

# ISCHEMISK KRANSKÄRLSSJUKDOM

med fokus på akut koronärt syndrom

*Eva Velebová*

ISCHEMI = LOKAL SYREBRIST I VÄVNAD

ISCHEMISK HJÄRTSJUKDOM = BRIST PÅ  
TILLRÄCKLIG BLODTILLFÖRSEL TILL  
HJÄRTMUSKELN VIA HJÄRTATS KRANSKÄRL

*(MEDICINSK ORDBOK)*

**DEN VANLIGASTE ORSAKEN ÄR ATEROSKLEROS ( 97%)**

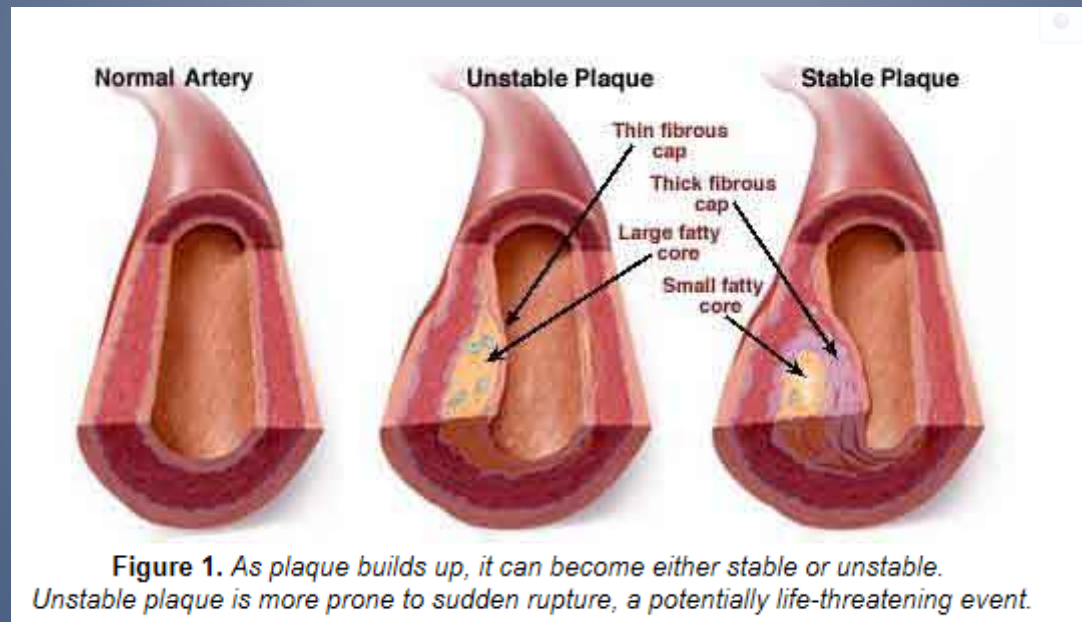
## ISCHEMISK HJÄRTSJUKDOM:

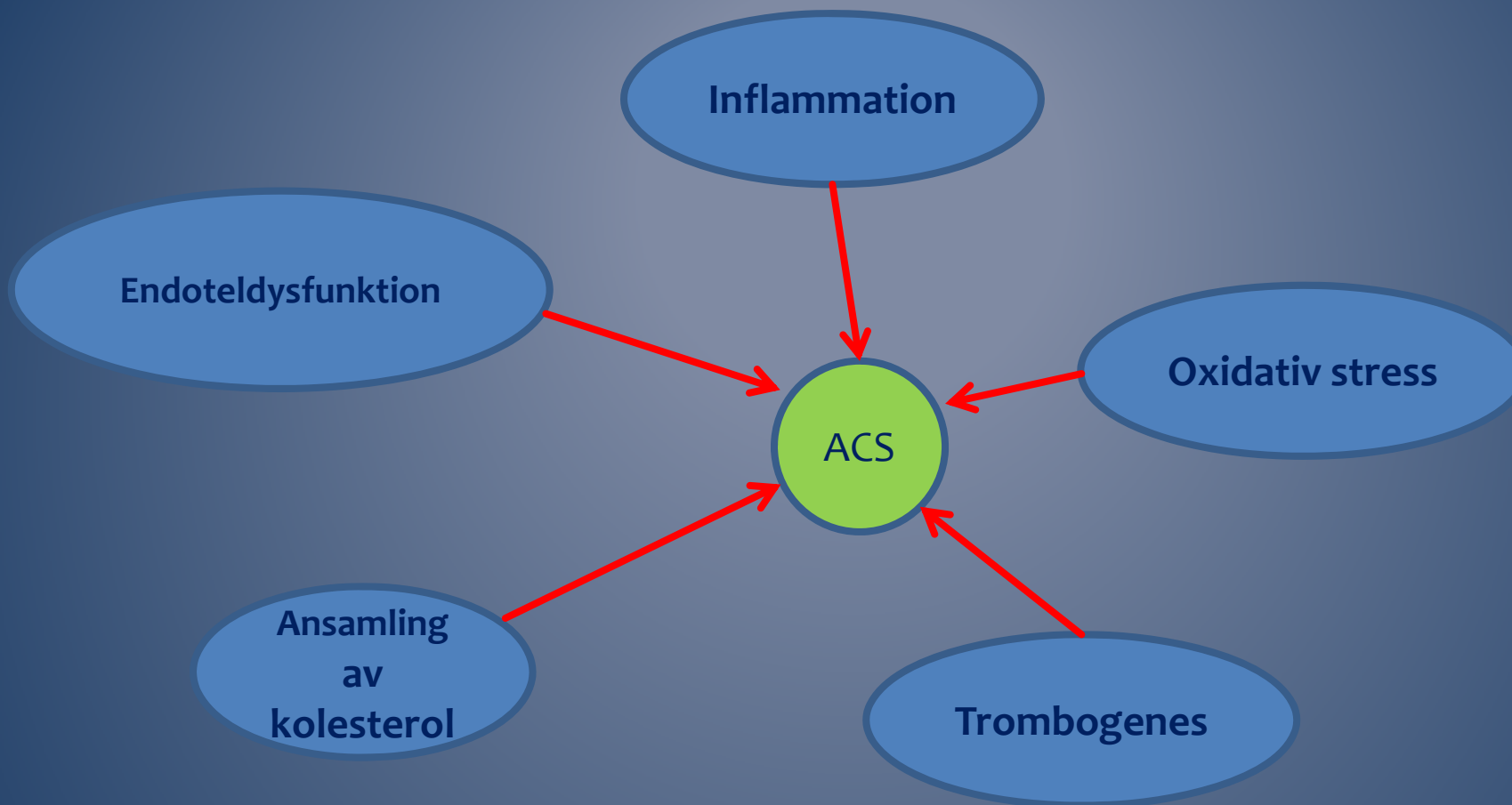
### AKUTA FORMER:

- *Instabil angina pectoris*
- *Akut hjärtinfarkt (STEMI,NSTEMI)*
- *Plötslig död*

### • KRONISKA FORMER:

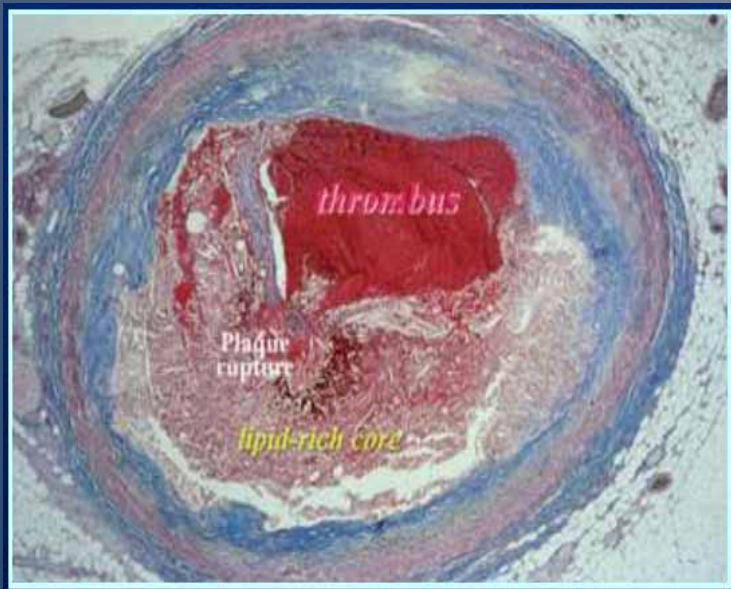
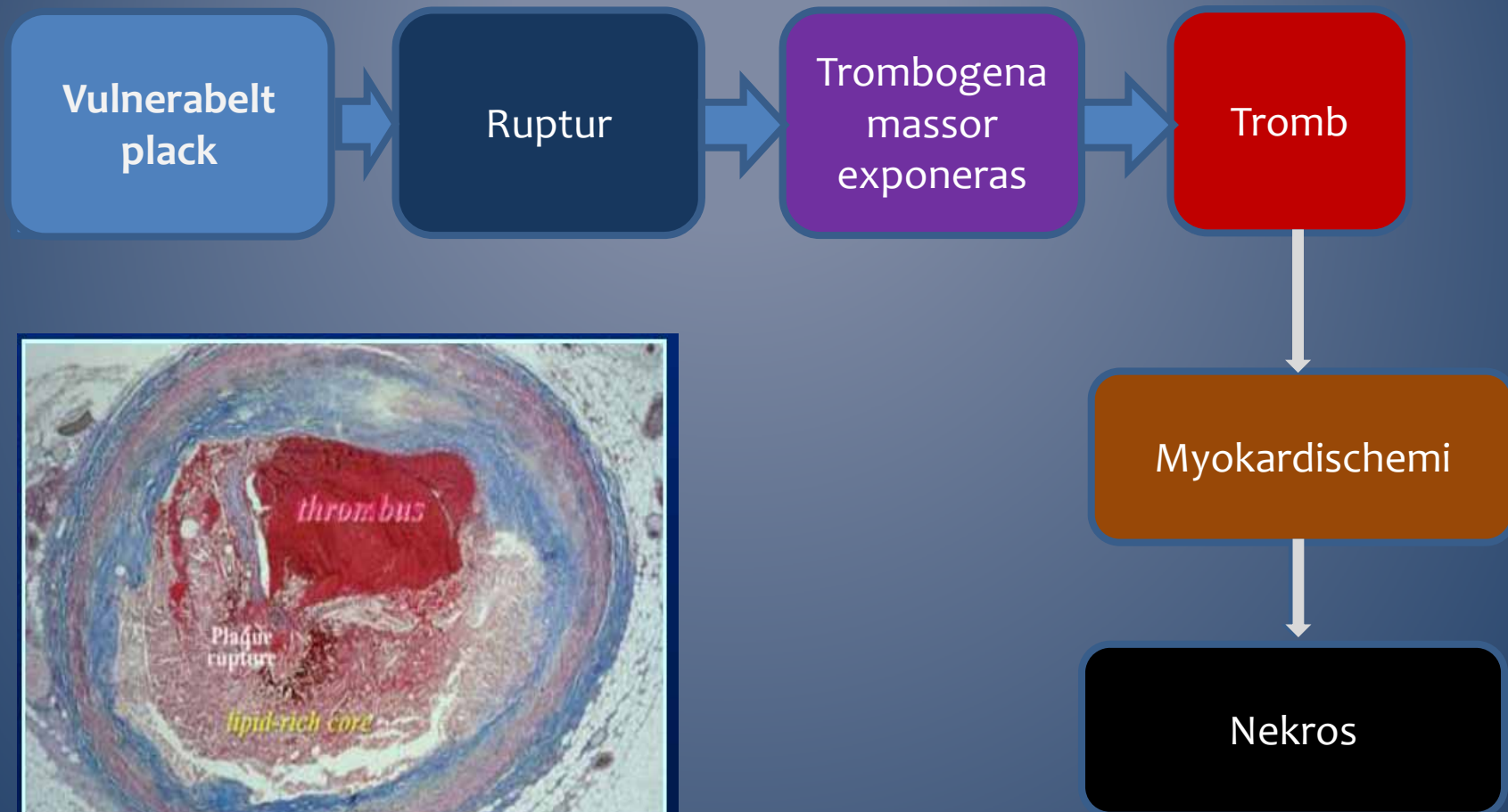
- - *Stabil angina pectoris*
- - *Ischemisk kardiomyopati - hjärtsvikt ( +/- angina )*
- - *Arytmi*
- - *Tyst ischemi*





DEN EXAKTA ORSAKEN TILL PLACKDESTABILISERING OCH RUPTUR VET VI INTE !

# PATOGENES AV AKUT KORONÄRT SYNDROM



## DEN UNIVERSELLA DEFINITIONEN AV HJÄRTINFARKT:

- Nekros av kardiomyocyter till följd av akut myokardischemi
- Detektion av typisk dynamik i en biomarker ( hs- Tn)  
+ en av följande:
  - ✓ Symtom förenliga med ischemi
  - ✓ Nya eller förmodade nya signifikanta STT förändringar/LBBB på 12-avlednings EKG
  - ✓ Utveckling av patologiska Q vågor på EKG
  - ✓ Nyttillkommen förlust av viabelt myokard på UKG,MR eller myokardscint
  - ✓ Intrakoronär tromb påvisad via angiografi eller obduktion

## OLIKA MEKANISMER AV HJÄRTINFARKT:

➤ Typ 1 hjärtinfarkt:

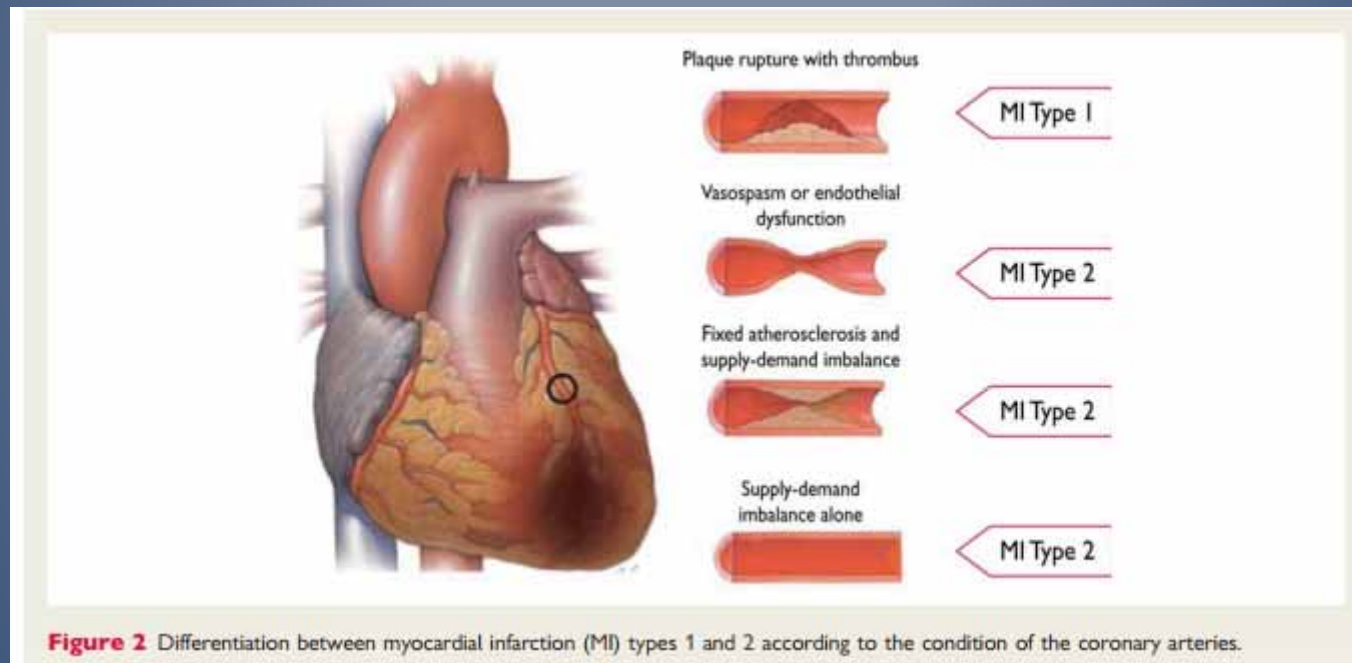
en akut intrakoronär händelse av typ plackruptur ,fissur, dissektion mm som har till följd att en tromb bildas och en myokardnekros utvecklas via nedsatt blodtillförsel och via event distal embolisering

➤ Typ 2 hjärtinfarkt:

uppstår till följd av en annan intrakoronär händelse än ett instabilt plack.Obalans mellan syrgasbehov/tillförsel. Exempel: spasm, takyarytmier, svår anemi, svår hypotoni,sepsis mm.



# TYP 1 VERSUS TYP 2 HJÄRTINFARKT :



## "ICKE-KORONÄRA" ORSAKER TILL TROPONINSTEGRING :

- Trauma – hjärtkontusion
- Hjärtsvikt
- Hypertoni
- Hypotoni
- Postoperativa stegringar
- Njursvikt
- Kritiska tillstånd , ffa hos diabetiker
- Läkemedelstoxicitet
- Hypothyreos
- Inflammatoriska tillstånd
- Myokardit
- Inlagringssjukdomar, ex. amyloidos, sarkoidos
- Lungemboli
- Sepsis
- Brännskador ( ffa > 30% )
- Akuta neurologiska åkommor inklusive stroke
- Rabdomyolys

# INSTABIL ANGINA PECTORIS

**AKUT KORONÄRT SYNDROM UTAN MYOKARDNEKROS  
= TROPONIN NEGATIV**

- LÅNGVARIG ( > 20 MIN ) ANGINÖS BRÖSTSMÄRTA I VILA
- ”DE NOVO” ANGINA CLASS CCS II-III
- NY DESTABILISERING AV SEDAN TIDIGARE STABIL ANGINA AV MINST GRAD CCS III ( CRESCENDO ANGINA )

# AKS - EKG BASERAD DEFINITION

- Bröstsmärta + persisterande (>20min) ST-höjning :  
oftast betyder en akut total kärlocklusion  
**= STEMI**, indikation för omedelbar reperfusion
- Bröstsmärta utan persisterande ST- höjning :  
övergående ST höjningar,ST-sänkningar,T-vågsinversion  
eller normalt ekg  
**= NSTE – AKS** (NSTEMI,instabil angina pectoris)  
! En mindre andel av dessa patienter har indikation för  
omgående angiografi/reperfusion: pågående smärta med  
markerade ST-sänkningar och hemodynamisk/elektrisk  
instabilitet

Low Likelihood

High Likelihood

1. Presentation



2. ECG



3. Troponin

-

+

++

4. Diagnosis

Noncardiac

UA

Other  
Cardiac

NSTEMI

STEMI

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

## BRÖSTSMÄRTA PÅ AKUTEN :

- 5-10% STEMI
- 15-20% NSTEMI
- 10% instabil angina
- 15% andra kardiella insjuknanden
- 50% icke kardiella tillstånd  
(lungsjukdom, gastrointestinal sjukdom, muskuloskeletara problem mm )

