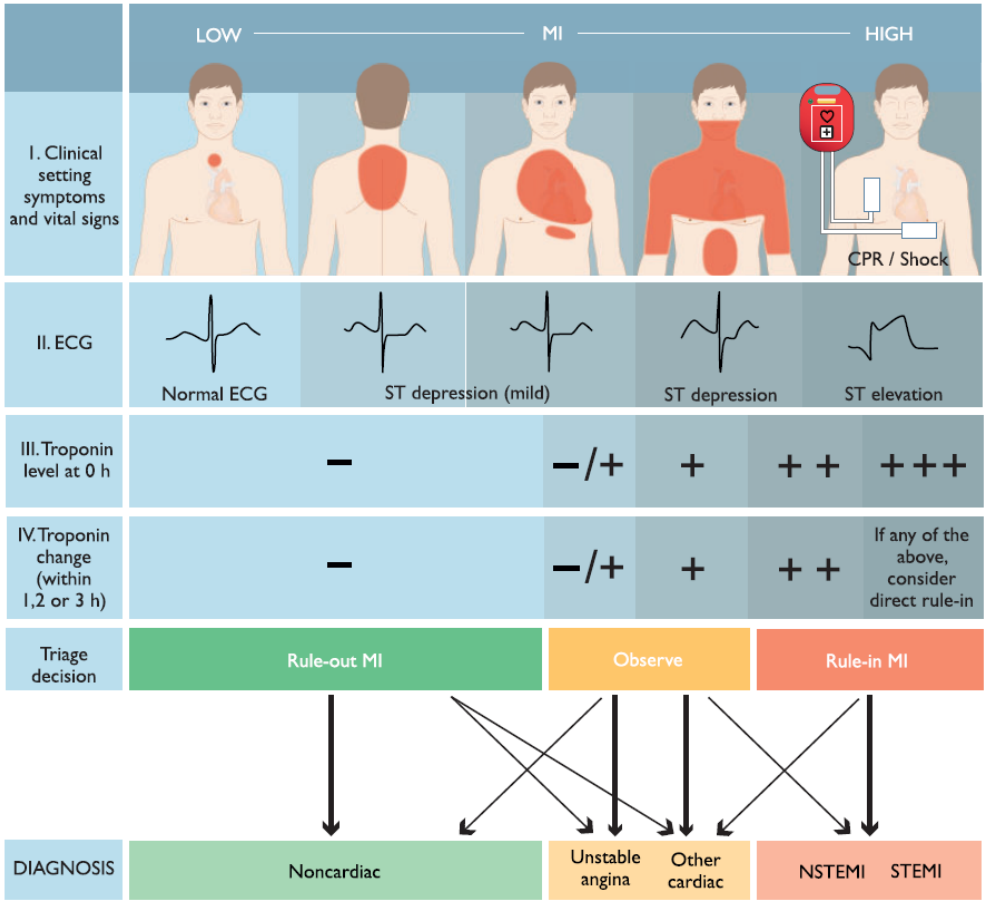
In-hospital management of patients with acute coronary syndrome presenting without ST-segment elevation (NSTEACS)

Aim: assisting health professionals in proposing the best management strategies for an individual patient with a given condition. This protocol should facilitate decision making of health professionals in their daily practice. This local protocol is based on the current guidelines of the European Society of Cardiology released in 2020.

Diagnosis of NSTEACS:

1. **ECG**
    - The resting 12-lead ECG is the first-line diagnostic tool in the assessment of patients with suspected ACS.
    - It is recommended to perform it within 10 min of the patient's arrival in the emergency room or, ideally, at first contact with the emergency medical services in the pre-hospital setting and to have it immediately interpreted by a qualified physician. While the ECG in the setting of NSTE-ACS may be normal in more than 30% of patients, characteristic abnormalities include ST-segment depression, transient ST-segment elevation, and T-wave changes.



