MI management novelties

www.greatnetwork.org

The greatnetwork. In the world

Prof. Salvatore Di Somma, MD, PhD

Professor of Emergency Medicine
Director Postgraduate School of Emergency Medicine
Sapienza University of Rome Italy
Visiting Scholar Professor University Calfornia San Diego USA
Expert Professor University of Lund Malmoe Sweden
President GREAT –Network Italy

SAPIENZA UNIVERSITÀ DI ROMA

UC San Diego HEALTH SCIENCES

LUND UNIVERSITY

GREAT global research on acute conditions team

EXPERT CONSENSUS DOCUMENT

Fourth Universal Definition of Myocardial Infarction (2018)

Joint ESC/ACC/AHA/WHF Task Force for the Universal Definition of Myocardial Infarction

ESC European Society of Cardiology

Fourth Joint ESC/ACC/AHA/WHF Universal Definition of Myocardial Infarction
European Heart Journal 2019; 40: 237-269 - doi:10.1093/eurheartj/ehy462

Universal Definition of Myocardial Infarction

ESC European Society of Cardiology

Criteria for Clinical Myocardial Infarction

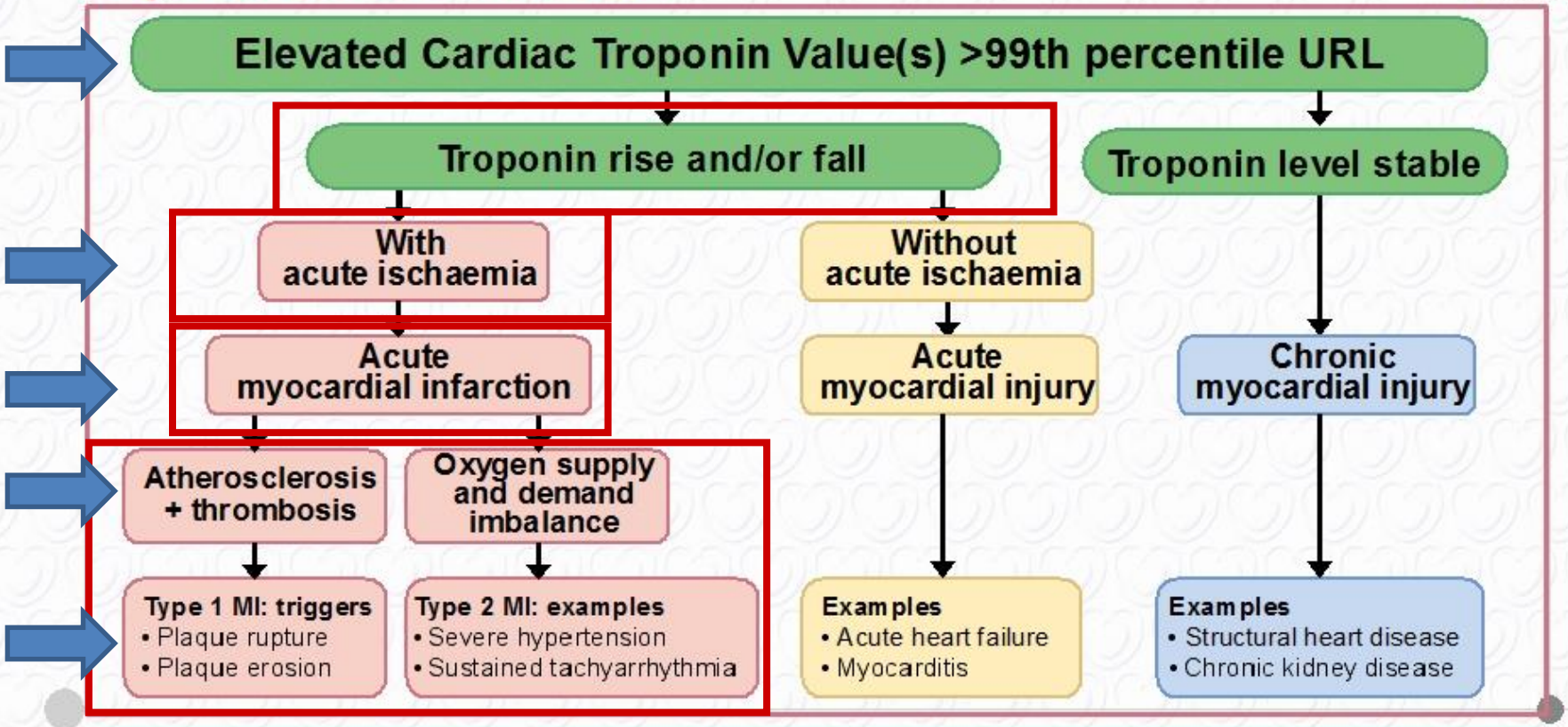
Clinical definition of myocardial infarction denotes presence of acute myocardial injury detected by abnormal cardiac biomarkers in the setting of evidence of acute myocardial ischaemia.

