Medical University of Graz

Infarkt oder „Troponitis“

Univ. Prof. Dr. Andreas Zirlik

Herzanästhesiekongress

Graz, den 24. Juni 2022

Universitäres Herzzentrum Graz

Disclosures for Andreas Zirlik, MD

In compliance with CME policy, the following disclosures to the session audience are declared:

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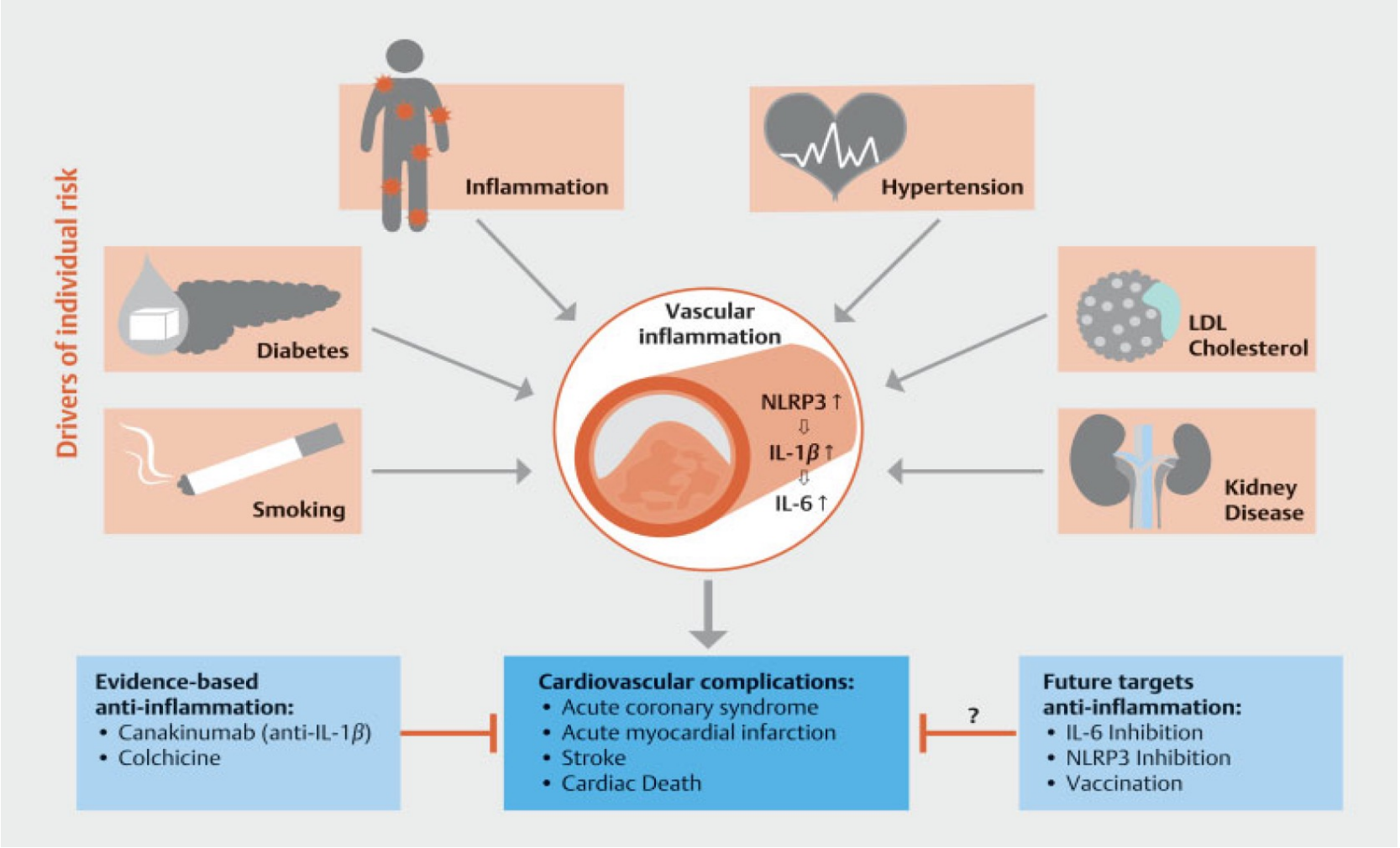
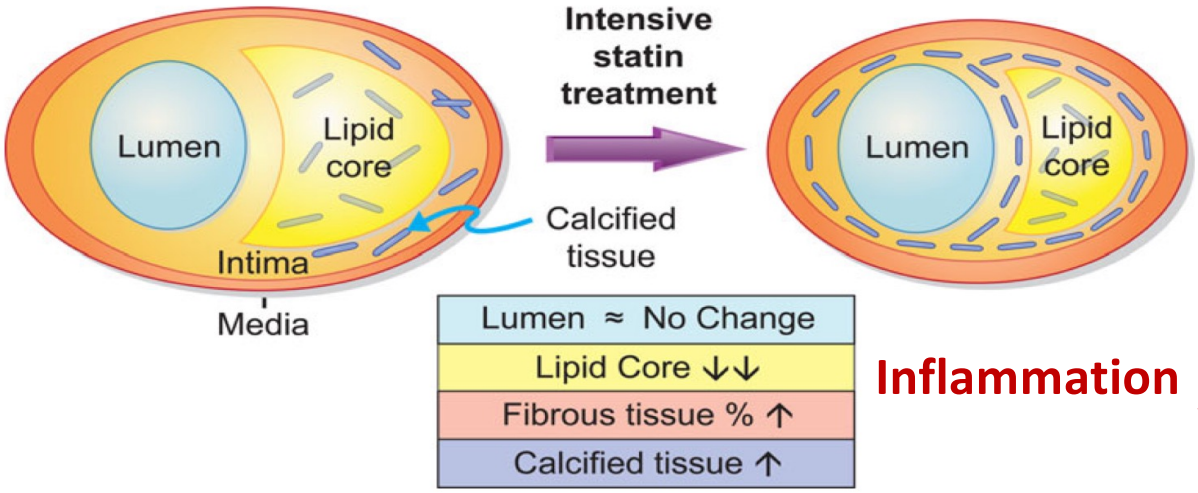
Honoraria for lectures	Bayer Health Care, Astra Zeneca, Medtronic, ResMed, Boehringer Ingelheim, Rigel, Sanofi Aventis, Pfizer, Janssen-Cilag, Novartis, Novo Nordisk, Edwards, Amgen, Bristol Myers Squibb, Abiomed, Daichi Sankyo, Abbott, Cardiac Dimensions

