Heart Failure: An Ounce of Prevention vs a Pound of Cure

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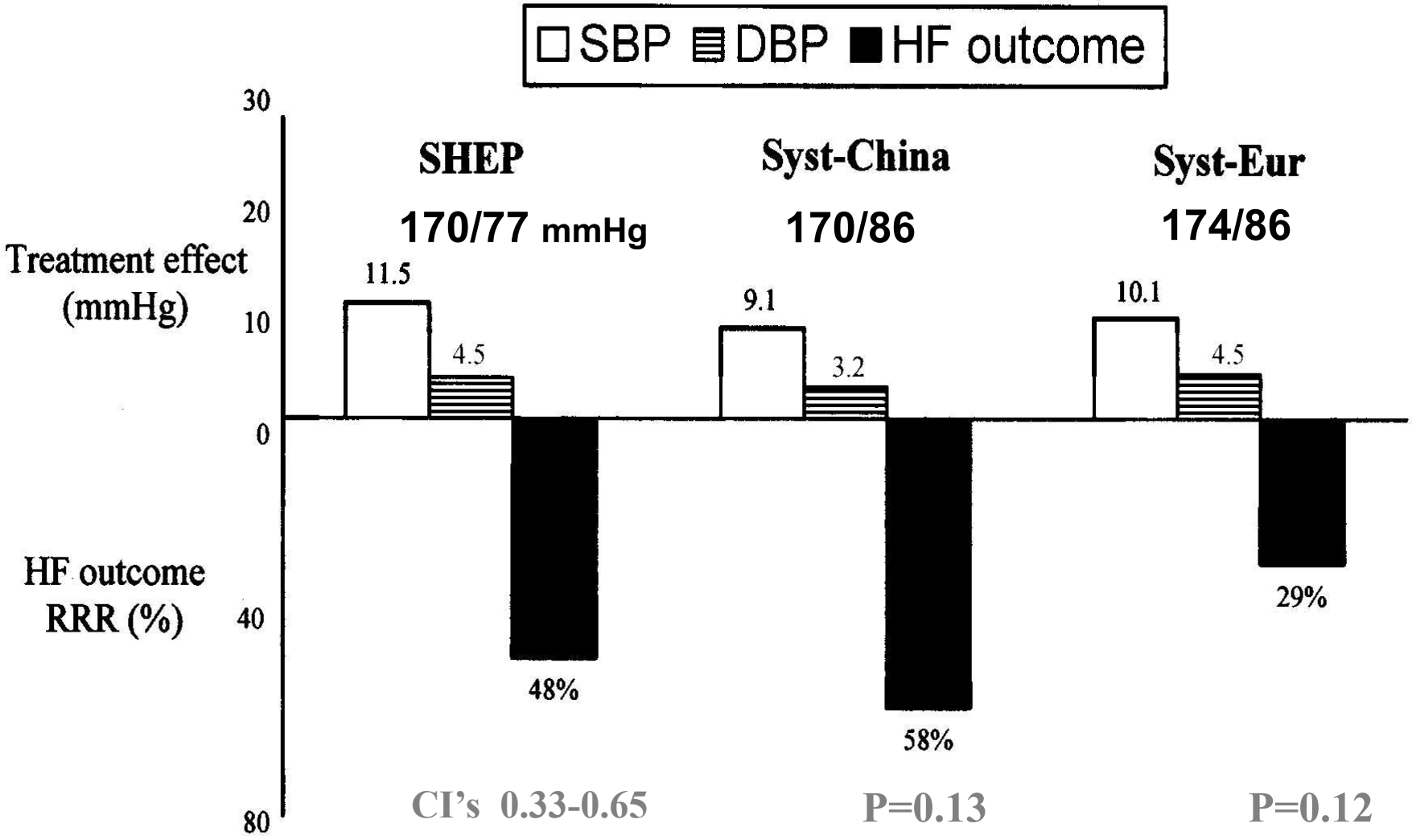
General Principles of HF Prevention

- Maintain healthy life-style habits
- Avoid excessive alcohol
- Have regular ‘flu shot
- Identify those at risk
- Prevent myocardial infarction
- Treat hypertension, DM, lipids
- Correct ischemia
- Correct valvular regurgitation
- Correct uncontrolled A Fib