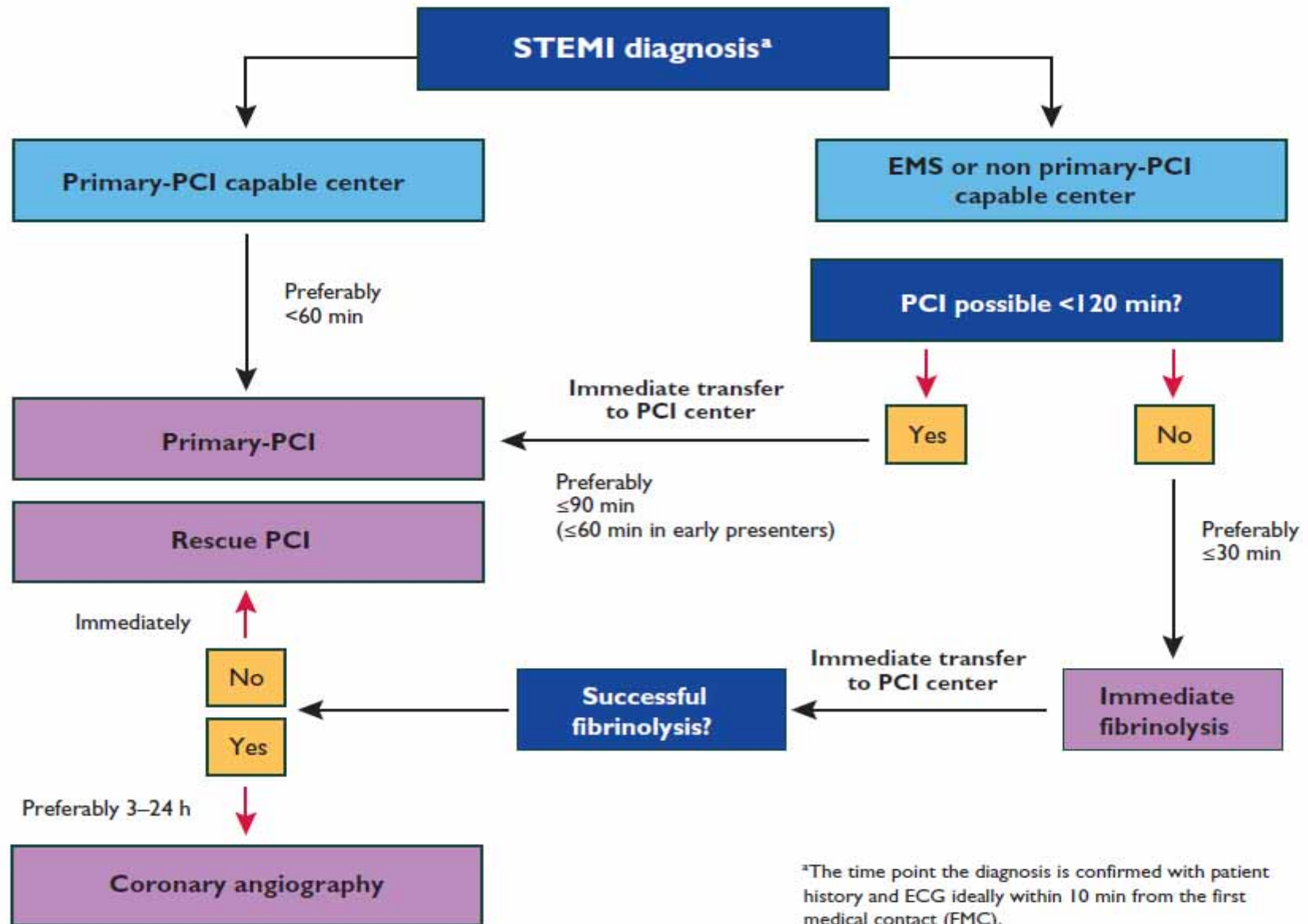
! Ffa följande differentialdiagnoser får inte missas:

aortadissektion

lungemboli

tensionspneumothorax

STEMI



<sup>a</sup>The time point the diagnosis is confirmed with patient history and ECG ideally within 10 min from the first medical contact (FMC).  
All delays are related to FMC (first medical contact).

Cath = catheterization laboratory; EMS = emergency medical system; FMC = first medical contact; PCI = percutaneous coronary intervention; STEMI = ST-segment elevation myocardial infarction.

**Figure 2** Prehospital and in-hospital management, and reperfusion strategies within 24 h of FMC (adapted from Wijns et al.).<sup>4</sup>



**Table 6** Recommendations for relief of pain, breathlessness and anxiety

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Titrated i.v. opioids are indicated to relieve pain.	I	C
Oxygen is indicated in patients with hypoxia (SaO <sub>2</sub> <95%), breathlessness, or acute heart failure.	I	C
Tranquillizer may be considered in very anxious patients.	IIa	C

i.v. = intravenous; SaO<sub>2</sub> = saturated oxygen.

<sup>a</sup>Class of recommendation.

<sup>b</sup>Level of evidence.

## AKUT PERIPROCEDURAL MEDICINERING

- Laddningsdos ASA – Trombyl 300mg p.o., därefter tabl 75mg x 1 dagligen ,livslångt
- Laddningsdos ticagrelor – Brilique 180mg , därefter tabl 90mg x 2 i 12 månader
- I.v. antikoagulans på PCI-lab enligt rutin,oftast bivalirudin

# VÅRD EFTER PCI

- Alla infarkt patienter ska genomgå ekokardiografi
- Ställningstagande till PCI av event ytterligare kranskärlsstenoser (inneliggande före hemgång, elektivt eller efter stress test)
- Telemetri minst 24 timmar på HIA, vid okomplicerat förlopp ytterligare 24-48 timmar EKG-övervakning på vanlig avdelning
- Behandling av event komplikationer så som hjärtsvikt,arytmi
- Hemgång vid okomplicerade fall efter 4-5 dagar, i fall möjlighet finns till tidig kontroll kan hemgång redan efter 3 dagar övervägas hos selekterade låg-risk patienter

# RUTINBEHANDLING EFTER GENOMGÅNGEN STEMI

DAPT should be used up to 1 year in patients with STEMI who did not receive a stent.	IIa	C	-
Gastric protection with a proton pump inhibitor should be considered for the duration of DAPT therapy in patients at high risk of bleeding.	IIa	C	256
Oral treatment with beta-blockers should be considered during hospital stay and continued thereafter in all STEMI patients without contraindications.	IIa	B	1,266
Oral treatment with beta-blockers is indicated in patients with heart failure or LV dysfunction.	I	A	284–288
Intravenous beta-blockers must be avoided in patients with hypotension or heart failure.	III	B	266
Intravenous beta-blockers should be considered at the time of presentation in patients without contraindications, with high blood pressure, tachycardia and no signs of heart failure.	IIa	B	266
A fasting lipid profile must be obtained in all STEMI patients, as soon as possible after presentation.	I	C	-
It is recommended to initiate or continue high dose statins early after admission in all STEMI patients without contraindication or history of intolerance, regardless of initial cholesterol values.	I	A	267
Reassessment of LDL-cholesterol should be considered after 4–6 weeks to ensure that a target value of $\leq 1.8$ mmol/L (70 mg/dL) has been reached.	IIa	C	270
Verapamil may be considered for secondary prevention in patients with absolute contraindications to beta-blockers and no heart failure.	IIb	B	276
ACE inhibitors are indicated starting within the first 24 h of STEMI in patients with evidence of heart failure, LV systolic dysfunction, diabetes or an anterior infarct.	I	A	279
An ARB, preferably valsartan, is an alternative to ACE inhibitors in patients with heart failure or LV systolic dysfunction, particularly those who are intolerant to ACE inhibitors.	I	B	280, 281
ACE inhibitors should be considered in all patients in the absence of contraindications.	IIa	A	289, 290
Aldosterone antagonists, e.g. eplerenone, are indicated in patients with an ejection fraction $\leq 40\%$ and heart failure or diabetes, provided no renal failure or hyperkalaemia.	I	B	282

ACE = angiotensin-converting enzyme; ACS = acute coronary syndrome; ARB = angiotensin receptor blocker; BMS = bare metal stent; DAPT = dual antiplatelet therapy; DES = drug-eluting stent; LDL = low-density lipoprotein; LV = left ventricular; STEMI = ST-segment elevation myocardial infarction.