Risk factors drive inflammation

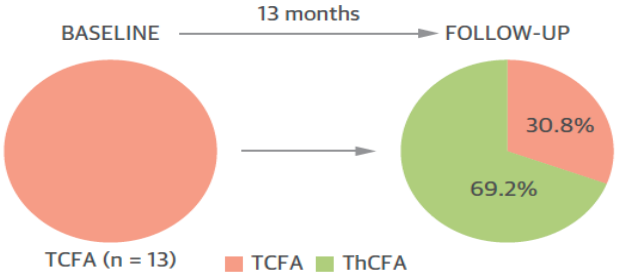


Heiko Bugger & Andreas Zirlik. Hämostaseologie 2021; 41:433-422.

LLT reduces plaque inflammation

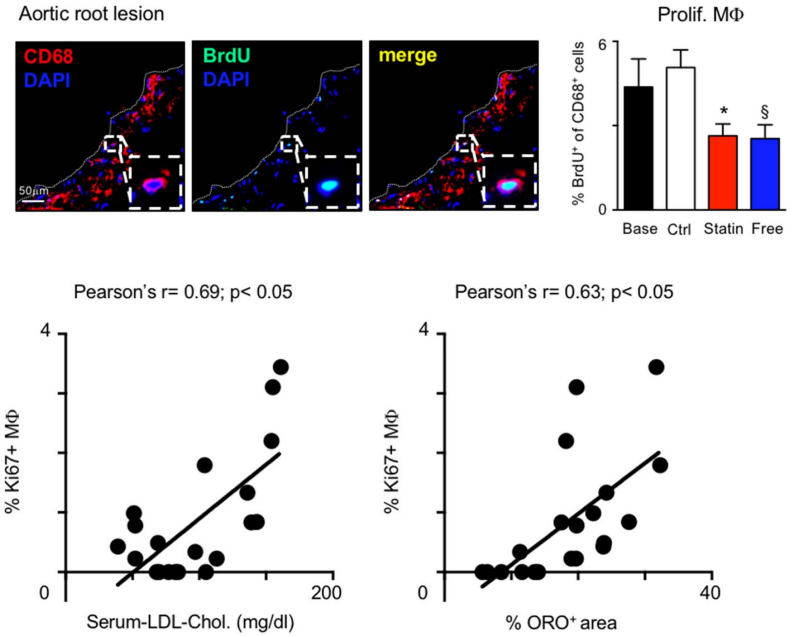


Inflammation ↓



IBIS-4: high intensity statin therapy after MI stabilizes plaques

LLT slows macrophage proliferation in murine and human plaques

