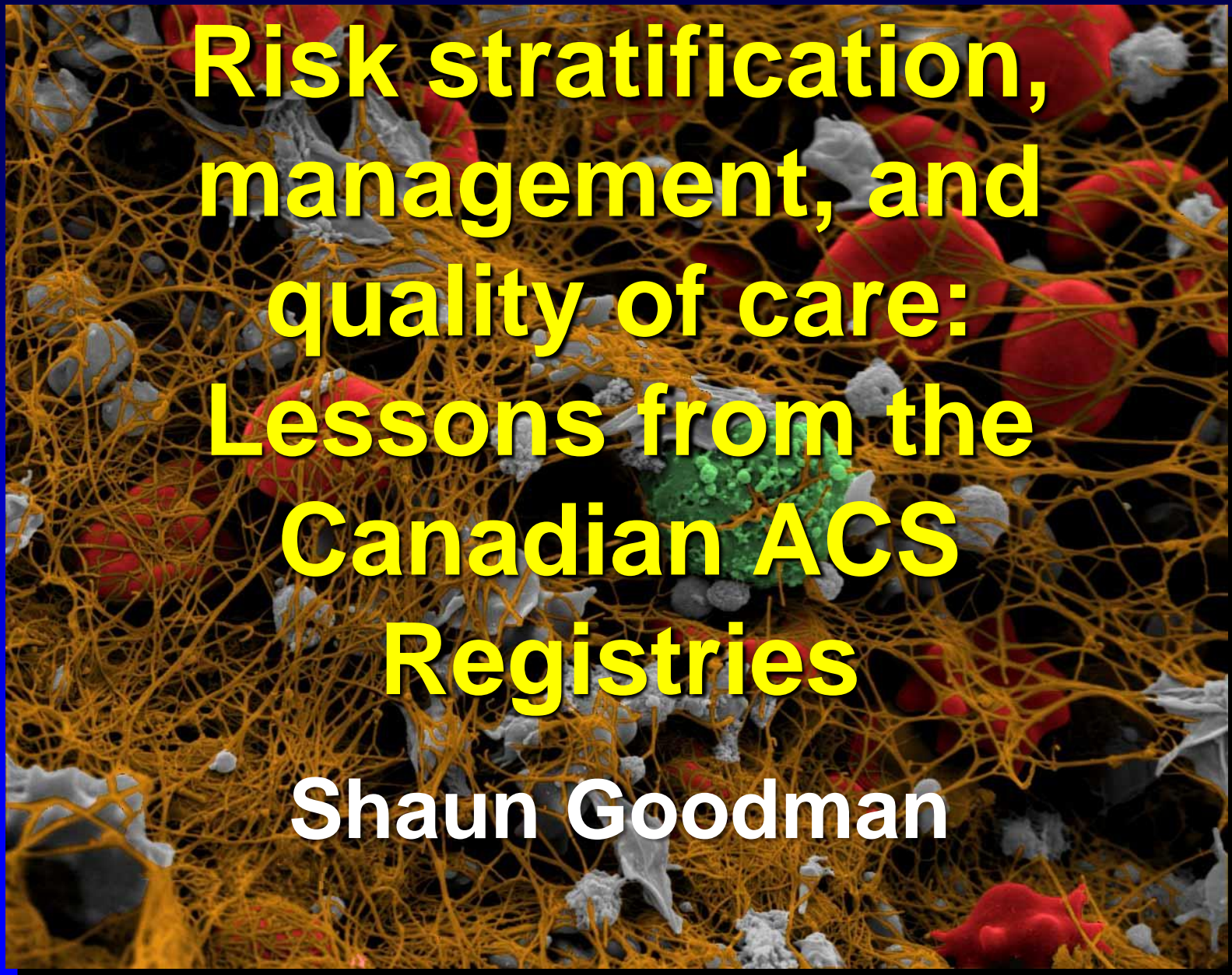




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UNIVERSITY OF TORONTO



Risk stratification, management, and quality of care: Lessons from the Canadian ACS Registries

Shaun Goodman

Photo courtesy of John W. Weisel, University of Pennsylvania



The Plan

- **Conflicts of Interest**
- **Acute Coronary Syndrome Registries in Canada**
 - Canadian ACS I and II
 - Global Registry of Acute Coronary Events (GRACE/GRACE²/CANRACE)
 - Canadian ACS Reflective
- **The evidence-to-practice Care Gap**
 - Misinterpretation of the presenting ECG
 - Under-/over-estimating risk
 - Underutilization of new antiplatelet therapy
 - Clinical trial vs. “real-world” ACS patients