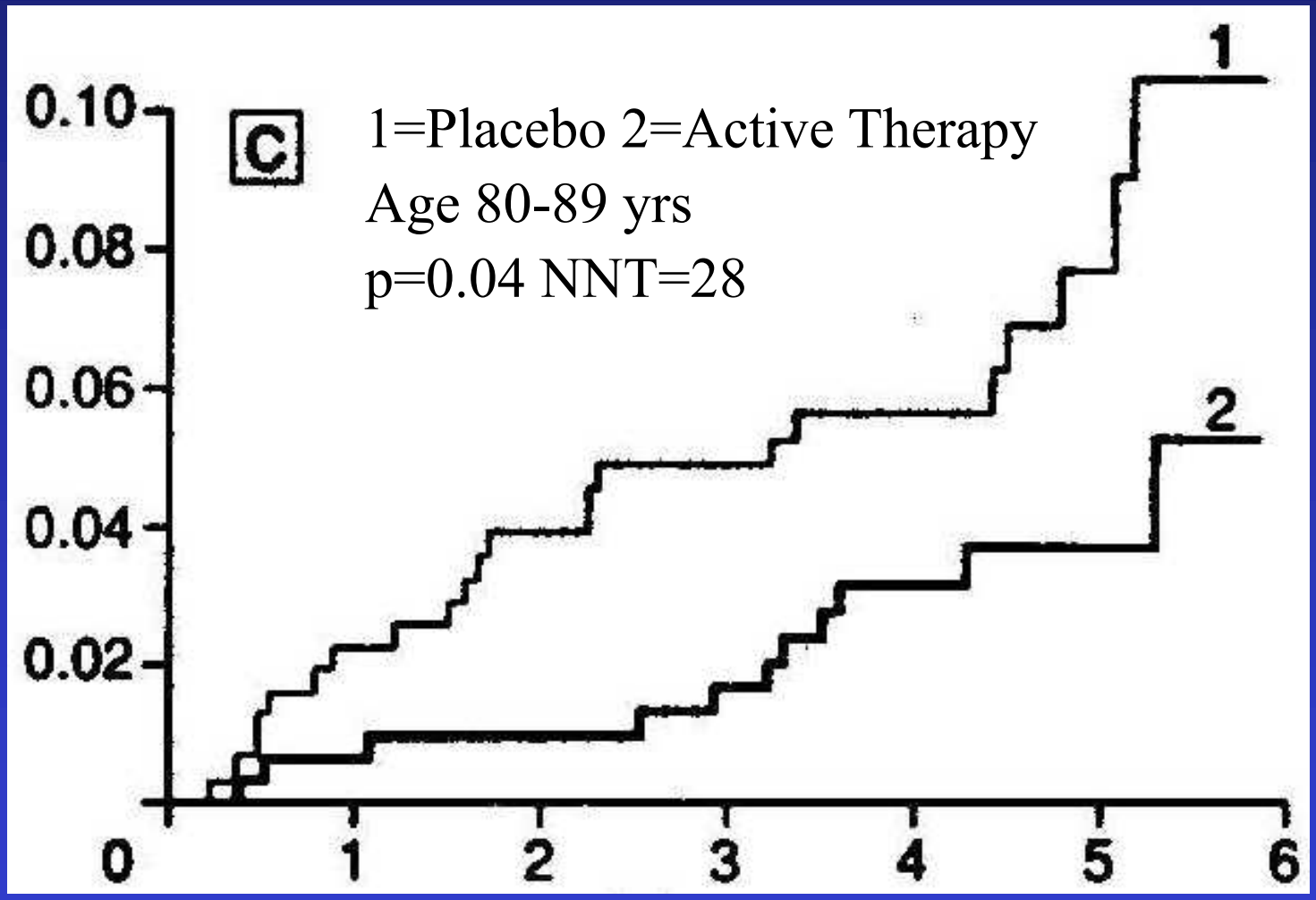
Systolic Hypertension Trials



Lee & Arnold 2003

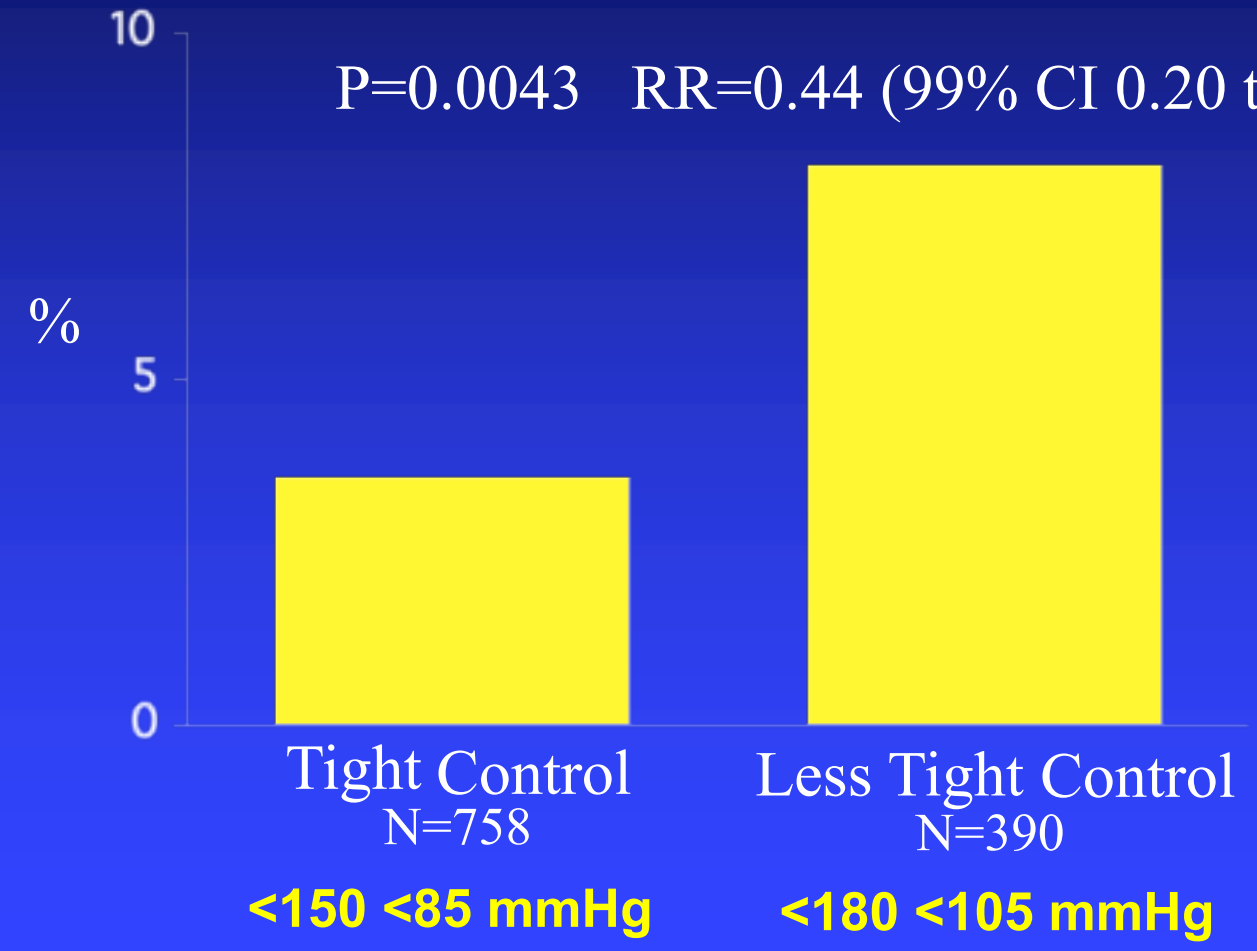
SHEP

Fatal & Hospitalized nonfatal HF



Kostis et al. JAMA 1997;278:212-6

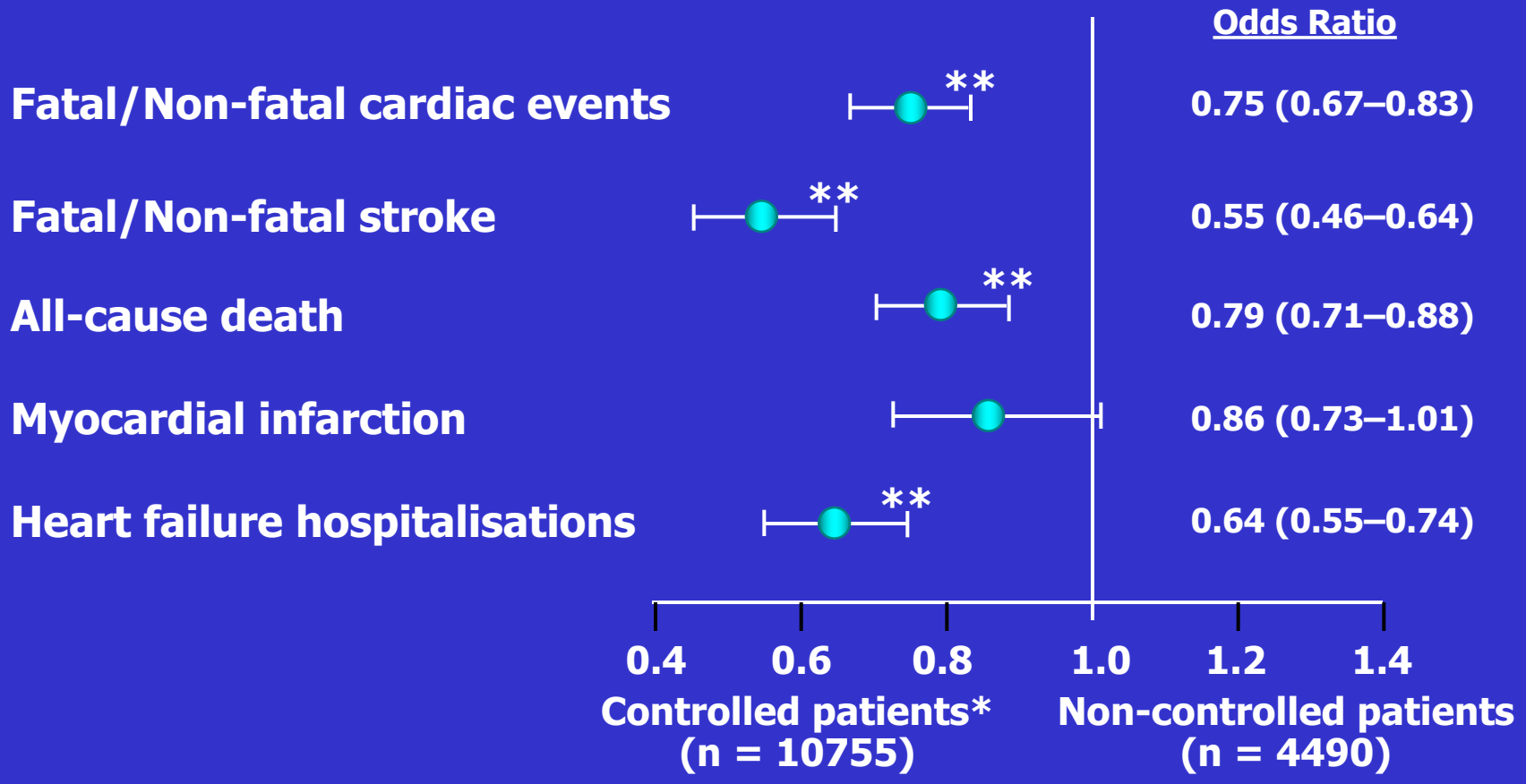
Heart Failure Endpoint in UKPDS 38



BMJ 1998;317:703-713

VALUE: Analysis of Results Based on BP Control at 6 Months

Pooled Treatment Groups



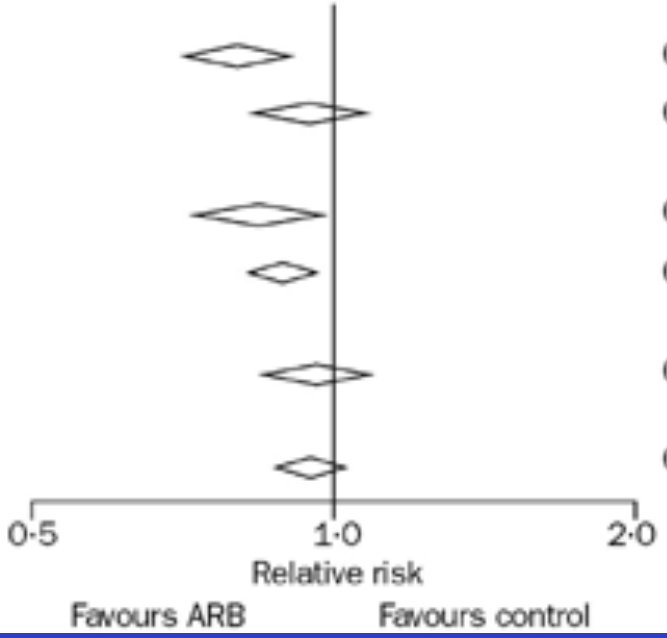
*SBP < 140 mmHg at 6 months

**$P < 0.01$.

Weber MA et al. *Lancet.* 2004;363:2047–49

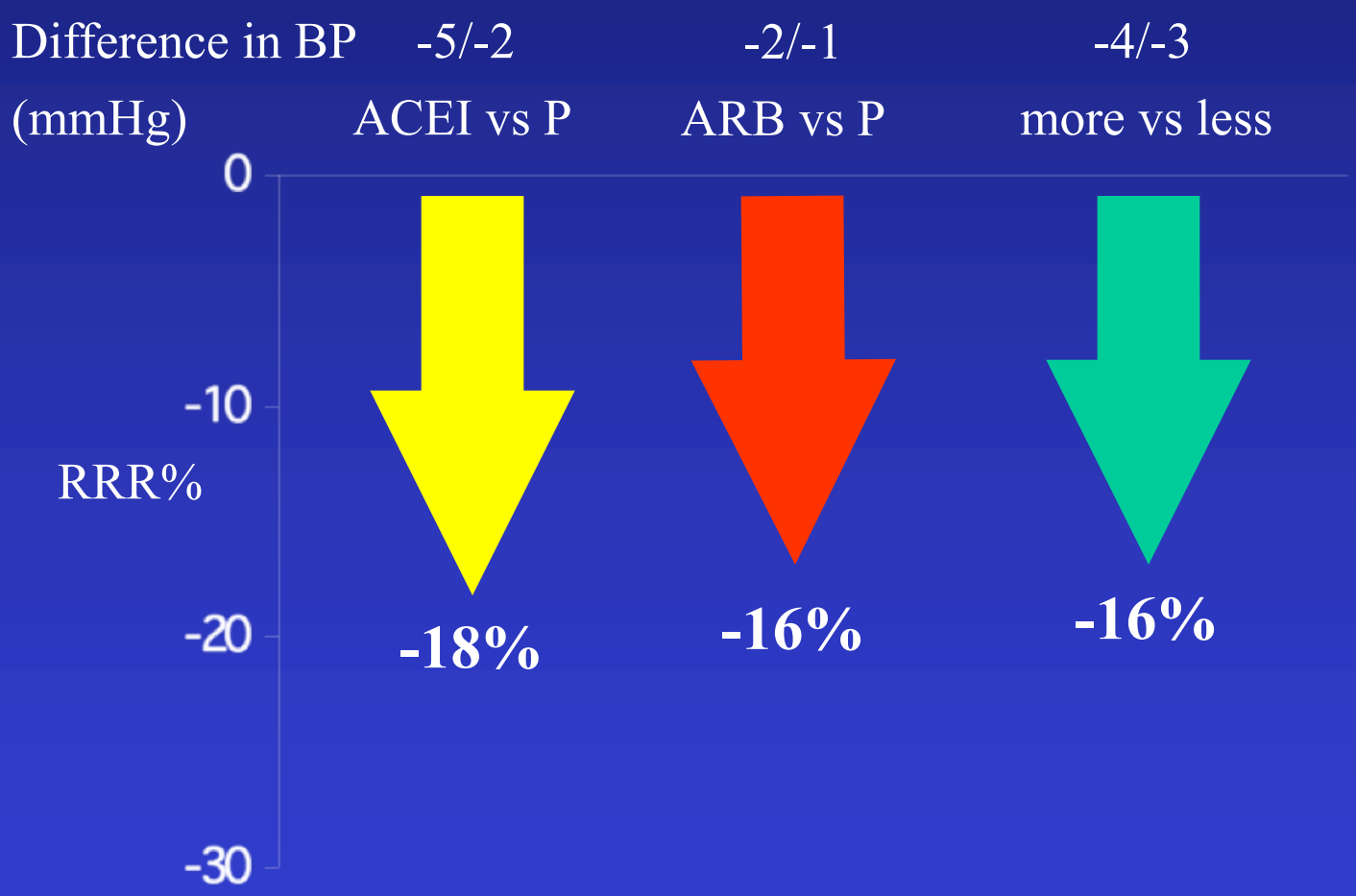
ARB BASED BP LOWERING REGIMENS

	Trials	Events/participants ARB	Control	Difference in BP* (mean, mm Hg)	Relative risk (95% CI)	p
Stroke[12–15]	4	396/8412	500/8379	–2/–1	0·79 (0·69–0·90)	0·46
Coronary heart disease[12–15]	4	435/8412	450/8379	–2/–1	0·96 (0·85–1·09)	0·43
Heart failure[13–15]	3	302/5935	359/5919	–2/–1	0·84 (0·72–0·97)	0·26
Major cardiovascular events[12–15]	4	1135/8412	1268/8379	–2/–1	0·90 (0·83–0·96)	0·78
Cardiovascular death[12–15]	4	491/8412	511/8379	–2/–1	0·96 (0·85–1·08)	0·34
Total mortality[12–15]	4	887/8412	943/8379	–2/–1	0·94 (0·86–1·02)	0·59



