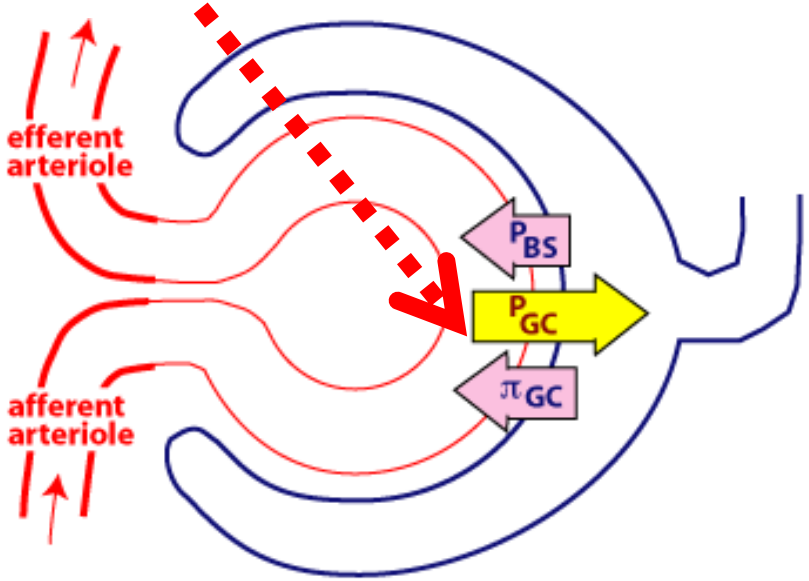
Καρδιονεφρικό Σύνδρομο Τύπου ΙΙ: Χρόνιο Καρδιονεφρικό Σύνδρομο



Ronco C et al, J Am Coll Cardiol 2008



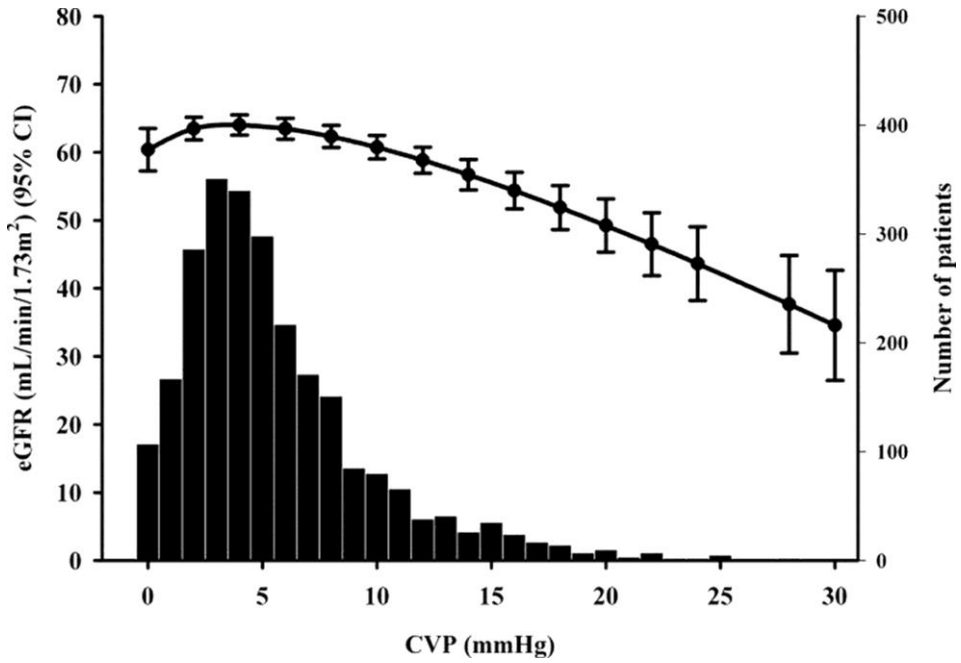


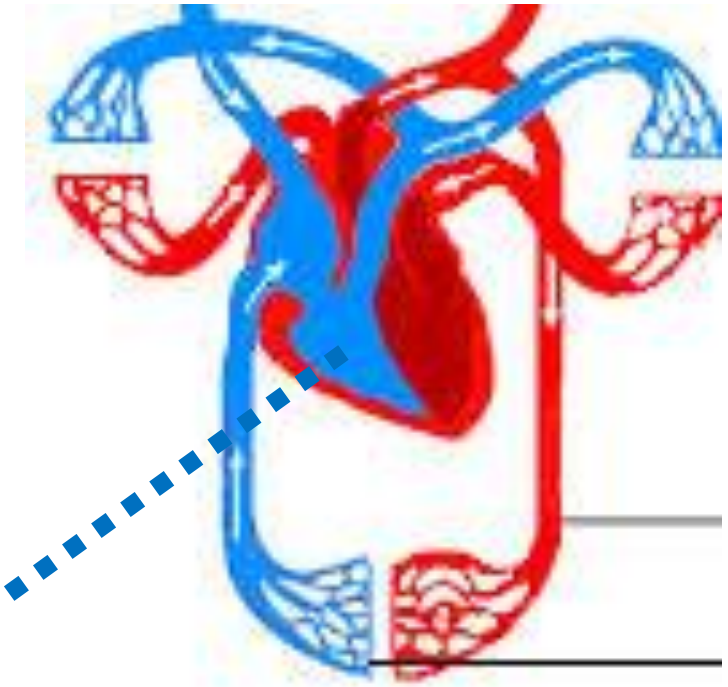


P_{GC} = 60 mmHg

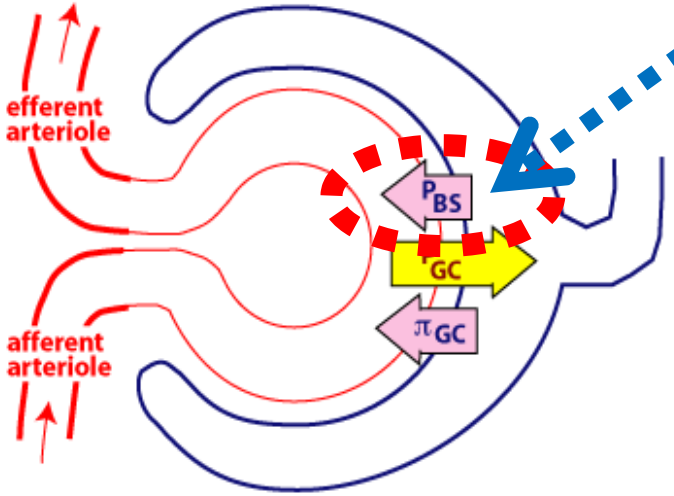
P_{BS} = -15 mmHg

π_{GC} = -29 mmHg





Bock J S , Gottlieb S S Circulation 2010;121:2592-2600

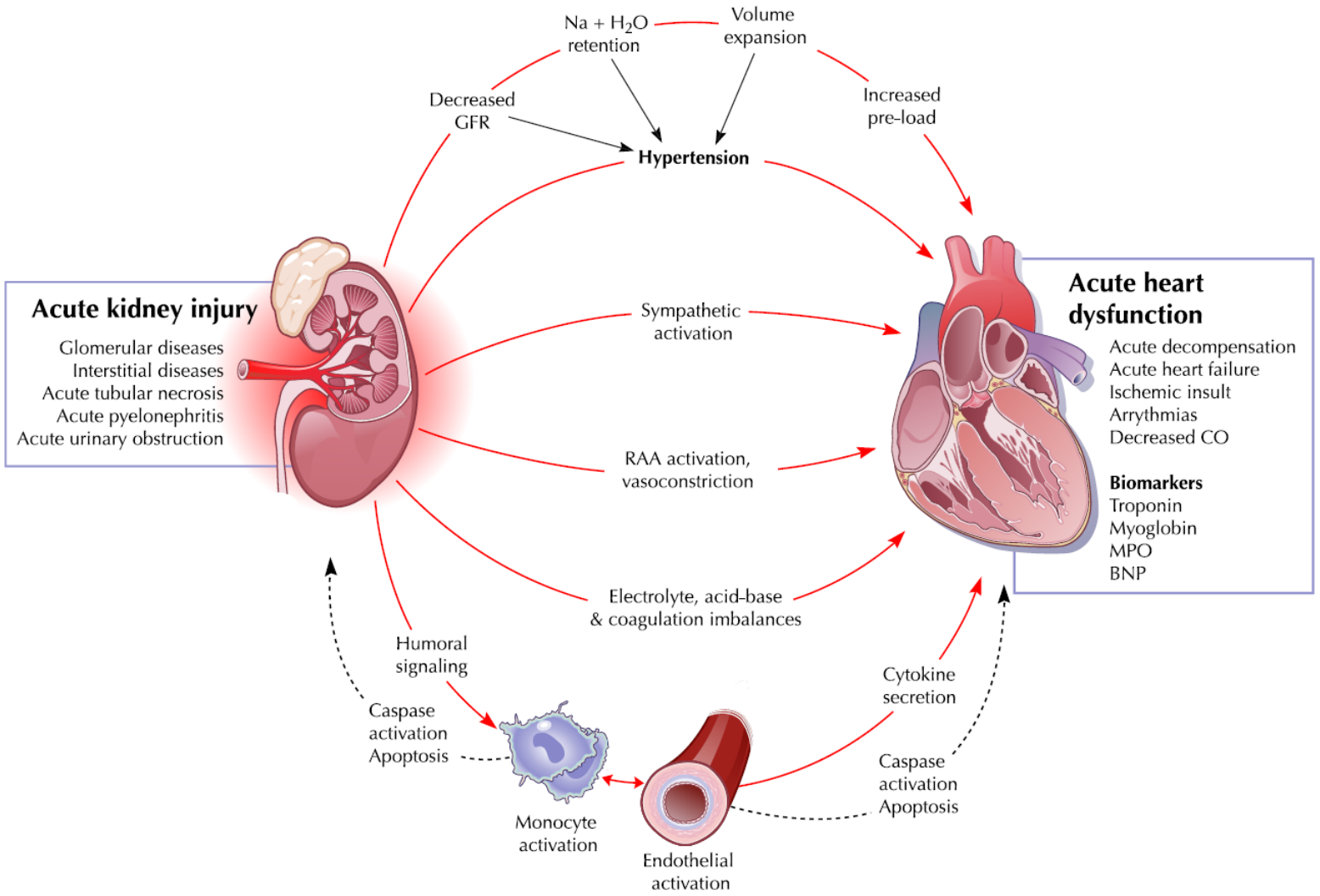


P_{GC} = 60 mmHg

P_{BS} = -15 mmHg

π_{GC} = -29 mmHg

Καρδιονεφρικό Σύνδρομο Τύπου ΙΙΙ: Οξύ Νεφροκαρδιακό Σύνδρομο



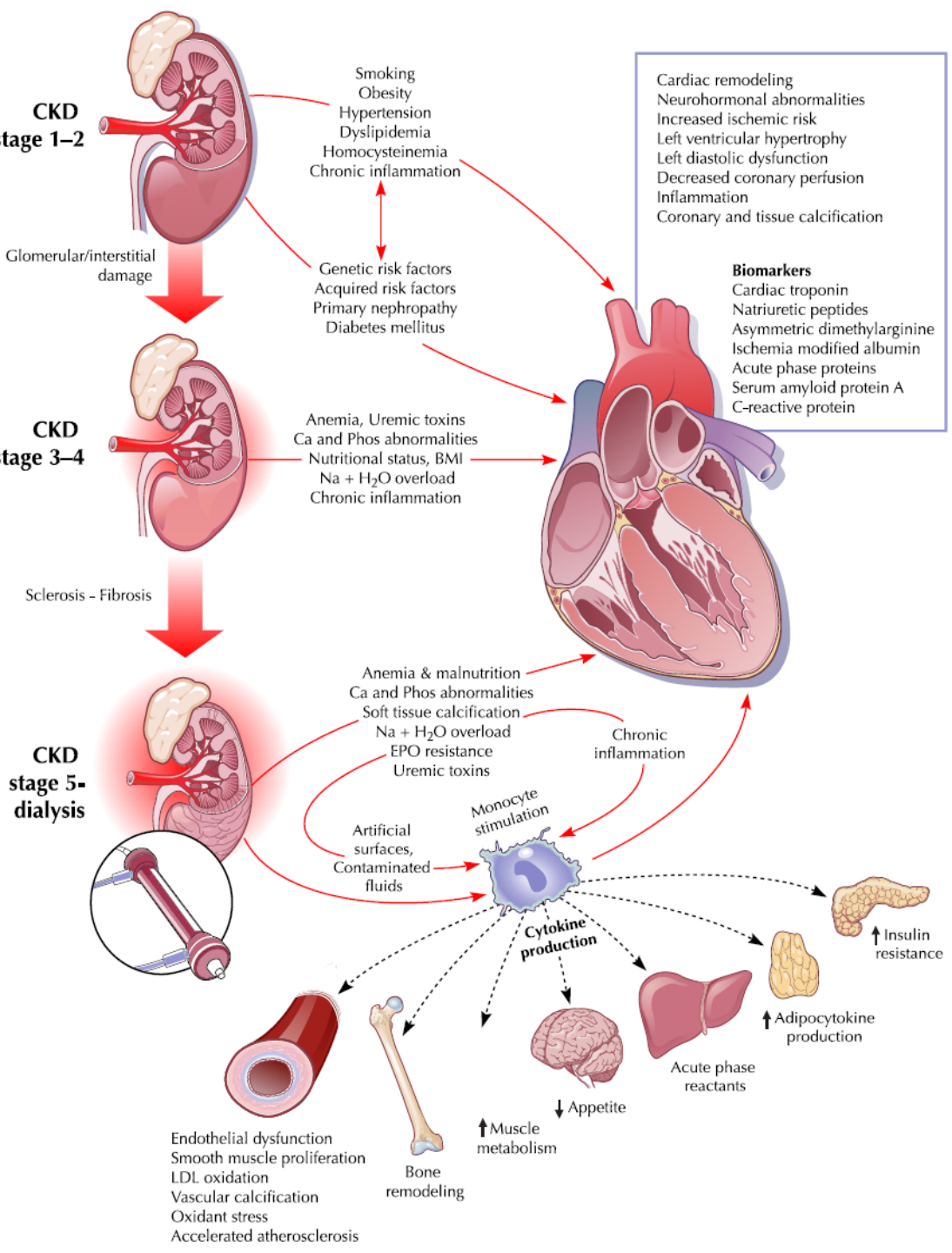
Ronco C et al, J Am Coll Cardiol 2008

CRS type 3

- When the RIFLE (risk, injury, and failure; loss; and end-stage kidney disease) consensus definition is used, AKI has been identified in close to 9% of hospital patients. (Uchino S *et al.*, 2006)
- In a large ICU database, AKI was observed in more than 35% of patients. (Bagshaw *et al.*, 2008)
- Fluid overload can contribute to the development of pulmonary edema.
- Hyperkalemia can contribute to arrhythmias and may cause cardiac arrest.
- Untreated uremia affects myocardial contractility through the accumulation of myocardial depressant factors (Blake *et al.*, 1996) and pericarditis (Coresh *et al.*, 2003).
- Acidemia produces pulmonary vasoconstriction, which can significantly contribute to right-sided HF
- Acidemia appears to have a negative inotropic effect (Brady & Hasbargen, 2000)

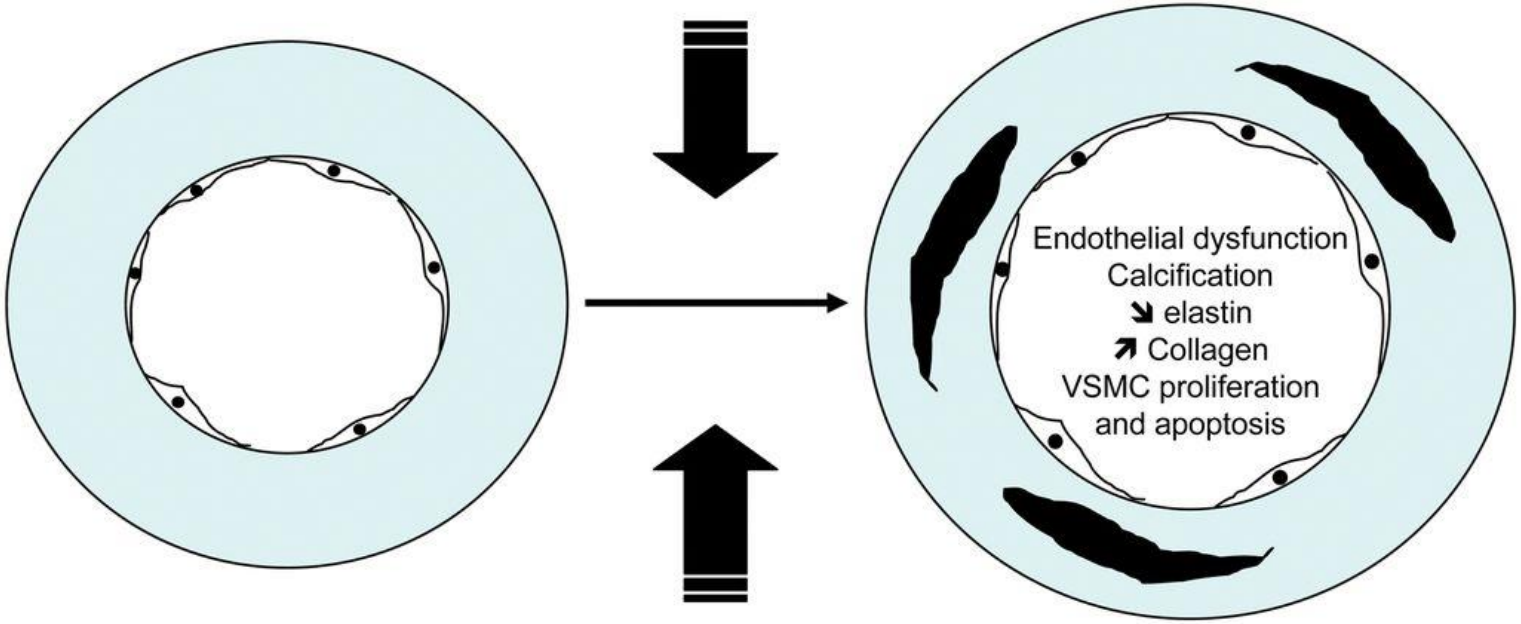
Καρδιονεφρικό Σύνδρομο Τύπου IV: Χρόνιο Νεφροκαρδιακό Σύνδρομο

Ronco C et al, J Am Coll Cardiol 2008



TRADITIONAL CV RISK FACTORS

Age Hypertension Dyslipidemia Overweight Diabetes Smoking



FGF-23, Klotho, PTH
Phosphorus

RAS activation
Endothelin-1

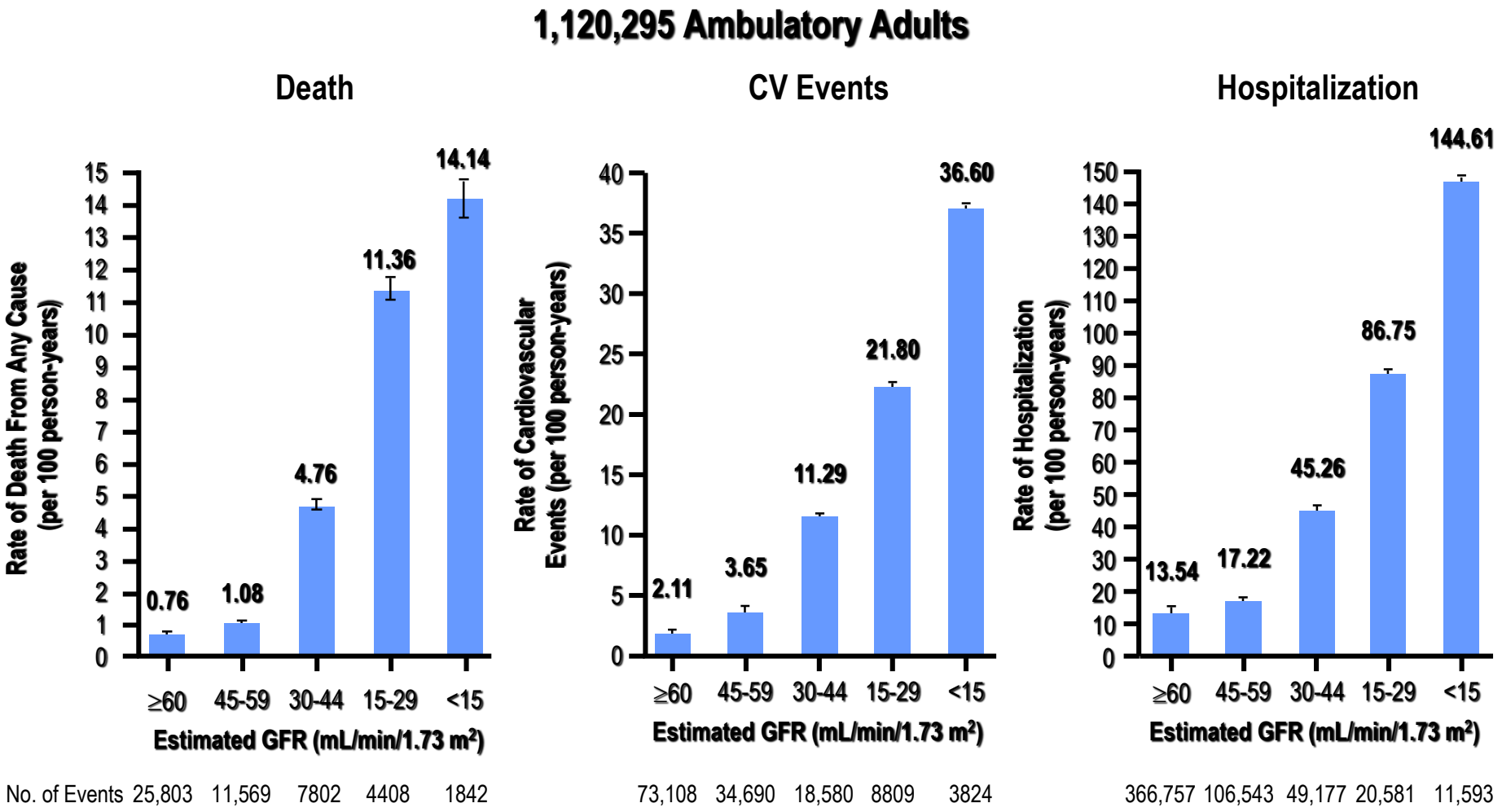
Inflammation
Oxidative stress

ADMA

microparticles

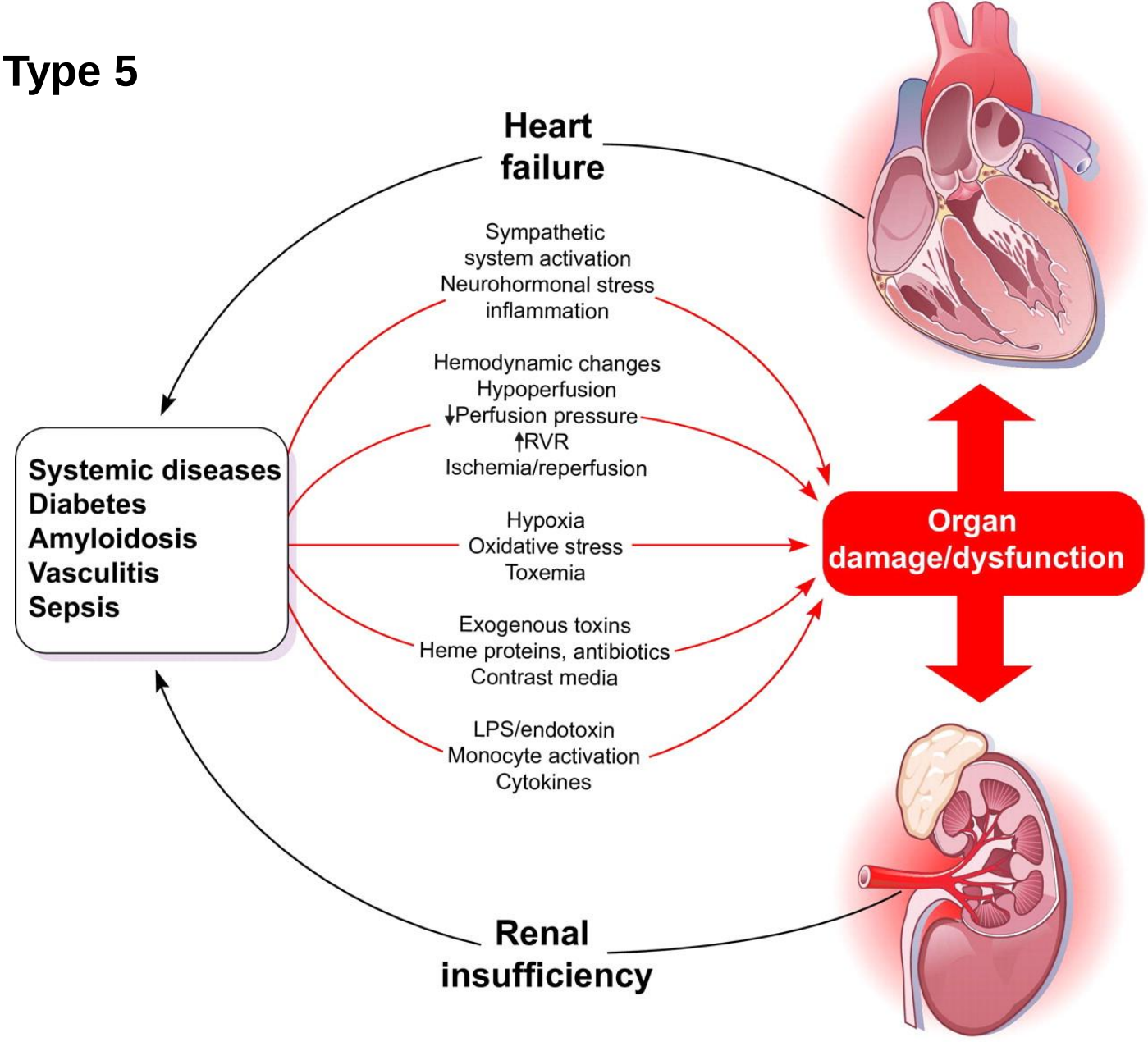
CV RISK FACTORS ASSOCIATED WITH CKD

Age-Adjusted Death, Cardiovascular Events, and Hospitalization in Chronic Kidney Disease



Go et al. *N Engl J Med*. 2004;351:1296-1305.

