EMERGENZE CARDIOLOGICHE

Società Italiana di Medicina d'Emergenza-Urgenza
* SIMEU *

x congresso nazionale
simeu
NAPOLI 18-20 NOVEMBRE 2016

Napoli. Giardini Certosa San Martino

Dolore Toracico e Sindrome Coronarica Acuta

2016: a che punto siamo con la diagnosi?
Manuale per il Medico d'Urgenza

Alberto Conti
Medicina d'Urgenza & PS
Area Vasta Nord-Ovest SSN Toscana
Massa-Carrara-Pontremoli-Fivizzano-Aulla

HEART SCORE
NO stress-test nei pazienti a basso rischio

Nei pazienti a intermedio rischio angio-CT?
Ancora un ruolo per stress-test?

CHEST PAIN
2000, NEJM Evaluation of the patient with chest pain.
2002, Eur Heart J Task force on the management of chest pain.

ACS
2012, Eur Heart J ESC Guidelines for the management of AMI in patients presenting with ST-segment elevation.
2015, Eur Heart J ESC Guidelines for the management of ACS in patients presenting without persistent ST-s-E.

CHEST PAIN
2015, Circulation. The Heart Pathway RCT: ED patients with chest pain for early discharge
2016, NICE Guidelines. Chest pain of recent onset (in development:GID-CGWAVE0774)
2016, Circulation. State of the Art Evaluation of ED patients with potential ACS

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State-of-the-Art Evaluation of ED patients with potential ACS

HISTORY AND PHYSICAL EXAMINATION

history and physical examination do not distinguish sufficiently between the many conditions that can cause acute chest pain syndromes. Cardiac risk factors do not have sufficient discriminatory ability in symptomatic patients presenting to the emergency department.

Napoli. Statua del Nilo

State-of-the-Art Evaluation of ED patients with potential ACS

Clinical Feature	Likelihood Ratio (95% CI)
Increased likelihood of AMI	
Described as pressure	1.3 (1.2–1.5)
Pain in chest or left arm	2.7*
Chest pain radiation	
To right arm or shoulder	4.7 (1.9–12)
To left arm	2.3 (1.7–3.1)
To both left and right arm	7.1 (3.6–14.2)
To both arms or shoulders	4.1 (2.5–6.5)
Chest pain most important symptom	2.0*
Chest pain associated with exertion	2.4 (1.5–3.8)
Worse than previous angina or similar to prior AMI	1.8 (1.6–2.0)
History of MI	1.5–3.0†
Nausea or vomiting	1.9 (1.7–2.3)
Diaphoresis	2.0 (1.9–2.2)
Third heart sound	3.2 (1.6–6.5)
Hypotension (systolic BP <80 mm Hg)	3.1 (1.8–5.2)
Pulmonary crackles	2.1 (1.4–3.1)
Decreased likelihood of AMI	
Pleuritic chest pain	0.2 (0.1–0.3)
Described as sharp	0.3 (0.2–0.5)
Positional chest pain	0.3 (0.2–0.5)
Reproduced by palpation	0.3 (0.2–0.4)
Inframammary location	0.8 (0.7–0.9)
Not associated with exertion	0.8 (0.6–0.9)

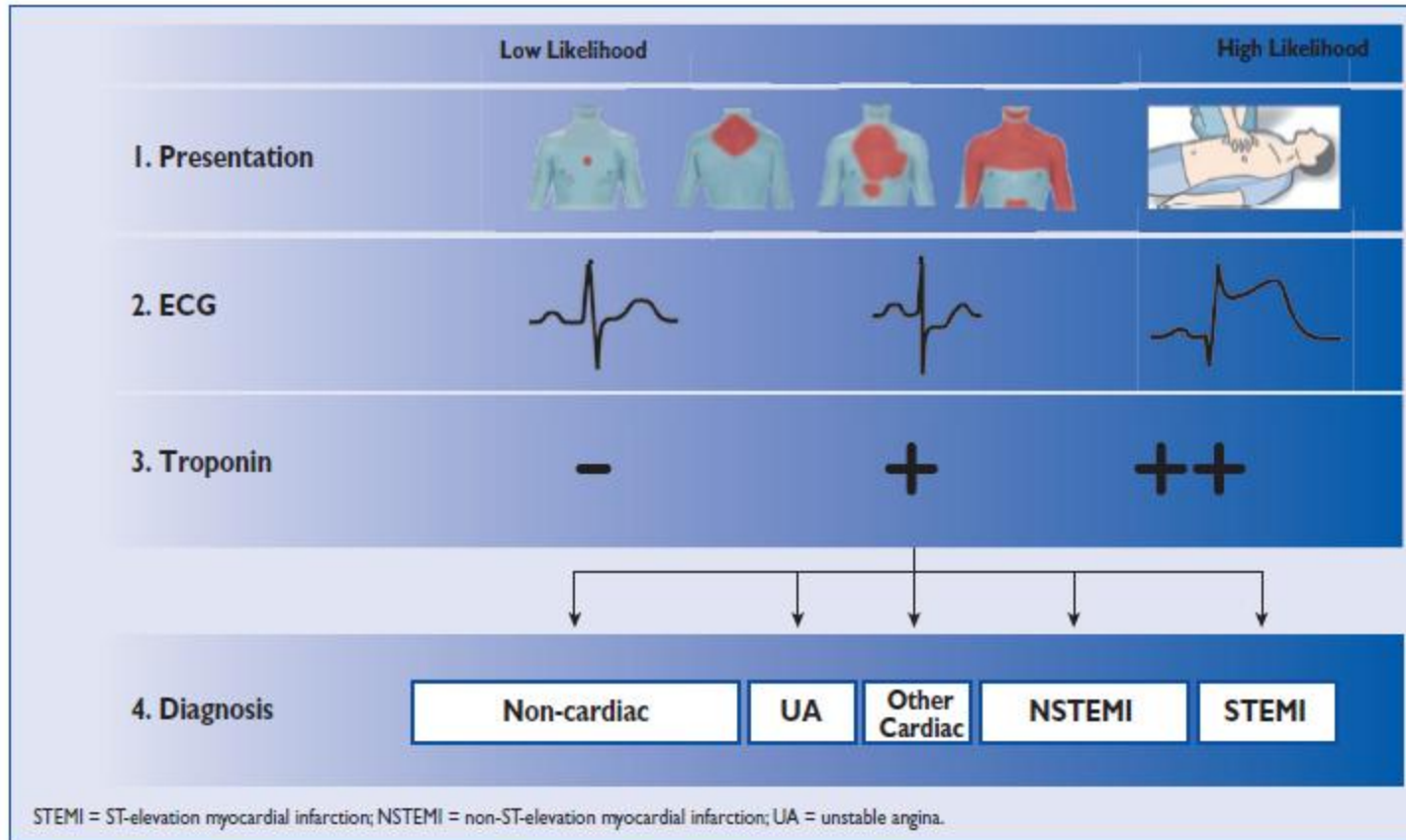Panju Value and limitations of Cphistory in suspected ACS. JAMA 2005

- Chest pain or arms, back, jaws,
- lasting longer 15 minutes,

associates with

- nausea, vomiting, sweating, brethlessness, or haemodynamic instability.