2. **Biomarkers**
    - Measurement of a biomarker of cardiomyocyte injury, preferably hs-cTn, is mandatory in all patients with suspected NSTEACS.
    - Cardiac troponins are more sensitive and specific markers of cardiomyocyte injury than creatine kinase (CK), its myocardial band isoenzyme (CK-MB), and myoglobin.
    - Elevations of hs-cTn beyond 5-fold the upper reference limit have high (>90%) PPV for acute type 1 MI.
    - Elevations up to 3-fold the upper reference limit have only limited (50_60%) PPV for AMI and may be associated with a broad spectrum of conditions biomarker results should be considered in tight association with ECG and clinical findings.
    - There are several conditions, where elevated hs-cTn may not be consequence of a Type 1 MI:
        i. Tachyarrhythmias
        ii. Heart failure
        iii. Hypertensive emergencies
        iv. Critical illness (e.g. shock/sepsis/burns)
        v. Myocarditisa
        vi. Takotsubo syndrome
        vii. Valvular heart disease (e.g. aortic stenosis)
        viii. Aortic dissection
        ix. Pulmonary embolism, pulmonary hypertension
        x. Renal dysfunction and associated cardiac disease
        xi. Acute neurological event (e.g. stroke or subarachnoid haemorrhage)
        xii. Cardiac contusion or cardiac procedures (CABG, PCI, ablation, pacing, cardioversion, or endomyocardial biopsy)
        xiii. Hypo- and hyperthyroidism
        xiv. Infiltrative diseases (e.g. amyloidosis, haemochromatosis, sarcoidosis, scleroderma)
        xv. Myocardial drug toxicity or poisoning (e.g. doxorubicin, 5-fluorouracil, herceptin, snake venoms)
        xvi. Extreme endurance efforts
        xvii. Rhabdomyolysis

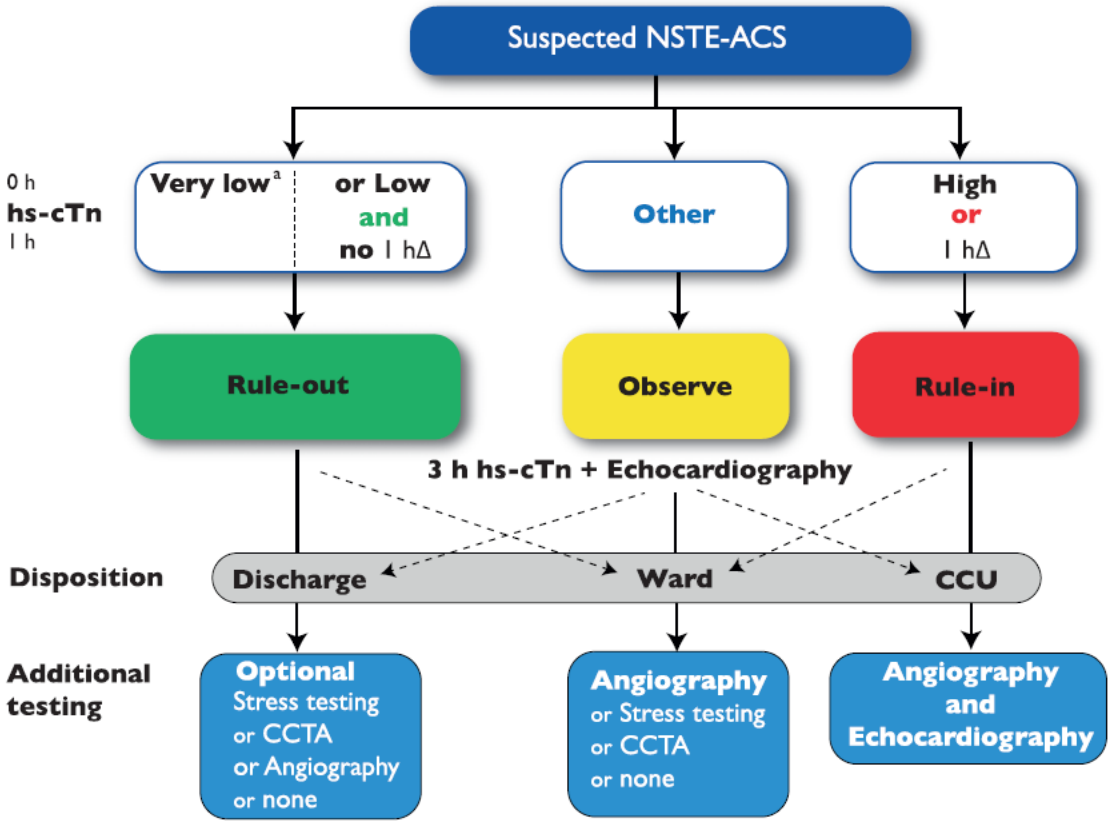
3. **Non-invasive imaging:**
    - echocardiography
        i. Transthoracic echocardiography should be routinely available in emergency rooms and chest pain units and performed/interpreted by trained physicians in all patients during hospitalization for NSTE-ACS.
        ii. This imaging modality is useful to identify abnormalities suggestive of myocardial ischaemia or necrosis (i.e. segmental hypokinesia or akinesia). In the absence of significant wall motion abnormalities, impaired myocardial perfusion detected by contrast echocardiography or reduced regional function using strain and strain rate imaging might improve the diagnostic and prognostic value of conventional echocardiography.
        iii. Echocardiography can help in detecting alternative pathologies associated with chest pain, such as acute aortic dissection, pericardial effusion, aortic valve stenosis, hypertrophic cardiomyopathy, mitral valve prolapse, or right ventricular dilatation suggestive of acute

