

# Unstable Angina/NSTEMI

----a noninvasive cardiologist's view

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# Initial Assumptions

- ER assessment
  - Patient admitted with diagnosis of probable or definite ACS (UA/NSTEMI)
  - Treatment initiated with
    - O<sub>2</sub>
    - Beta blockers
    - Antiplatelet Rx
    - Anticoagulant
- Next question
  - Early invasive
  - Conservative (at least initially noninvasive)

# Risk Stratification Models

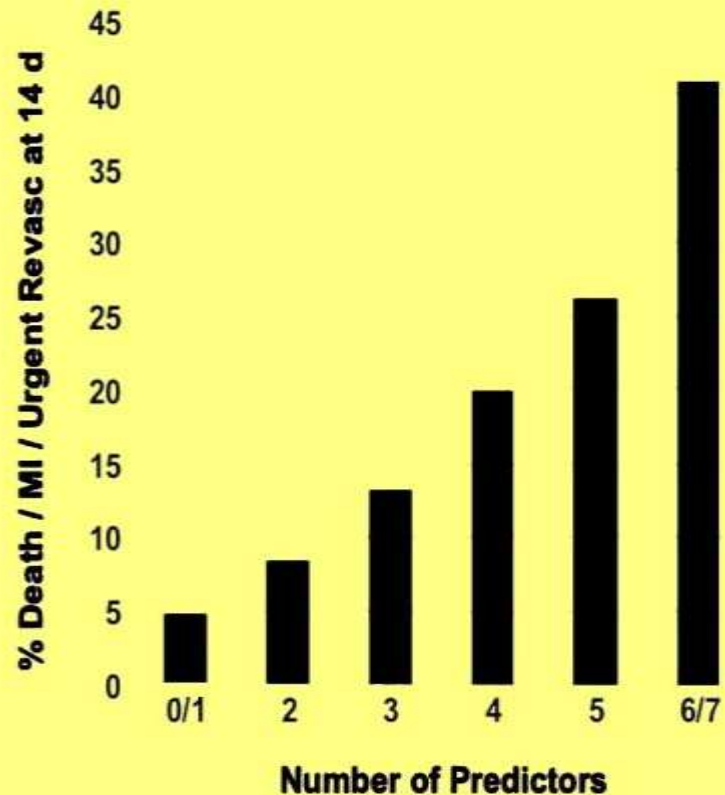
- TIMI Risk Score
- GRACE Risk Model
- FRISC Risk Model
- PURSUIT Risk Score

# TIMI Risk Score

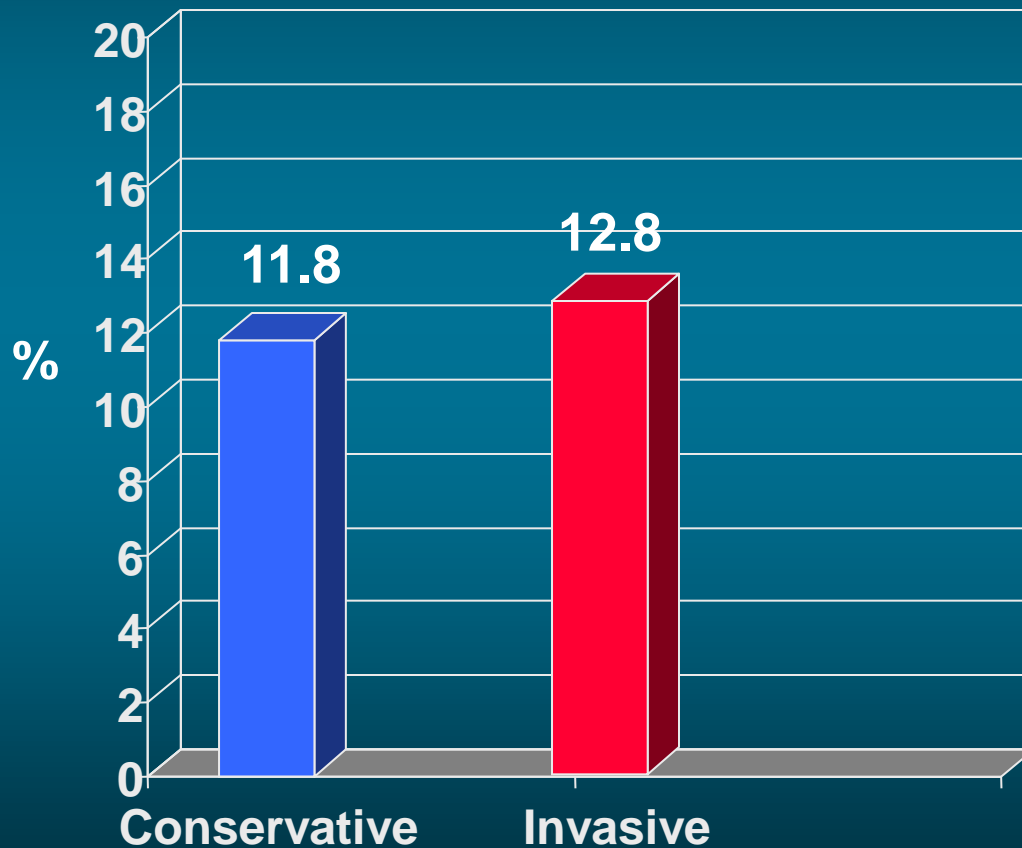
- TIMI 11B
- ESSENCE (Enoxaparin in Non-Q-Wave MI)
- 7081 pts
- Predicts all-cause mortality, new or recurrent MI, or severe recurrent ischemia requiring PCI/CABG within two weeks
- Validated in several studies

# TIMI Risk Score

1. Age at least 65 y/o
2. At least 3 CAD risk factors
3. Prior coronary stenosis at least 50%
4. ECG: ST deviation
5. 2 or more episodes of angina in past 24 hours
6. Aspirin use in last 7 days
7. Elevated CK-MB or troponin



# TACTICS Study Validates Low (0-2) TIMI Risk Score



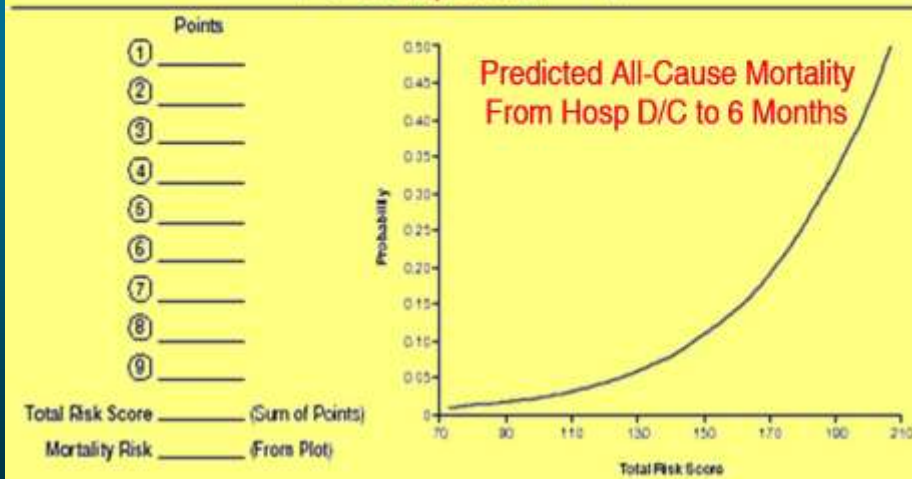
- Death, MI, or Readmission with ACS over 6 months
- 555 TIMI 0-2 patients
- However, in the entire cohort of 2220 patients, early invasive outcomes were better than conservative

# GRACE Risk Model

- Predicts all cause mortality
- Time frame: from discharge to 6 months
- Validated

# GRACE Risk Model

Medical Hx	Findings at Initial Presentation	Findings During Hospitalization
<b>① Age</b> Points <29 _____ 0 30-39 _____ 0 40-49 _____ 18 50-59 _____ 36 60-69 _____ 55 70-79 _____ 73 80-89 _____ 91 ≥90 _____ 100  <b>② H/O CHF</b> _____ 24 <b>③ H/O MI</b> _____ 12	<b>④ Resting Heart Rate</b> Points ≤49.9 _____ 0 50-69.9 _____ 3 70-89.9 _____ 9 90-109.9 _____ 14 110-149.9 _____ 23 150-199.9 _____ 35 ≥200 _____ 43  <b>⑤ Systolic BP</b> ≤79.9 _____ 24 80-99.9 _____ 22 100-119.9 _____ 18 120-139.9 _____ 14 140-159.9 _____ 10 160-199.9 _____ 4 ≥200 _____ 0 1 <b>⑥ ST depression</b> _____ 11	<b>⑦ Initial Creatinine</b> Points 0-0.39 _____ 1 0.4-0.79 _____ 3 0.8-1.19 _____ 5 1.2-1.59 _____ 7 1.6-1.99 _____ 9 2-3.99 _____ 15 ≥4 _____ 20  <b>⑧ Elevated Biomarkers</b> _____ 15 <b>⑨ No PCI In-Hospital</b> _____ 14



Grace Score	Risk	Prob. Of Death
1-88	Low	<3%
89-118	Mid	3-8%
119-263	High	>8%

# 59 y/o woman presents to ED

Alice S Smith

Hx: After awakening with 20 min of precordial and left arm pressure, dyspnea, diaphoresis; similar episode hours earlier while walking her 16 y/o dachshund.