SAPIENZA UNIVERSITÀ DI ROMA

GREAT global research on acute conditions team

Model for interpreting Myocardial Injury and Myocardial Infarction

ESC
European Society of Cardiology



www.escardio.org/guidelines

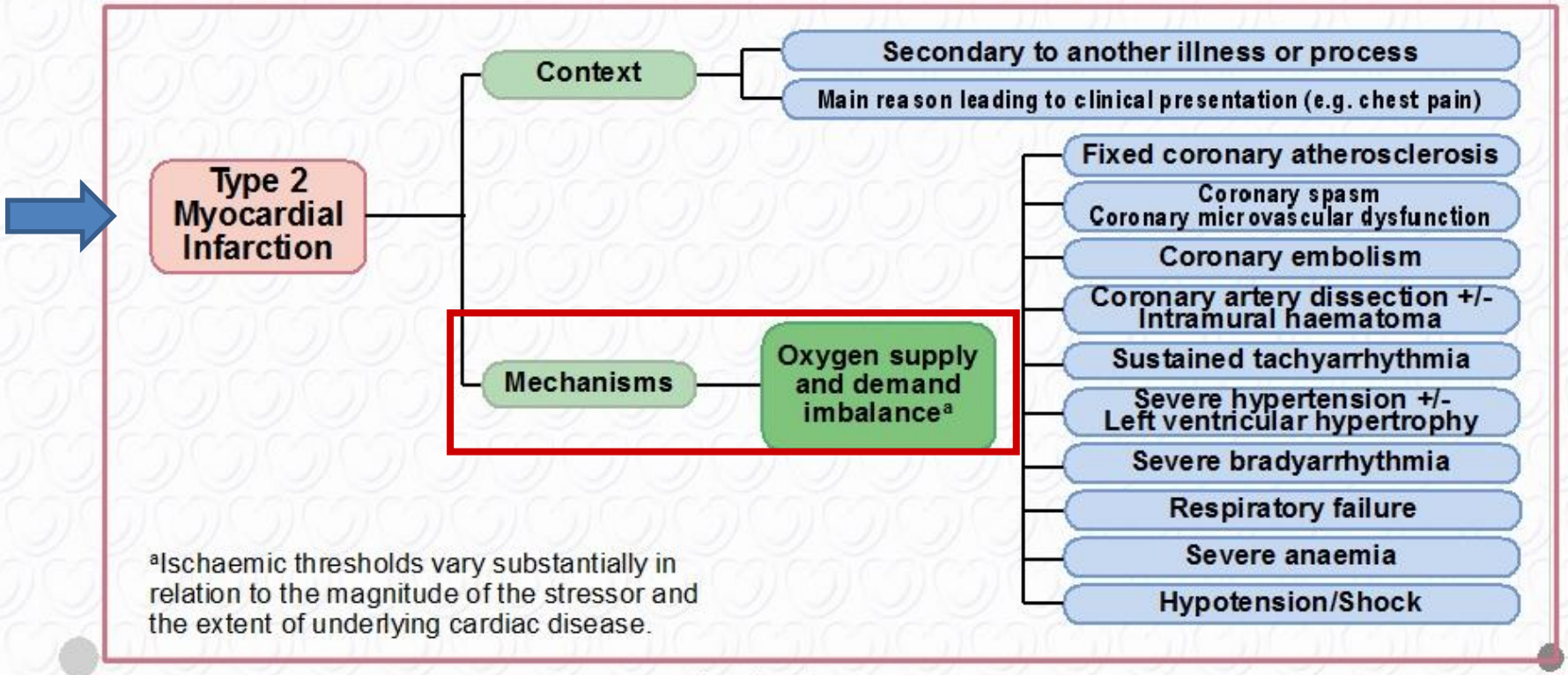
Fourth Joint ESC/ACC/AHA/WHF Universal Definition of Myocardial Infarction
European Heart Journal 2019; 40: 237-269 - doi:10.1093/eurheartj/ehy462

SAPIENZA UNIVERSITÀ DI ROMA

GREAT global research on acute conditions team

Framework for Type 2 MI considering Context and Mechanisms attributable to Acute Myocardial Ischaemia

ESC European Society of Cardiology



www.escardio.org/guidelines

Fourth Joint ESC/ACC/AHA/WHF Universal Definition of Myocardial Infarction
European Heart Journal 2019; 40: 237-269 - doi:10.1093/eurheartj/ehy462

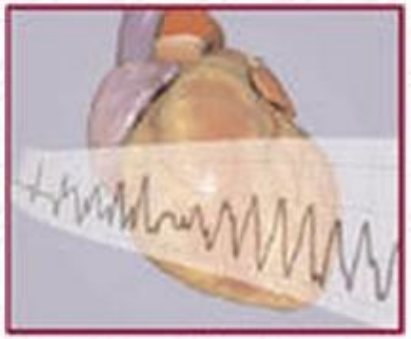
SAPIENZA UNIVERSITÀ DI ROMA

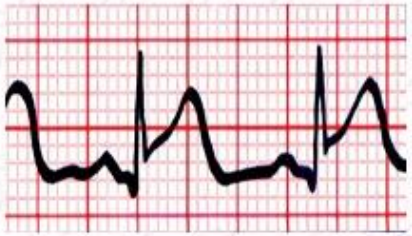
GREAT global research on acute conditions team

Criteria for Type 3 Myocardial Infarction

ESC European Society of Cardiology

Patients who suffer cardiac death, with symptoms suggestive of myocardial ischaemia accompanied by presumed new ischaemic ECG changes or ventricular fibrillation, but die before blood samples for biomarkers can be obtained, or before increases in cardiac biomarkers can be identified or myocardial infarction detected by autopsy examination.





www.escardio.org/guidelines

Fourth Joint ESC/ACC/AHA/WHF Universal Definition of Myocardial Infarction
European Heart Journal 2019; 40: 237-269 - doi:10.1093/eurheartj/ehy462

SAPIENZA UNIVERSITÀ DI ROMA

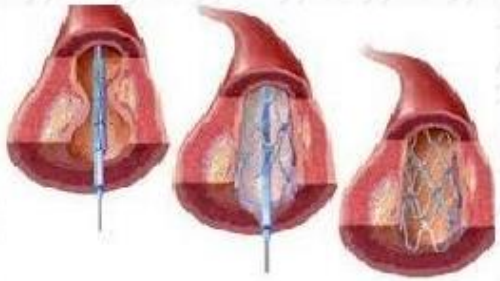
GREAT global research on acute conditions team

Myocardial Infarction Type 4a

ESC
European Society of Cardiology

PCI-related MI ≤48 h after the index procedure is defined by elevation of cardiac troponin values >5 times 99th percentile URL. In addition, either

- New ischaemic ECG changes or
- Imaging demonstration of new loss of viable myocardium or new regional wall motion abnormality consistent with an ischaemic aetiology
- Angiographic findings consistent with a procedural flow-limiting complication such as coronary dissection, occlusion of a major epicardial artery or a side-branch occlusion/ thrombus, disruption of collateral flow or distal embolization



Isolated development of new Q waves meets the criteria if cTn values are elevated and rising but less than the pre-specified thresholds for PCI

If cTn values are not >5 X 99th percentile URL, then the term myocardial injury should be used

www.escardio.org/guidelines

Fourth Joint ESC/ACC/AHA/WHF Universal Definition of Myocardial Infarction
European Heart Journal 2019; 40: 237-269 - doi:10.1093/eurheartj/ehy462

SAPIENZA UNIVERSITÀ DI ROMA

GREAT global research on acute conditions team

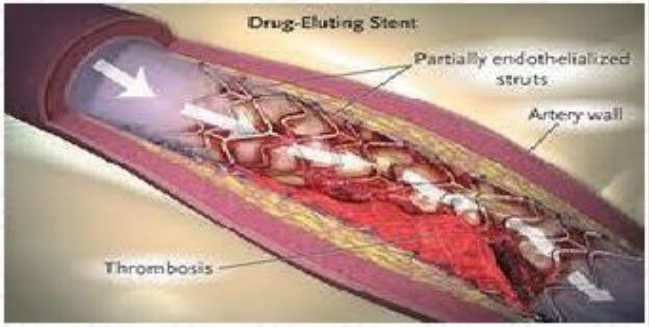
Myocardial Infarction Type 4b

ESC European Society of Cardiology

Myocardial infarction related to stent-thrombosis is detected by coronary angiography or autopsy in the setting of myocardial ischaemia and with a rise and/or fall of cardiac troponin values with at least one value >99th percentile URL.