New onset CP or deterioration in stable angina.
Do not use peoples's response to nitrates.
Do not assess symptoms of an ACS differently in men and women, or in ethnic groups.

Dolore toracico alla presentazione…ACS o non-ACS?

	Low Likelihood		High Likelihood
1. Presentation			
2. ECG			
3. Troponin	−	+	++
4. Diagnosis	Non-cardiac	UA / Other Cardiac	NSTEMI / STEMI

STEMI = ST-elevation myocardial infarction; NSTEMI = non-ST-elevation myocardial infarction; UA = unstable angina.

Clinica: alta sensibilità, bassa specificità…necessario ECG

ECG: chiave della stratificazione del rischio

Lab. Emodinamica o UCIC   Osservazione Breve in DEA
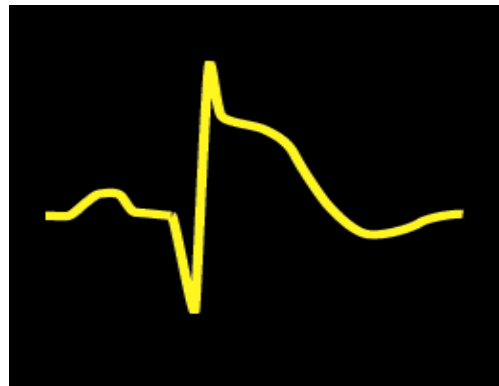
Δ ST   **ECG: normale
o non diagnostico**

alto rischio   basso rischio
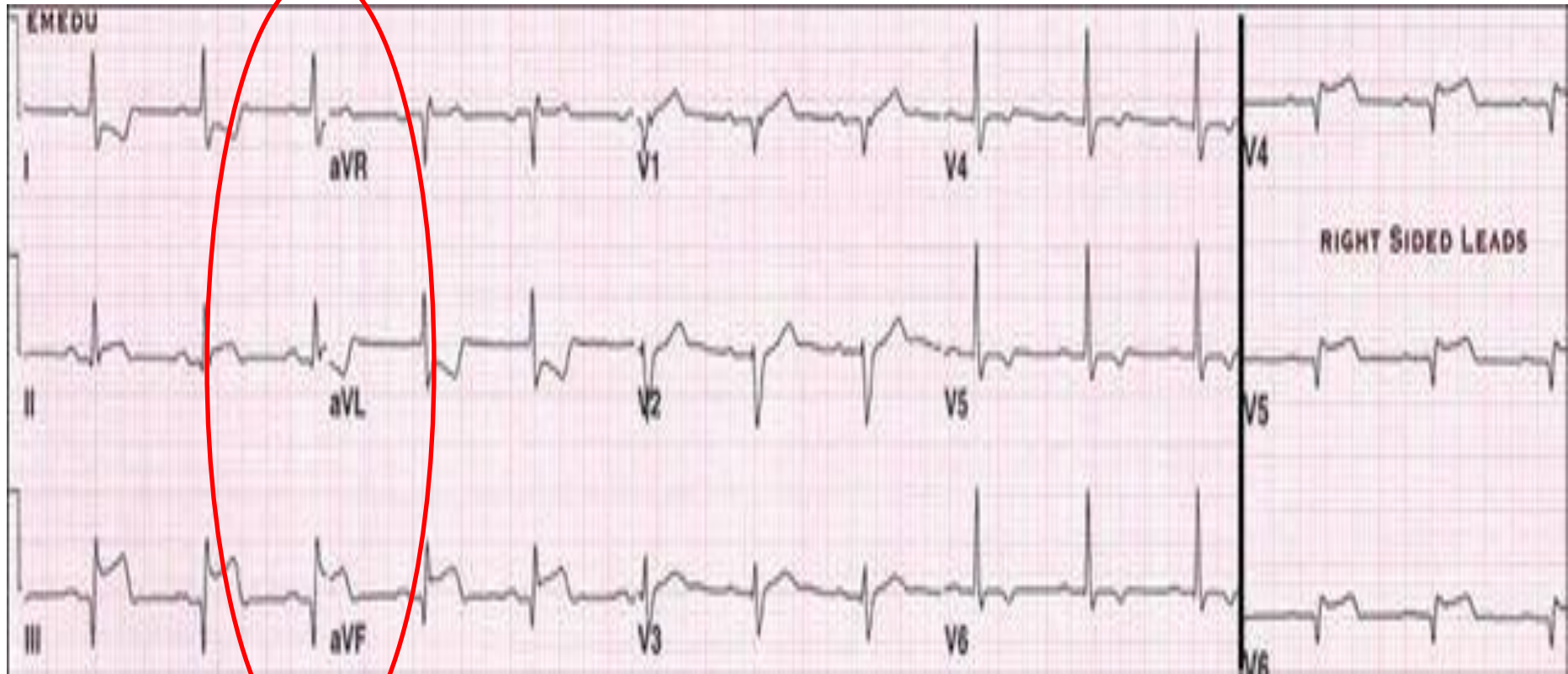>70%   <5-20%

probabilità bassa o intermedia

Lab. Emodinamica o UCIC

1
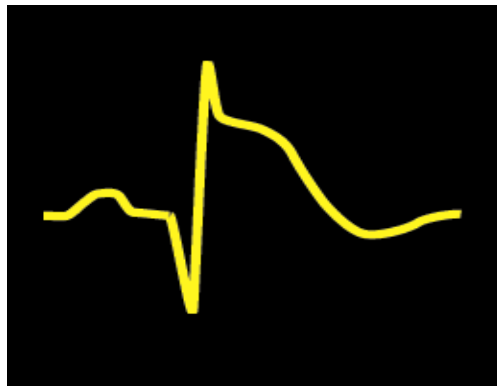
∆ ST

alto rischio
>70%

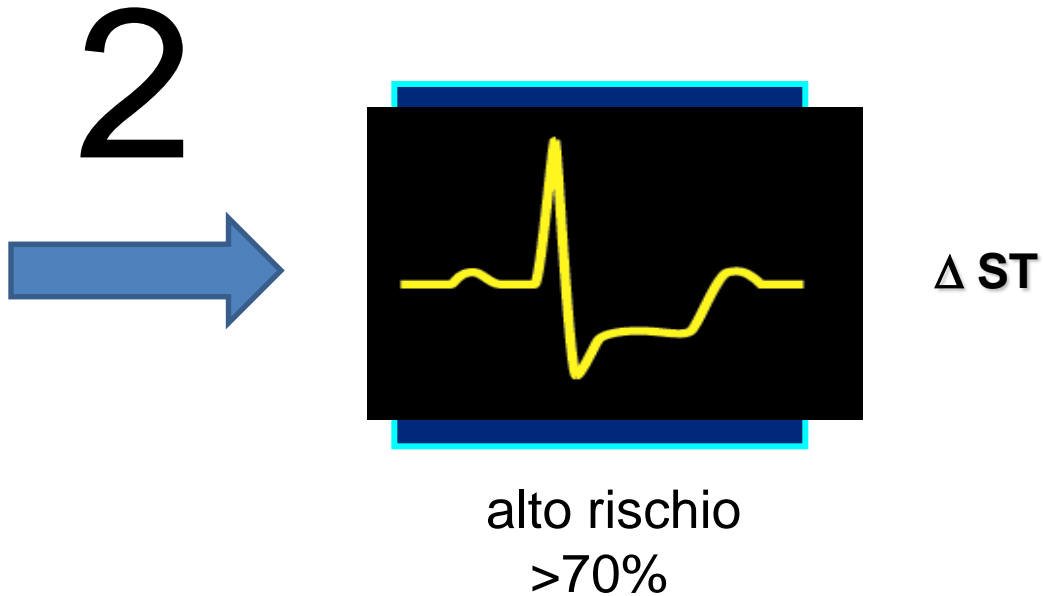Napoli. Panorama del Golfo

Criteria for ST Segment Elevation

New ST elevation at the J point in
2 contiguous leads with the following
cut-points:

- ≥ 0.1 mV in all leads except
  leads V_2-V_3 in men and women;

- In leads V_2-V_3,
  ≥ 0.2 mV in men ≥ 40 years and
  ≥ 0.25 mV in men < 40 years;
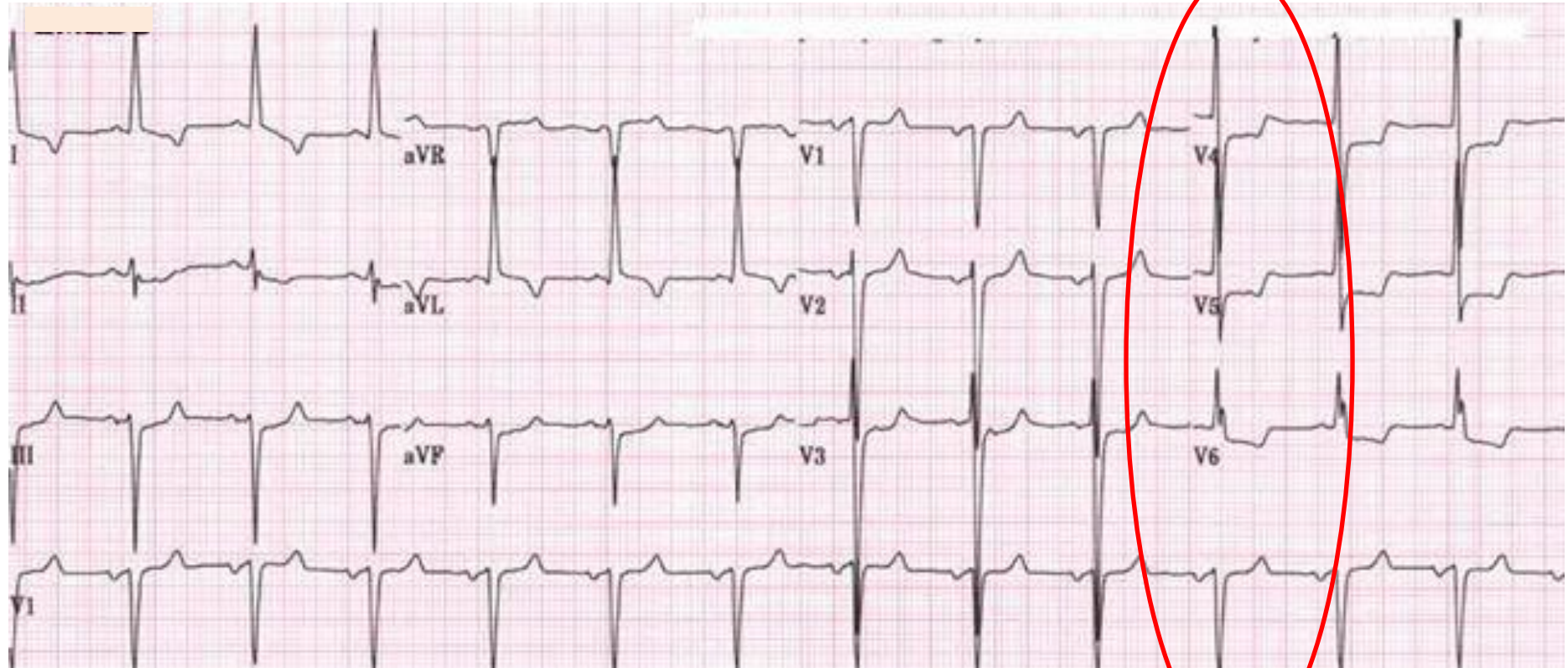
- In leads V_2-V_3,
  ≥ 0.15 mV in women.
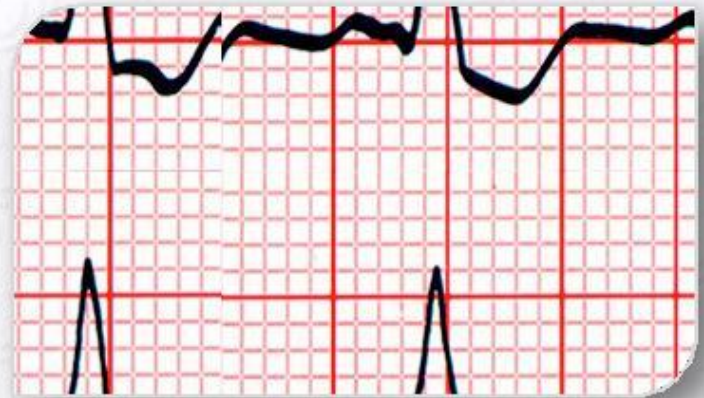
Lab. Emodinamica o UCIC

2

→

Δ ST

alto rischio
>70%

Criteria for Non-ST Segment Elevation

New horizontal or down-sloping
ST segment depression ≥ 0.05 mV
in 2 contiguous leads,