Risk Factors: Treated HTN

PMH: UGI bleed 2 months ago

Meds: Thiazide, omeprazole

FH: Adopted

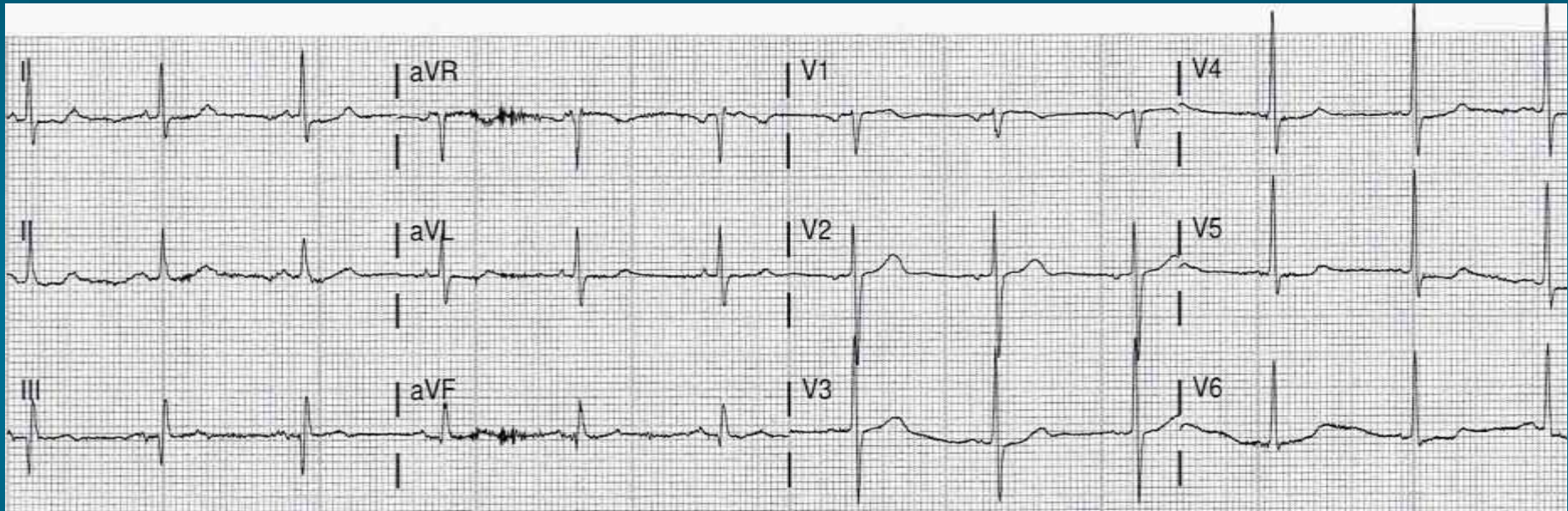
Exam: P 90 regular, BP 128/75, S4; otherwise normal

Lab: Initial biomarkers negative; BMP & CBC normal

ECG: ST depression



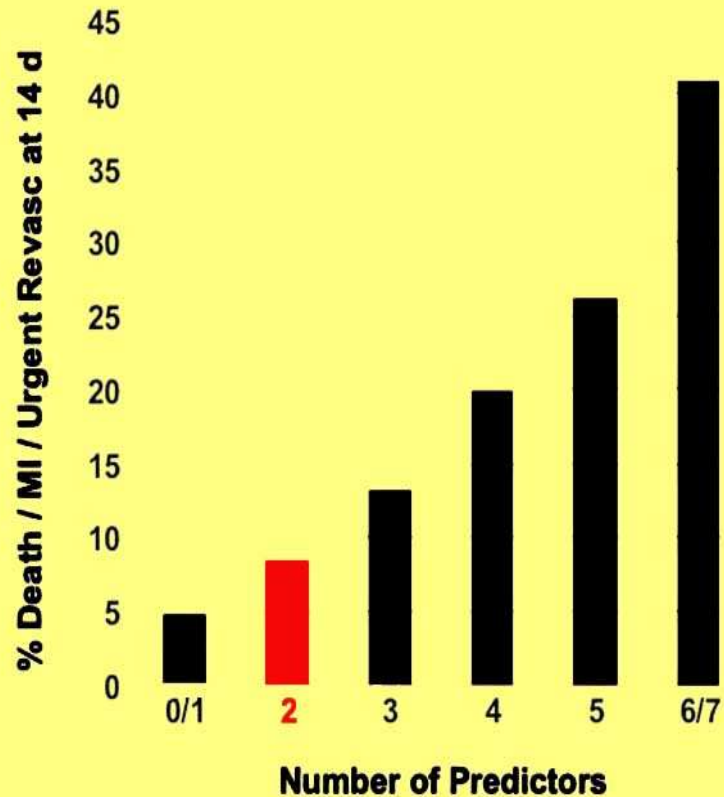
# Ms. Smith's Admission ECG



Electrocardiogram was normal one year ago

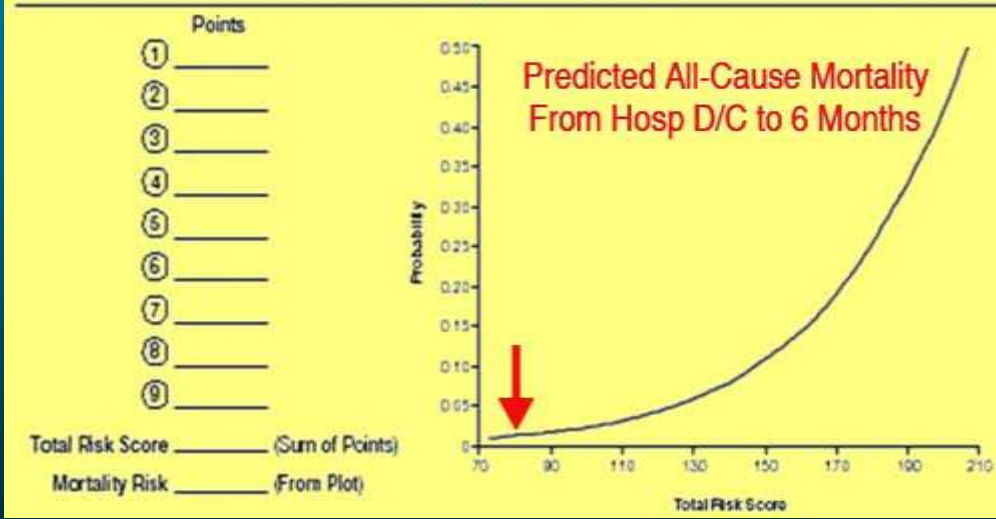
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6. Aspirin use in last 7 days
7. Elevated CK-MB or troponin



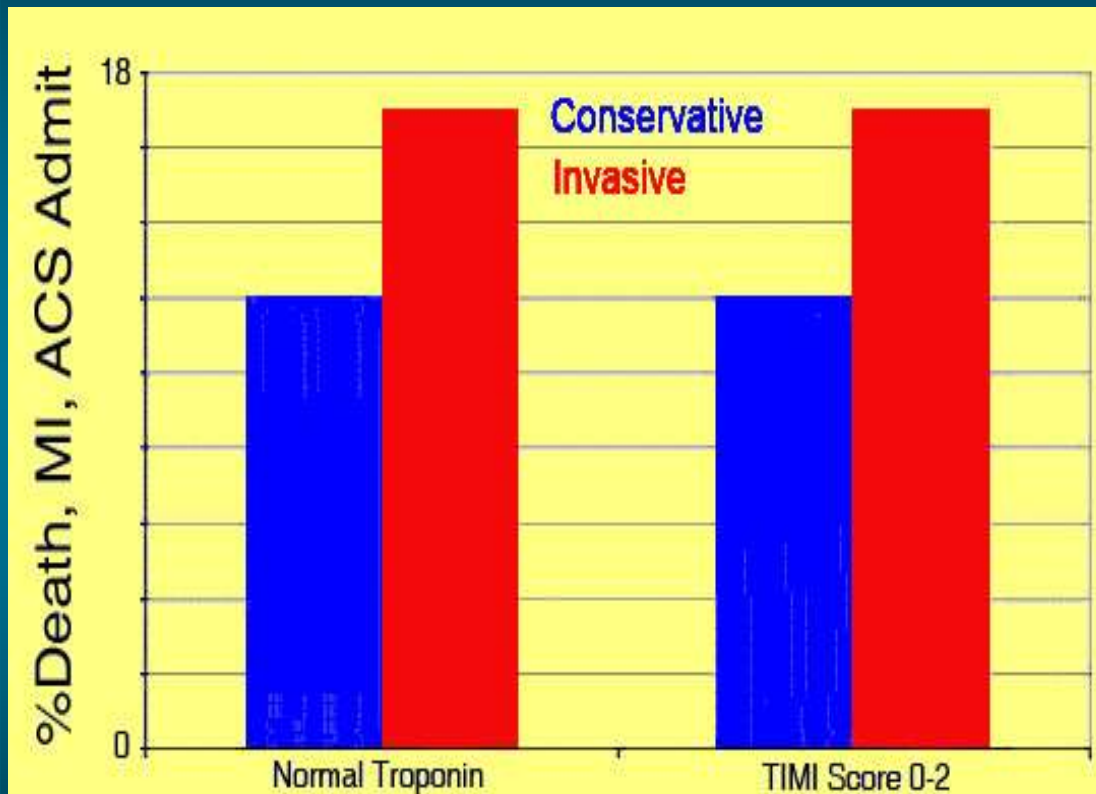
Medical Hx	Findings at Initial Presentation	Findings During Hospitalization
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	<b>⑥ ST depression</b> _____ 11	