CRS Type 5



Ronco, C. et al. J Am Coll Cardiol 2008;52:1527-1539

ΓΗΡΑΝΣΗ ΠΛΗΘΥΣΜΟΥ

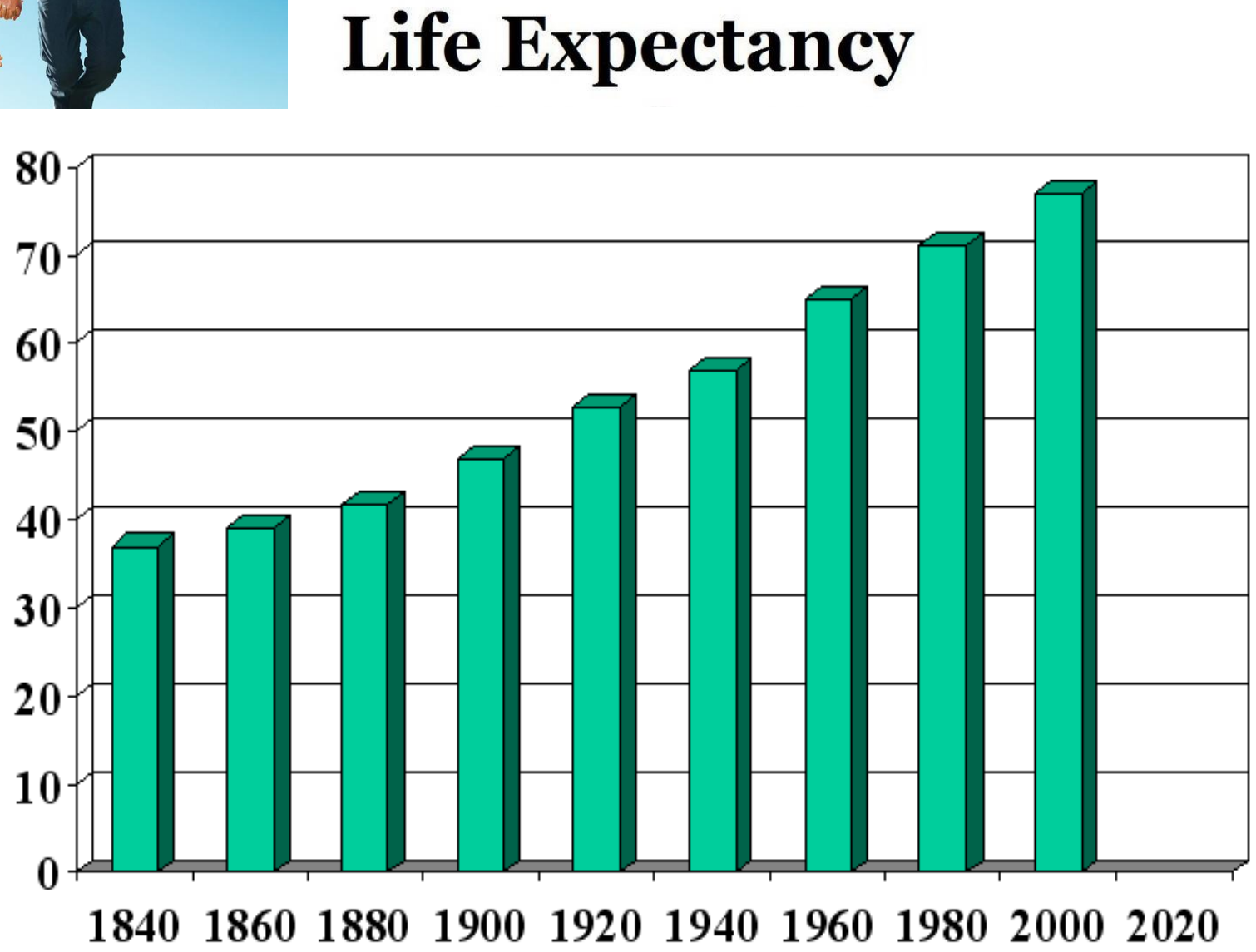
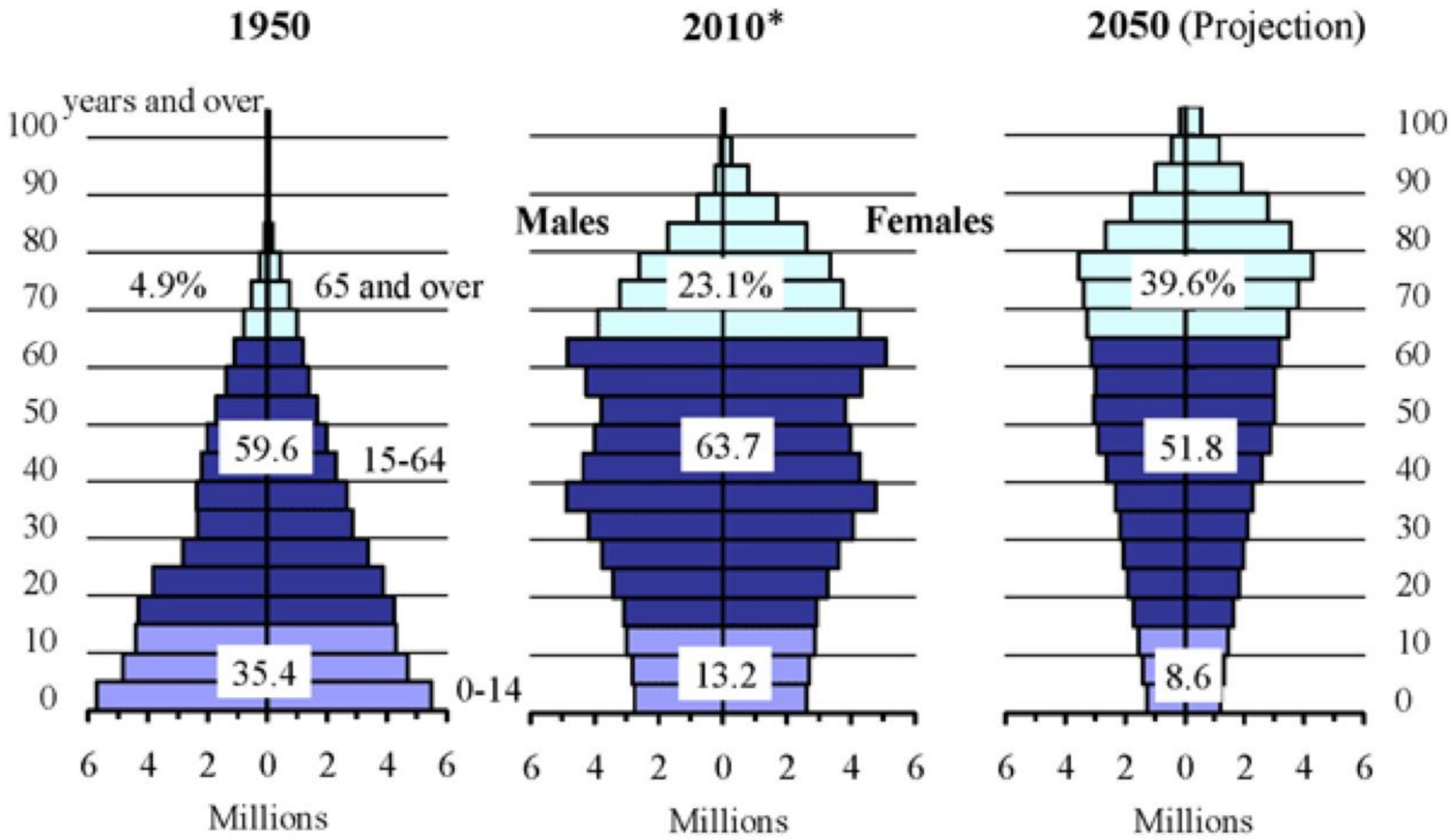
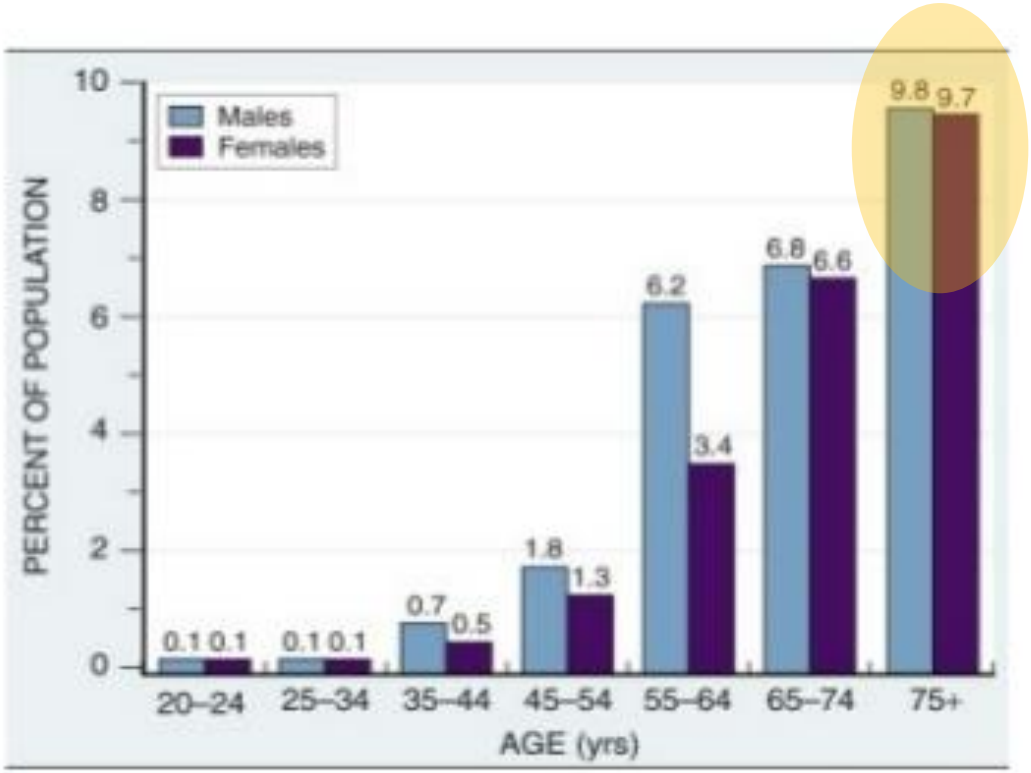


Figure 2.3
Changes in the Population Pyramid



Source: Statistics Bureau, MIC; Ministry of Health, Labour and Welfare.

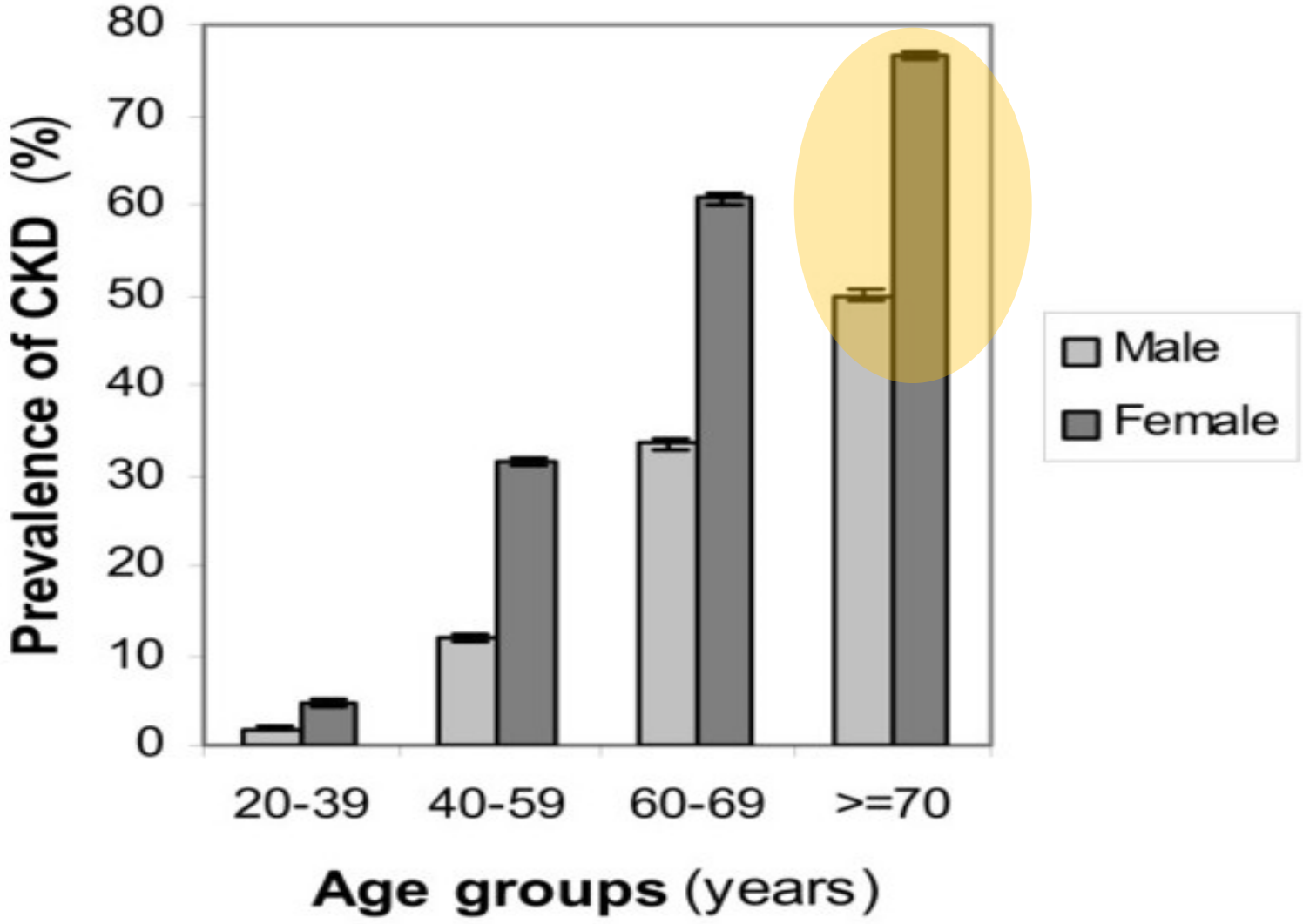
Prevalence rates of heart failure by gender and age in the United States



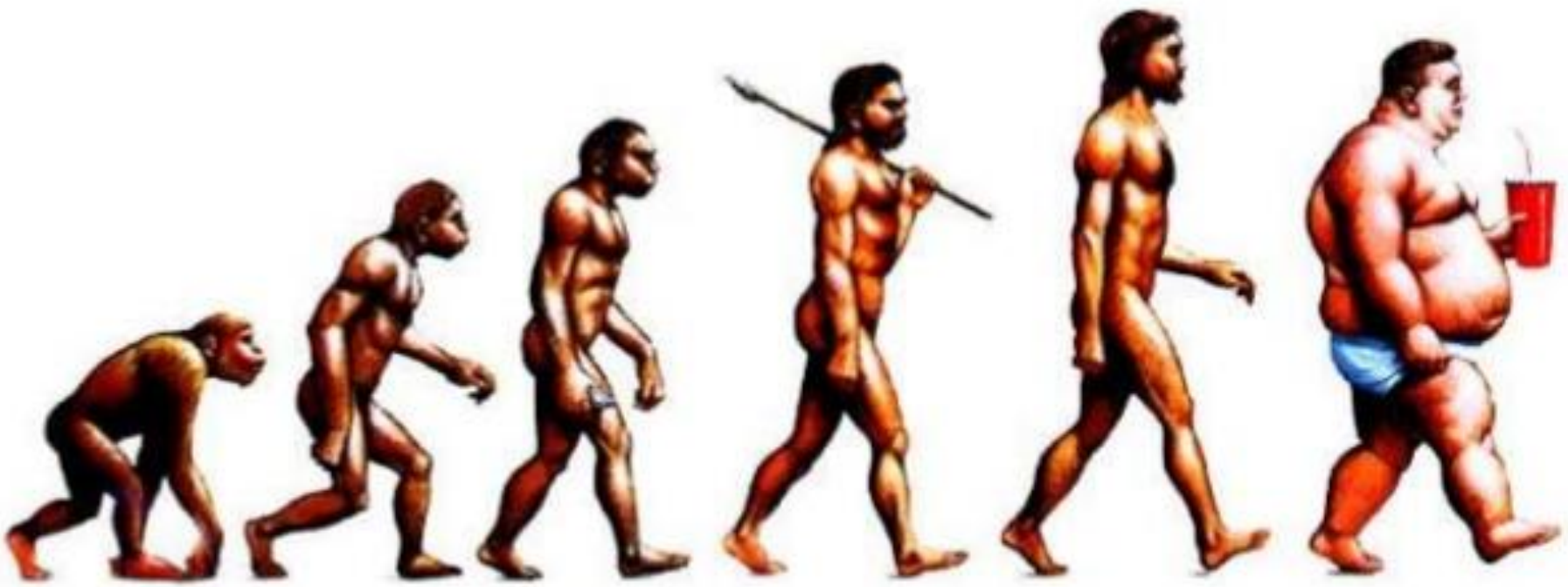
Data from American Heart Association: Heart Disease and Stroke Statistics

NEWER ADVANCES IN THE MANAGEMENT

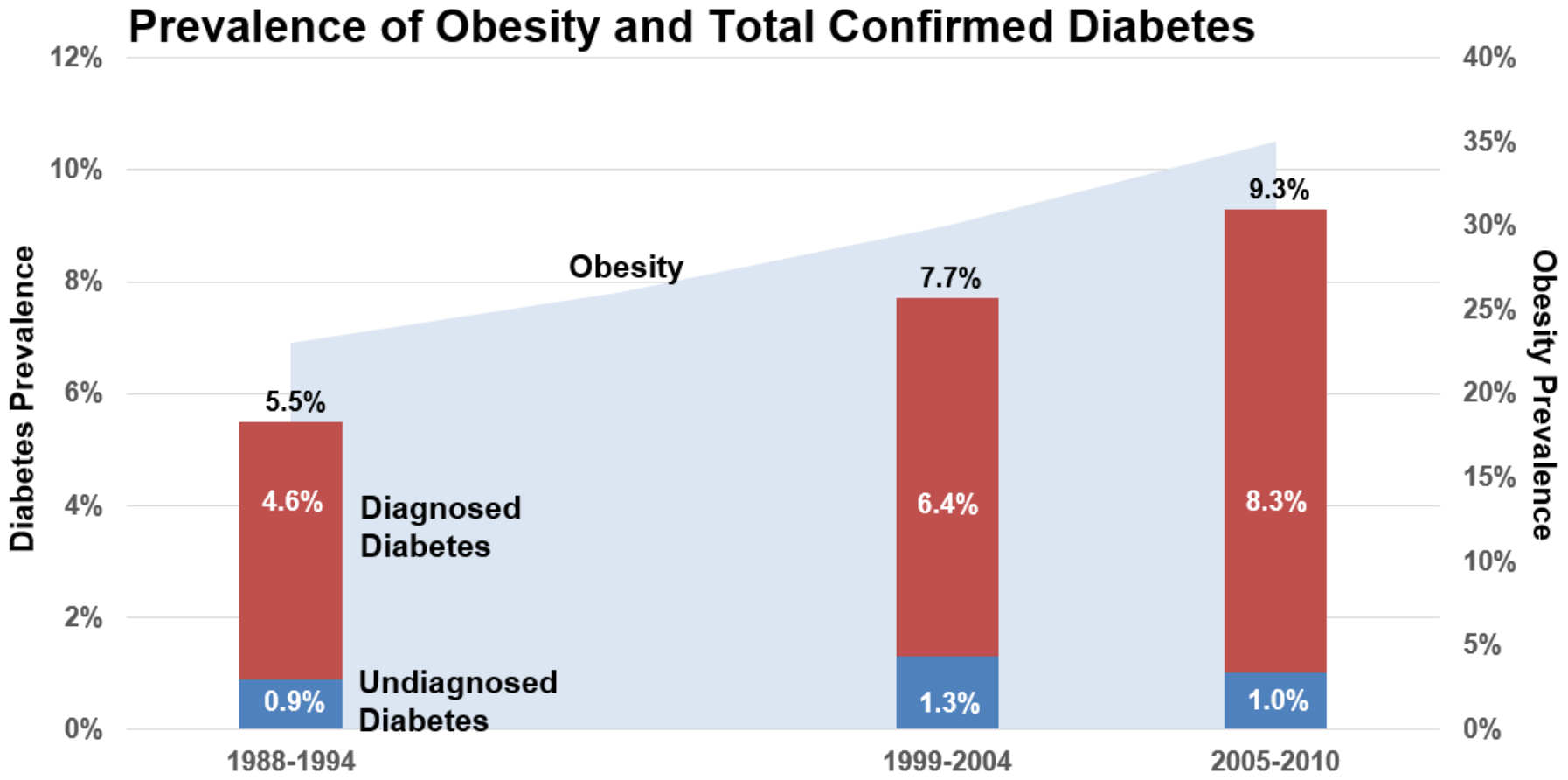
Estimated GFR (ml/min/1.73 m²)
180
160
140
120
100
80
60
40
20
0
0
20
40
60
80
Age (years)
CKD
- 1 ml/min/year > 40 y
Inulin (Davies and Shock, 1950)
NHANES III Estimated GFR (median, 5th, 95th percentiles