BP Lowering Collaboration Lancet 2003;362:1527-35

BP LOWERING REGIMENS IN HF



P=placebo
More vs less BP lowering regimens

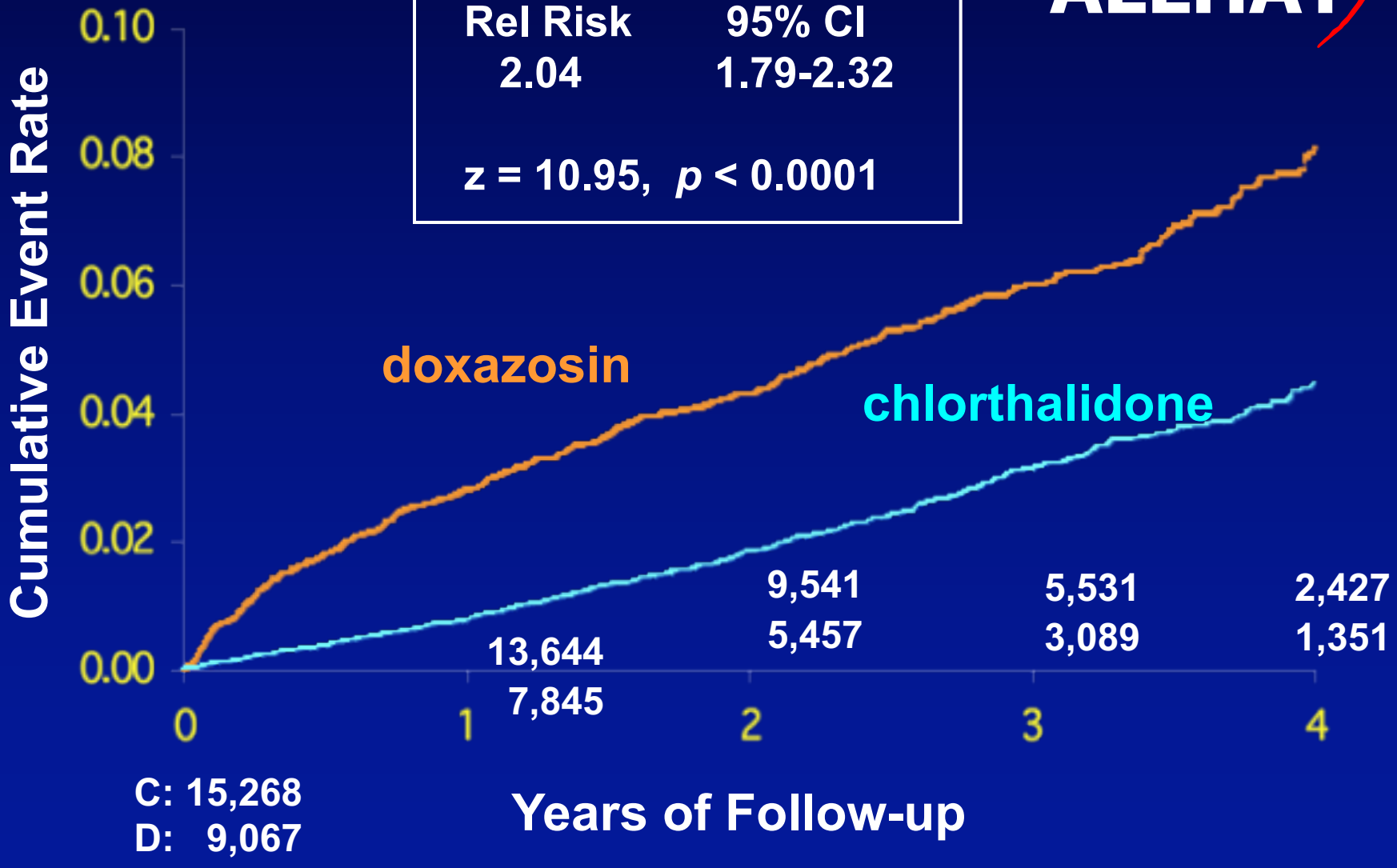
BP Trialists. Lancet 2003;362:1527-35

Heart Failure

ALLHAT

Rel Risk	95% CI
2.04	1.79-2.32

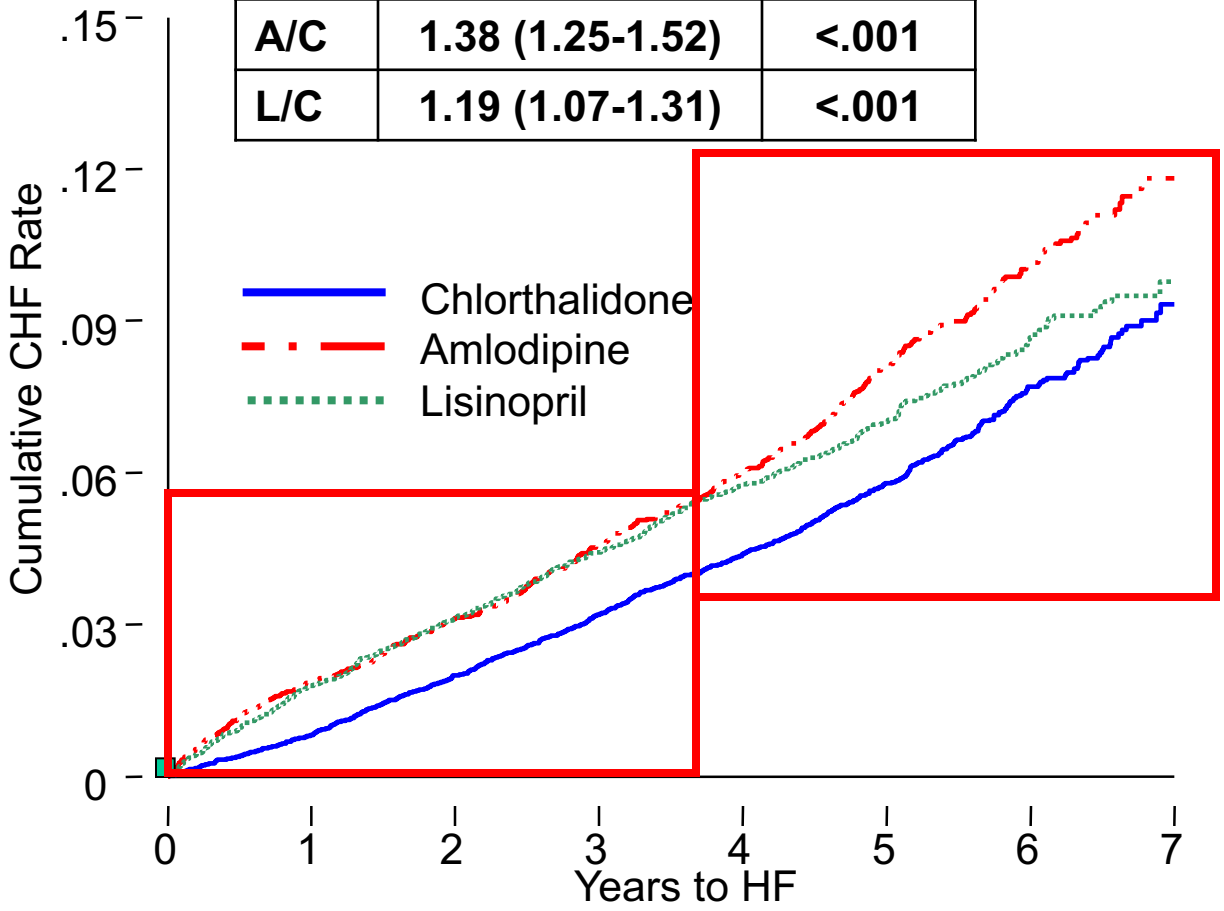
$z = 10.95$, $p < 0.0001$



JAMA. 2000;283:1967-1975

Cumulative Event Rates for Heart Failure by ALLHAT Treatment Group

	HR (95% CI)	p value
A/C	1.38 (1.25-1.52)	<.001
L/C	1.19 (1.07-1.31)	<.001



Number at risk:								
Chlor	15, 255	14, 528	13, 898	13, 224	11, 511	6, 369	3, 016	384
Amlo	9, 048	8, 535	8, 185	7, 801	6, 785	3, 775	1, 780	210
Lisin	9, 054	8, 496	8, 096	7, 689	6, 698	3, 789	1, 837	313

BENEFITS OF LOWERING BP

	Average % Reduction
Stroke Incidence	35-40
Myocardial Infarction	20-25
Heart Failure	50

In stage 1 HTN and additional CVD risk factors, achieving a sustained 12 mmHg reduction in SBP over 10 years, will prevent 1 death for every 11 patients treated

Simvastatin and HF

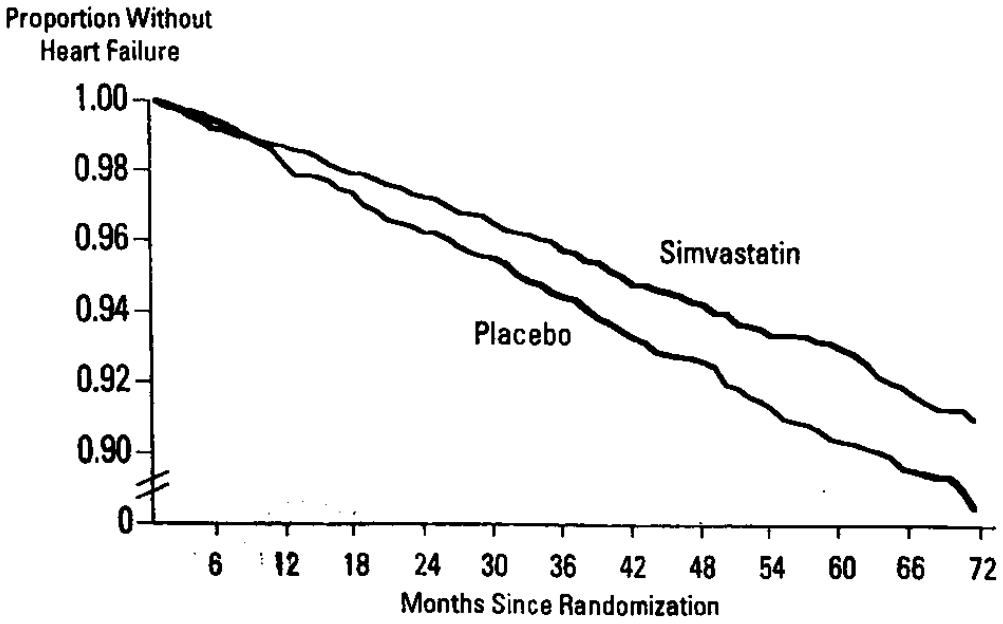
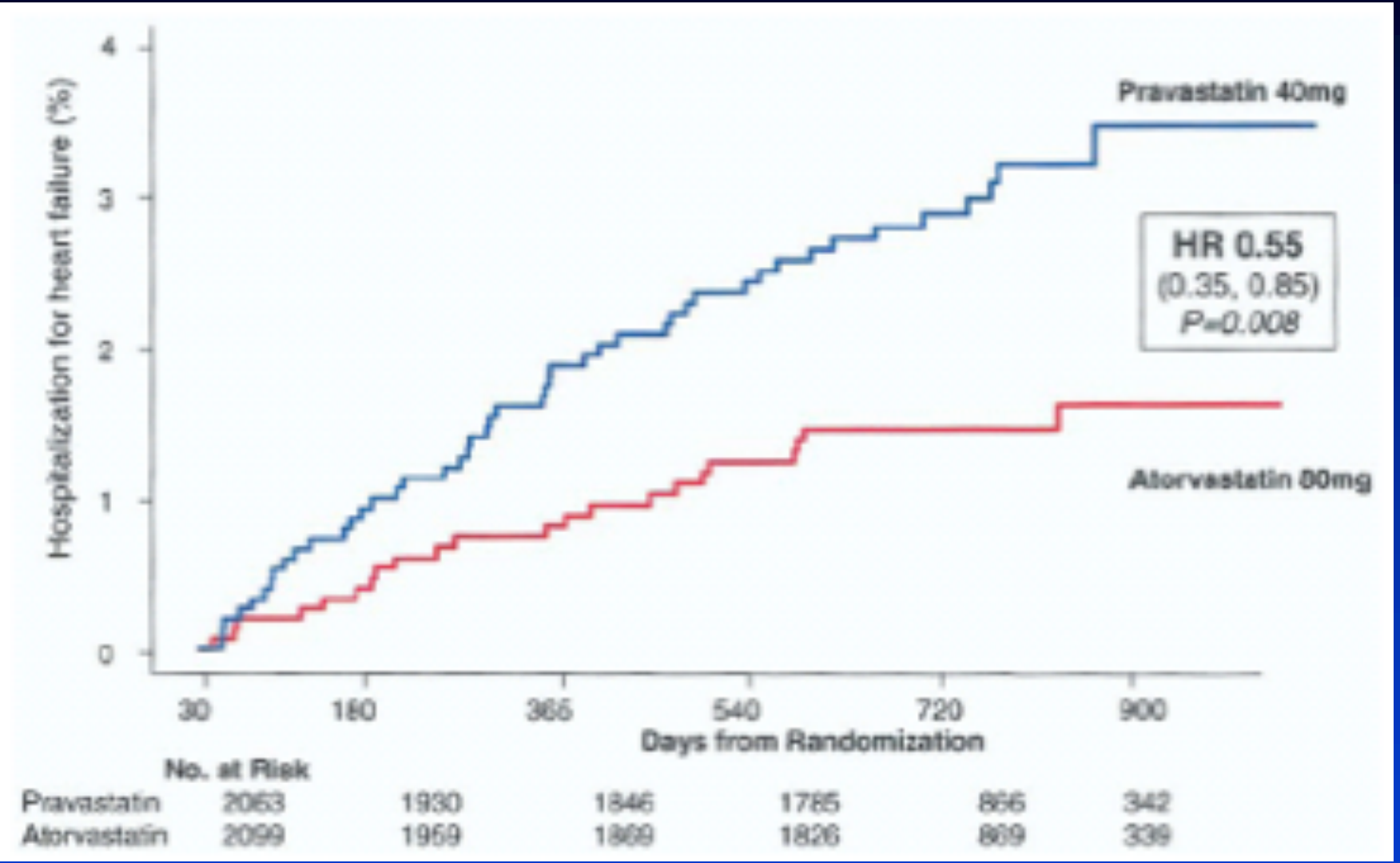