pulmonary embolism. Echocardiography is the diagnostic tool of choice for patients with haemodynamic instability of suspected cardiac origin.

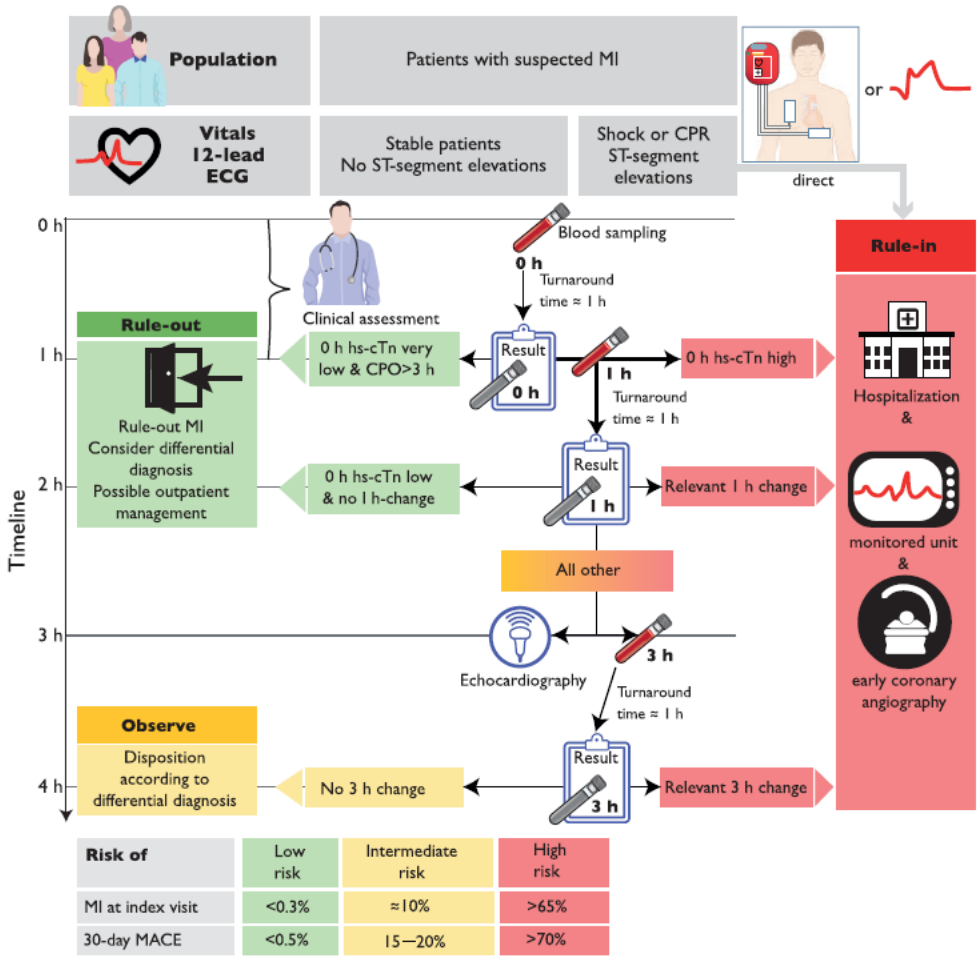
iv. Evaluation of left ventricular (LV) systolic function, at the latest by the time of hospital discharge, is important to estimate prognosis, and echocardiography (as well as other imaging modalities) can provide this information.

