Peri-operative Troponin Measurements - Pathophysiology and Prognosis

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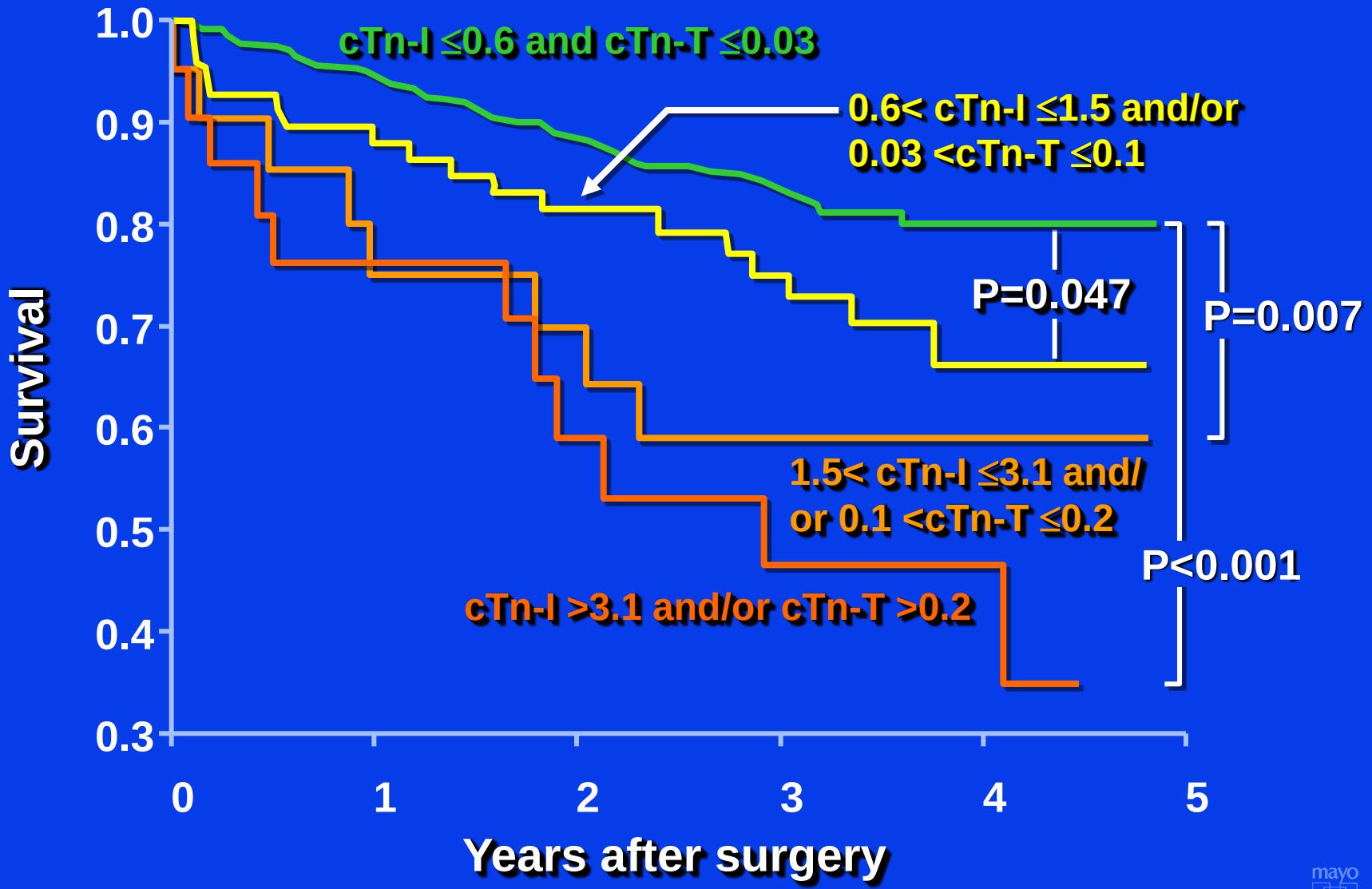
mayo

Elevations of Troponins without Overt Ischemic Heart Disease

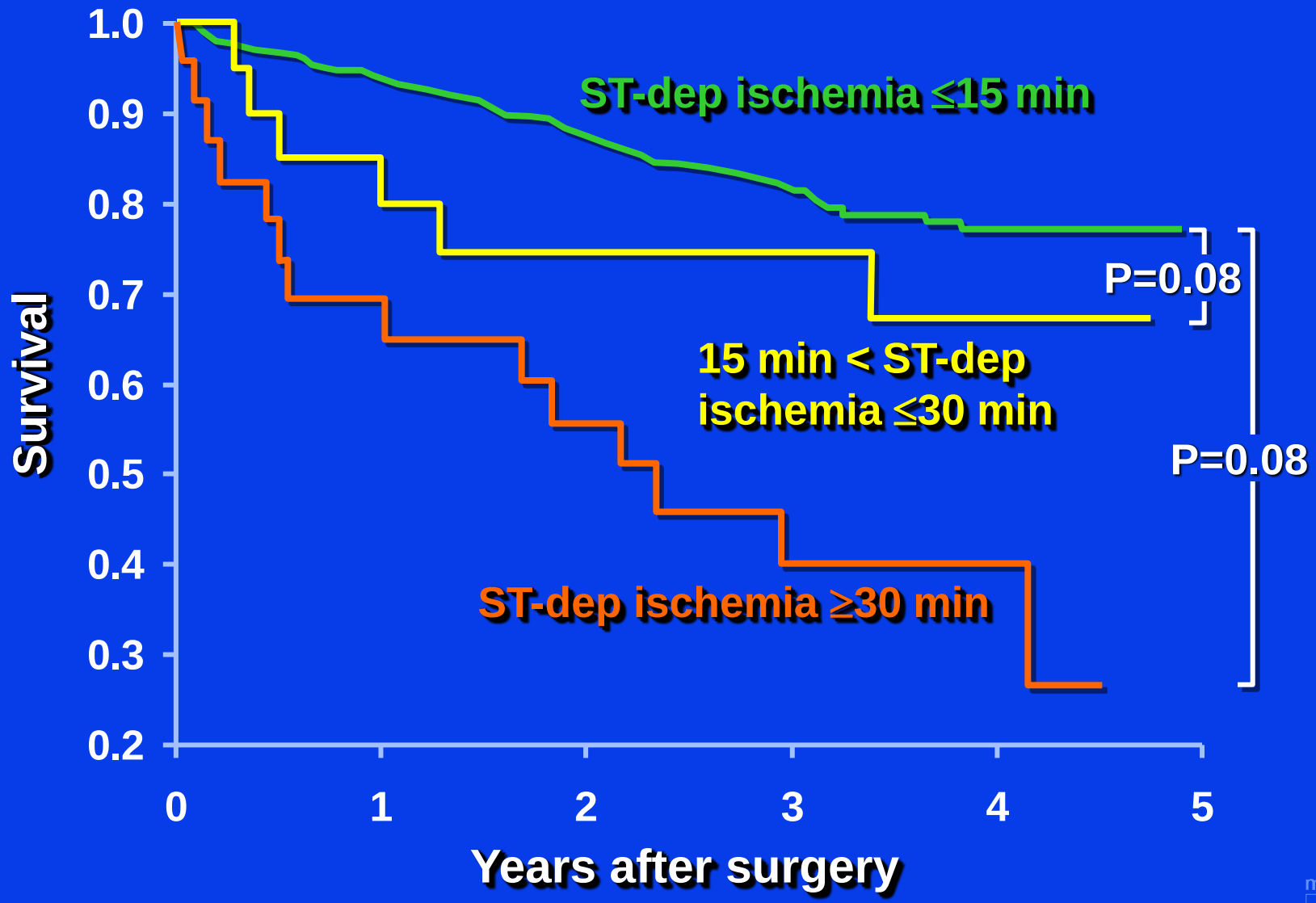
- Trauma (including contusion, ablation, pacing, *ICD firings including atrial defibrillators*, cardioversion, endomyocardial biopsy, cardiac surgery, after interventional closure of ASDs)
- *Congestive heart failure–acute and chronic*
- Aortic valve disease and HOCM with significant LVH
- Hyper and hypotension, especially with arrhythmias
- Postoperative noncardiac surgery patients who seem to do well
- *Renal failure*
- Critically ill patients, with respiratory failure, gastrointestinal bleeding, *sepsis,* heat stroke
- Drug toxicity, eg adriamycin, 5 FU, herceptin, snake venoms, carbon monoxide poisoning
- Hypothyroidism
- Abnormalities in coronary vasomotion, including coronary vasospasm
- Apical ballooning syndrome
- *Inflammatory diseases eg. myocarditis, eg. Parvovirus B19, Kawasaki disease, sarcoid, smallpox vaccination, or myocardial extension of BE*
- Post PCI patients who appear to be uncomplicated
- *Pulmonary embolism, severe pulmonary hypertension*
- *Sepsis*
- Burns, esp if TBSA > 30%
- *Cardiomyopathies including Infiltrative diseases such as amyloidosis, hemachromatosis, sarcoidosis and scleroderma, non compaction syndrome*
- *Acute neurological disease, including CVA, subarchnoid bleeds*
- Rhabdomyolysis with cardiac injury
- Transplant vasculopathy
- Vital Exhaustion