Fig. 1. Kaplan–Meier curves for new adverse experience of clinical heart failure in patients with coronary artery disease but no previous evidence of heart failure.

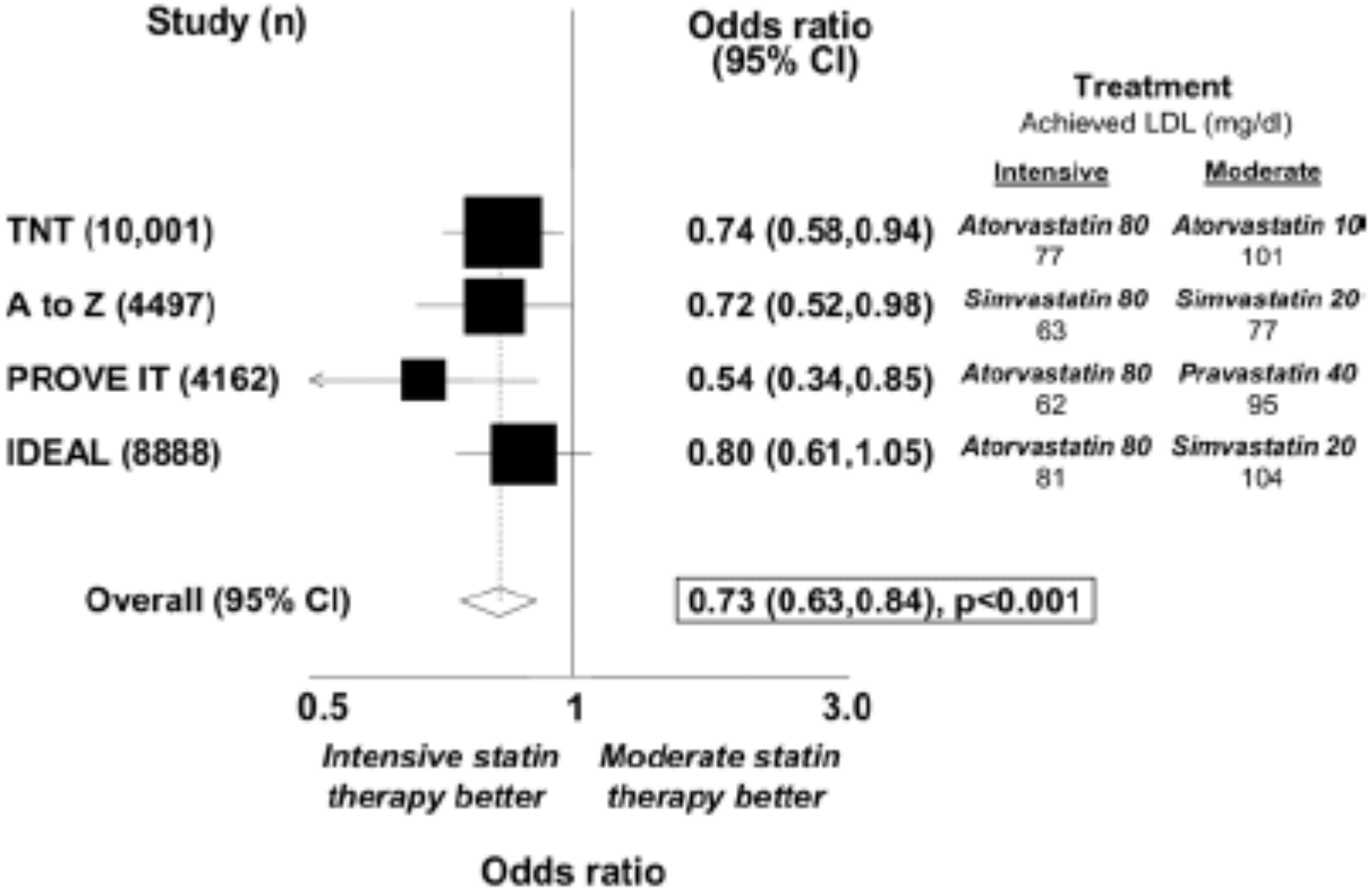
Kjekshus et al J Cardiac Failure 1997;3:249-54

