

# Biomarkers and ACS

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# Disclosures

- Swiss National Science Foundation



- Schweizerische Herzstiftung  
Fondation Suisse de Cardiologie  
Fondazione Svizzera di Cardiologia
- University Hospital  
Basel



- Abbott
- Alere™
- BÜHLMANN
- B·R·A·H·M·S
- CRITICAL DIAGNOSTICS
- Nanosphere
- Roche
- SCHILLER  
The Art of Diagnostics
- SIEMENS

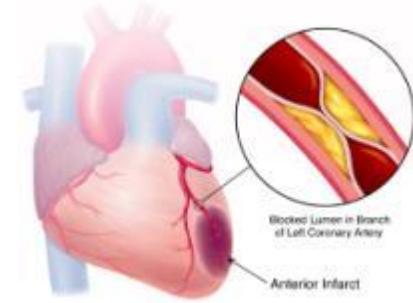




# Biomarkers and ACS

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1. Diagnosis of AMI
2. Hs-cTn
3. Copeptin





# Chest Pain → AMI

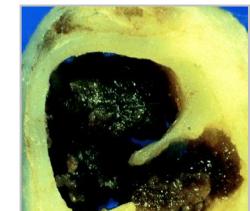
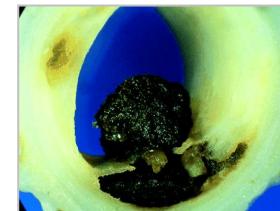
*History*