Postop Survival by cTnI Values



J Am Coll Cardiol 42:1551, 2003

Postop Survival by ECG Changes



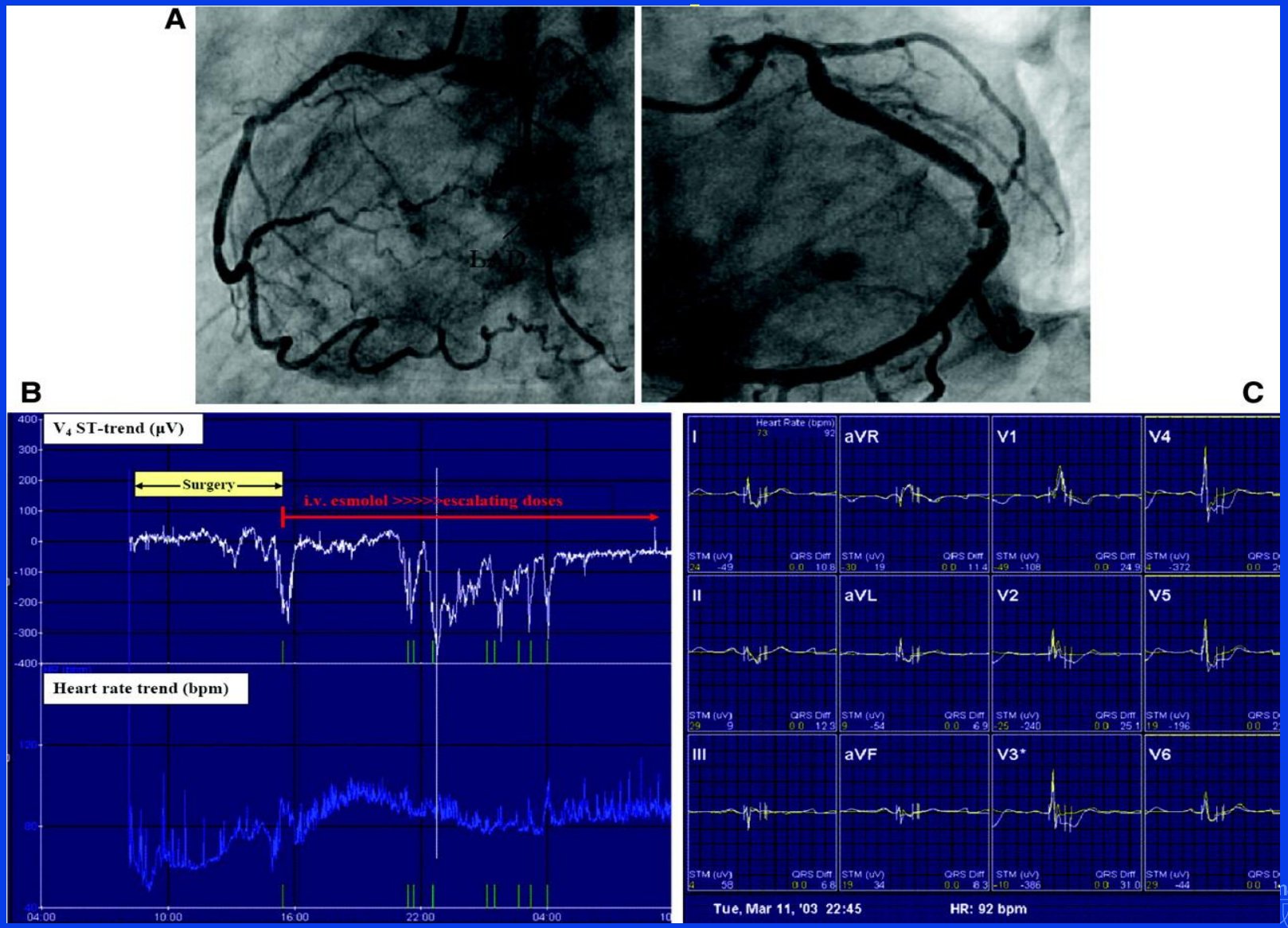
J Am Coll Cardiol 42:1551, 2003

Association of Longest Ischemia Duration with Biochemical Markers of MI

	Total		Ischemia >15 min		Ischemia >30 min		Ischemia >60 min		Symptoms attributable to MI	
	No.	%	No.	%	No.	%	No.	%	No.	%
CK >170 IU and MB >5%	34	6.7	17	50.0	14	41.2	12	35.3	7	20.5
CK >170 IU and MB >10%	14	2.9	8	57.1	7	50.0	7	50.0	5	35.7
cTn-I >0.6 ng/mL and or cTn-T >0.03 ng/mL	107	23.9	34	31.8	29	27.1	21	19.6	19	17.7
cTn-I >1.5 ng/mL and or cTn-T >0.1 ng/mL	41	8.7	38	87.8	24	58.3	19	46.3	18	43.9
cTn-I >3.1 ng/mL and or cTn-T >0.2 ng/mL	21	4.2	19	90.5	17	81.0	17	81.0	13	61.9

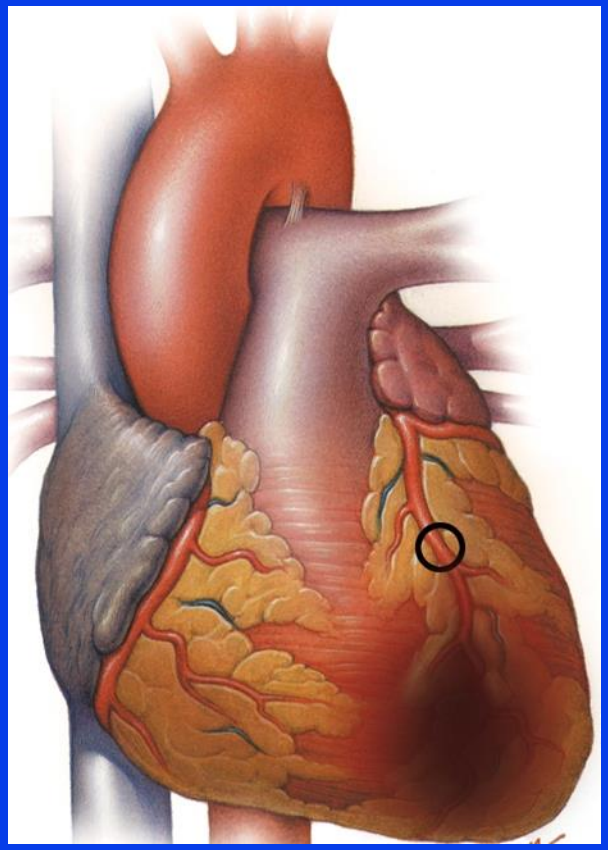
J Am Coll Cardiol 42:1549, 2003

A 67-year-old man - abdominal aortic aneurysm



Landesberg G et al. Circulation 2009;119:2936-2944

Differentiation between MI Types according to the Condition of the Coronary Arteries



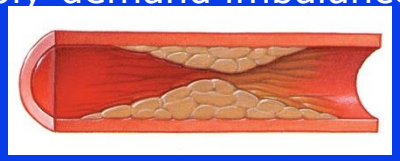
Plaque rupture with clot

MI Type 1

Vasospasm or endothelial dysfunction

MI Type 2

Fixed Atherosclerosis and Supply-demand imbalance



MI Type 2

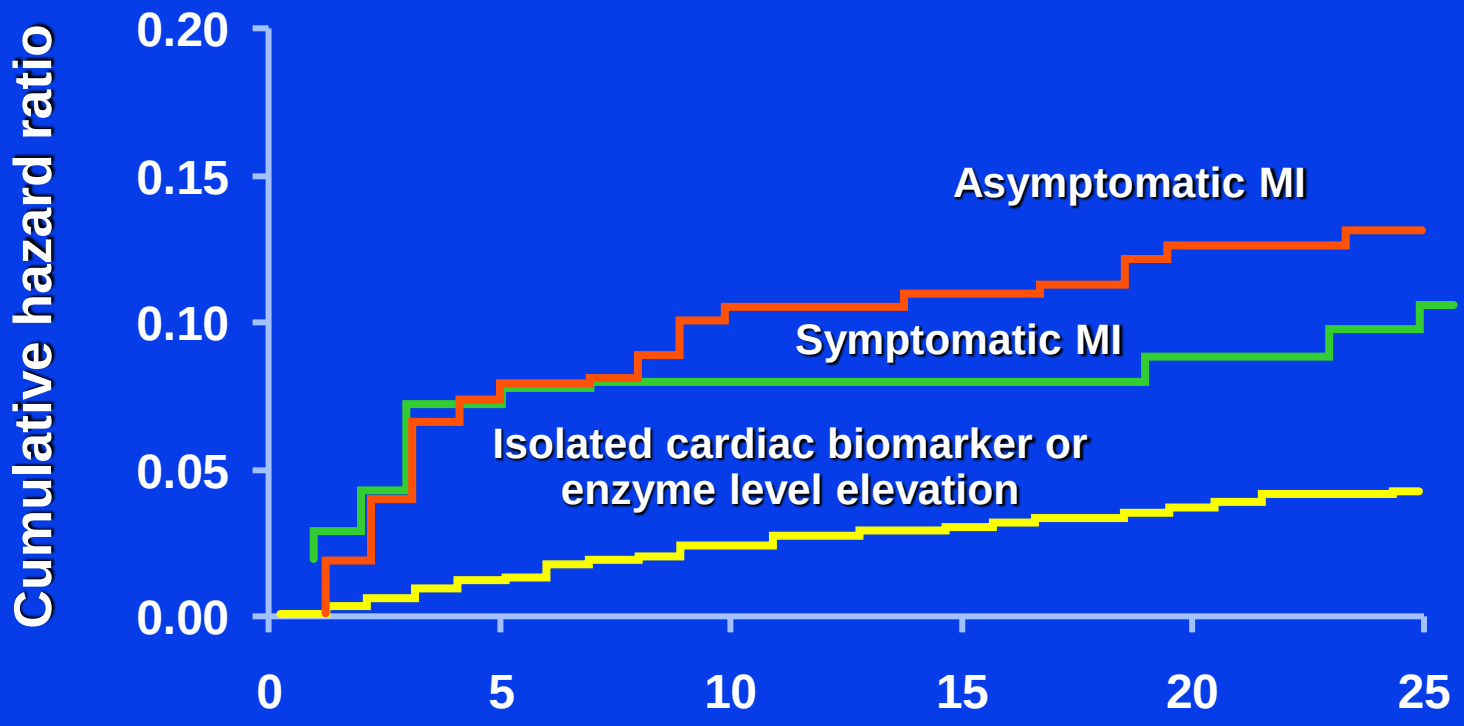
Supply-demand imbalance alone

MI Type 2

CHARACTERISTICS OF TYPE 1 AND TYPE 2 AMIS

Type 1	Type 2
Spontaneous around known triggers	Some evidence of increased demand
Higher cTn	Lower cTn
Persistent ECG changes, especially ST segment depression	More transient ECG changes
Out patients	Procedure related often
More procoagulant activity	Procoagulation related inadequate perfusion

Prognosis Over Time After Surgery (POISE)

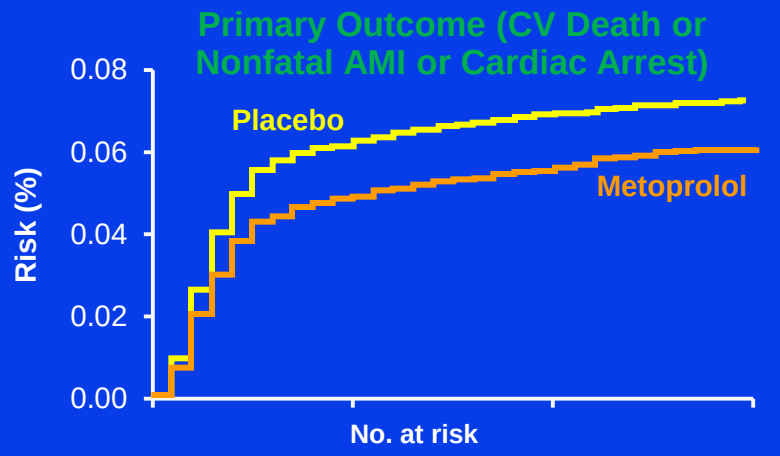


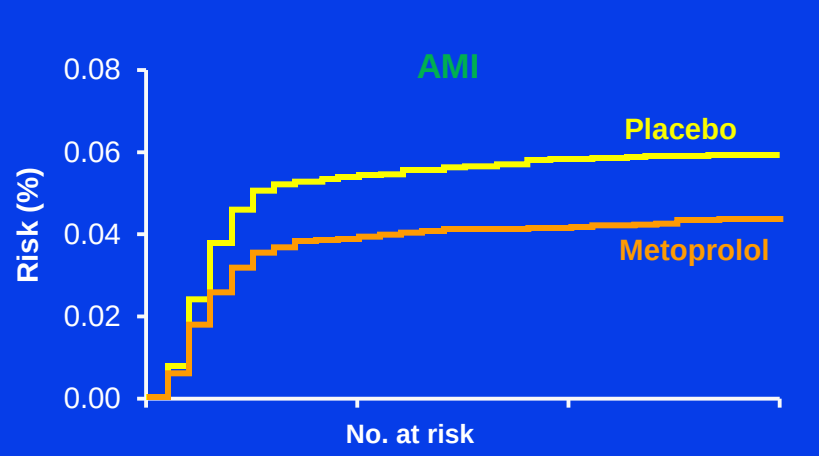
Pt at risk (no.)