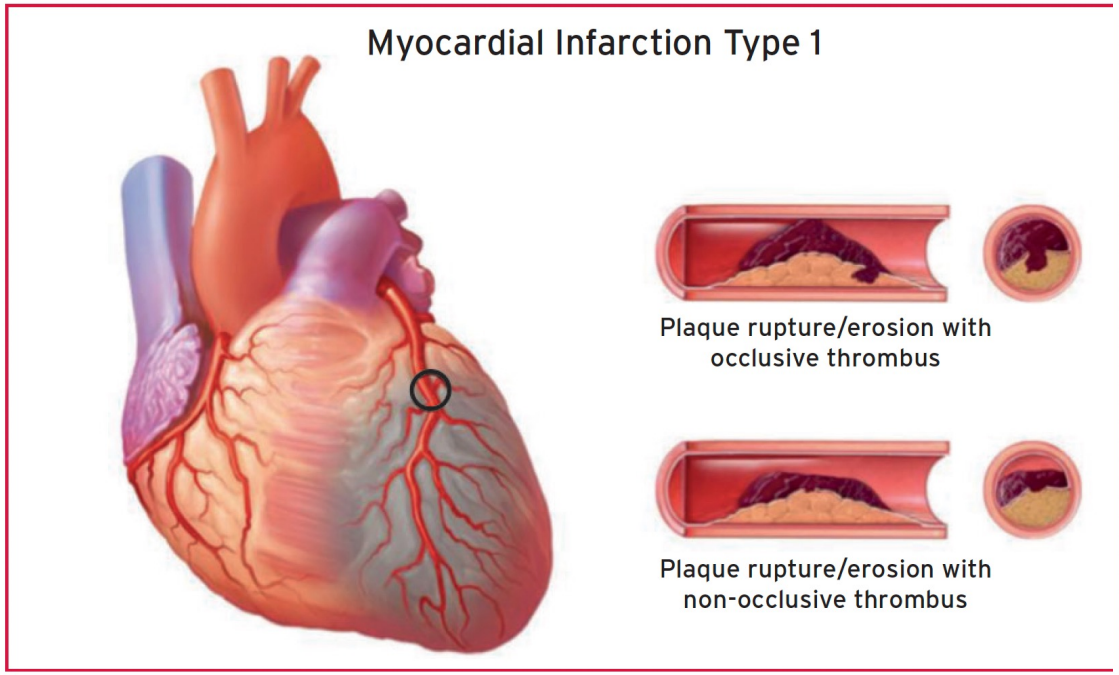


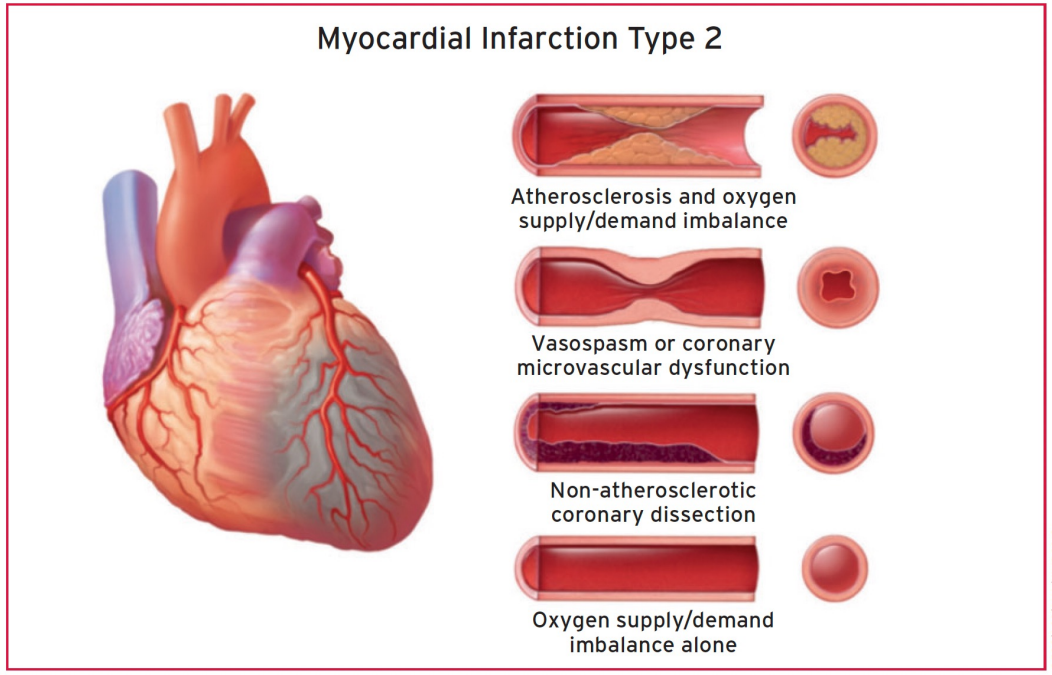
Libby P. European Heart Journal 2015:36:472-474.

Räber L. et al. J Am Coll Cardiol Img. 2019;12:1518-28.

Härdtner C. et al, Zirlik, Hilgendorf. Basic Research Cardiol 2020; 115:78.

What is MI: 4th universal definition





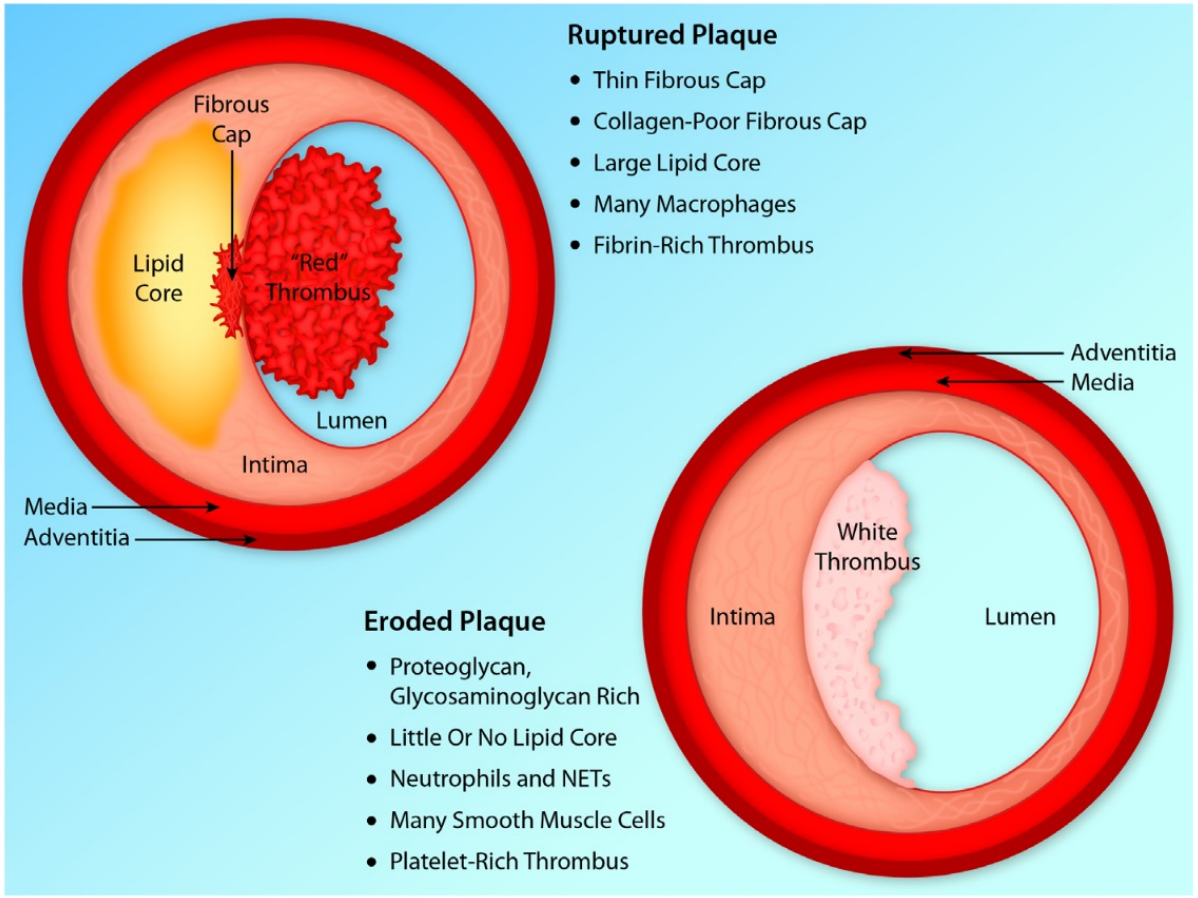
Myocardial Infarction Type 3:
No biomarkers, CV death