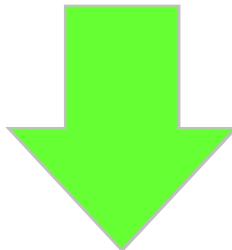
*ECG*

No ST ↑

ST ↑



*Troponin*

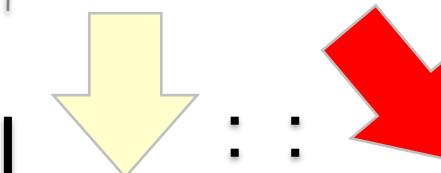


ACS

*Diagnosis*

**Other**

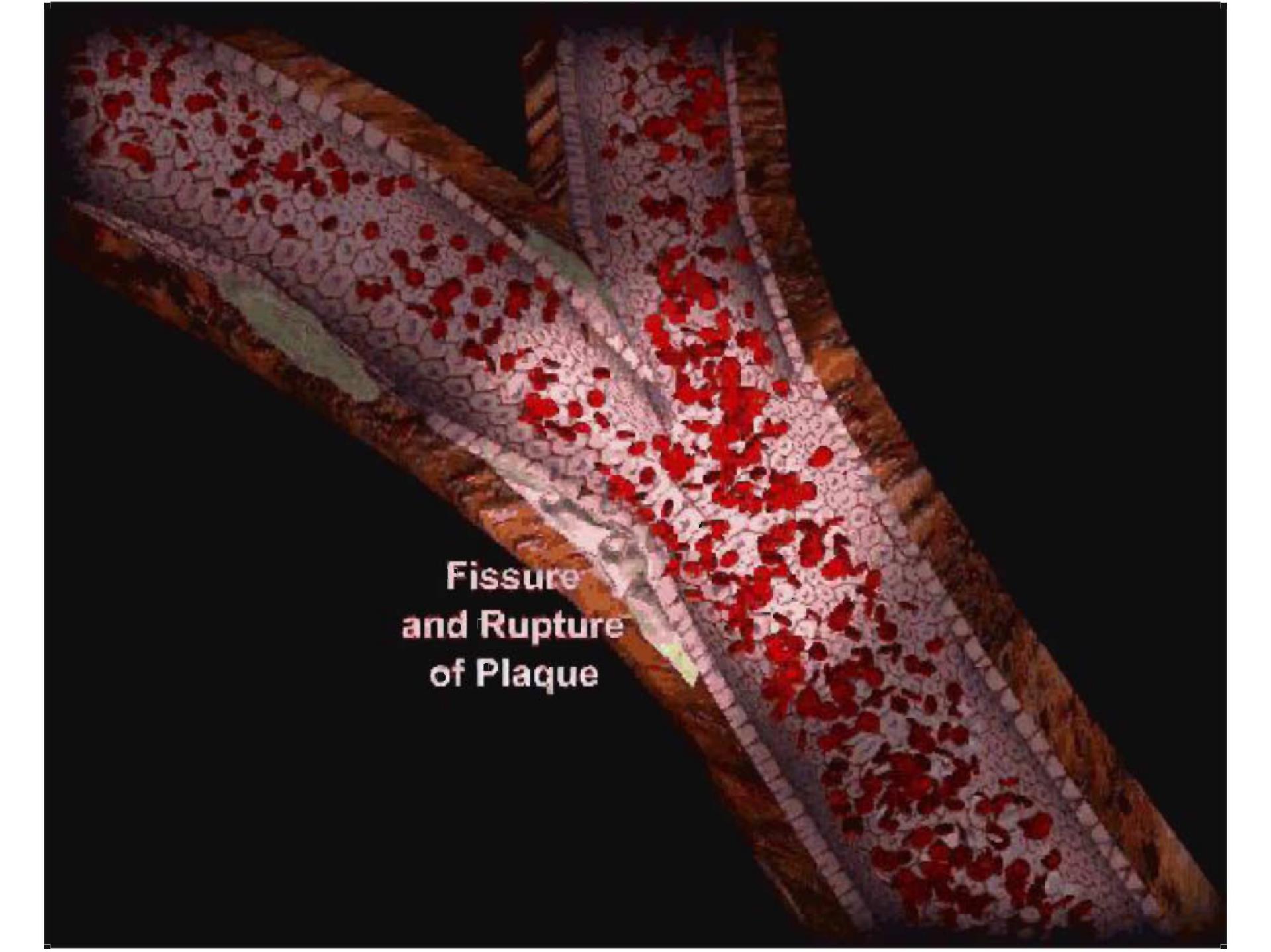
Unstable Angina



**NSTEMI**

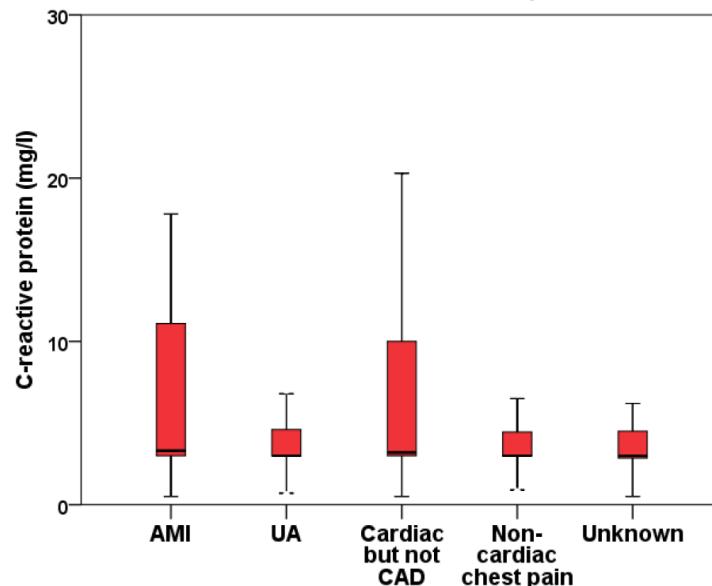
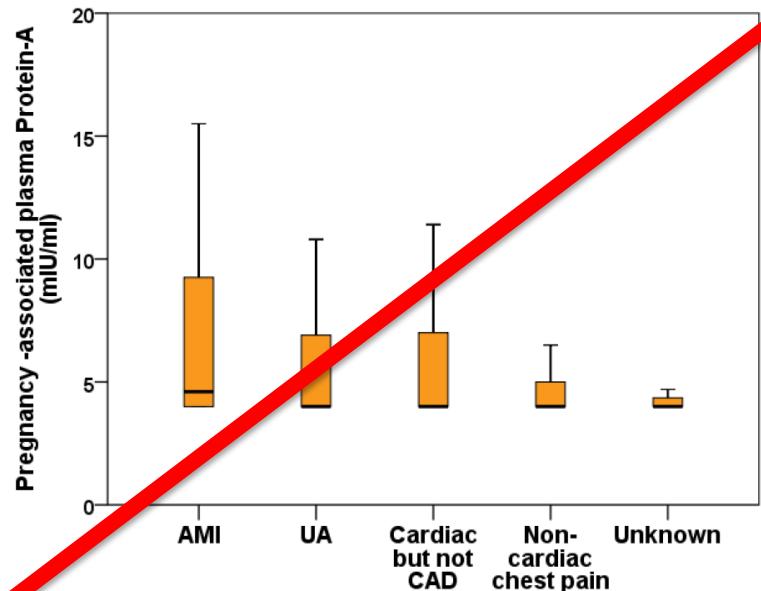
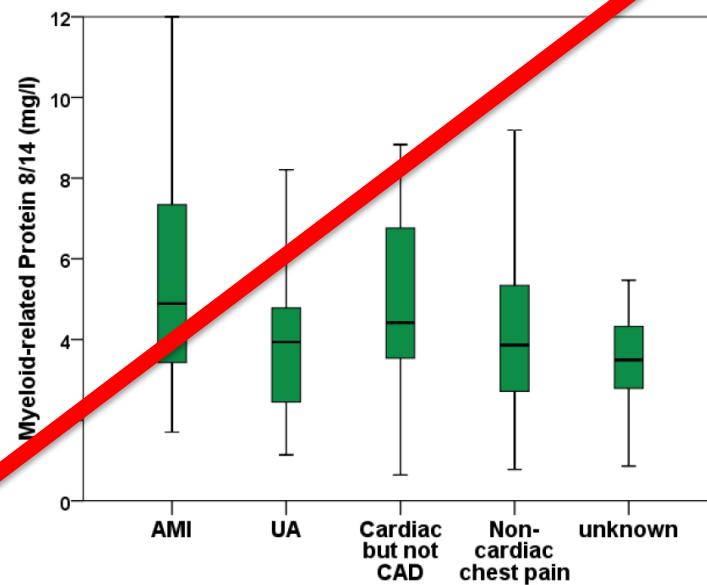
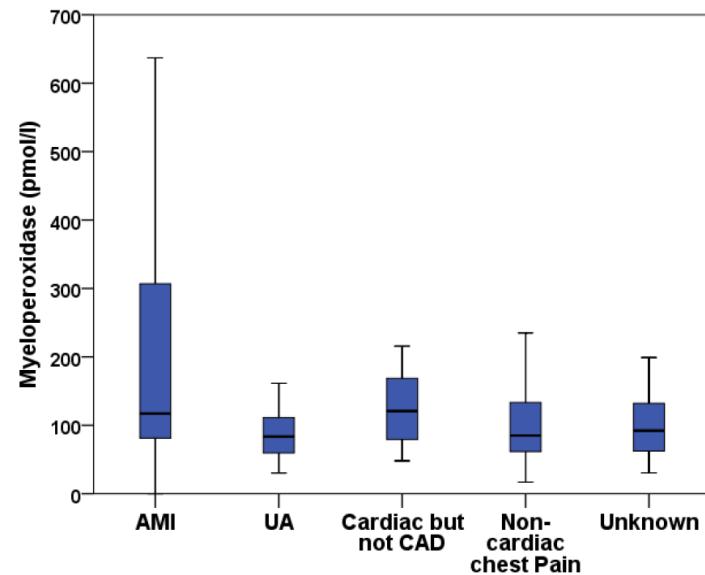
**AMI**

**STEMI**

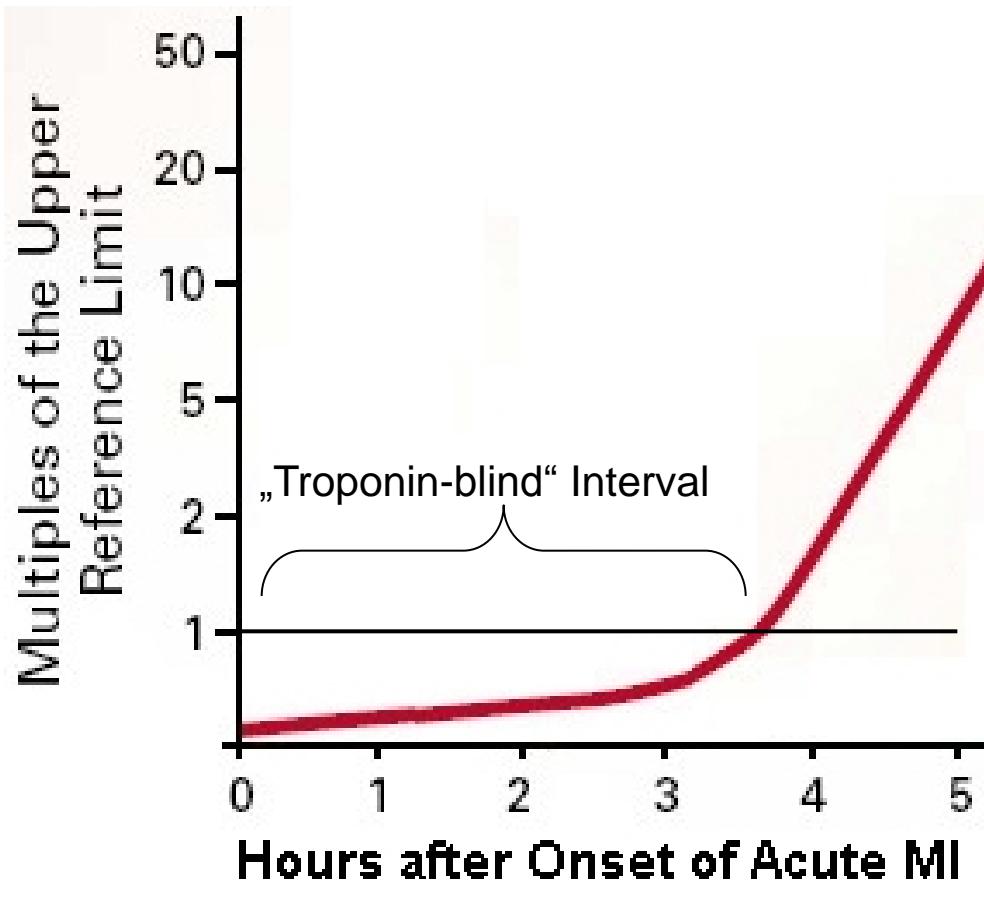


A 3D rendering of a coronary artery segment. The lumen is filled with red blood cells. A large, irregularly shaped plaque is visible, composed of various cellular components and lipid deposits. A vertical fissure or tear has developed in the top portion of the plaque, with some plaque material protruding into the lumen. The surrounding arterial wall is made of smooth muscle cells and elastic fibers.  
**Fissure  
and Rupture  
of Plaque**