STATINS AND PROVE IT



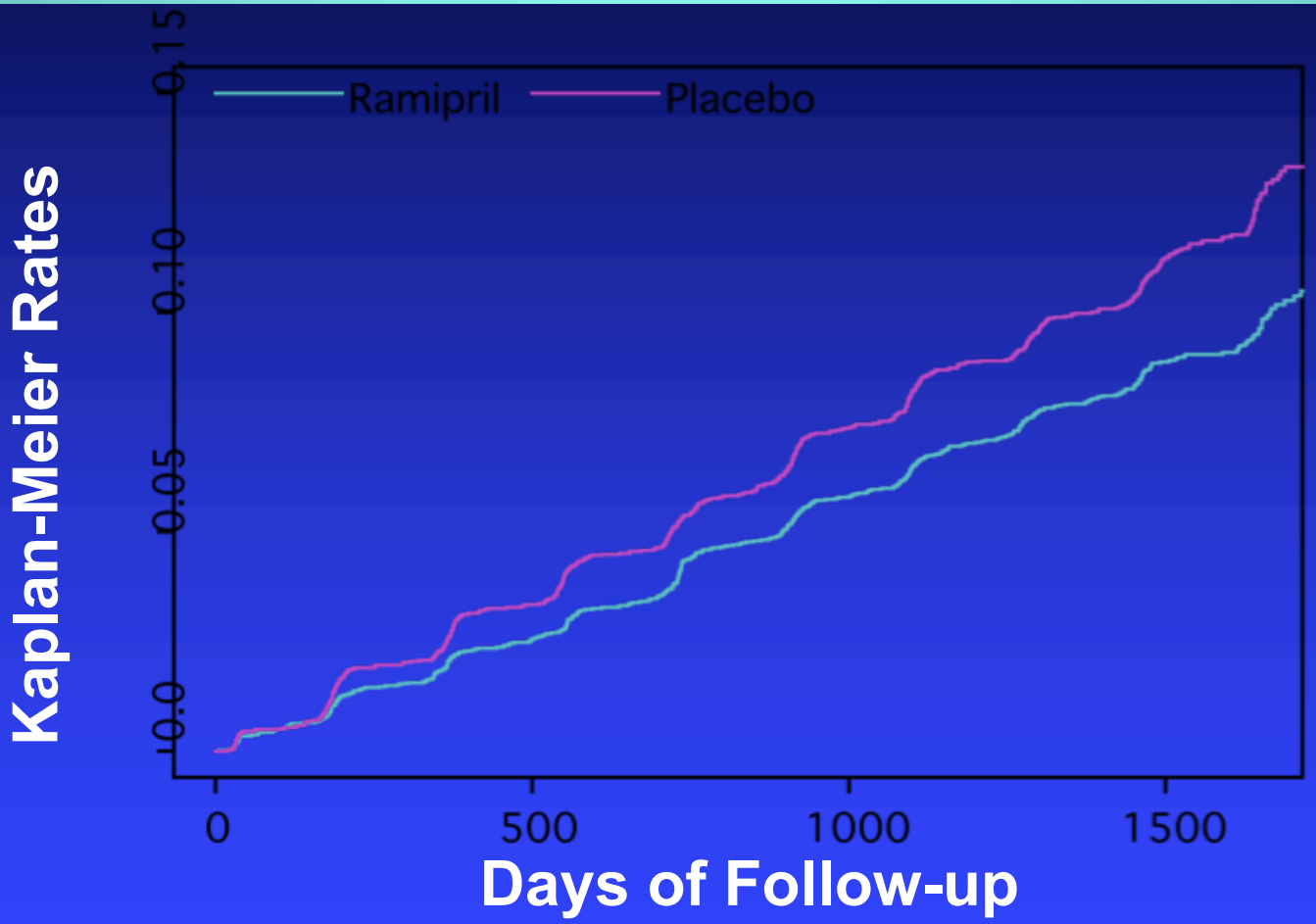
Scirica et al. JACC 2006;47:2326-31

STATIN TRIALS METANALYSIS
Hospitalization for HF n=27,546 patients



Scirica et al. JACC 2006;47:2326-31

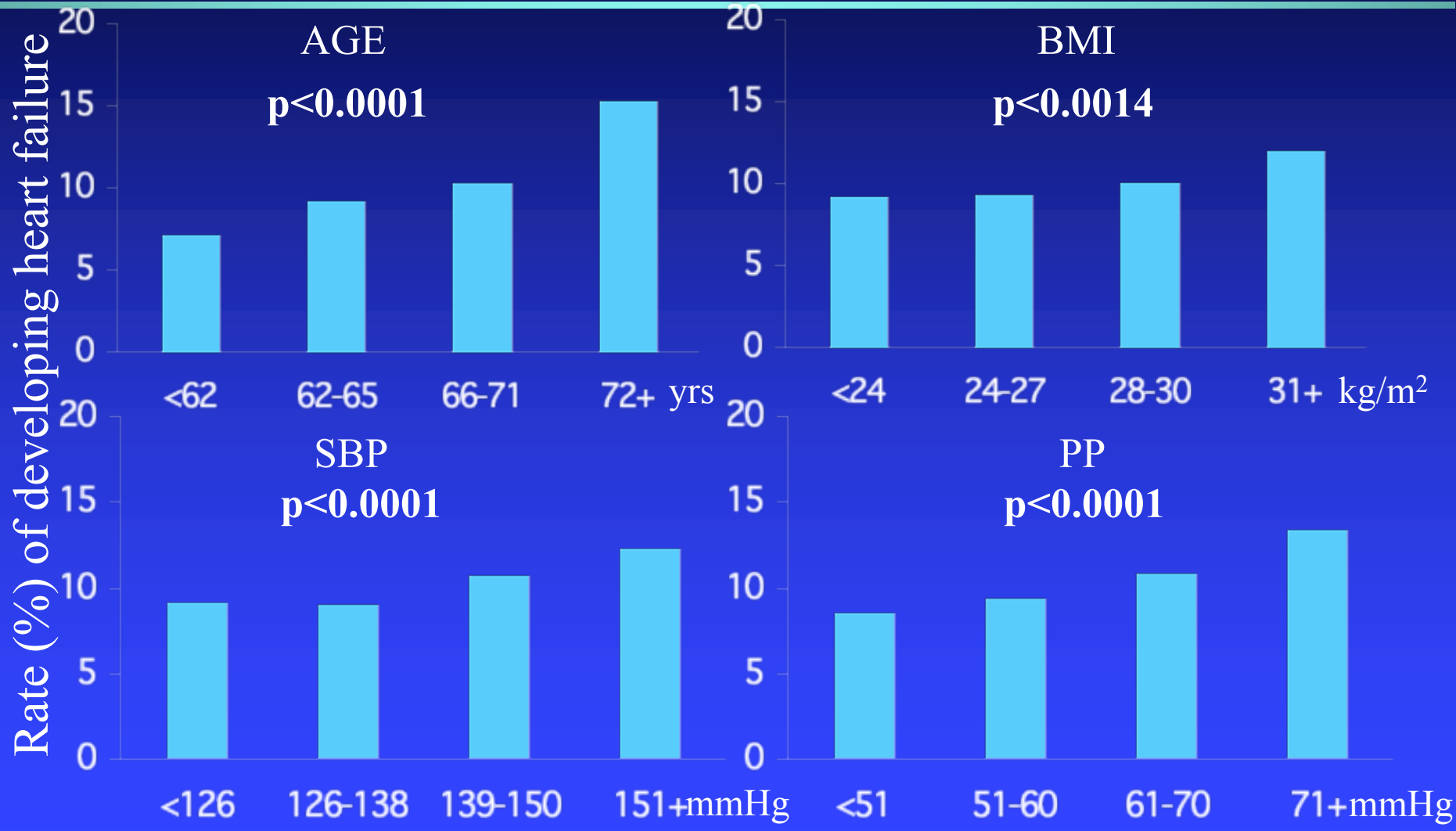
All Heart Failure



RR=0.77 (0.68-0.87) p<0.0001

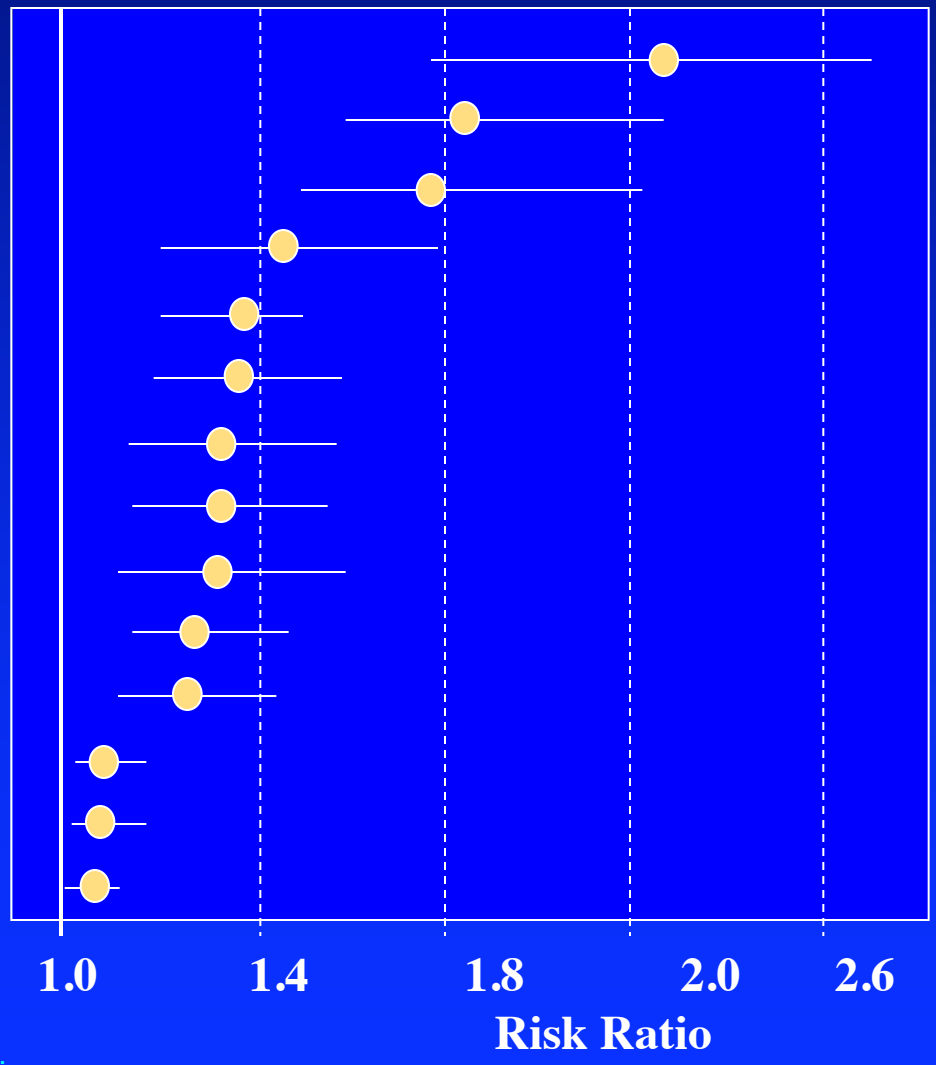
Arnold et al. Circulation 2003;107:1282-8

Prevention of HF in HOPE



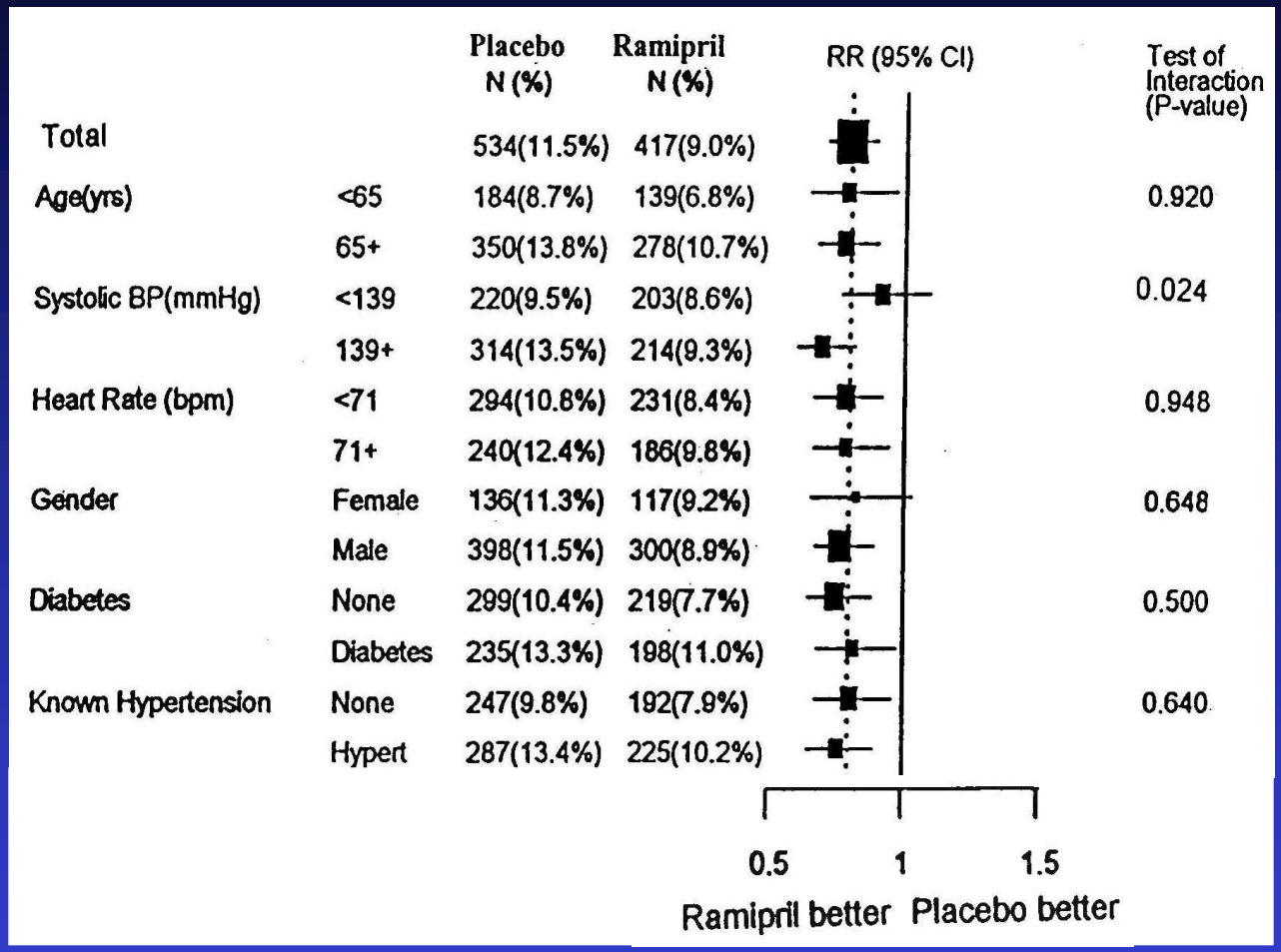
Arnold et al. Circulation 2003;107:1282-8