# GRACE Risk Score 80



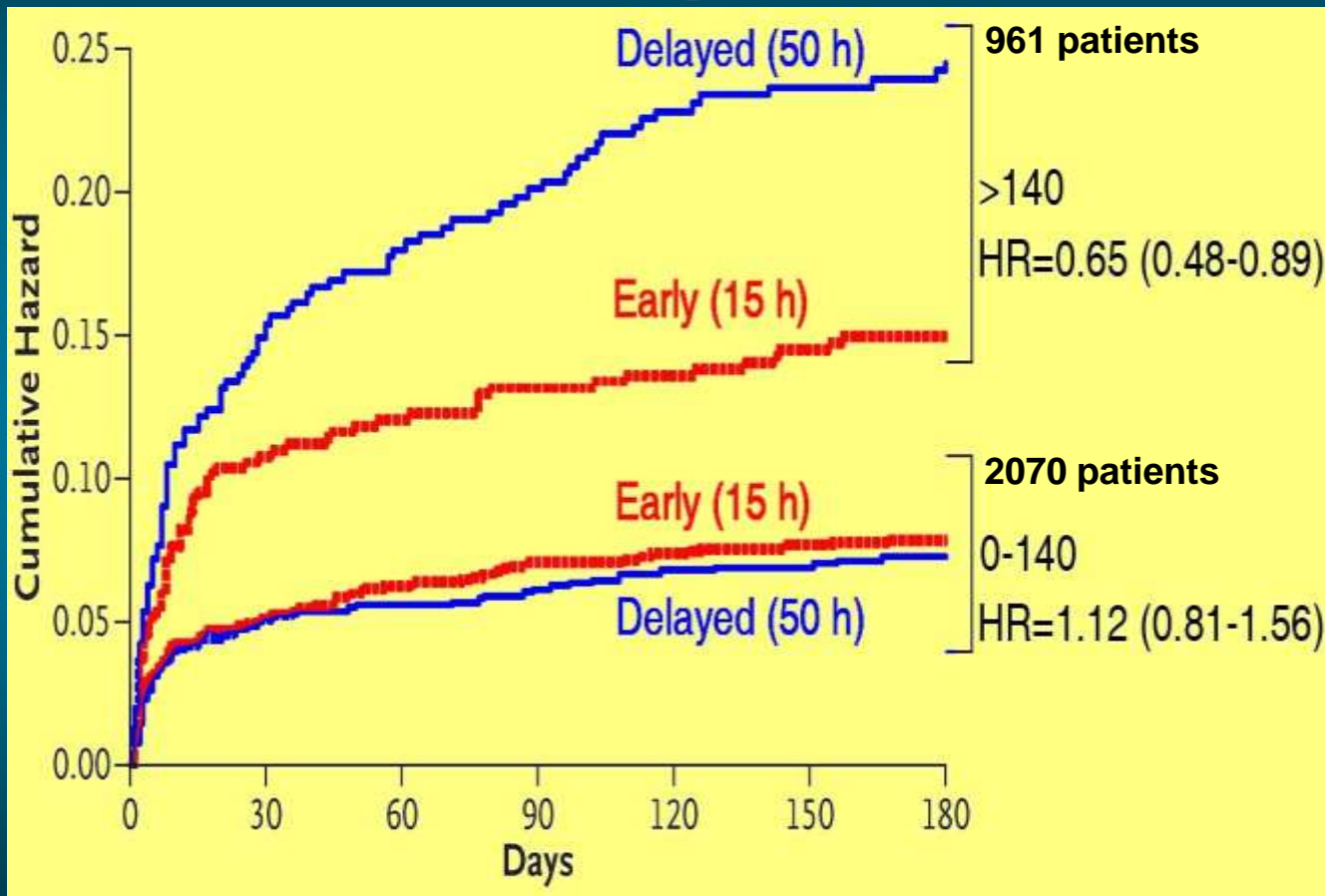
Grace Score	Risk	Prob. Of Death
1-88	Low	<3%
89-118	Mid	3-8%
119-263	High	>8%

# Early Invasive vs. Conservative Management in Low-Risk Women in TACTICS Substudy



- 2220 Patients
- 169 Centers
- 9 Countries
- Follow-up 180 days

# TIMACS: Results by GRACE Score

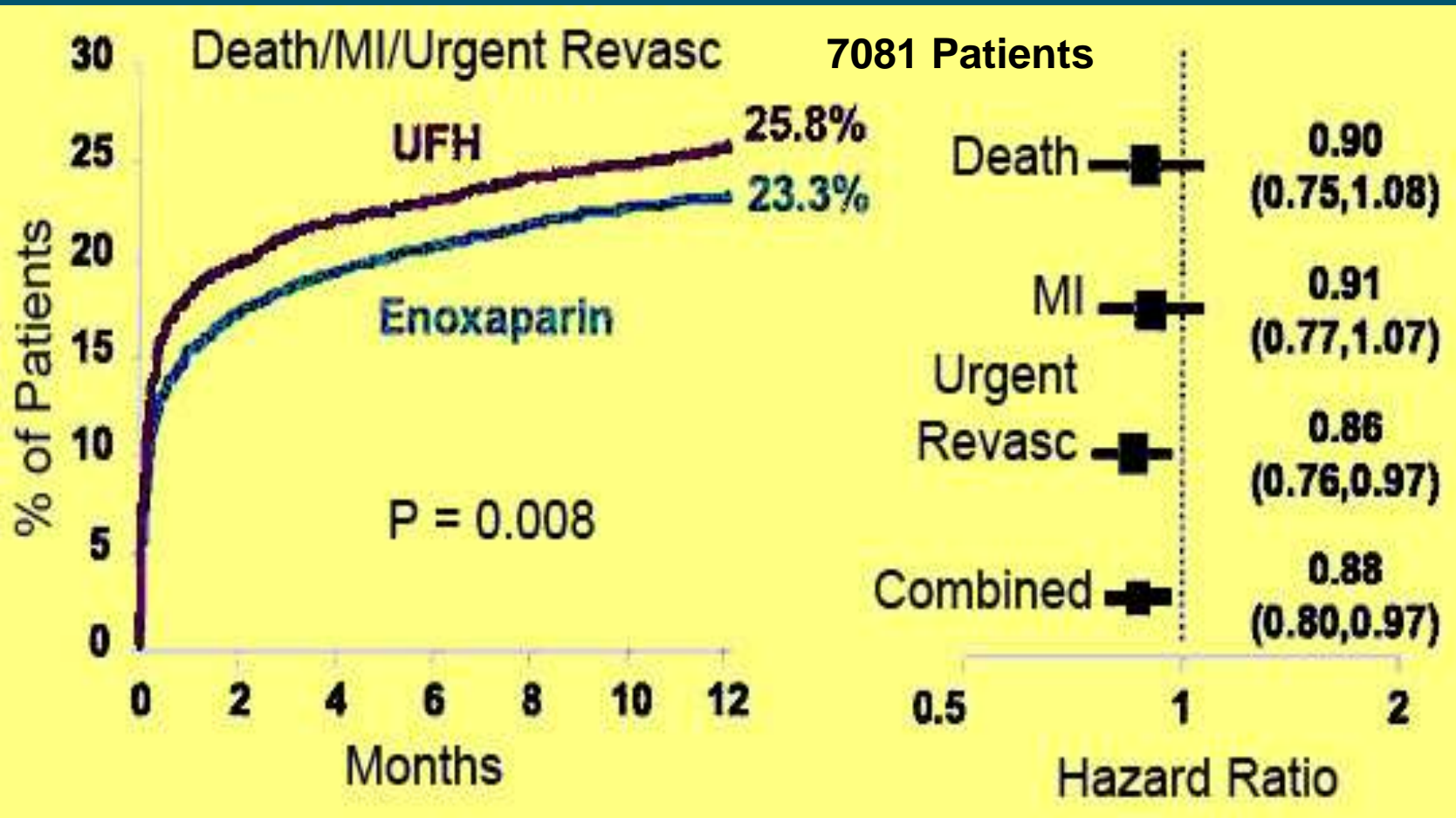


Composite of  
Death, MI, or Stroke

# Treatment Strategy with Ms. Smith

- Antiplatelet Rx
- Anticoagulants
- Risk factor Rx
- Education
- Assess for development of high risk features as outlined in TIMI and GRACE risk parameters
- Assess LVEF and undertake risk stratification stress testing