Prevalence of CKD (%)
80
70
60
50
40
30
20
10
0
20-39
40-59
60-69
>=70
Age groups (years)
Male
Female

ΠΑΧΥΣΑΡΚΙΑ

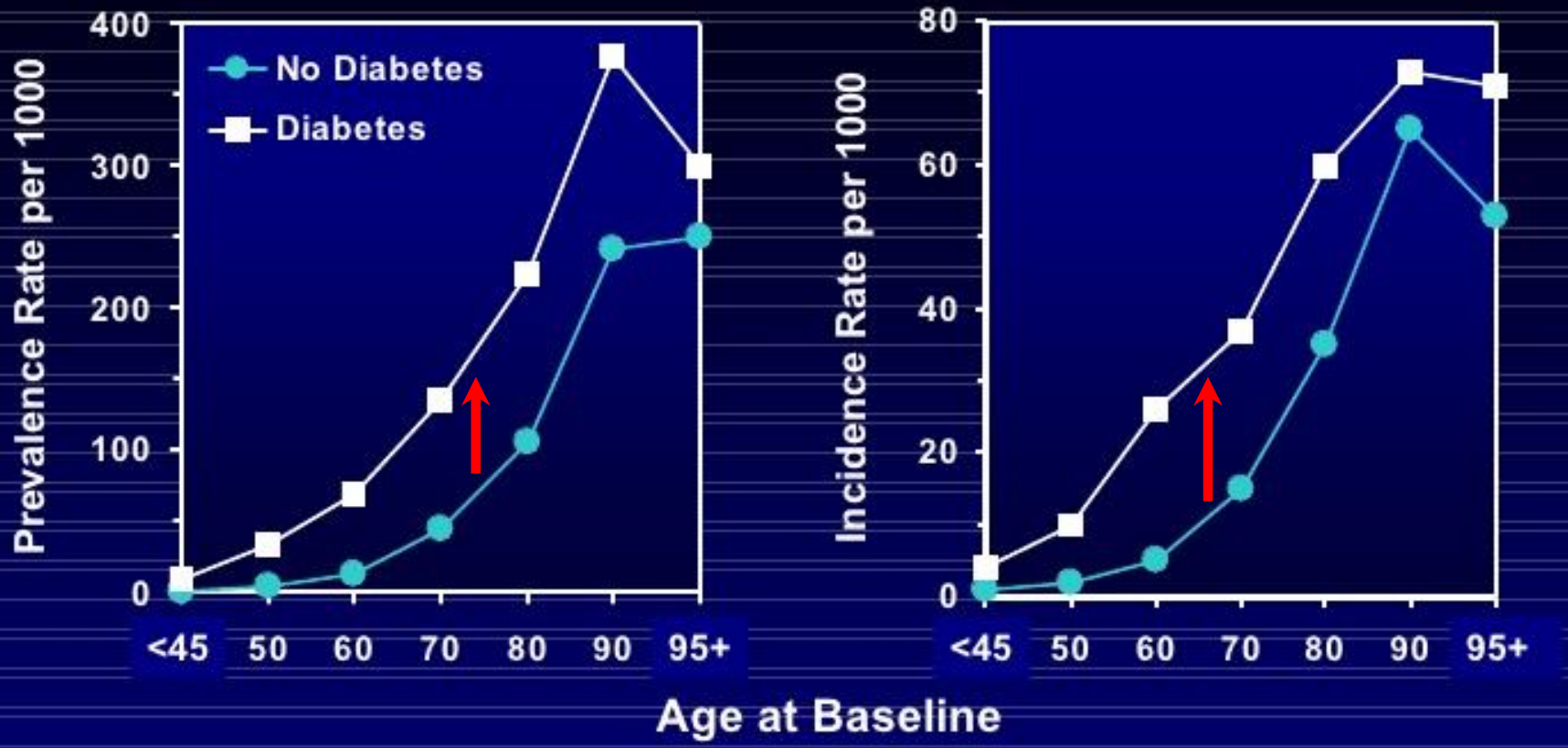


1/3 του πληθυσμού παχύσαρκοι
1/3 παχυσάρκων διαβητικοί



Source: Selvin et al, 2014.04, *Ann Int Med*

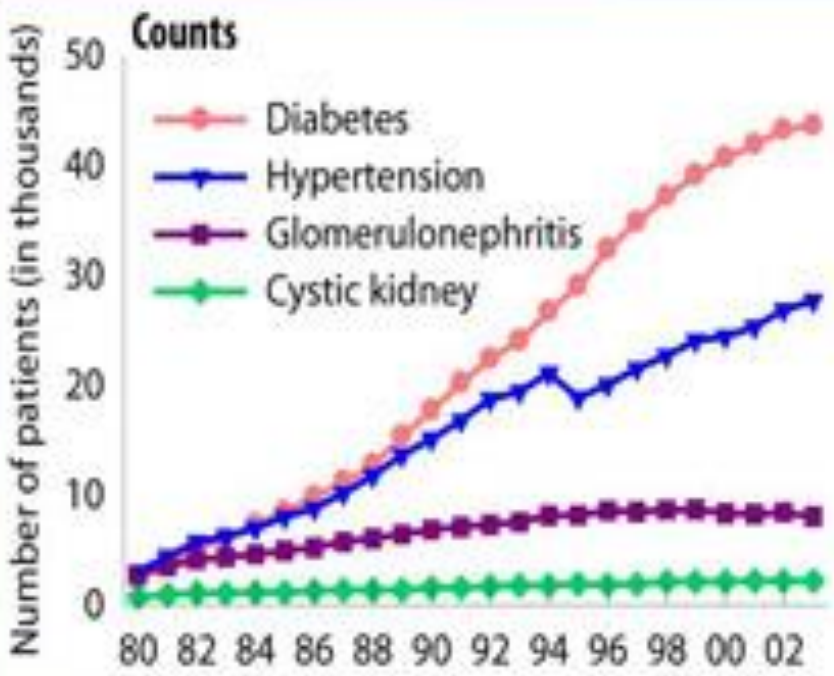
Congestive Heart Failure Is More Common in Patients With Type 2 Diabetes

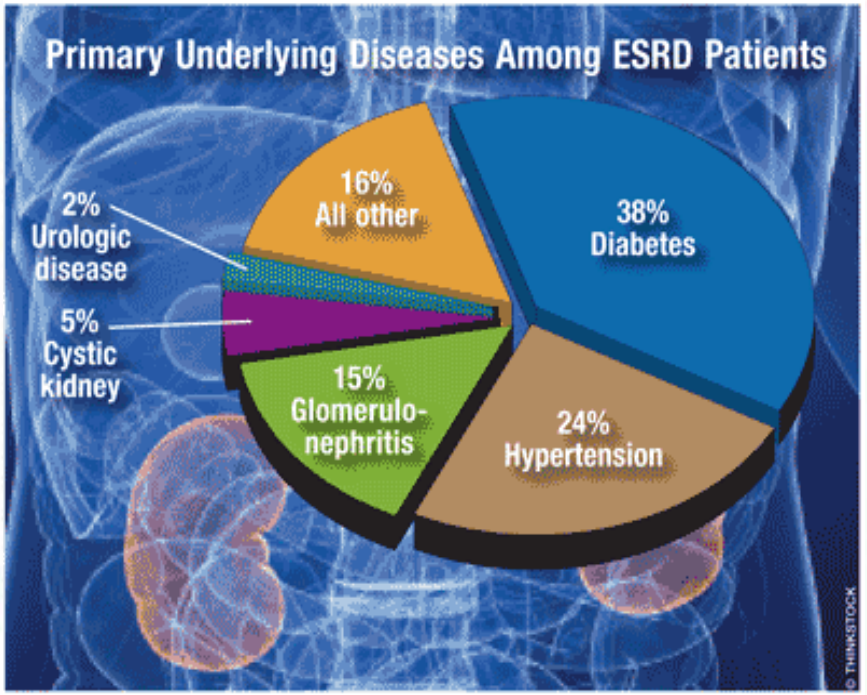


CHF present in 14% DM subjects at inception with 8% new cases over 5 years

Nichols, GA, et al. *Diabetes Care*. 2001; 24: 1614-9

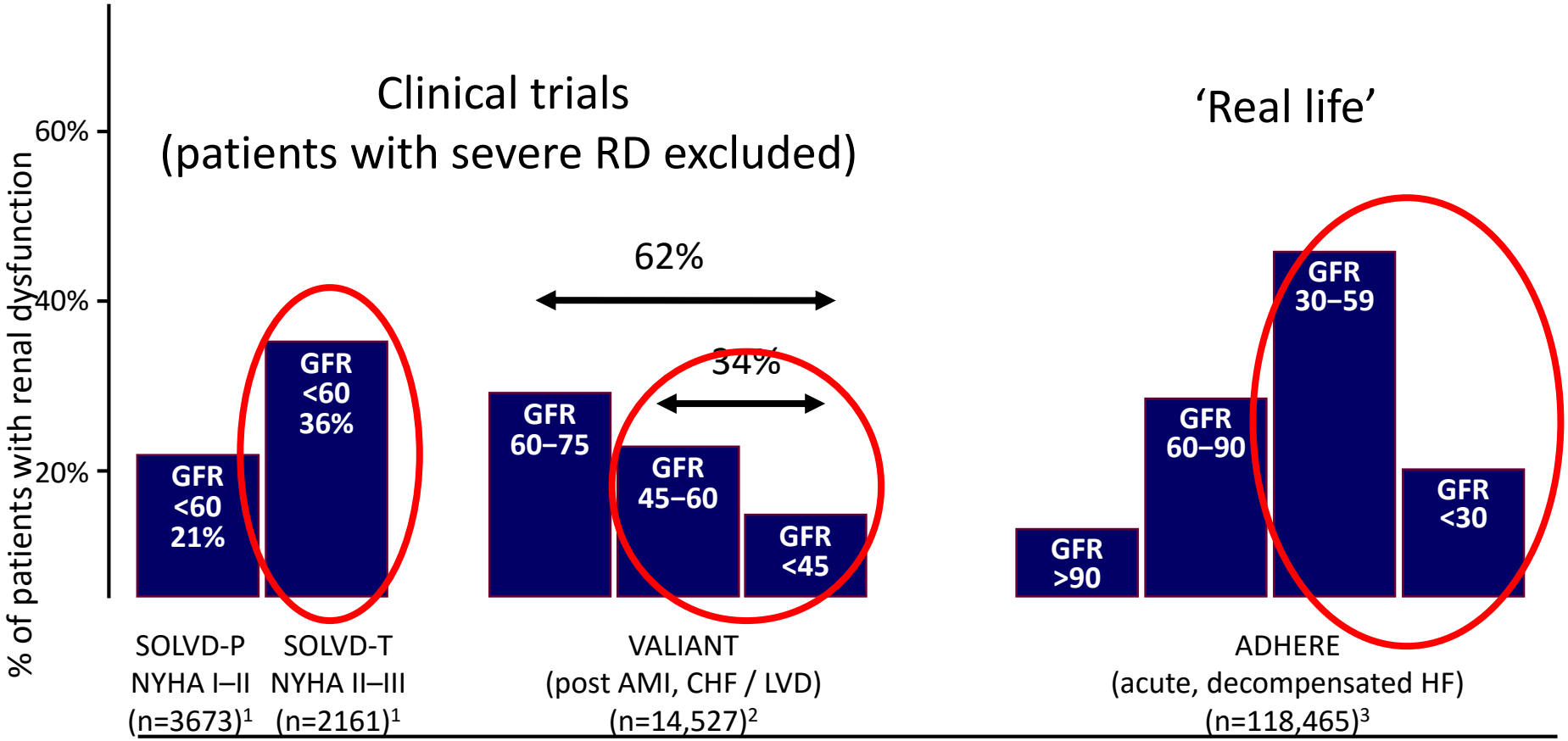
Incident Counts and Rates of ESRD by Primary Diagnosis





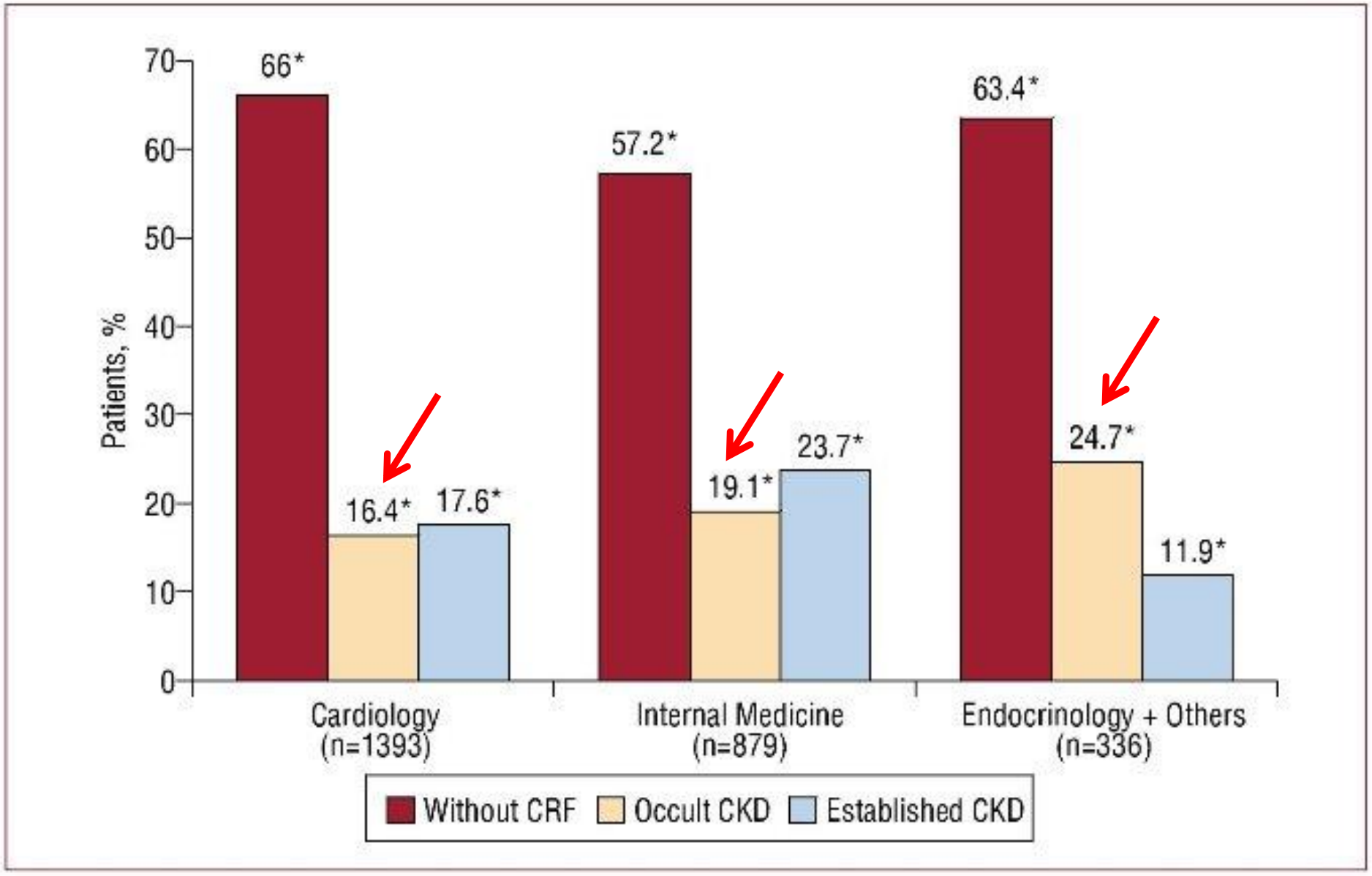
USRDS 2005

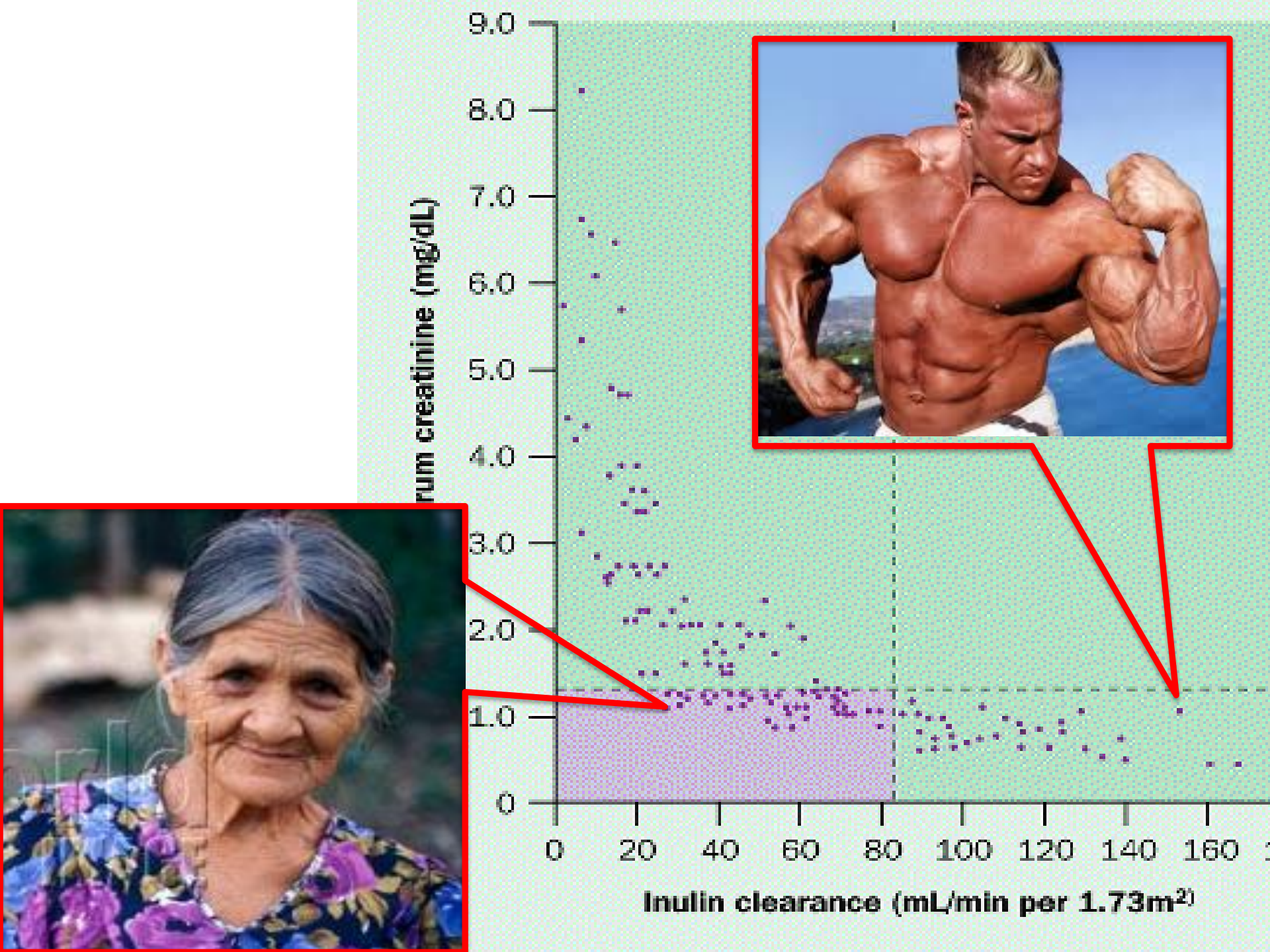
Τουλάχιστον 1/3 των ασθενών με ΚΑ έχουν ΧΝΝ = CRS



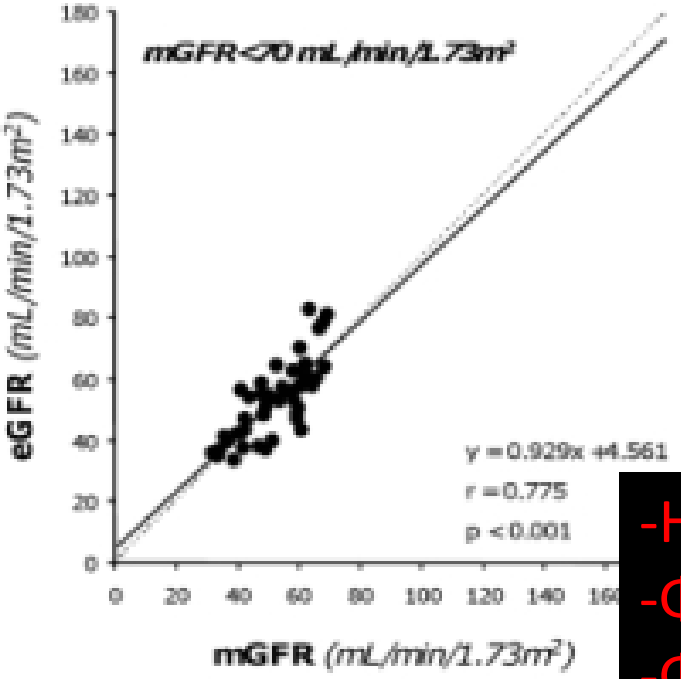
1. Dries DL et al. *J Am Coll Cardiol* 2000;35:681–689
2. Anavekar NS et al. *N Engl J Med* 2004;351:1285–1295
3. Heywood JT et al. *J Card Fail* 2007;13:422–430