Shaun Goodman: Research Grant Support, Speaker/Consulting Honorarium



Canadian Heart Research Centre ACS Registries



All ACS
Sep 1999-Jun 2001
N=5312, 51 hospitals, 9 provinces

Non-ST[↑] ACS
Oct 2002-Dec 2003
N=2356, 36 hospitals, 7 provinces

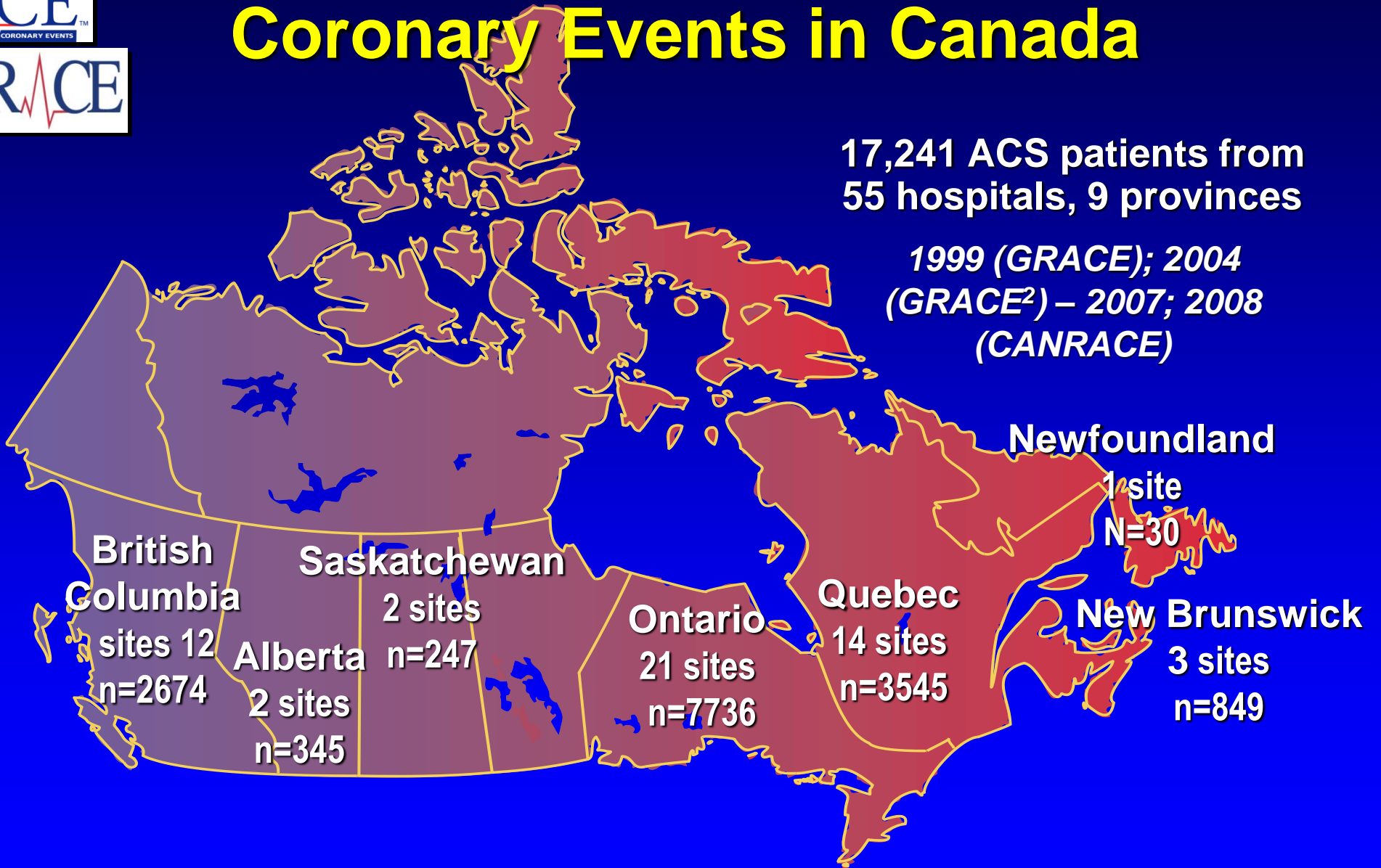


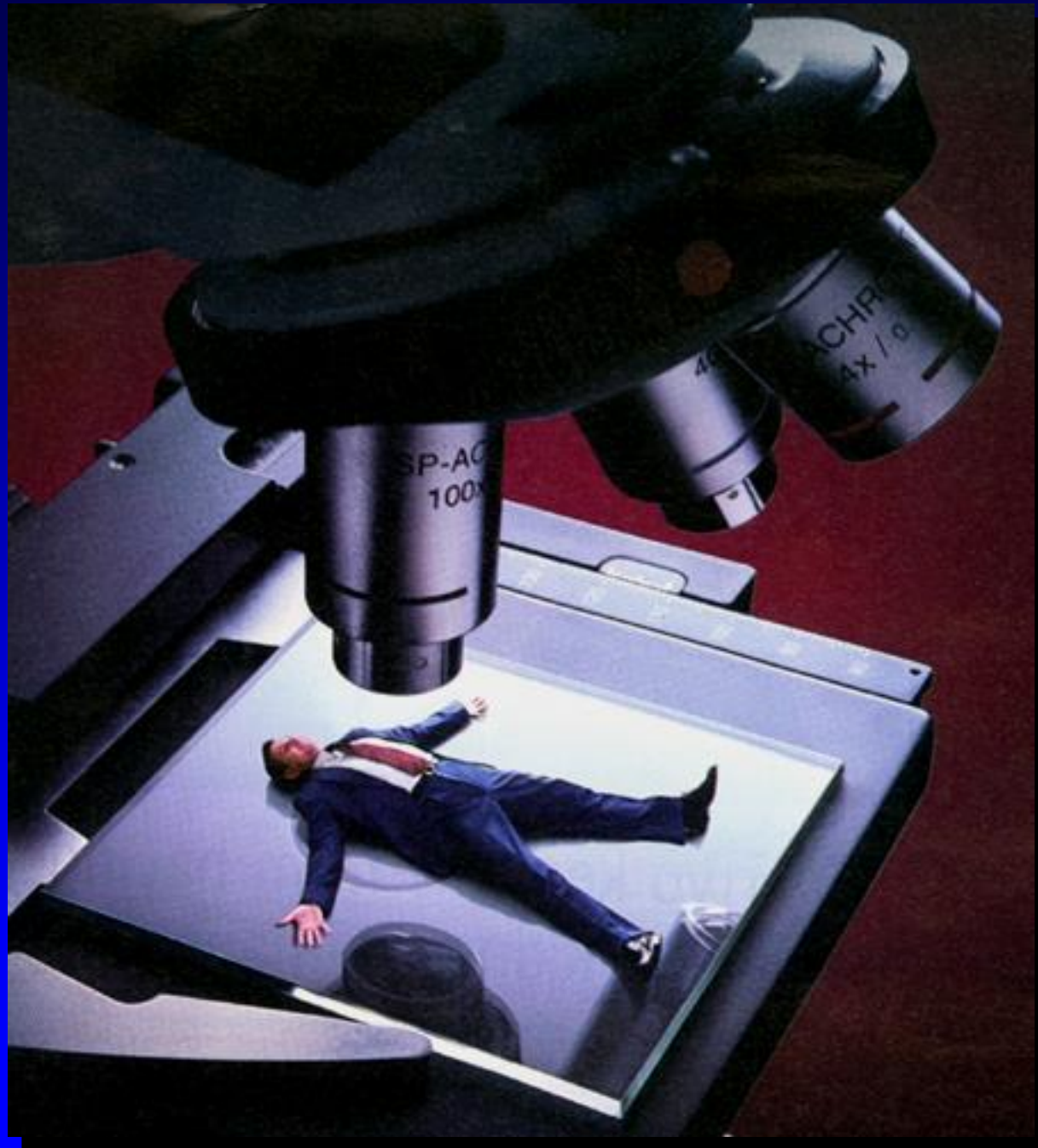


Global Registry of Acute Coronary Events in Canada

17,241 ACS patients from 55 hospitals, 9 provinces

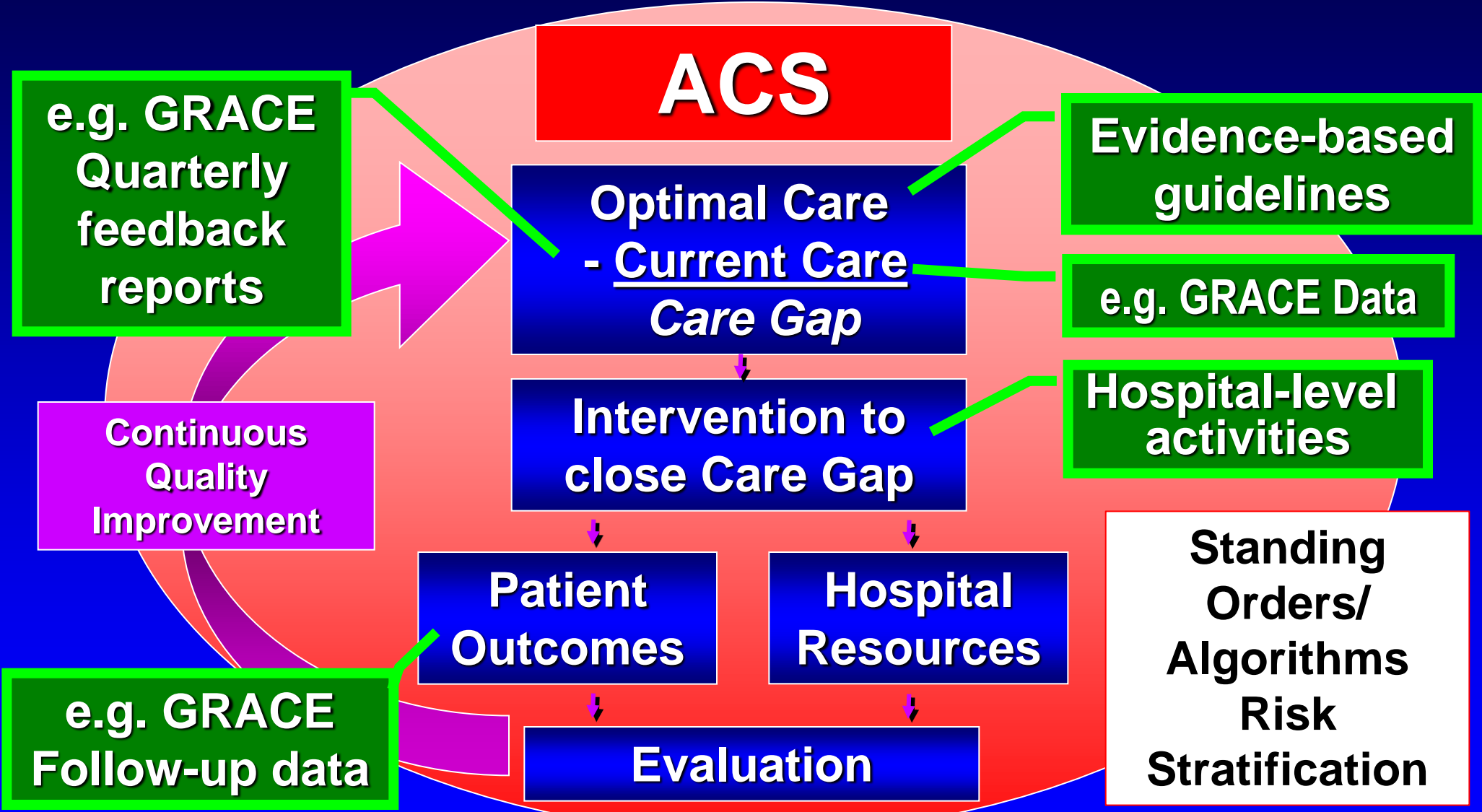
1999 (GRACE); 2004 (GRACE²) – 2007; 2008 (CANRACE)







Optimal ACS Management: Closing the Care Gap



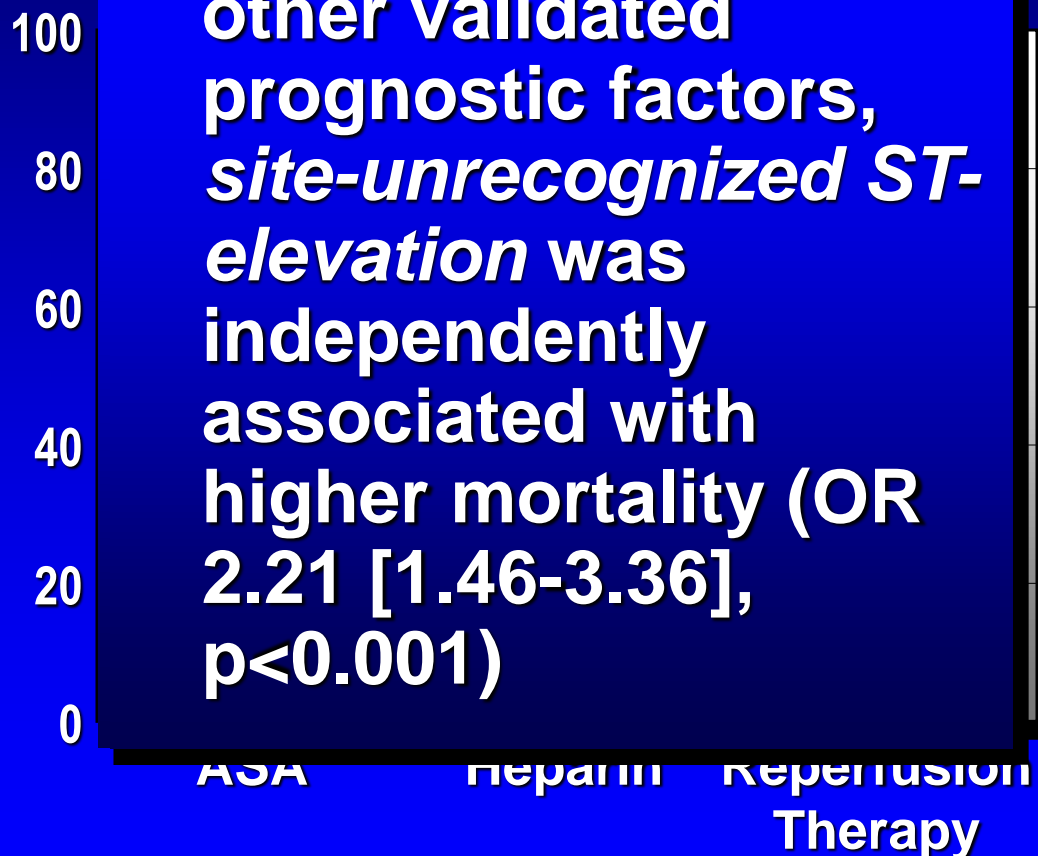
Adapted from Goodman et al Am Heart J 2009;158:193-201



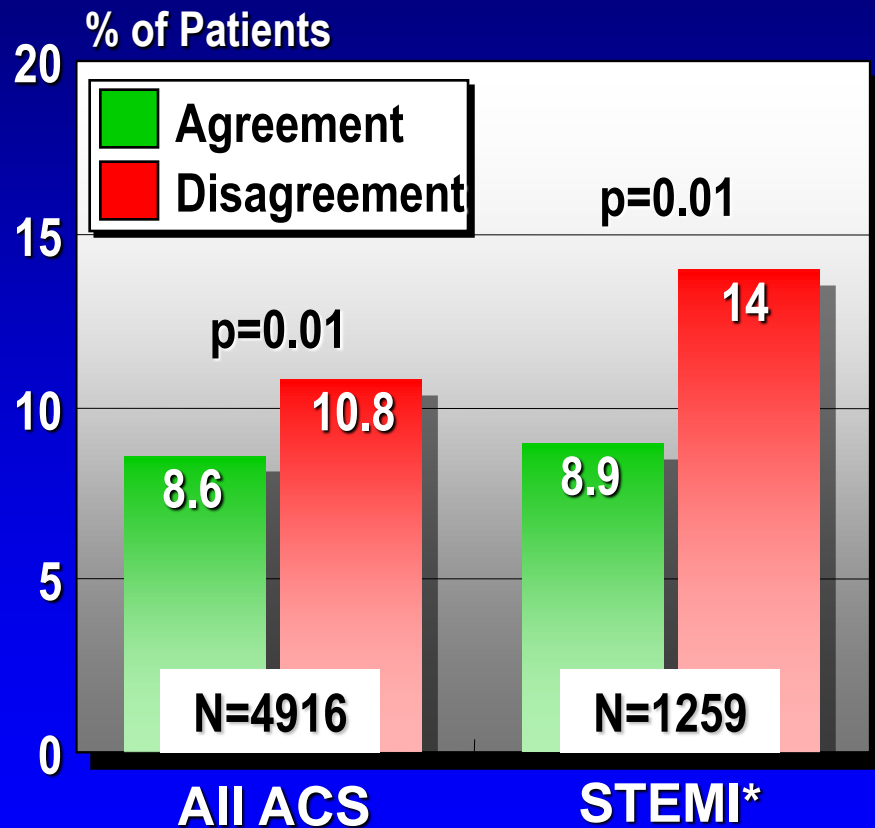
Local Hospital vs. Core-Laboratory Interpretation of the Admission ECG

Selected Therapies in STEMI*

■ After adjusting for other validated prognostic factors, *site-unrecognized ST-elevation* was independently associated with higher mortality (OR 2.21 [1.46-3.36], $p < 0.001$)



1-Year Mortality



* Core-lab-defined STE and + CK, CK-MB ± troponin



Based on these Risk Score results, you've got
about 15 minutes to live.



Frosty
the
Snow
Man

© DAN
PIRARO
11.4.02

BIZARRO.COM
Dist. by Universal Press Synd.



Snow in Israel

Israelis play in the snow in the Golan Heights. For more on the storm that hit Israel last week, see pages 4 and 33.

[Flash90 photo]





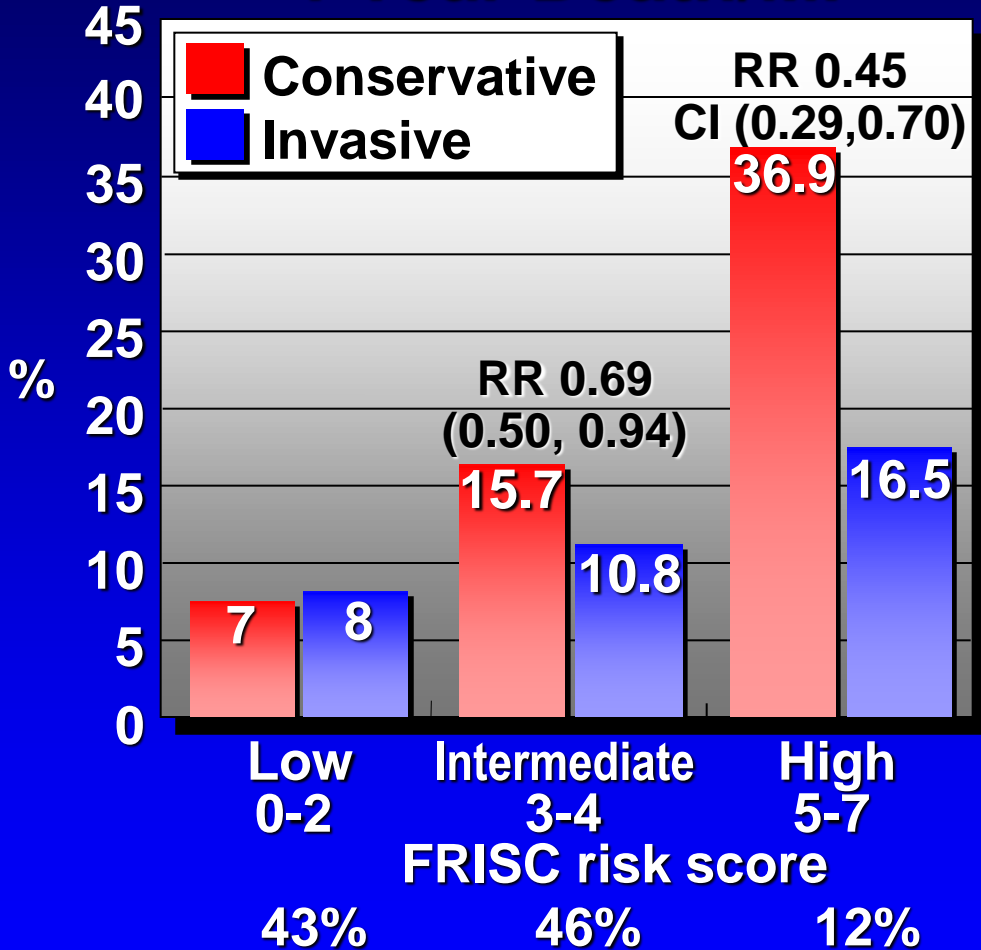
FRISC-II



TACTICS-TIMI 18

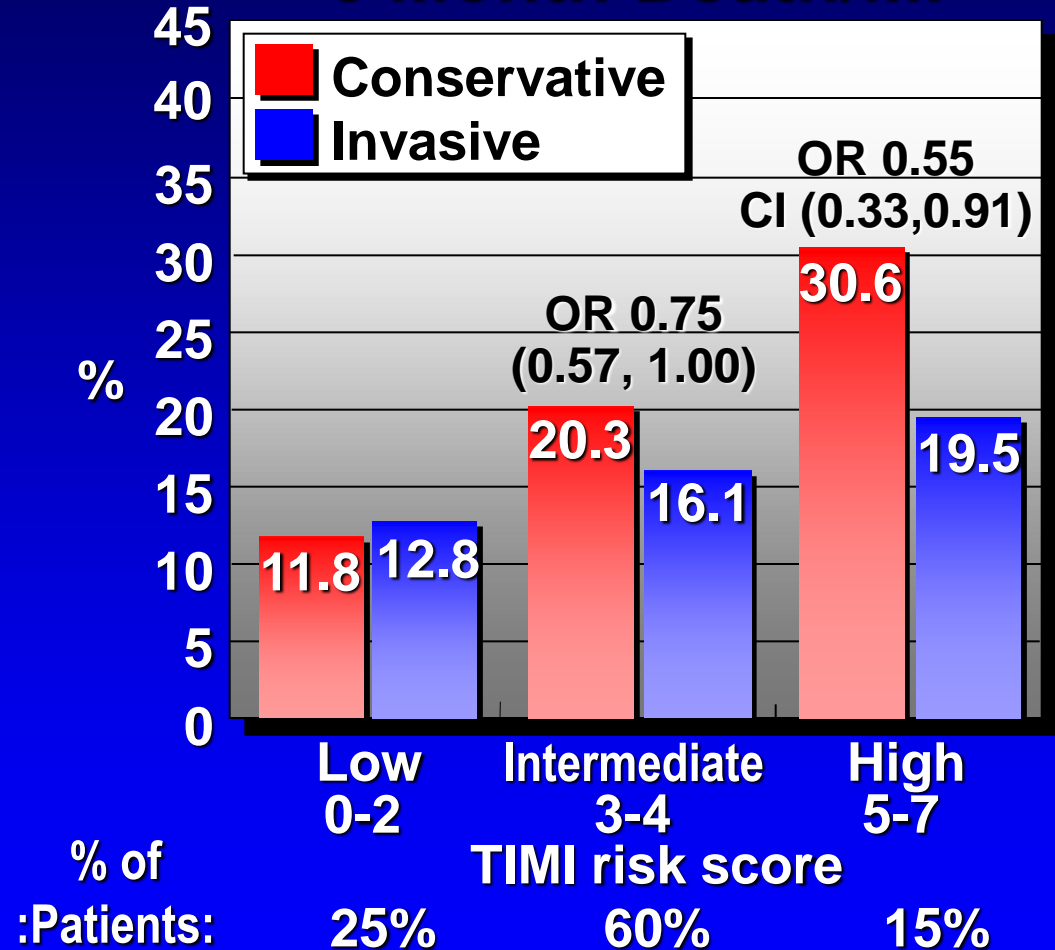


1 Year Death/MI



Lagerqvist et al
Heart 2005;91:1047-52

6 Month Death/MI



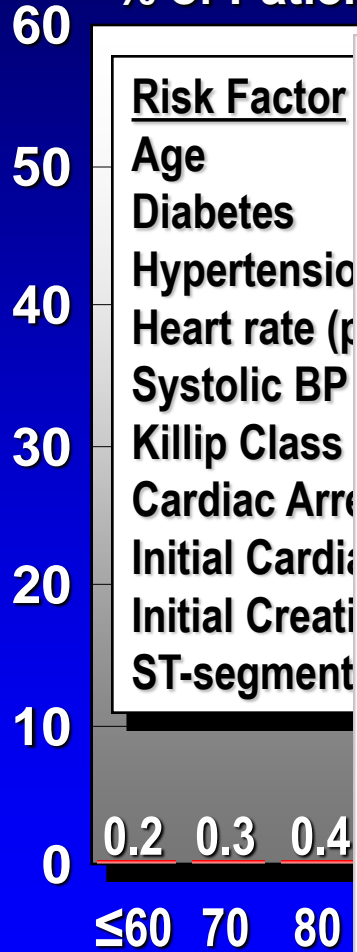
Cannon et al
N Engl J Med 2001;344:1879-87