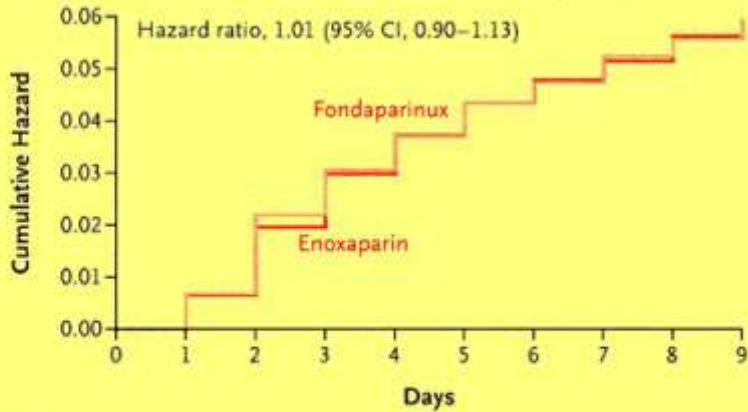
# Enoxaparin vs UFH in TIMI 11B and ESSENCE



# Oasis-5

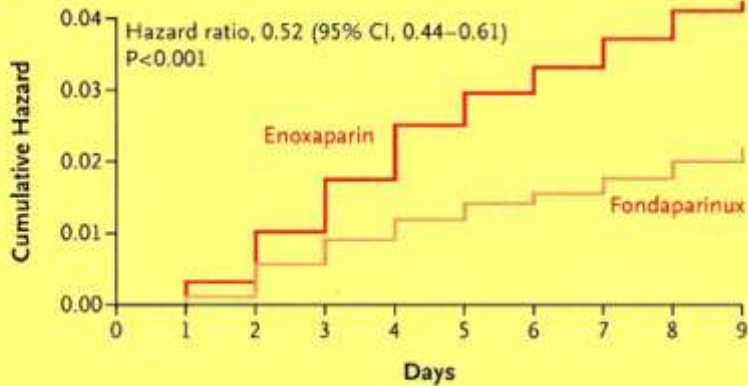
## Enoxaparin vs Fondaparinux 1152 Patients

**A Death, Myocardial Infarction, or Refractory Ischemia through Day 9**



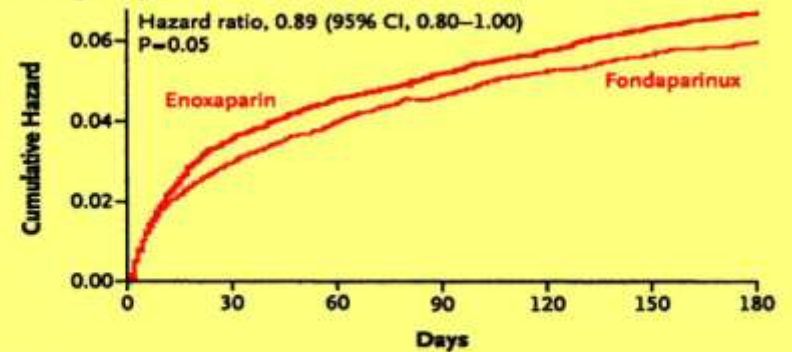
No. at Risk									
Enoxaparin	10,021	9954	9824	9724	9652	9593	9550	9515	9470
Fondaparinux	10,057	9986	9836	9752	9684	9628	9589	9541	9510

**B Major Bleeding through Day 9**



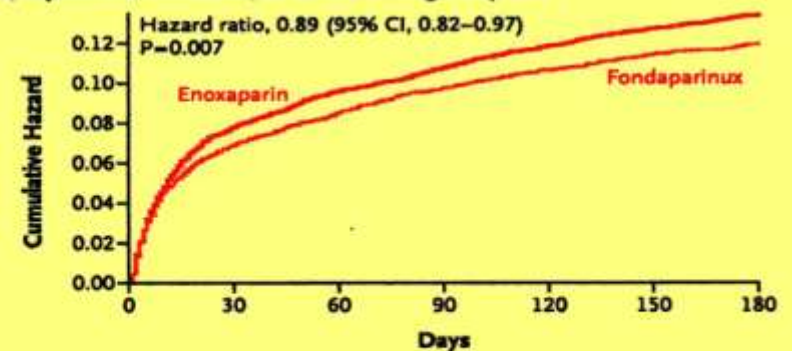
No. at Risk									
Enoxaparin	10,021	9,979	9871	9774	9682	9625	9575	9527	9478
Fondaparinux	10,057	10,028	9951	9884	9838	9796	9773	9738	9709

**A Death through Day 180**



No. at Risk							
Enoxaparin	10,021	9673	9574	9495	8594	8506	8321
Fondaparinux	10,057	9762	9664	9585	8611	8549	8386

**B Death, Myocardial Infarction, or Stroke through Day 180**



No. at Risk							
Enoxaparin	10,021	9274	9105	8985	8078	7971	7772
Fondaparinux	10,057	9390	9238	9110	8141	8053	7888

# ACS



Hx: 59 y/o who presents to ED after awakening with 20 min of precordial and left arm pressure, dyspnea, diaphoresis; no prior history of chest discomfort.