# Markers of Plaque Instability



# Cardiac Troponin



- cTn 0h + cTn 6h
- ECG Monitoring 6-8h
- Time + Ressources



# Acute Chest Pain

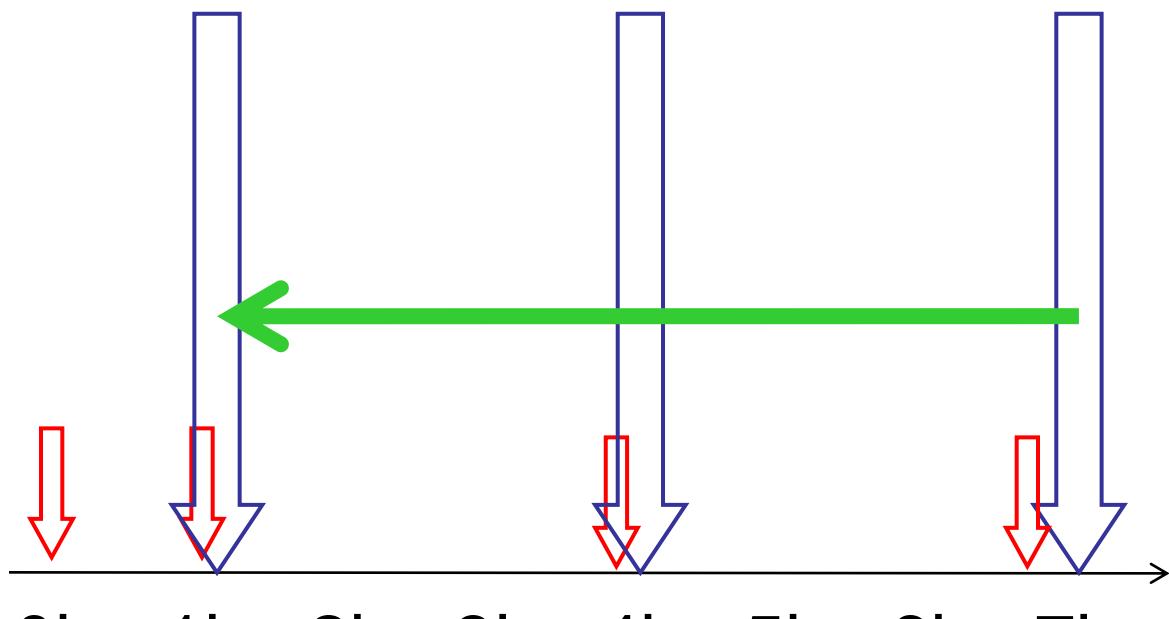
1.Rule-in

.... 2014??