- coronary CT angio: CCTA allows visualization of the coronary arteries and a normal scan excludes CAD. CCTA has a high NPV to exclude ACS (by excluding CAD) and an excellent outcome in patients presenting to the emergency department with low-to-intermediate pre-test probability for ACS and a normal CCTA.

Summary of diagnostic algorythm:



Timing of decision making process in patients with suspected NSTEACS



Treatment of patients with NSTEACS:

1. **Pharmacological treatment:**
    a. Antithrombotic treatment:
        i. mandatory in NSTE-ACS patients with and without invasive management
        ii. the time point of initiation, and the treatment duration depend on various intrinsic and extrinsic (procedural) factors
        iii. both ischaemic and bleeding complications significantly influence the outcome of NSTE-ACS patients and their overall mortality risk
        iv. Dose regimen of antiplatelet and anticoagulant drugs in non-ST-segment elevation acute coronary syndrome patients:

I. Antiplatelet drugs	
Aspirin	LD of 150–300 mg orally or 75–250 mg i.v. if oral ingestion is not possible, followed by oral MD of 75–100 mg o.d.
$P2Y_{12}$ receptor inhibitors (oral or i.v.)	
Clopidogrel	LD of 300–600 mg orally, followed by a MD of 75 mg o.d., no specific dose adjustment in CKD patients.
Prasugrel	LD of 60 mg orally, followed by a MD of 10 mg o.d. In patients with body weight <60 kg, a MD of 5 mg o.d. is recommended. In patients aged ≥75 years, prasugrel should be used with caution, but a dose of 5 mg o.d. should be used if treatment is deemed necessary. No specific dose adjustment in CKD patients. Prior stroke is a contraindication for prasugrel.
Ticagrelor	LD of 180 mg orally, followed by a MD of 90 mg b.i.d., no specific dose adjustment in CKD patients.
Cangrelor	Bolus of 30 μg/kg i.v. followed by 4 μg/kg/min infusion for at least 2 h or the duration of the procedure (whichever is longer).
GP IIb/IIIa receptor inhibitors (i.v.)	
Abciximab	Bolus of 0.25 mg/kg i.v. and 0.125 μg/kg/min infusion (maximum 10 μg/min) for 12 h (drug is not supplied anymore).
Eptifibatide	Double bolus of 180 μg/kg i.v. (given at a 10-min interval) followed by an infusion of 2.0 μg/kg/min for up to18 h.
Tirofiban	Bolus of 25 μg/kg i.v. over 3 min, followed by an infusion of 0.15 μg/kg/min for up to 18 h.
II. Anticoagulant drugs (for use before and during PCI)	
UFH	70–100 U/kg i.v. bolus when no GP IIb/IIIa inhibitor is planned. 50–70 U/kg i.v. bolus with GP IIb/IIIa inhibitors.
Enoxaparin	0.5 mg/kg i.v. bolus.
Bivalirudin	0.75 mg/kg i.v. bolus followed by i.v. infusion of 1.75 mg/kg/h for up to 4 h after the procedure as clinically warranted.
Fondaparinux	2.5 mg/d subcutaneously (only before PCI).
III. Oral anticoagulant drugs[b]	
Rivaroxaban	Very low MD of 2.5 mg b.i.d. (in combination with aspirin) for long-term extended antithrombotic treatment in a secondary prevention setting of CAD patients.