**Risk Factors:** 7 yr H/O type 2 diabetes mellitus, Current smoker (25 pk yrs)

**PMH:** Otherwise negative

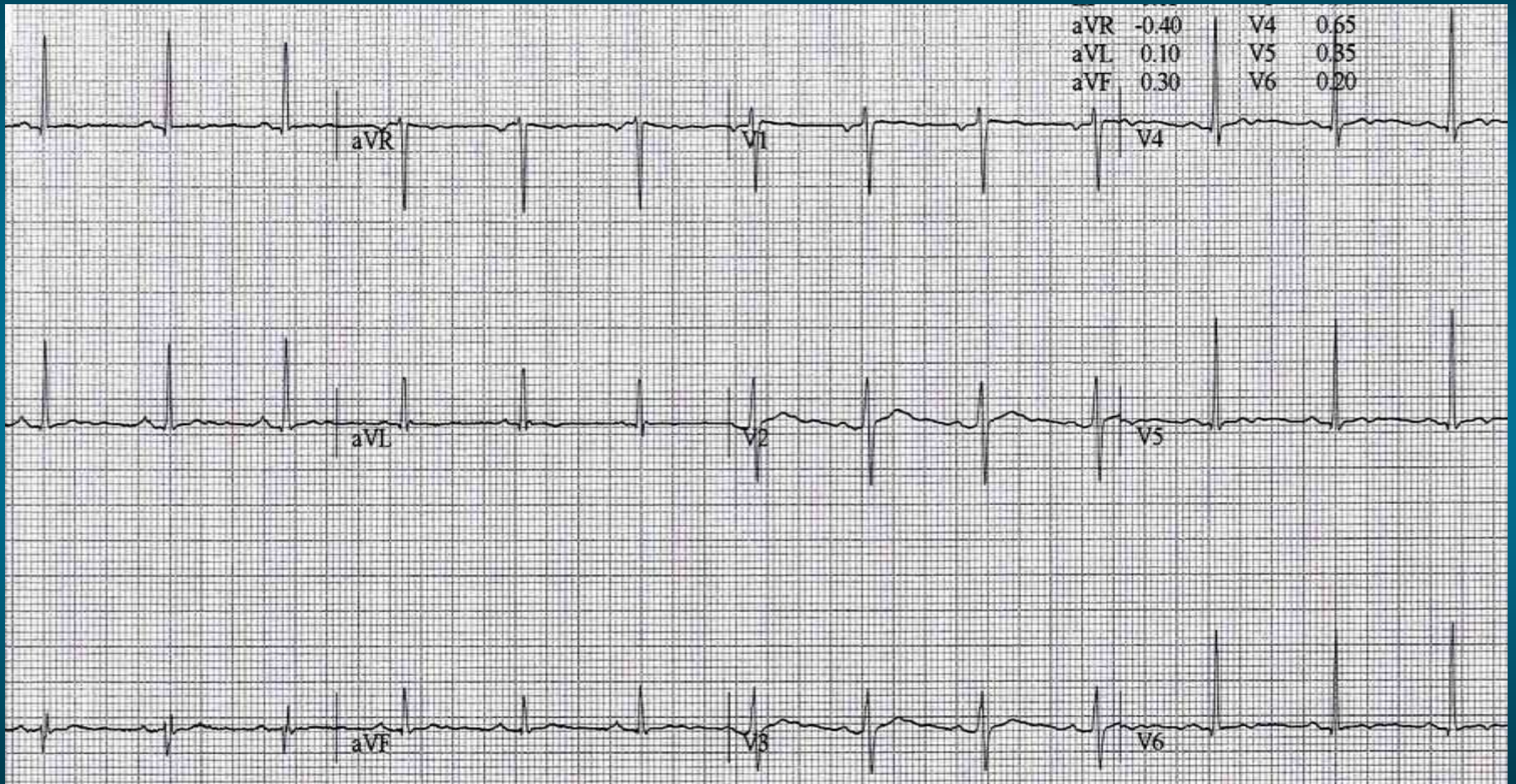
**Meds:** Metformin

**FH:** Adopted

**Exam:** P 90 regular, BP 128/75, S4; otherwise normal

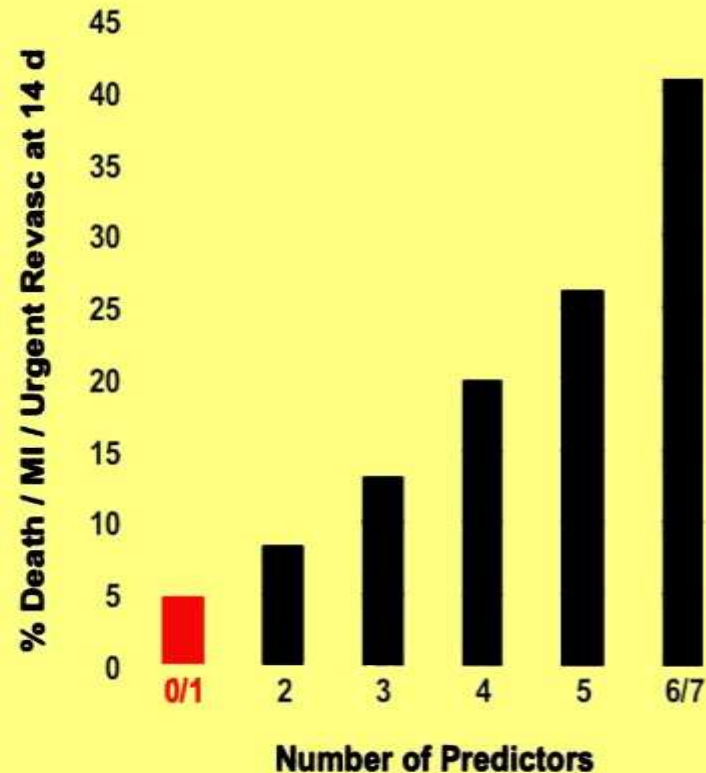
**Lab:** Initial biomarkers negative; BMP & CBC normal

**ECG:** T wave abnormality

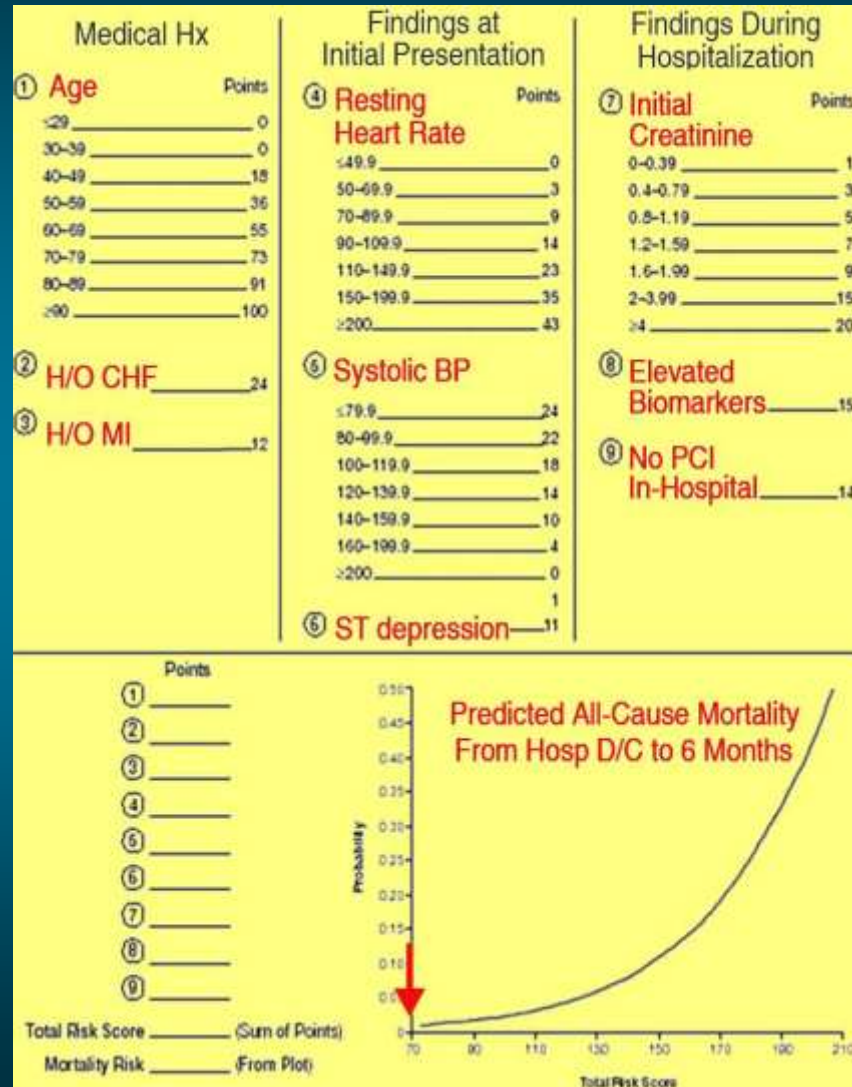


# TIMI Risk Score

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6. Aspirin use in last 7 days
7. Elevated CK-MB or troponin



# GRACE Score 69



# Smokers' Paradox

- Reduced risk of mortality during an ACS event
- Younger
- Tendency to develop thrombi on less severe lesions
- Less severe CAD at presentation
- Tendency to develop thrombi on less severe lesions

# ACS

Hx: 59 y/o who presents to ED after awakening with 20 min of precordial and left arm pressure, dyspnea, diaphoresis; similar episode hours earlier while walking her 16 y/o dachshund.

Risk Factors: Treated HTN

PMH: Otherwise negative

Meds: Thiazide, ASA 81 mg QD for several years on advice of next door neighbor

FH: Adopted

Exam: P 90 regular, BP 128/75, S4; otherwise normal

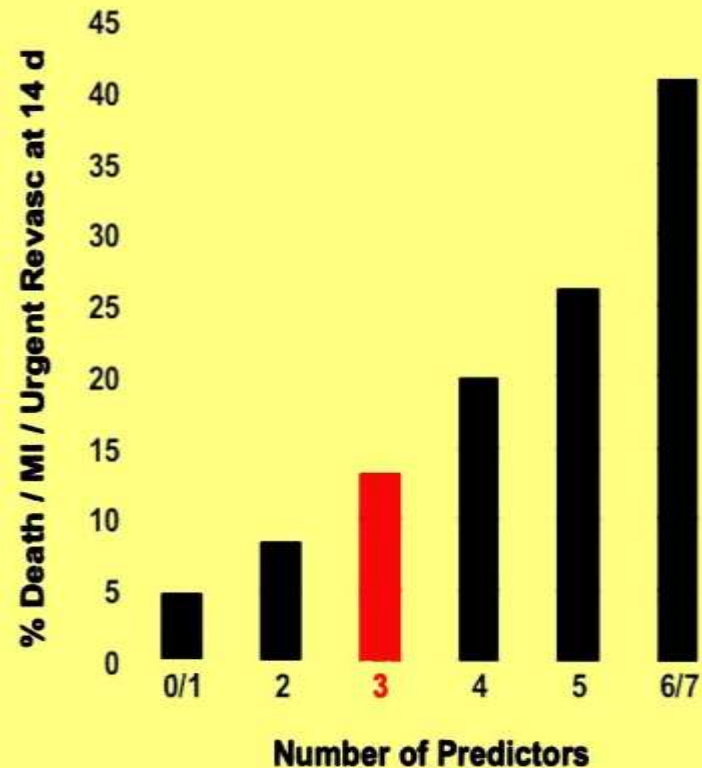
Lab: Initial biomarkers negative; BMP & CBC normal

ECG: ST depression



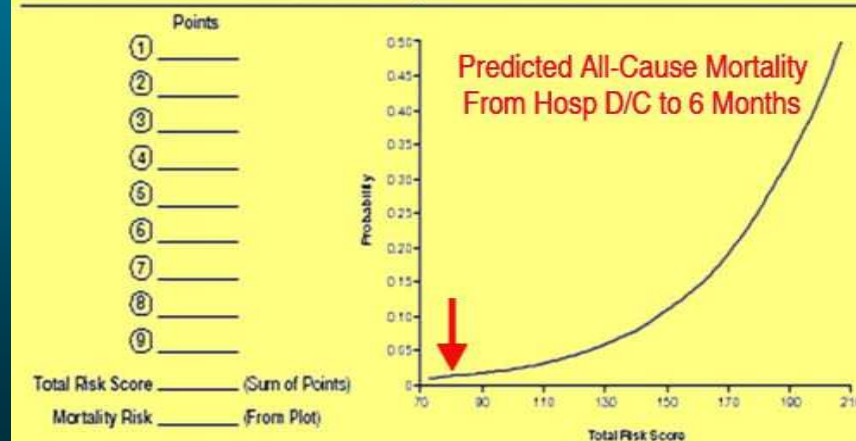
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# GRACE Score 80

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	<b>⑥ ST depression</b> _____ 11	



# Aspirin Paradox

- Tend to have more diffuse disease
- Some suggest that these patients may delay coming in
- Best considered a marker of higher risk
- Not likely to be due to ASA resistance

# ACS

Hx: 59 y/o who presents to ED after awakening with 20 min of precordial and left arm pressure, dyspnea, diaphoresis; no prior history of chest discomfort.