ESC 2011

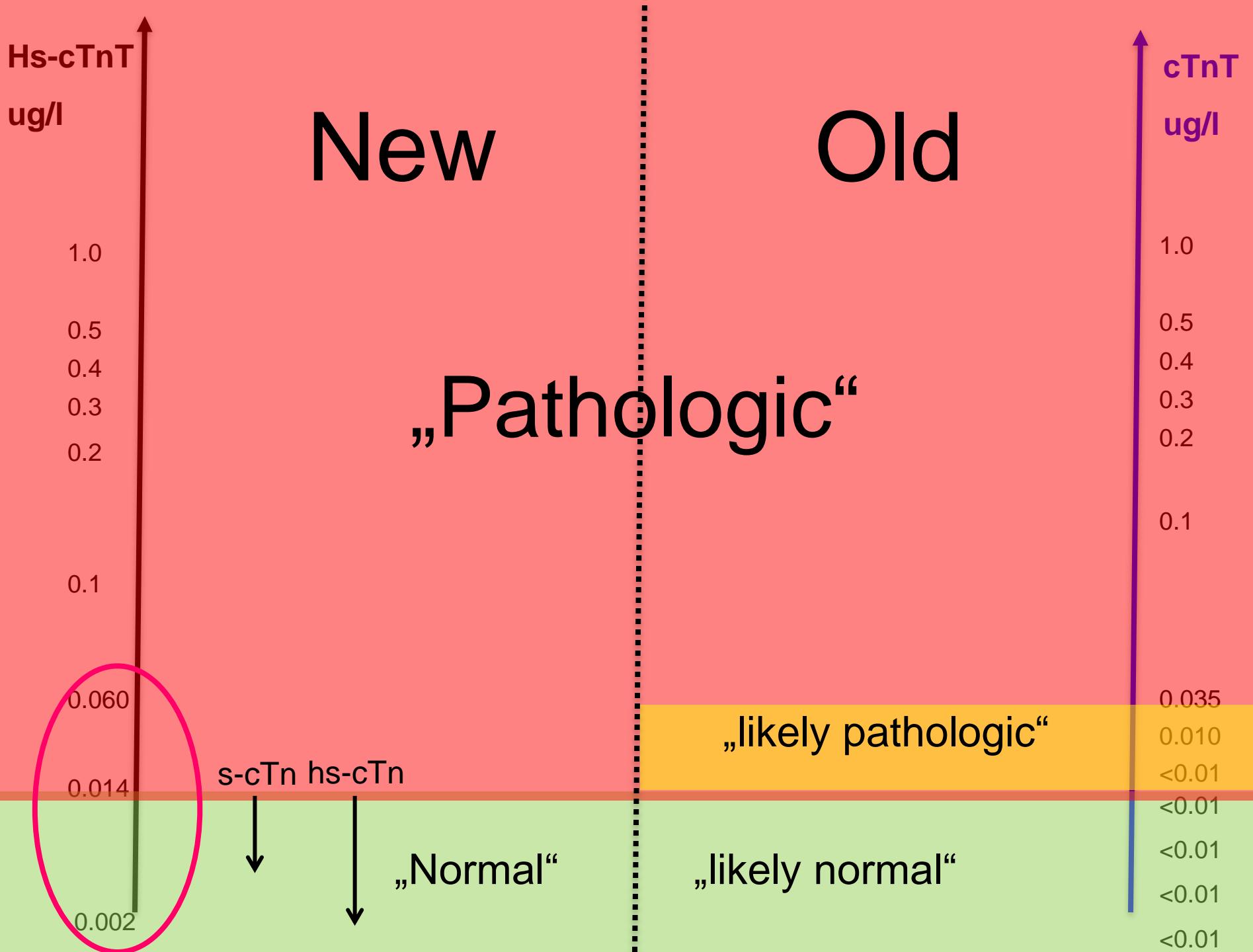
ESC 2011, US 2013

2.Rule-out

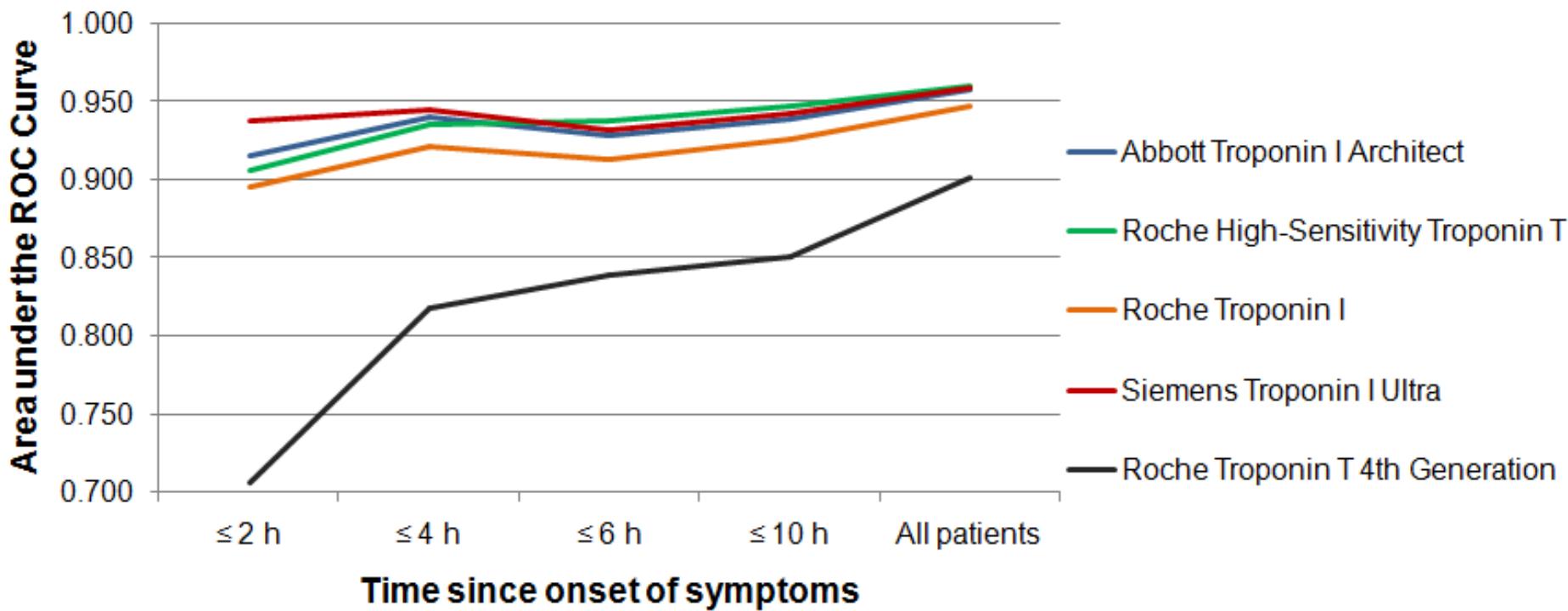


hs-cTn + copeptin

hs-cTn



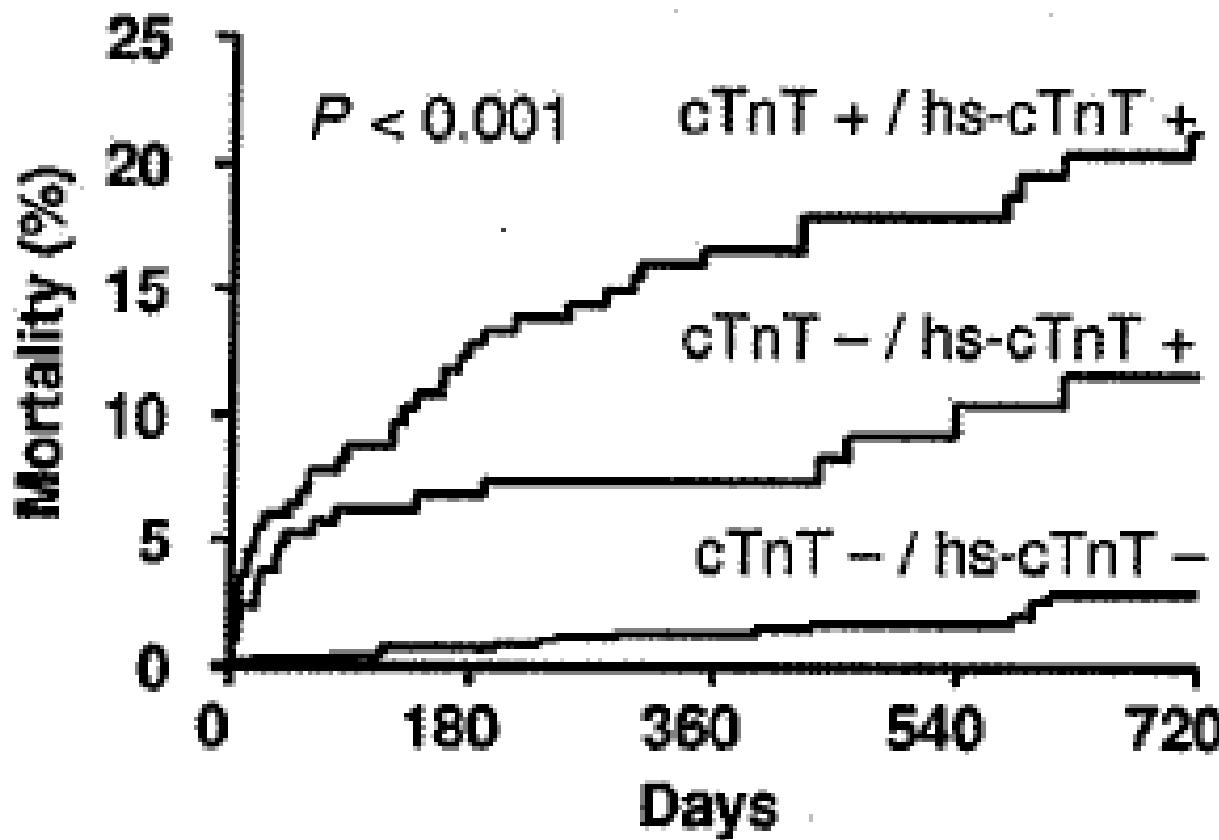
# S-cTn increase diagnostic accuracy at presentation



s-Tn + ECG + Clinical → Rule out ↑ + Rule in ↑



# Early risk stratification ↑



# Hs-cTn for early diagnosis of AMI: 5 keys



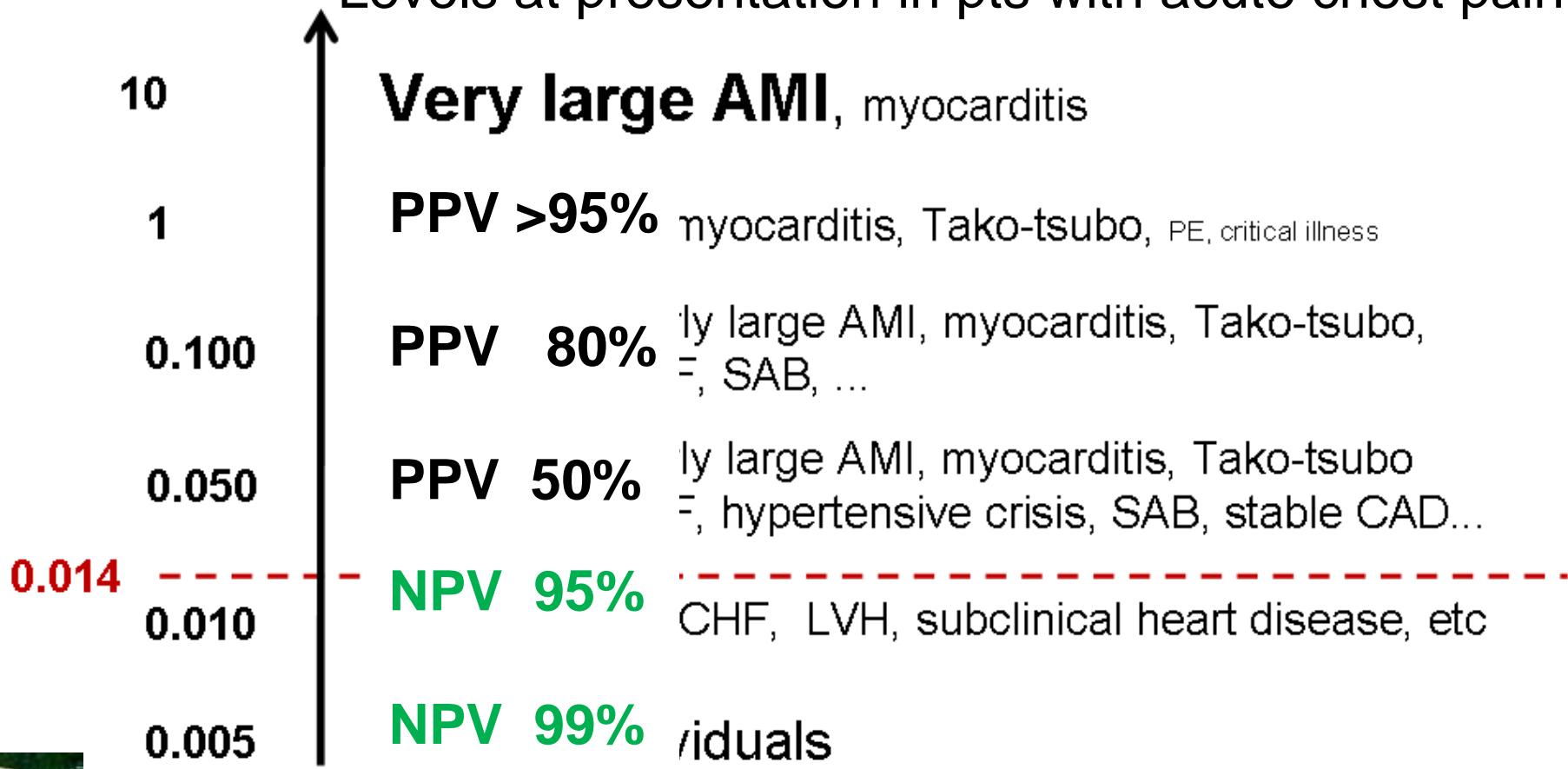
- 1) Knowing the differential Dg of an elevated cTn
- 2) Use of all available clinical information
- 3) Use of quantitative hs-cTn levels
- 4) Use of hs-cTn changes
- 5) Cardiac work-up

# Absolute levels of hs-cTnT

Hs-cTnT (ug/l)