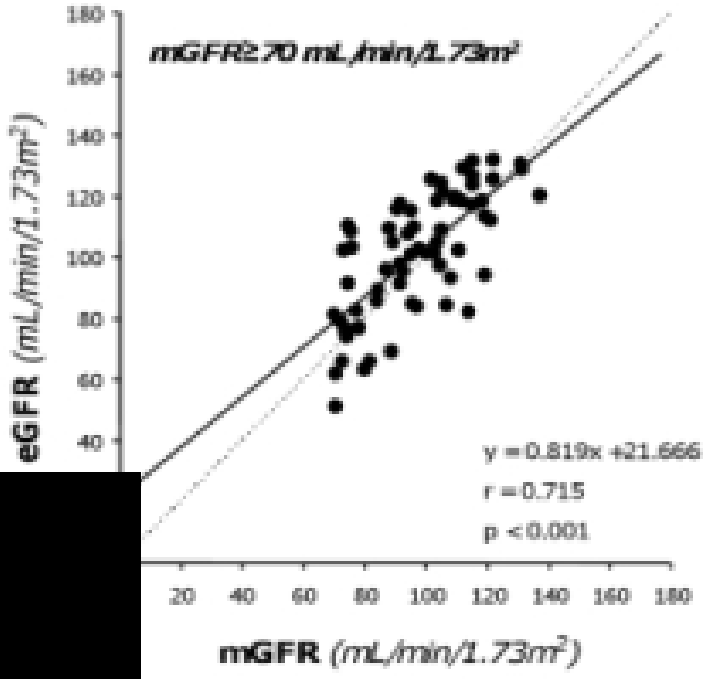
GFR, glomerular filtration rate


Patients, %
70
60
50
40
30
20
10
0
66*
16.4*
17.6*
57.2*
19.1*
23.7*
63.4*
24.7*
11.9*
Cardiology
(n=1393)
Internal Medicine
(n=879)
Endocrinology + Others
(n=336)
Without CRF
Occult CKD
Established CKD


9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
rum creatinine (mg/dL)
0
20
40
60
80
100
120
140
160
Inulin clearance (mL/min per 1.73m2)

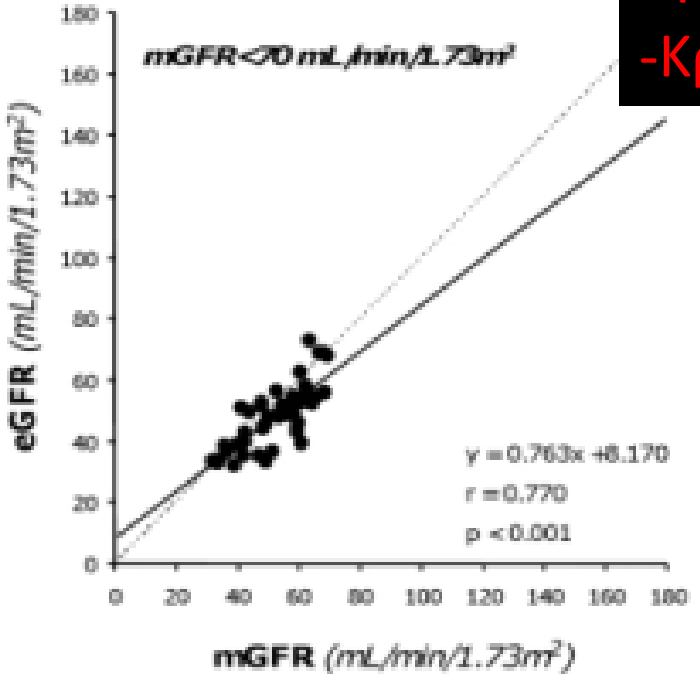
CKD-Epi

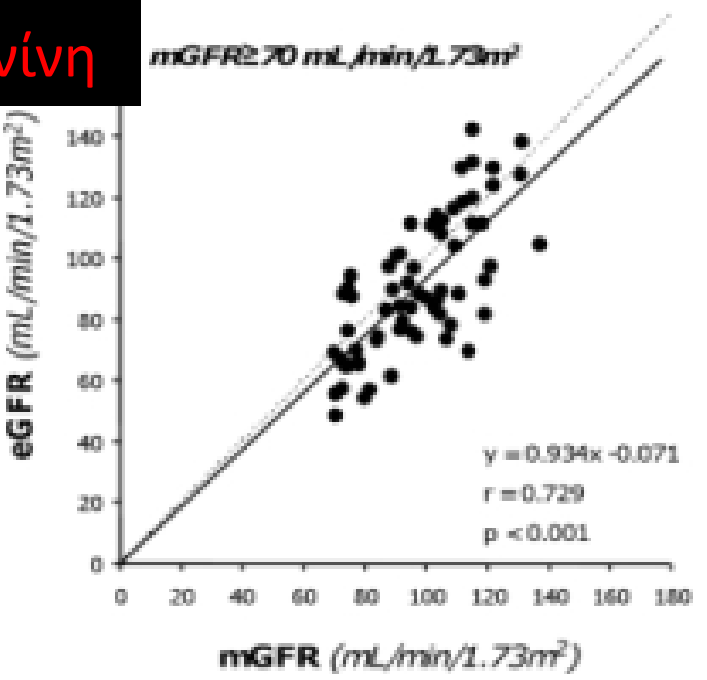




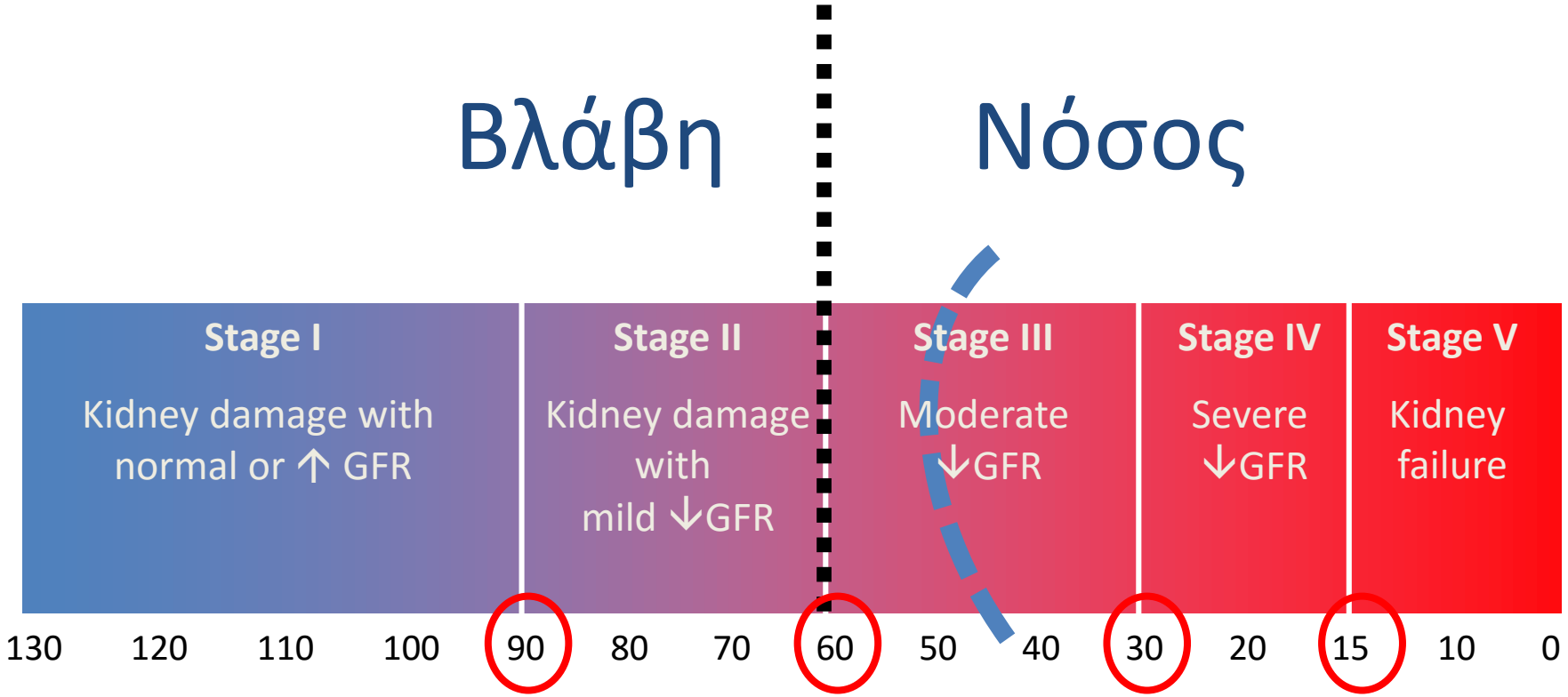
-Ηλικία
-Φύλο
-Φυλή
-Κρεατινίνη

aMDRD



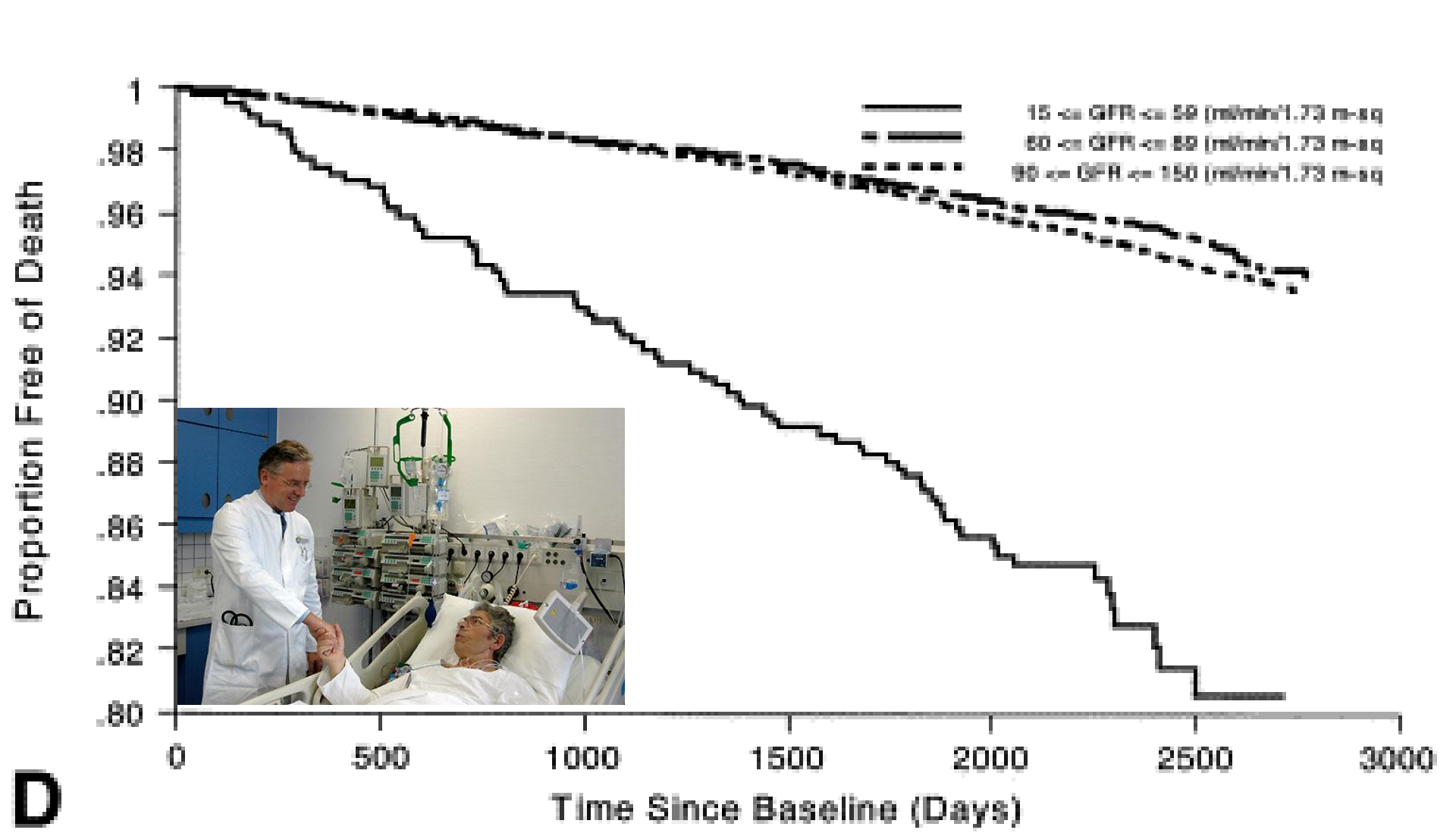


<60 ml/min για > 3 μήνες



Glomerular filtration rate (mL/min/1.73m^2)

National Kidney Foundation. *Am J Kidney Dis* 2002; 39(2 Suppl 1):S1–S266



Ο βαθμός της νεφρικής βλάβης αποτελεί ανεξάρτητο παράγοντα κινδύνου για θάνατο από καρδιαγγειακή νόσο, JACC 2003

Στην ***οξεία νεφρική ανεπάρκεια δεν ισχύουν οι τύποι κάθαρσης!***

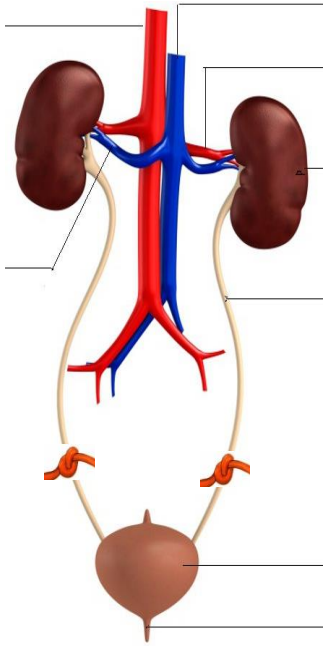
Ρυθμός μεταβολής της κρεατινίνης από ημέρα-σε-ημέρα:

< 1 mg/dl = όχι πλήρης ανεπάρκεια

1-3 mg/dl = πλήρης ανεπάρκεια

δηλαδή GFR < 10 ml/min

> 3 mg/dl = ραβδομυόλυση



Καρδιονεφρικό Σύνδρομο στη σύγχρονη εποχή

Η αλληλεπίδραση Καρδιάς-

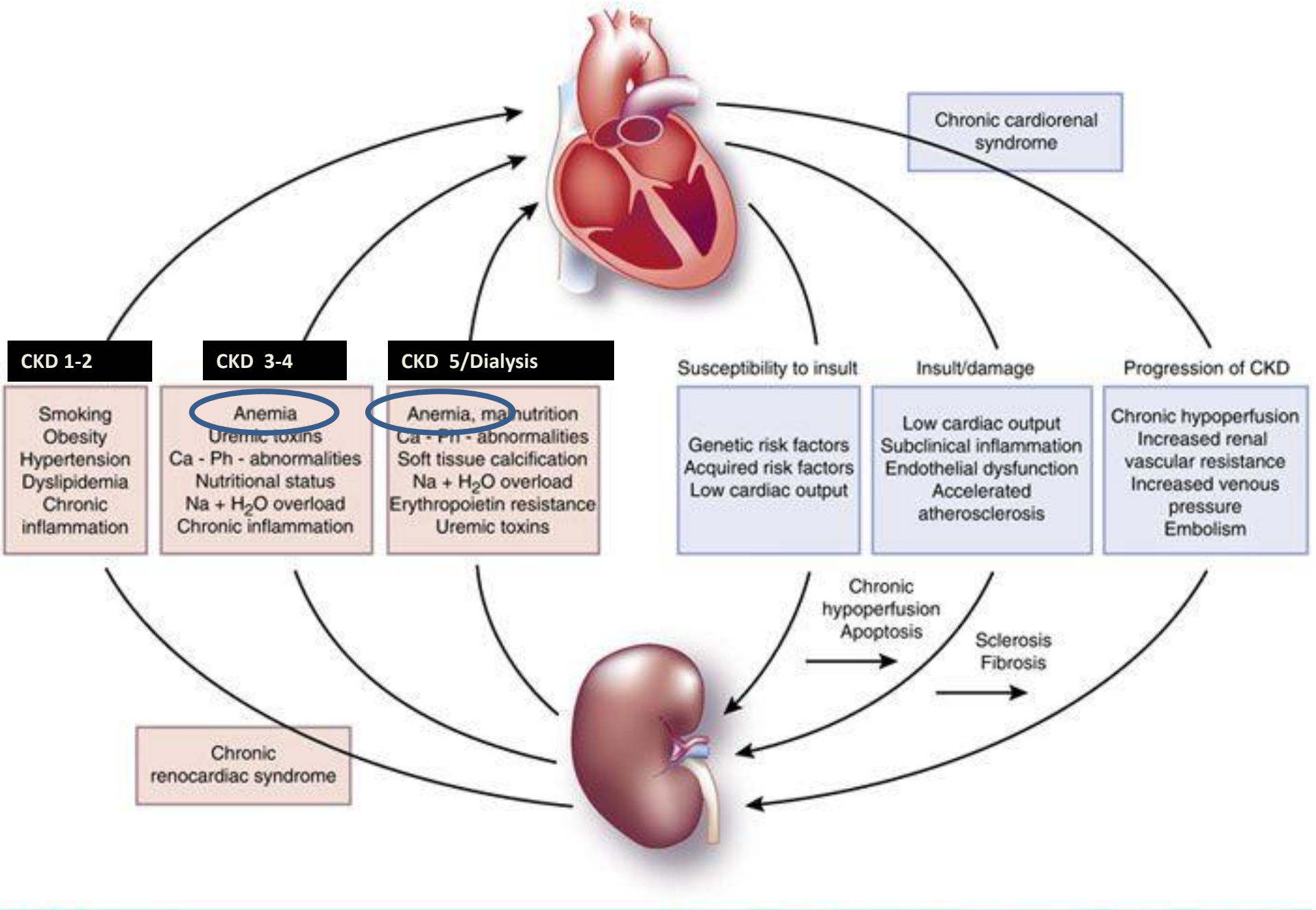
Νεφρών είναι πολύ πιο

περιπλοκή και πολυεπίπεδη από

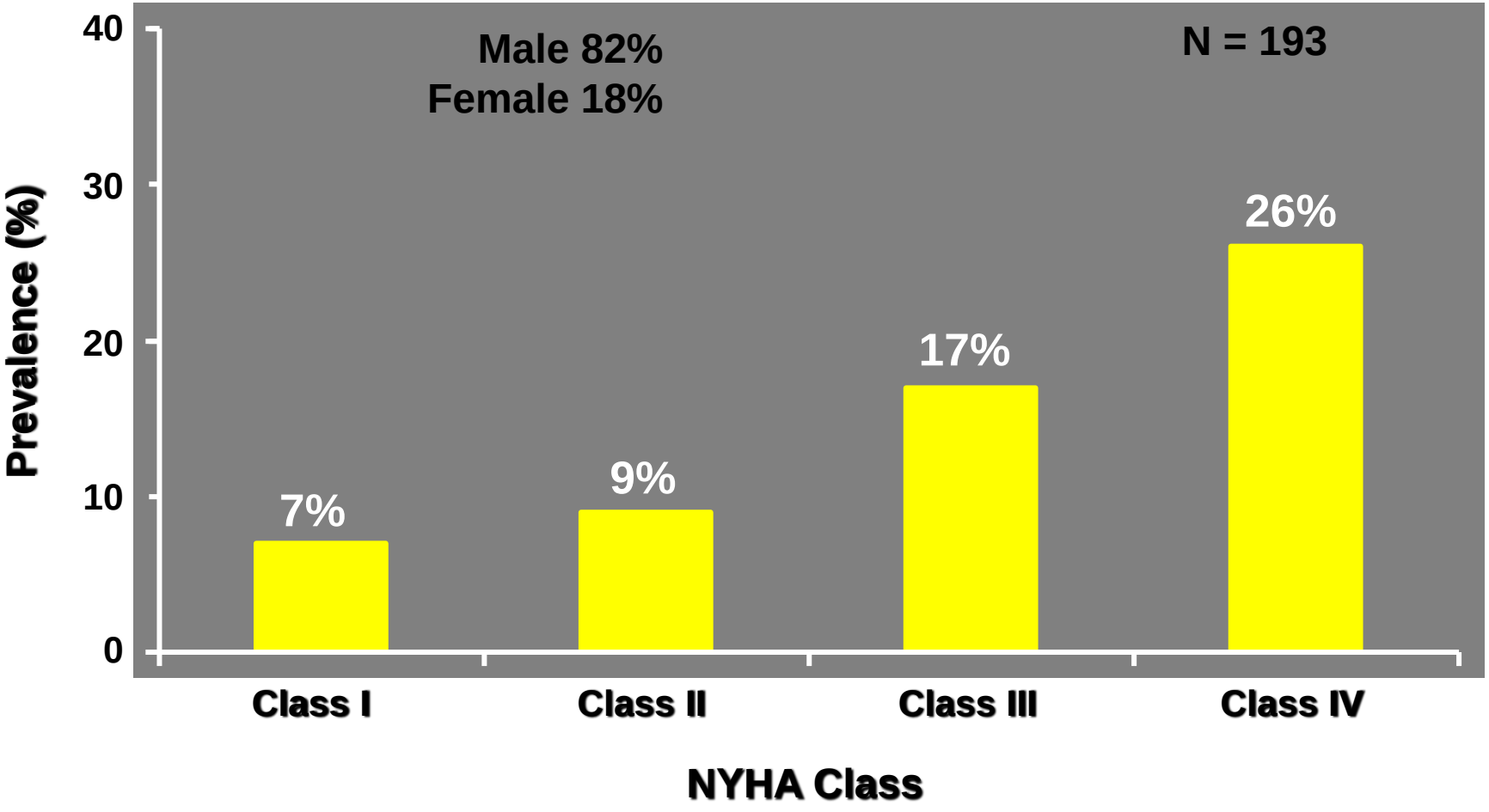
το απλό παθοφυσιολογικό

πρότυπο «αντλίας» και

«φίλτρου»