Risk Factors: 7 yr H/O type 2 diabetes mellitus, Current smoker (25 pk yrs)

PMH: Otherwise negative

Meds: Metformin

FH: Adopted

Exam: P 90 regular, BP 128/75, S4; otherwise normal

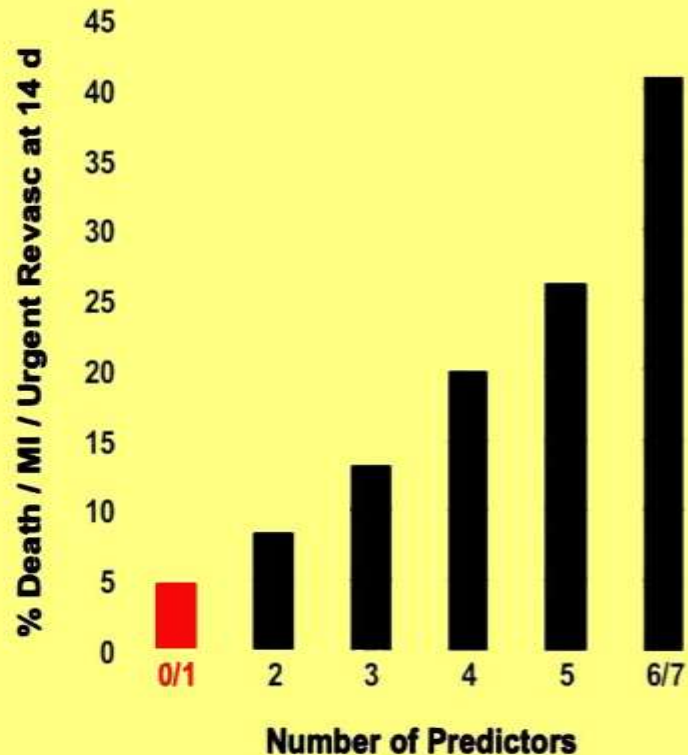
Lab: Initial TnI 0.11 ng/ml; BMP & CBC normal

ECG: T wave abnormality



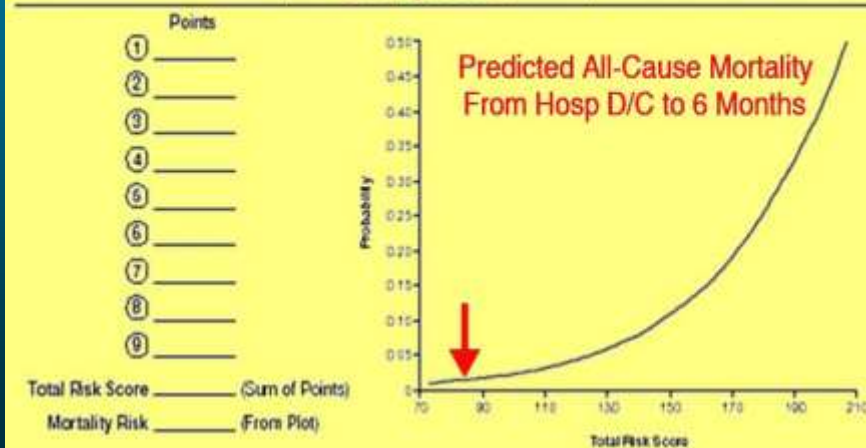
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# Grace Score 84

Medical Hx		Findings at Initial Presentation		Findings During Hospitalization	
① Age	Points	④ Resting Heart Rate	Points	⑦ Initial Creatinine	Points
<29	0	≤49.9	0	0-0.39	1
30-39	0	50-69.9	3	0.4-0.79	3
40-49	18	70-89.9	9	0.8-1.19	5
50-59	36	90-109.9	14	1.2-1.59	7
60-69	55	110-149.9	23	1.6-1.99	9
70-79	73	150-199.9	35	2-3.99	15
80-89	91	>200	43	>4	20
≥90	100				
② H/O CHF	24	⑤ Systolic BP		⑧ Elevated Biomarkers	15
③ H/O MI	12	≤79.9	24	⑨ No PCI In-Hospital	14
		80-99.9	22		
		100-119.9	18		
		120-139.9	14		
		140-159.9	10		
		160-199.9	4		
		>200	0		
			1		
		⑥ ST depression	11		



# TACTICS Substudy

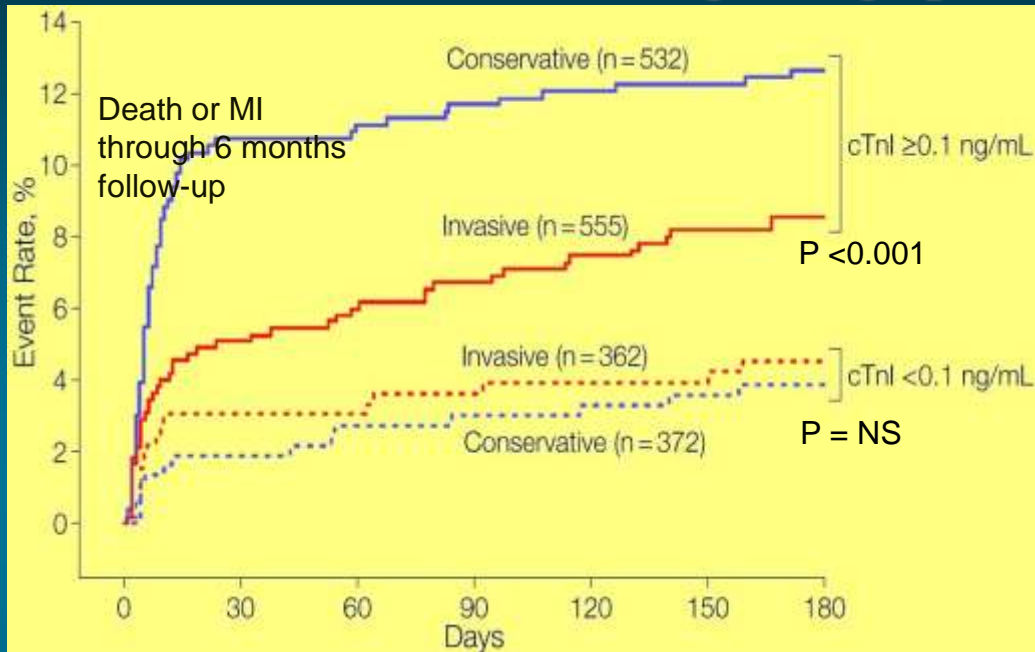
## Death, MI, or Readmission for ACS in Women Based on Troponin