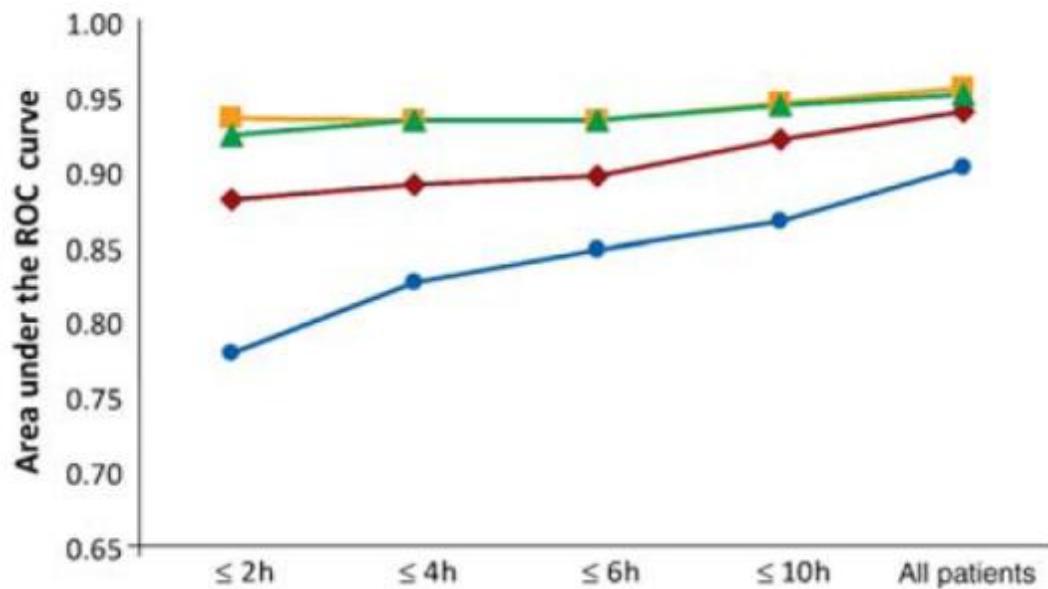
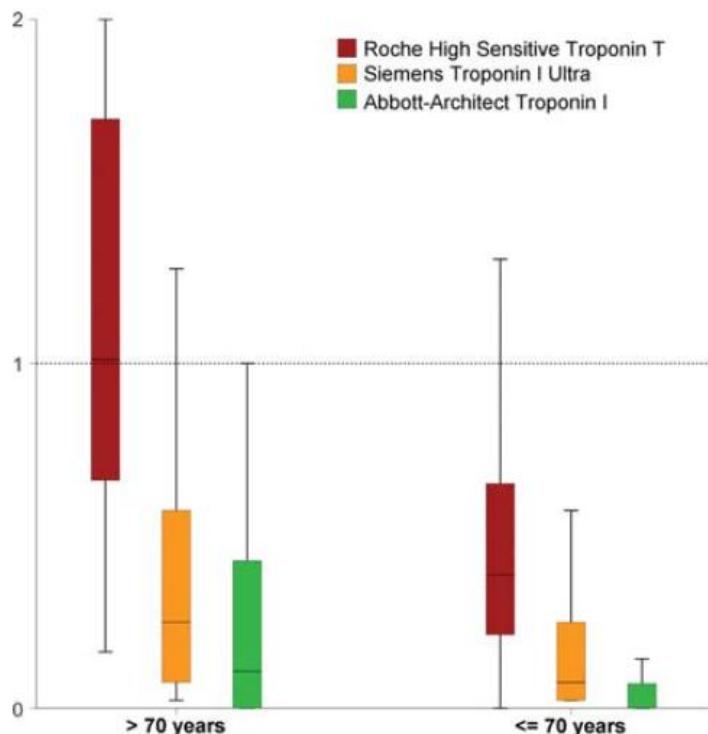
**Hs-cTnT = Quantitative Marker**