The following temporal categories are suggested:

- **Acute, 0–24 h**
- **Subacute, > 24 h to 30 days**
- **Late, > 30 days to 1 year**
- **Very late > 1 year**



www.escardio.org/guidelines

Fourth Joint ESC/ACC/AHA/WHF Universal Definition of Myocardial Infarction
European Heart Journal 2019; 40: 237-269 - doi:10.1093/eurheartj/ehy462

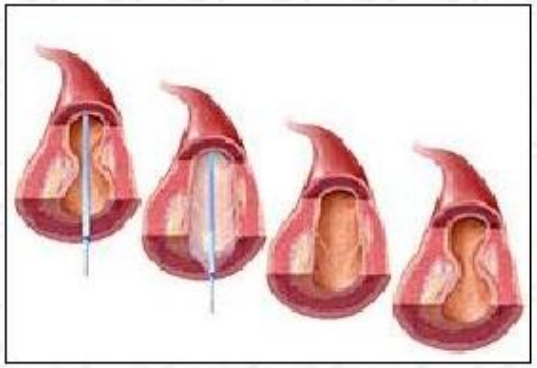
SAPIENZA UNIVERSITÀ DI ROMA

GREAT global research on acute conditions team

Myocardial Infarction Type 4c

ESC European Society of Cardiology

Myocardial infarction related to in-stent restenosis, or restenosis following balloon angioplasty in the infarct territory is detected by coronary angiography in the setting of myocardial ischaemia and with a rise and/or fall of cardiac troponin values with at least one value >99th percentile URL



www.escardio.org/guidelines

Fourth Universal Definition of Myocardial Infarction
European Heart Journal 2019; 40: 226 - https://doi.org/10.1093/eurheartj/ehy856

SAPIENZA UNIVERSITÀ DI ROMA

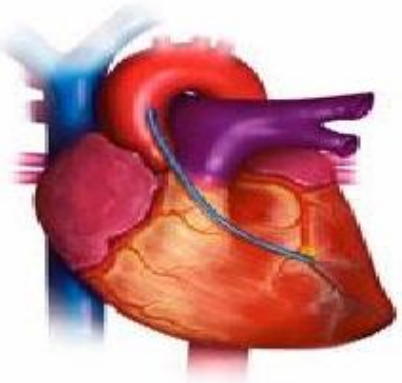
GREAT global research on acute conditions team

Myocardial Infarction Type 5

ESC
European Society of Cardiology

CABG-related MI ≤48 h after the index procedure is defined by elevation of cardiac troponin values >10 times 99th percentile URL. In addition, either

- **new pathological Q waves or**
- **angiographic documented new graft or new native coronary artery occlusion, or**
- **imaging evidence of new loss of viable myocardium or new regional wall motion abnormality and in a pattern consistent with an ischaemic aetiology.**



Isolated development of new Q waves meets the criteria if cTn values are elevated and rising but less than the pre-specified thresholds for CABG

If cTn values are not >10 X 99th percentile URL, then the term myocardial injury should be used

www.escardio.org/guidelines

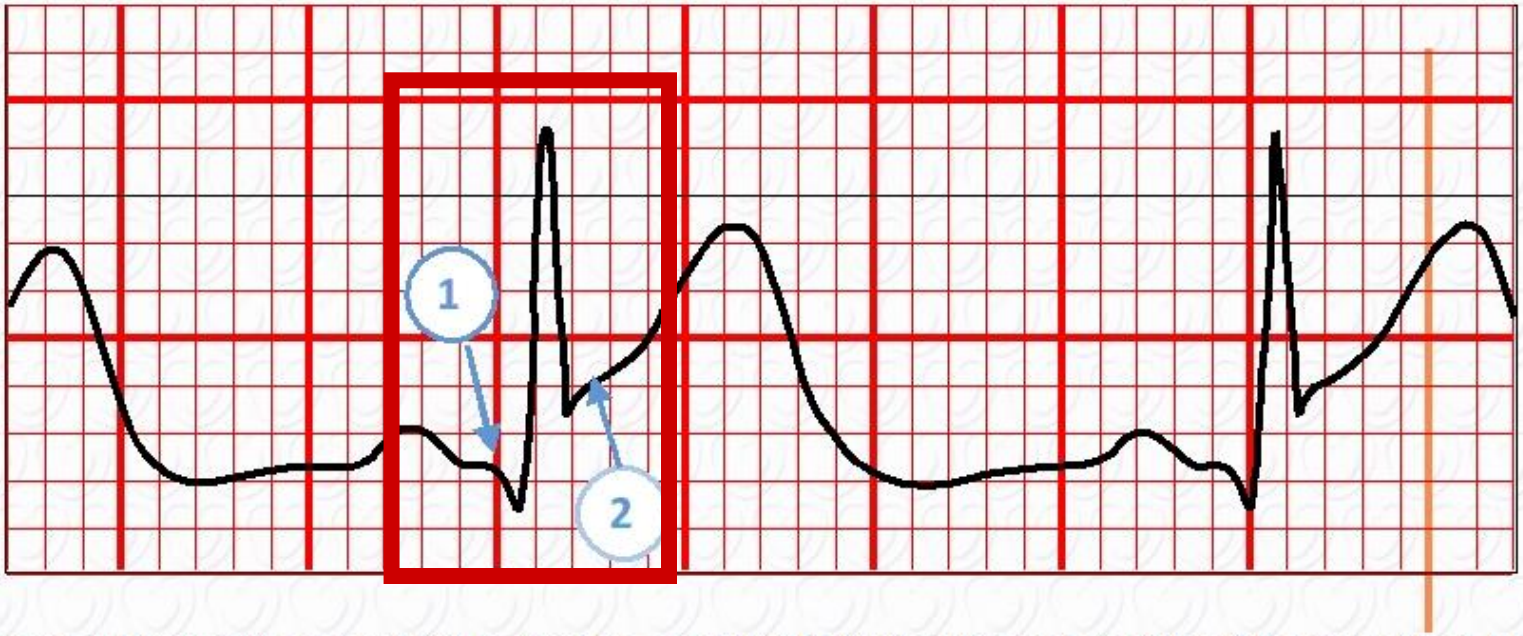
Fourth Joint ESC/ACC/AHA/WHF Universal Definition of Myocardial Infarction
European Heart Journal 2019; 40: 237-269 - doi:10.1093/eurheartj/ehy462