GRACE Risk Score For All ACS

In-Hospital

GRACE ACS Risk Score 2.0

% of Patients



Macromedia Flash Player 7

File View Control Help

GRACE
Global Registry of Acute Coronary Events

At Admission (in-hospital/to 6 months)

Age: 50-59

HR: 70-89

SBP: 120-139

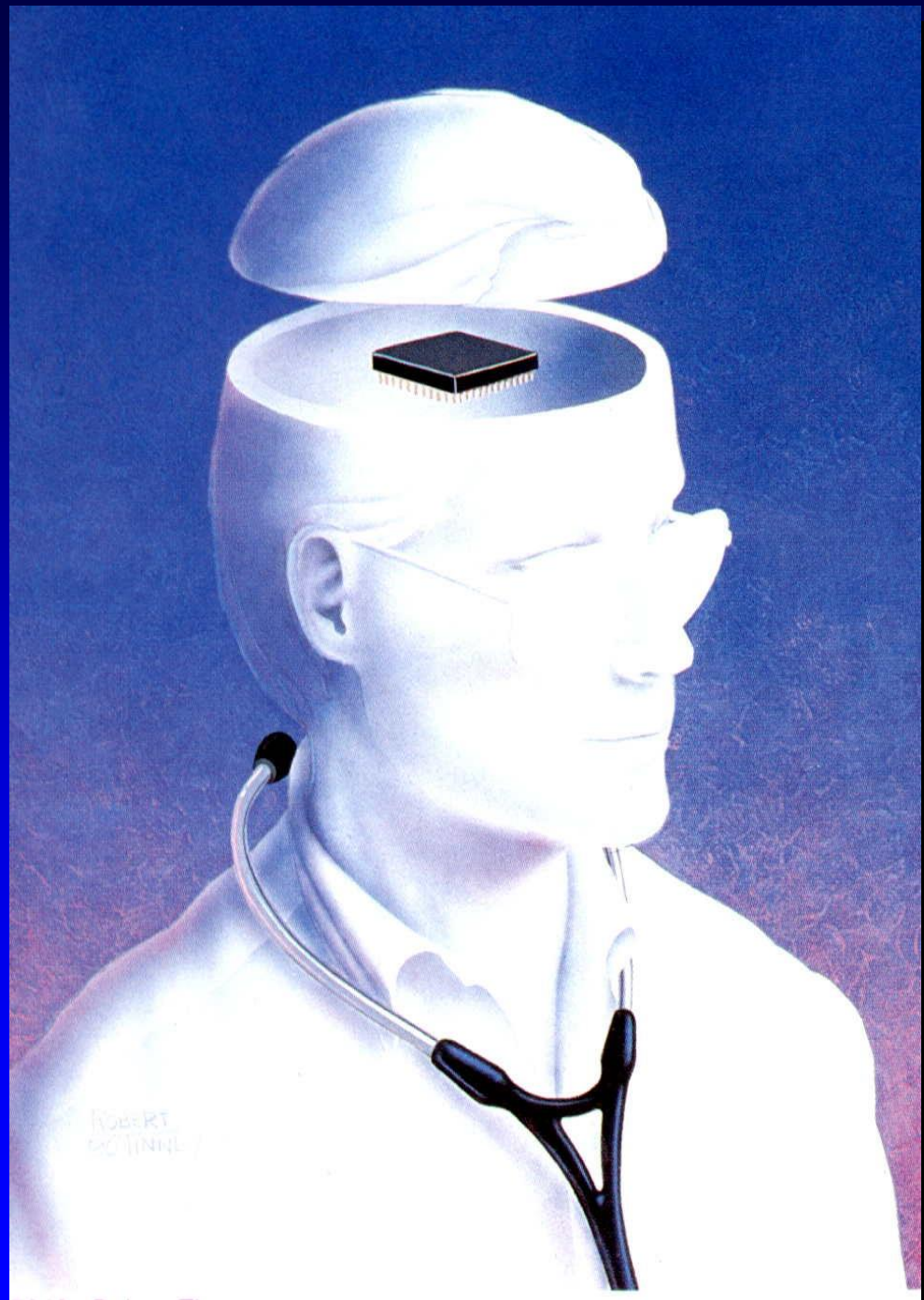
Creat.: 1.6-1.99

CHF: III (pulmonary edema)

SI Units

Calculator | Instructions

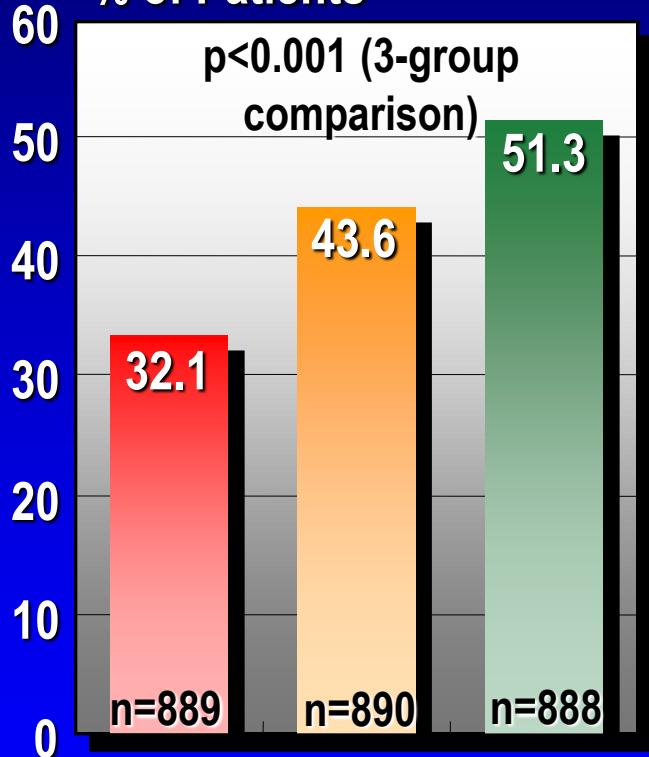




Management and Outcomes in Non-ST \uparrow ACS Patients By GRACE Risk Score

In-Hospital Cath.

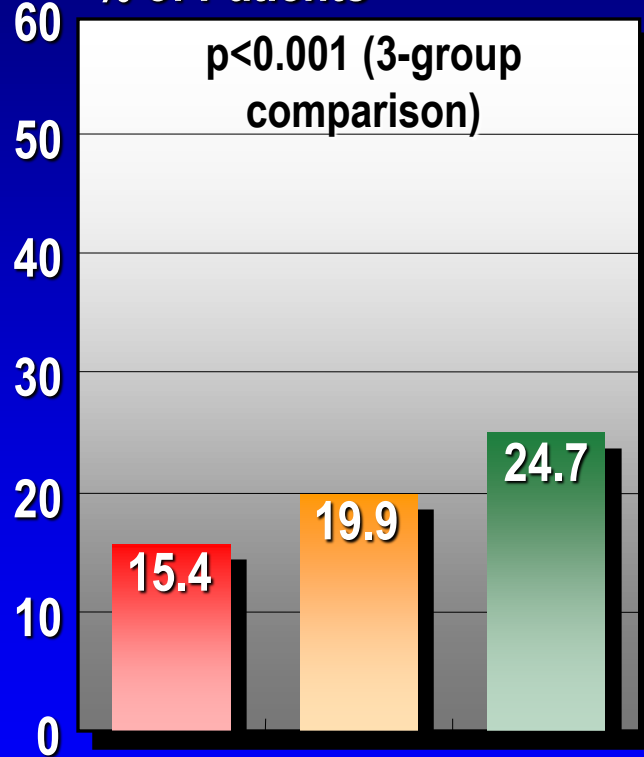
% of Patients



High Intermed. Low
149 118 85
(137,171) (105,119) (74,92)

In-Hospital Revasc.

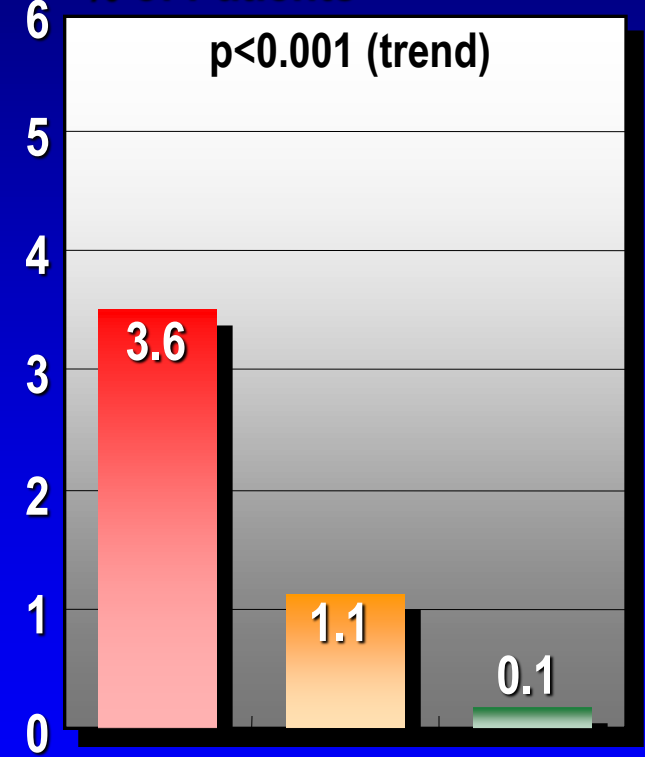
% of Patients



High Intermed. Low
Median GRACE Risk Score
(25th, 75th percentiles)