	Invasive	Conservative
Elevated Troponin	19%	29%
Normal Troponin	17%	12%

**P = 0.02**

- 2220 Patients
- 169 Centers
- 9 Countries
- Follow-up 180 days

# 6 Month Outcomes Based on TnI in TACTICS-TIMI 18



**2220 ACS patients**  
**169 Hospitals**  
**9 Countries**

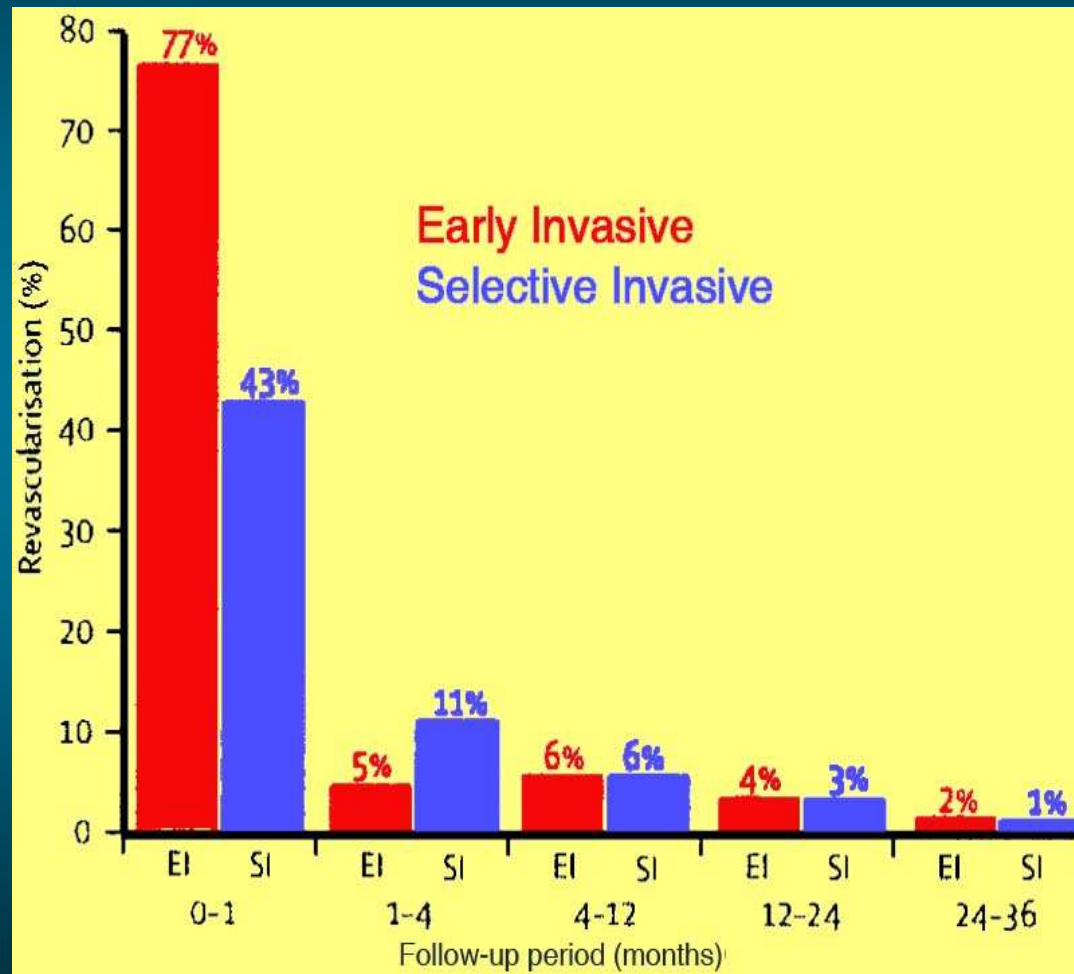
**Primary endpoint: Death, MI, or readmission within 6 months for ACS**

Primary End Point	No.	Event Rate, %		Favors Invasive Treatment	Favors Conservative Treatment
		Conservative Treatment	Invasive Treatment		
<0.1 ng/mL	734	4.3	6.6		
0.1 - <0.4	181	16.5	4.4		
Death or MI					
<0.1 ng/mL	734	1.9	3.0		
0.1 - <0.4	181	12.1	4.4		

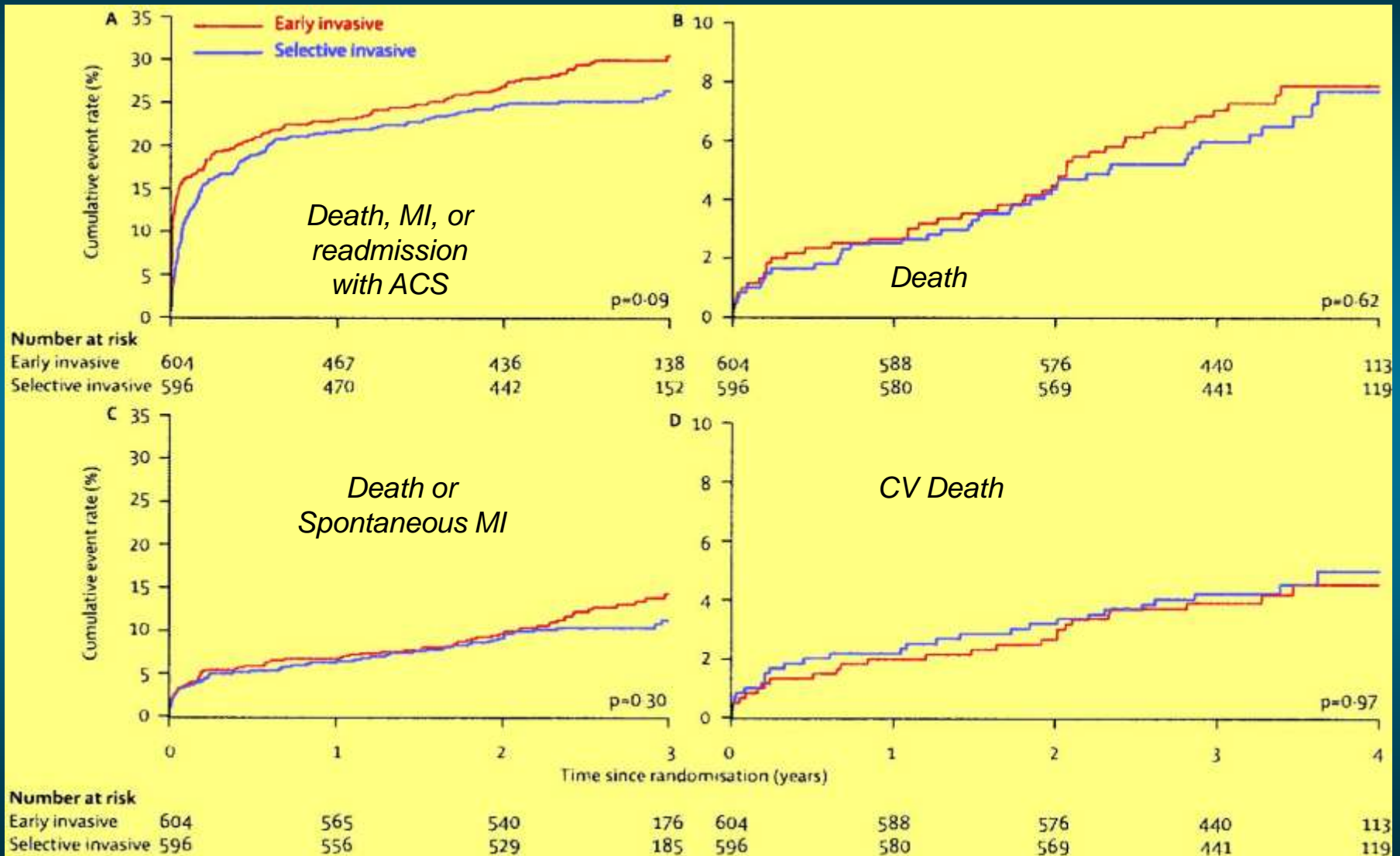
# ICTUS

- 1200 patients
- 42 hospitals in The Netherlands
- All with:
  - Elevated troponin
  - Unstable ischemic Sx
  - ECG ischemic change or prior documented CAD
- Randomized to early invasive or to selectively invasive strategy
- Treated with ASA, enoxaparin, and (at time of PCI) abciximab
- 4 years follow-up

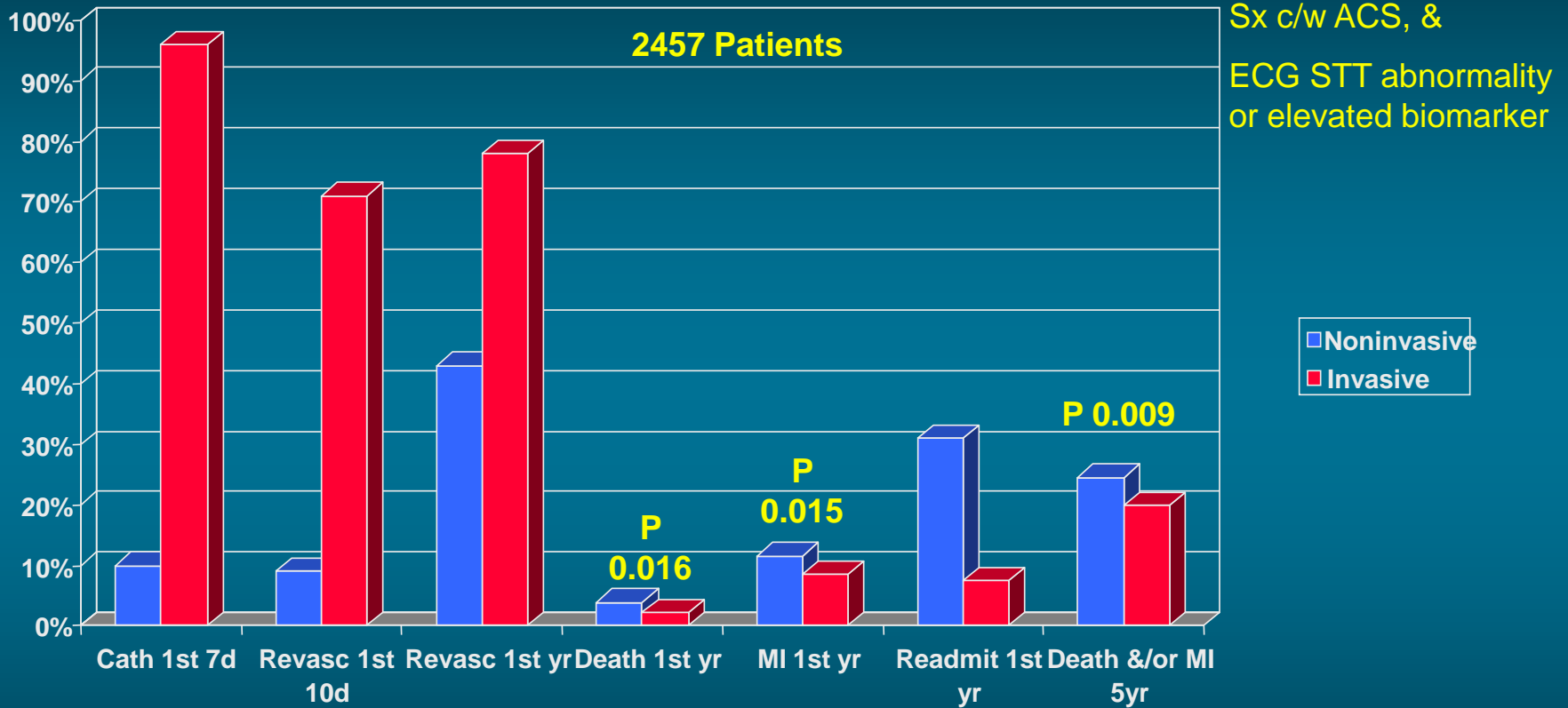
# Revascularization procedures (CABG/PCI) in ICTUS over time