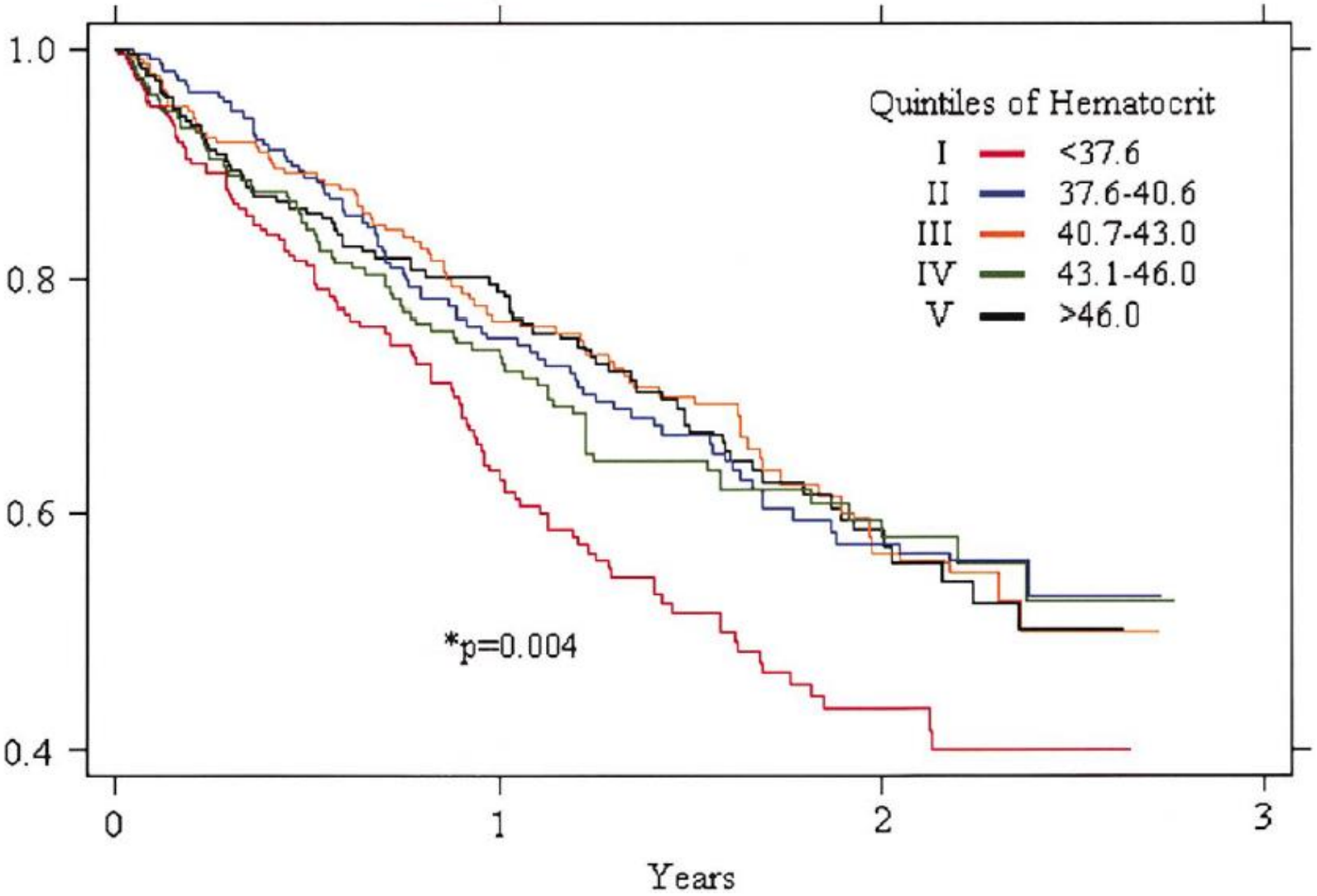


Prevalence of Anaemia in a CHF Outpatient Clinic (Hgb < 12 g/dL)

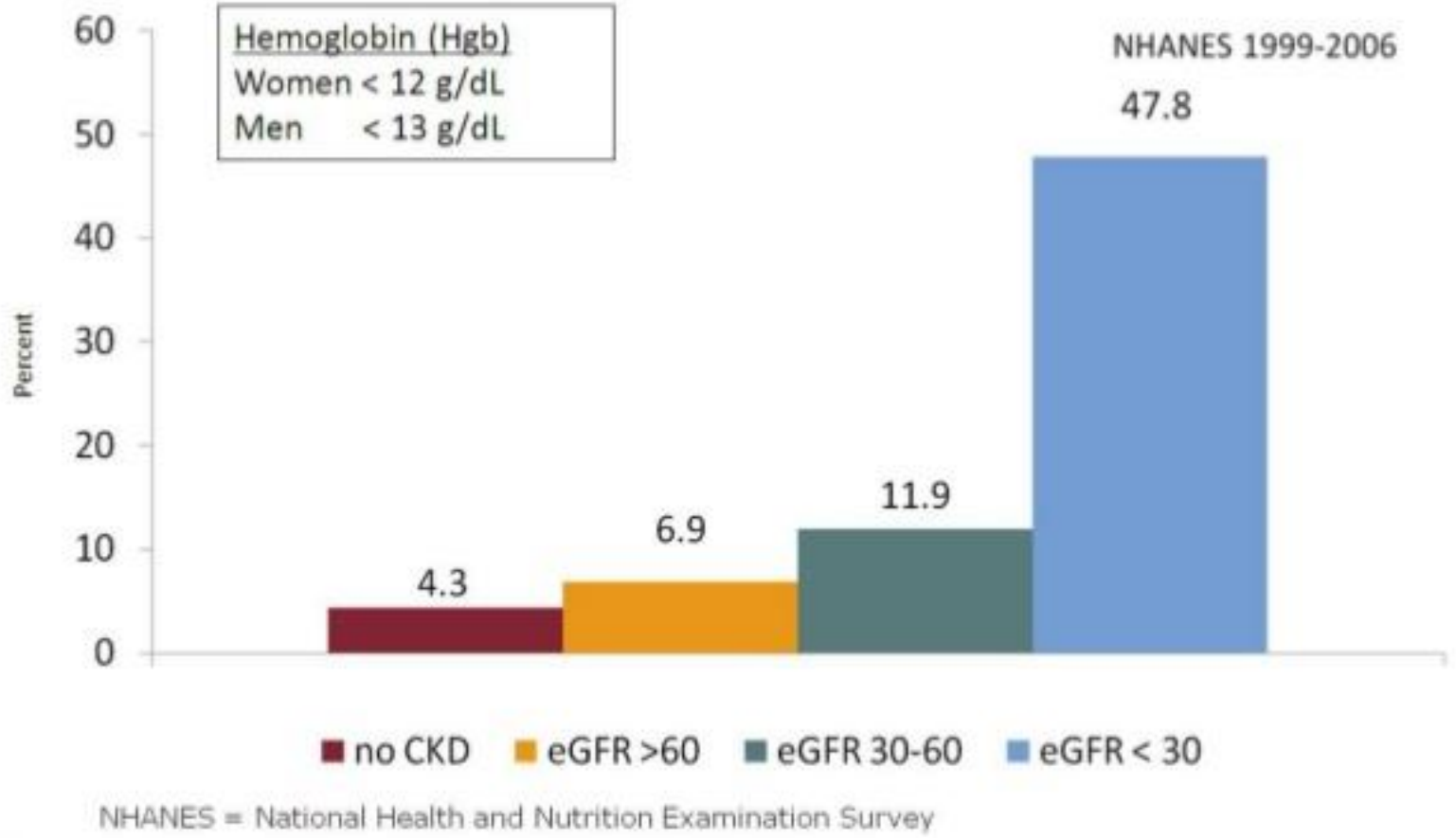


Tanner H et al. Int J Cardiol 2002

Anemia predicts mortality in severe heart failure (**PRAISE**)
JACC 2003;41:1933



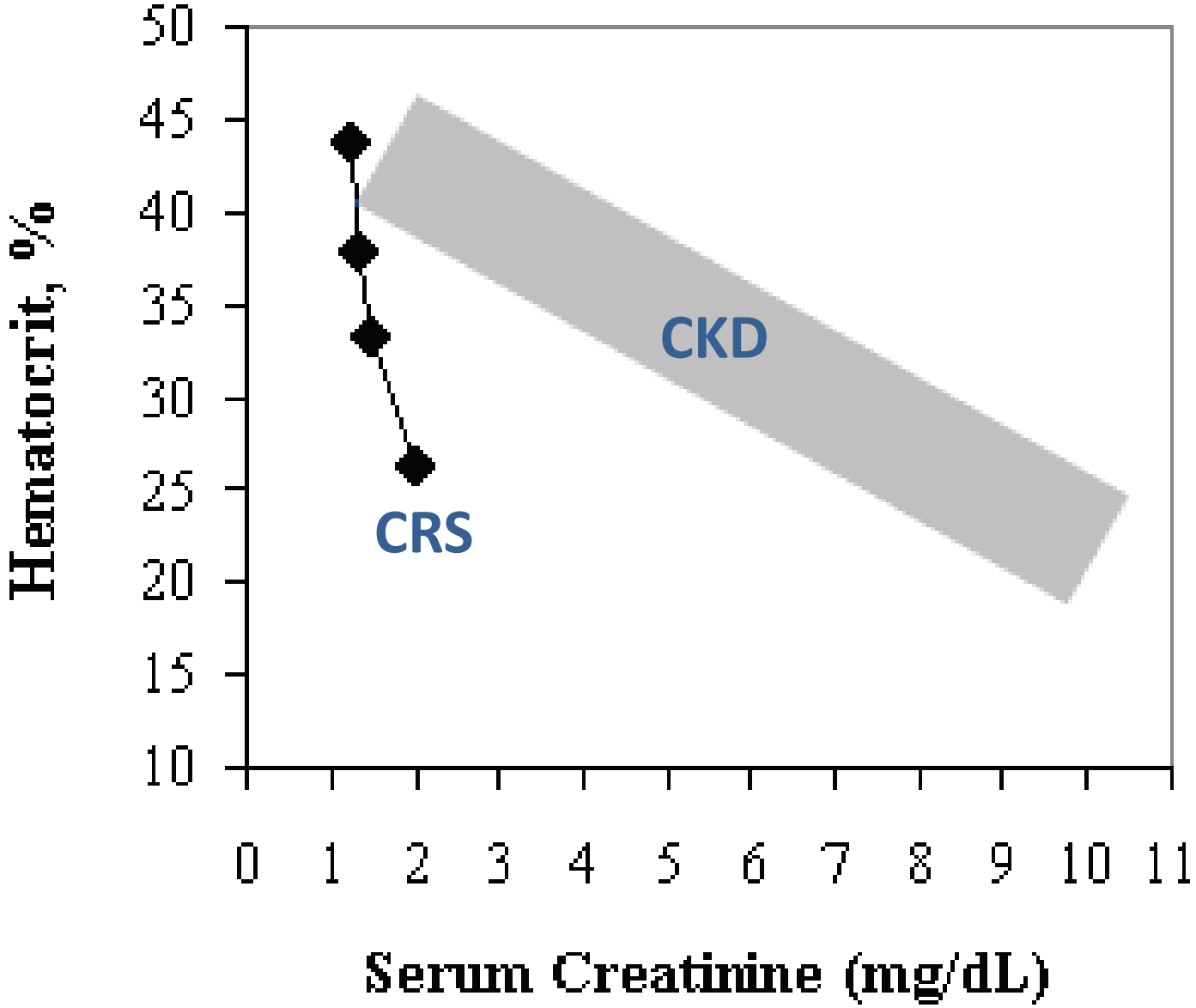
Anemia may develop as eGFR declines



NHANES = National Health and Nutrition Examination Survey

NKDEP

Reference: Adapted from USRDS Annual Data Report (NIDDK, 2009)


Hematocrit, %
50
45
40
35
30
25
20
15
10
0
1
2
3
4
5
6
7
8
9
10
11
Serum Creatinine (mg/dL)
CKD
CRS

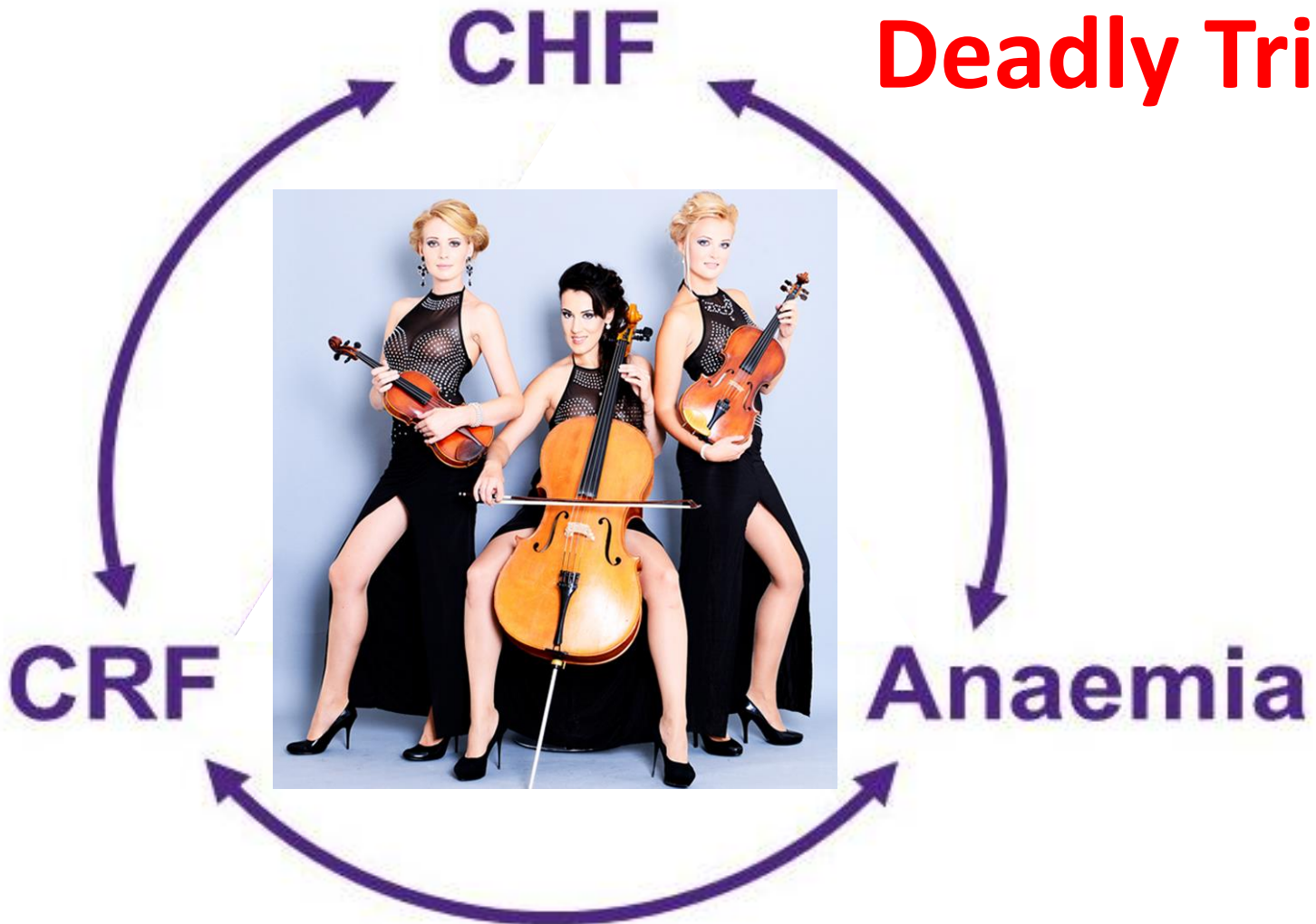
CRS – OMINOUS CO-EXISTENCE

2-year mortality and incidence of ESRD in a 5% sample of Medicare patients from the USA (1.1 million patients)

	2 Year mortality %	2 Year Incidence of ESRD%
No Anaemia/ CHF/ CKI	7.7	0.1
Anaemia	16.6	0.1
CHF	26.1	0.2
CHF & Anaemia	34.6	0.3
CKI	16.4	2.6
CKI & Anaemia	27.3	5.4
CHF & CKI	38.4	3.5
CHF, CKI & Anaemia	45.6	5.9

Gilbertson D. *J Am Soc Nephrol* 2002;13:SA848

Cardiorenal anaemia syndrome: a vicious circle of destruction



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 ↓**

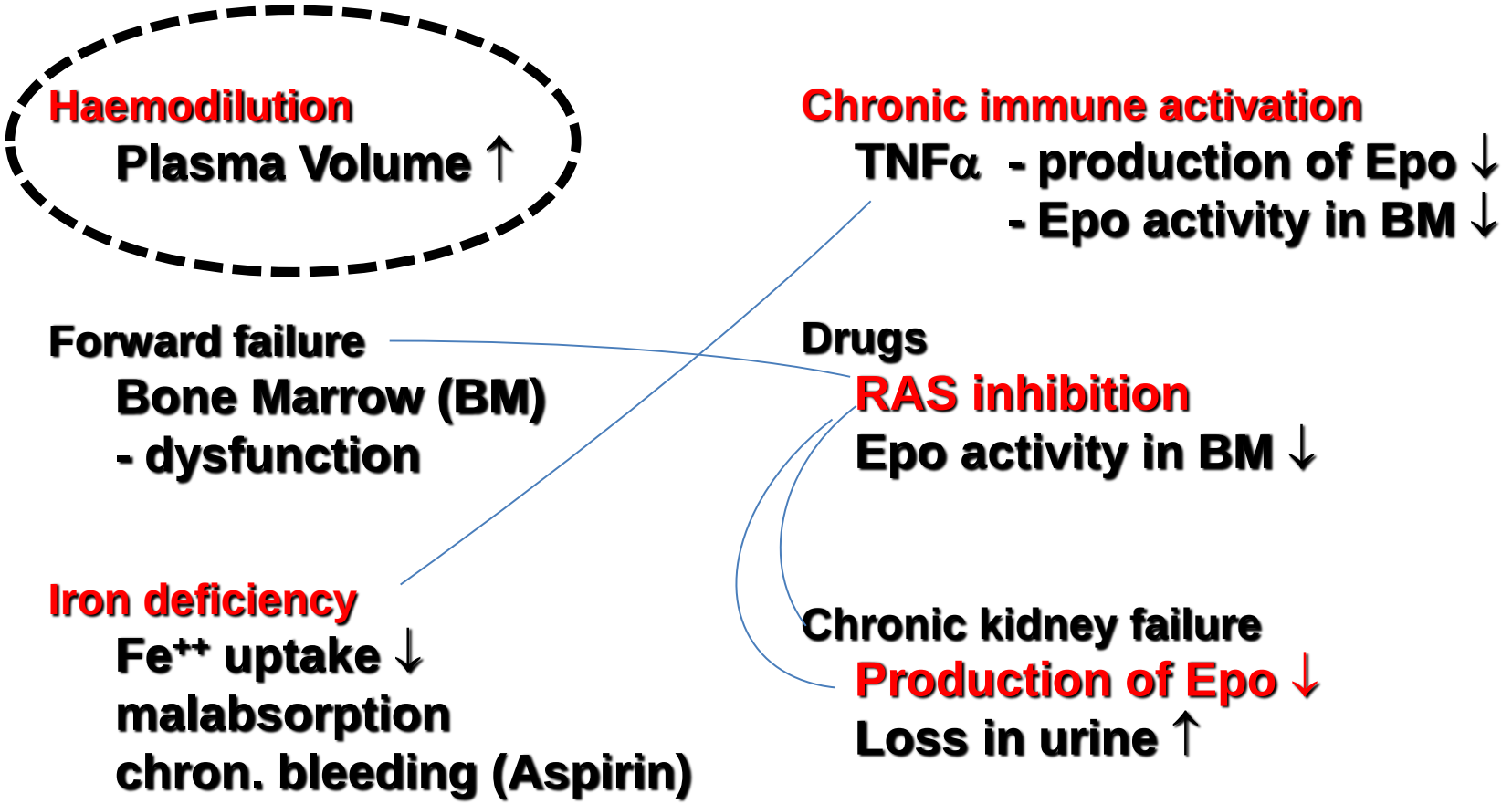
Drugs
- **RAS inhibition**
- **Epo activity in BM**

Chronic kidney failure
- **Production of Epo ↓**
- **Loss in urine ↑**

Epo - Erythropoietin

Silverberg DS et al. J Am Coll Cardiol 2000

Mechanisms of Anaemia in CHF

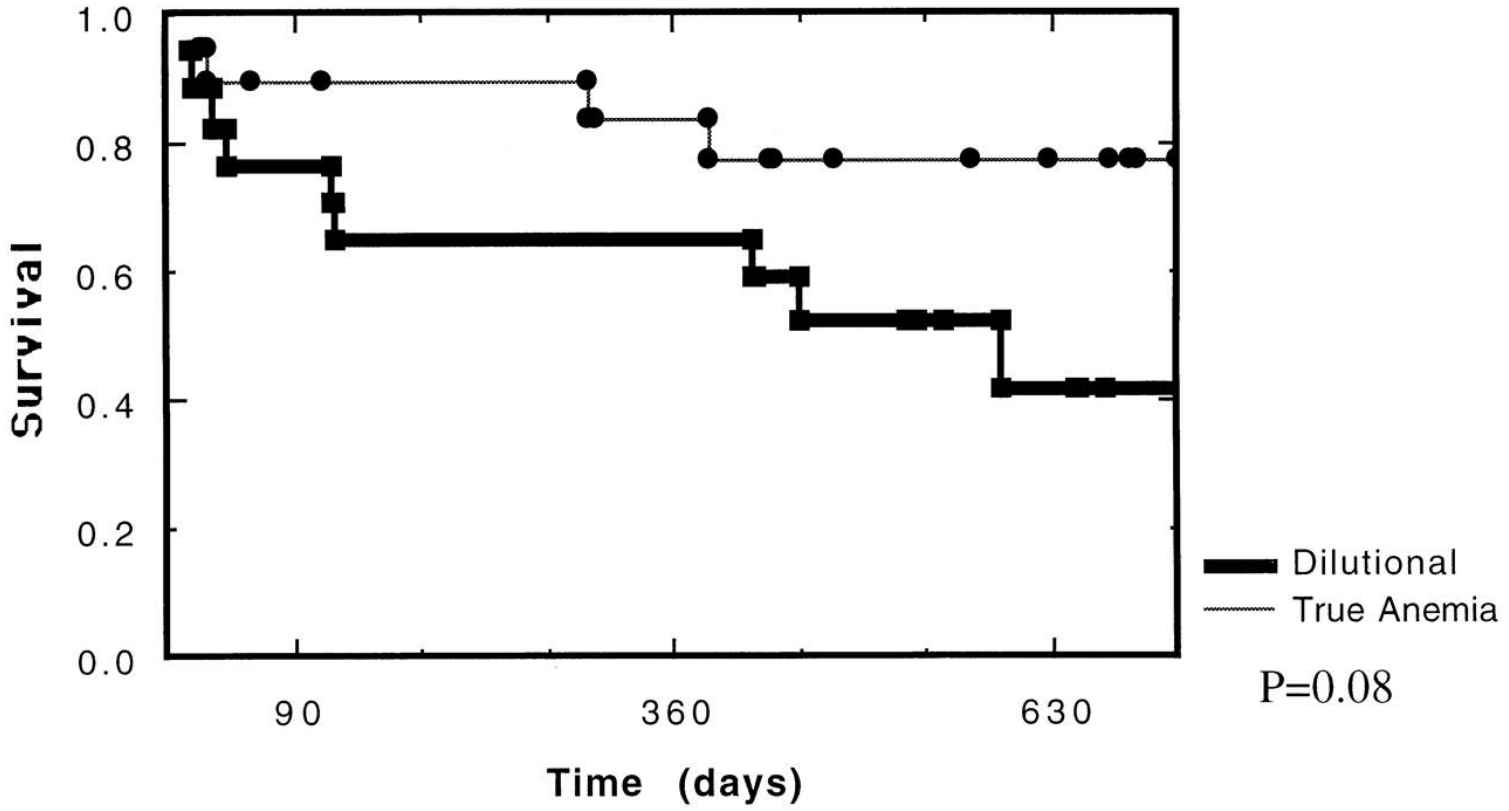


Epo - Erythropoietin

Silverberg DS et al. J Am Coll Cardiol 2000

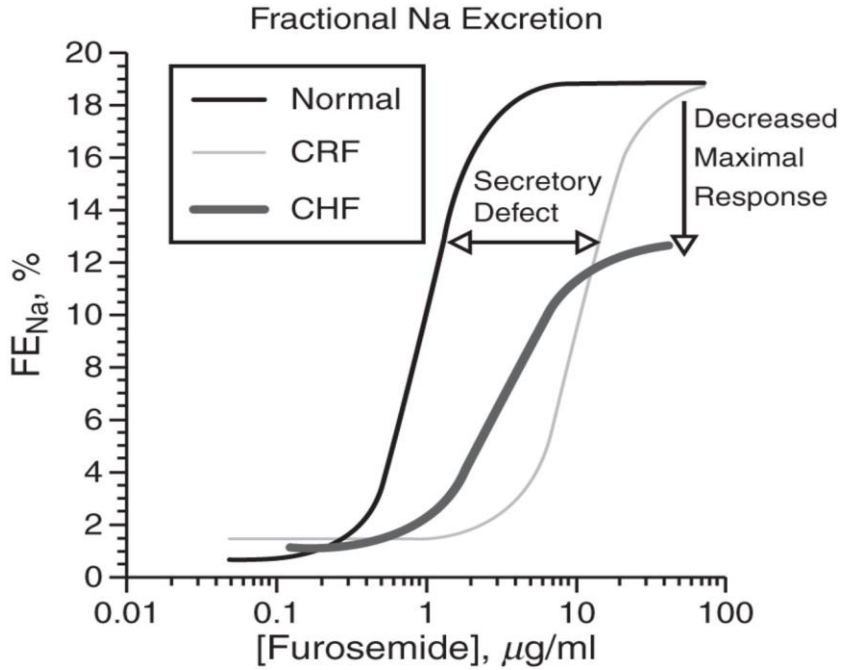
Survival curves of the patients with HF and true anemia versus hemodilution.