Myocardial Infarction Type 4:
PCI-related

Myocardial Infarction Type 5:
Bypass-related

Thygesen K et al. Eur Heart Journal 2019; 40:237-269.

Plaque rupture and erosion



INFLAMMATION

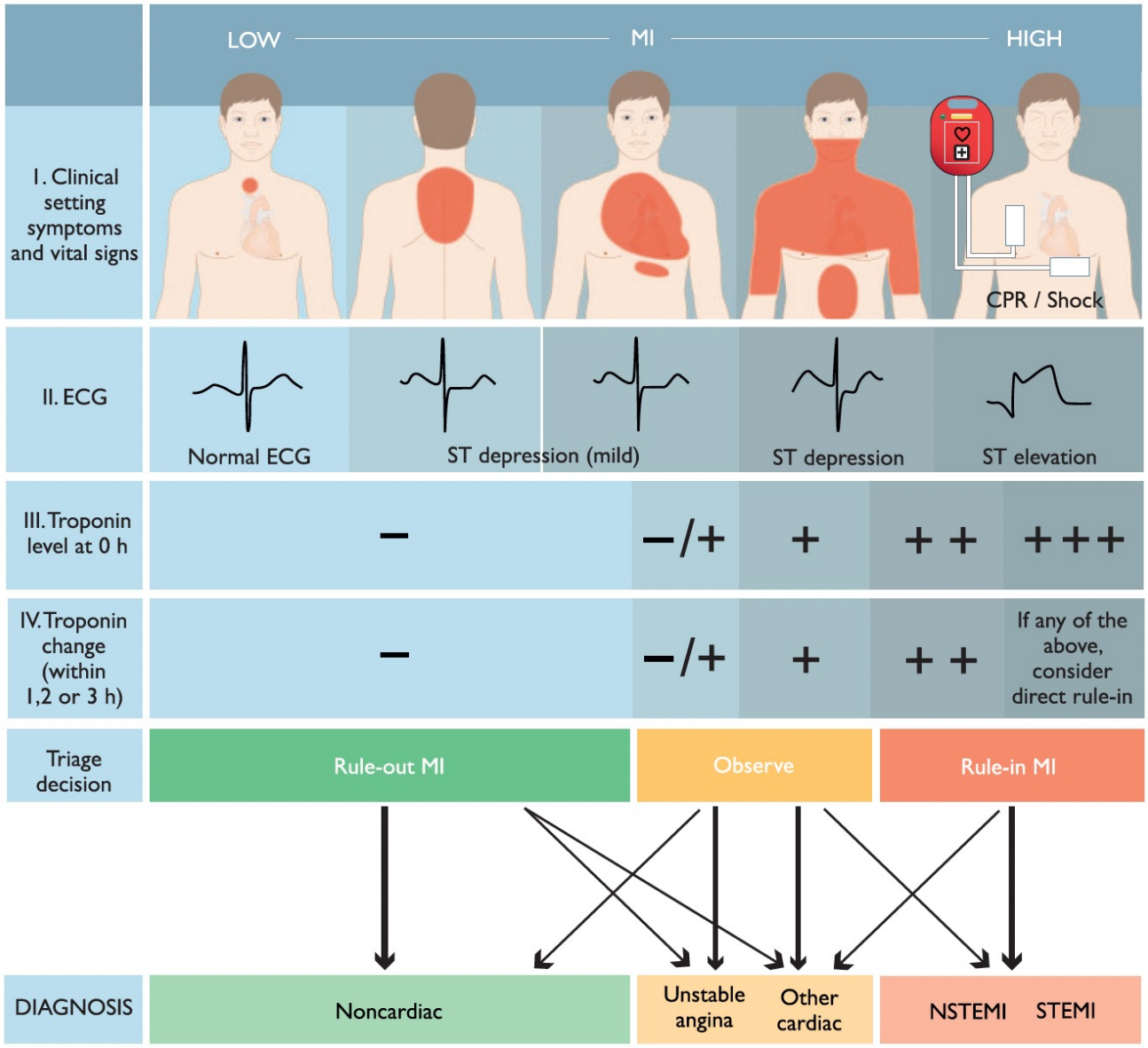
STEMI

LLT

NSTEMI

UA

Libby P et al. Circ Res 2019; 124:150-160..