<sup>a</sup>Class of recommendation.

<sup>b</sup>Level of evidence.

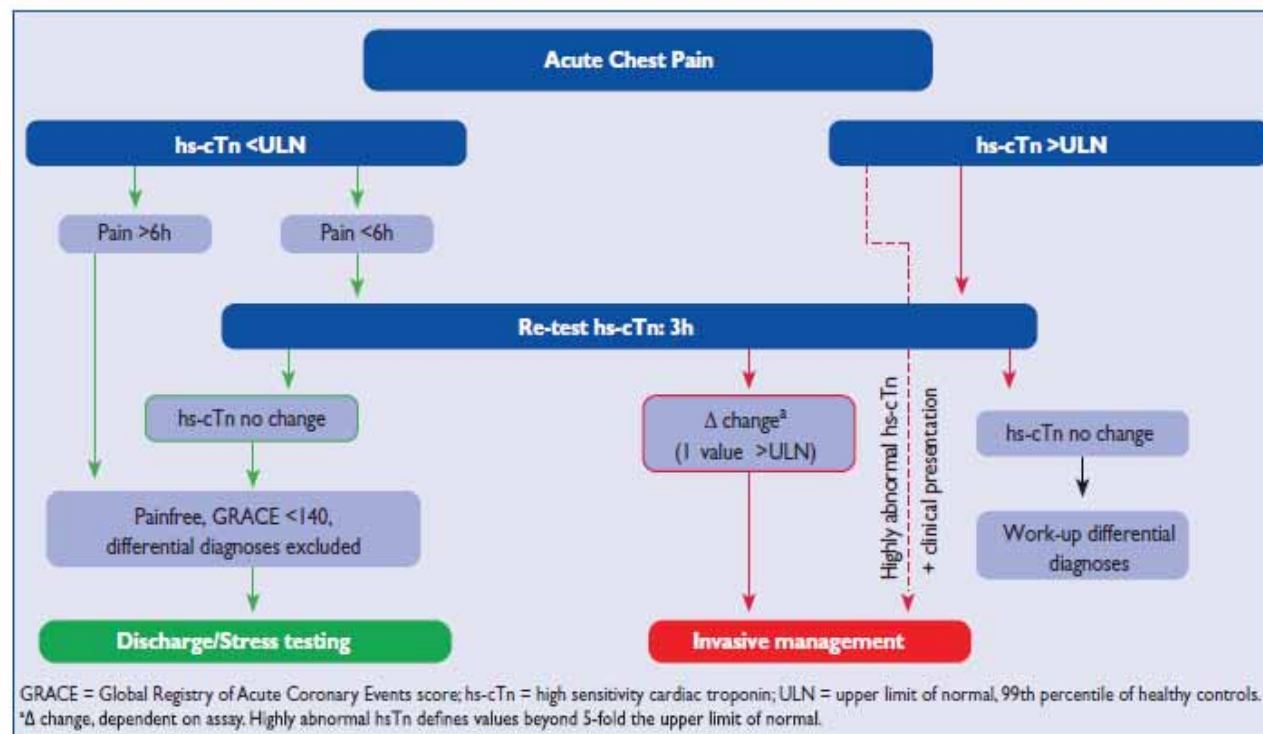
<sup>c</sup>References.

## ANDRA ÅTGÄRDER, UPPFÖLJNING

- Livsstilsförändringar, rökstopp, motion
- Sjukgymnastbedömning, träningsprogram
- Psykosocialt stöd
- Uppföljning av riskfaktorer - lipider, hypertoni
- Patienter med hjärtsvikt/ signifikant nedsatt kammarfunktion knyts till hjärtsviktsmottagningen och kontrolleras efter medicinoptimeringen av kardiolog med UKG för ställningstagande till event primärprofylaktisk ICD

NSTEMI

# NSTE-AKS DIAGNOSTIK:



**Figure 2** 0 h/3 h rule-out algorithm of non-ST-elevation acute coronary syndromes using high-sensitivity cardiac troponin assays.

## NSTE-AKS RISKBEDÖMNING:

- Riskfaktorer som ökar risk är diabetes , njursvikt, högre ålder.
- Klinisk bild: smärta – i vila ? pågående/återkommande?  
tecken på hjärtsvikt, takykardi, hypotoni ?
- EKG: djupa ST – sänkningar ? övergående ST-lyft ? arytmi?
- Biomarkörer: hs-Tn – positive ? Ju högre inkomst Tn-värde desto sämre prognos.
- **Användandet av score system är överlägsen den kliniska bedömningen ensam - GRACE calculator**
- **<http://www.mdcalc.com/grace-acs-risk-and-mortality-calculator/>**



## GRACE Score For Risk Of Death In Non-ST Elevation Acute Coronary Syndrome

Risk Factor	Finding	Points
Event Type	Non-ST Elevation ACS	---
Killip Class	Select <input type="text"/> <input type="button" value="v"/>	
Systolic Blood Pressure	Select <input type="text"/> <input type="button" value="v"/>	
Heart Rate	Select <input type="text"/> <input type="button" value="v"/>	
Age	Select <input type="text"/> <input type="button" value="v"/>	
Creatinine Level (mg%)	Select <input type="text"/> <input type="button" value="v"/>	
Cardiac Arrest At Admission	Select <input type="text"/> <input type="button" value="v"/>	
ST-Segment Deviation	Select <input type="text"/> <input type="button" value="v"/>	
Elevated Cardiac Enzyme Levels*	Select <input type="text"/> <input type="button" value="v"/>	
Point Total		
In-Hospital Mortality Risk Category		

\*Initial findings following hospital admission

Due to variability in published documentation of risk scoring, GRACE mortality risk as an absolute number should be obtained from the [GRACE Web site calculators](#).

Arch Intern Med. 2003;163:2345-2353

Calculator Design and HTML transfer by Dr. John Coyle, 2010.

# RISKBASERAD REKOMMENDATION FÖR ÖVERVAKNING

**Table 7** Recommended unit and duration of monitoring according to clinical presentation after established NSTEMI-ACS diagnosis

Clinical Presentation	Unit	Rhythm monitoring
Unstable angina	Regular ward or discharge	None
NSTEMI at low risk for cardiac arrhythmias <sup>a</sup>	Intermediate care unit or coronary care unit	≤24 h
NSTEMI at intermediate to high risk for cardiac arrhythmias <sup>b</sup>	Intensive/coronary care units or intermediate care unit	>24 h

NSTEMI = Non-ST-elevation myocardial infarction.

<sup>a</sup>If none of the following criteria: haemodynamically unstable, major arrhythmias, left ventricular ejection fraction <40%, failed reperfusion, additional critical coronary stenoses of major vessels or complications related to percutaneous revascularization.