Levels at presentation in pts with acute chest pain



# Elderly (>70y)

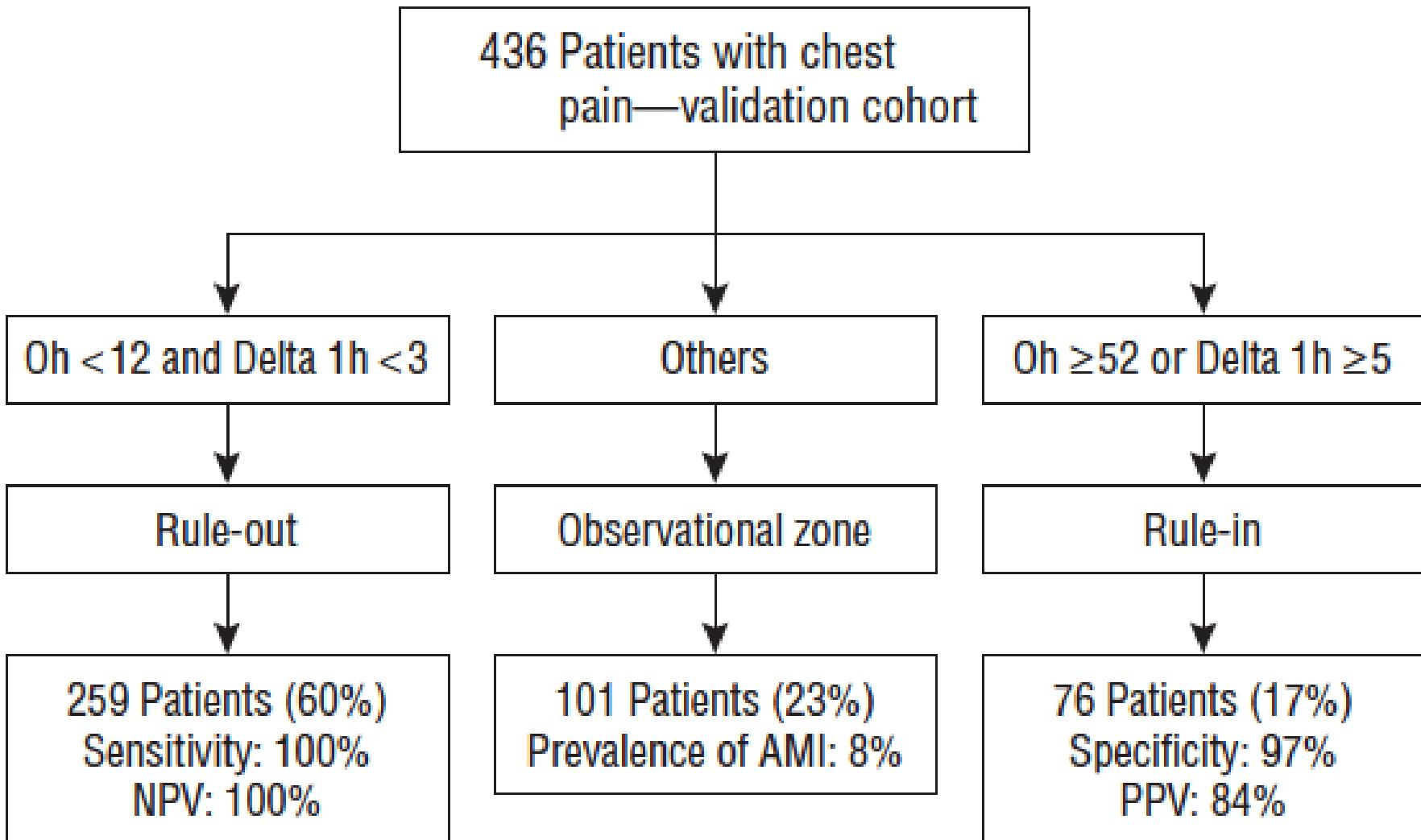
∅ AMI



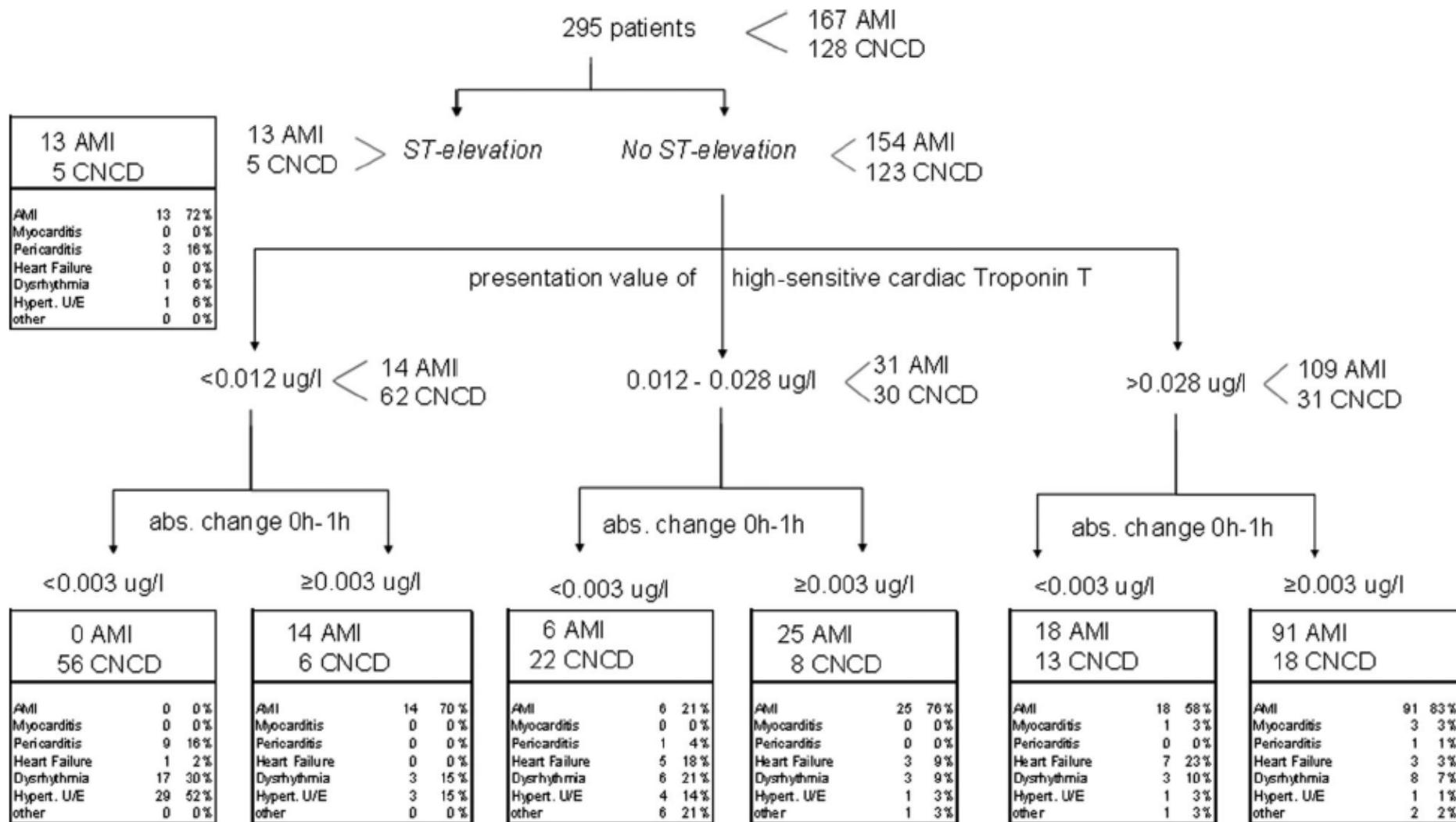
→ cut-off Werte ↑



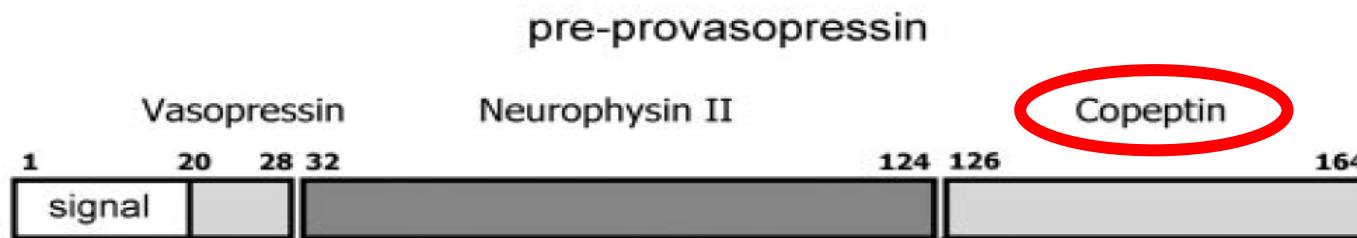
# 1h Algorithm



# AMI versus other Cardiac



# Copeptin



Hypothesis

Cardiomyocyte ↓ + Endogenous Stress  
cTn Copeptin

Rule-out of AMI

- at presentation (0h)
- without 2.nd cTn after 6h

# Incremental Value of Copeptin for Rapid Rule Out of Acute Myocardial Infarction

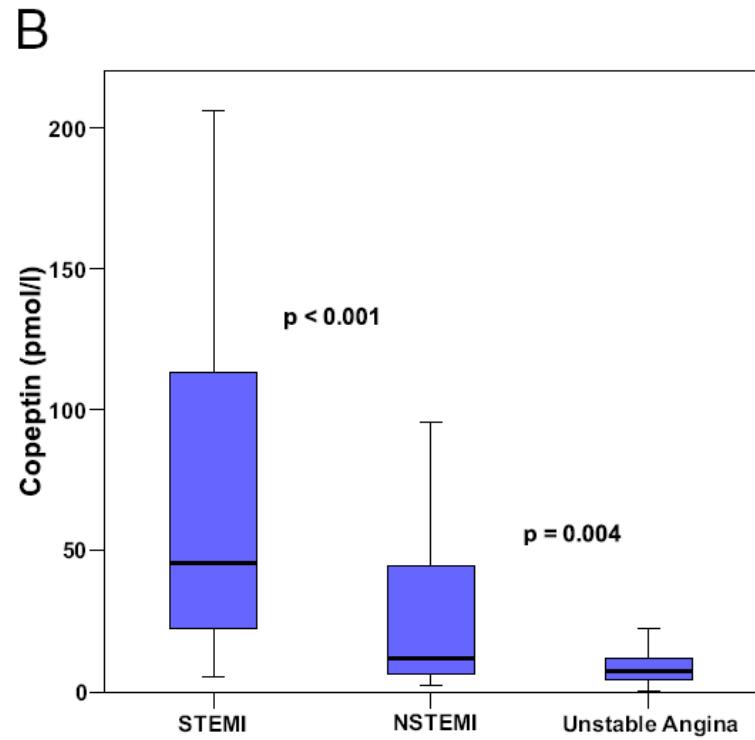
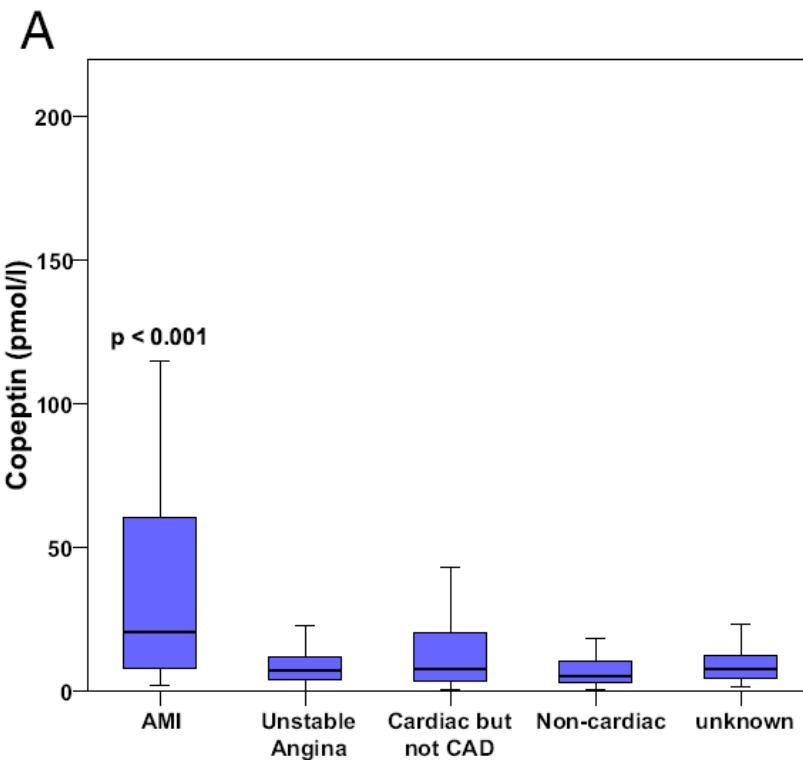