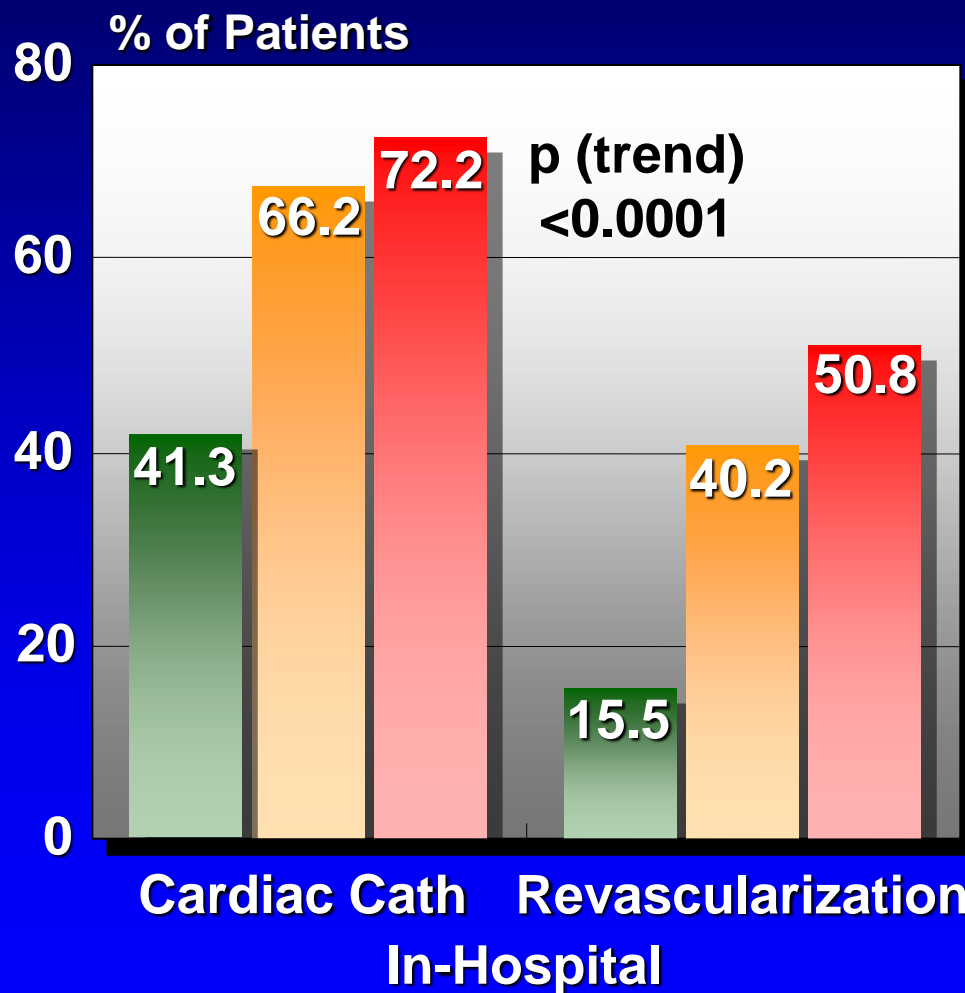
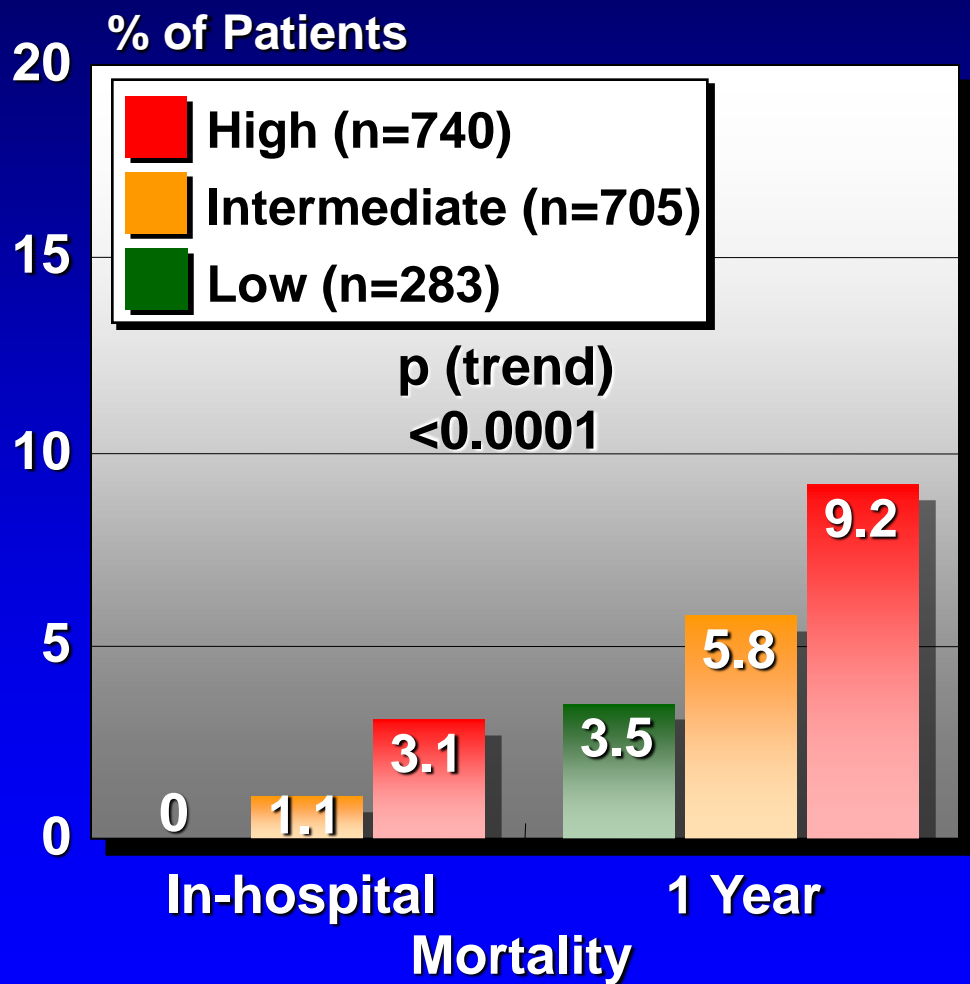
In-Hospital Death

% of Patients

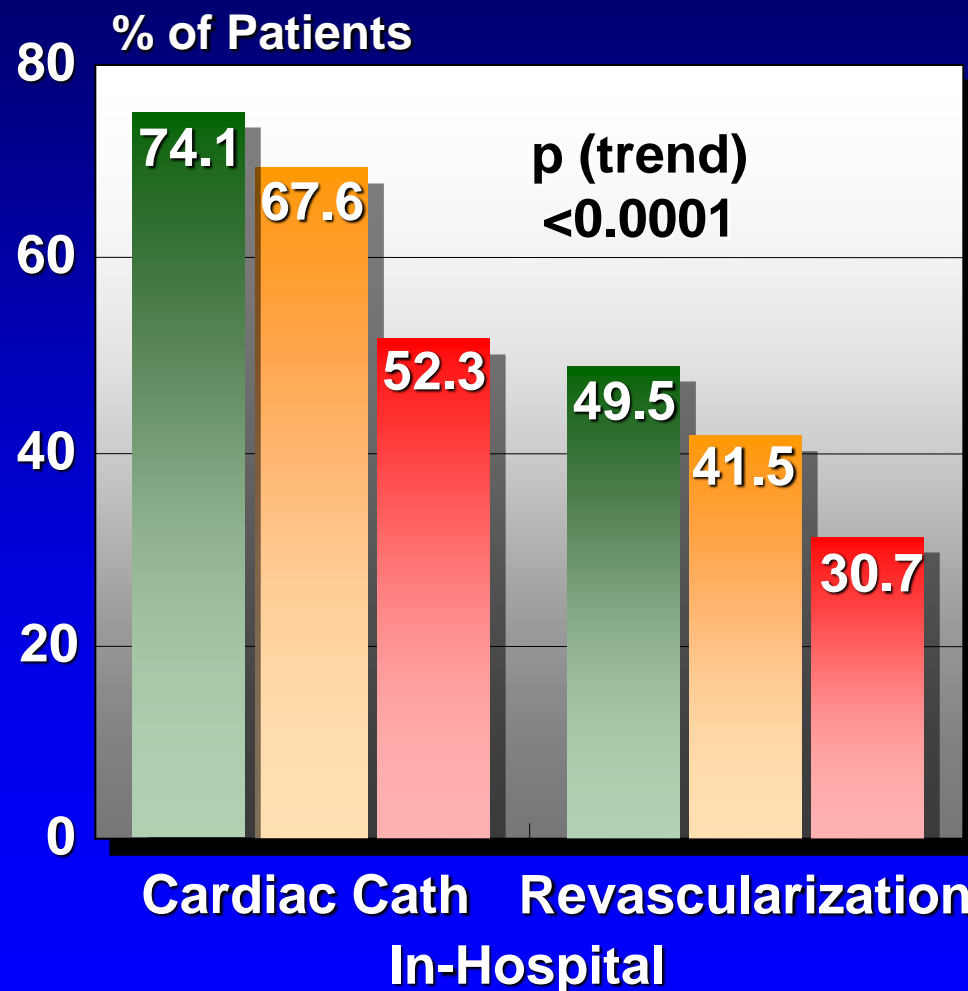
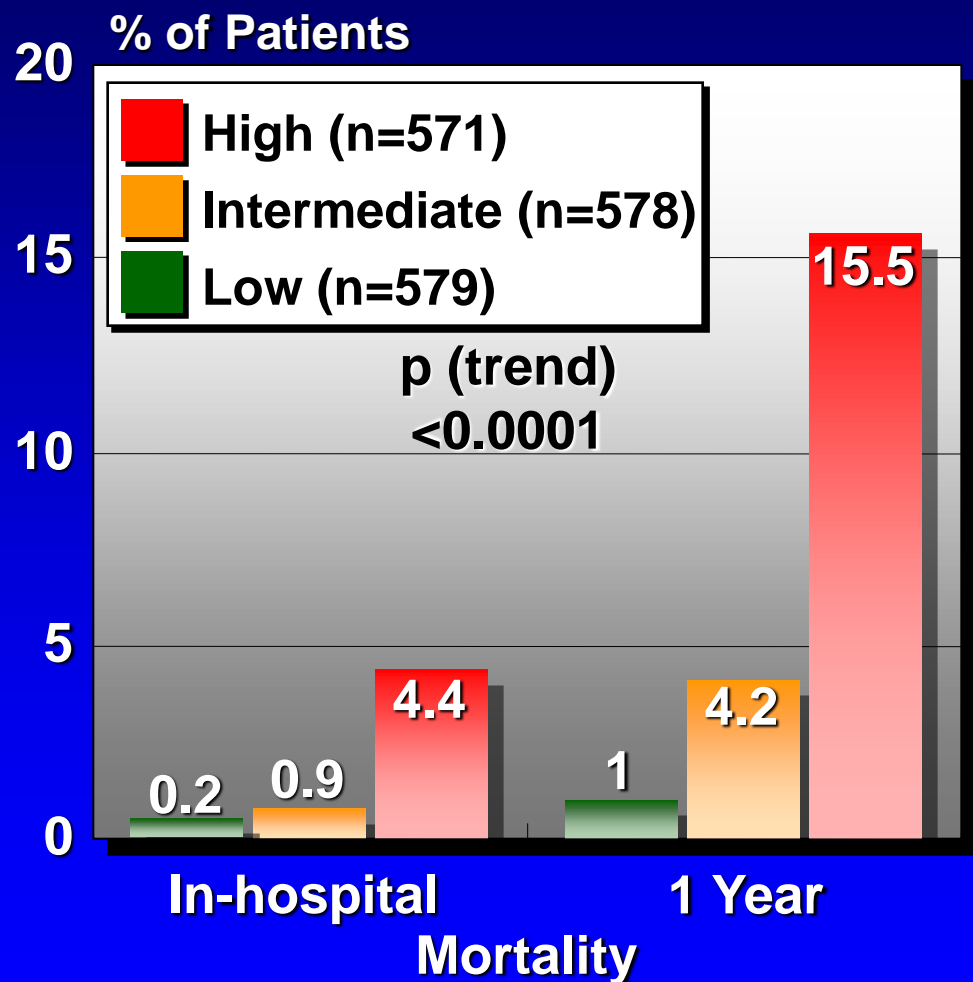


High Intermed. Low

Risk Stratification in Non-ST \uparrow ACS: Physician Assessment



Risk Stratification in Non-ST \uparrow ACS: GRACE Risk Score



Physician Assessment and the GRACE Risk Score

1 Year Mortality Model

<u>Predictor Variables</u>	<u>Adjusted Odds Ratios (95% CI)</u>	<u>P value</u>
Physician assessment		
Low risk	1 [Referent]	
Intermediate risk	1.67 (0.78-3.59)	0.19
High risk	2.45 (1.16-5.16)	0.02
GRACE risk score		
Low risk	1 [Referent]	
Intermediate risk	4.04 (1.51-10.79)	<0.0001
High risk	14.45 (5.75-36.29)	<0.001

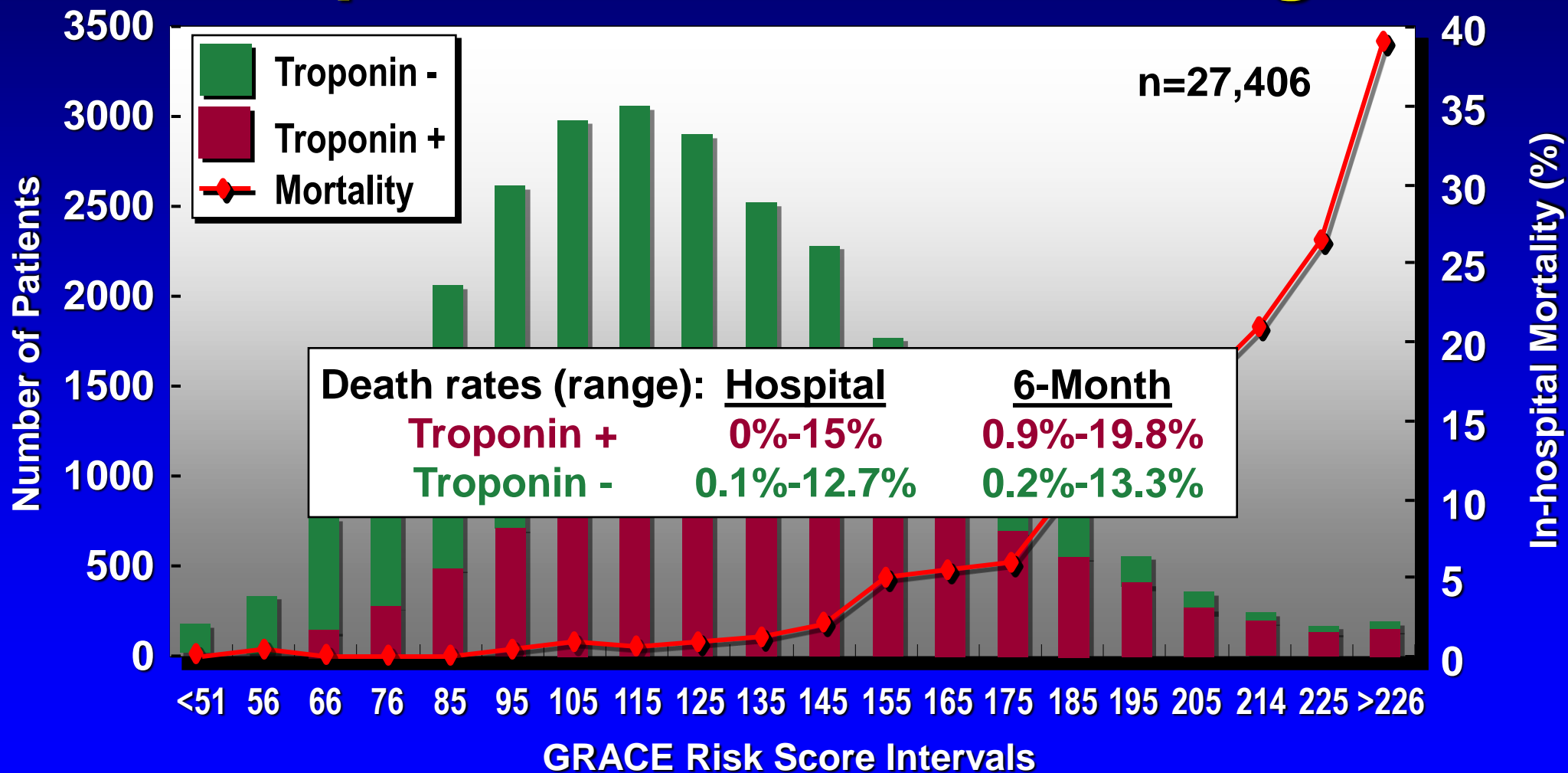
Risk Stratification in Non-ST[↑] ACS: Simpler is Not Necessarily Better