# ICTUS Study

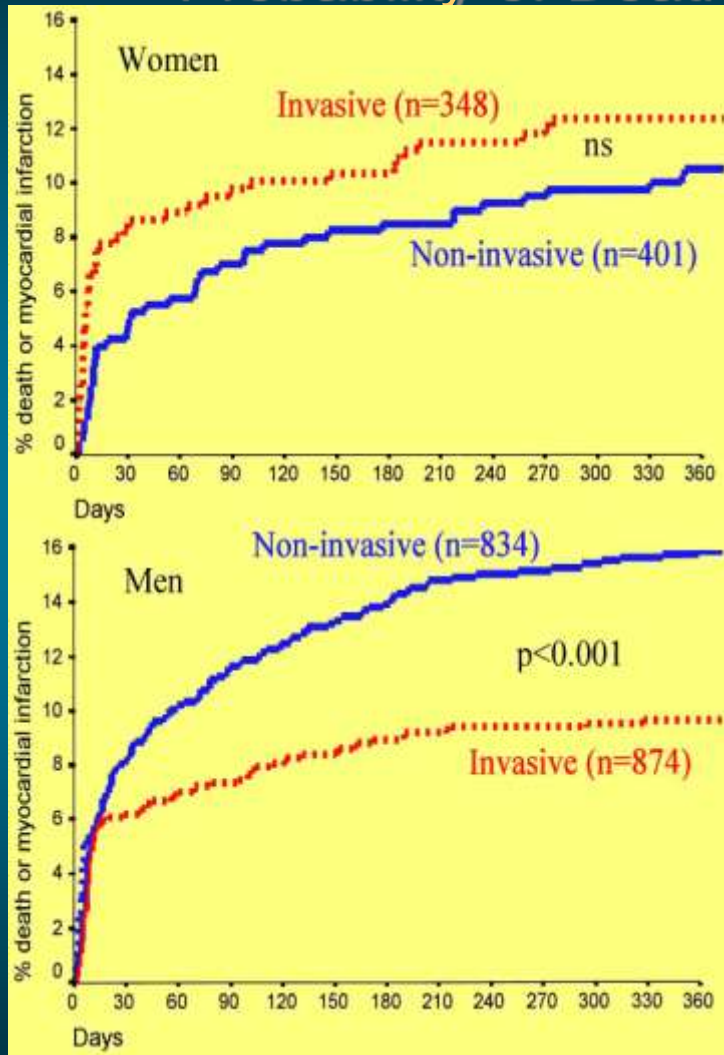


# FRISC-II



# FRISC-II

## Probability of Death or MI Based on Gender



### Death following CABG:

- Women: 10/101 (9.9%)
- Men: 4/324 (1.2%)
- $P < 0.001$

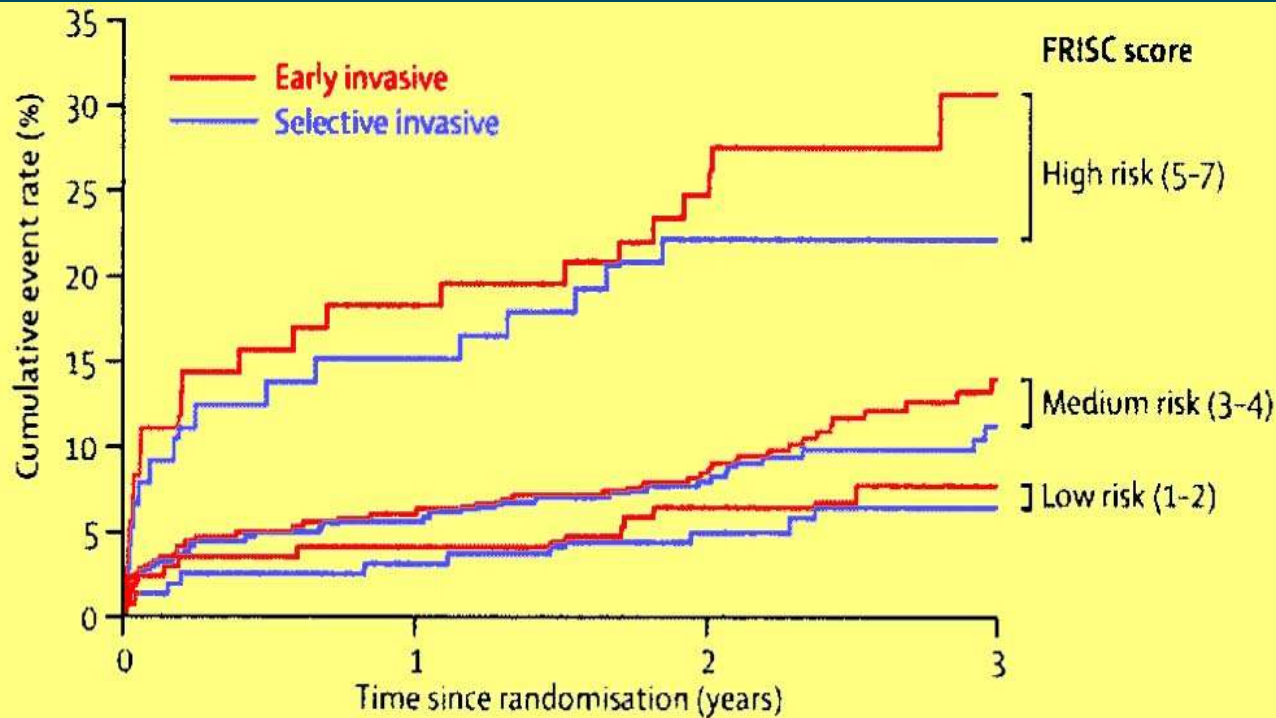
### Benefit confined to:

- Men
- Nonsmokers
- Patients with at least 2 risk factors

# FRISC Score

- Age >70
- Male
- Diabetes mellitus
- Prior myocardial infarction
- ST depression
- Elevated troponin
- Elevated interleukin6 or CRP

# ICTUS Study



Death or Spontaneous MI

## Number at risk

Early invasive	604	565	540	176
Selective invasive	596	556	529	185

# Conservative Strategy

- O<sub>2</sub>, Antiplatelet Rx, Beta blockade, Consider ACEI/ARB
- Anticoagulants
  - UFH
  - Enoxaparin
  - Fondaparinux
- Treat risk factors
- Educate
- Assess LV function/Risk strat. stress test
- Ongoing risk assessment during follow-up

# 2009 Appropriateness Criteria for Coronary Revascularization

- Evaluated approximately 180 clinical scenarios
- Three specifically address NSTEMI, and identify revascularization as appropriate
  - Successful culprit vessel PCI during admit
    - Recurrent ischemic Sx &/or high-risk stress test after discharge
    - Revascularization of add'l artery(s)
  - Revascularization of multiple vessels in high risk pt when culprit artery cannot be determined
  - Cardiogenic shock
    - Revascularization of 1 or more arteries

# Points to Ponder

- The high risk features are enumerated in these risk models
- Low risk pts can be treated conservatively (or at least with a delayed invasive strategy)
- Women at low risk generally do worse with an invasive strategy
- Consider fondaparinux in pts at increased bleeding risk
- Aspirin paradox
- Smokers' paradox

# So how would this noninvasive cardiologist treat our 4 patients?

- **Alice**
  - 2 episodes of pain, ST depression
  - HTN
  - Recent GI bleed
  - TIMI score 2 and GRACE score 80 (both low risk)
- **Ann**
  - 1 episode of pain, T wave abnormality
  - Diabetes, tobacco
  - TIMI score 0 and GRACE score 69 (both very low risk)
- **Alicia**
  - 2 episodes of pain, ASA, ST depression
  - HTN
  - TIMI score 3 (intermediate risk) and GRACE score 80 (low risk)
- **Aphrodite**
  - 1 episode of pain, mildly abnormal troponin, T wave abnormality
  - Diabetes, tobacco
  - TIMI score 1 and GRACE score 84 (both low risk)