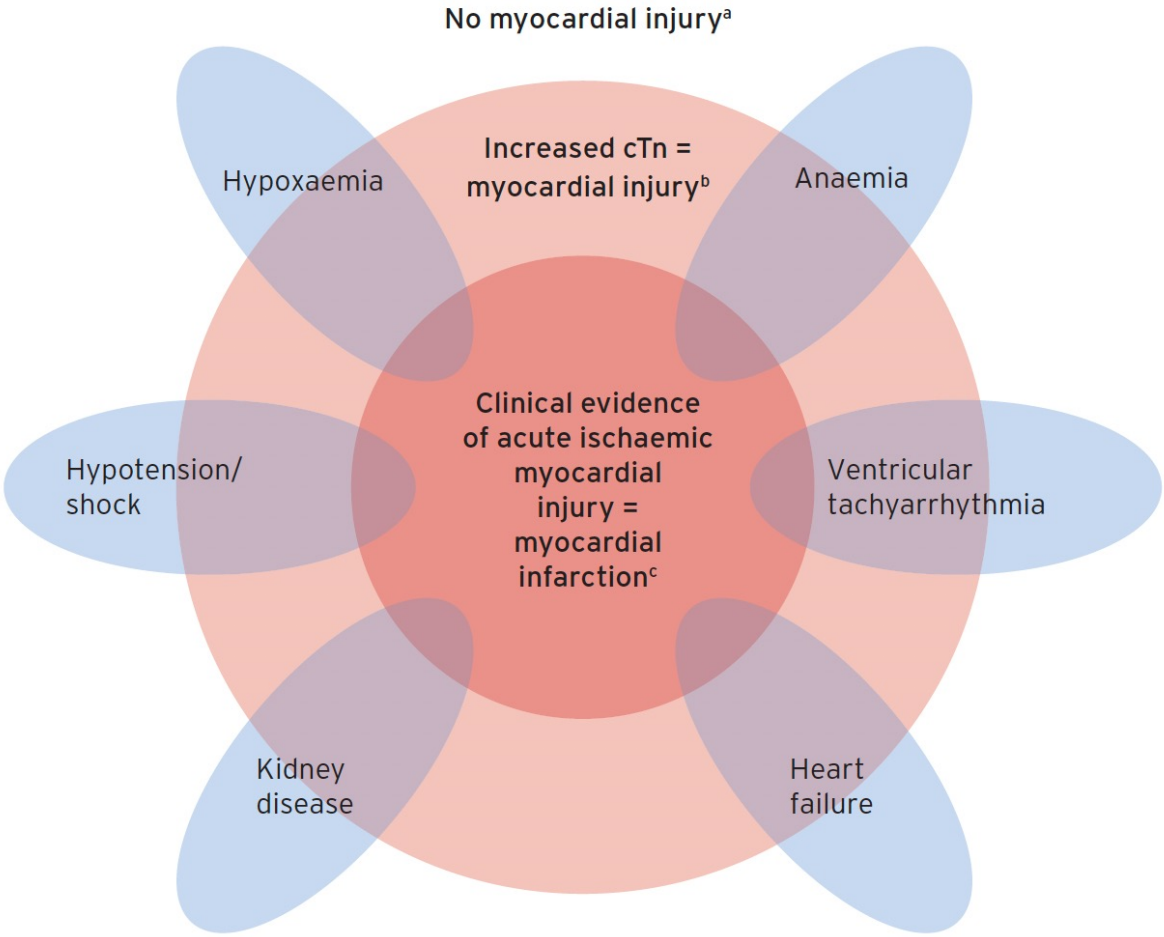


Diagnosis MI

Symptoms ECG Biomarkers

Collet J P et al. Eur Heart J 2021;42:1289-1367.