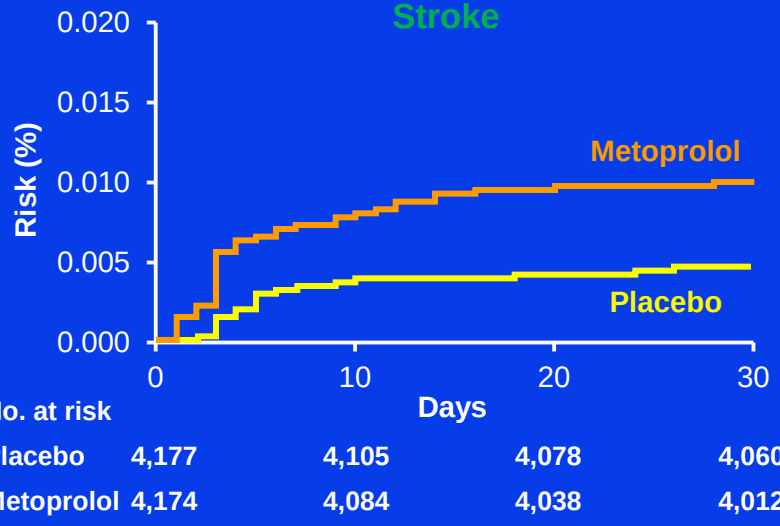
Symptomatic MI	144	130	126	118	106
Asymptomatic MI	271	238	234	226	214
Isolated cardiac biomarker or enzyme level elevation	697	665	658	645	624

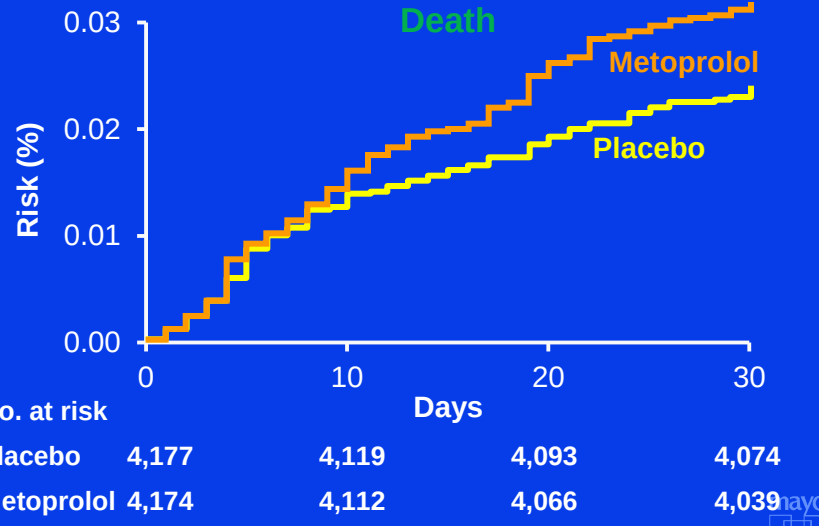
Devereaux et al: Ann Intern Med 154:523, 2011

Outcomes in POISE



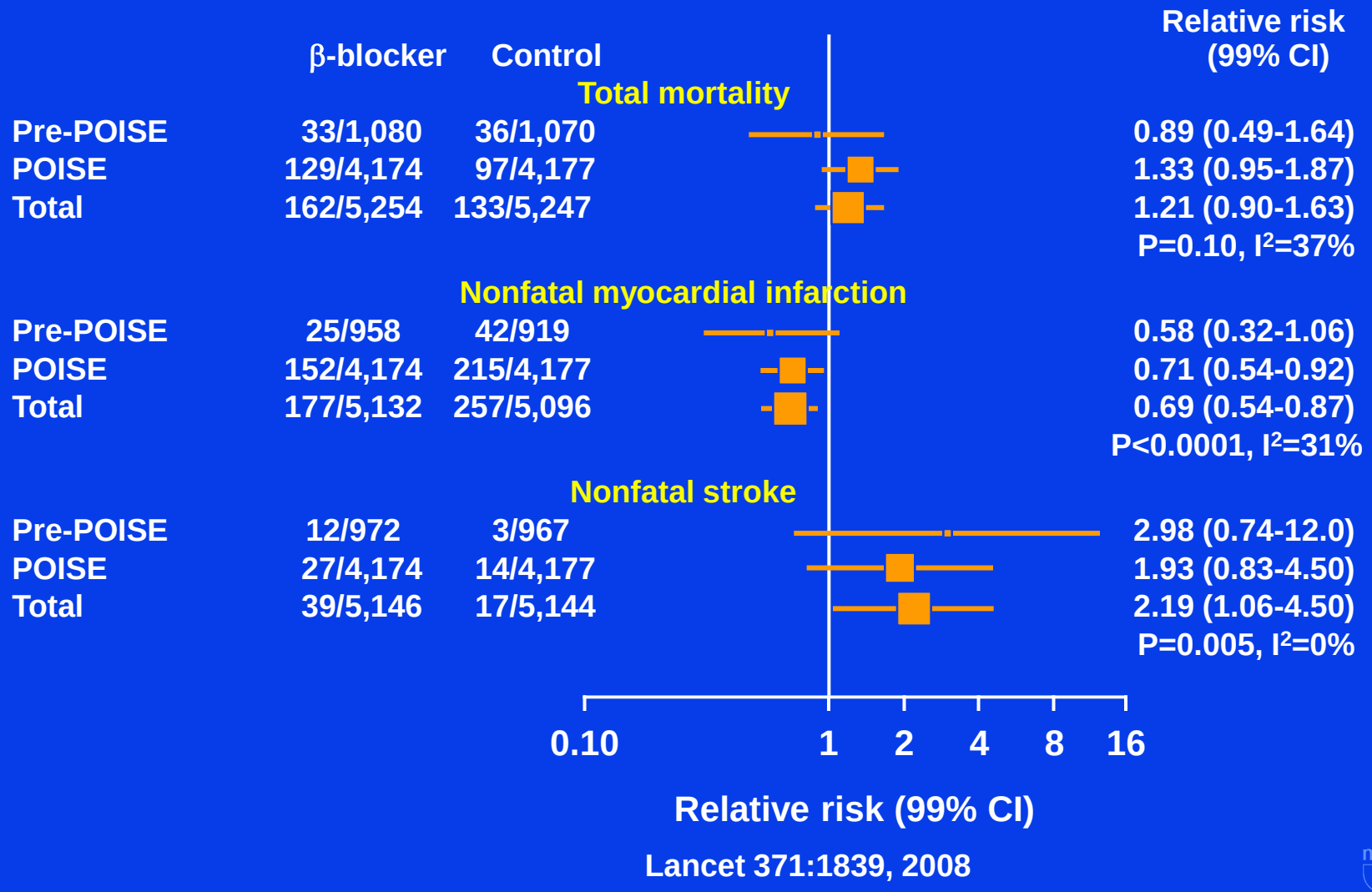






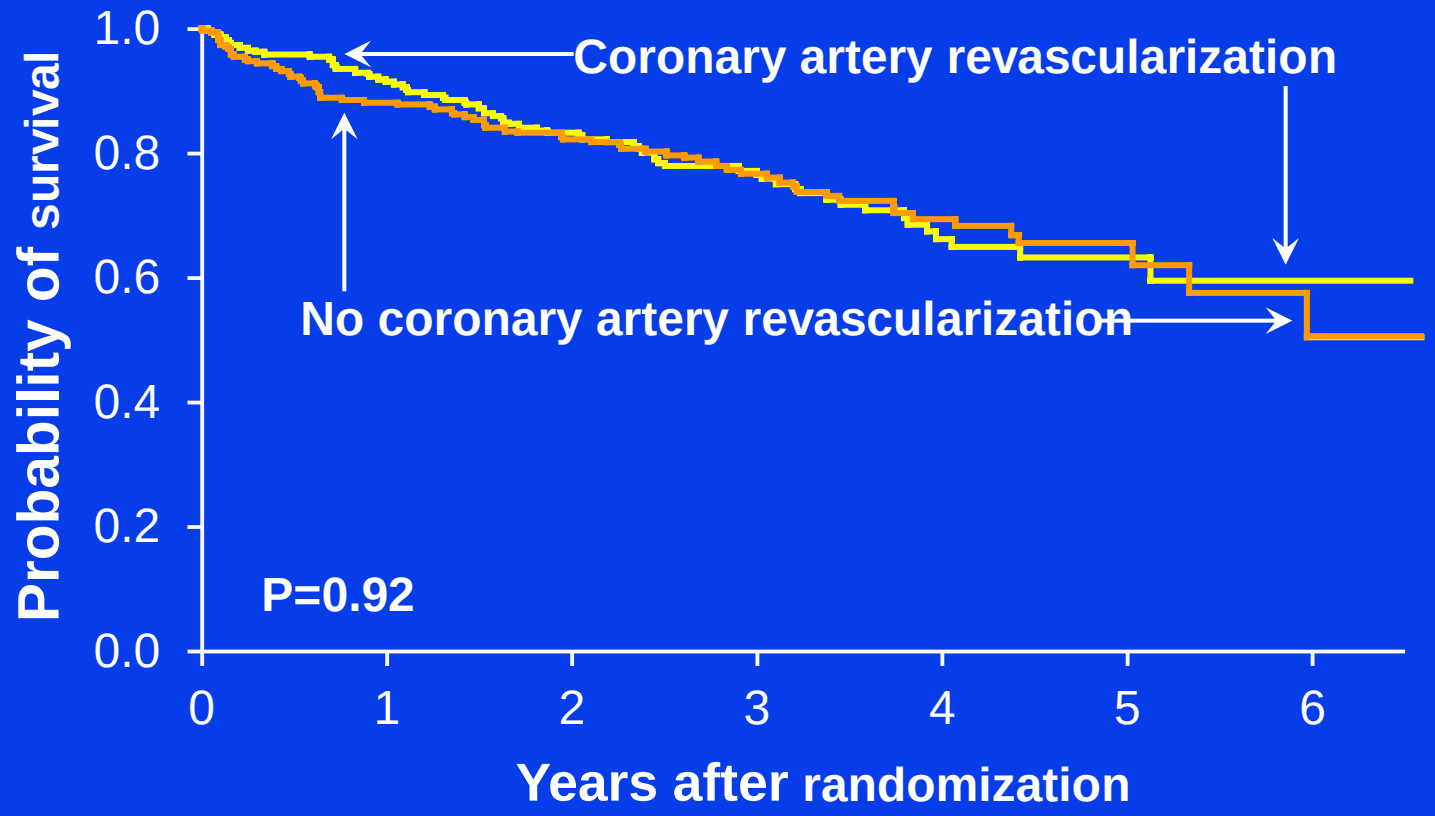
Lancet 371:1839, 2008

Meta-Analysis of β-Blocker Trials



Lancet 371:1839, 2008

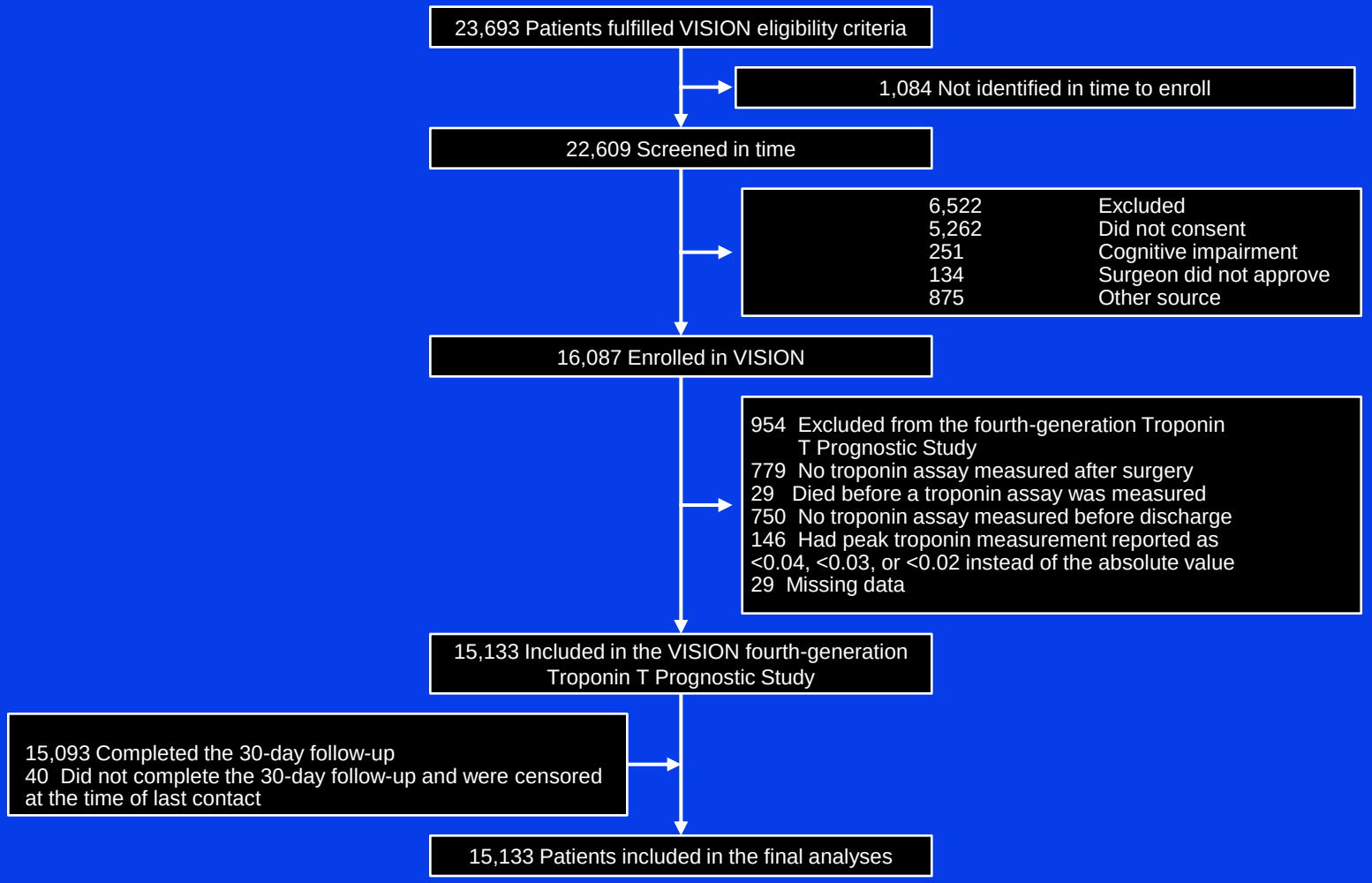
Survival in Postoperative Patients With and Without Coronary Revascularization