- Physicians may be reluctant to use risk scores at the bedside
 - Inconvenient?
 - Time-consuming?
 - Belief that they can readily discern and integrate high-risk features into overall risk estimation without the aid of risk scores
 - Lack of definitive data demonstrating incremental prognostic utility of risk scores beyond global risk assessment

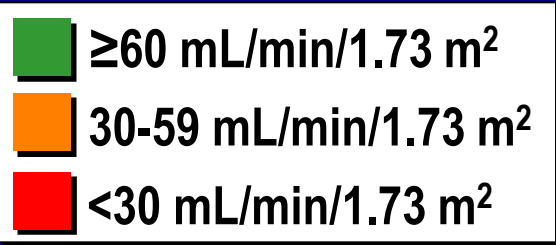
“I thought so !
Troponitis”



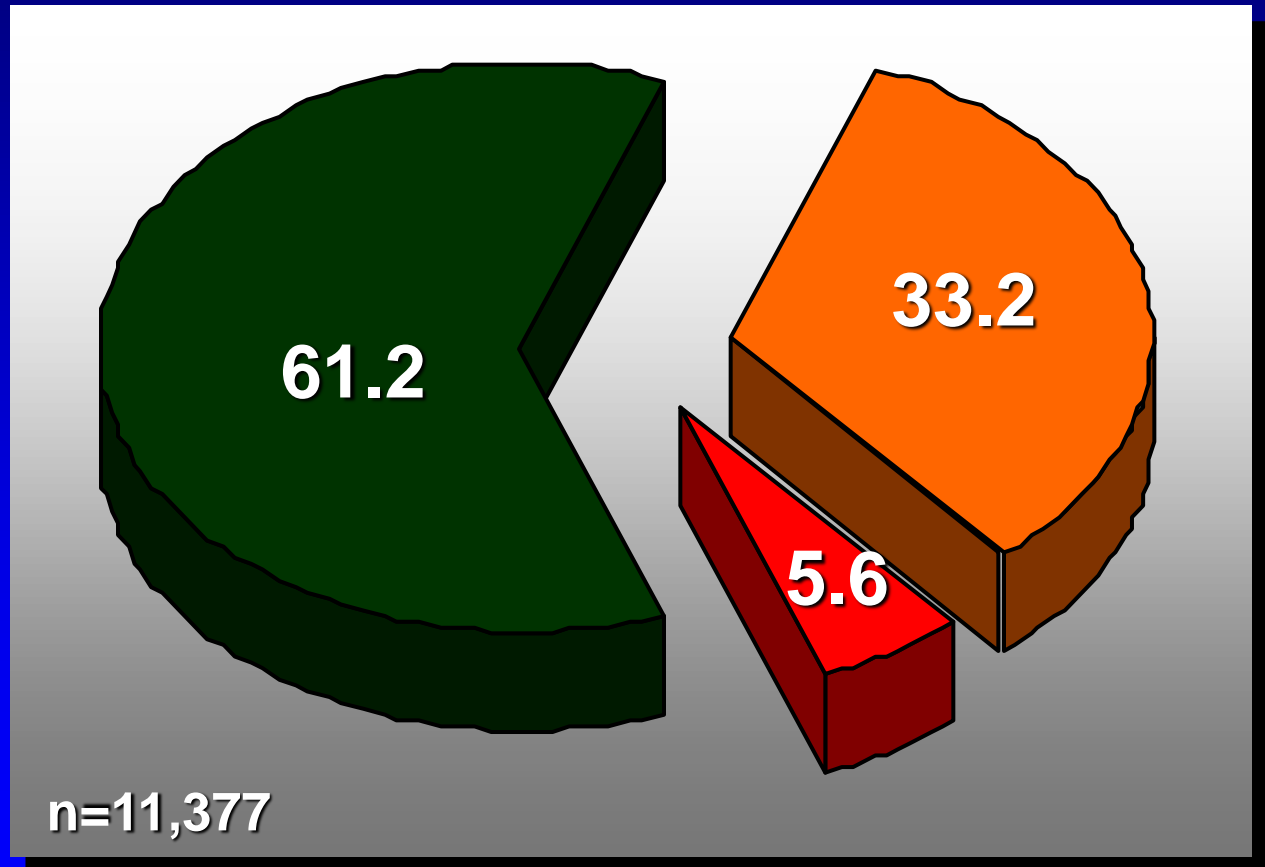
Risk Stratification in Non-STE ACS: Troponin is Often Not Enough



Kidney Dysfunction in Non-ST Elevation ACS

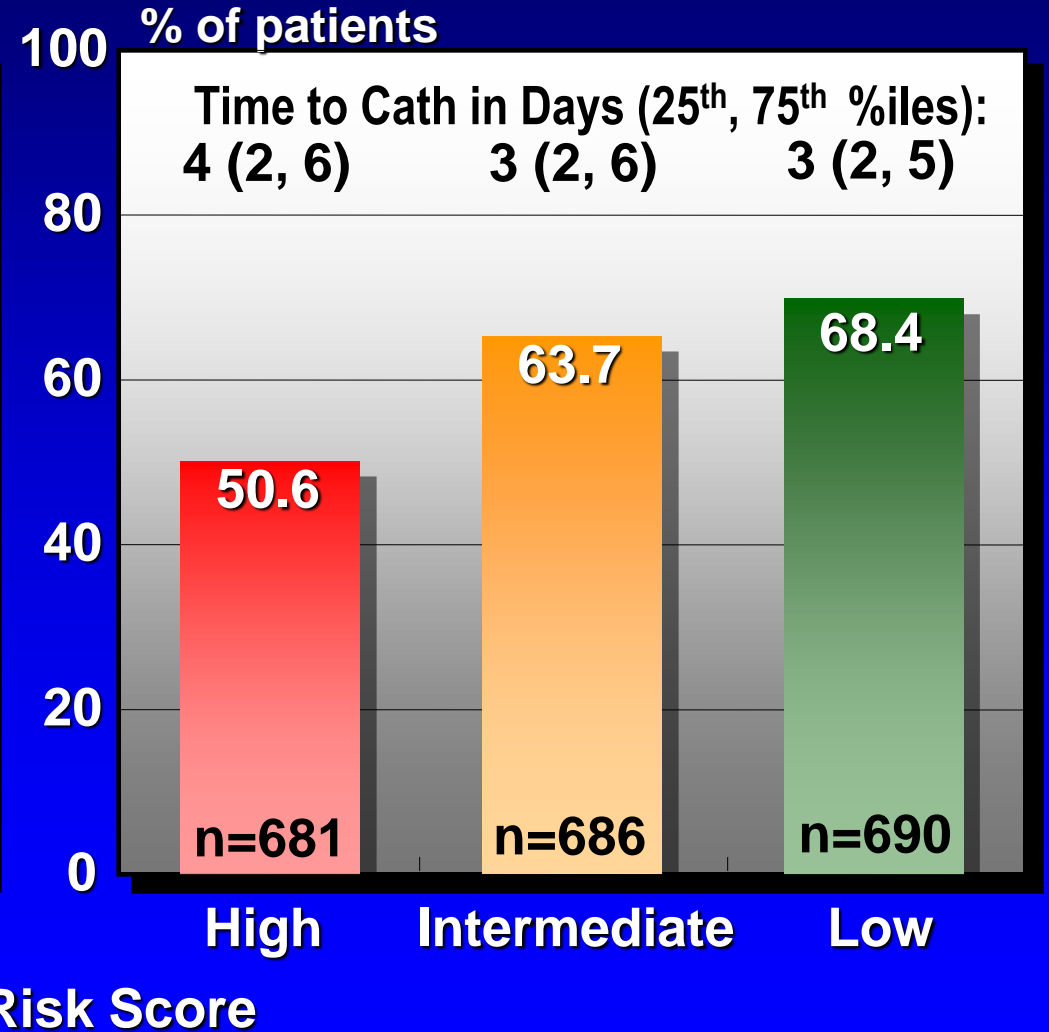
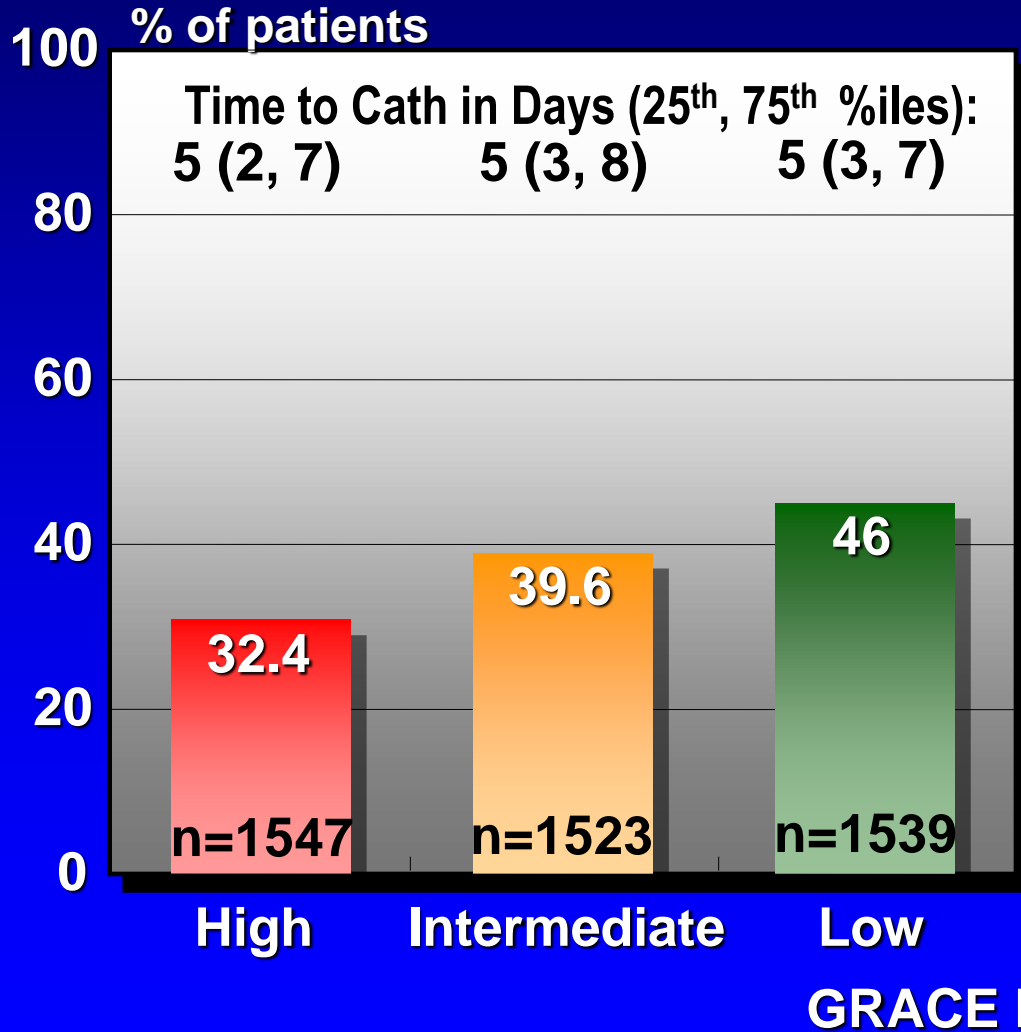


~4 in 10 patients have moderate-to-severe renal dysfunction on presentation to hospital



Cardiac Catheterization

During index hospitalization

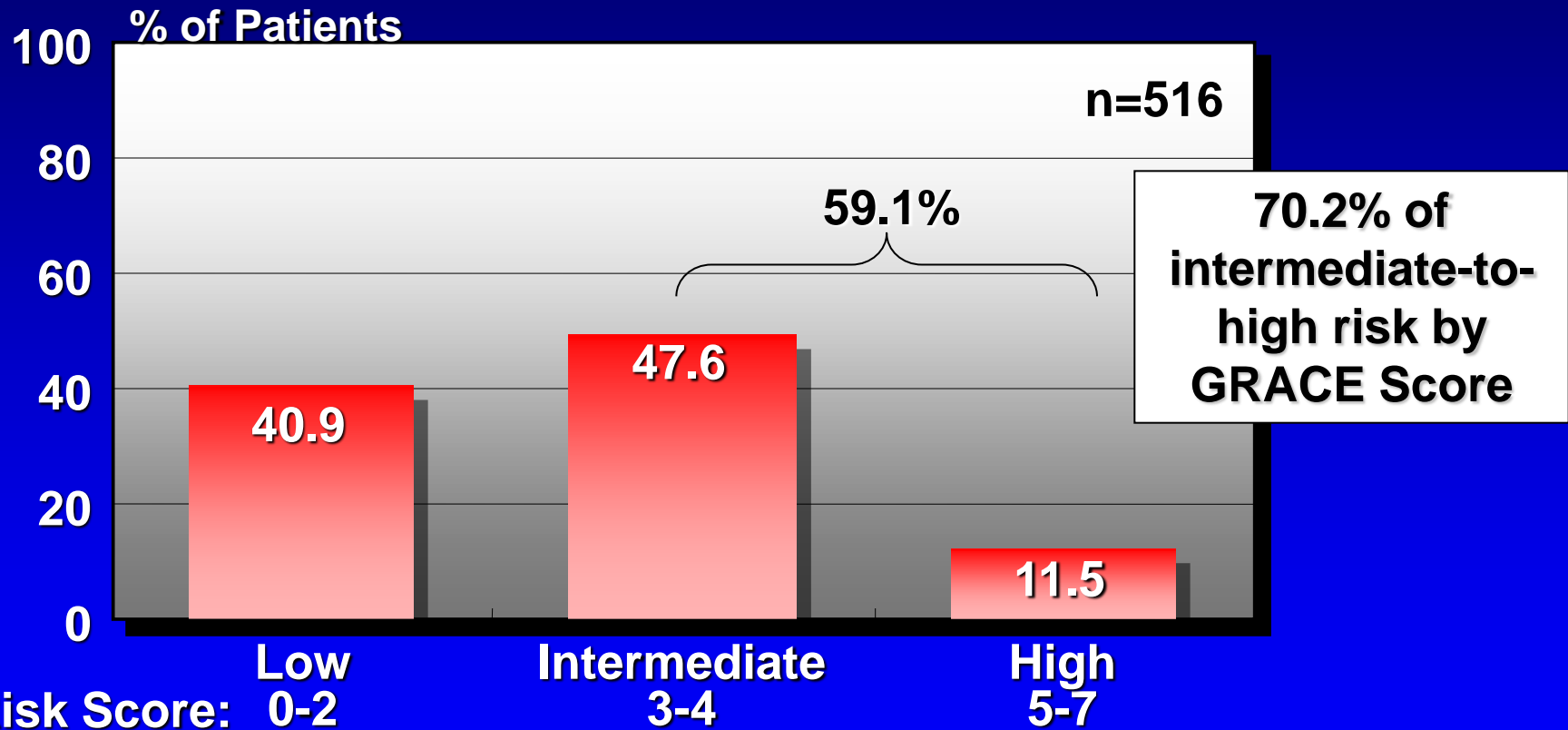




Primary Reason for NOT Referring a Patient for Cardiac Catheterization

(n=754)	%
Patient not high risk enough or clinical evidence does not support use	68.4
Patient/family refusal	4.2
Renal insufficiency	1.6
Active bleeding/recent surgery or trauma	0.1
Other comorbid conditions	5.7
Other safety concerns	3.4
Anatomy already defined	
Unsuitable to intervention	12.3
Planned intervention	4.1