Androne et al. Circulation 2003



Diuretics

- Loop, thiazide and potassium-sparing diuretics provide diuresis and natriuresis in as quickly as 20 min after administration.
- Moreover, they provide effective short-term symptomatic relief. However, the use of diuretics is not free from drawbacks, such as long-term deleterious cardiovascular effects.
- A Cochrane review (Salvador D *et al.*, 2004) examined eight trials comparing continuous infusion of a loop diuretic with bolus injections in 254 patients with CHF. The urine output (as measured in mL/24 h) was noted to be greater in patients given continuous infusion



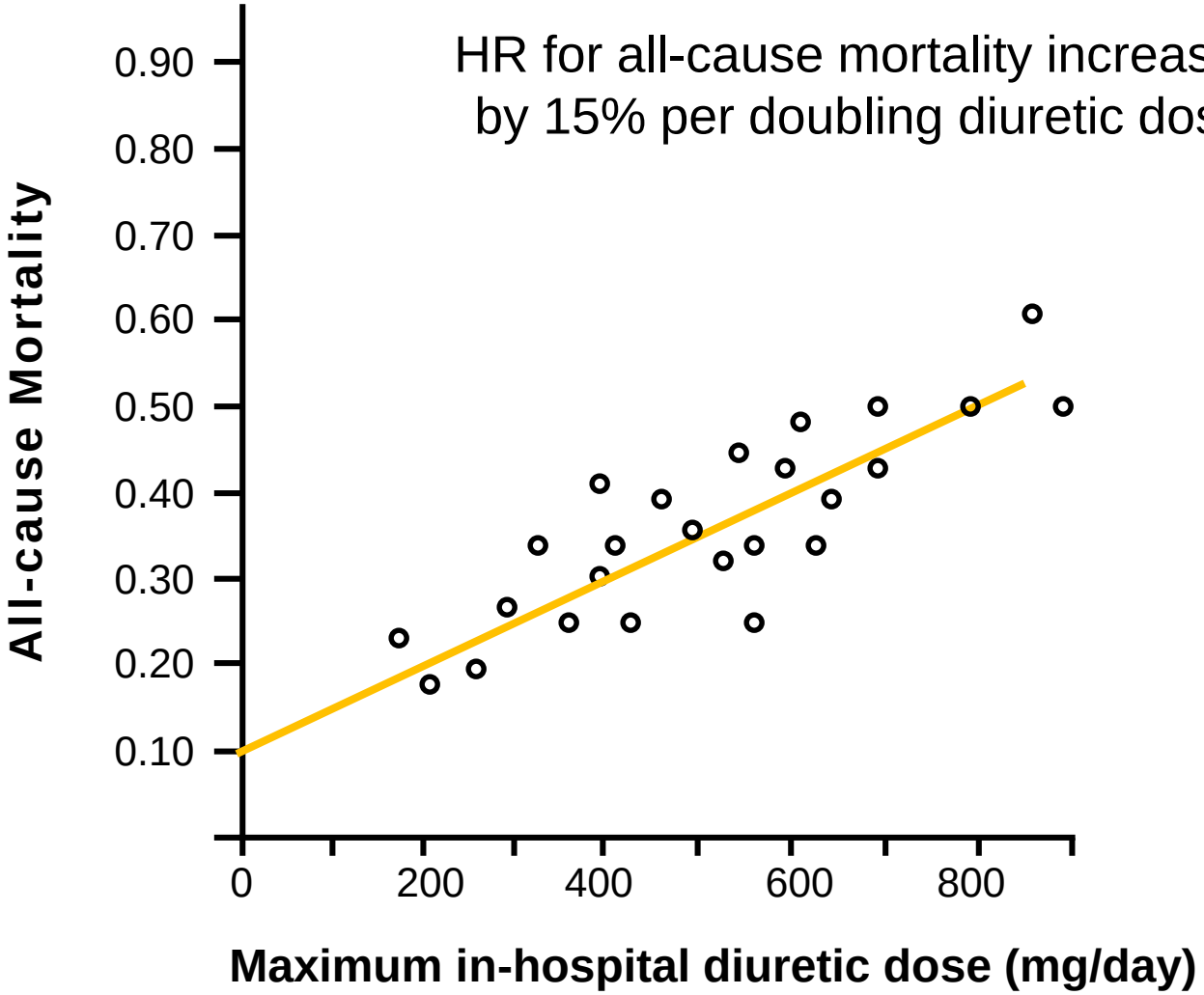
CEILING DOSES FOR I.V. LOOP DIURETICS
(in mgs)

	CIRRHOSIS	HEART FAILURE	NEPHROTIC SYNDROME	AFR/CRF Moderate (x2)	AFR/CRF Severe (x4)
Furosemide	40 to 80	40 to 80	80 to 120	80 to 160	160 to 200
Bumetanide	1 to 2	1 to 2	2 to 3	4 to 8	8 to 10
Torsemide	10 to 20	10 to 20	20 to 50	20 to 50	50 to 100

Protein Binding Increases Ceiling Dose

Impaired Delivery Increases Ceiling Dose

Mortality as a Function of Maximum In-Hospital Diuretic Dose : ESCAPE Trial



Hasselblad V et al. Eur J Heart Fail 2007;9:1064-9

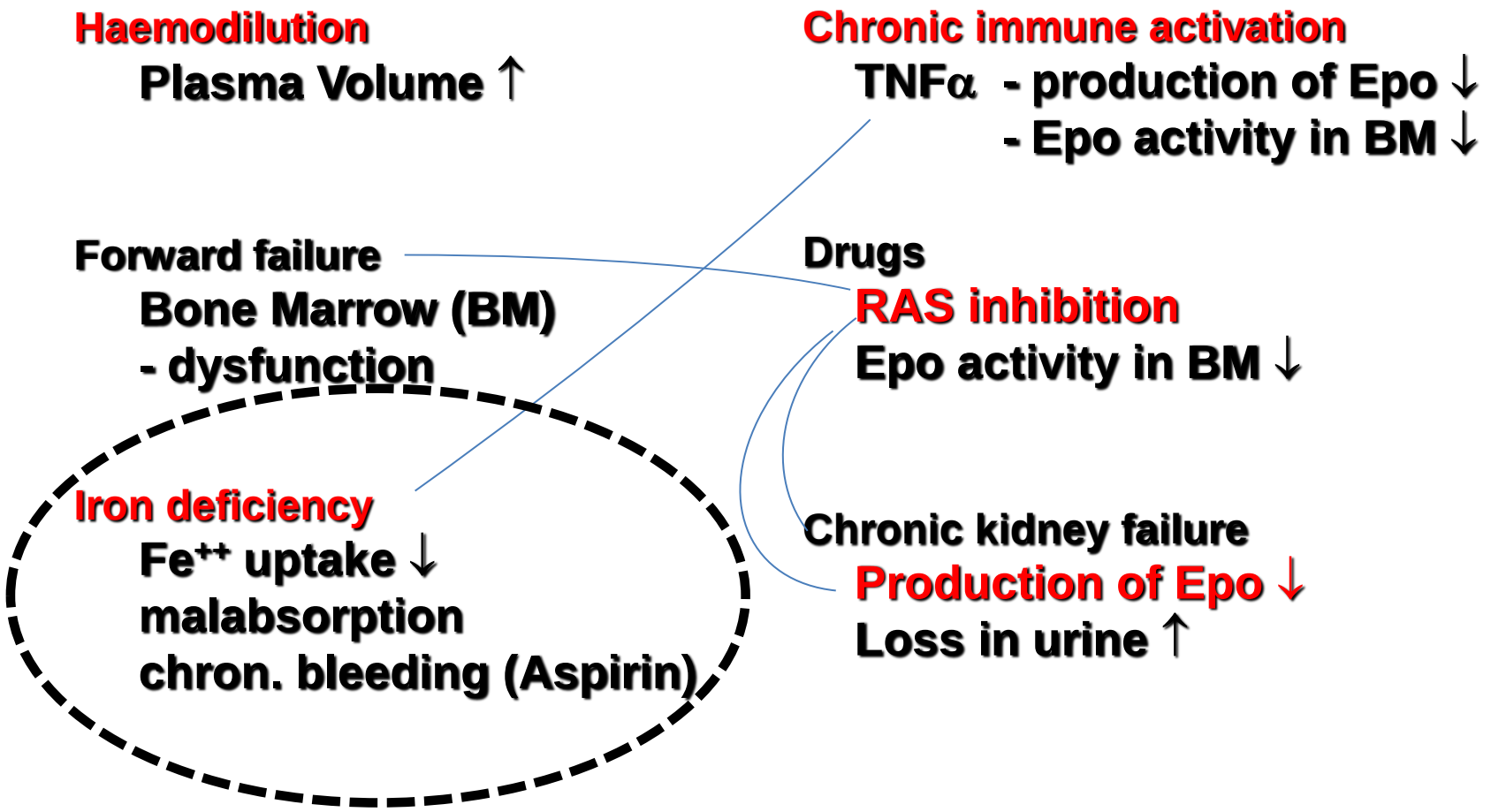
Diuretic Use and the Risk of Mortality in Patients with Left Ventricular Dysfunction: SOLVD Database

Mortality Risk by Diuretic Use at Baseline

	Diuretic (n=2901)		No Diuretic (n=3896)		
	N	Incidence	N	Incidence	*P* value
Death: all cause	1013	12.8	586	5.3	.001
CV Death	903	11.4	510	4.6	.001
Sudden Death	241	3.1	183	1.7	.001

Cooper HA et al. *Circulation.* 1999;100:1311.

Mechanisms of Anaemia in CHF

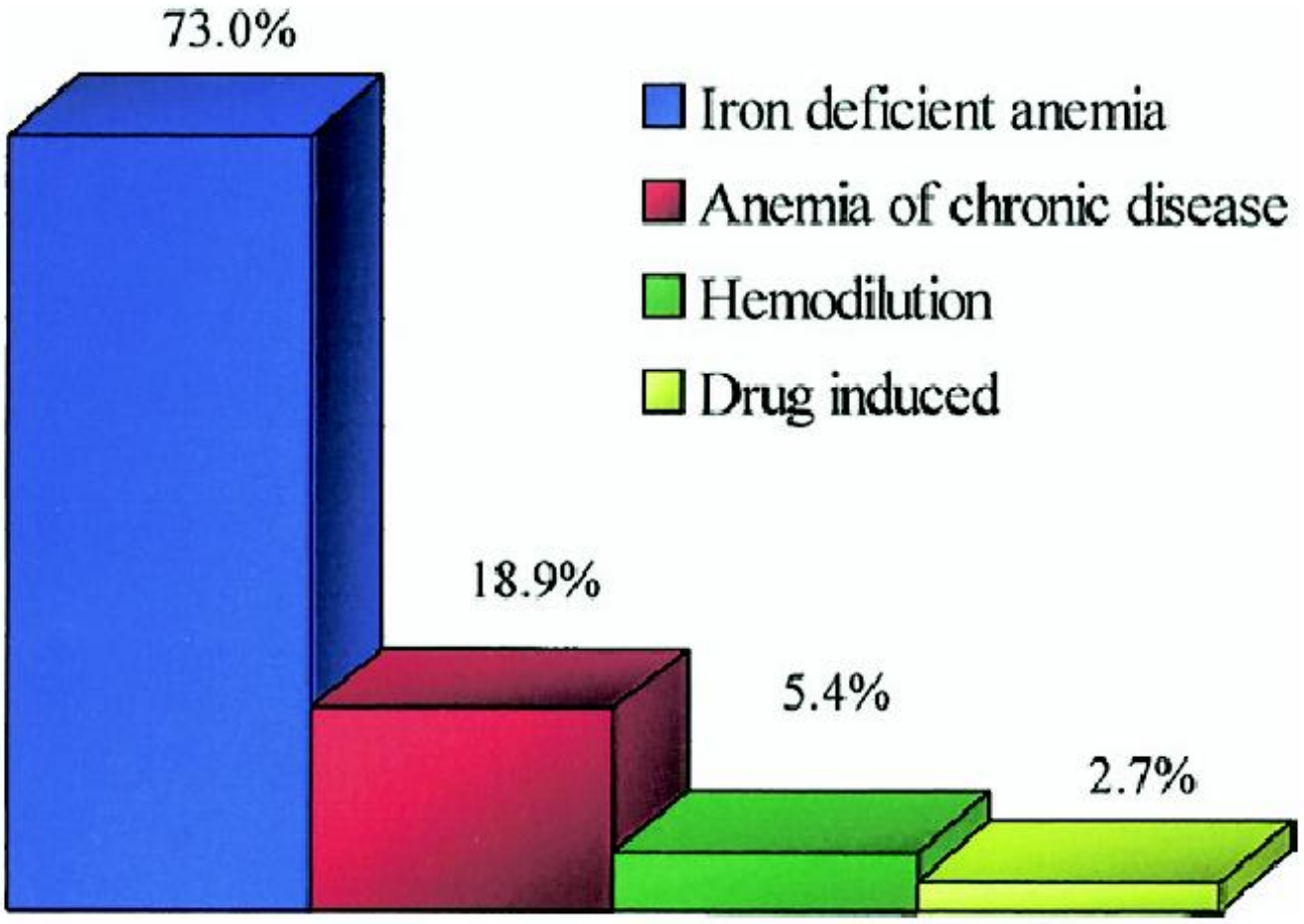


Epo - Erythropoietin

Silverberg DS et al. J Am Coll Cardiol 2000

Etiology of Anemia in Patients With Advanced Heart Failure

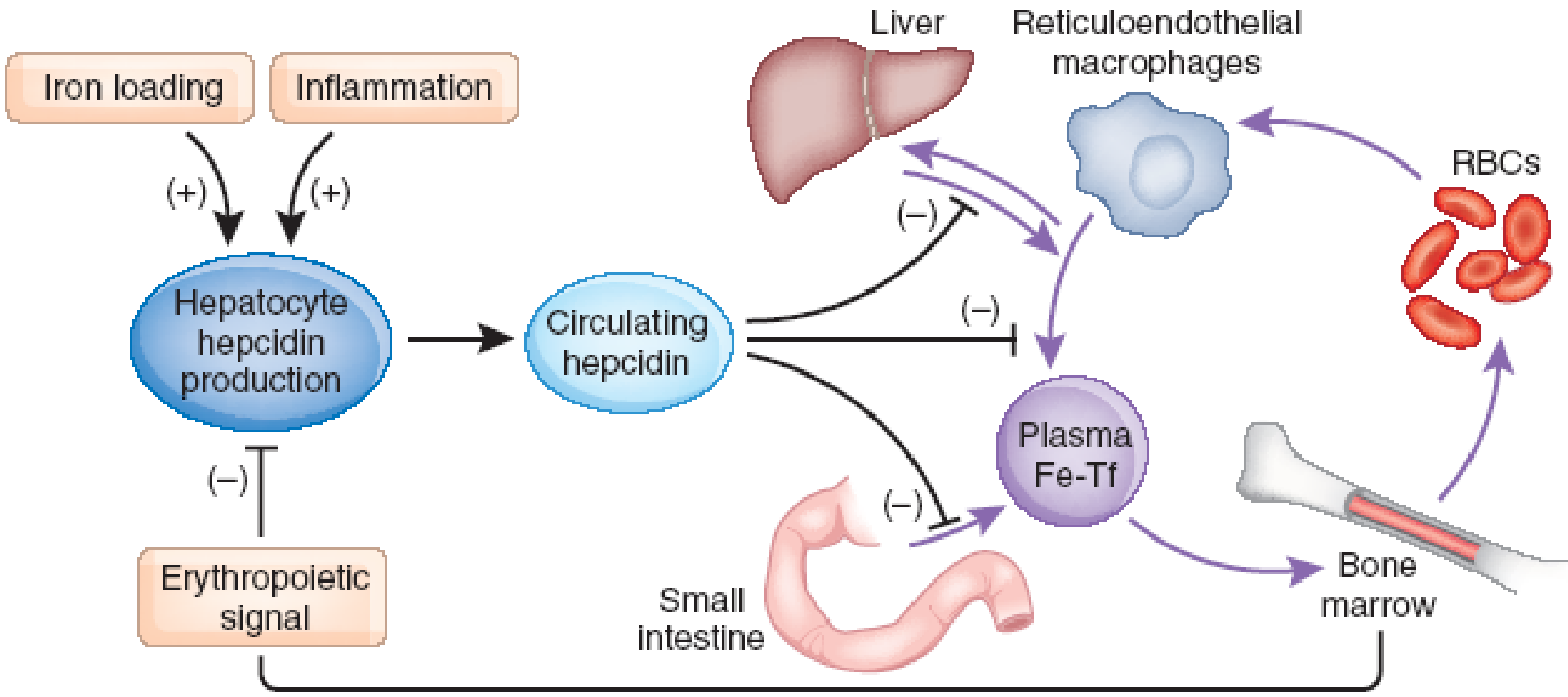
37 advanced CHF pts; NYHA IV; mean LVEF: 22%.



Nanas J et al. J Am Coll Cardiol 2006

Young and Zaritsky

Clin J Am Soc Nephrol 4: 1384–1387, 2009



Η μελέτη FAIR-HF

Anker S, et al. *N Engl J Med* 2009

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

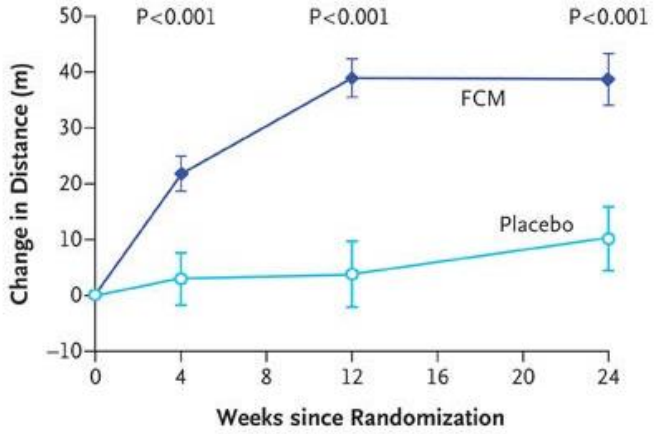
Ferric Carboxymaltose in Patients with Heart Failure and Iron Deficiency

Stefan D. Anker, M.D., Ph.D., Josep Comin Colet, M.D.,
Gerasimos Filippatos, M.D., Ronnie Willenheimer, M.D.,
Kenneth Dickstein, M.D., Ph.D., Helmut Drexler, M.D.,*
Thomas F. Lüscher, M.D., Boris Bart, M.D., Waldemar Banasiak, M.D., Ph.D.,
Joanna Niegowska, M.D., Bridget-Anne Kirwan, Ph.D., Claudio Mori, M.D.,
Barbara von Eisenhart Rothe, M.D., Stuart J. Pocock, Ph.D.,
Philip A. Poole-Wilson, M.D.,* and Piotr Ponikowski, M.D., Ph.D.,
for the FAIR-HF Trial Investigators†

N Engl J Med 2009;361:2436-48.