Figure 1

Copeptin Levels at Presentation



# Incremental Value of Copeptin for Rapid Rule Out of Acute Myocardial Infarction

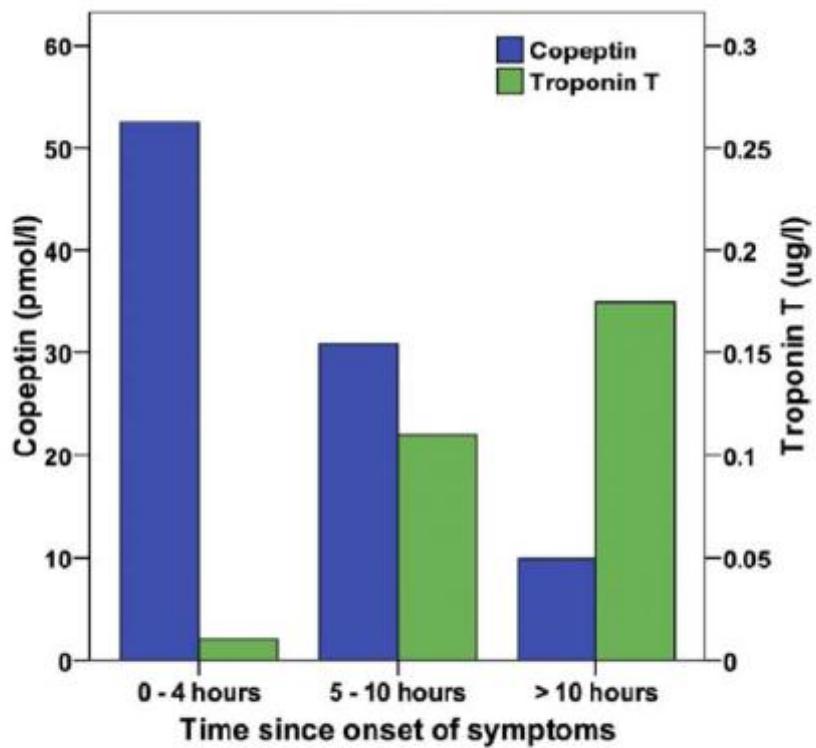


Figure 2

Copeptin and Troponin T Levels at Presentation in Relation to Time Since Onset of Symptoms

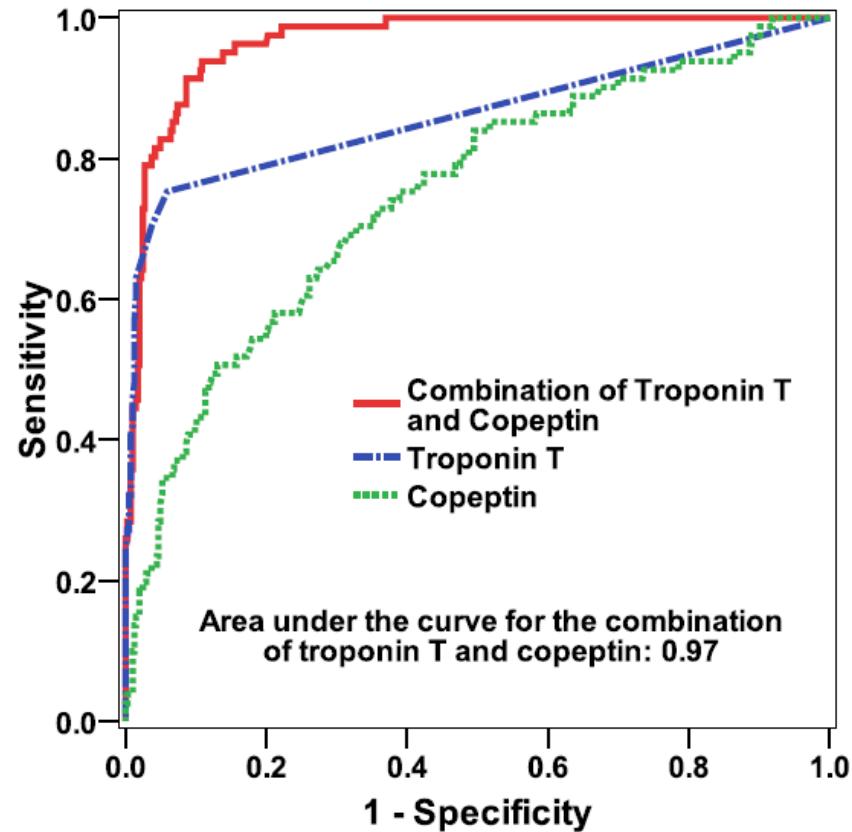
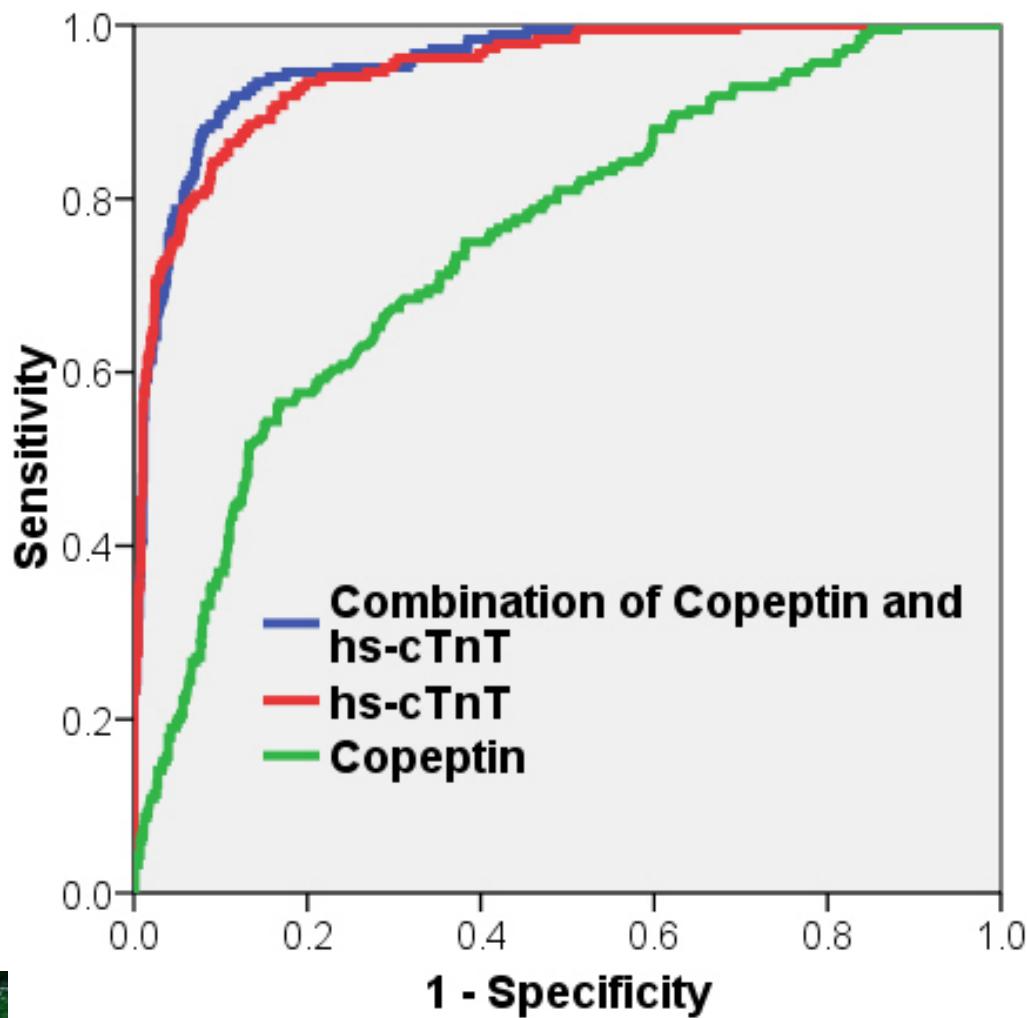