No. at risk						
Revascularization	226	175	113	65	18	7
No revascularization	229	172	108	55	17	12

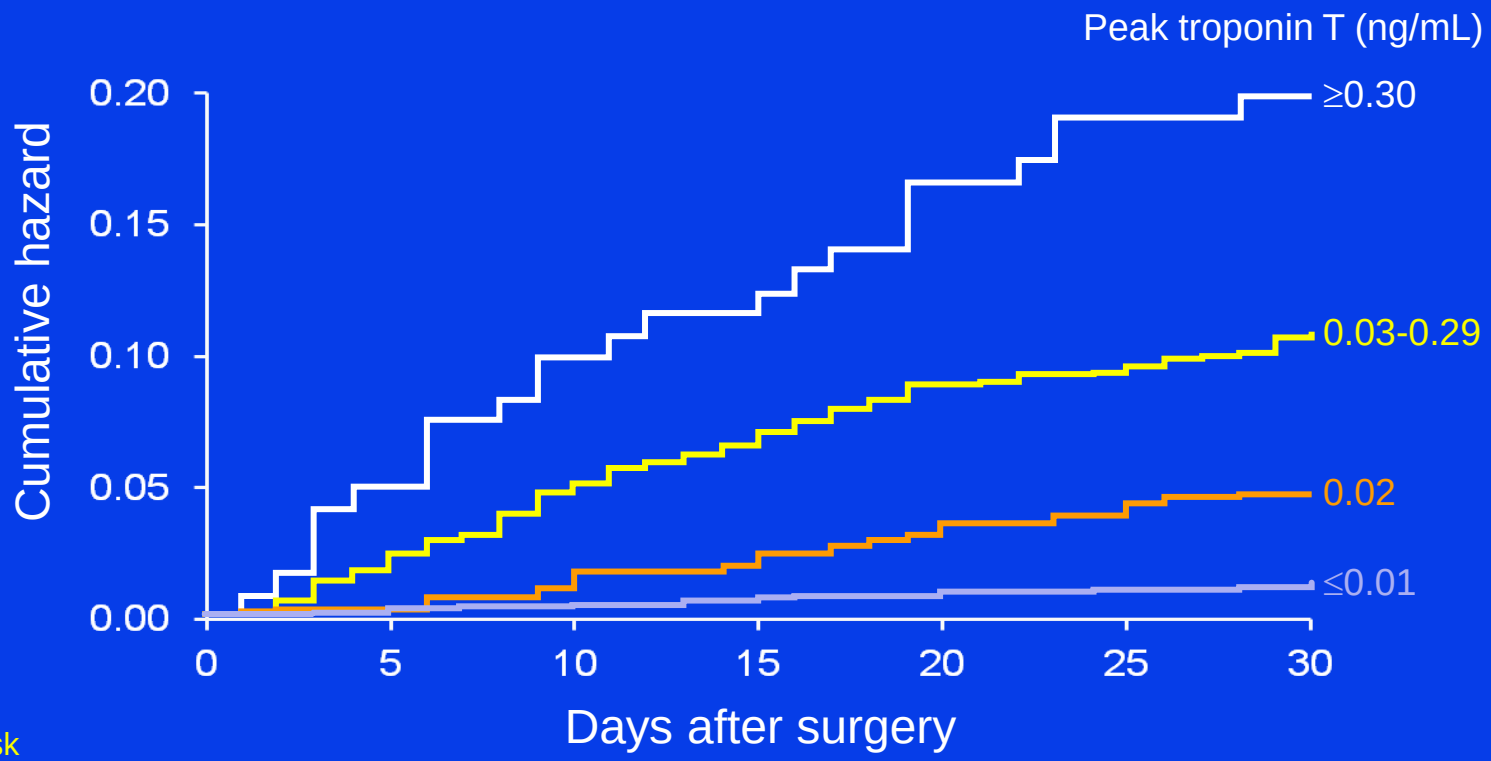
McFalls et al: NEJM 351(27):2795, 2004

Patient Flow in the Vision Study



JAMA. 2012;307(21):2295-2304

Mortality Analysis by Peak cTnT Value (VISION)



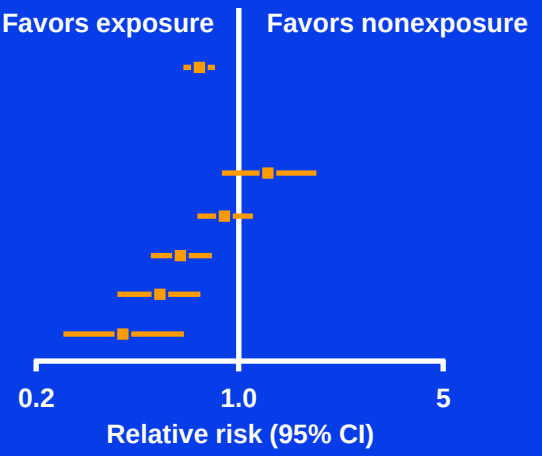
No. at risk

Peak troponin T (ng/mL)							
≥0.30	142	136	129	127	121	118	117
0.03-0.29	1121	1103	1075	1058	1036	1030	1018
0.02	494	492	489	485	480	477	473
≤0.01	13,376	13,348	13,300	13,271	13,250	12,230	13,209

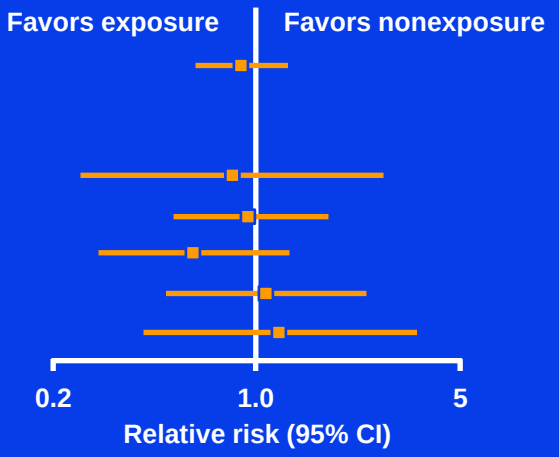
JAMA. 2012;307(21):2295-2304

Relationship of β-Blockers and 30-Day Mortality

All surgery	No. of patients		No. of deaths	
	Exposed	Not exposed	Exposed	Not exposed
All patients	37,805	37,805	426	583
Revised cardiac risk index predictors (no.)				
0	12,250	12,250	67	53
1	16,057	16,057	166	186
2	6,795	6,795	111	176
3	2,090	2,090	59	110
>4	613	613	23	58



Vascular surgery	No. of patients		No. of deaths	
	Exposed	Not exposed	Exposed	Not exposed
All patients	3,999	3,999	55	62
Revised cardiac risk index predictors (no.)				
0	857	857	5	6
1	1,593	1,593	20	21
2	1,033	1,033	11	18
3	403	403	13	12
>4	113	113	6	5

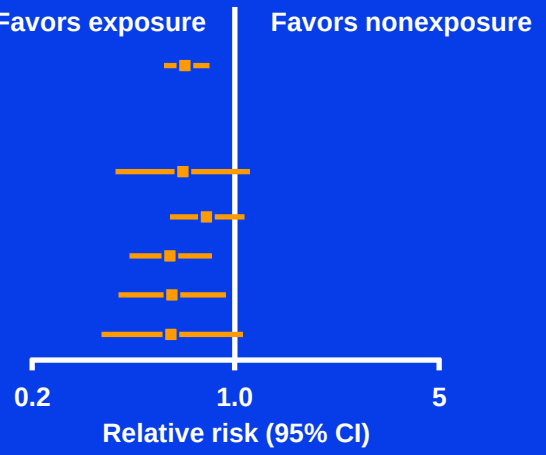


London et al: JAMA 309(16):1704, 2013

Relationship of β-Blockers and 30-Day Cardiac Morbidity

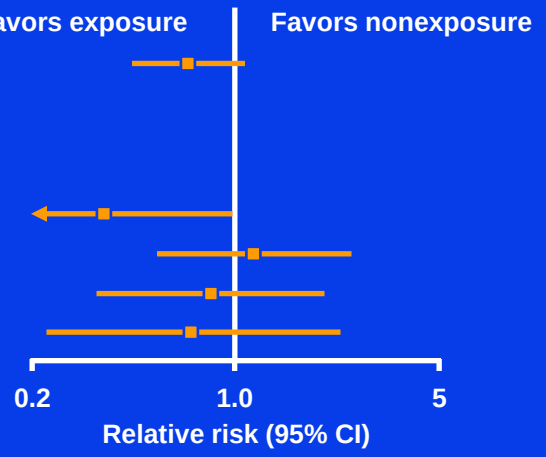
All surgery

	No. of patients		No. of deaths	
	Exposed	Not exposed	Exposed	Not exposed
All patients	37,662	37,662	225	336
Revised cardiac risk index predictors (no.)				
0	12,228	12,228	23	35
1	16,004	16,004	83	104
2	6,761	6,761	63	105
3	2,063	2,063	36	59
>4	606	606	20	33