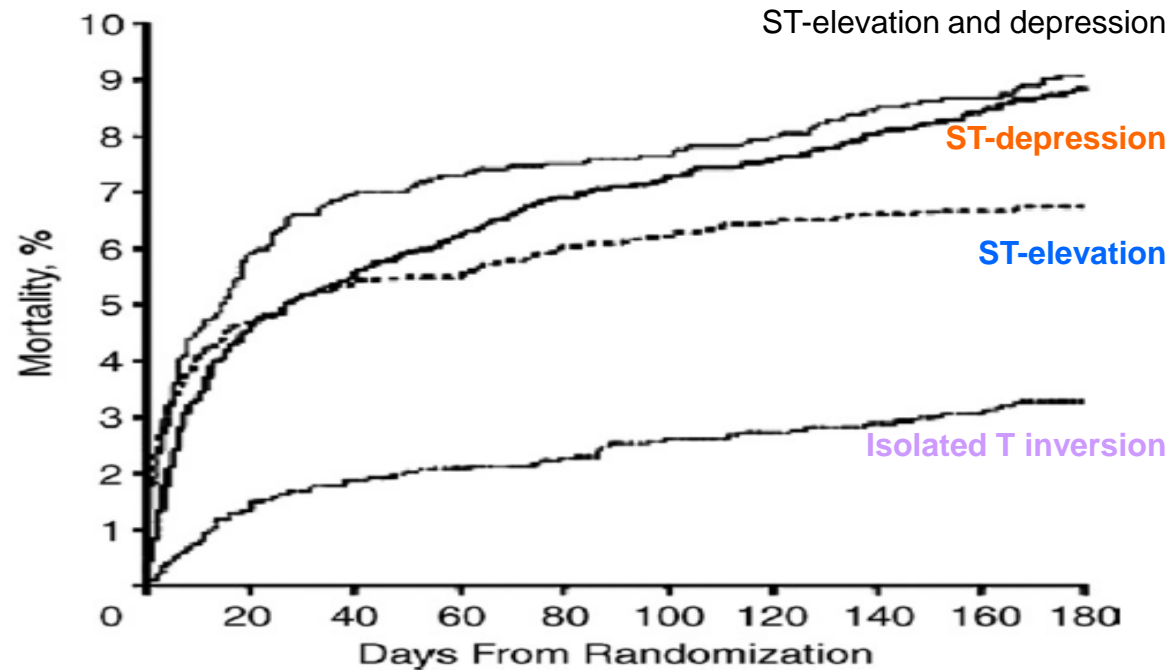**or**

T inversion ≥ 0.1 mV in 2 contiguous
leads with prominent R wave or
R/S ratio > 1.

NSTE-ACS e mortalità: **1.5-4% (breve-termine); 5-11% (medio-termine: 6-mesi).**

Savonitto JAMA 1999.

NSTEACS: risk criteria for invasive strategy

Very-high-risk criteria
• Haemodynamic instability or cardiogenic shock
• Recurrent or ongoing chest pain refractory to medical treatment
• Life-threatening arrhythmias or cardiac arrest
• Mechanical complications of MI
• Acute heart failure
• Recurrent dynamic ST-T wave changes, particularly with intermittent ST-elevation

High-risk criteria
• Rise or fall in cardiac troponin compatible with MI
• Dynamic ST- or T-wave changes (symptomatic or silent)
• GRACE score >140

Intermediate-risk criteria	
• Diabetes mellitus	*
• Renal insufficiency (eGFR <60 mL/min/1.73 m²)	
• LVEF <40% or congestive heart failure	
• Early post-infarction angina	
• Prior PCI	*
• Prior CABG	
• GRACE risk score >109 and <140	*

Low-risk criteria
• Any characteristics not mentioned above

NSTEACS: risk criteria for invasive strategy

Very-high-risk criteria
• Haemodynamic instability or cardiogenic shock
• Recurrent or ongoing chest pain refractory to medical treatment
• Life-threatening arrhythmias or cardiac arrest
• Mechanical complications of MI
• Acute heart failure
• Recurrent dynamic ST-T wave changes, particularly with intermittent ST-elevation

High-risk criteria
• Rise or fall in cardiac troponin
• Dynamic

I pazienti NSTEACS, ma ad alto rischio, secondo le indicazioni in tabella, andrebbero trattati con stessa tempistica degli STEACS
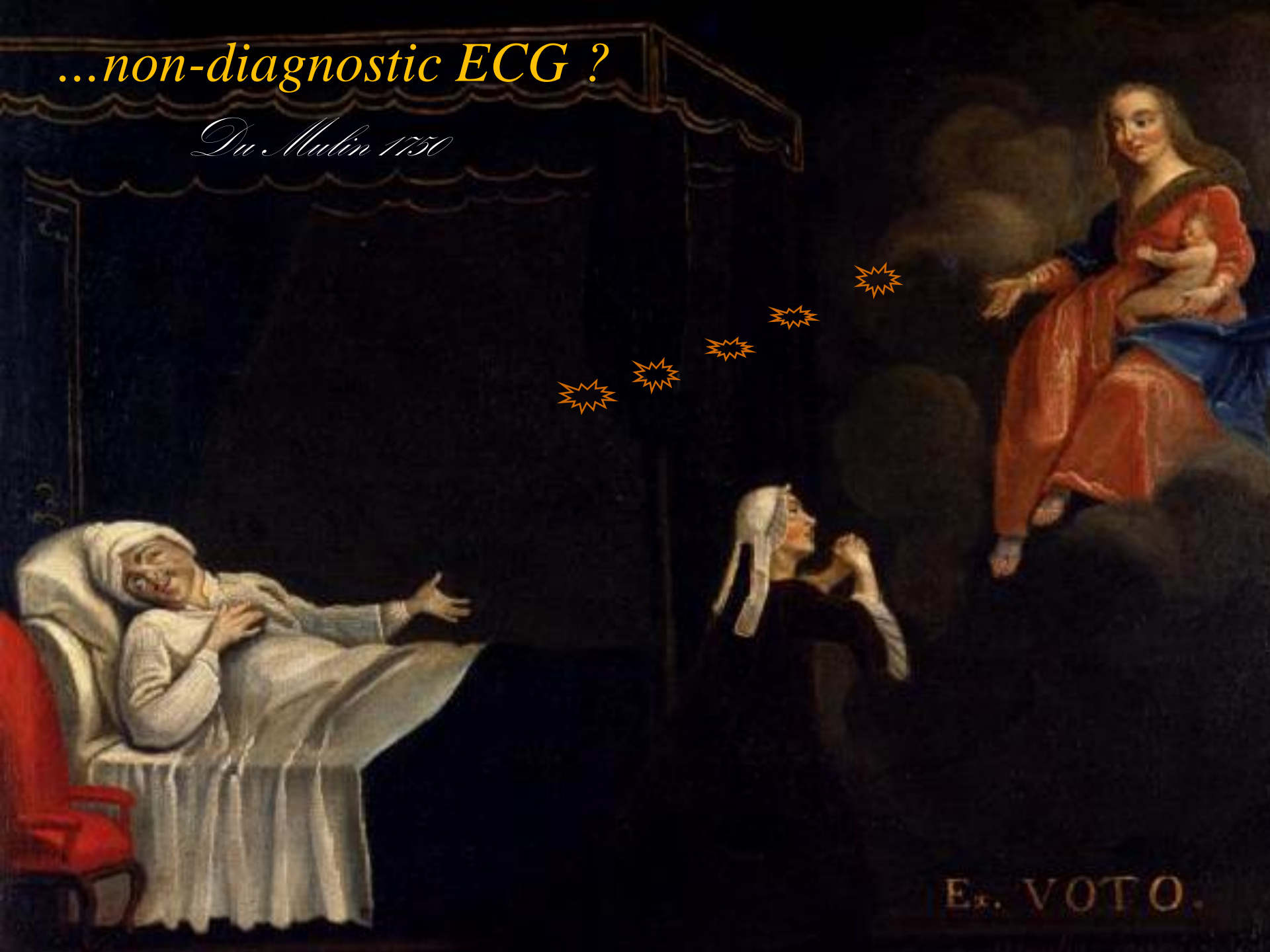
3

ECG Normale/Non-Diagnostico

Diagnosi e Disposition

Napoli. Piazza del Plebiscito nell'800

...non-diagnostic ECG ?

Du Mulin 1750

Ex. VOTO.