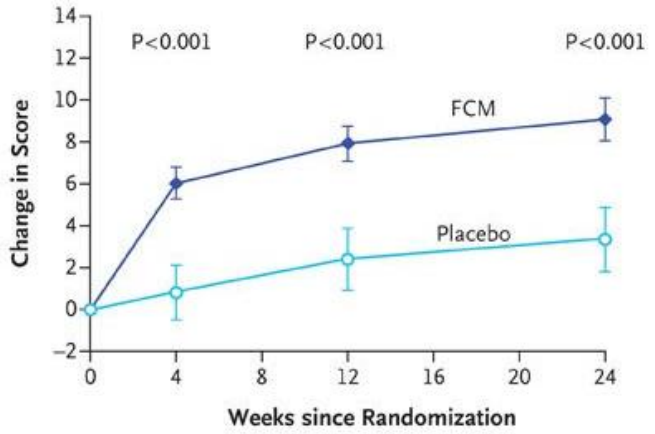
Self-Reported Patient Global Assessment and New York Heart Association (NYHA) Functional Class at Week 24, According to Assigned Study Treatment

C 6-Minute-Walk Test



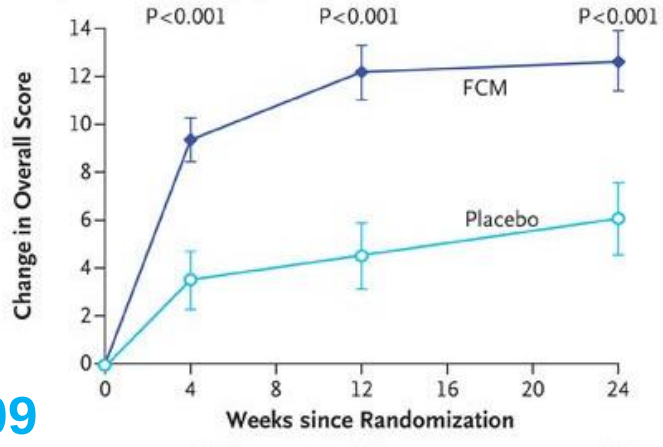
FCM				
No. of patients	303	284	280	268
Mean distance (m)	274±6	294±7	312±6	313±7
Placebo				
No. of patients	155	144	141	134
Mean distance (m)	269±9	269±10	272±10	277±10
Mean Study-Treatment Effect		21±6	37±7	35±8

D EQ-5D Visual Analog Scale



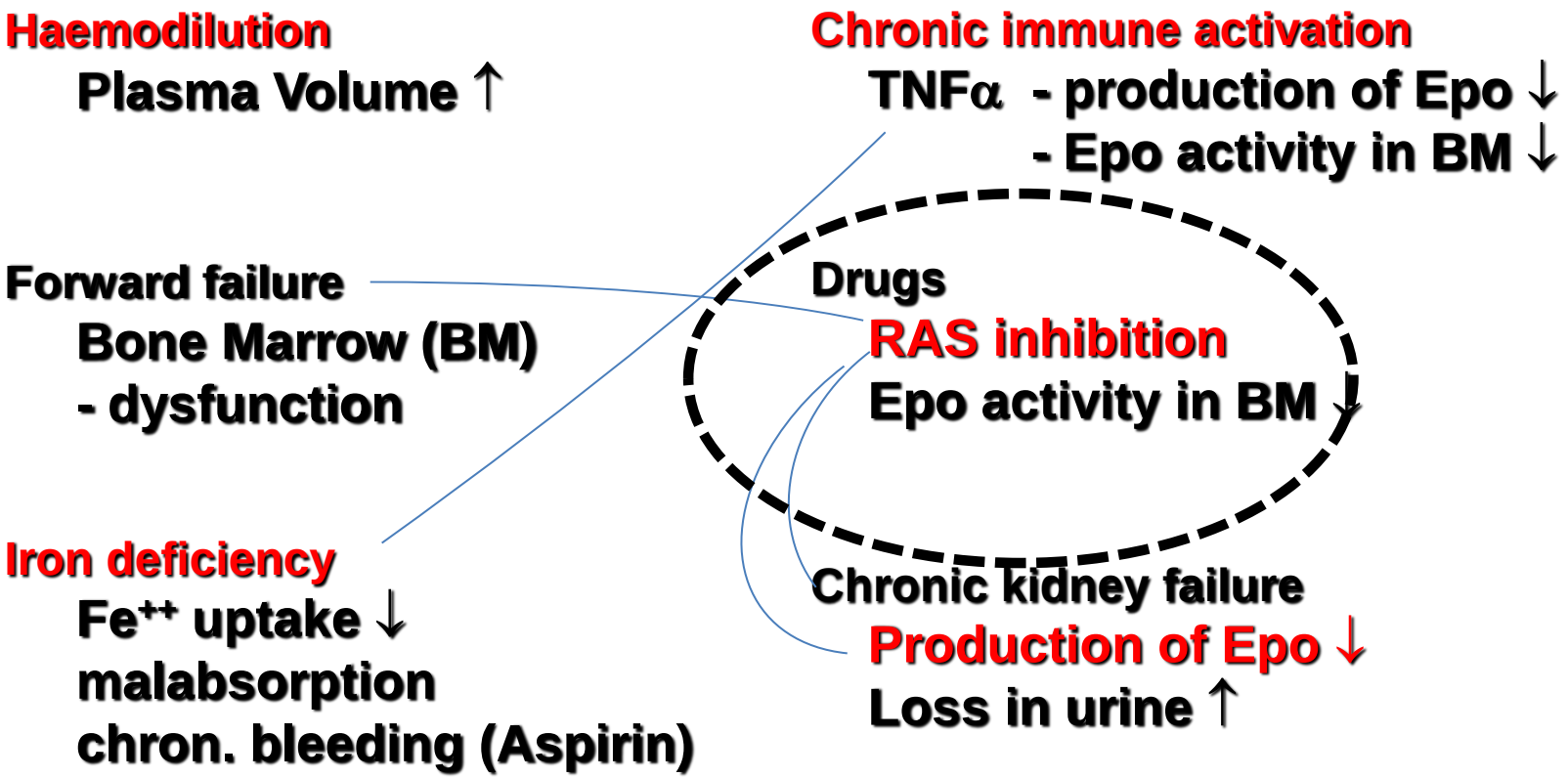
FCM				
No. of patients	295	274	283	285
Mean score	54±1	60±1	62±1	63±1
Placebo				
No. of patients	152	140	145	146
Mean score	54±1	54±2	56±2	57±2
Mean Study-Treatment Effect		6±1	6±2	7±2

E Kansas City Cardiomyopathy Questionnaire



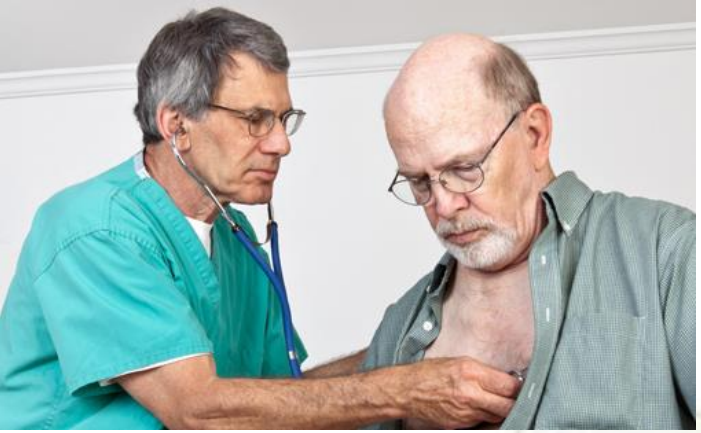
Anker S et al.
N Engl J Med 2009

Mechanisms of Anaemia in CHF



Epo - Erythropoietin

Silverberg DS et al. J Am Coll Cardiol 2000



Stage A
High risk with no symptoms

Stage B
Structural heart disease, no symptoms

Stage C
Structural disease, previous or current symptoms

Stage D
Refractory symptoms requiring special intervention

Hospice

VAD, transplantation

Inotropes

Aldosterone antagonist,

Consider multidisciplinary team

Revascularization, mitral-valve surgery

Cardiac resynchronization if bundle-branch block present

Dietary sodium restriction, diuretics (and digoxin ?)

ACE inhibitors and beta-blockers in all patients

ACE inhibitors or ARBs in all patients; beta-blockers in selected patients

Treat hypertension, diabetes, dyslipidemia; ACE inhibitors or ARBs in some patients

Risk-factor reduction, patient and family education

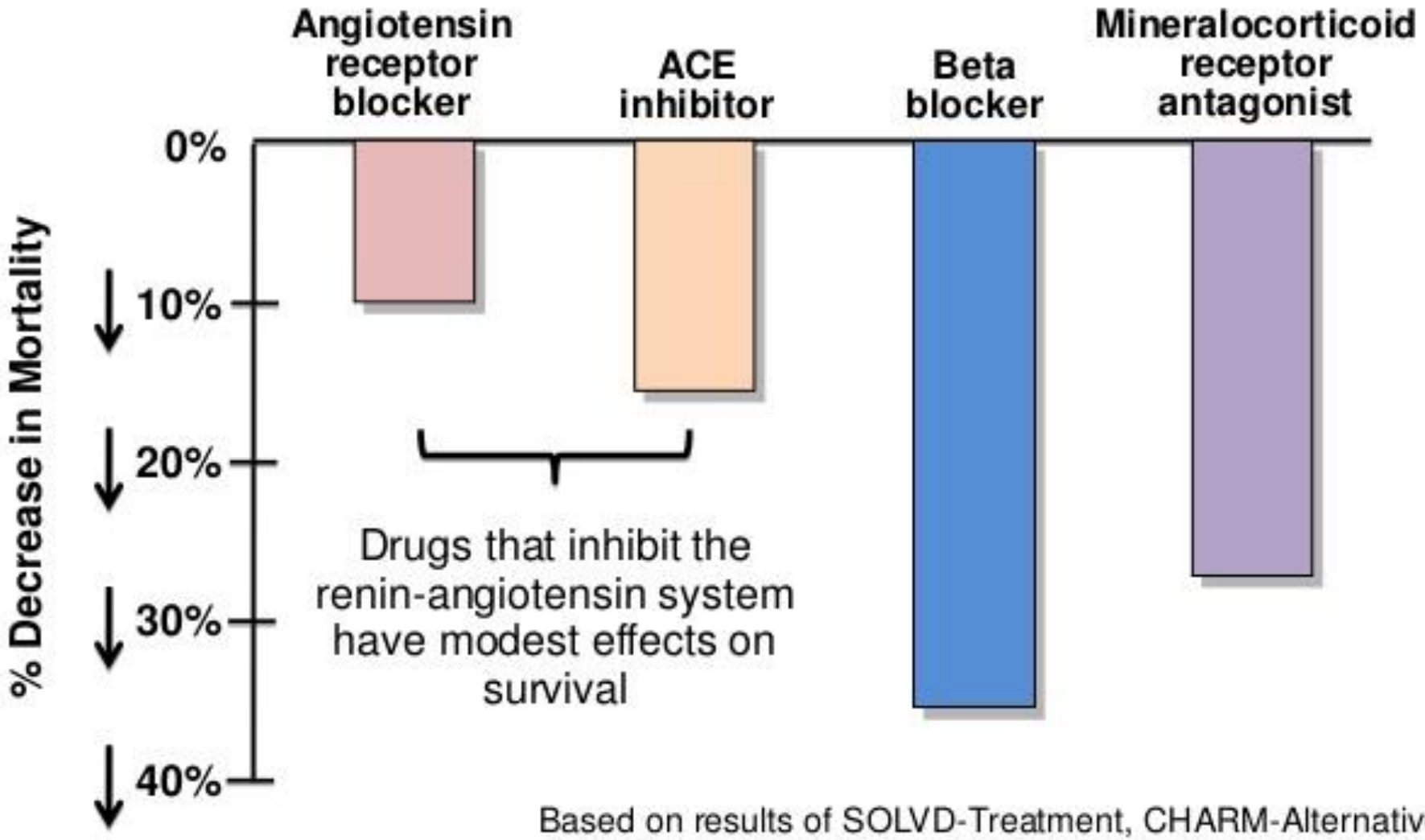
CHF

αΜΕΑ ή σαρτάνες

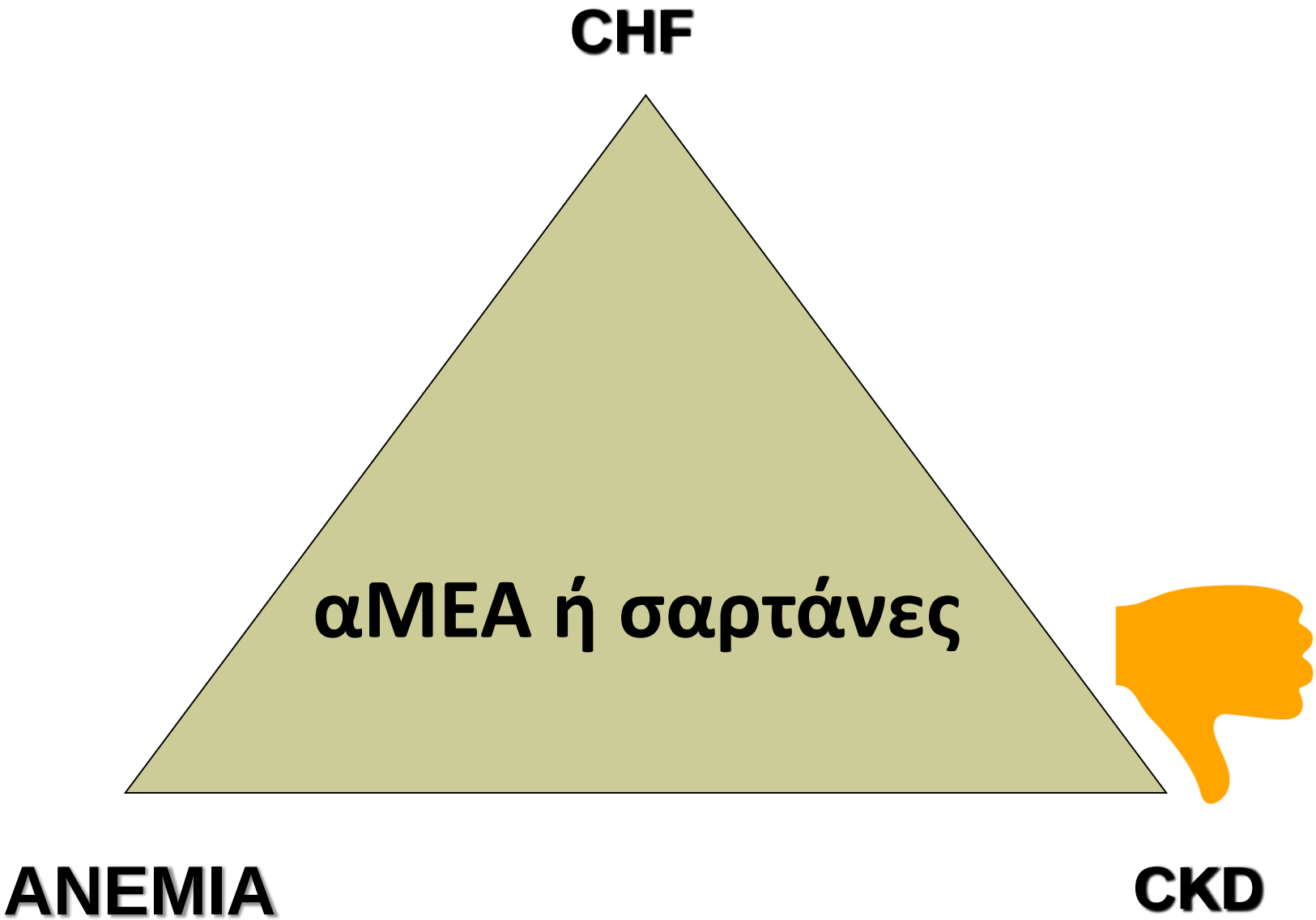
ANEMIA

CKD

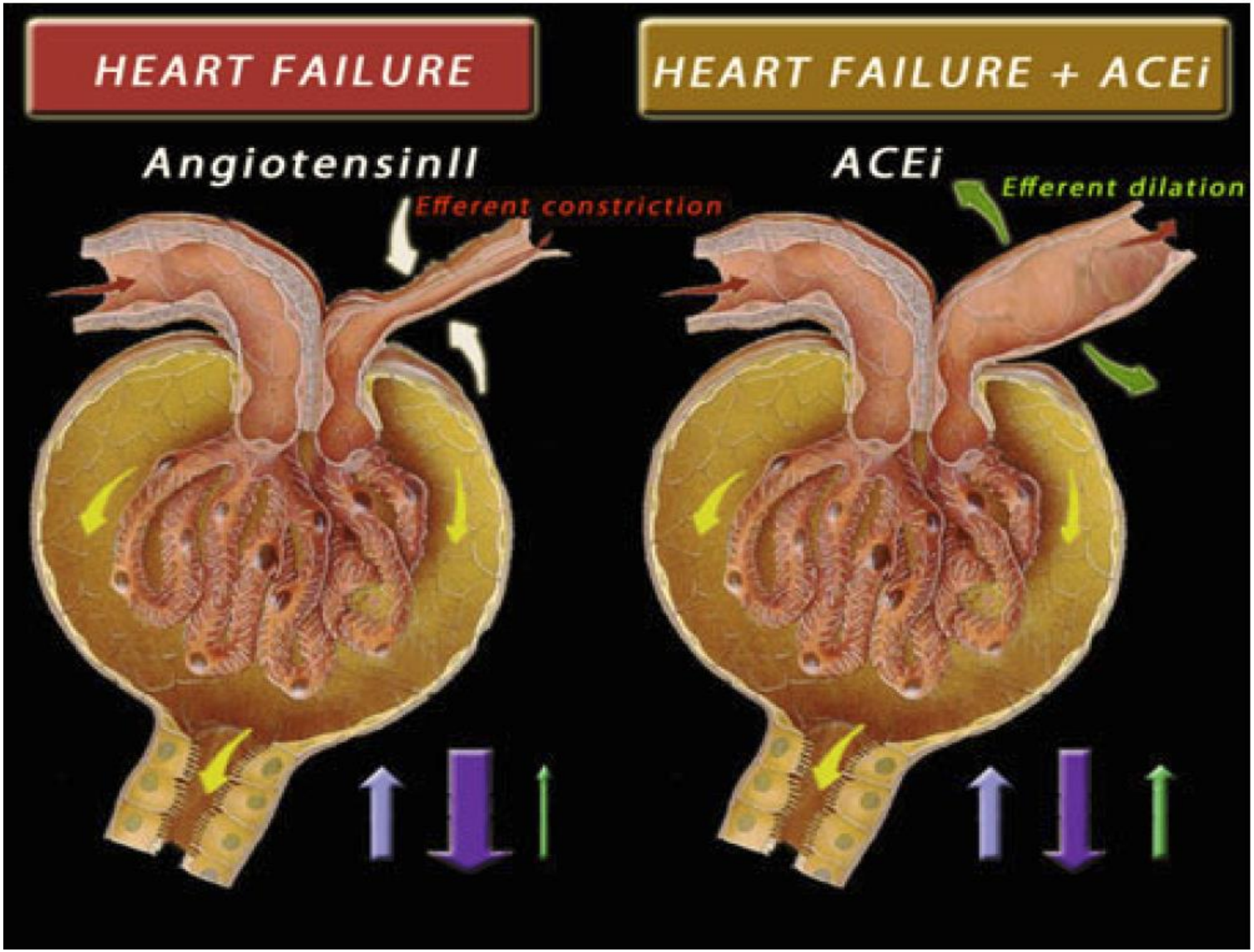
Drugs That Reduce Mortality in Heart Failure With Reduced Ejection Fraction



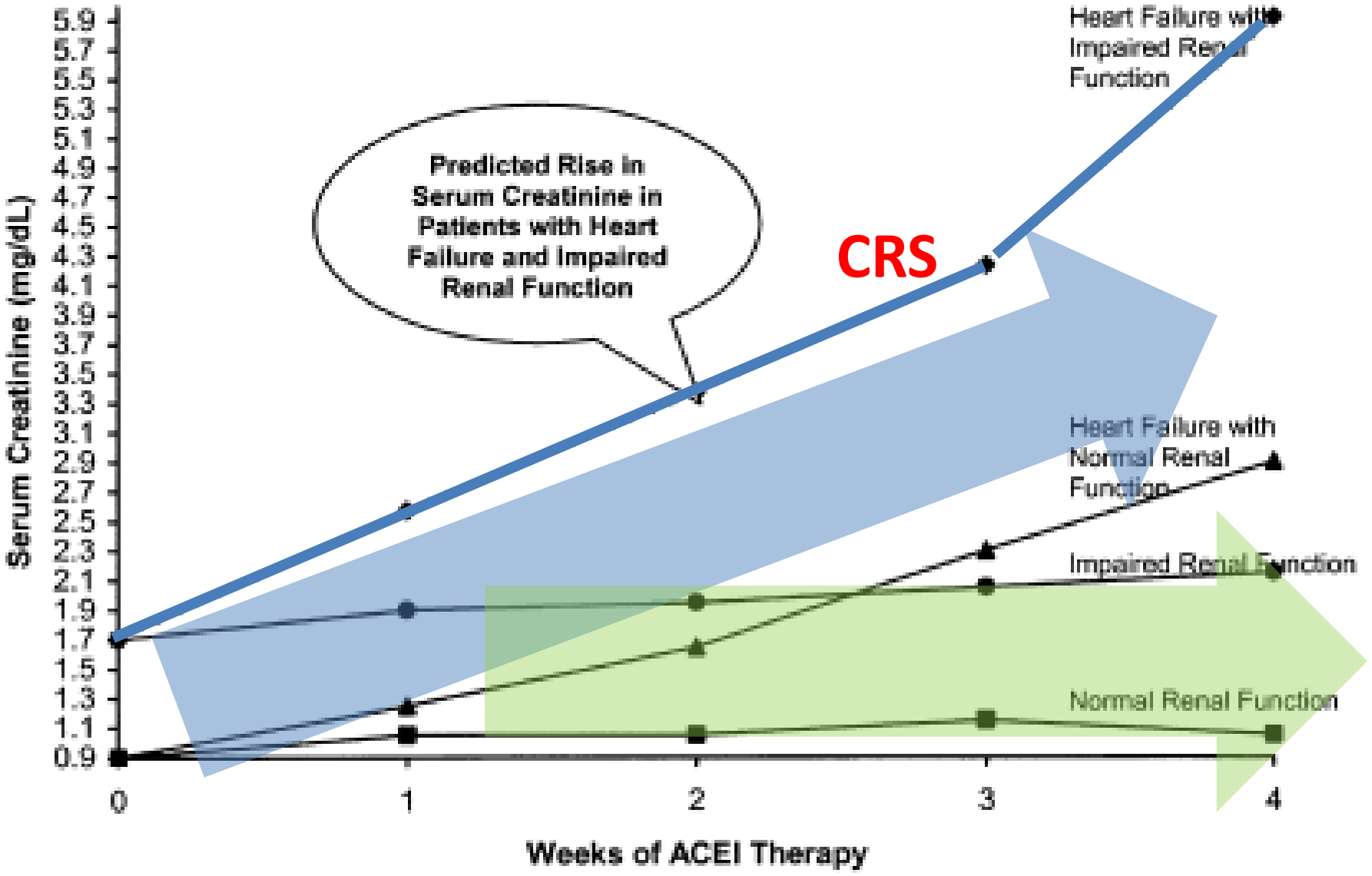
Based on results of SOLVD-Treatment, CHARM-Alternative, COPERNICUS, MERIT-HF, CIBIS II, RALES and EMPHASIS-HF


CHF
αΜΕΑ ή σαρτάνες
ANEMIA
CKD

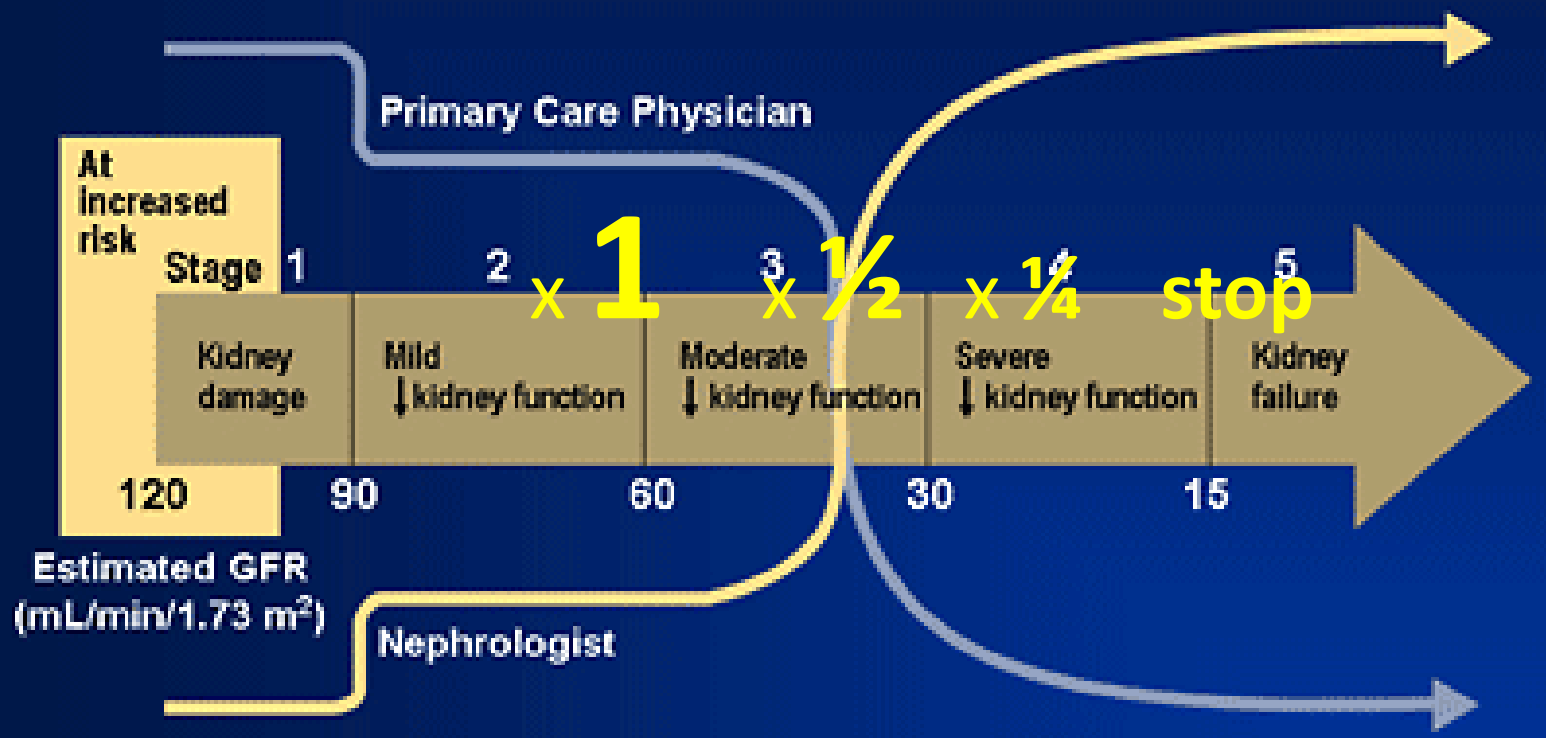
ACE-I initiation and sCr



Triposkiadis, Starling, Boudoulas, Giamouzis, Butler. Heart Fail Rev 2011


Predicted Rise in Serum Creatinine in Patients with Heart Failure and Impaired Renal Function
CRS
Heart Failure with Impaired Renal Function
Heart Failure with Normal Renal Function
Impaired Renal Function
Normal Renal Function
Serum Creatinine (mg/dL)
5.9
5.7
5.5
5.3
5.1
4.9
4.7
4.5
4.3
4.1
3.9
3.7
3.5
3.3
3.1
2.9
2.7
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0
1
2
3
4
Weeks of ACEI Therapy

Προσαρμογή δόσης αΜΕΑ ή ARB:



Particular concern applies to -blockers excreted by the kidney, such as atenolol, nadolol, or sotalol.