v. Aspirin is recommended for all patients without contraindications at an initial oral LD of 150_300 mg (or 75_250 mg i.v.), and at a MD of 75_100 mg o.d. for long-term treatment.

vi. A P2Y12 receptor inhibitor is recommended in addition to aspirin, and maintained over 12 months unless there are contraindications or an excessive risk of bleeding

1. Prasugrel in P2Y12 receptor inhibitor-naıve patients proceeding to PCI (60 mg LD, 10 mg/d as standard dose, 5 mg/d for patients aged >_75 years or with a body weight <60 kg)
2. Ticagrelor irrespective of the planned treatment strategy (invasive or conservative) (180 mg LD, 90 mg b.i.d.).
3. Clopidogrel (300_600 mg LD, 75 mg daily dose), only when prasugrel or ticagrelor are not available, cannot be tolerated, or are contraindicated.

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

viii. peri-interventional anticoagulant treatment:

1. Parenteral anticoagulation is recommended for all patients, in addition to antiplatelet treatment, at the time of diagnosis and, especially, during revascularization procedures according to both ischaemic and bleeding risks
2. UFH (weight-adjusted i.v. bolus during PCI of 70_100 IU/kg, or 50_70 IU/kg in combination with a GP IIb/IIIa inhibitor; activated clotting time target range of 250_350 s, or 200_250 s if a GP IIb/IIIa inhibitor is given) is recommended in patients undergoing PCI.
3. Crossover of UFH and LMWH is not recommended.

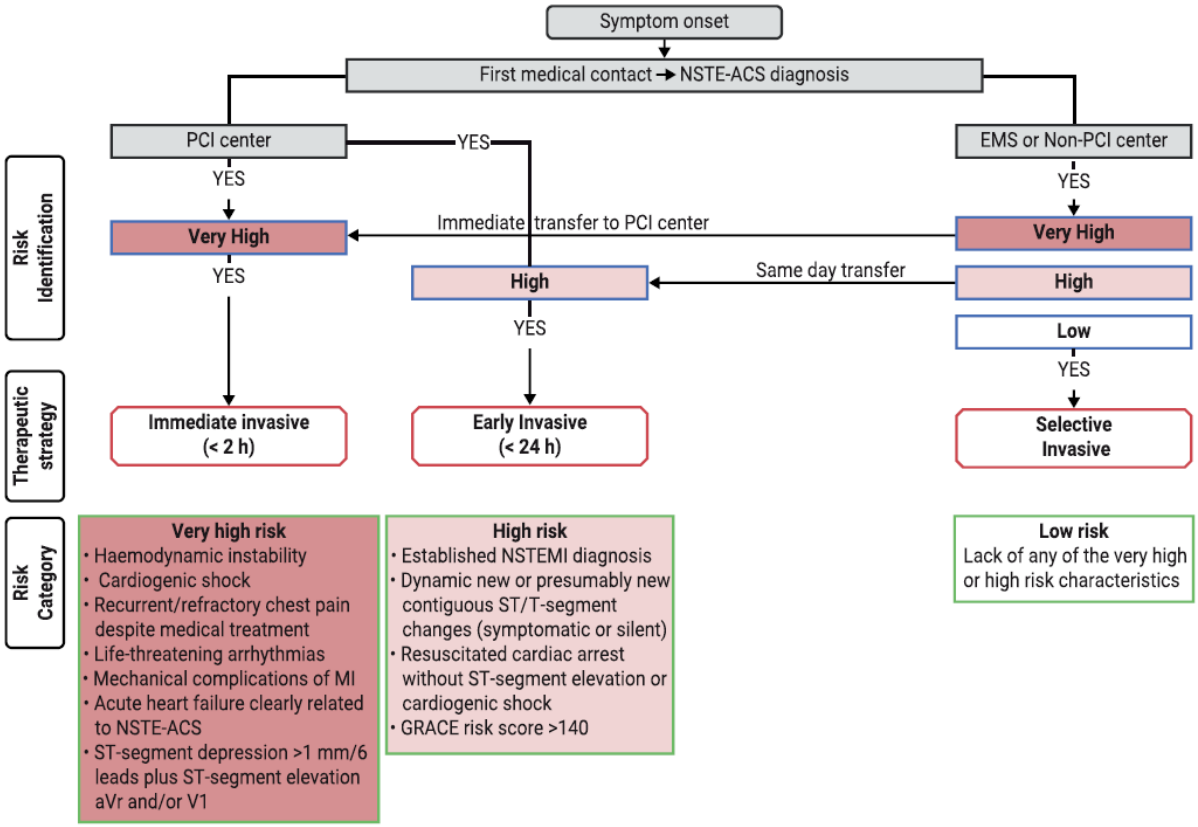
ix.