Non-ST[↑] ACS Patients NOT Referred For An In-Hospital Cardiac Cath Because They Are NOT High Risk Enough or Clinical Evidence/Guidelines Don't Support Use



6-7 of 10 NSTEMI patients not referred for in-hospital angiography because their primary physician didn't think they were high enough risk had an intermediate-to-high risk TIMI or GRACE Score



Clinical Trial vs. "Real World" ACS Patients

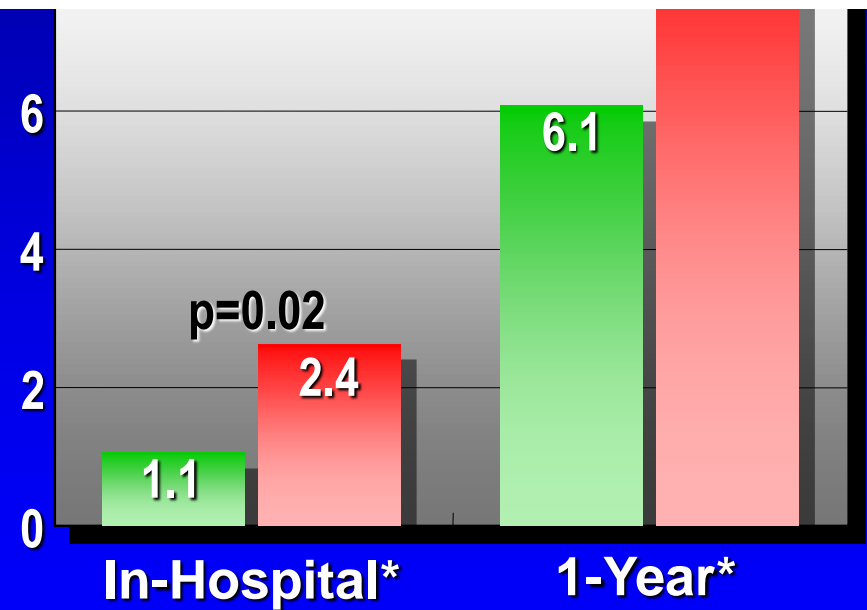
**Multivariable analysis:
mortality risk numerically,
but not statistically
significantly, lower in clinical
trial participants
(in-hospital OR 0.58 [0.29-1.16];
1-year 0.79 [0.59-1.09])**

**Risk-adjusted in-hospital
mortality significantly lower
in clinical trial participants
vs. eligible (OR 1.61 [1.06-
2.43]) and ineligible (OR 1.97
[1.24-3.13])**

Steg et al Arch Intern Med 2007;167:68-73

...e coronary syndromes enrolled

**... Strauss^c, Shlomi Matetzky^d, Mary Tan^b,
...man^{a,b} for the Canadian Acute Coronary**



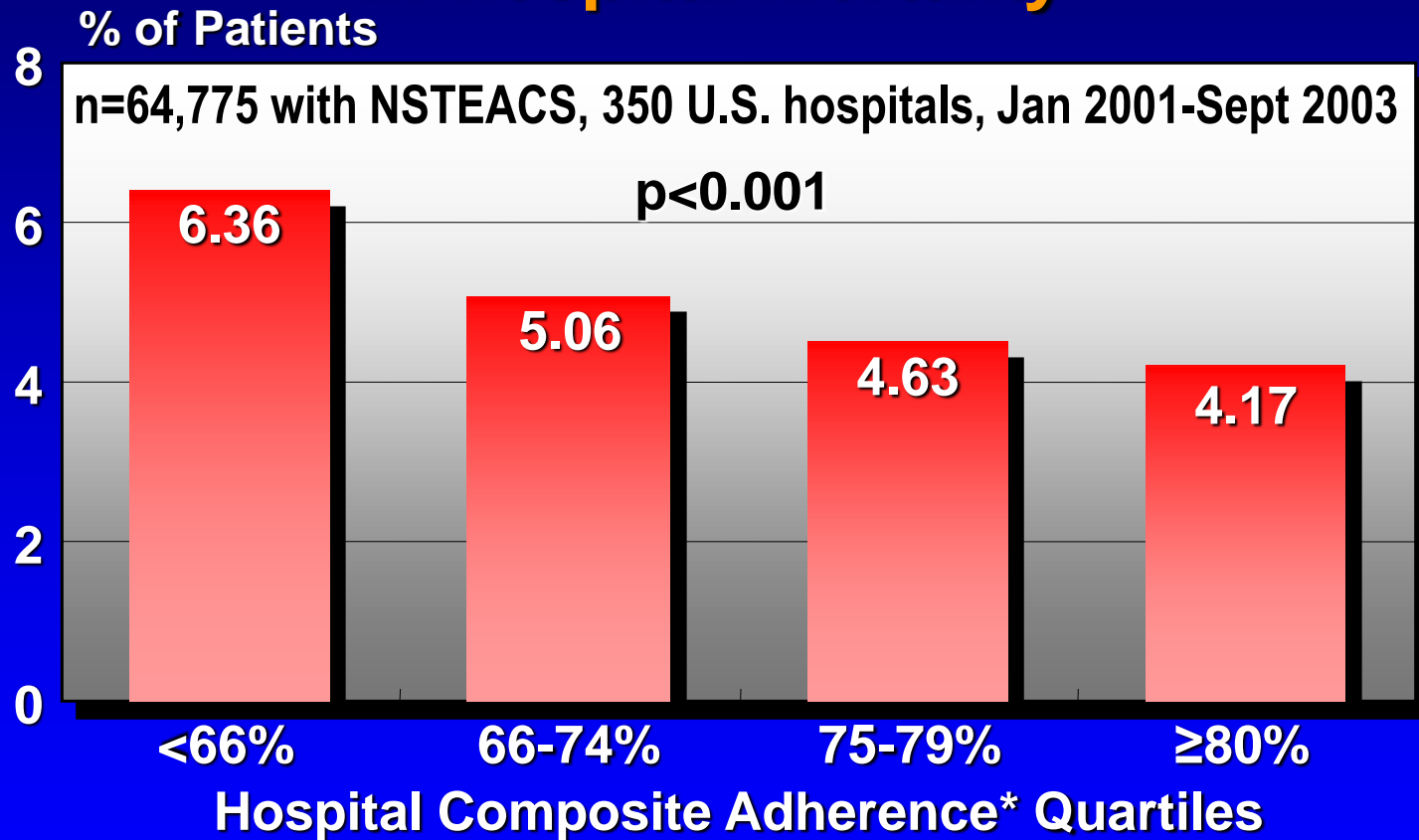
* Follow-up: 100% (in-hospital), 93% (1-year)

Segev et al Cor Art Dis 2009;20:473-6



Performance Matters!

Relationship between Process and Outcome In-hospital Mortality



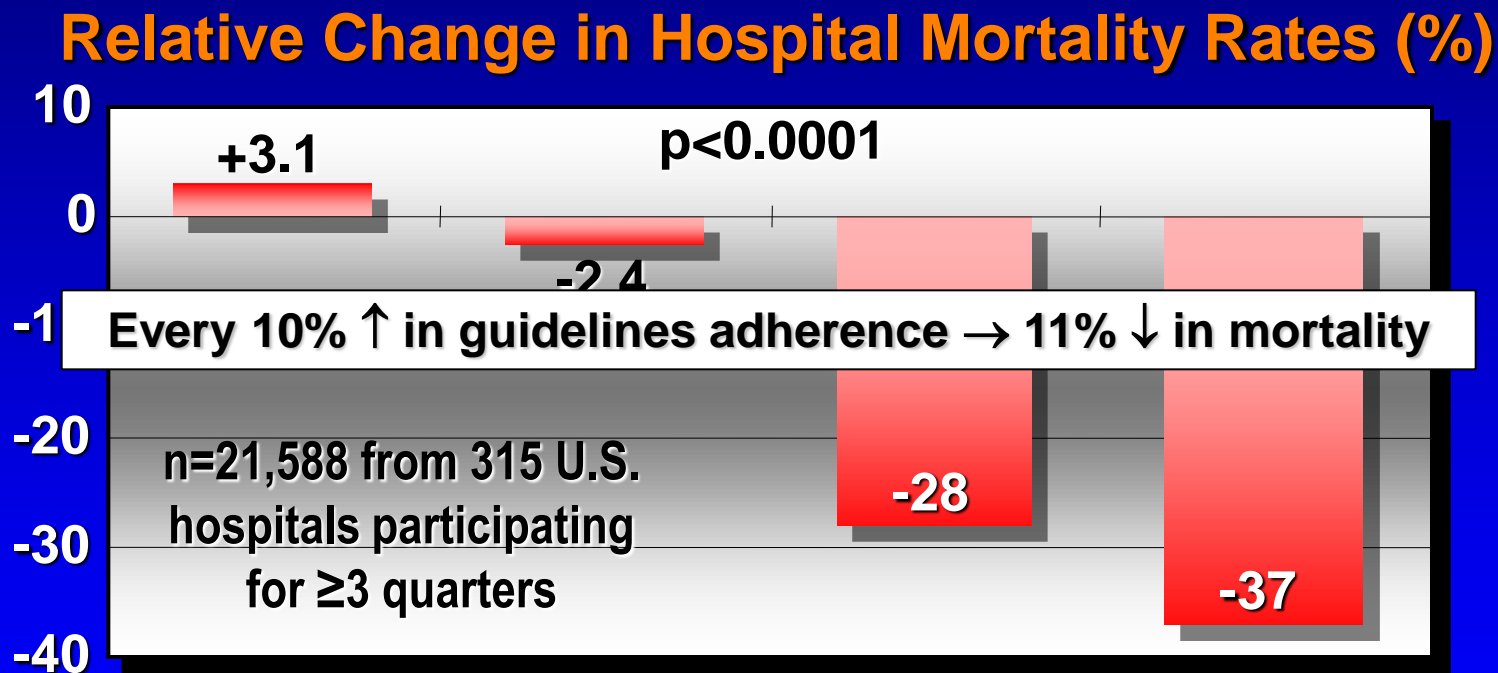
* Use of 9 ACC/AHA Class I care indicators (ASA, β -blocker, heparin, GP IIb/IIIa inhib. ≤ 24 hrs; discharge ASA, β -blocker, clopidogrel, ACEi, lipid-lowering med use) among eligible pts without contraindications (adjusted for pt + hospital features)

Peterson et al *JAMA* 2006;295:1912-20



Performance Matters!

Changes in Hospital Non-ST ACS Guideline Adherence and Patient Outcomes



Hospital Quartiles: 1 (N=78) 2 (N=79) 3 (N=79) 4 (N=79)

Absolute Change in

Guideline Adherence: -4.6% (worse) +1.8% (better) +6.8% (better) +15.6% (better)

Peterson et al *Circulation* 2004;110:III-785

Decline in Rates of Death and Heart Failure in Acute Coronary Syndromes, 1999-2006

Keith A. A. Fox, MB, ChB, FRCP

Philippe Gabriel Steg, MD

Kim A. Eagle, MD

Shaun G. Goodman, MD, MSc

Frederick A. Anderson, Jr, PhD

Christopher B. Granger, MD

Marcus D. Flather, MBBS, FRCP

Andrzej Budaj, MD, PhD

Ann Quill, MA

Joel M. Gore, MD

for the GRACE Investigators

Objective To determine whether changes in hospital management of patients with ST-segment elevation myocardial infarction (STEMI) and NSTEMI ACS are associated with improvements in clinical outcome.

Design, Setting, and Patients In the Global Registry of Acute Coronary Events (GRACE), a multinational cohort study, 44 372 patients with an ACS were enrolled and followed up in 113 hospitals in 14 countries between July 1, 1999, and December 31, 2006.

Main Outcome Measures Temporal trends in the use of evidence-based pharmacological and interventional therapies; patient outcomes (death, congestive heart failure, pulmonary edema, cardiogenic shock, stroke, myocardial infarction).

Conclusions In this multinational observational study, improvements in the management of patients with ACS were associated with significant reductions in the rates of new heart failure and mortality and in rates of stroke and myocardial infarction at 6 months.