American Heart Association®

State-of-the-Art Evaluation of ED patients with potential ACS

Incidence of ACS in patients with normal or nonspecific ECG is 5% to 28%.

New ECG abnormalities increases the UA risk of 14-43% and AMI risk of 25-73%

Selker HP, Zalenski RJ, Antman EM, Aufderheide TP, Bernard SA, Bonow RO, Gibler WB, Hagen MD, Johnson P, Lau J, McNutt RA, Ornato J, Schwartz JS, Scott JD, Tunick PA, Weaver WD. An evaluation of technologies for identifying acute cardiac ischemia in the emergency department: a report from a National Heart Attack Alert Program Working Group. *Ann Emerg Med.* 1997;29:13–87.

1 CP and NSTEACS…the problem: in ED

- **CP or equivalent symptoms represents 4-9% of all ED visits**

- Gibler BW   AHA 2001   8%

- Conti A   AHJ 2002   9%

- Goodacre SW   BMJ 2002   4%

- Christenson J   MAJ 2004 7%

CP and NSTEACS…the problem: in ED

1

- CP or equivalent symptoms represents 4-9% of all ED visits

- **Only 30% of patients with CP have AMI or ACS (50% of admitted)**

  Lee NEJM 2000

- CP or equivalent symptoms represents 4-9% of all ED visits

- Only 30% of CP patients have AMI or ACS (50% of admitted)

- **Admission rate 40-60%**

- Gibler BW   AHA 2001   60%

- Conti A   AHJ 2002   40%

- Goodacre SW   BMJ 2002   57%

1 CP and NSTEACS…the problem: in ED

- CP or equivalent symptoms represents 4-9% of all ED visits

- Only 30% of CP patients have AMI or ACS (50% of admitted)

- Admission rate 40-60%

- **Morbidity/Mortality for missed AMI is high 20% < 24h** **(Missed AMI: 2-5%)**

  Lee, Am J Cardiol 1987

  In these patients mortality is double than other admitted

2

Effetto **Bullying:**

l'organizzazione e il management esercita pressione nei confronti dei dipendenti per raggiungere i targets adottando comportamenti al limite del lecito ed eticamente discutibili

2 Hitting the target & missing the point:
4 hour wait in A&E (Bevan 2010)

Delay admission

A good solution?

Finding the Holy Grail Is Not a Short-Term Project

Early instruments had poor clinical uptake because of unacceptably low sensitivity: these include the Goldman Risk score, acute cardiac ischemia time–insensitive predictive instrument (ACI-TIPI), the Thrombolysis in Myocardial Infarction (TIMI) risk score, and Global Registry of Acute Coronary Events (GRACE).

Graal = risk-score?

Finding the Holy Grail Is Not a Short-Term Project

More recently the North American

…la troponina

Protocol to Assess Patients With C_____ms Using
Contemporary Troponins (A_____ the HEART
(History, Electrocardi_____ factors, Troponin)
Pathway, among othe_____porated conventional tro-
ponins into their clinica_____on instruments.

Graal = algorhythm?

Finding the Holy Grail Is Not a Short-Term Project

the HEART Pathway, which showed 100% sensitivity using 2 sets of conventional troponins.

CL Atzema, MJ Schull. Circulation 2016

External validation:

the HEART Pathway had a miss rate of 1.7% (95% confidence interval, 1.0–2.9)

Mahler SA. The HEART Pathway RCT. Circ Cardiovasc Qual Outcomes 2015.

Editorial Eur Heart J 2016

(e.g. the hs-cTn 0 h/3 h-algorithm)

Tutta la diagnostica per tutti i pazienti?
Una unica scarpa per calzare tutti i ipiedi?

Napoli. Palazzo reale: Scala d'Ingresso

HEART SCORE
NO stress-test nei pazienti a basso rischio

The HEART Pathway Randomized Trial: Identifying Emergency Department Patients With Acute Chest Pain for Early Discharge

Simon A. Mahler, Robert F. Riley, Brian C. Hiestand, Gregory B. Russell, James W. Hoekstra, Cedric W. Lefebvre, Bret A. Nicks, David M. Cline, Kim L. Askew, Stephanie B. Elliott, David M. Herrington, Gregory L. Burke and Chadwick D. Miller

Background

The HEART Pathway is a decision aid designed to identify emergency department patients with acute chest pain for early discharge. No randomized trials have compared the HEART Pathway with usual care.

Methods and Results

Adult emergency department patients with symptoms related to acute coronary syndrome without ST-elevation on ECG (n=282) were randomized to the HEART Pathway or usual care. In the HEART Pathway arm, emergency department providers used the HEART score, a validated decision aid, and troponin measures at 0 and 3 hours to identify patients for early discharge. Usual care was based on American College of Cardiology/American Heart Association guidelines. The primary outcome, objective cardiac testing (stress testing or angiography), and secondary outcomes, index length of stay, early discharge, and major adverse cardiac events (death, myocardial infarction, or coronary revascularization), were assessed at 30 days by phone interview and record review. Participants had a mean age of 53 years, 16% had previous myocardial infarction, and 6% (95% confidence interval, 3.6%–9.5%) had major adverse cardiac events within 30 days of randomization. Compared with usual care, use of the HEART Pathway decreased objective cardiac testing at 30 days by 12.1% (68.8% versus 56.7%; $P=0.048$) and length of stay by 12 hours (9.9 versus 21.9 hours; $P=0.013$) and increased early discharges by 21.3% (39.7% versus 18.4%; $P<0.001$). No patients identified for early discharge had major adverse cardiac events within 30 days.

Conclusions

The HEART Pathway reduces objective cardiac testing during 30 days, shortens length of stay, and increases early discharges. These important efficiency gains occurred without any patients identified for early discharge suffering MACE at 30 days.

Chest pain in the ER: a multicenter validation of the HEART Score (2010)
The HEART score for patients with CP in the ED: a multinational validation study (2013)

The HEART score for Chest Pain Patients in the ED		
History	Highly Suspicious Moderately Suspicious Slightly or Non-Suspicious	2 ponits 1 point 0 points
ECG	Significant ST-Depression Nonspecific repolarization Normal	2 ponits 1 point 0 points
Age	≥ 65 years > 45 - <65 years ≤ 45 years	2 ponits 1 point 0 points
Risk Factors	≥ 3 or istory of CAD 1 or 2 RF No RF	2 ponits 1 point 0 points
Troponin	≥ 3 x Normal Limit > 1 - < 3 x Normal Limit ≤ Normal Limit	2 ponits 1 point 0 points

Risk factors: DM, current or recent (< 1 month) smoker, HTN, HLP, family history of CAD, & obesity

Score 0-3: 2.5% MACE over next 6 weeks —> Discharge Home
Score 4-6: 20.3% MACE over next 6 weeks —> Admit for Clinical Observation
Score 7-10: 72.7% MACE over next 6 weeks —> Early invasive Strategies

Backus BE. *Crit Pathw Cardiol. 2010;9:164–169.* Six AJ. *Crit Pathw Cardiol. 2013;12:121–126.*

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ECG	Significant ST-Depression	2 ponits
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	Normal	0 points
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	> 45 - <65 years	1 point
	≤ 45 years	0 points
Risk Factors	≥ 3 or istory of CAD	2 points
	1 or 2 RF	1 point
	No RF	0 points
Troponin	≥ 3 x Normal Limit	2 ponits
	> 1 - < 3 x Normal Limit	1 point
	≤ Normal Limit	0 points

0= Low MACE Discharge!