2. Invasive therapy

a. General considerations:

i. Does not reduce all-cause mortality risk in the overall population of NSTE-ACS patients
ii. Increases the risk of periprocedural complications such as periprocedural MI and bleeding.
iii. Reduces the risk of composite ischaemic endpoints, particularly in high-risk patients
iv. advanced age, female sex, chronic kidney disease (CKD), diabetes mellitus, prior heart failure/revascularization, history of cancer, and frailty are the major reported reasons accounting for withholding diagnostic ICA

b. Timing of invasive treatment



c. recommendation for coronary revascularisation
i. An immediate invasive strategy (<2 h) is recommended in patients with at least one of the following very high-risk criteria:
1. Haemodynamic instability or CS.
2. Recurrent or refractory chest pain despite medical treatment.
3. Life-threatening arrhythmias.
4. Mechanical complications of MI.
5. Heart failure clearly related to NSTE-ACS.
6. Presence of ST-segment depression >1 mm in >_6 leads additional to ST-segment elevation in aVR and/or V1.

ii. An early invasive strategy within 24 h is recommended in patients with any of the following high-risk criteria:
1. Diagnosis of NSTEMI suggested by the diagnostic algorithm recommended

2. Dynamic or presumably new contiguous ST/T-segment changes suggesting ongoing ischaemia.
3. Transient ST-segment elevation
4. GRACE risk score >140

iii. A selective invasive strategy after appropriate ischaemia testing or detection of obstructive CAD by CCTA is recommended in patients considered at low risk

3. Post-MI in-hospital patient care

a. monitoring and treated at a dedicated CCU (part of the Invasive Cardiology Unit)
b. search for cardiovascular risk factors (diabetes mellitus, hypertension, smoking) and start therapy
c. facilitate cardiac rehabilitation at our Cardic Rehabilitation Dept.
d. long-time lifestyle advices at discharge
e. involve every patient with NSTEACS in cardiology out-patient program (according tot he living place)

Source: Jean-Philippe Collet, Holger Thiele, Emanuele Barbato, Olivier Barthélémy, Johann Bauersachs, Deepak L Bhatt, Paul Dendale, Maria Dorobantu, Thor Edvardsen, Thierry Folliguet, Chris P Gale, Martine Gilard, Alexander Jobs, Peter Jüni, Ekaterini Lambrinou, Basil S Lewis, Julinda Mehilli, Emanuele Meliga, Béla Merkely, Christian Mueller, Marco Roffi, Frans H Rutten, Dirk Sibbing, George C M Siontis. **2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: The Task Force for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation of the European Society of Cardiology (ESC)**. European Heart Journal (2020). doi:10.1093/eurheartj/ehaa575