<sup>b</sup>If one or more of the above criteria are present.

## Recommendations for anti-ischaemic drugs in the acute phase of non-ST-elevation acute coronary syndromes

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>	Ref. <sup>c</sup>
Early initiation of beta-blocker treatment is recommended in patients with ongoing ischaemic symptoms and without contraindications.	I	B	119
It is recommended to continue chronic beta-blocker therapy, unless the patient is in Killip class III or higher.	I	B	126
Sublingual or i.v. nitrates are recommended to relieve angina; <sup>d</sup> i.v. treatment is recommended in patients with recurrent angina, uncontrolled hypertension or signs of heart failure.	I	C	
In patients with suspected/confirmed vasospastic angina, calcium channel blockers and nitrates should be considered and beta-blockers avoided.	IIa	B	127

## ANTITROMBOTISK BEHANDLING

- Laddningsdos ASA – Trombyl 300mg p.o., därefter tabl. 75mg x 1 livet ut
- Laddningsdos ticagrelor - Brilique 180mg, därefter tabl. 90mg x 2 i 12 månader för alla patienter med ”moderate-to-high risk ”
- Clopidogrel i stället för ticagrelor för patienter som inte kan ha ticagrelor eller som behöver stå på (N)OAC . Laddningsdos clopidogrel 600mg, därefter tabl . 75mg x 1 , 12 månaders behandling
- Dubbel trombocythämning kan ges i kortare tid ( 3 – 6 månader ) hos patienter med hög blödningsrisk efter PCI med DES
- Antikoagulans i den akuta fasen: fondaparinux – Arixtra 2,5mg sc. Event enoxaparine – Klexane 1mg/kg sc. x 2

# ÖVRIG BEHANDLING

Skiljer sig inte från behandling vid STEMI

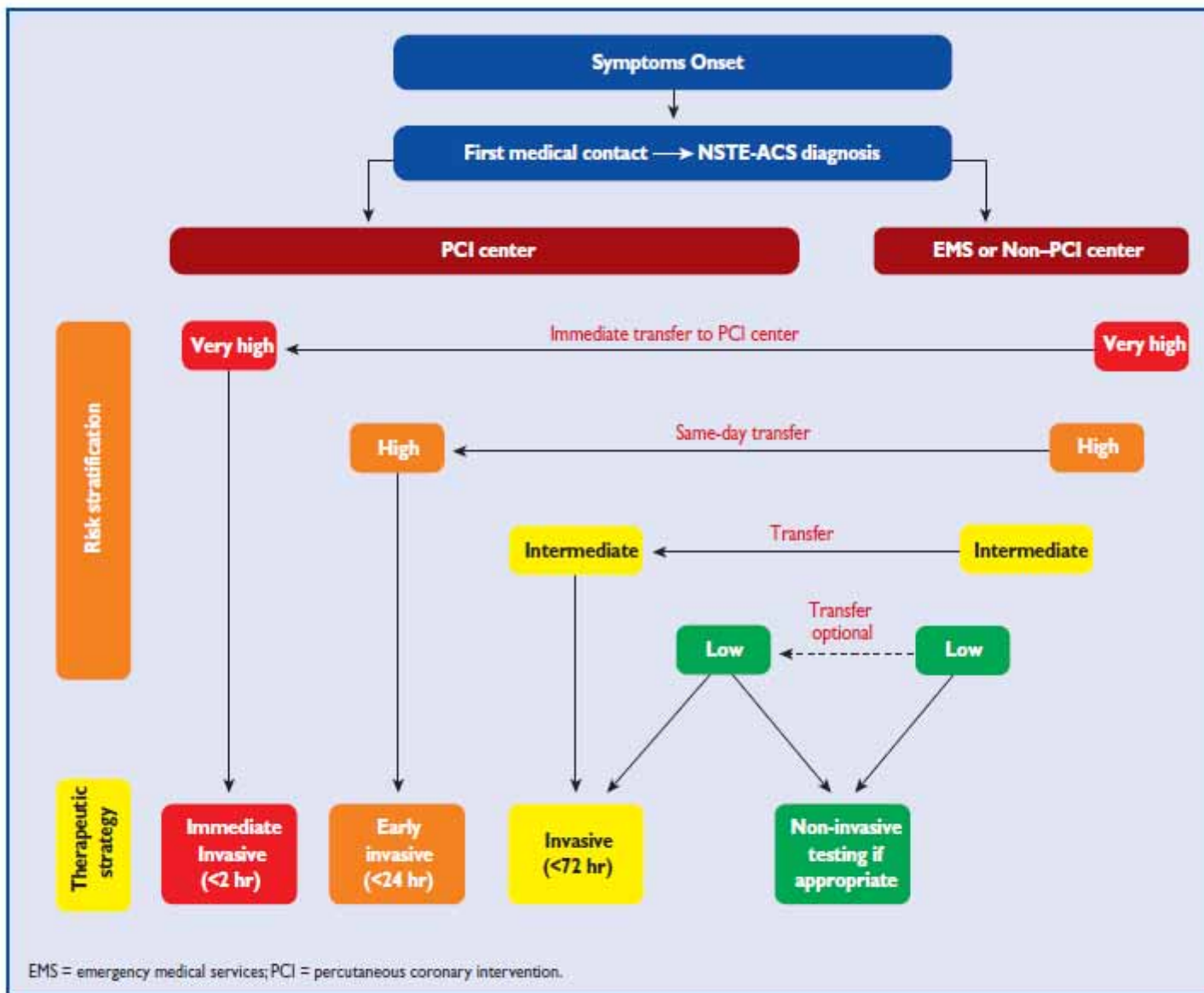
- Betablockerare
- ACE-hämmare
- Statiner

Uppföljning och övriga åtgärder – samma som STEMI patienter

**Table 13 Risk criteria mandating invasive strategy in NSTEMI-ACS**

<b>Very-high-risk criteria</b>
• 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
<b>High-risk criteria</b>
• Rise or fall in cardiac troponin compatible with MI
• Dynamic ST- or T-wave changes (symptomatic or silent)
• GRACE score >140
<b>Intermediate-risk criteria</b>
• Diabetes mellitus
• Renal insufficiency (eGFR <60 mL/min/1.73 m <sup>2</sup> )
• LVEF <40% or congestive heart failure
• Early post-infarction angina
• Prior PCI
• Prior CABG
• GRACE risk score >109 and <140
<b>Low-risk criteria</b>
• Any characteristics not mentioned above

CABG = coronary artery bypass graft; eGFR = estimated glomerular filtration rate; GRACE = Global Registry of Acute Coronary Events; LVEF = left ventricular ejection fraction; PCI = percutaneous coronary intervention; MI = myocardial infarction.



**Figure 6** Selection of non-ST-elevation acute coronary syndrome (NSTEMI-ACS) treatment strategy and timing according to initial risk stratification.