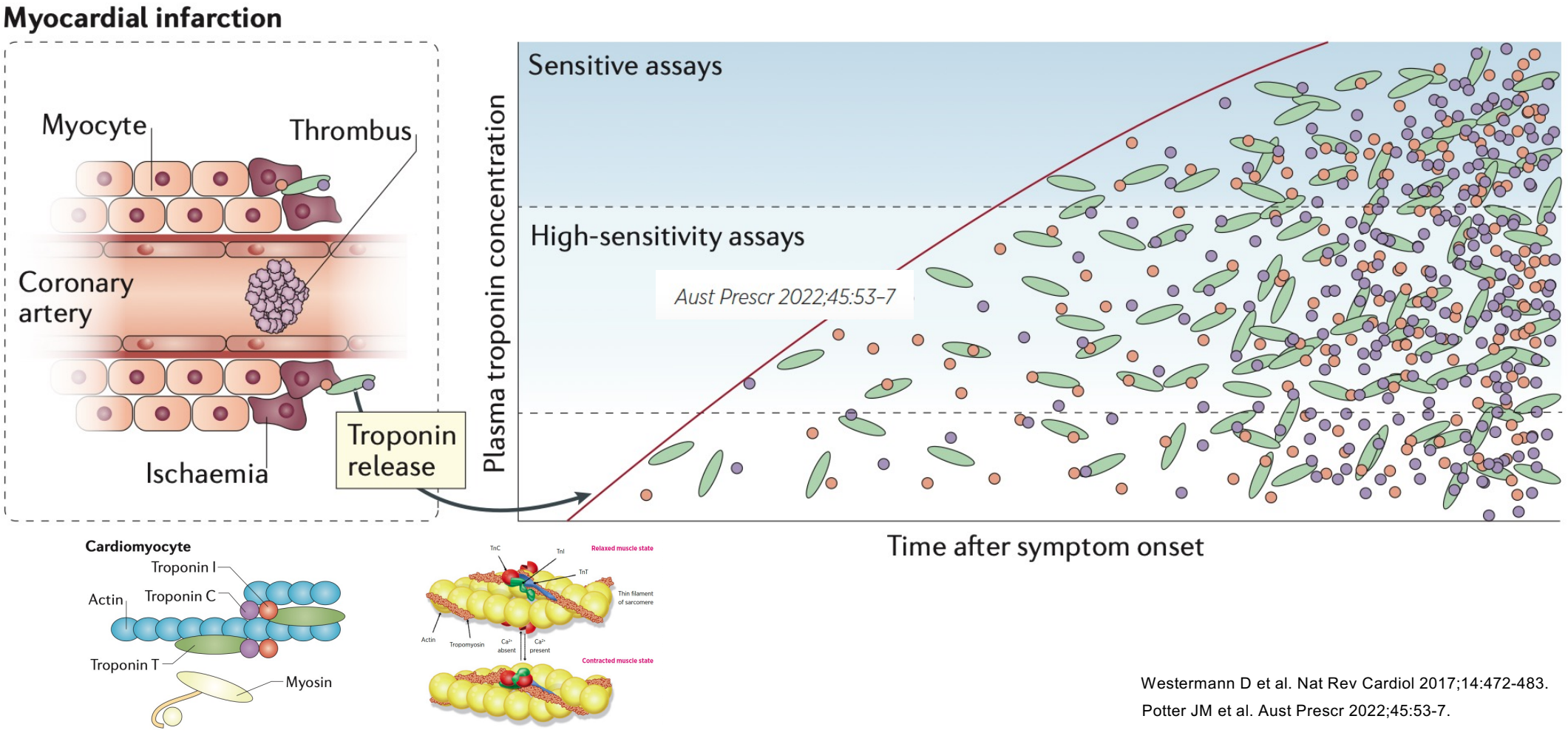
Acute myocardial injury is dynamic



The term myocardial injury should be used when there is evidence of elevated cardiac troponin values (cTn) with at least one value above
the 99th percentile upper reference limit (URL). The myocardial injury is considered acute if there is a rise and/or fall of cTn values.

Thygesen K et al. Eur Heart Journal 2019; 40:237-269.

Pathophysiology of Troponin release



Westermann D et al. Nat Rev Cardiol 2017;14:472-483.

Potter JM et al. Aust Prescr 2022;45:53-7.

Reasons for Troponin elevations

Myocardial injury related to acute myocardial ischaemia

Atherosclerotic plaque disruption with thrombosis.

Myocardial injury related to acute myocardial ischaemia because of oxygen supply/demand imbalance

Reduced myocardial perfusion, e.g.

- Coronary artery spasm, microvascular dysfunction
- Coronary embolism
- Coronary artery dissection
- Sustained bradyarrhythmia
- Hypotension or shock
- Respiratory failure
- Severe anaemia

Increased myocardial oxygen demand, e.g.

- Sustained tachyarrhythmia
- Severe hypertension with or without left ventricular hypertrophy

Other causes of myocardial injury

Cardiac conditions, e.g.

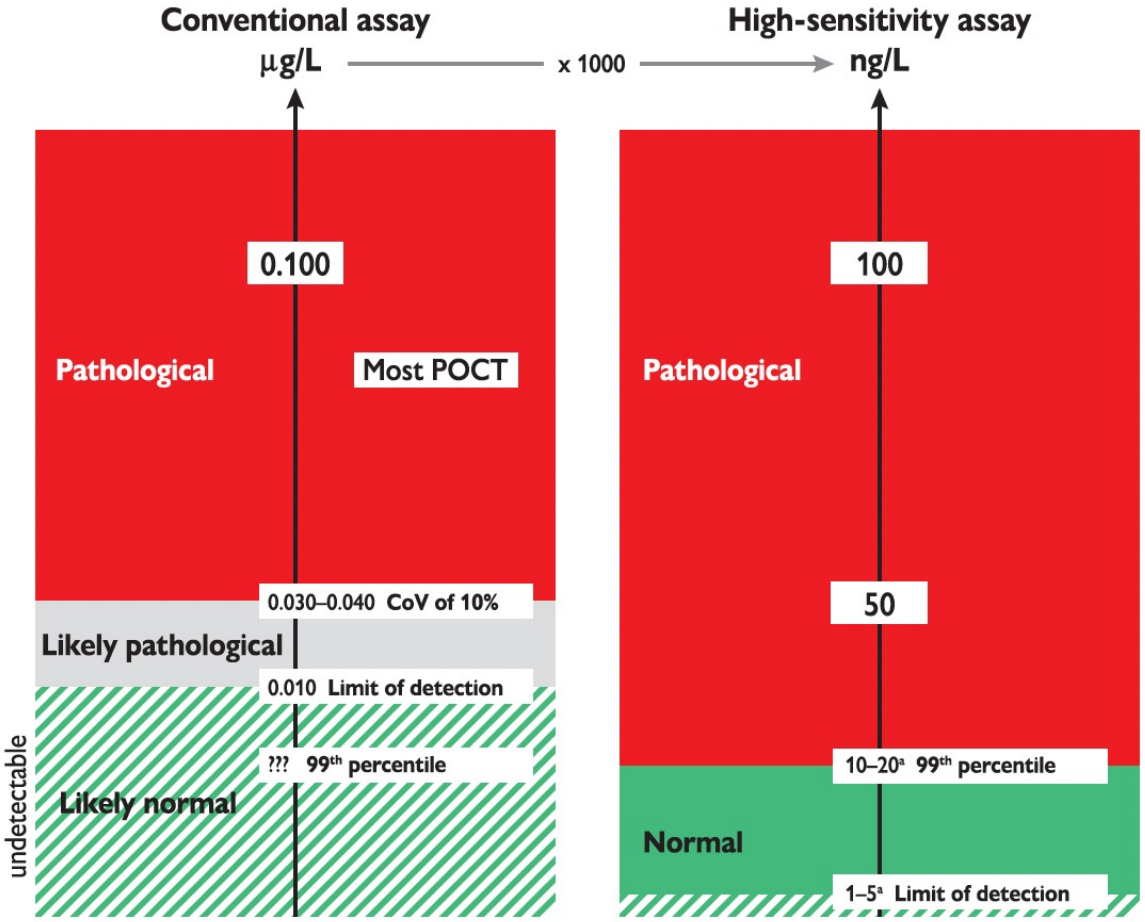
- Heart failure
- Myocarditis
- Cardiomyopathy (any type)
- Takotsubo syndrome
- Coronary revascularization procedure
- Cardiac procedure other than revascularization
- Catheter ablation
- Defibrillator shocks
- Cardiac contusion