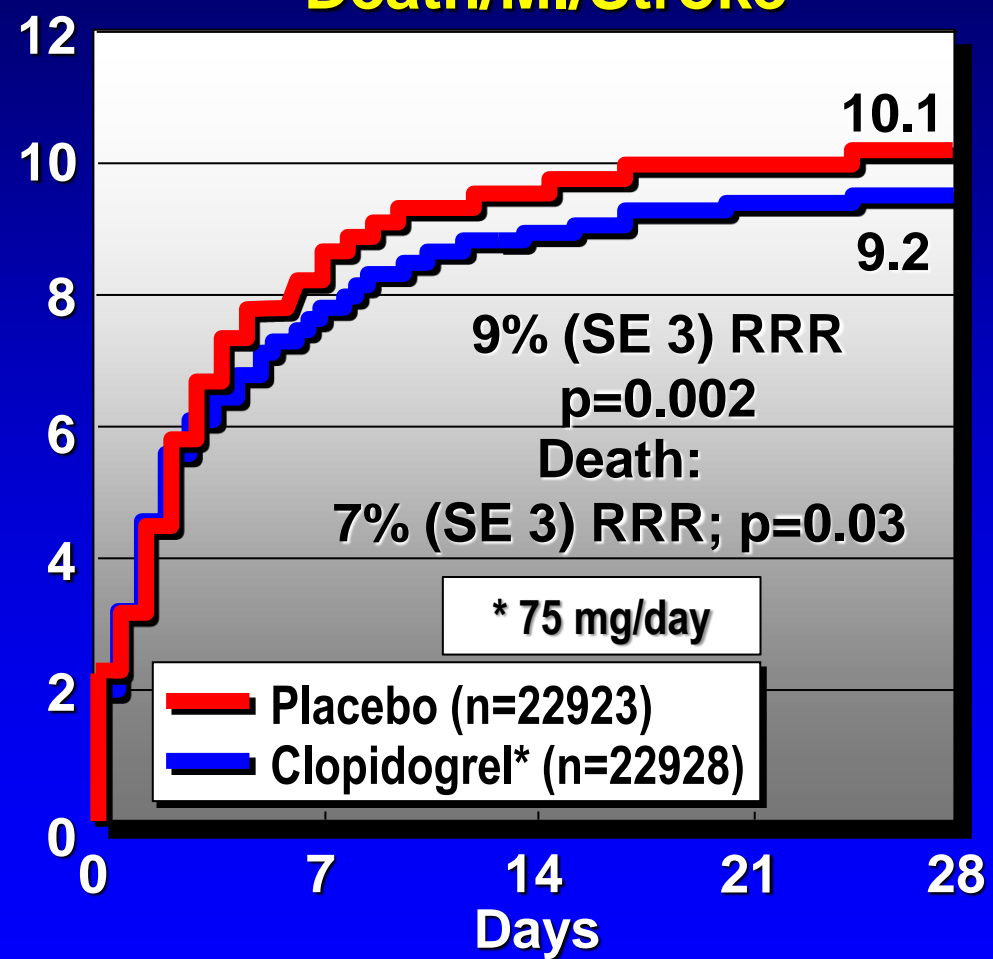
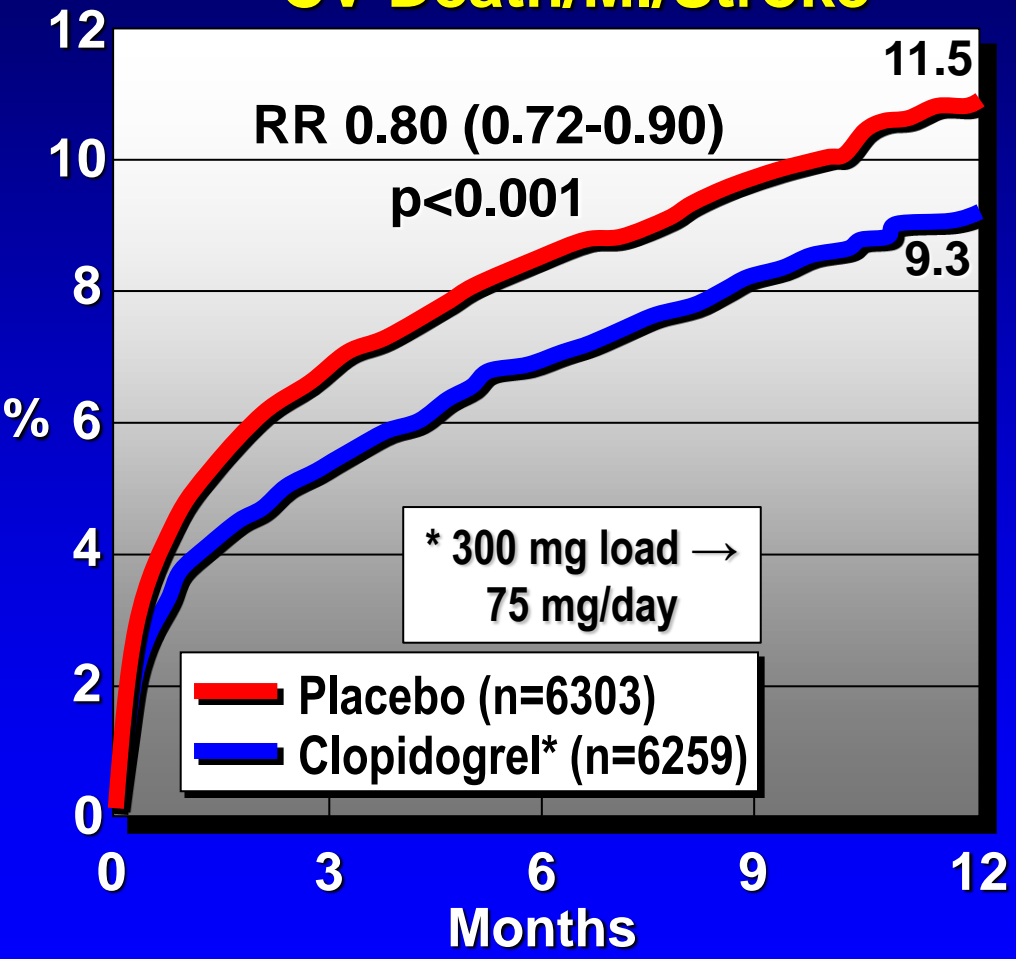