## LÅG - RISK PATIENT MED INSTABIL ANGINA

- INGA ÅTERKOMMANDE BRÖSTSMÄRTOR
- INGA TECKEN PÅ HJÄRTSVIKT
- INGA EKG FÖRÄNDRINGAR PÅ DEN INITIALA EKG - KURVAN ELLER PÅ KONTROLL EKG ( 6-9 TIMMAR)
- NORMALA TROPONINER UTAN DYNAMIK
- LÅG RISK ENLIGT GRACE-SCORE < 108



DEN DIAGNOSTISKA OCH PROGNOTISKA  
UTREDNINGEN FÅR TILLÄMPAS ENLIGT RUTINER  
FÖR STABIL KRANSKÄRLSSJUKDOM



# CABG FÖR NSTE-MI :

- *Indikation avgörs via diskussion med thoraxkirurg – hjärtkonferens*  
*- kranskärlsanatomi, klinisk bild, risker, övriga sjukdomar*
- *Svårt instabila patienter där PCI av infarkt-relaterat kranskärl ej är möjligt får CABG opereras akut oavsett given dubbel trombocythämning*
- *Stabila patienter : ticagrelor utsätts i minst 5 dagar före operation, ASA fortsätter*
- *Efter kirurgi : dubbel trombocythämning i 12 månader om inga kontraindikationer*

# PCI ELLER CABG ?

**Recommendation for the type of revascularization (CABG or PCI) in patients with SCAD with suitable coronary anatomy for both procedures and low predicted surgical mortality**

Recommendations according to extent of CAD	CABG		PCI		Ref <sup>c</sup>
	Class <sup>a</sup>	Level <sup>b</sup>	Class <sup>a</sup>	Level <sup>b</sup>	
One or two-vessel disease without proximal LAD stenosis.	IIb	C	I	C	
One-vessel disease with proximal LAD stenosis.	I	A	I	A	107,108,160, 161,178,179
Two-vessel disease with proximal LAD stenosis.	I	B	I	C	108,135,137
Left main disease with a SYNTAX score ≤ 22.	I	B	I	B	17,134,170
Left main disease with a SYNTAX score 23–32.	I	B	IIa	B	17
Left main disease with a SYNTAX score >32.	I	B	III	B	17
Three-vessel disease with a SYNTAX score ≤ 22.	I	A	I	B	17,157,175,176
Three-vessel disease with a SYNTAX score 23–32.	I	A	III	B	17,157,175,176
Three-vessel disease with a SYNTAX score >32.	I	A	III	B	17,157,175,176

CABG = coronary artery bypass grafting; LAD = left anterior descending coronary artery; PCI = percutaneous coronary intervention; SCAD = stable coronary artery disease.

<sup>a</sup>Class of recommendation.

<sup>b</sup>Level of evidence.

<sup>c</sup>References.

## KONSERVATIV BEHANDLING

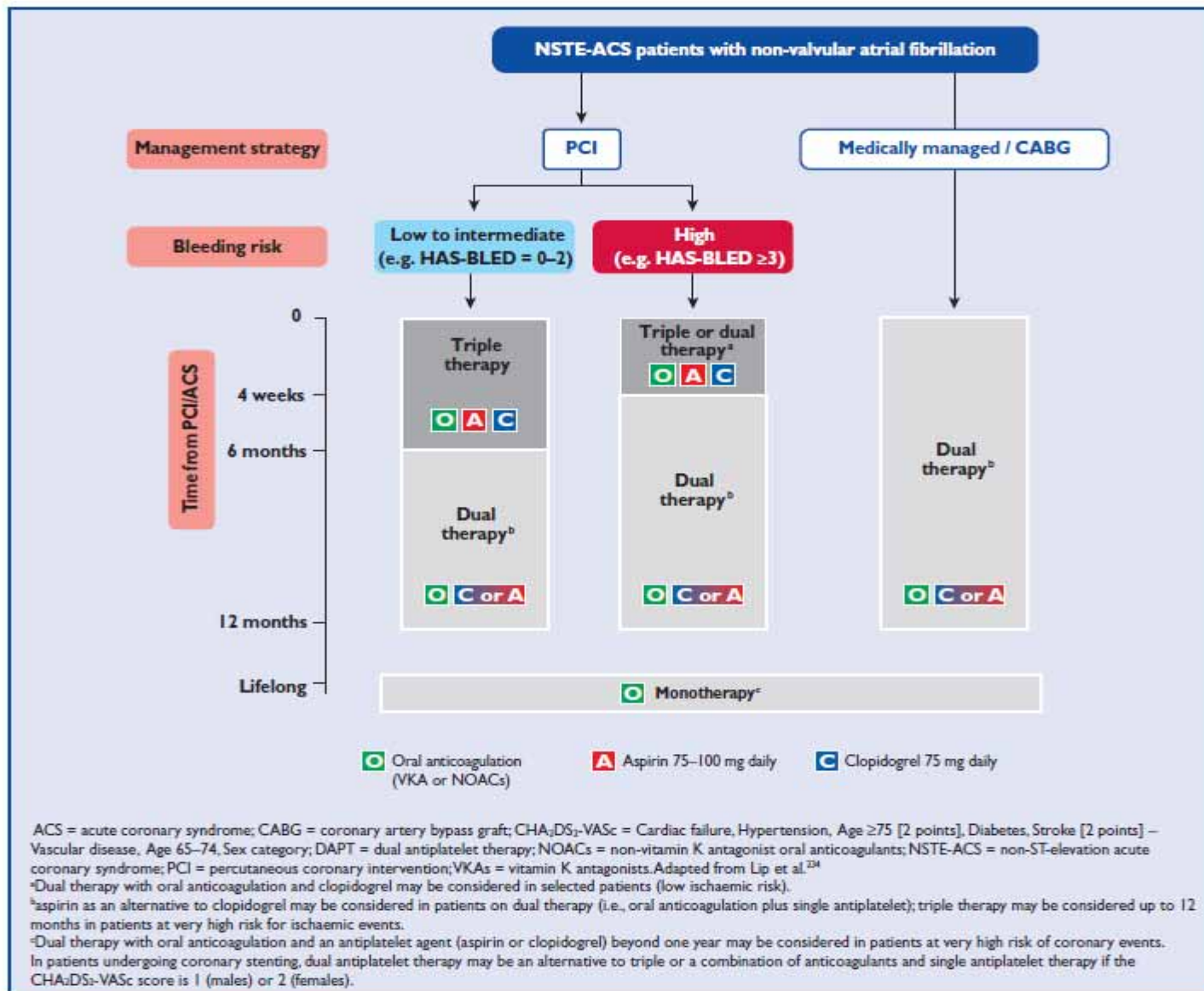
- Icke – obstruktiv kranskärlssjukdom – angiografi påvisar ateromatos utan signifikanta stenoser som lämpar sig för PCI
- Patienter som av någon anledning inte lämpar sig för invasiv utredning pga hög risk / osäker nytta av revaskularisering : multisjuka sköra äldre, dementa pat, pat med oacceptabelt hög blödningsrisk, cancersjukdom m.m.
- Patienter där angiografi visar svårt/diffust drabbade kärl som varken lämpar sig för PCI eller CABG
- Normal angiografi – s k MINCA – hjärtinfarkt med normala kranskärl (vasospasm, Tako-tsubo kardiomyopati, småkärlssjuka, embolisering )