GFR = glo

Eknoyan G,

CHF

αΜΕΑ ή σαρτάνες

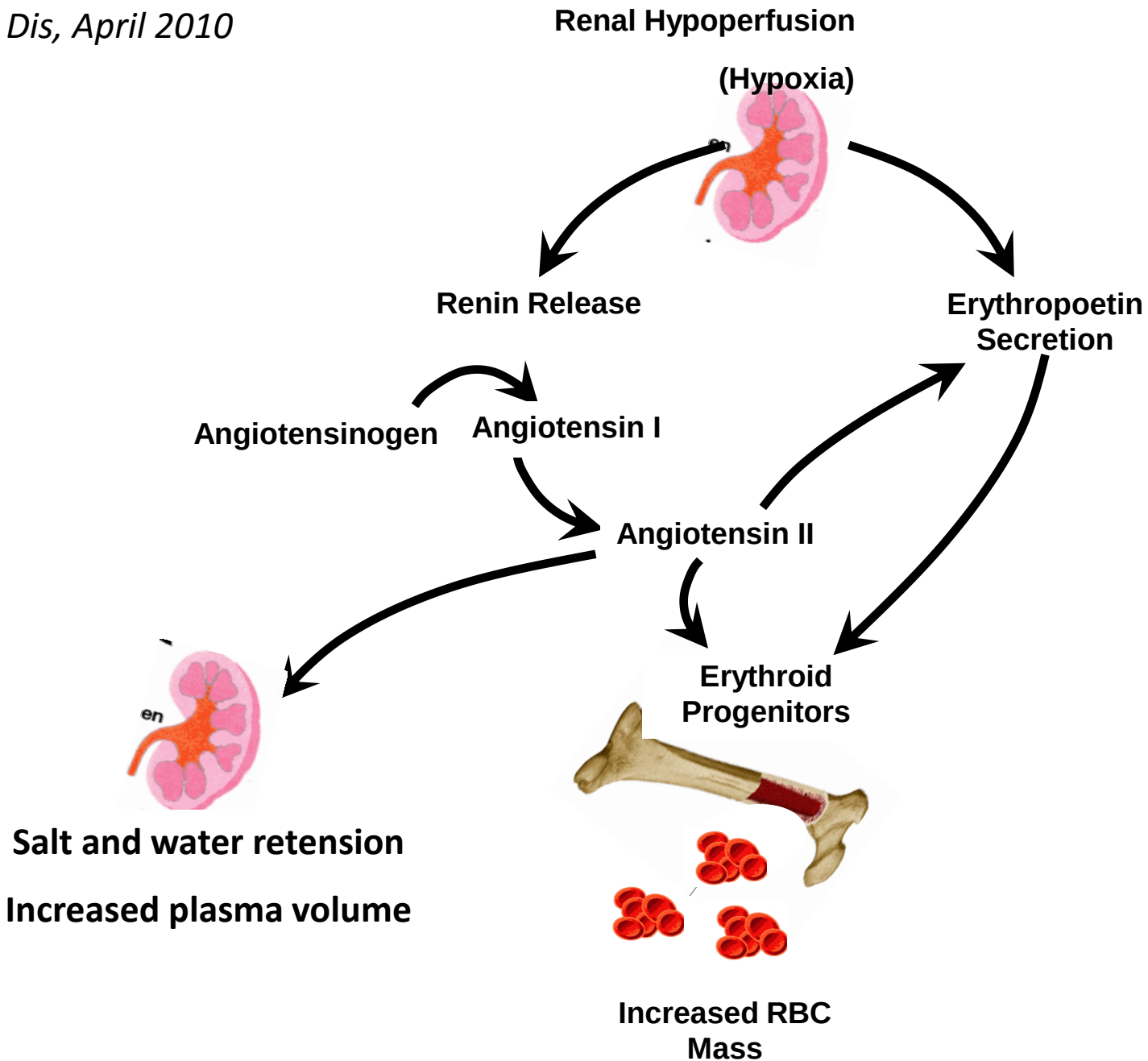
ANEMIA

CKD

The Role of the Renin-Angiotensin System in the Regulation of Erythropoiesis

D. V. Vlahakos, K.P. Marathias, and N.E. Madias,

Am J Kidney Dis, April 2010



Volpe et al. Am J Cardiol 1994

TABLE II Radioactive Measurements of Blood Volume in Patients with Congestive Heart Failure (NYHA class IV) and in Normal Subjects

	Control Subjects (n = 11)	CHF Patients (n = 9)	p Value
Plasma EPO levels (mU/ml)	2.0 ± 0.7	37 ± 9	<0.001
Plasma volume (ml)	2,863 ± 128	4,009 ± 322	<0.01
Whole blood volume (ml)	4,902 ± 234	6,616 ± 487	<0.01
Red blood cell volume (ml)	2,028 ± 119	2,616 ± 235	<0.05
Hematocrit (%)	41.3 ± 0.9	39.3 ± 2	NS

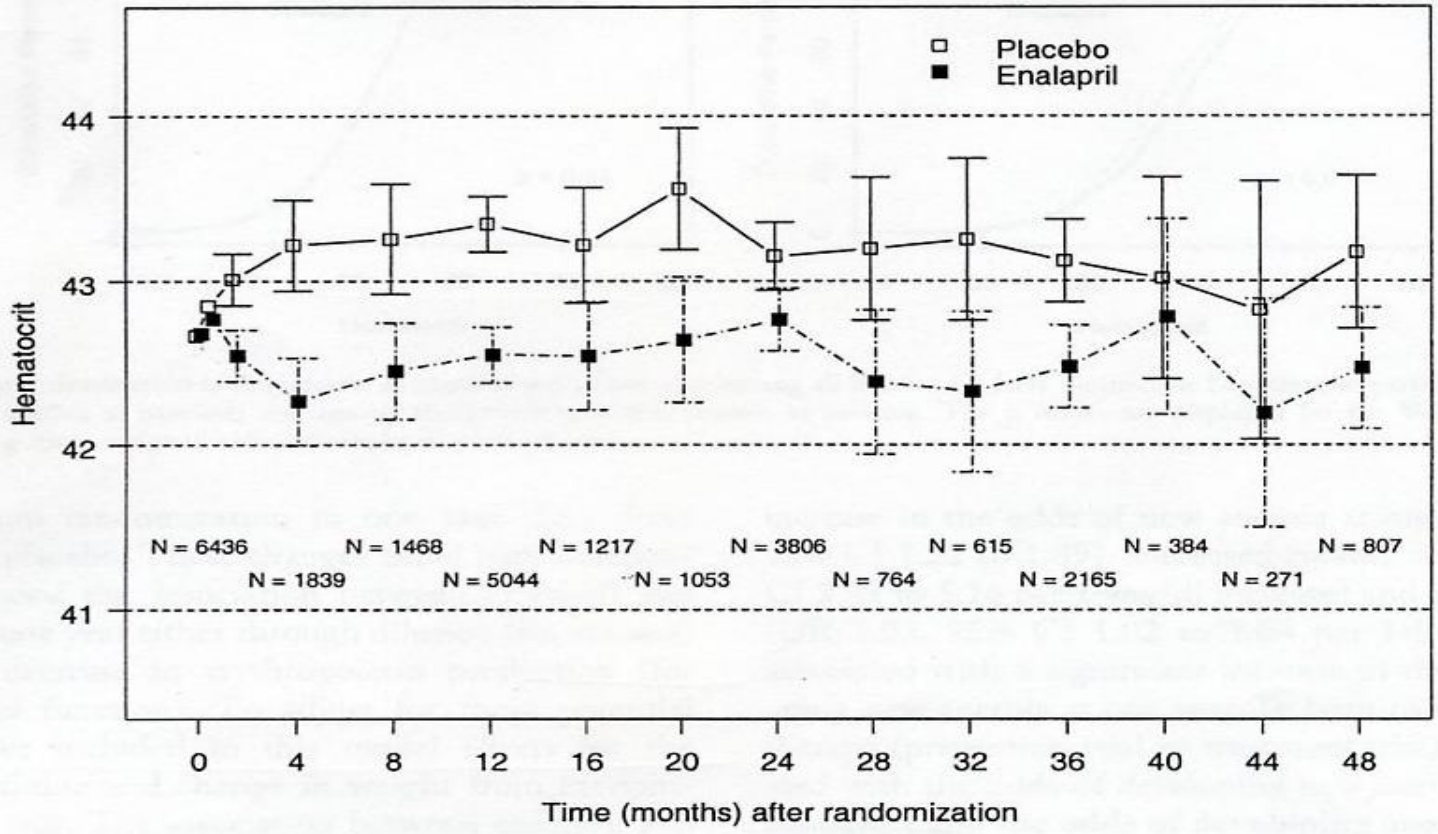
CHF = congestive heart failure; EPO = erythropoietin; NYHA = New York Heart Association.

SOLVD Database Ishani et al. JACC, 2005

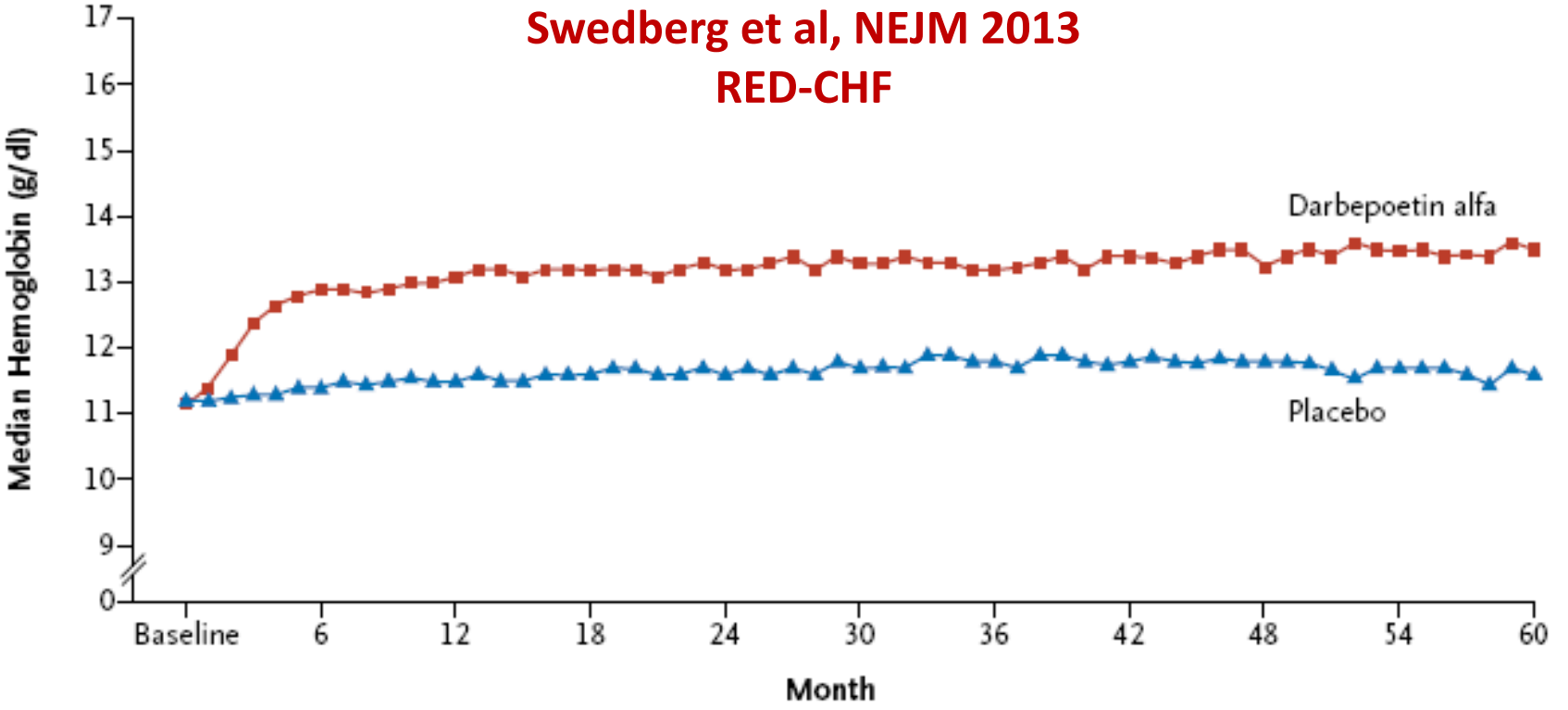
, for analyses of new anemia at one year, we luals to have complete data at one year; this exclusion of 1,075 patients. Consequently, ncluded 4,174 patients (analyses of new justment for data at one year), 5,249 patients ew anemia with adjustment for data at , or 6,436 individuals (analyses of prevalent ia and all survival analyses) (Fig. 1). The teristics of those included in our main anal- ed that there were no significant differences

Enalapril and the odds of d anemia at one year. At one year after r 3% of those randomized to enalapril h nemia, compared to 7.9% of thos djusted odds ratio [OR] 1.48, 95% conf 1.20 to 1.82). In a logistic model (Table 2) for confounders, enalapril continued to be as th new anemia at one year (adjusted OR 1.56, 95% CI 1.26 to 1.93). A potential confounder of this analysis was that individuals randomized to enalapril had greater changes in creatinine

48%

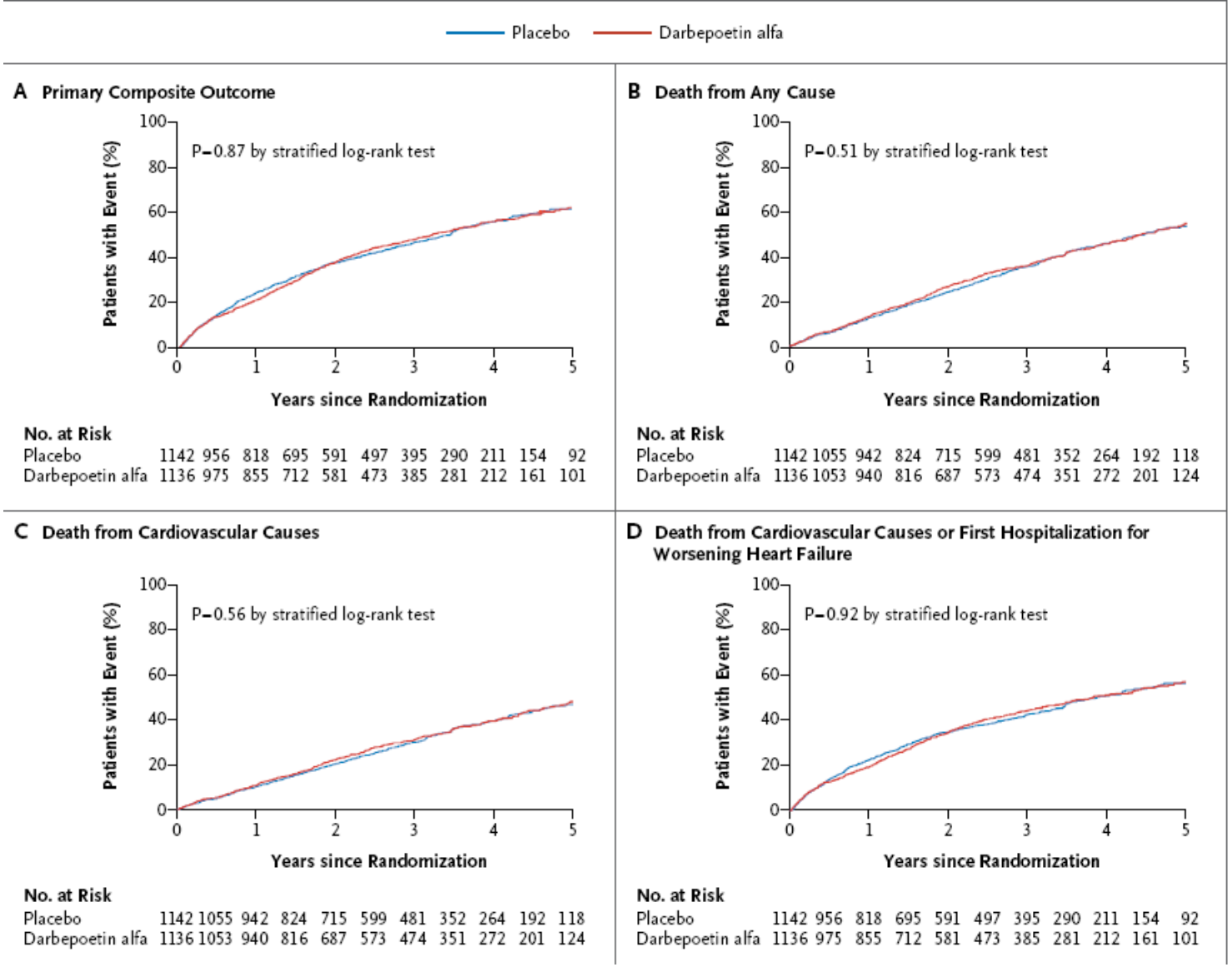


Swedberg et al, NEJM 2013
RED-CHF



No. at Risk											
Placebo	1140	966	803	676	560	459	377	265	182	140	99
Darbepoetin alfa	1133	959	827	673	569	465	372	289	208	158	115

Figure 1. Monthly Hemoglobin Levels through 60 Months According to Study Group.



Treatment with darbepoetin alfa did not improve clinical outcomes in patients with systolic heart failure and mild-to-moderate anemia.

Χορήγηση εξωγενώς ερυθροποιητίνης σε ασθενείς με ΧΝΑ

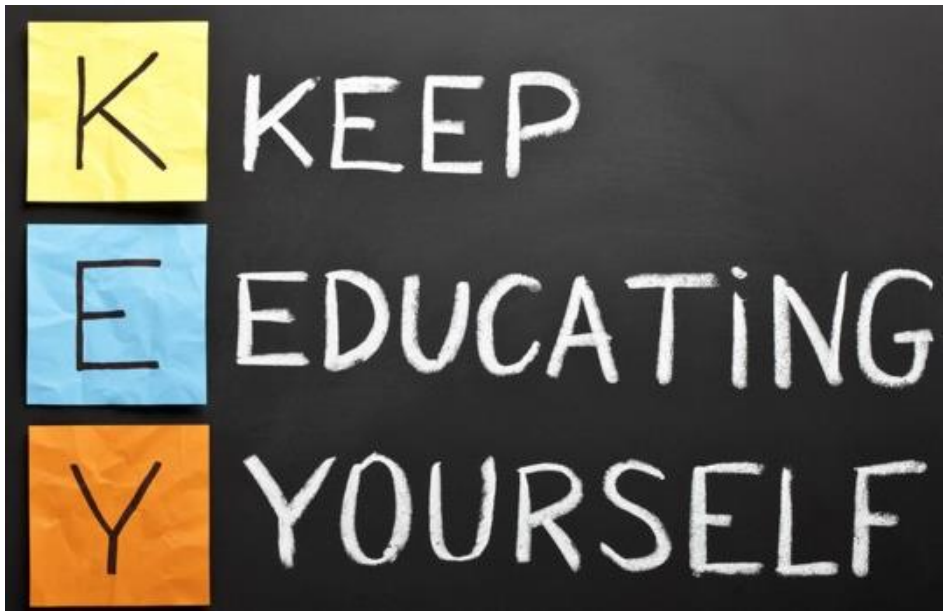
- ΕΡΟ μπορεί να χορηγηθεί, αν η συγκέντρωση της **Hb<10.0 g/dl** (2D)
- Αν δοθεί ΕΡΟ ο στόχος της συγκέντρωσης Hb είναι **11-12 g/dl (2C)** και πάντως **ποτέ >13 g/dl (1A)**

ΣΥΜΠΕΡΑΣΜΑΤΑ

- Ο ορισμός, η παθοφυσιολογία και η θεραπεία του CRS δεν έχουν πλήρως διευκρινισθεί.
- Κύριες αιτίες ανάπτυξης CRS είναι η γήρανση του πληθυσμού και η επιδημία παχυσαρκίας /διαβήτη.
- Ο υπολογισμός της νεφρικής κάθαρσης είναι απαραίτητος γιατί προσφέρει διαγνωστικά, προγνωστικά και θεραπευτικά πλεονεκτήματα.
- Η αναστολή του ΣΡΑΑ μειώνει την θνησιμότητα και νοσηρότητα των καρδιοπαθών, αλλά επιδεινώνει την νεφρική λειτουργία και μειώνει τον αιματοκρίτη προκαλώντας αναιμία (CRAS).

ΣΥΜΠΕΡΑΣΜΑΤΑ (2)

- Επι σιδηροπενίας με δυσαπορρόφηση σιδήρου λόγω φλεγμονής απαιτείται IV σίδηρος.
- Χορήγηση EPO αν Hb <10.0 g/dl με στόχο Hb 11-12 g/dl (ποτέ > 13 g/dl).
- Η συνεργασία καρδιολόγων και νεφρολόγων είναι απαραίτητη.



Ευχαριστώ για την προσοχή σας!