Baseline Characteristics Independently Associated with Heart Failure in HOPE



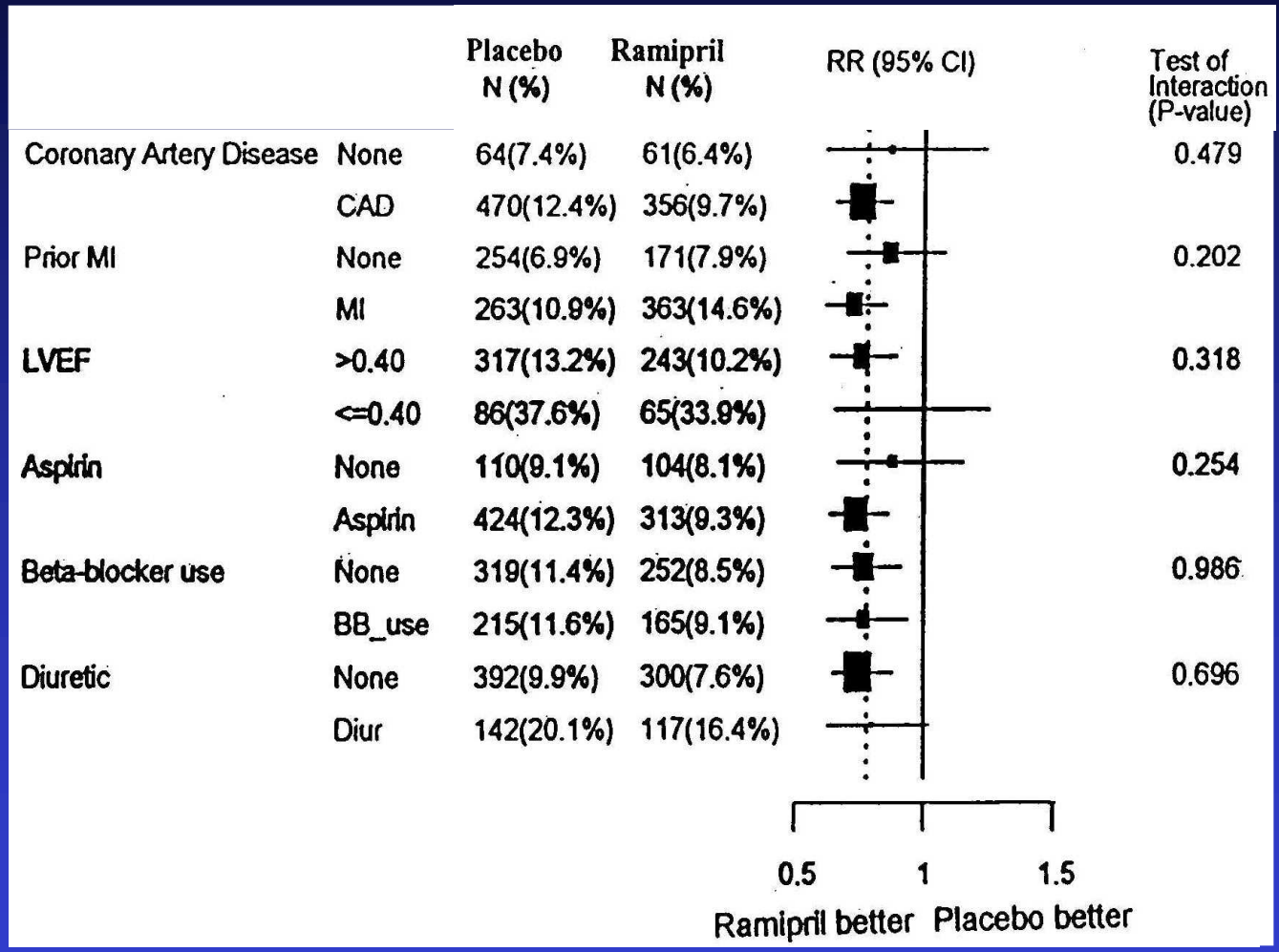
Arnold JMO, et al. Circulation 2003; 107:1282-8.

Prevention of HF in HOPE



Arnold et al. Circulation 2003;107:1282-8

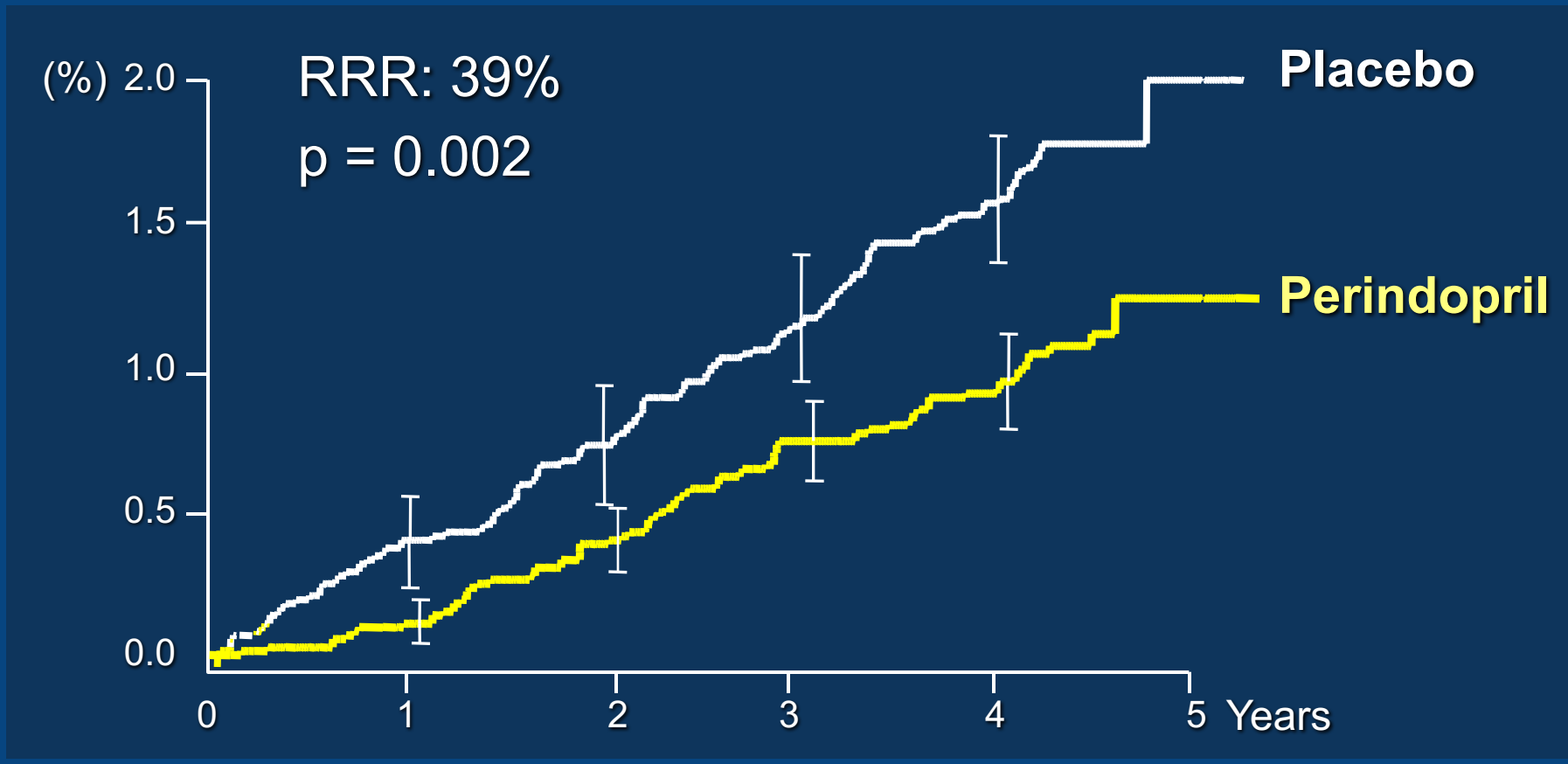
Prevention of HF in HOPE



Arnold et al. Circulation 2003;107:1282-8

EUROPA

Hospitalisation for heart failure



Placebo Annual Event Rate: 0.4%

PEACE

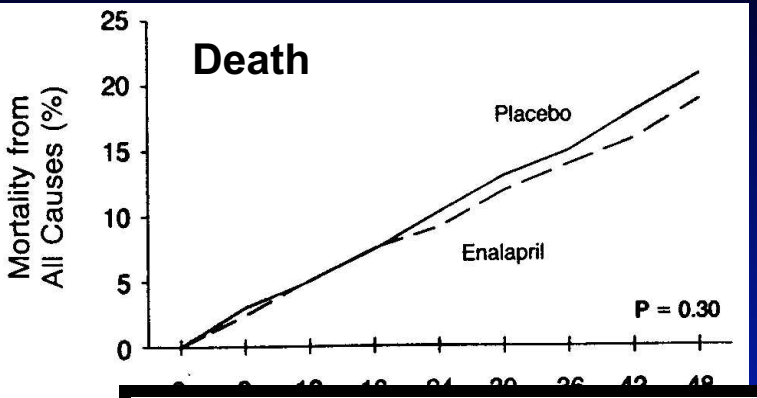
Post hoc analyses	Trandolapril	Placebo	Hazard Ratio	P value
Death from cardiovascular causes, nonfatal MI, or stroke (outcome in HOPE)	396 (9.5)	420 (10.2)	0.93 (0.81–1.07)	0.32
Death from cardiovascular causes, nonfatal MI, or cardiac arrest (outcome in EUROPA)	346 (8.3)	356 (8.6)	0.96 (0.83–1.12)	0.62
CHF				
As primary cause of hospitalization or death	115 (2.8)	152 (3.7)	0.75 (0.59–0.95)	0.02
As primary cause of hospitalization	105 (2.5)	134 (3.2)	0.77 (0.60–1.00)	0.05
As primary cause of death	15 (0.4)	25 (0.6)	0.59 (0.31–1.13)	0.11
Stroke	71 (1.7)	92 (2.2)	0.76 (0.56–1.04)	0.09
Onset of new diabetes†	335 (9.8)	399 (11.5)	0.83 (0.72–0.96)	0.01

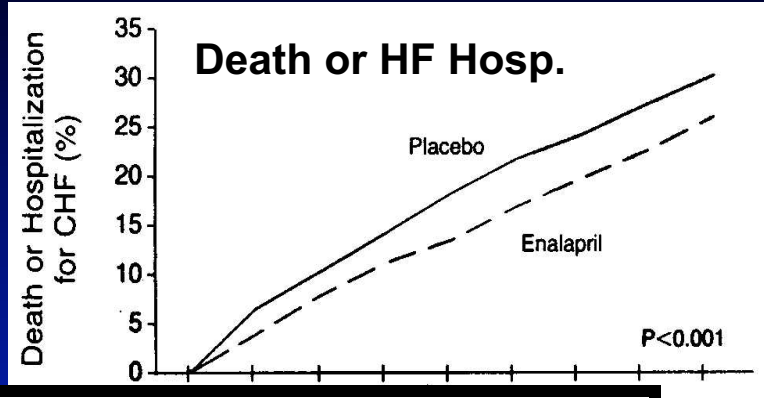
* CI denotes confidence interval, MI myocardial infarction, CHF congestive heart failure, PEACE the Prevention of Events with Angiotensin Converting Enzyme Inhibition Trial, HOPE the Heart Outcomes Prevention Evaluation,[15] and EUROPA the European Trial on Reduction of Cardiac Events with Perindopril in Stable Coronary Artery Disease.[16]

† The analysis included 3432 patients in the trandolapril group and 3472 patients in the placebo group and excluded patients with diabetes at baseline.

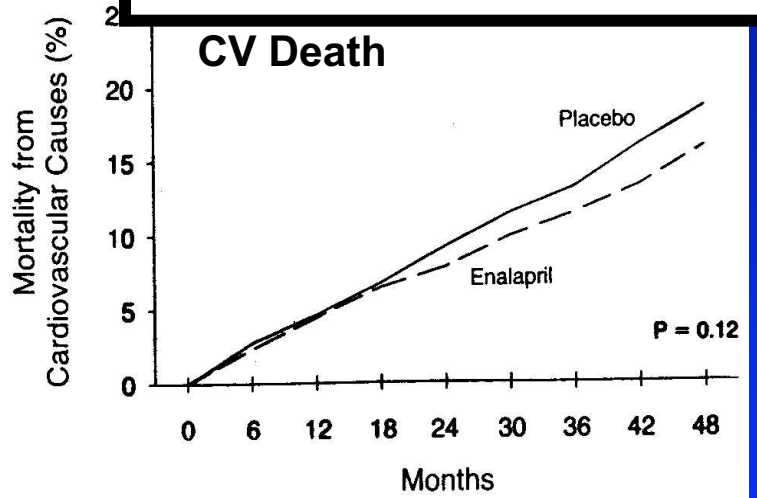
PEACE Investigators NEJM 2004;351:2058-68

SOLVD PREVENTION





Benefits greater in LVEF < 0.28



Placebo	2117	2054	2009	1854	1566	1234	934	627	399
Enalapril	2111	2059	2000	1837	1580	1244	955	684	436

Figure 1. Total Mortality (Upper Panel) and Mortality from Cardiovascular Causes (Lower Panel) in the Prevention Trial.