SAPIENZA UNIVERSITÀ DI ROMA

GREAT global research on acute conditions team

How to assess ST-segment elevation

ESC
European Society of Cardiology



Arrow 1 indicates the onset of the Q wave. Arrow 2 Indicates the onset of the ST-segment or J-point. The difference between points 1 and 2 denotes the magnitude of the ST-segment elevation

www.escardio.org/guidelines

Fourth Joint ESC/ACC/AHA/WHF Universal Definition of Myocardial Infarction
European Heart Journal 2019; 40: 237-269 - doi:10.1093/eurheartj/ehy462

SAPIENZA
UNIVERSITÀ DI ROMA

GREAT
global research on acute conditions team

Electrocardiographic Changes* suggestive of Acute Myocardial Ischaemia

ESC European Society of Cardiology

ST-elevation
New ST-elevation at the J-point in two contiguous leads with the cut points: ≥1 mm in all leads other than leads V_2–V_3 where the following cut points apply: ≥2mm in men ≥40 years; ≥2.5 mm in men <40 years, or ≥1.5 mm in women regardless of age.
ST-depression and T wave changes
New horizontal or down-sloping ST-depression ≥0.5 mm in two contiguous leads and/or T inversion >1 mm in two contiguous leads with prominent R wave or R/S ratio >1.

*in absence of left ventricular hypertrophy and bundle branch block

www.escardio.org/guidelines

Fourth Joint ESC/ACC/AHA/WHF Universal Definition of Myocardial Infarction
European Heart Journal 2019; 40: 237-269 - doi:10.1093/eurheartj/ehy462

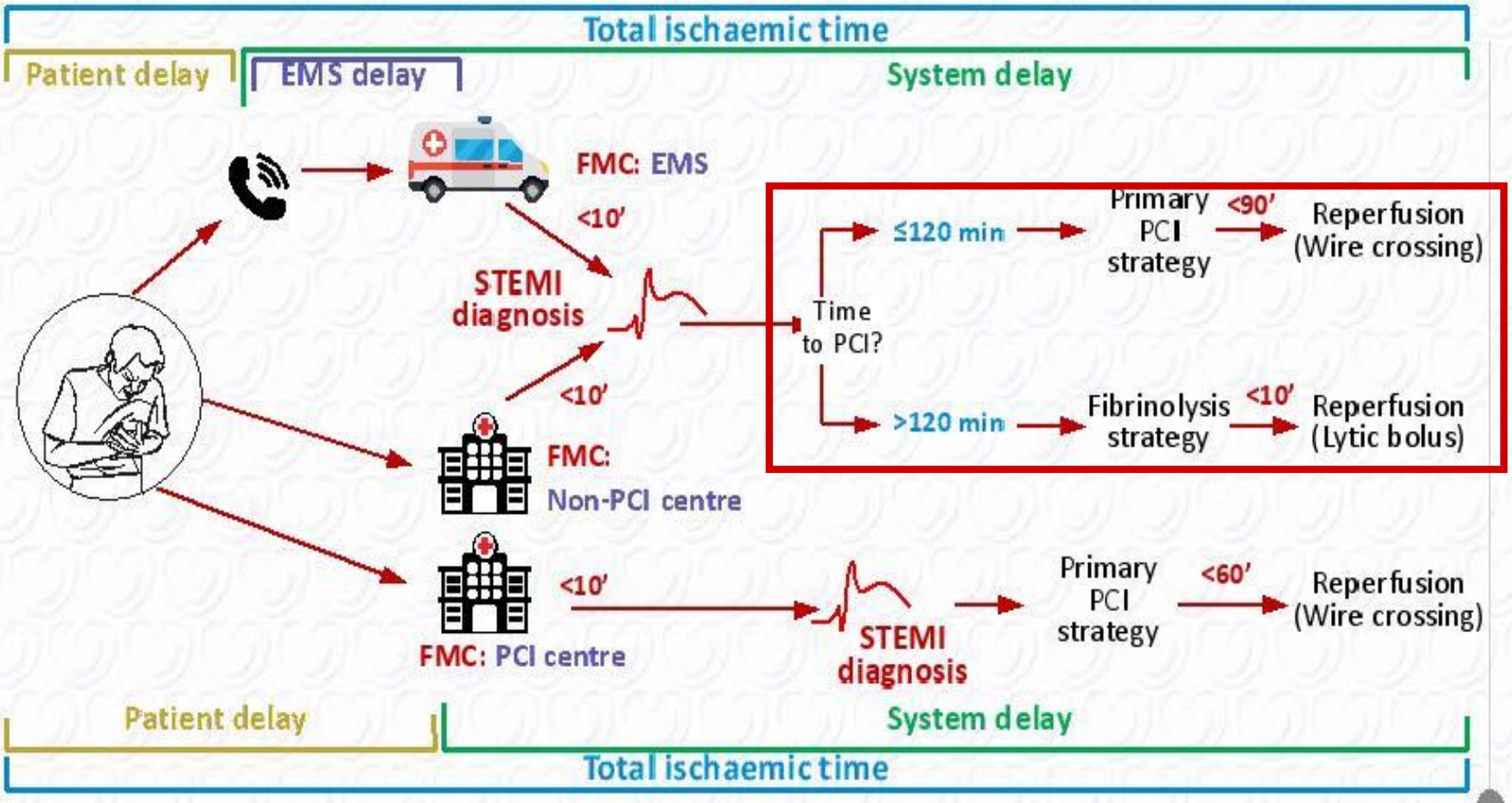
SAPIENZA UNIVERSITÀ DI ROMA

GREAT global research on acute conditions team

STEMI MANAGEMENT

Modes of patient presentation, components of ischaemic time and flowchart for reperfusion strategy selection

ESC European Society of Cardiology



www.escardio.org/guidelines 2017 ESC Guidelines for the Management of AMI-STEMI (European Heart Journal 2017 - doi:10.1093/eurheartj/ehx095)

SAPIENZA UNIVERSITÀ DI ROMA

GREAT global research on acute conditions team

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation

www.escardio.org/guidelines

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)

What is new? New key recommendations (1)

ESC
European Society of Cardiology

Diagnosis

As an alternative to the ESC 0 h/1 h algorithm, it is recommended to use the ESC 0 h/2 h algorithm with blood sampling at 0 h and 2 h, if an hs-cTn test with a validated 0 h/2 h algorithm is available.