Risk factors: DM, current or recent (< 1 month) smoker, HTN, HLP, family history of CAD, & obesity

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6=20% MACE Observation!

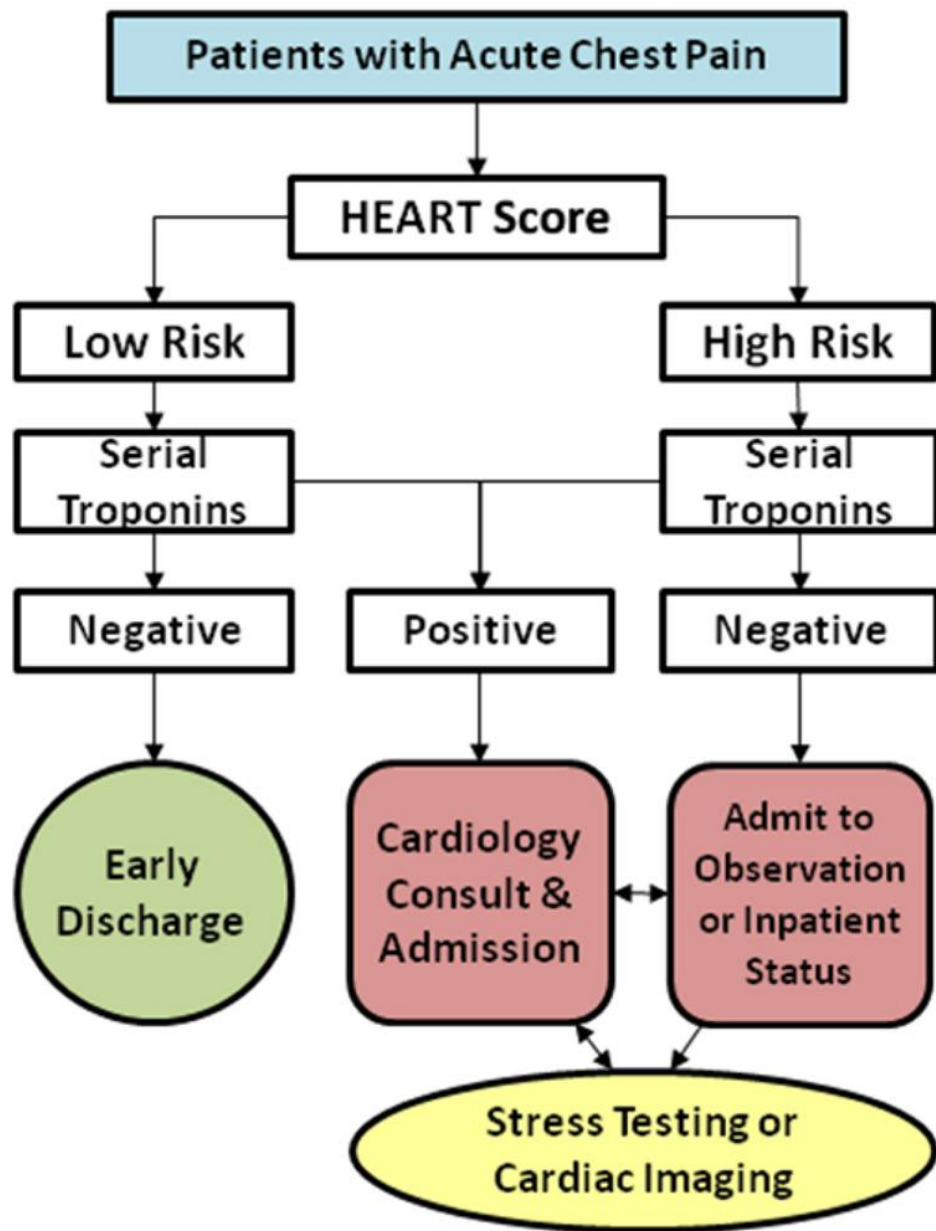Risk factors: DM, current or recent (< 1 month) smoker, HTN, HLP, family history of CAD, & obesity

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8=70% MACE Admit!

Score 0-3: 2.5% MACE over next 6 weeks —> Discharge Home
Score 4-6: 20.3% MACE over next 6 weeks —> Admit for Clinical Observation
Score 7-10: 72.7% MACE over next 6 weeks —> Early invasive Strategies

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HEART Pathway

A new simple risk score in patients with acute chest pain without existing known coronary disease

The clinical prediction rule, composed of 5 independent prognostic variables (CP score higher than 6, male gender, age older than 50 years, MS, and DM), patients with a risk ranging from 1% 25% (group C, rule 5-6) (Figs. 3 and 4

Chest Pain Score >6
Male gender
Age > 50 years
MS or DM

0-1 risk of MACE… 1%
2-4 risk of MACE… 4-11%
5-6 risk of MACE… 25%

HEART SCORE Pathway
NO stress-test nei pazienti a basso rischio

Nei pazienti a intermedio rischio angio-CT?
Ancora un ruolo per stress-test?

CP in the ED: which tests?

Gold Standard: angiography

Invasive	Costly	High-dose rad.	Angiography (6)
Not invasive	Costly (High)	High-dose rad.	MSCT (5)
Not invasive	Costly (High)	Low-dose rad.	Stress-MPI (4)
Not invasive	Low-cost	no rad.	Stress-Echo (2,3)
Not invasive	Very low-cost	no rad.	ETT (1)

Costly?
Invasive?
Radiations?

(1) Circulation. 2000 Sep 19;102(12):1463-7
(2) Am J Med. 2001;111:18 –23.
(3) Eur Heart J. 2006 Oct;27(20):2448-58.
(4) NEJM vol 344,n°24 June 14, 2001
(5) Circulation 2007;115(13):1762-8
(6) J Am Coll Cardiol 2001;37:2042-9.