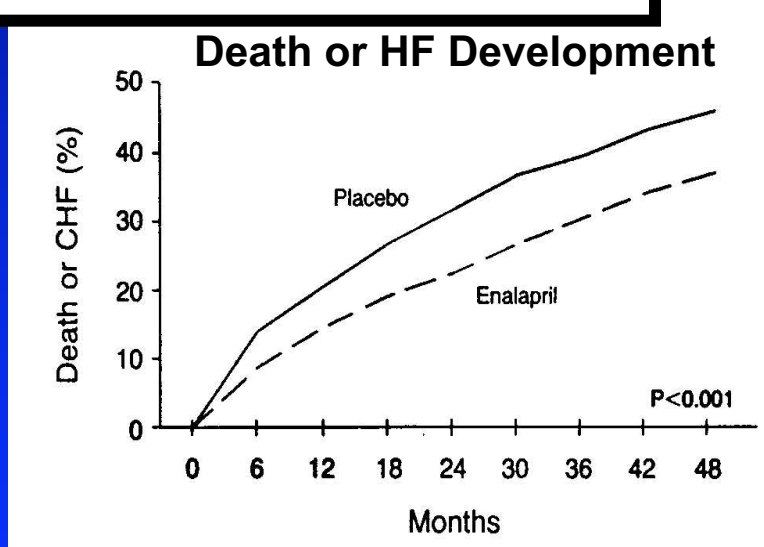


Figure 2. Death or Hospitalization for Congestive Heart Failure (CHF) and Death or Development of Heart Failure in the Prevention Trial.

The SOLVD Investigators N Engl J Med 1992;327:685-91

Enalapril Beneficial in LV Dysfunction with Hypertension

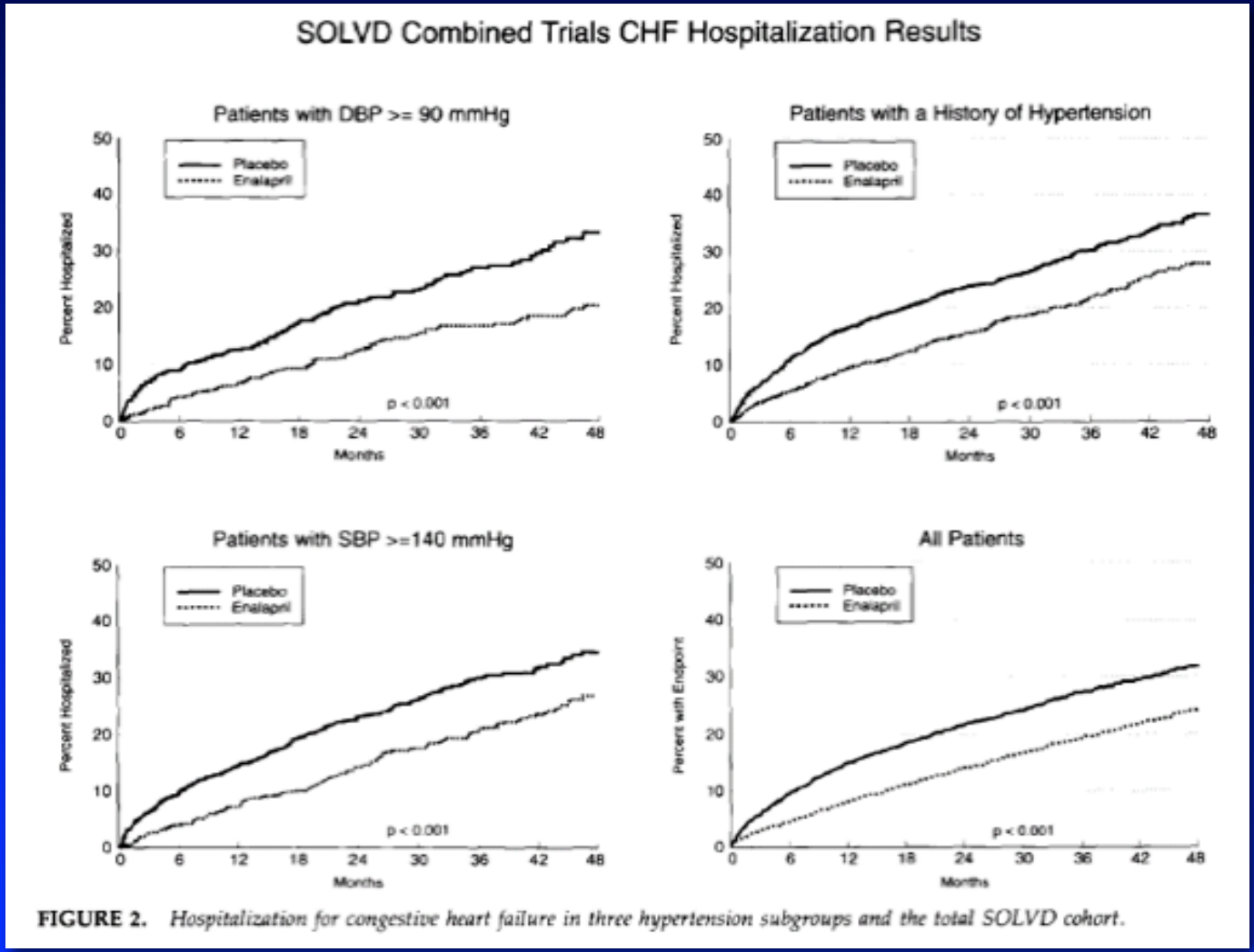
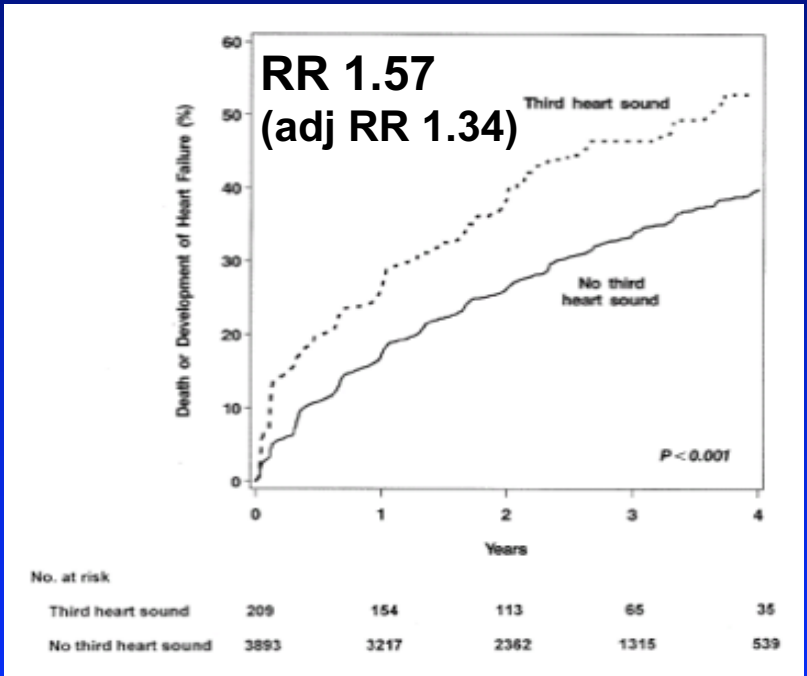


FIGURE 2. *Hospitalization for congestive heart failure in three hypertension subgroups and the total SOLVD cohort.*