Figure 4

ROC Curves at Presentation for the Diagnosis of AMI

# hs-cTnT + Copeptin



**NPV > 99%**

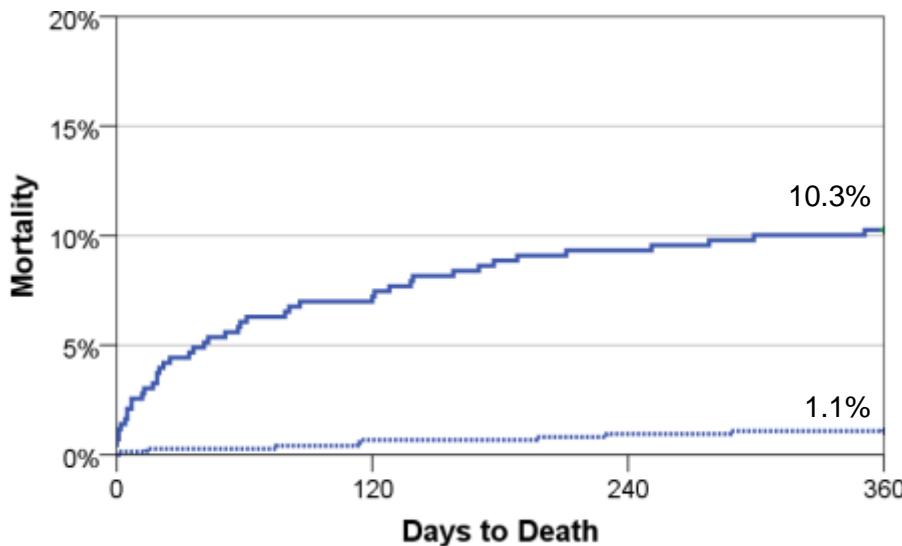
- Reichlin 2009  
Keller 2010  
Chenevier-Gobeaux C 2011  
Giavarina 2011  
Giannitsis 2011  
Charpentier 2012  
Ray 2012  
Meune 2012  
Folli 2012  
Potocki 2012  
Chopin 2013  
.....



# Mortality Prediction

## High-sensitive Troponin

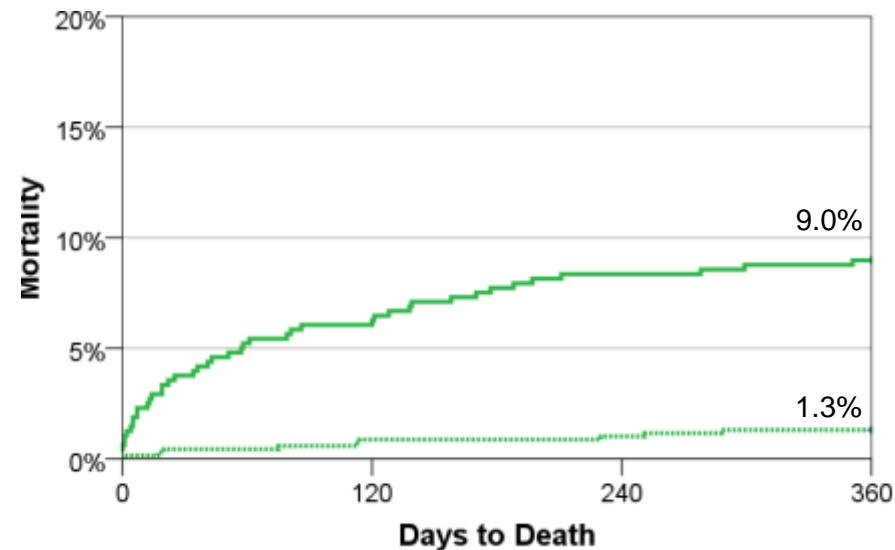
Cutoff-value: 0.014 µg/l



Log-rank p<0.001, HR 10.0

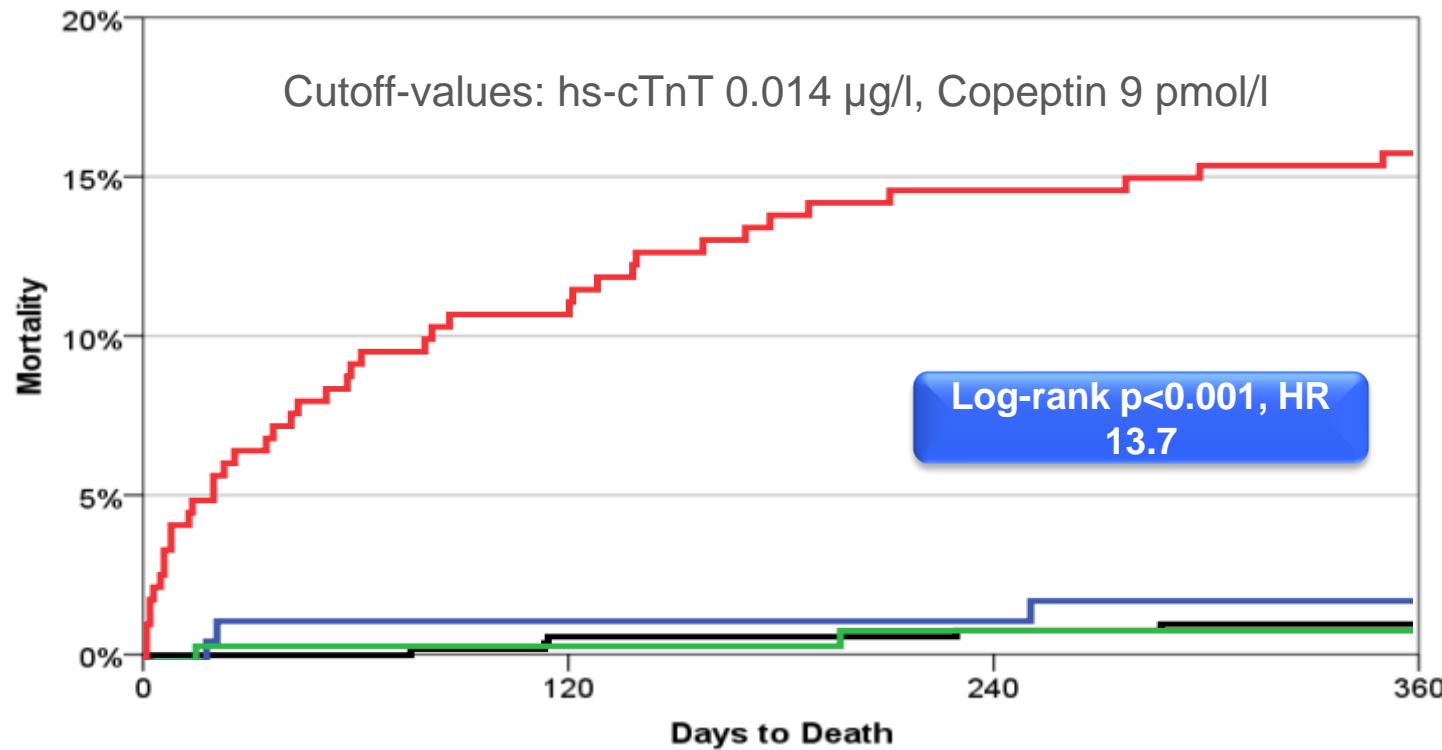
## Copeptin

Cutoff-value: 9 pmol/l



Log-rank p<0.001, HR 7.2

# Results – Mortality Prediction



Combination	n	Events – n (%)
Hs-cTnT + / Copeptin +	266	41 (15.4%)
Hs-cTnT + / Copeptin -	163	2 (1.8%)
Hs-cTnT - / Copeptin +	213	3 (0.09%)
Hs-cTnT - / Copeptin -	528	6 (1.1 %)

# Acute Chest Pain

1.Rule-in

.... 2014??

ESC 2011

ESC 2011, US 2013

2.Rule-out