MSTC multi slice computer tomography
SPECT single photon emission computed tomography
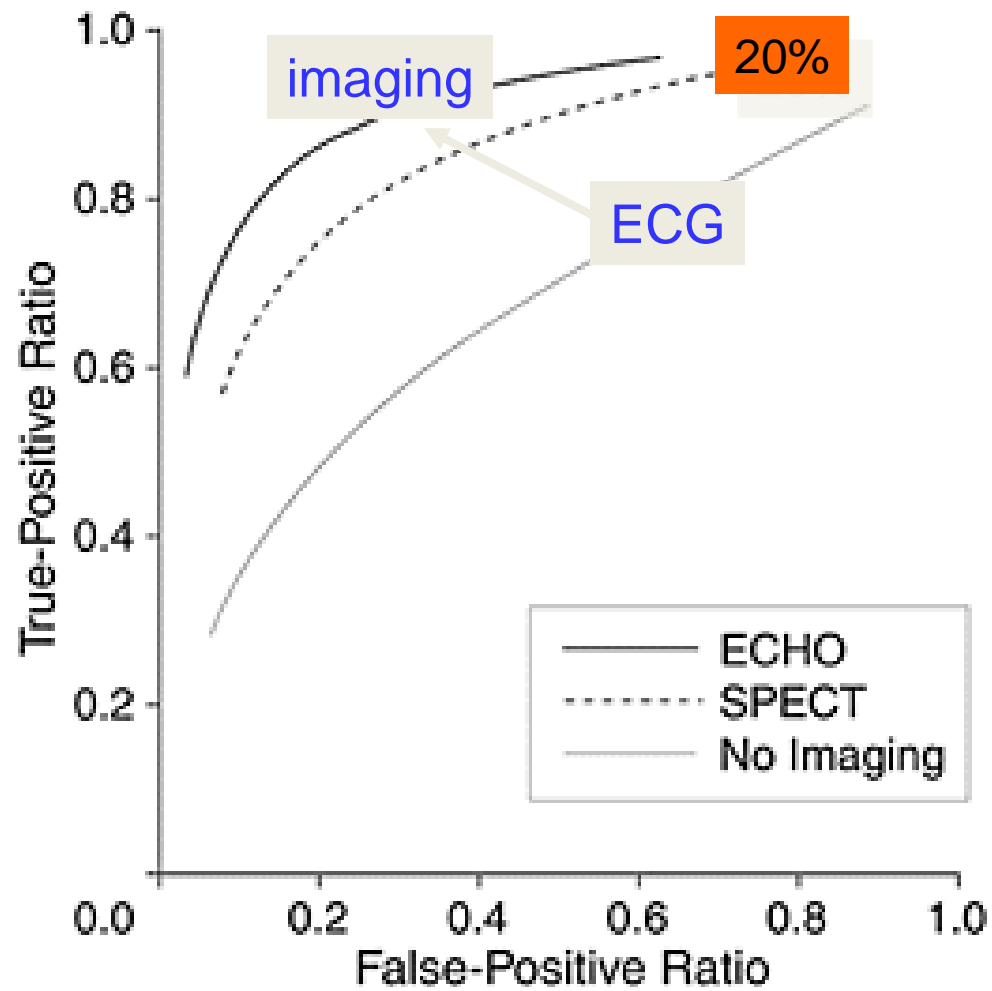ETT exercise tolerance test

"Diagnostic value of testing in CP patients"

- Clin (clinical parameters)
- Ex-ECG (Stress)
- Echo (resting)
- Echo (Stress)
- SPECT (stress)
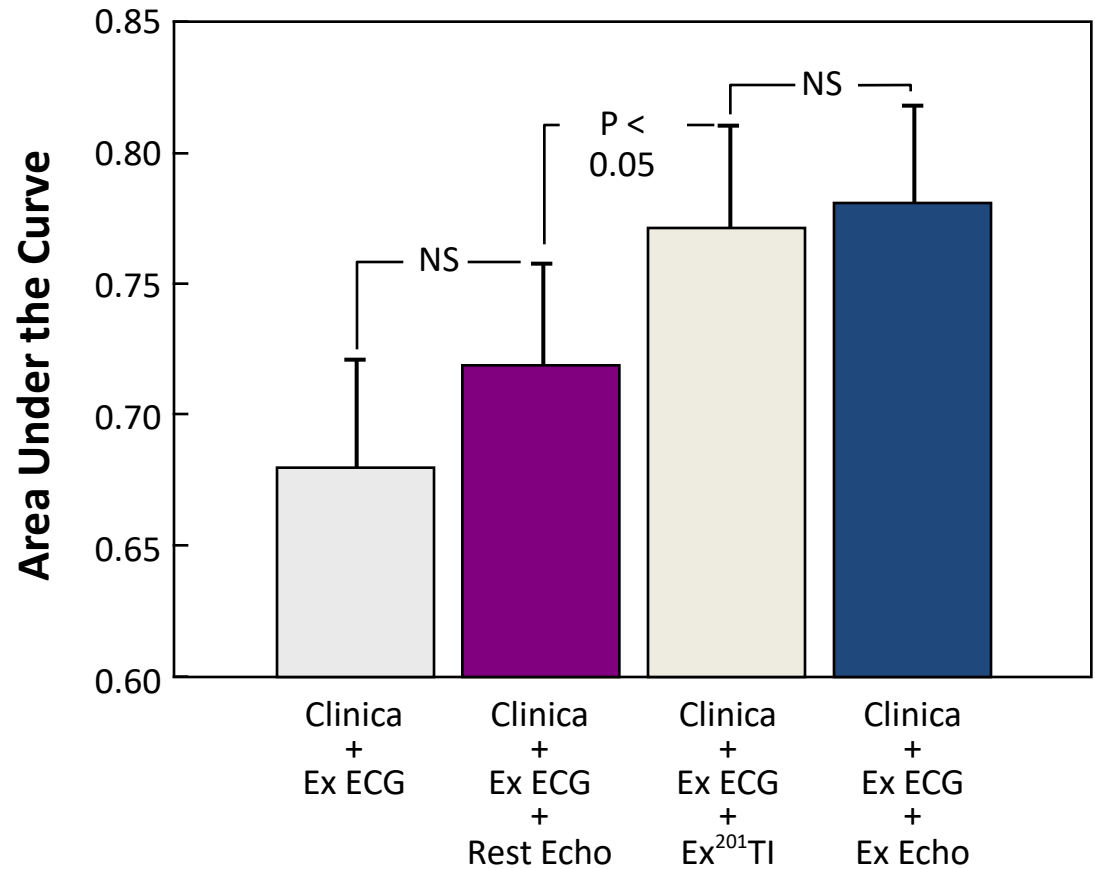
Exercise-MPI Imaging and Exercise-Echocardiography ?

Exercise-ECG, stress-MPI, stress-Echo, MSCT-CTA: MA in 431 studies

Test Accuracy (First Authors, Year [Ref. #])	No. Studied	Methods	Sensitivity, %	Specificity, %
ECG (Gaibazzi et al., 2011 [12])	11,691	MA of 68 studies	67	72
SPECT (Heijenbrok-kal et al., 2007 [5])				
Exercise	5,786	MA of 55 studies	88	69
Adenosine	2,132	MA of 11 studies	91	81
Dipyridamole	1,434	MA of 58 studies	90	75
Dobutamine	1,066	MA of 102 studies	84	75
Echo (Heijenbrok-kal et al., 2007 [5])				
Exercise	7,787	MA of 48 studies	83	84
Adenosine	1,194	MA of 14 studies	79	92
Dipyridamole	9,341	MA of 23 studies	72	95
Dobutamine	18,142	MA of 16 studies	81	84
CTA (Meijboom et al., 2007 [8])	33	Diagnosis confirmed with invasive CA	100	80
12-month cardiac event rates				

Test Strategy	CTA (13)	ECG (12)	SPECT (11)	Echo (11)
n	517	536	5,946	2,900
Initial negative diagnostic test, %	0.95	2.97	0.58	1.03
In patients who test positive on invasive CA (9)		4.8%		
In patients who test negative on invasive CA (10)		0.6%		

CA = coronary angiography; CTA = computed tomographic angiography; ECG = electrocardiography; Echo = echocardiography; MA = meta-analysis; SPECT = single photon-emitting computed tomography.

a Gaibazzi N, Contrast stress-echo or exercise-ECG in CP and normal ECG and 12-hour cTnI. Am J Cardiol 2011;107: 161–7.
b Heijenbrok-Kal MH, Stress echo, stress-SPECT and CT for the assessment of CAD: a meta-analysis. Am Heart J 2007;154: 415–23.
c Meijboom WB, 64-Slice CT coronary angiography in patients with non-ST elevation ACS. Heart 2007;93:1386 –92.