**Recommendations for combining antiplatelet agents and anticoagulants in non-ST-elevation acute coronary syndrome patients requiring chronic oral anticoagulation**

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>	Ref. <sup>c</sup>
In patients with a firm indication for OAC (e.g. atrial fibrillation with a CHA <sub>2</sub> DS <sub>2</sub> -VASc score $\geq 2$ , recent venous thromboembolism, LV thrombus or mechanical valve prosthesis), OAC is recommended in addition to antiplatelet therapy.	I	C	
An early invasive coronary angiography (within 24 h) should be considered in moderate- to high-risk patients, <sup>d</sup> irrespective of OAC exposure, to expedite treatment allocation (medical vs. PCI vs. CABG) and to determine the optimal antithrombotic regimen.	IIa	C	
Initial dual antiplatelet therapy with aspirin plus a P2Y <sub>12</sub> inhibitor in addition to OAC before coronary angiography is not recommended.	III	C	
<b>Patients undergoing coronary stenting</b>			
<b>Anticoagulation</b>			
During PCI, additional parenteral anticoagulation is recommended, irrespective of the timing of the last dose of all NOACs and if INR is $< 2.5$ in VKA-treated patients.	I	C	
Uninterrupted therapeutic anticoagulation with VKA or NOACs should be considered during the periprocedural phase.	IIa	C	

**Antiplatelet treatment**

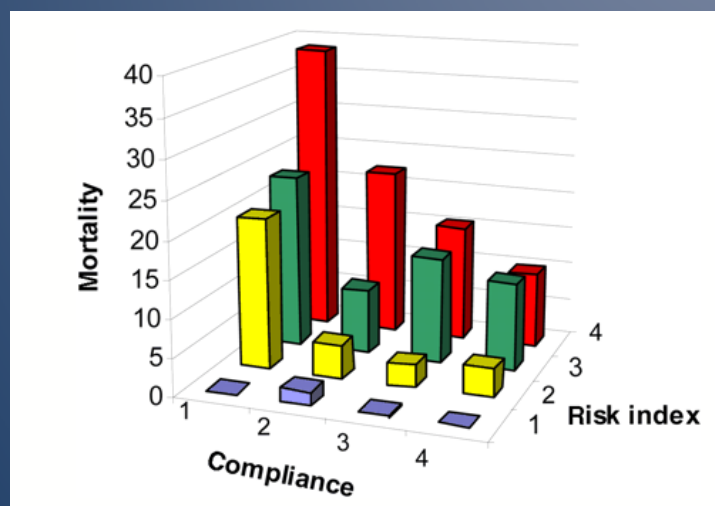
Following coronary stenting, DAPT including new P2Y <sub>12</sub> inhibitors should be considered as an alternative to triple therapy for patients with NSTEMI-ACS and atrial fibrillation with a CHA <sub>2</sub> DS <sub>2</sub> -VASc score of 1 (in males) or 2 (in females).	IIa	C	
If at low bleeding risk (HAS-BLED $\leq 2$ ), triple therapy with OAC, aspirin (75–100 mg/day) and clopidogrel 75 mg/day should be considered for 6 months, followed by OAC and aspirin 75–100 mg/day or clopidogrel (75 mg/day) continued up to 12 months.	IIa	C	
If at high bleeding risk (HAS-BLED $\geq 3$ ), triple therapy with OAC, aspirin (75–100 mg/day) and clopidogrel 75 mg/day should be considered for a duration of 1 month, followed by OAC and aspirin 75–100 mg/day or clopidogrel (75 mg/day) continued up to 12 months irrespective of the stent type (BMS or new-generation DES).	IIa	C	
Dual therapy with OAC and clopidogrel 75 mg/day may be considered as an alternative to triple antithrombotic therapy in selected patients (HAS-BLED $\geq 3$ and low risk of stent thrombosis).	IIb	B	246, 248
The use of ticagrelor or prasugrel as part of triple therapy is not recommended.	III	C	
<b>Vascular access and stent type</b>			
Radial over femoral access is recommended for coronary angiography and PCI.	I	A	251
The use of new-generation DES over BMS should be considered among patients requiring OAC.	IIa	B	245, 252
<b>Medically managed patients</b>			
One antiplatelet agent in addition to OAC should be considered for up to 1 year.	IIa	C	



**Figure 5** Antithrombotic strategies in patients with non-ST-elevation acute coronary syndromes (NSTE-ACS) and non-valvular atrial fibrillation.

## TAKE HOME MESSAGE :

- AKS är ett allvarligt, ofta livshotande tillstånd
- Patientens prognos avgörs inte bara av riskfaktorer utan också av:
  - compliance med **guidelines**
  - användande av **moderna behandlingsmetoder**



*Schiele et al. 2005*

# Compliance with guidelines and 1-year mortality in patients with acute myocardial infarction: a prospective study

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Received 29 July 2004; revised 2 December 2004; accepted 9 December 2004; online publish-ahead-of-print 28 January 2005

## KEYWORDS

Guidelines;  
Myocardial infarction;  
Risk score;  
Registry

**Aims** In patients with acute myocardial infarction (MI), mortality can be predicted by risk scoring systems, but the impact of therapy recommended by guidelines is poorly documented. The aim of this study was to determine, taking into account the patient's condition at admission, to what extent the degree of guideline compliance influences the 1-year survival of patients admitted for acute MI.

**Methods and results** A 6-month registry was carried out in a geographically limited area, prospectively including all patients with acute MI. A risk score based on initial presentation, and a compliance index based on patient characteristics, type of MI, in-hospital management (including revascularization strategies and use of recommended drugs) were established. Patients were clinically followed at 1 year. A total of 754 patients, 333 ST elevation MI and 421 non-ST elevation MI, were included. The median compliance index (percentage of optimal compliance with guidelines) was 0.66 (95% CI 0.5;8.3). One-year mortality rate was 11.5%. By logistic regression, three variables were independently related to mortality: type of MI [OR = 2.6 (1.5;4.3)], risk score [OR = 2.4 (1.9;3.1) per additional 10%], and compliance index [OR = 0.8 (0.7;0.9) per additional 10%].

**Conclusion** A clear relationship between the extent of guideline implementation, and 1-year mortality was shown and this relationship remained strong after stratification on the risk score at admission and the type of MI. These data emphasize the need for thorough implementation of guidelines to improve the outcome of patients suffering from acute MI.