Systemic conditions, e.g.

- Sepsis, infectious disease
- Chronic kidney disease
- Stroke, subarachnoid haemorrhage
- Pulmonary embolism, pulmonary hypertension
- Infiltrative diseases, e.g. amyloidosis, sarcoidosis
- Chemotherapeutic agents
- Critically ill patients
- Strenuous exercise

Thygesen K et al. Eur Heart Journal 2019; 40:237-269.

Dynamics of Troponin release



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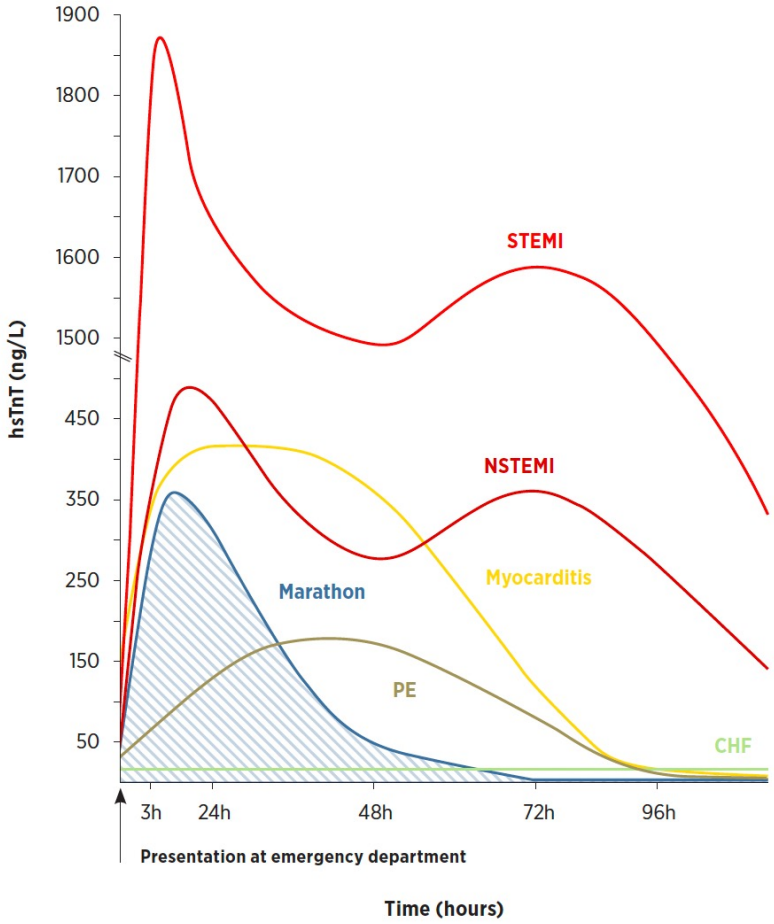
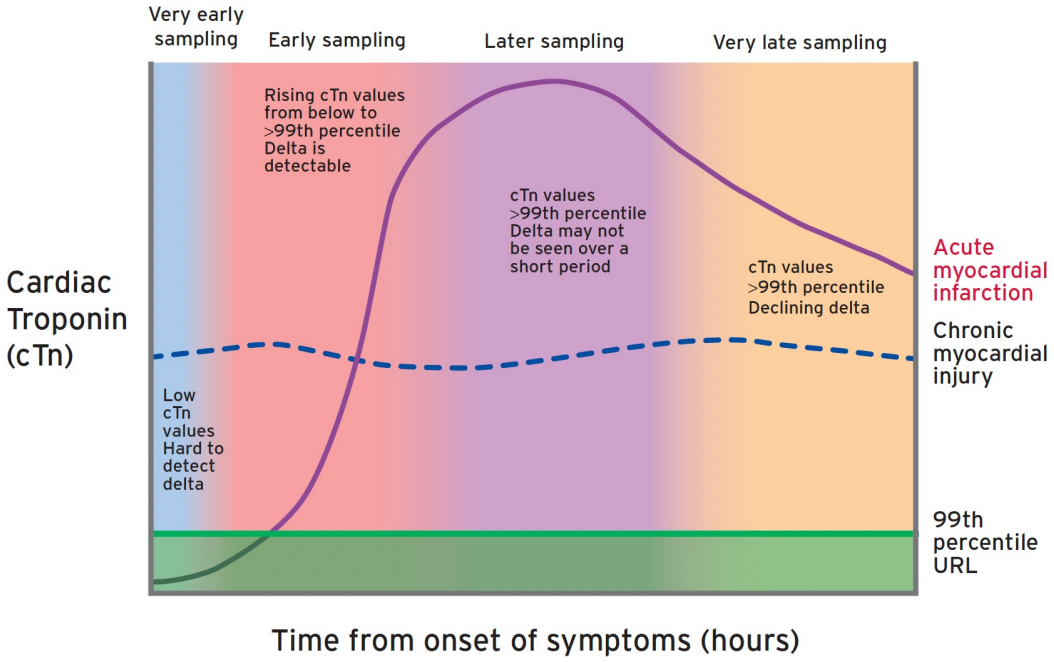