For diagnostic purposes, it is not recommended to routinely measure additional biomarkers such as CK, CK-MB, h-FABP, or copeptin, in addition to hs-cTn.

Risk stratification

Measuring BNP or NT-proBNP plasma concentrations should be considered to gain prognostic information.

Antithrombotic treatment

Prasugrel should be considered in preference to ticagrelor for NSTE-ACS patients who proceed to PCI.

www.escardio.org/guidelines

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)

SAPIENZA UNIVERSITÀ DI ROMA

GREAT global research on acute conditions team

What is new? New key recommendations (3)

ESC
European Society of Cardiology

Antithrombotic treatment (continued)
In patients with AF (CHA_2DS_2-VASc score ≥1 in men and ≥2 in women), after a short period of TAT (up to 1 week from the acute event), DAT is recommended as the default strategy using a NOAC at the recommended dose for stroke prevention and single oral antiplatelet agent (preferably clopidogrel).
Discontinuation of antiplatelet treatment in patients treated with OACs is recommended after 12 months.
DAT with an OAC and either ticagrelor or prasugrel may be considered as an alternative to TAT with an OAC, aspirin, and clopidogrel in patients with a moderate or high risk of stent thrombosis, irrespective of the type of stent used.

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)

What is new? New key recommendations (4)

ESC European Society of Cardiology

Invasive treatment
An early invasive strategy within 24 h is recommended in patients with any of the following high-risk criteria: • Diagnosis of NSTEMI • Dynamic or presumably new contiguous ST/T-segment changes suggesting ongoing ischaemia • Transient ST-segment elevation • GRACE risk score >140.
A selective invasive strategy after appropriate ischaemia testing or detection of obstructive coronary artery disease by CCTA is recommended in patients considered at low risk.

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)

What is new? Major changes in recommendations (3)

ESC European Society of Cardiology

2015	2020
Risk assessment	
It is recommended to use established risk scores for prognosis estimation.	GRACE risk score models should be considered for estimating prognosis.
Pharmacological treatments	
Bivalirudin (0.75 mg/kg i.v. bolus, followed by 1.75 mg/kg/h for up to 4 h after the procedure) is recommended as an alternative to UFH plus GP IIb/IIIa inhibitors during PCI.	Bivalirudin may be considered as an alternative to UFH.

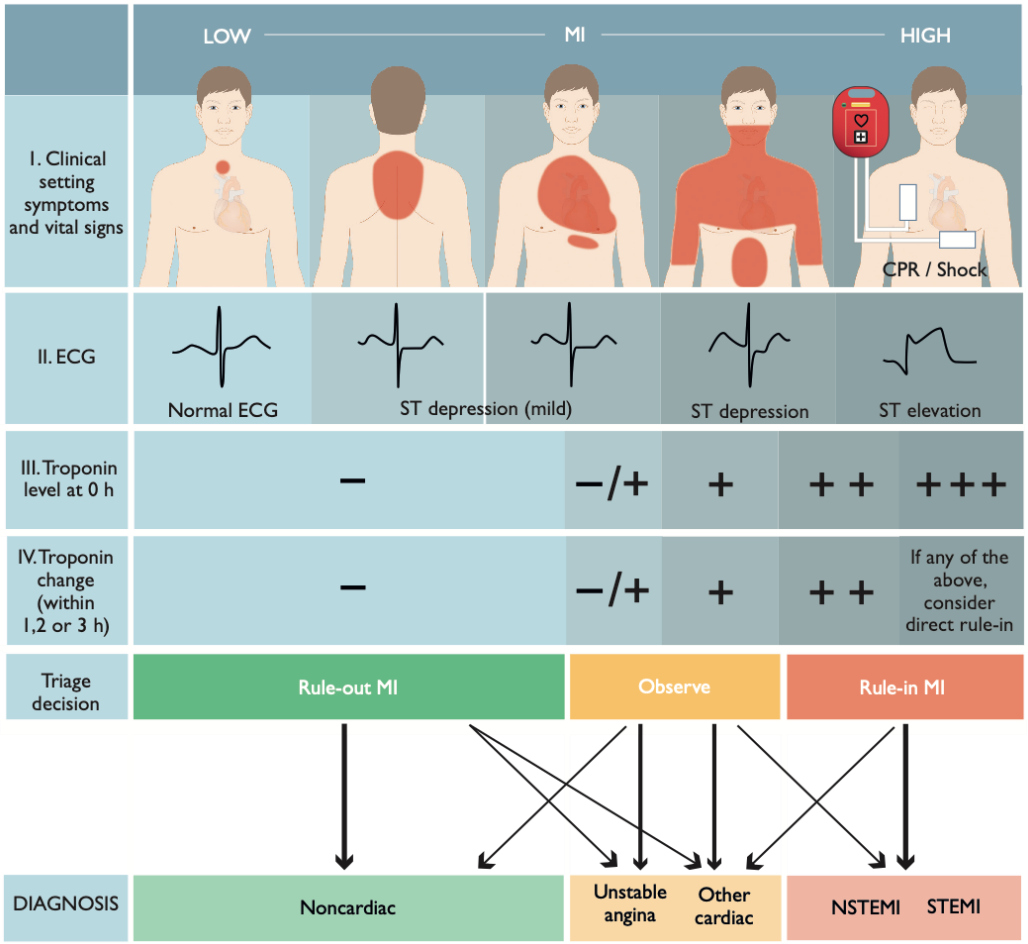
2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)

What is new? New key recommendations (5)

ESC European Society of Cardiology

Invasive treatment (continued)
Delayed, as opposed to immediate, angiography should be considered in haemodynamically stable patients without ST-segment elevation successfully resuscitated after an out-of-hospital cardiac arrest.
Complete revascularization should be considered in NSTE-ACS patients without cardiogenic shock and with multivessel CAD.
Complete revascularization during index PCI may be considered in NSTE-ACS patients with multivessel disease.
FFR-guided revascularization of non-culprit NSTE-ACS lesions may be used during index PCI.