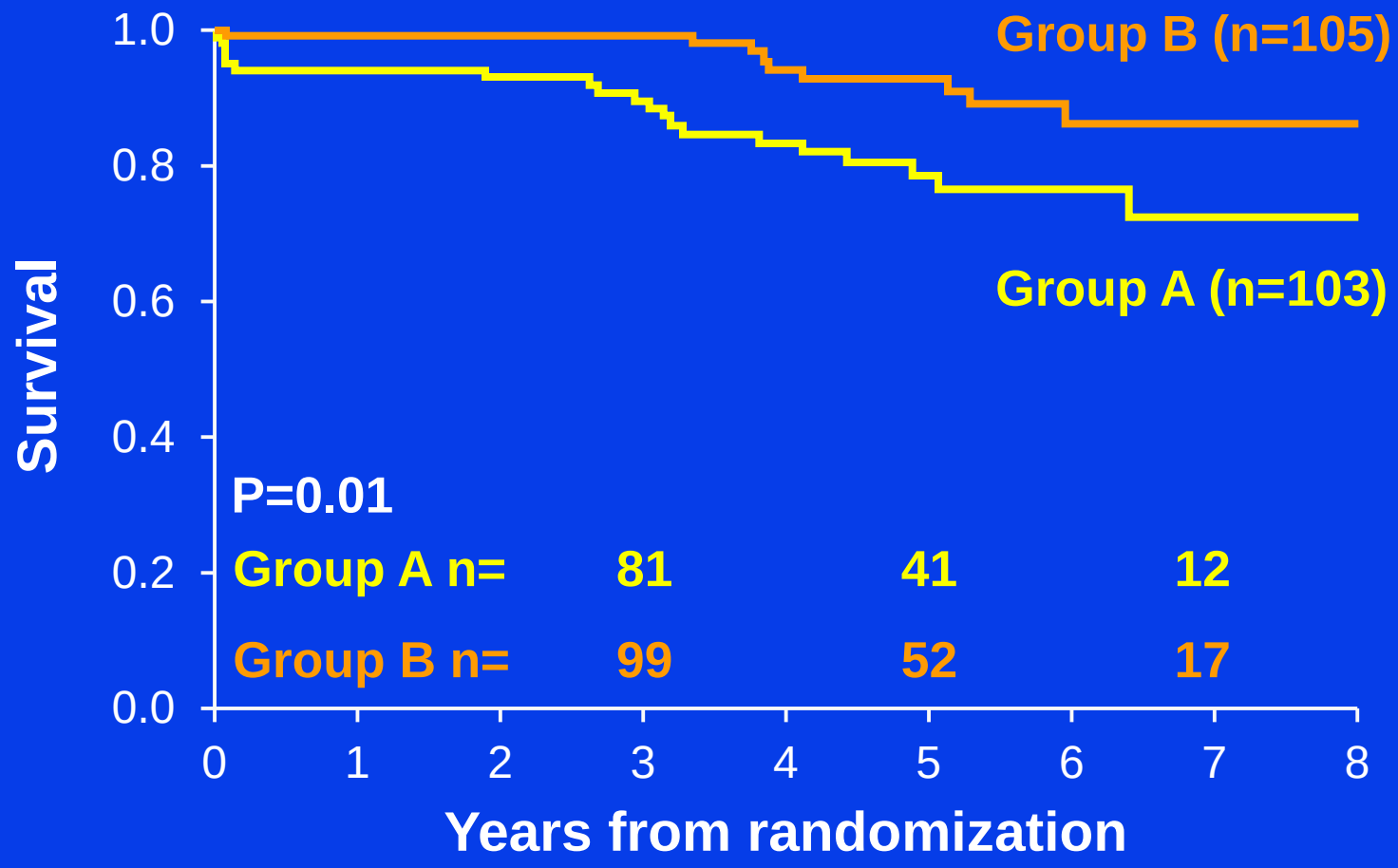
Vascular surgery

	No. of patients		No. of deaths	
	Exposed	Not exposed	Exposed	Not exposed
All patients	3,973	3,973	34	49
Revised cardiac risk index predictors (no.)				
0	852	852	0	4
1	1,590	1,590	5	14
2	1,024	1,024	15	13
3	395	395	9	11
>4	112	112	5	7



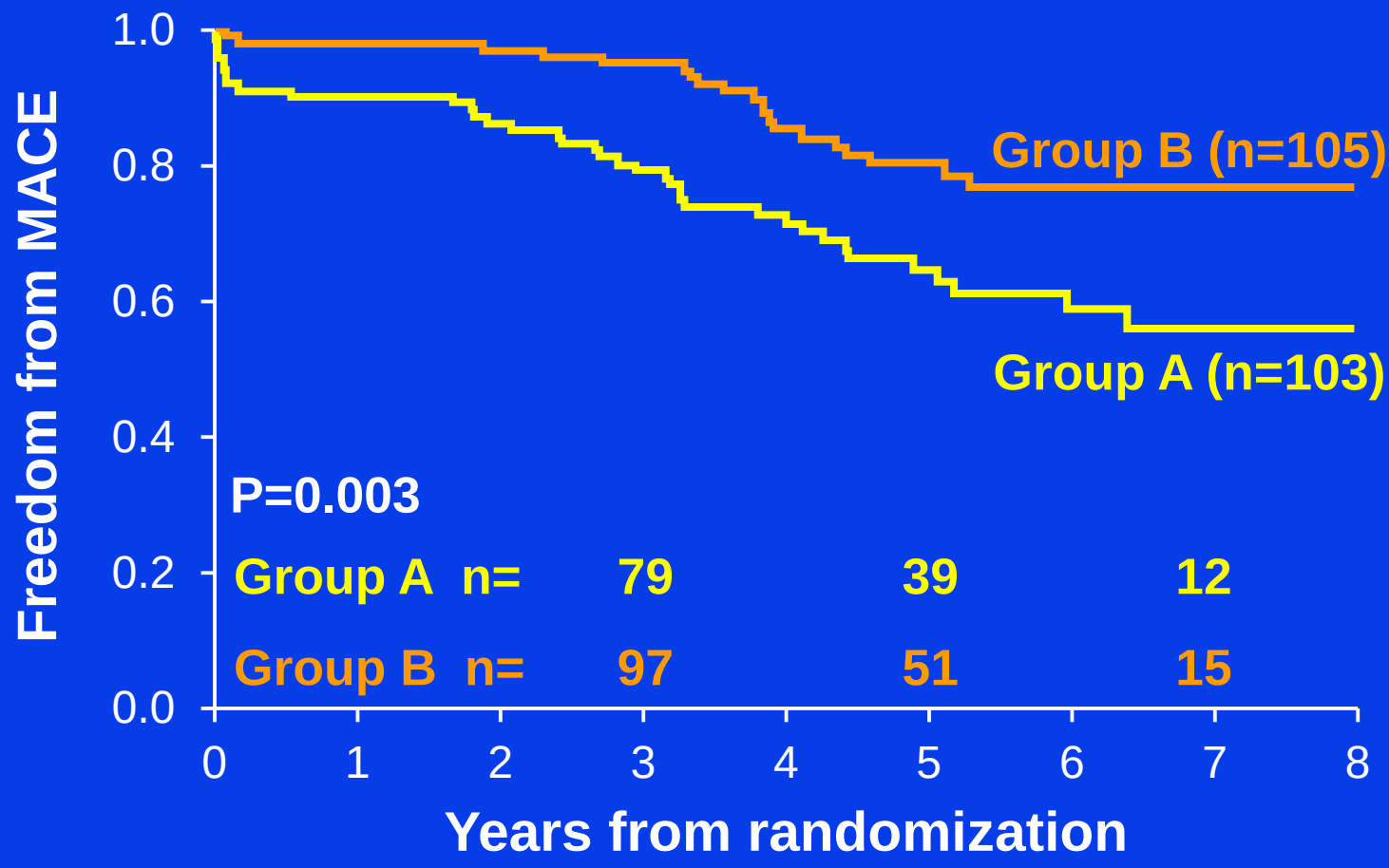
London et al: JAMA 309(16):1704, 2013

Cumulative Survival
(A= Stress testing, B = Angiography)



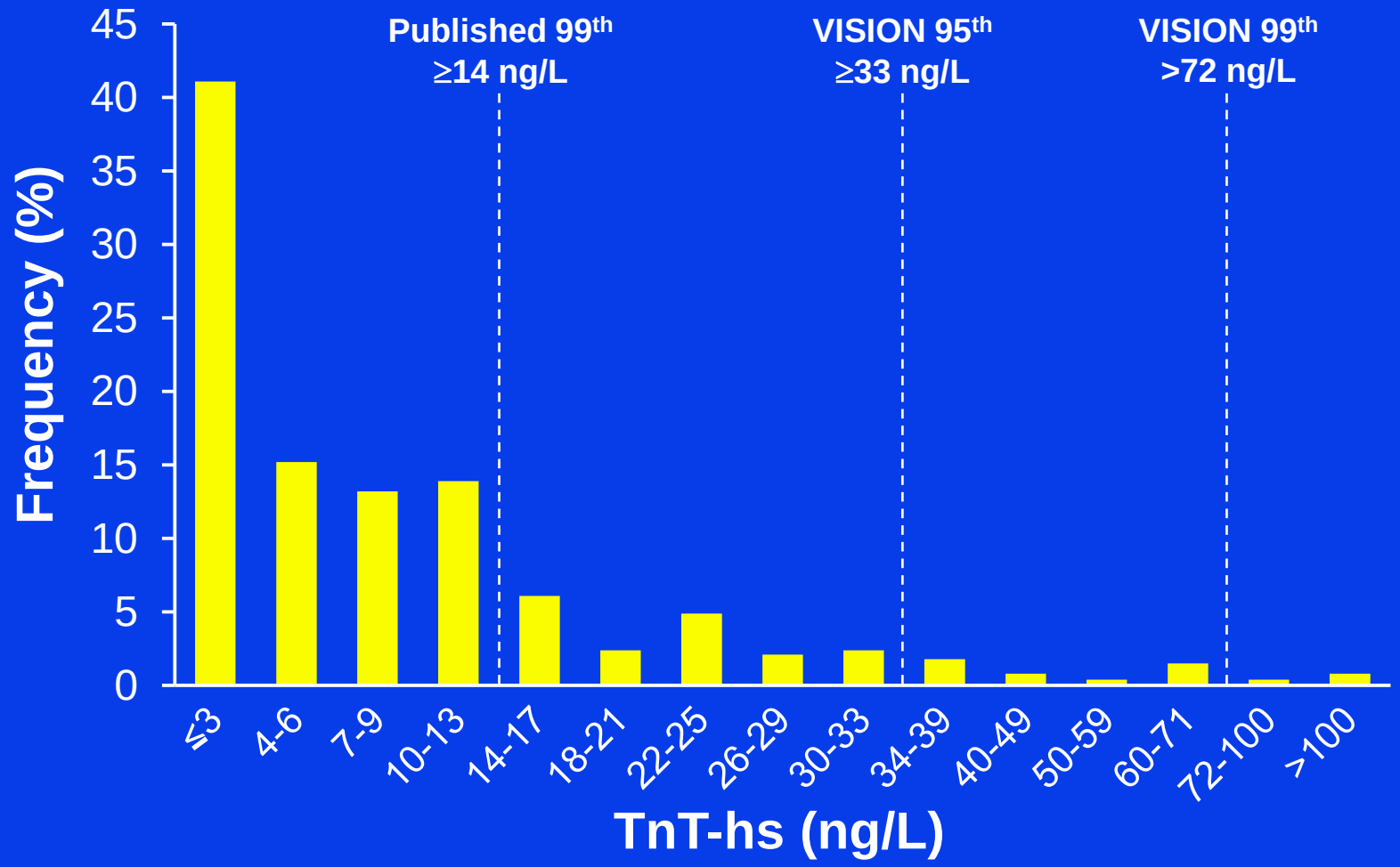
JACC 54(11):989, 2009

Freedom from Major Adverse Cardiac Events (A= Stress testing, B = Angiography)