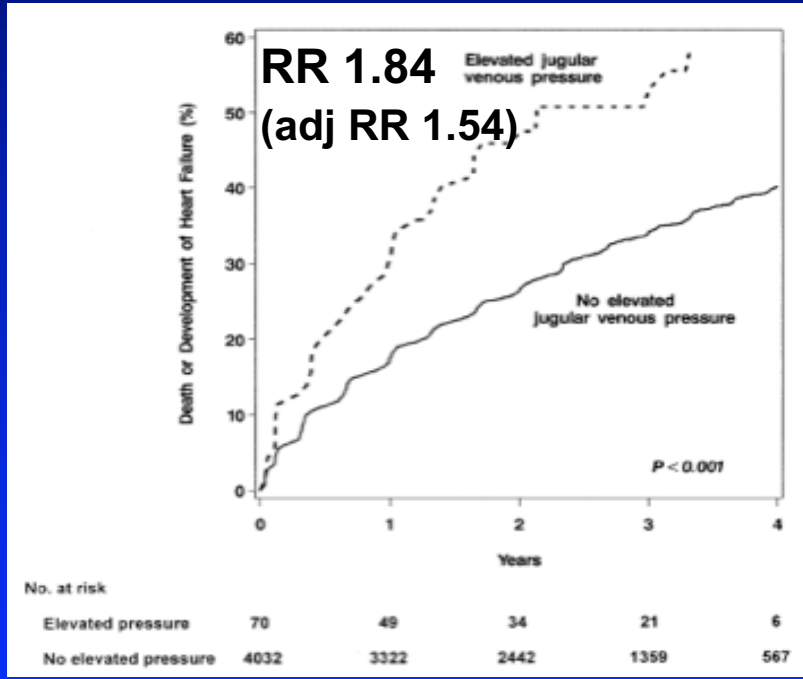
Kostis AJH 1995;8:909-14

S3 and JVP Predict HF Hospitalization SOLVD Prevention

S3



JVP



Drazner et al Am J Med 2003;114:431-7

Risk Factors for HF Development

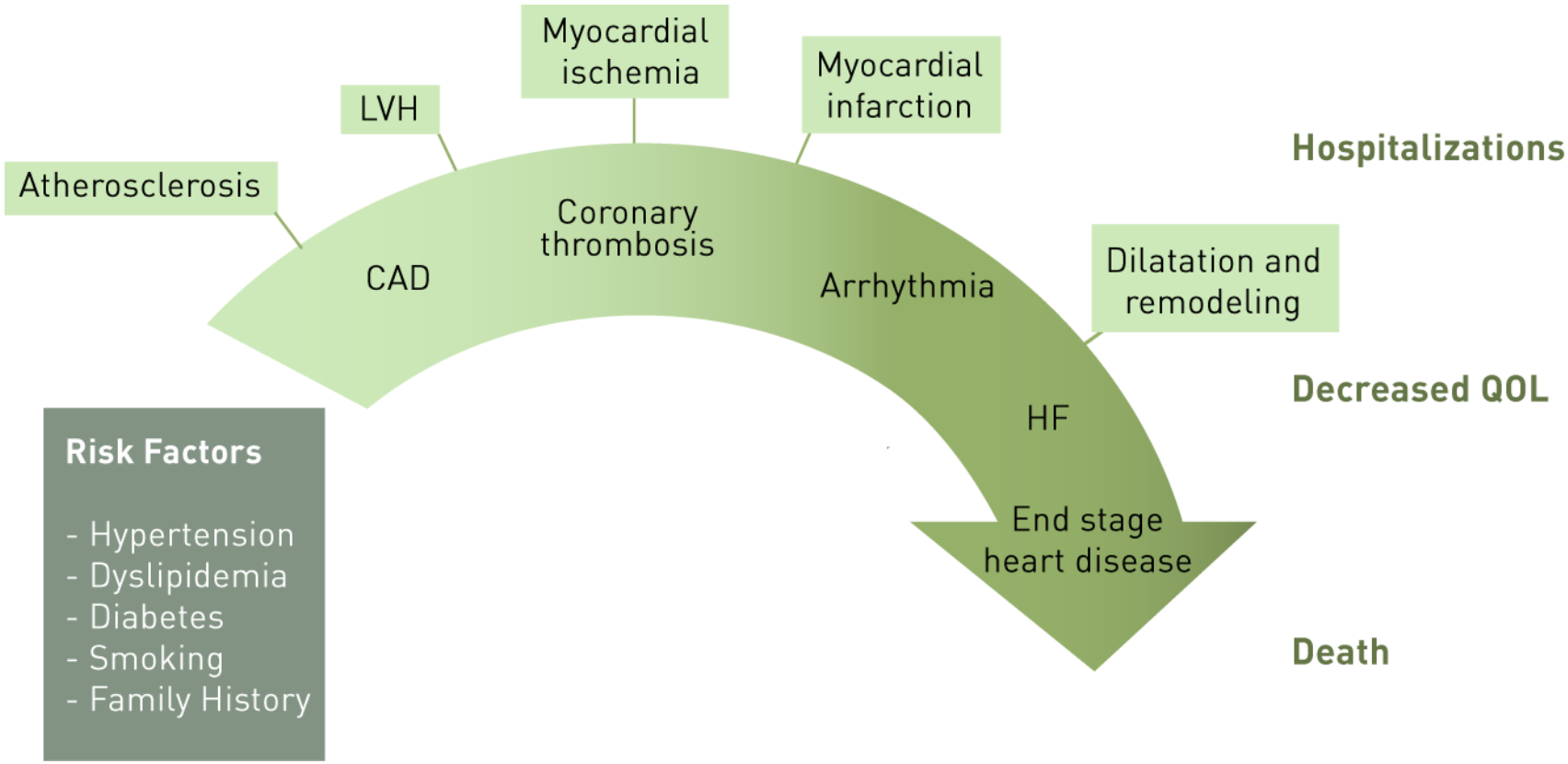
- Hypertension*
- Ischemic heart disease*
- Diabetes*/metabolic syndrome
- Hyperlipidemia*
- Smoking*
- Obesity
- Older age
- Male gender
- Ethnicity
- Physical inactivity
- Heavy alcohol consumption
- Excessive salt intake
- Cardiotoxic agents
- Family history/genetics
- Low ejection fraction*
- Impaired diastolic function
- Left ventricular hypertrophy
- Elevated neurohormonal biomarkers
- Abnormal ECG
- Increased cardiothoracic ratio
- Microalbuminuria
- Elevated resting heart rate

* Most important targets for prevention

Arnold JMO, Howlett JG, et al. *Can J Cardiol* 2007;23(1):21-45.

Leadership. Knowledge. Community.

The Heart Failure Continuum



Patients at Risk of Developing HF

- Clinical assessment is recommended in all patients to identify known or potential risk factors for HF (eg hypertension, IHD, diabetes, hyperlipidemia, smoking)

(Class I, Level C)

- All modifiable risk factors for HF, including those for CAD, such as hypertension, diabetes mellitus and hyperlipidemia, should be treated according to current national guidelines

(Class I, Level A)

Practical Tips

- Poor adherence to preventive measures is common. Reassess regularly to ensure targets achieved/maintained
- Patients at high risk for HF should receive influenza vaccine (yearly) and pneumococcal vaccine (if not in last 6 yrs)

Arnold JMO, Howlett JG, et al. *Can J Cardiol* 2007;23(1):21-45.

Hypertension, LV Hypertrophy and HF Risk

- Presence of hypertension increases risk of HF
  eg Framingham Study
- Presence of LVH increases risk of HF and risk is independent of association with hypertension
- Treatment of hypertension clearly reduces risk of HF
  eg BP Lowering Treatment Trialists' Collaboration

Practical Tips

- BP goal <140/90mmHg in most individuals
- <130/80mmHg in diabetes and/or kidney disease and perhaps in patients with multiple risk factors

Arnold JMO, Howlett JG, et al. *Can J Cardiol* 2007;23(1):21-45.

Ischemic Heart Disease and HF Risk

- 52% of HF diagnoses in general population attributed to CAD
- 40% of patients who have experienced an MI will develop HF over time
- 8-fold increase in risk of subsequent death when a new MI occurs in patients with established HF
- 1/3 of all deaths in HF are preceded by an ischemic event

- Target dyslipidemia, hypertension, diabetes, smoking. Treat aggressively

Arnold JMO, Howlett JG, et al. *Can J Cardiol* 2007;23(1):21-45.

Diabetes Mellitus and HF Risk

- DM increases risk 2 to 4 fold compared to patients without DM
- DM is well established risk factor for CAD/IHD
- DM may produce HF independently of CAD (diabetic CM)
- While increased HbA1C is associated with increased HF, no study to date has shown improved glycemic control reduces HF
- Canadian Diabetes Association recommends HbA1C ≤7.0% in most patients with DM

Arnold JMO, Howlett JG, et al. *Can J Cardiol* 2007;23(1):21-45.

Heart Failure and Diabetes

Recommendation

- Treat elevated blood glucose to achieve:
  - HbA1C ≤ 7.0%
  - fasting/preprandial blood glucose 4.4 mmol/L to 7.0 mmol/L

(Class I, Level A)

Practical Tips

- Oral antidiabetic therapy should be individualized; no compelling evidence exists to recommend one agent over another
- Metformin may be considered a first-line agent if the eGFR is > 30 mL/min but should be discontinued temporarily if renal function worsens significantly

Arnold JMO, Howlett JG, et al. *Can J Cardiol* 2007;23(1):21-45.

Hyperlipidemia and HF Risk

- Elevated TG and elevated TC/HDL are associated with increase in HF risk
- Statin therapy may reduce HF risk

Practical Tips

- Hyperlipidemia should be treated aggressively
- In patients at high risk for HF, target LDL may be <2.0mmol/L
- Statins may be the preferred drug

Arnold JMO, Howlett JG, et al. *Can J Cardiol* 2007;23(1):21-45.

Smoking and HF Risk

- Smoking may account for 17% of new HF cases
- Smoking has a direct and independent relationship with the development of asymptomatic ventricular dysfunction
- Smoking cessation can reduce morbidity and mortality by 30% within 2 years in patients with HF

Practical Tip

- Smoking cessation is an important strategy to prevent HF

Arnold JMO, Howlett JG, et al. *Can J Cardiol* 2007;23(1):21-45.

Patients with Asymptomatic LV Dysfunction

- ACE inhibitors should be used in all asymptomatic patients with LV dysfunction and LVEF <40%

  (Class 1, Level A, LVEF <35%; Class I, Level B, LVEF 35-40%)

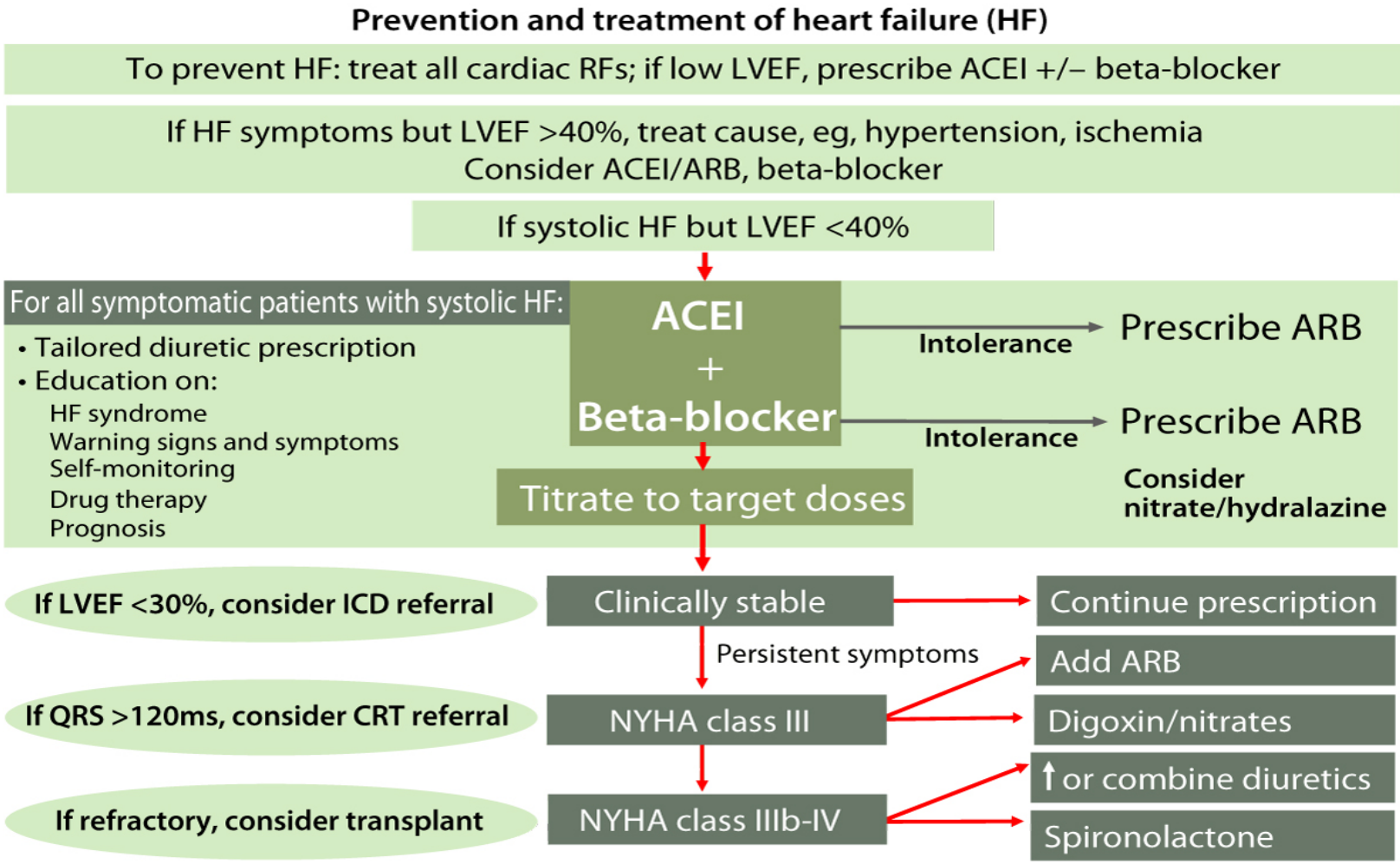
- Beta-blockers should be considered in all asymptomatic patients with LV dysfunction and LVEF < 40%

  (Class I, Level B, prior MI; Class IIa, Level C, no prior MI)

Arnold JMO, Howlett JG, et al. *Can J Cardiol* 2007;23(1):21-45.

Leadership. Knowledge. Community.

Heart Failure Management



Arnold JMO, Howlett JG, et al. *Can J Cardiol* 2007;23(1):21-45.

Prevention of Heart Failure: Key Points

- Actively review patients in your practice for heart failure risk factors
- Aggressively treat the most important target risk factors to prevent the development of heart failure
- Prescribe proven ACE-I and beta blocker for most patients with known LV systolic dysfunction