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)



ESC
European Society of Cardiology

Figure 1

Diagnostic algorithm and triage in acute coronary syndrome.

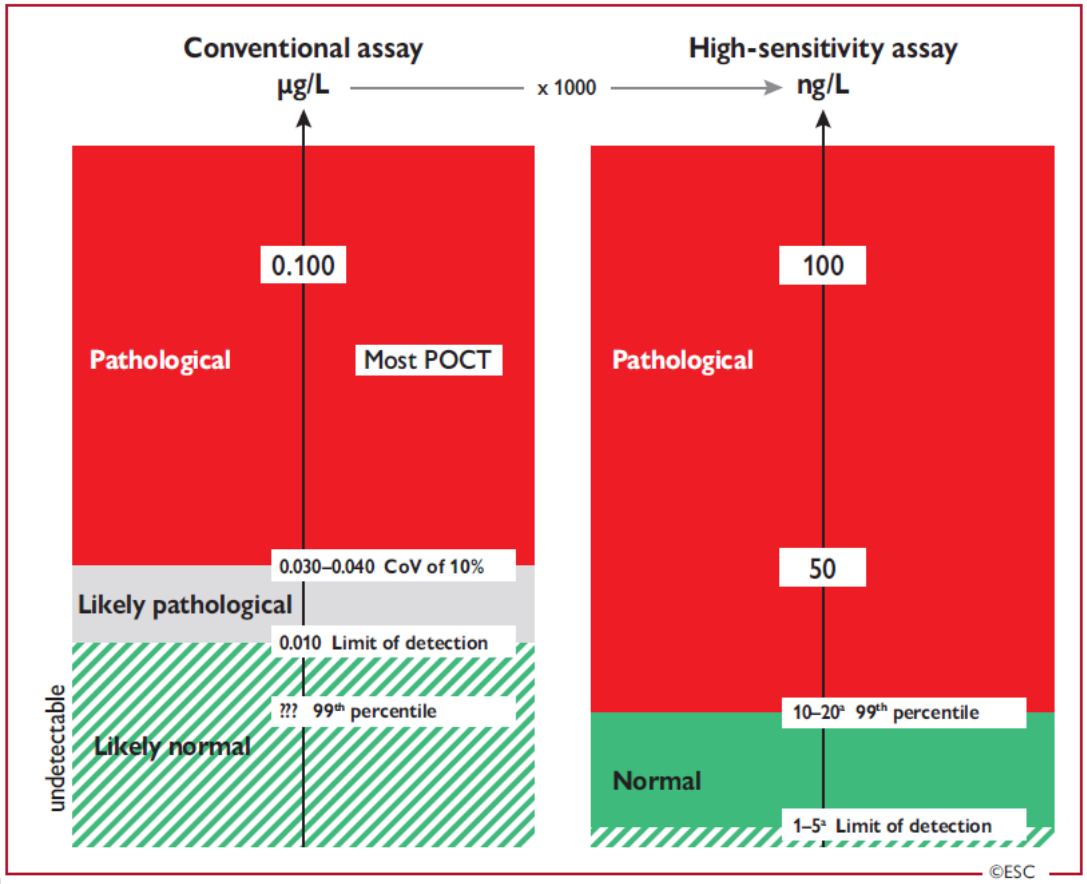
www.escardio.org/guidelines

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)

SAPIENZA
UNIVERSITÀ DI ROMA

GREAT
global research on acute conditions team

Figure 2 Value of high-sensitivity cardiac troponin.



hs-cTn assays (right) are reported in ng/L and provide identical information as conventional assays (left, reported in µg/L) if the concentration is substantially elevated, e.g. above 100 ng/L. In contrast, only hs-cTn allows a precise differentiation between 'normal' and mildly elevated. Therefore, hs-cTn detects a relevant proportion of patients with previously undetectable cardiac troponin concentrations with the conventional assay who have hs-cTn concentrations above the 99th percentile possibly related to AMI.
??? = unknown due to the inability of the assay to measure in the normal range

[a]The limit of detection varies among the different hs-cTn assays between 1 ng/L and 5 ng/L. Similarly, the 99th percentile varies among the different hs-cTn assays, mainly being between 10 ng/L and 20 ng/L.