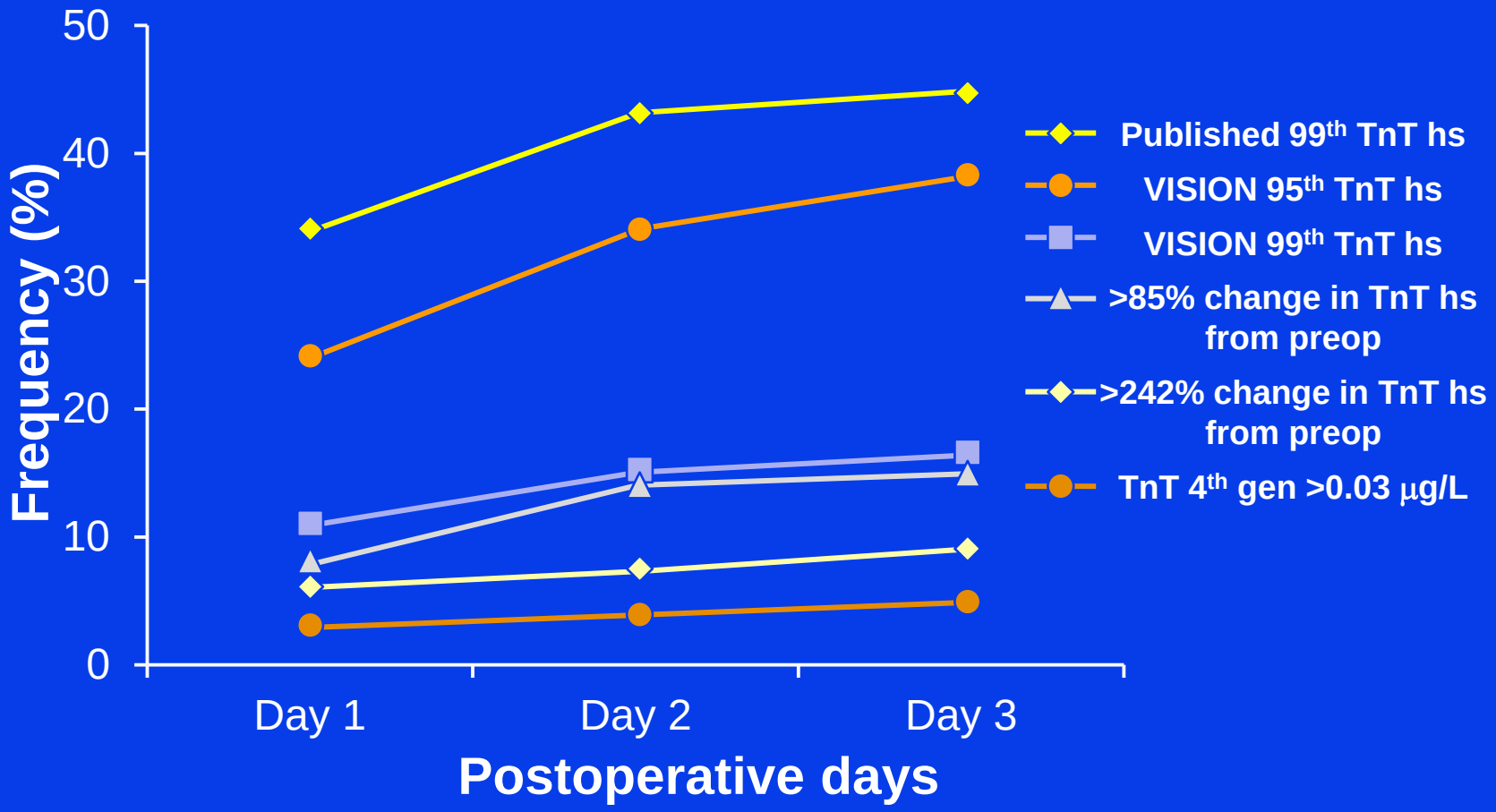
JACC 54(11):989, 2009

Distribution of Preoperative hsc-TnT Values in Vision



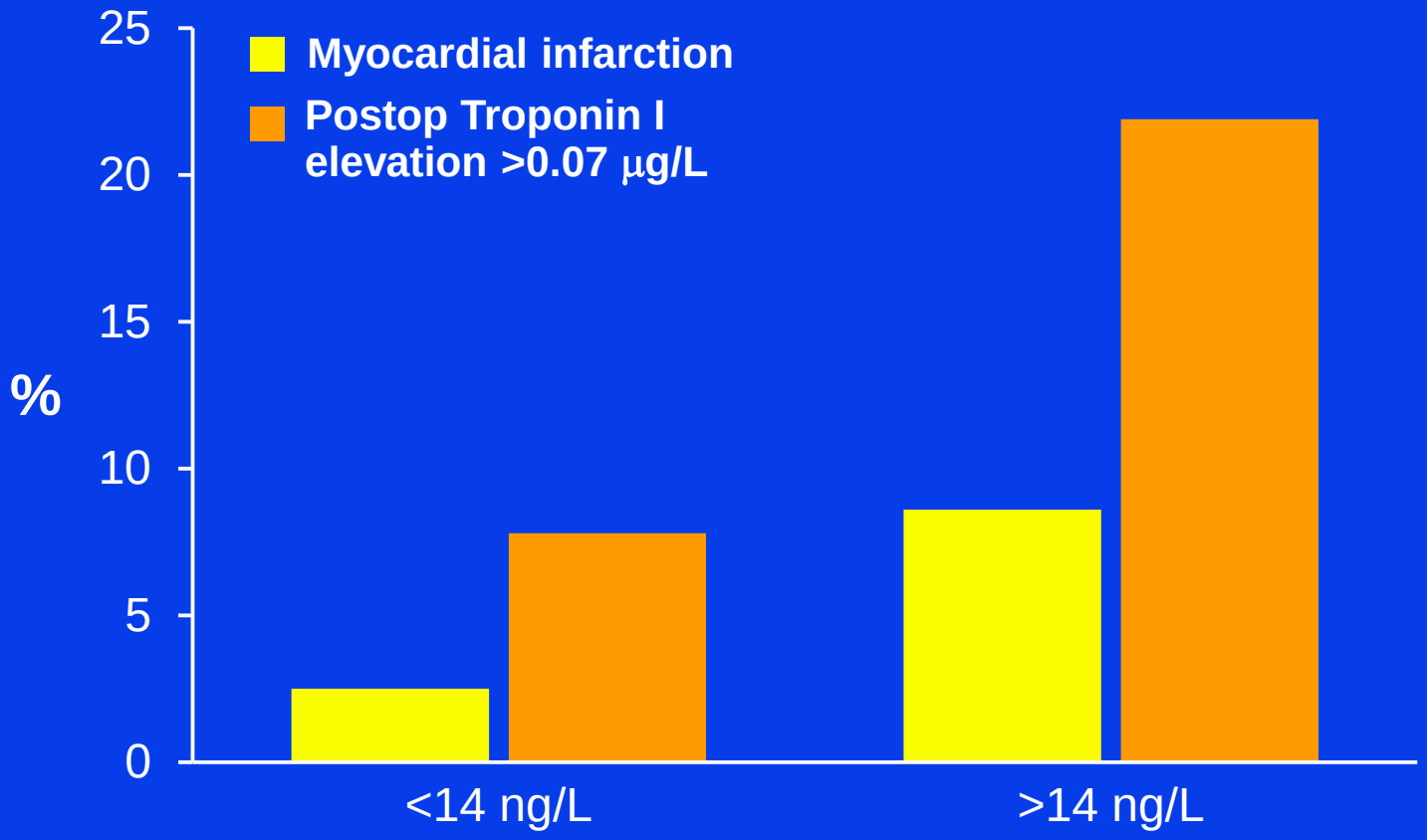
Kavsak et al: Clin Biochem 44:1021, 2011

Frequency of Elevated hsc-TnT Postoperative Values



Kavsak et al: Clin Biochem 44:1021, 2011

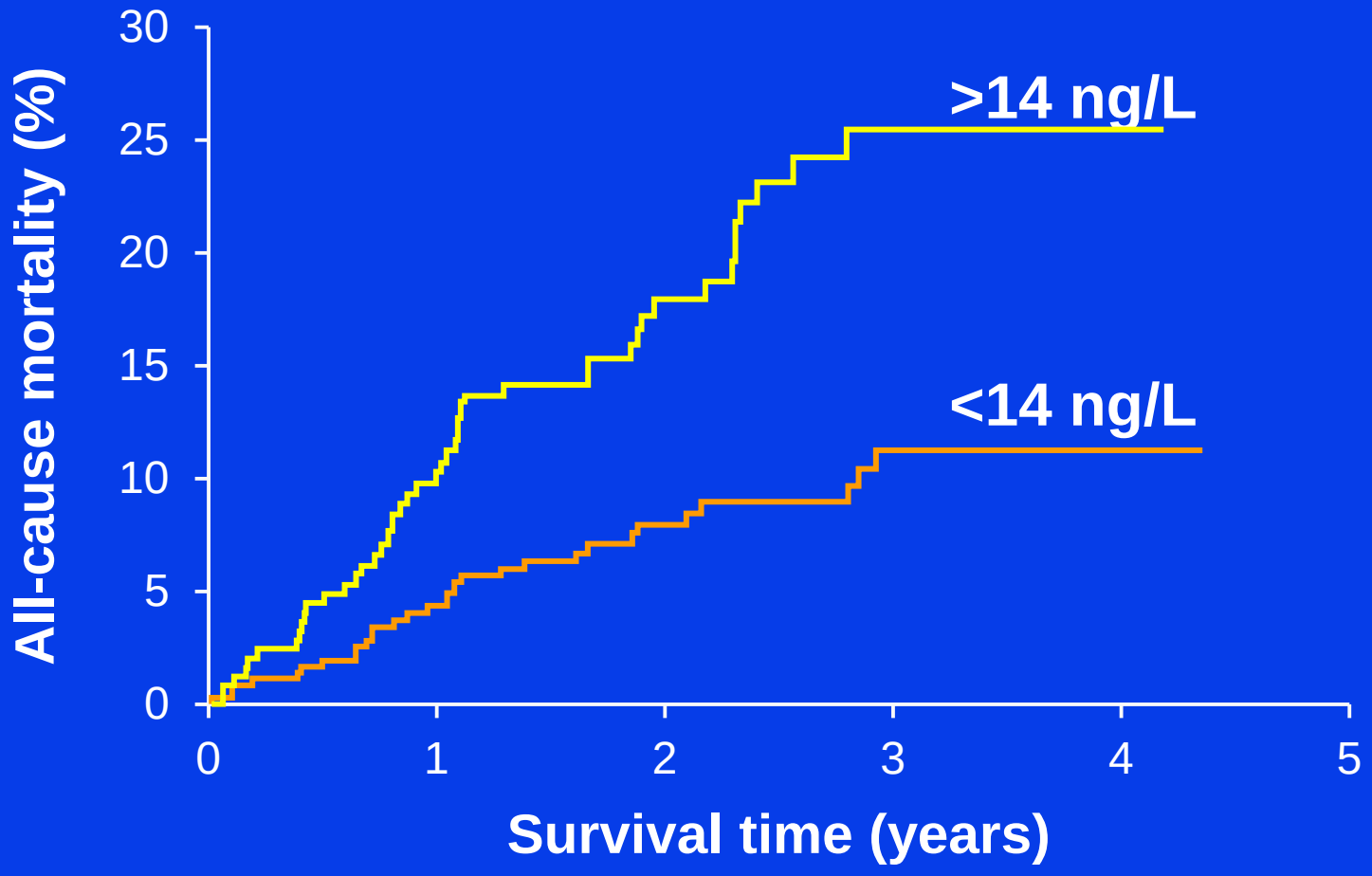
Preoperative hscTnT and Myocardial Infarction



Preoperative hs-cTnT concentration

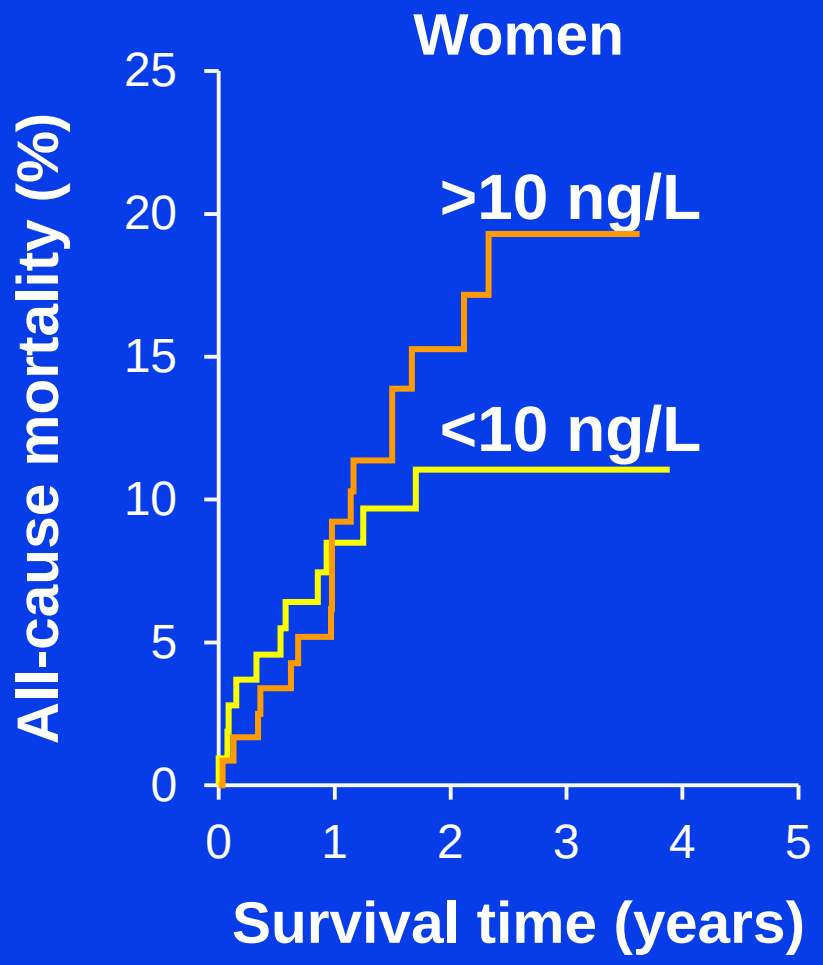
AHJ, 2013, (in press)