Non-ST Elevation ACS patients with ECG changes \pm cardiac marker elevation

Suspected acute MI (ST change or LBBB) within 24 h of symptom onset

CV Death/MI/Stroke

Death/MI/Stroke

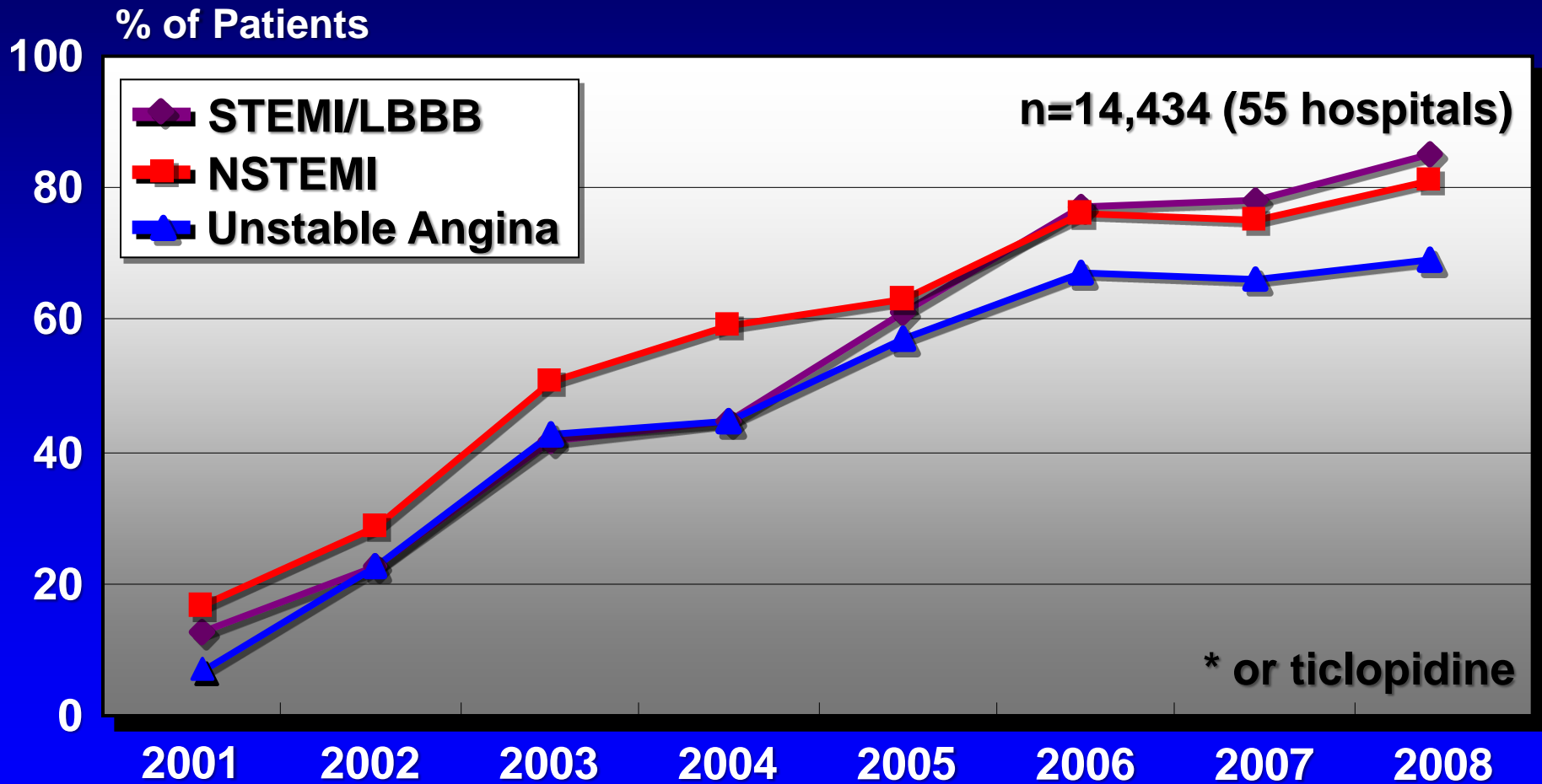


N Engl J Med 2001;345:494-502

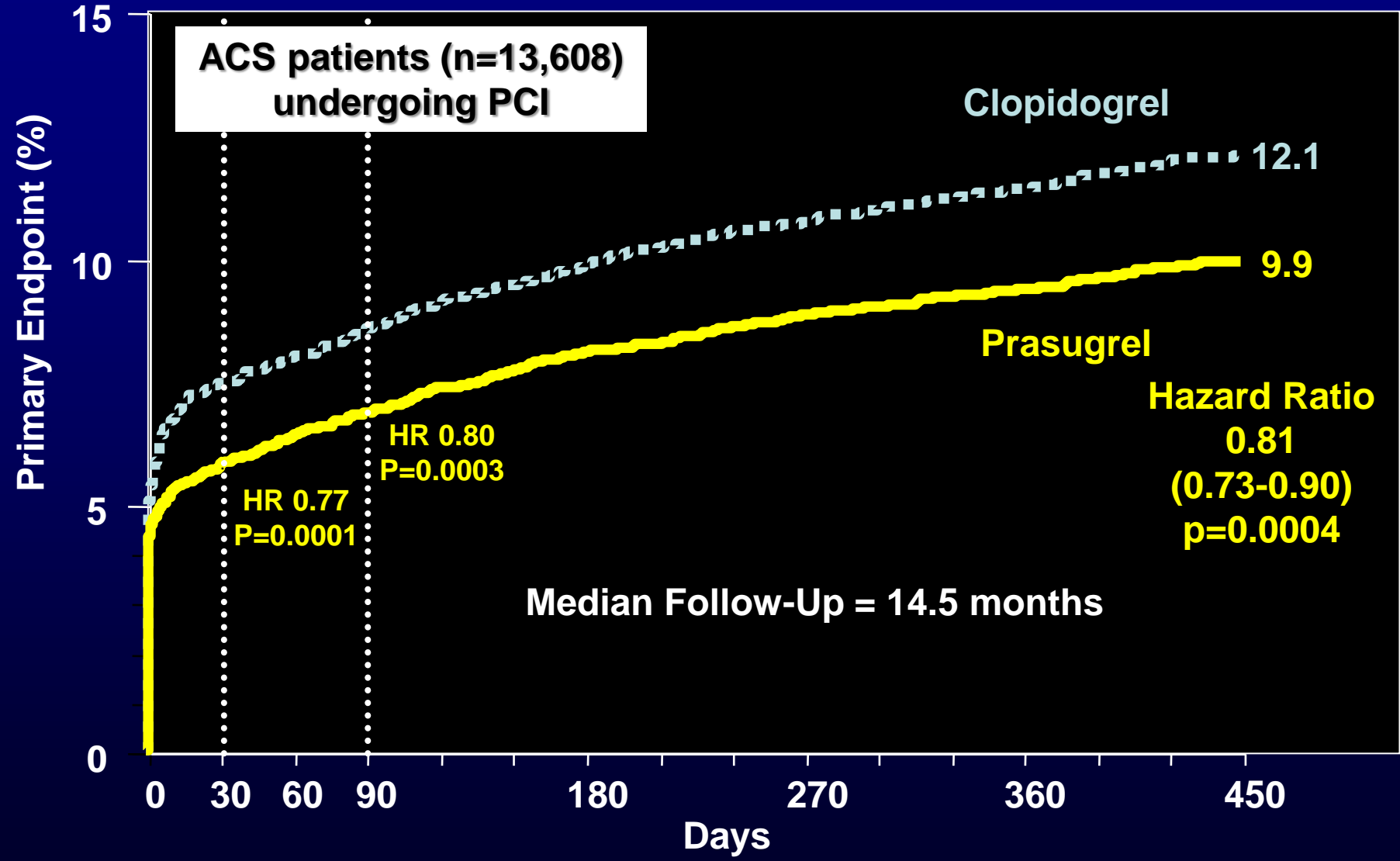
Lancet 2005;366:1607-21



Trends in Clopidogrel* Use at Admission

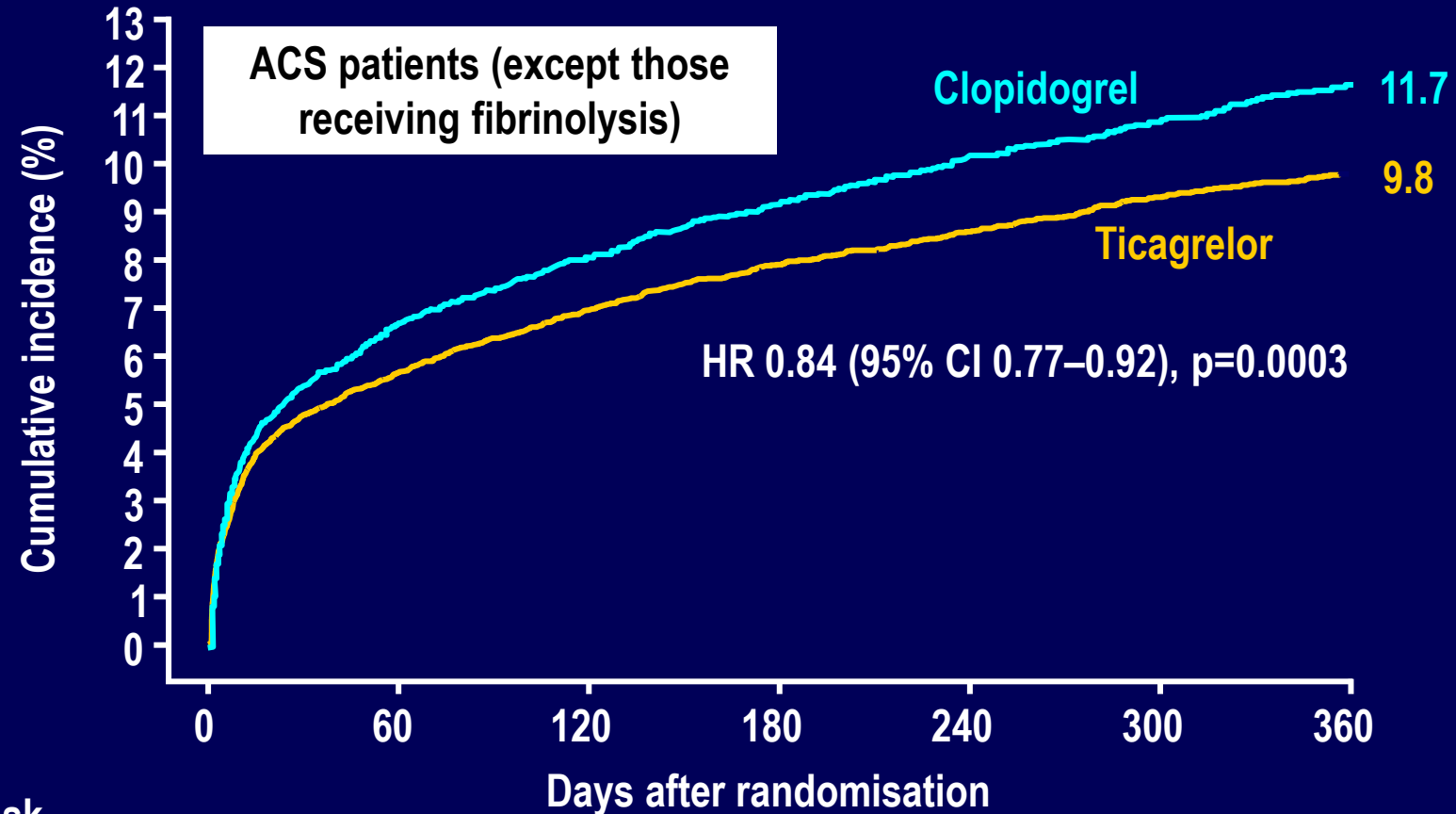


Primary Endpoint Cardiovascular (CV) Death, MI, or Stroke





Time to First Primary Efficacy Event: Composite of Cardiovascular Death, MI or Stroke



No. at risk	0	60	120	180	240	300	360
Ticagrelor	9,333	8,628	8,460	8,219	6,743	5,161	4,147
Clopidogrel	9,291	8,521	8,362	8,124	6,743	5,096	4,047

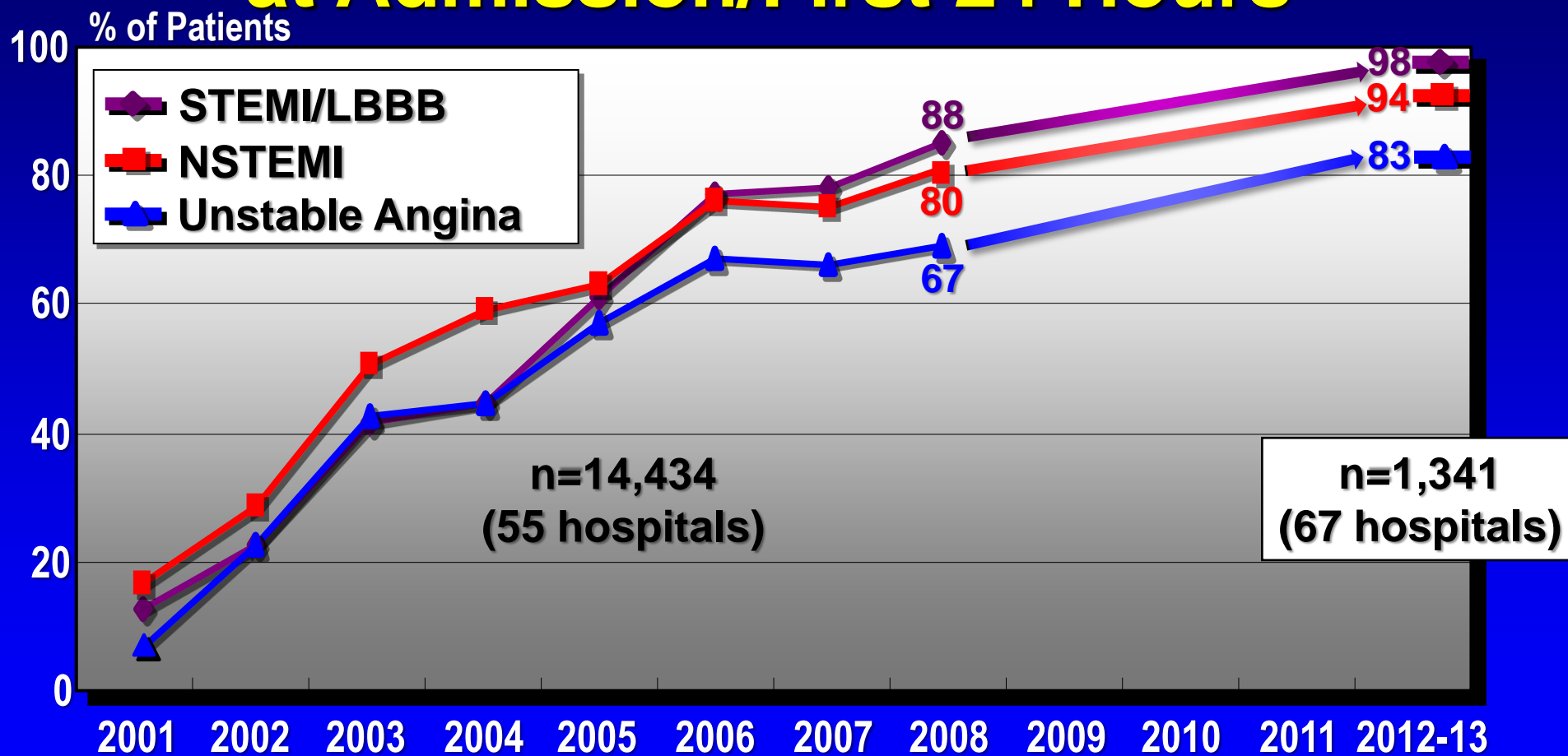


RECOMMENDATIONS

2012 Focused Update on the Canadian Cardiovascular Society Guidelines for the use of Antiplatelet Therapy

New ADP Receptor Inhibitors recommended over Clopidogrel

Trends in ADP Receptor Inhibitor Therapy at Admission/First 24 Hours



GRACE/GRACE² data adapted from Rao et al *Am Heart J* 2009;157:642-650.e1; CANRACE data unpublished; Canadian ACS Reflective data submitted by Gandhi et al *Can Cardiovasc Congress* 2013

Oral Antiplatelet Therapies at Admission

(n=1,419 ACS patients from 71 Canadian hospitals; Jan 2012-Feb 2013)

	STEMI (%) n=429	NSTEACS (%) n=929
ASA	98	97
ADP receptor inhibitor	98	91
Clopidogrel	87	88
Prasugrel	9	1
Ticagrelor	2	2

Prasugrel and ticagrelor use at presentation was low (mainly limited to STEMI patients treated with primary PCI)



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St. Michael's Computerized Order Entry

Non-ST Elevation ACS

Order picklists -- Web Page Dialog

Selected Visit Discharge F >>

Other Visit

No Visit

Common Patient Based **Order Sets** Search

Search Search

Order sets by specialty

***Acute Coronary Syndrome (Non ST-elevation MI / Unstable Angina)**

Admit to: Cardiology Diagnosis= Acute Coronary Syndrome

Admit to:

*****Print Decision Support Documentation found here: record scores and place in patient's chart**

[To Calculate GRACE risk score, click here](#)

[To Calculate TIMI risk score, click here](#)

[To Calculate CRUSADE bleeding risk score, click here](#)

Infection Control Status

Code Status

Diet

Activity

Monitoring

Acute Chest Pain Management

Cardiovascular Diagnostics

Respiratory Care

Elimination & Drains

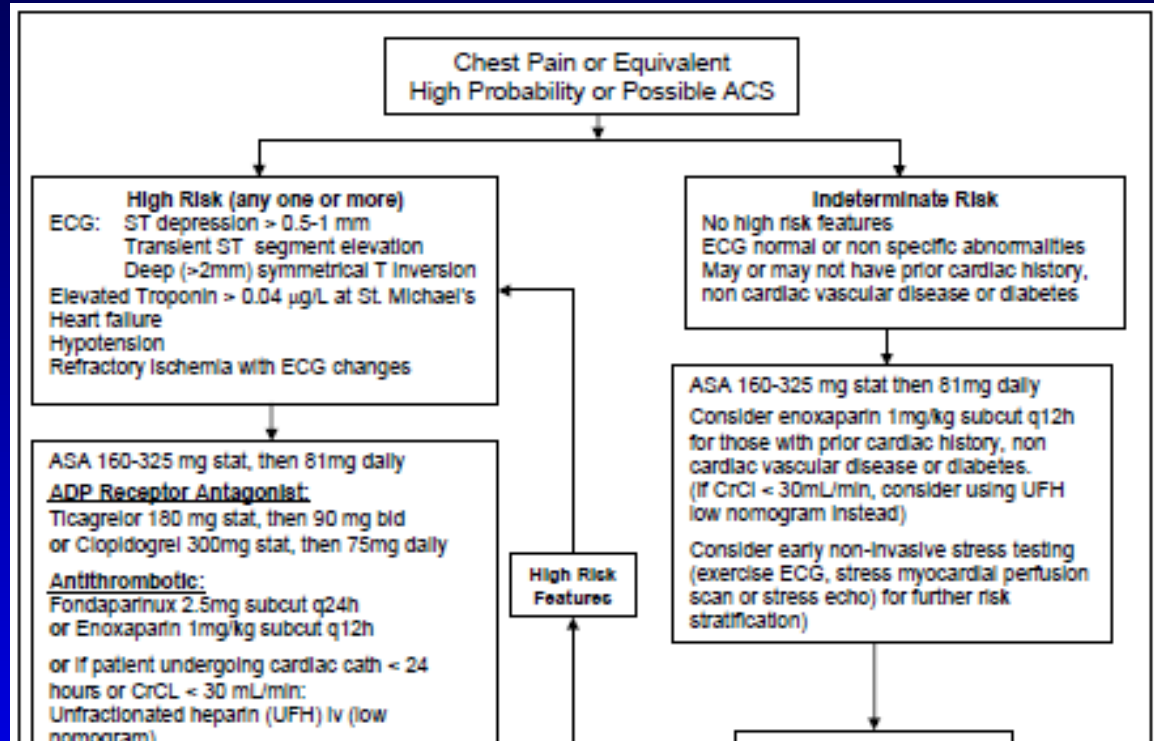
Laboratory

Imaging

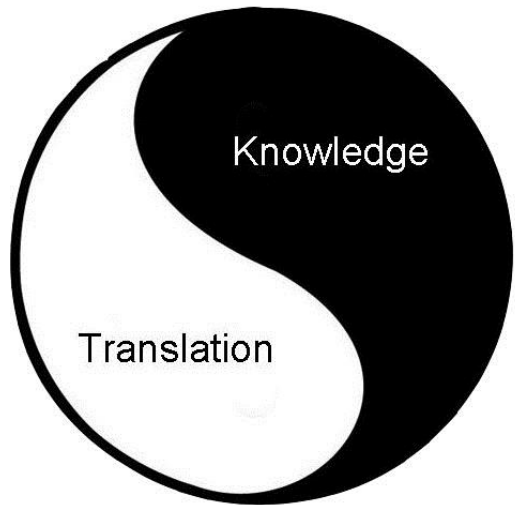


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St. Michael's Hospital Non-ST Elevation ACS Algorithm



ASA 160-325 mg stat, then 81mg daily
ADP Receptor Antagonist:
Ticagrelor 180 mg stat, then 90 mg bid
or Clopidogrel 300mg stat, then 75mg daily



“We have a lot of knowledge about your condition. We just need to translate it into better care for you.”