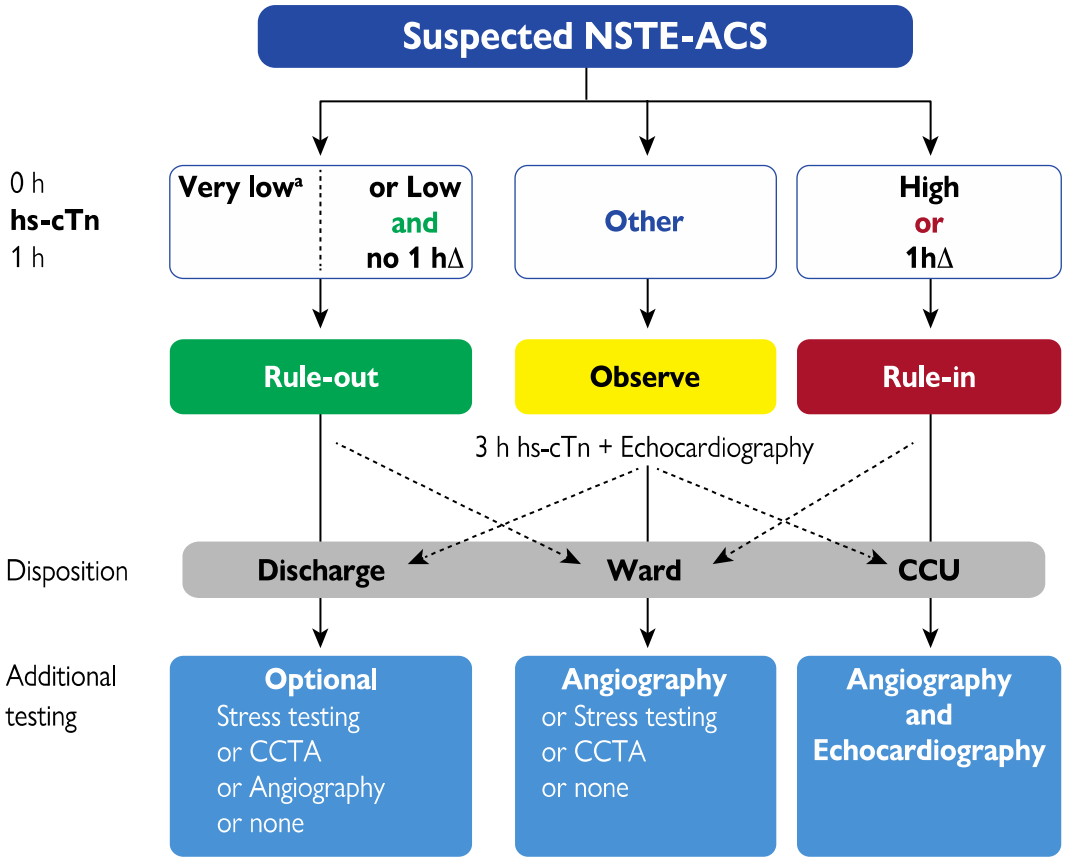
www.escardio.org/guidelines

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)

Table 1 Clinical implications of high-sensitivity cardiac troponin assays (1)

Compared with standard cardiac troponin assays, hs-cTn assays:
• Have higher NPV for AMI.
• Reduce the 'troponin-blind' interval leading to earlier detection of AMI.
• Result in ~4% absolute and ~20% relative increases in the detection of type 1 MI and a corresponding decrease in the diagnosis of unstable angina.
• Are associated with a 2-fold increase in the detection of type 2 MI.

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)



ESC
European Society
of Cardiology

Figure 3 (1)

0 h/1 h rule-out and rule-in algorithm using high-sensitivity cardiac troponin assays in haemodynamically stable patients presenting with suspected non-ST-segment elevation acute coronary syndrome to the emergency department.

[a]Only applicable if CPO >3 h.

www.escardio.org/guidelines

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)

SAPIENZA
UNIVERSITÀ DI ROMA

GREAT
global research on acute conditions team

Table 3 Assay specific cut-off levels in ng/l within the 0 h/1 h and 0 h/2 h algorithms (1)

0 h/1 h algorithm	Very low	Low	No 1h Δ	High	1h Δ
hs-cTn T (Elecsys; Roche)	<5	<12	<3	≥52	≥5
hs-cTn I (Architect; Abbott)	<4	<5	<2	≥64	≥6
hs-cTn I (Centaur; Siemens)	<3	<6	<3	≥120	≥12
hs-cTn I (Access; Beckman Coulter)	<4	<5	<4	≥50	≥15
hs-cTn I (Clarity; Singulex)	<1	<2	<1	≥30	≥6
hs-cTn I (Vitros; Clinical Diagnostics)	<1	<2	<1	≥40	≥4
hs-cTn I (Pathfast; LSI Medience)	<3	<4	<3	≥90	≥20
hs-cTn I (TriageTrue; Quidel)	<4	<5	<3	≥60	≥8

These cut-offs apply irrespective of age and renal function. Optimized cut-offs for patients above 75 years of age and patients with renal dysfunction have been evaluated, but not consistently shown to provide better balance between safety and efficacy as compared to these universal cut-offs. The algorithms for additional assays are in development.
hs-cTn = high-sensitivity cardiac troponin; TBD = to be determined.

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)

Table 3 Assay specific cut-off levels in ng/l within the 0 h/1 h and 0 h/2 h algorithms (2)

0 h/2 h algorithm	Very low	Low	No 2h Δ	High	2h Δ
hs-cTn T (Elecsys; Roche)	<5	<14	<4	≥52	≥10
hs-cTn I (Architect; Abbott)	<4	<6	<2	≥64	≥15
hs-cTn I (Centaur; Siemens)	<3	<8	<7	≥120	≥20
hs-cTn I (Access; Beckman Coulter)	<4	<5	<5	≥50	≥20
hs-cTn I (Clarity; Singulex)	<1	Tbd	Tbd	≥30	Tbd
hs-cTn I (Vitros; Clinical Diagnostics)	<1	Tbd	Tbd	≥40	Tbd
hs-cTn I (Pathfast; LSI Medience)	<3	Tbd	Tbd	≥90	Tbd
hs-cTn I (TriageTrue; Quidel)	<4	Tbd	Tbd	≥60	Tbd

These cut-offs apply irrespective of age and renal function. Optimized cut-offs for patients above 75 years of age and patients with renal dysfunction have been evaluated, but not consistently shown to provide better balance between safety and efficacy as compared to these universal cut-offs. The algorithms for additional assays are in development.
hs-cTn = high-sensitivity cardiac troponin; TBD = to be determined.

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)