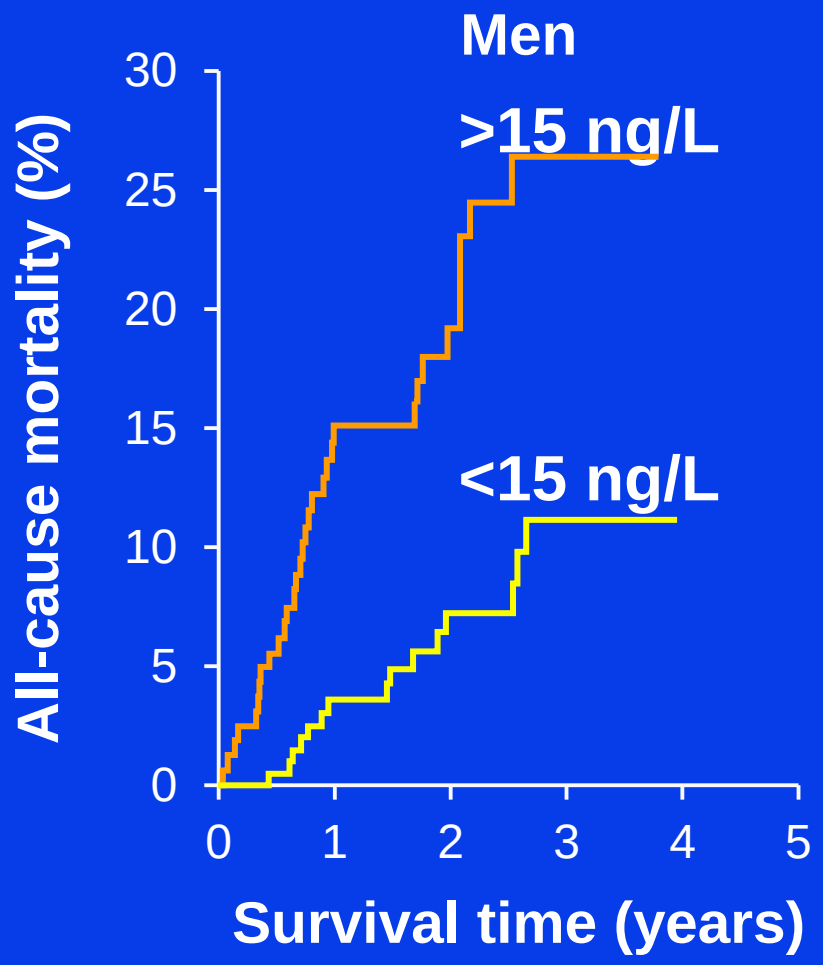
All-Cause Mortality based on Preopeartive hscTnT



AHJ, 2013, (in press)

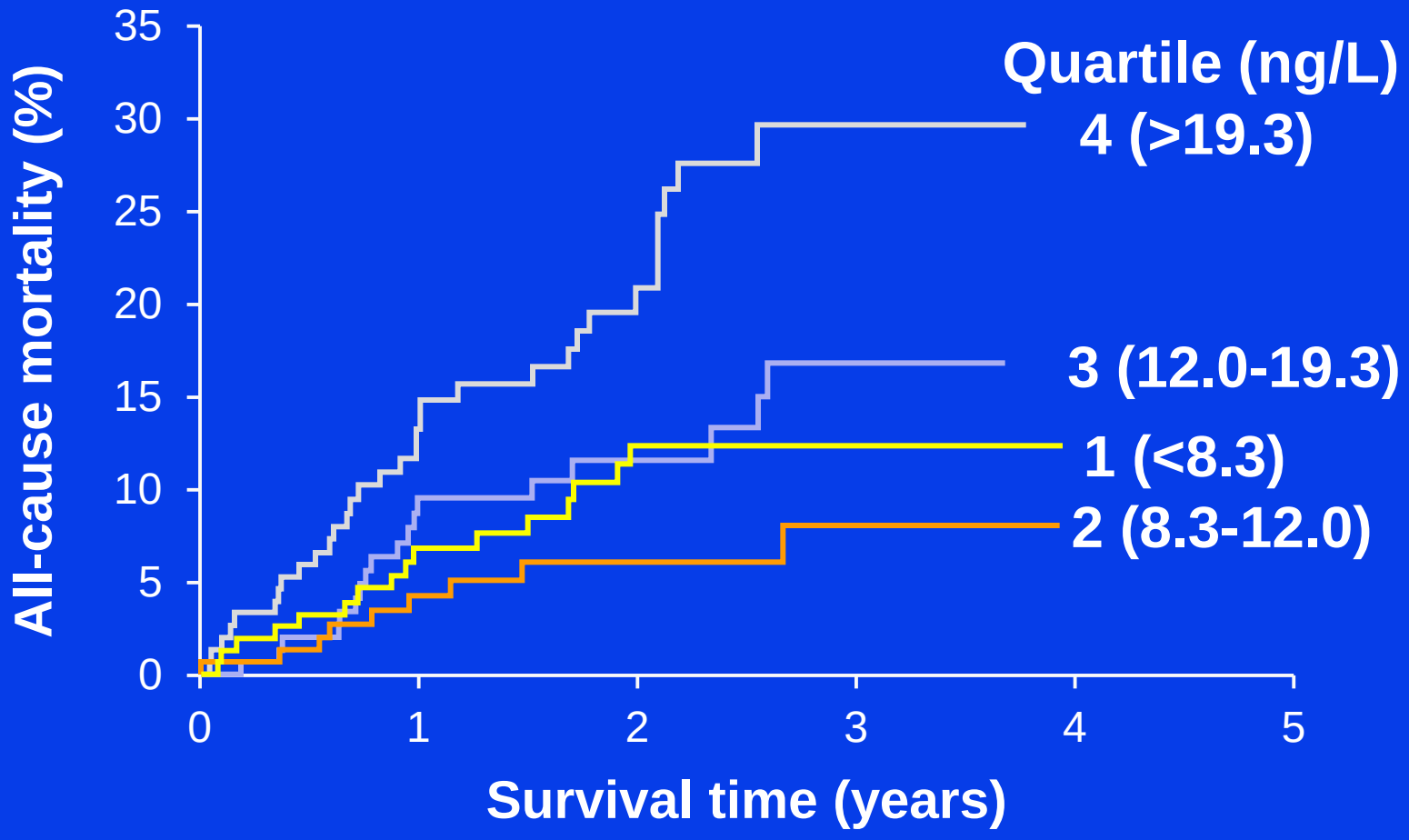
All-Cause Mortality based on Sex-Specific 99th Percentiles for Preoperative hscTnT





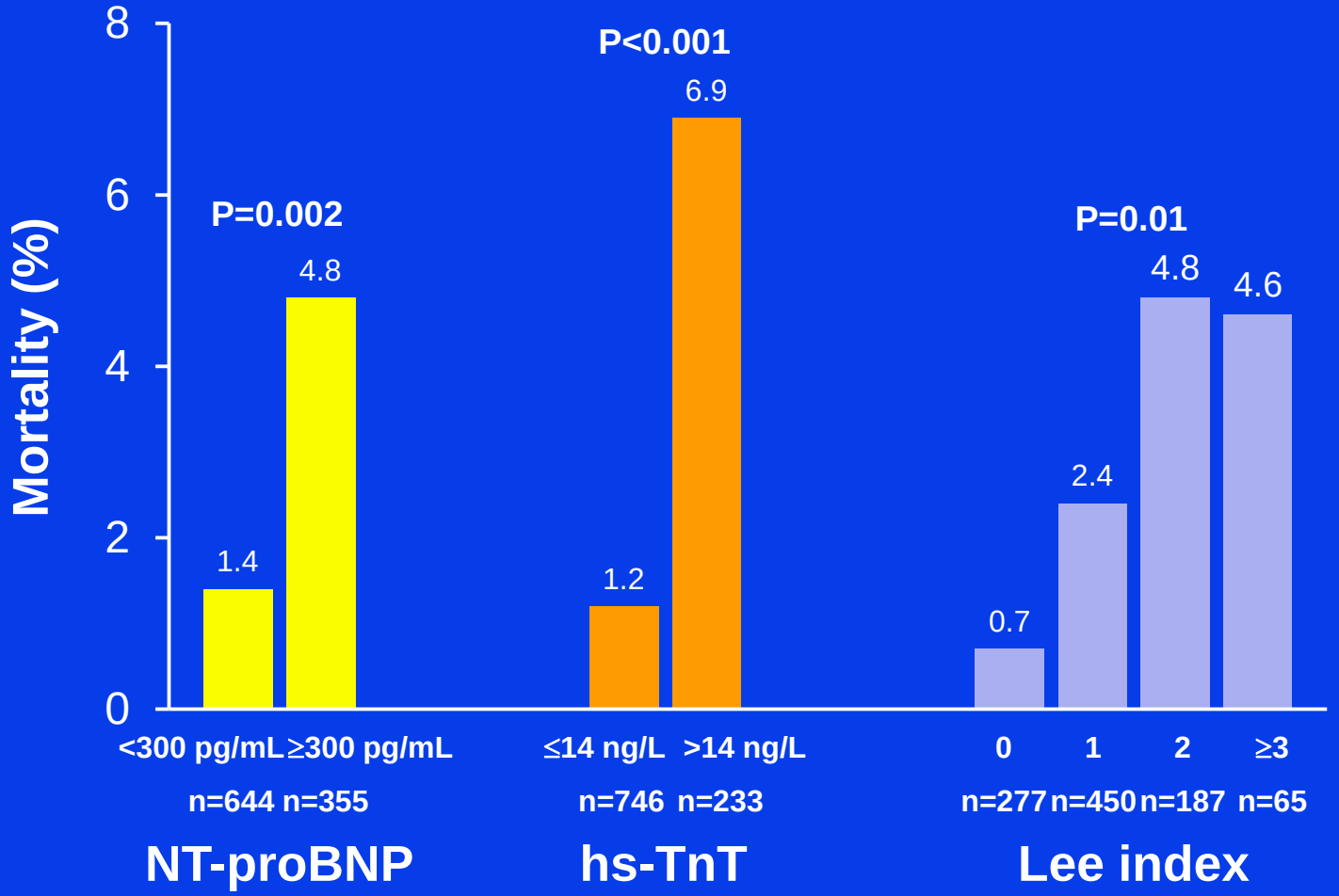
AHJ, 2013, (in press)