Exercise-ECG, stress-MPI, stress-Echo, MSCT (CTA)?

	Diagnosis of CAD	
	Sensitivity (%)	Specificity (%)
Exercise ECG [a, 91, 94, 95]	45–50	85–90
Exercise stress echocardiography[96]	80–85	80–88
Exercise stress SPECT[96-99]	73–92	63–87
Dobutamine stress echocardiography[96]	79–83	82–86
Dobutamine stress MRI[a,100]	79–88	81–91
Vasodilator stress echocardiography[96]	72–79	92–95
Vasodilator stress SPECT[96, 99]	90–91	75–84
Vasodilator stress MRI[a,98, 100-102]	67–94	61–85
Coronary CTA[c,103-105]	95–99	64–83
Vasodilator stress PET[97, 99, 106]	81–97	74–91

Highly sensitive troponin and coronary computed tomography angiography in the evaluation of CP.
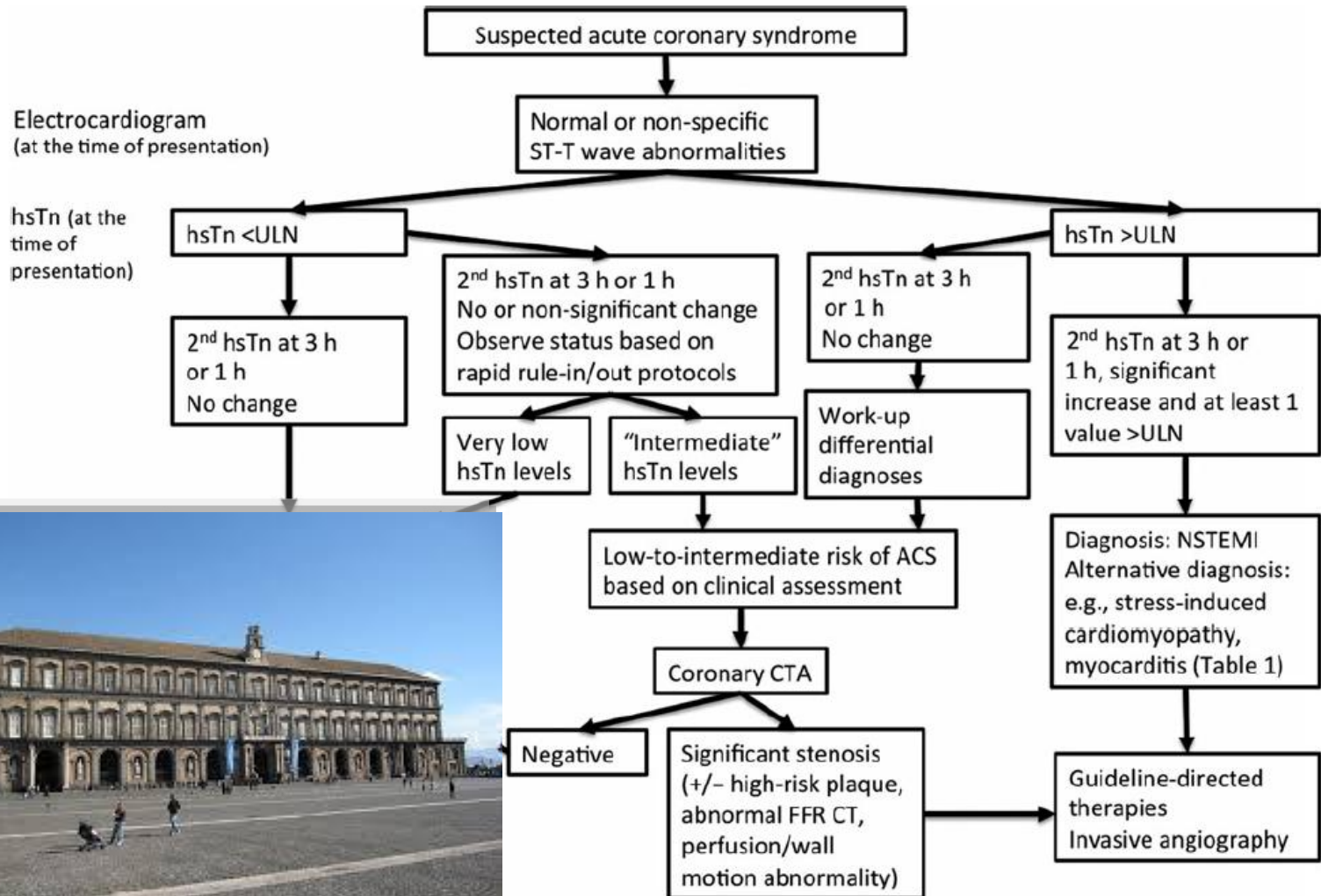
Napoli. Palazzo reale nell'800

Outcomes of Anatomical versus Functional Testing for Coronary Artery Disease

	90 days	2 years
Coronary-CT-Angiography	2534 $	
Functional stress tests	2255 $	
	+279 $ p=NS	+30 $ p=NS

Endpoint: death, MI, unstable angina	
CTA group	164 (3.3%)
Functional testing group	151 (3.0%)

CONCLUSIONS

In symptomatic patients with suspected CAD who required noninvasive testing, a strategy of initial CTA, as compared with functional testing, did not improve clinical outcomes over a median follow-up of 2 years. (Funded by the National Heart, Lung, and Blood Institute; PROMISE ClinicalTrials.gov number, NCT01174550.)

1 -In caso di dolore toracico tipico, ECG non diagnostico, Troponina normale, nei pazienti con età <65 anni indicata **Angio-TC-Coronarica**.

2 -In caso di dolore toracico tipico, ECG non diagnostico, Troponina normale, nei pazienti con età ≥65 anni indicata **Scintigrafia Miocardica SPECT o ECO-stress**.

3 -E' auspicabile che le donne, indipendentemente dall'età, vengano avviate alla **Angio-TC-Coronarica**. Possibile successiva ri-definizione diagnostica con **Scintigrafia miocardica SPECT**.

Gli appuntamenti via CUP dedicato al PS verranno presi in forma telematica dai computer del PS relativamente ai giorni:
- lunedì della terza settimana di ogni mese per le SPECT (5 slot)
- giovedì della terza settimana di ogni mese per le angio-TC-coronariche (5 slot)

EMERGENZE
CARDIOLOGICHE

Napoli. Veduta notturna

Alberto Conti
Medicina d'Urgenza
ASL Nord-Ovest SSN Toscana
Massa-Carrara-Pontremoli-Fivizzano-Aulla