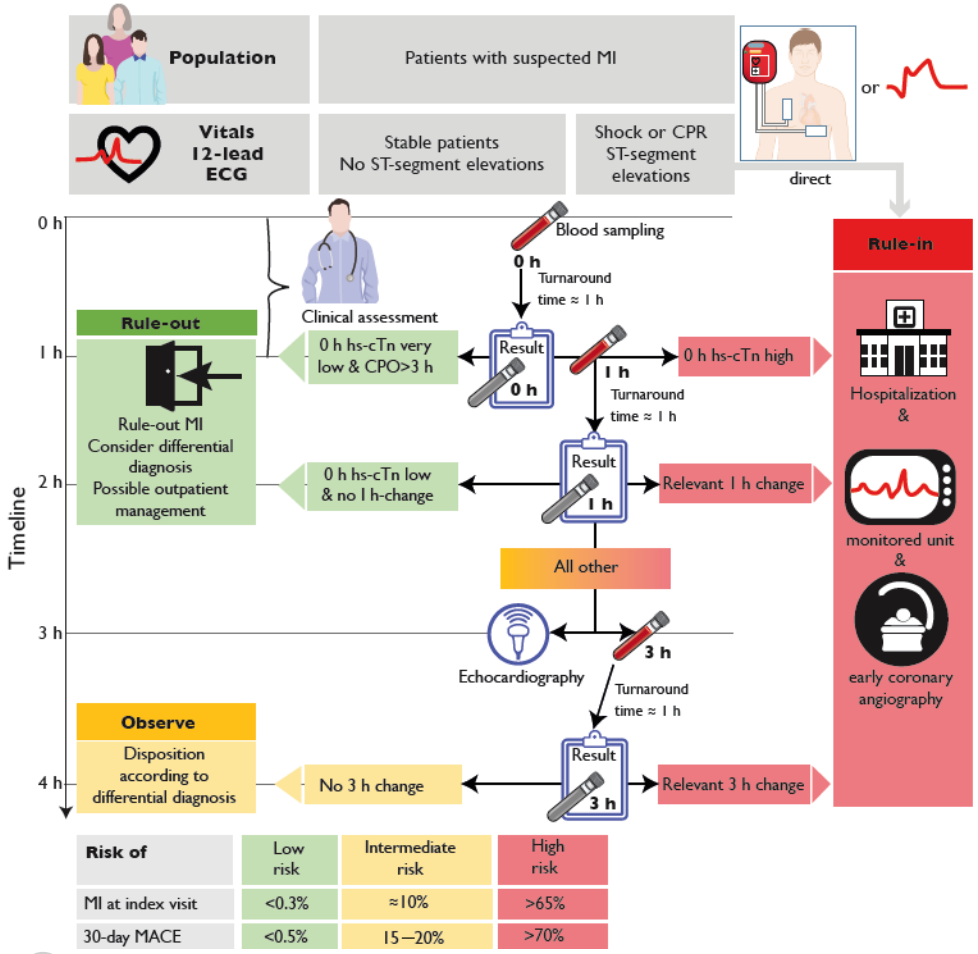


Figure 4 (1) **Timing of the blood draws and clinical decisions when using the European Society of Cardiology 0 h/1 h algorithm.**

www.escardio.org/guidelines

2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation (European Heart Journal 2020 - doi/10.1093/eurheartj/ehaa575)

COVID-19 Pandemic Leads to Decrease in Emergency Department Wait Times

Public health and medical officials have been trying to reduce wait times in emergency departments (EDs) for years. Surprisingly, the coronavirus disease 2019 (COVID-19) pandemic seems to have done just that.

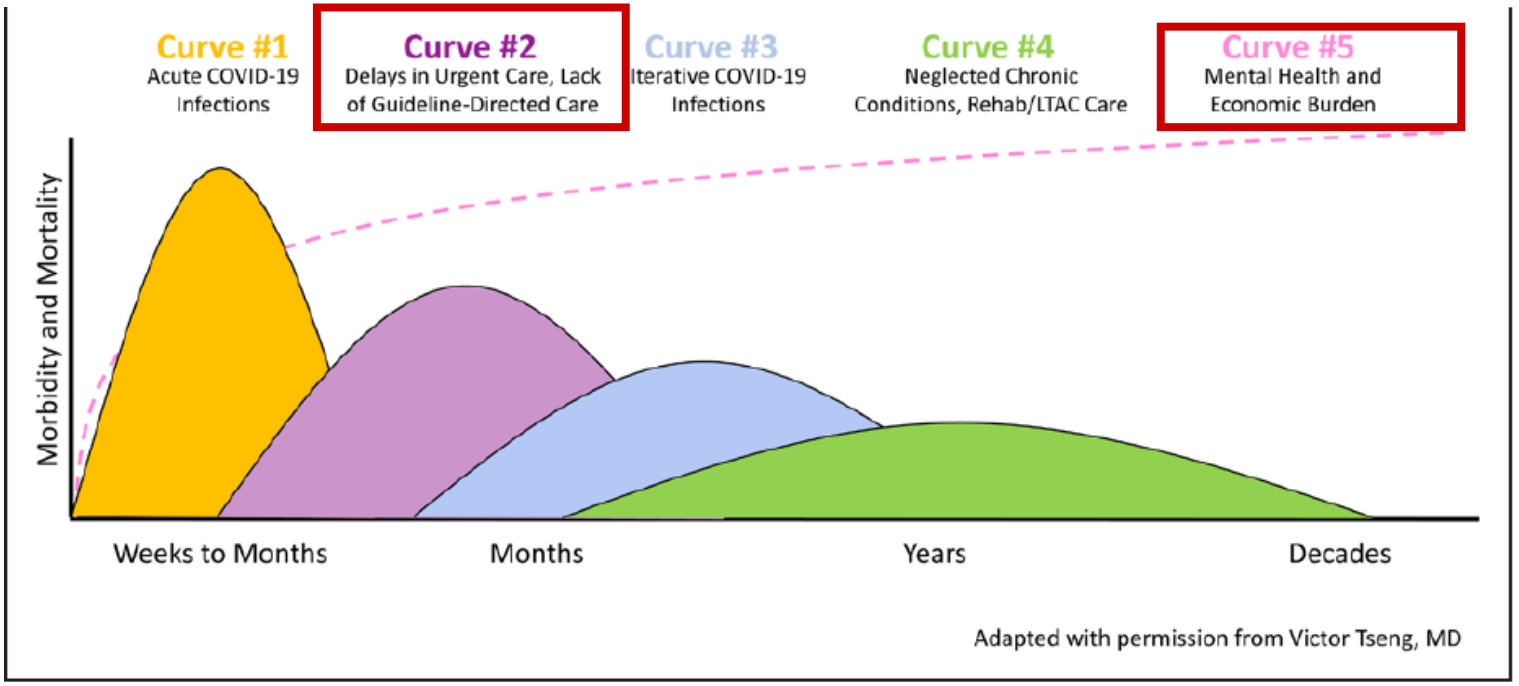
During the month of April 2020 , **ED visits across the country declined** a staggering 42% from the same time in 2019

Unfortunately, ED visits **for actual medical emergencies are declining as well**. Independent of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections, emergency calls for cardiac arrests increased dramatically in March and many patients were declared dead at the scene.

JAMA Forum COVID-19 ***September 17, 2020***

ON MY MIND

Surfing the Waves of the COVID-19 Pandemic as a Cardiovascular Clinician



Circulation. 2020;142:98–100. DOI: 10.1161/CIRCULATIONAHA.120.047901

Thank you From Rome Emergency Medicine Research Group

SAPIENZA
UNIVERSITÀ DI ROMA

GREAT
global research on acute conditions team