All-Cause Mortality Grouped by Preoperative hs-cTnT Quartiles



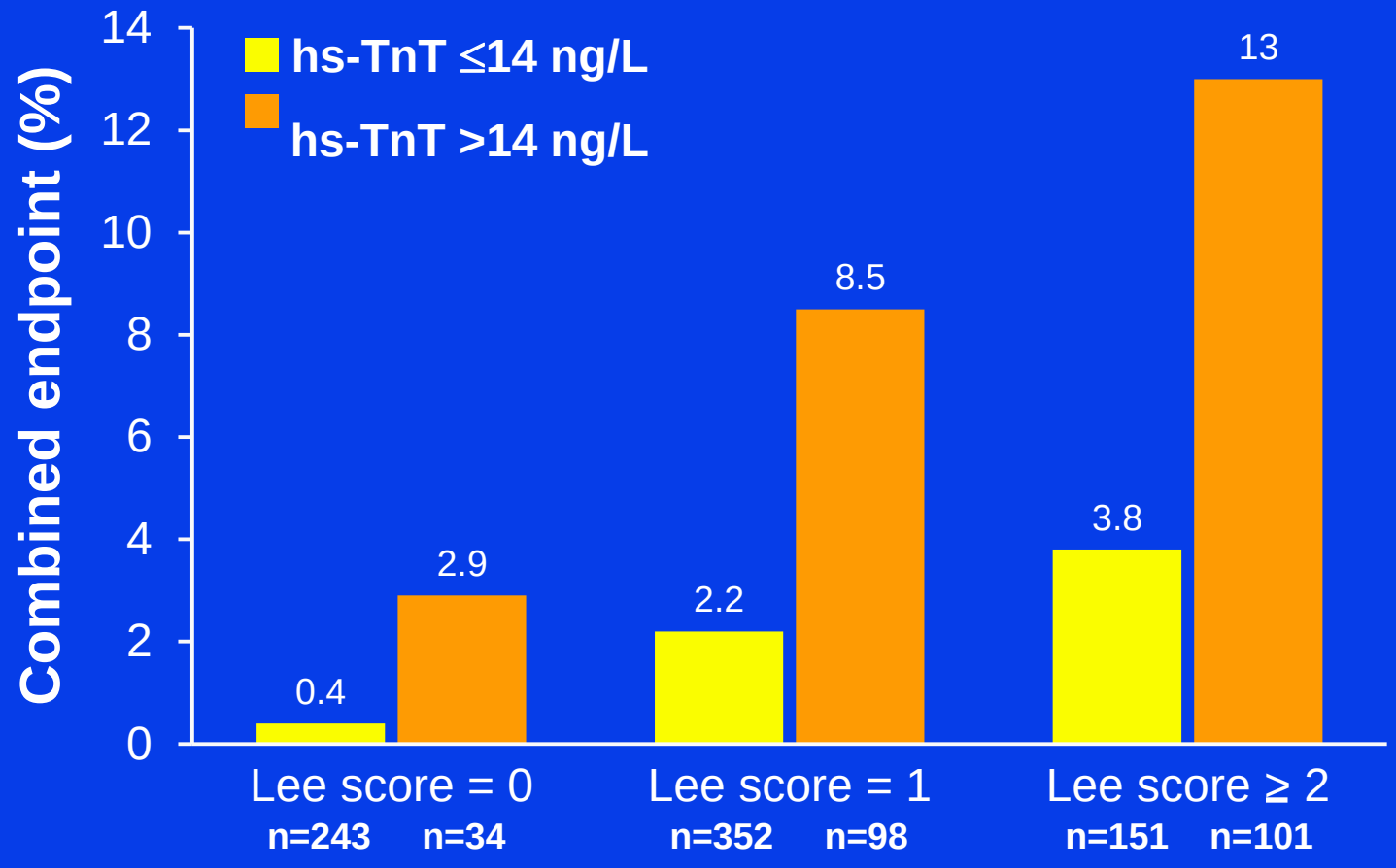
AHJ, 2013, (in press)

Predictive Accuracy of Biomarkers to Presage Mortality



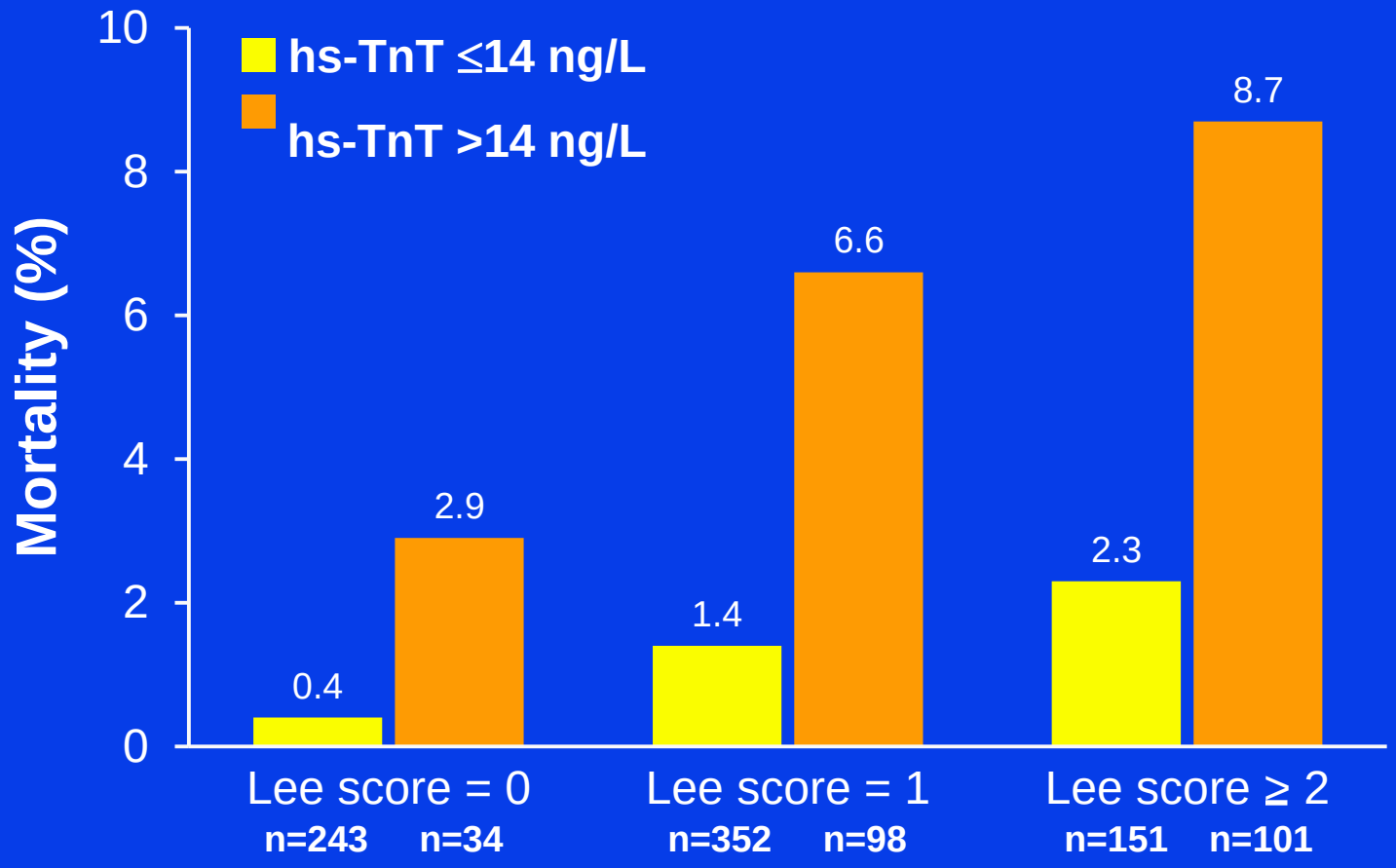
Weber et al: Eur Heart J 34:853, 2013

Combining Lee Index and hscTnT to Predict CV Events



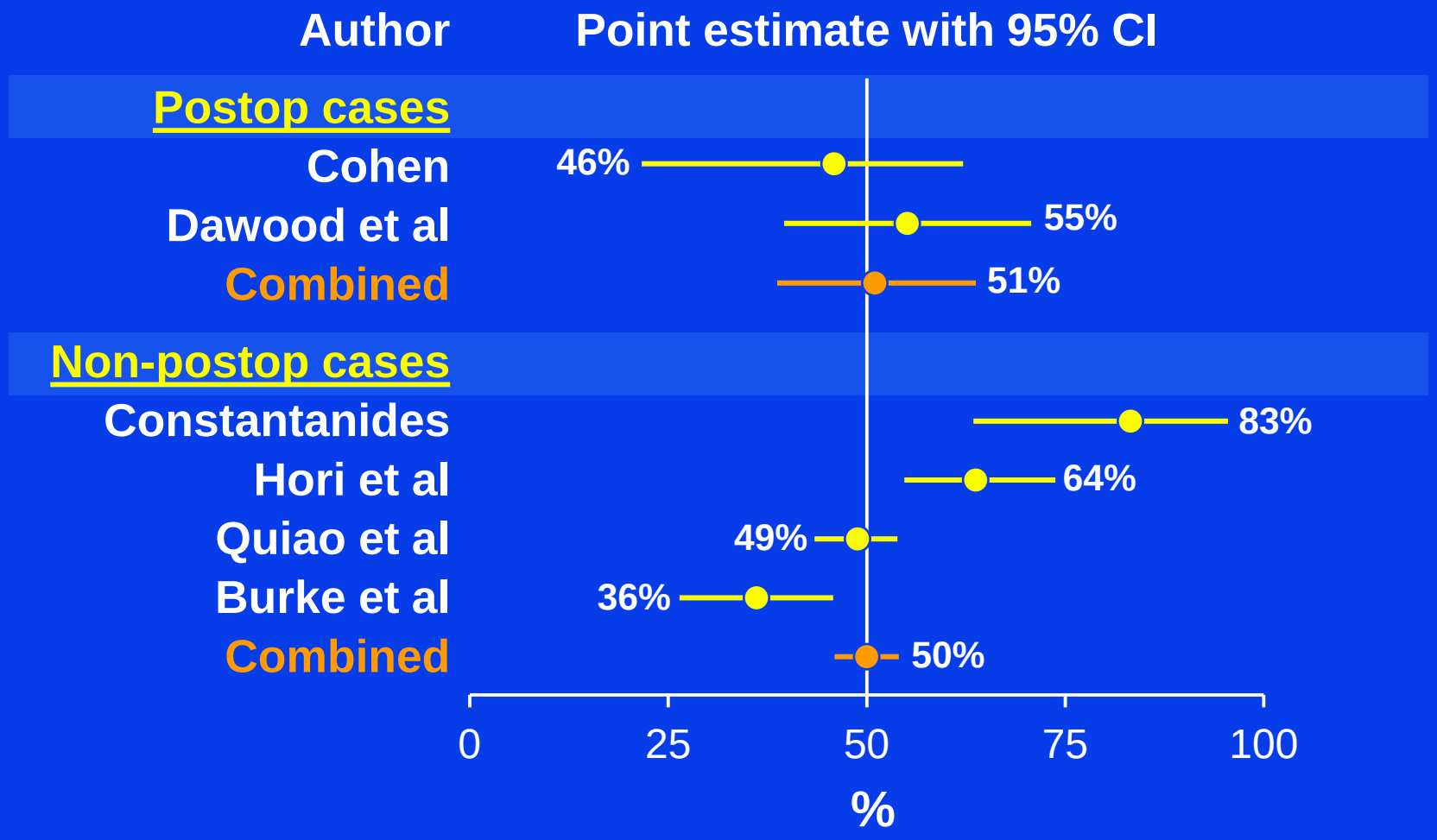
Weber et al: Eur Heart J 34:853, 2013

Combining Lee Index and hscTnT to Predict Mortality



Weber et al: Eur Heart J 34:853, 2013

Comparative Incidence of Plaque Rupture



Cohen and Aretz: Cardiovasc Pathol 8(3):133, 1999

Angiographic Characteristics

	PACS no. (%)	SACS no. (%)	Stable CAD no. (%)	P
Complex lesion	68 (56.7)	95 (79.2)	76 (31.8)	<0.001
Ambrose's type II lesions	54 (45.0)	68 (56.7)	44 (16.4)	<0.001
Thrombus	9 (7.5)	39 (32.5)	21 (8.8)	<0.001
Ulceration	15 (12.5)	18 (15.0)	16 (6.7)	0.03
Haziness	45 (37.5)	54 (45.0)	39 (16.3)	<0.001
TIMI flow <3	27 (22.5)	61 (50.8)	48 (20.1)	<0.001

Gualandro DM et al: Atherosclerosis, 2012 (in press)