Potter JM et al. Aust Prescr 2022;45:53-7.

Dynamics of Troponin release



Mild troponin elevations (< 3x ULN)

1 **What is the pre-test probability for MI based on chest pain onset, signs and ECG findings?**
E.g., typical pain, CPO 2h, ST-segment ↓ (resulting in a PPV for MI ≈ 90%)

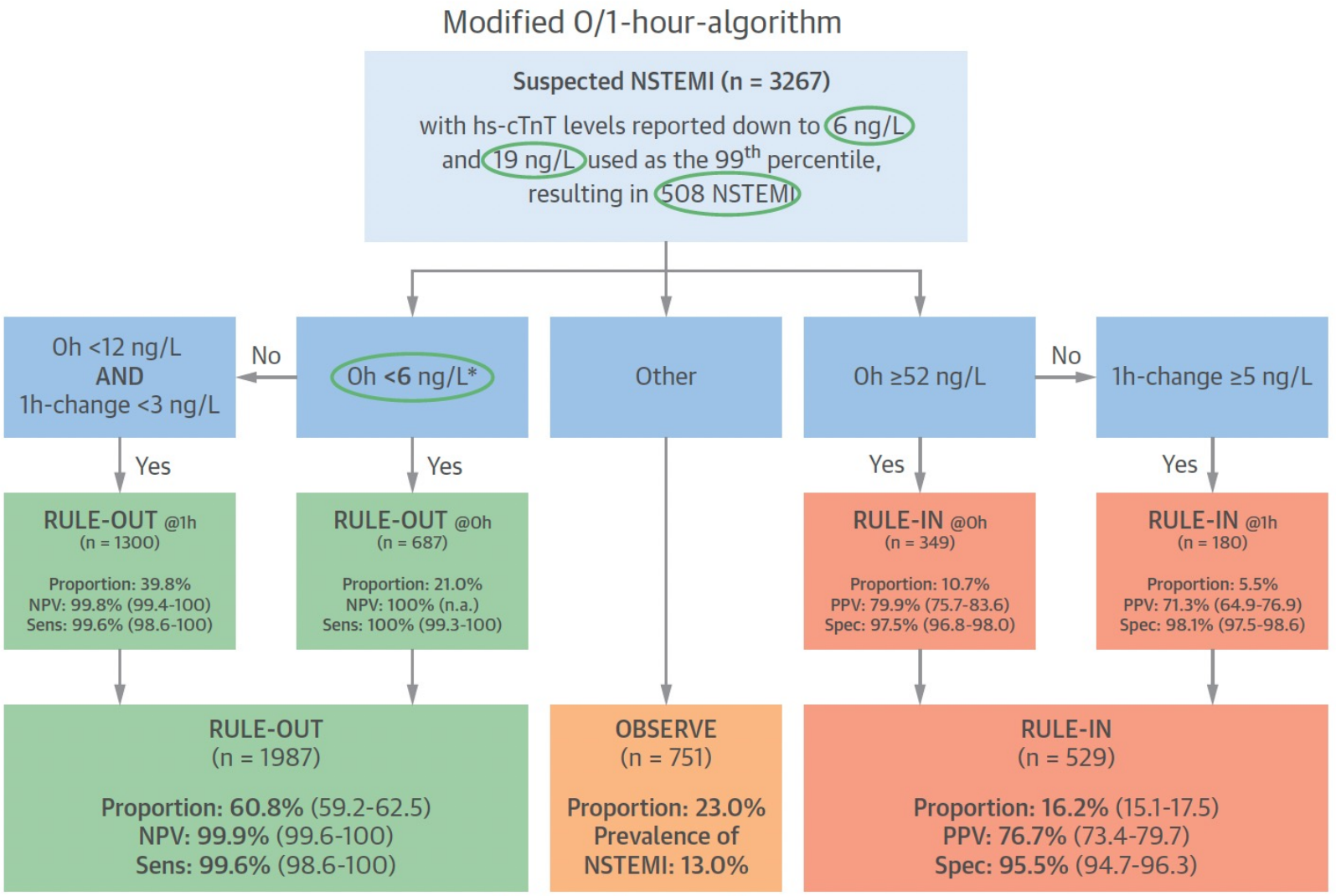
2 **Does my patient have a readily identifiable non-MI cause for low level cTn elevations?**
E.g., age, heart failure, aortic stenosis, pulmonary embolism.
The more plausible the alternative cause for low level cTn elevations, the less likely that any immediate further diagnostic work-up for MI is justified and/or necessary.

3 **What other diagnostic test is useful?**
1h/3h cTn re-measurement, echo, stress-echo, CMR, MPI-SPECT.

Thygesen K et al. Eur Heart Journal 2019; 40:237-269.

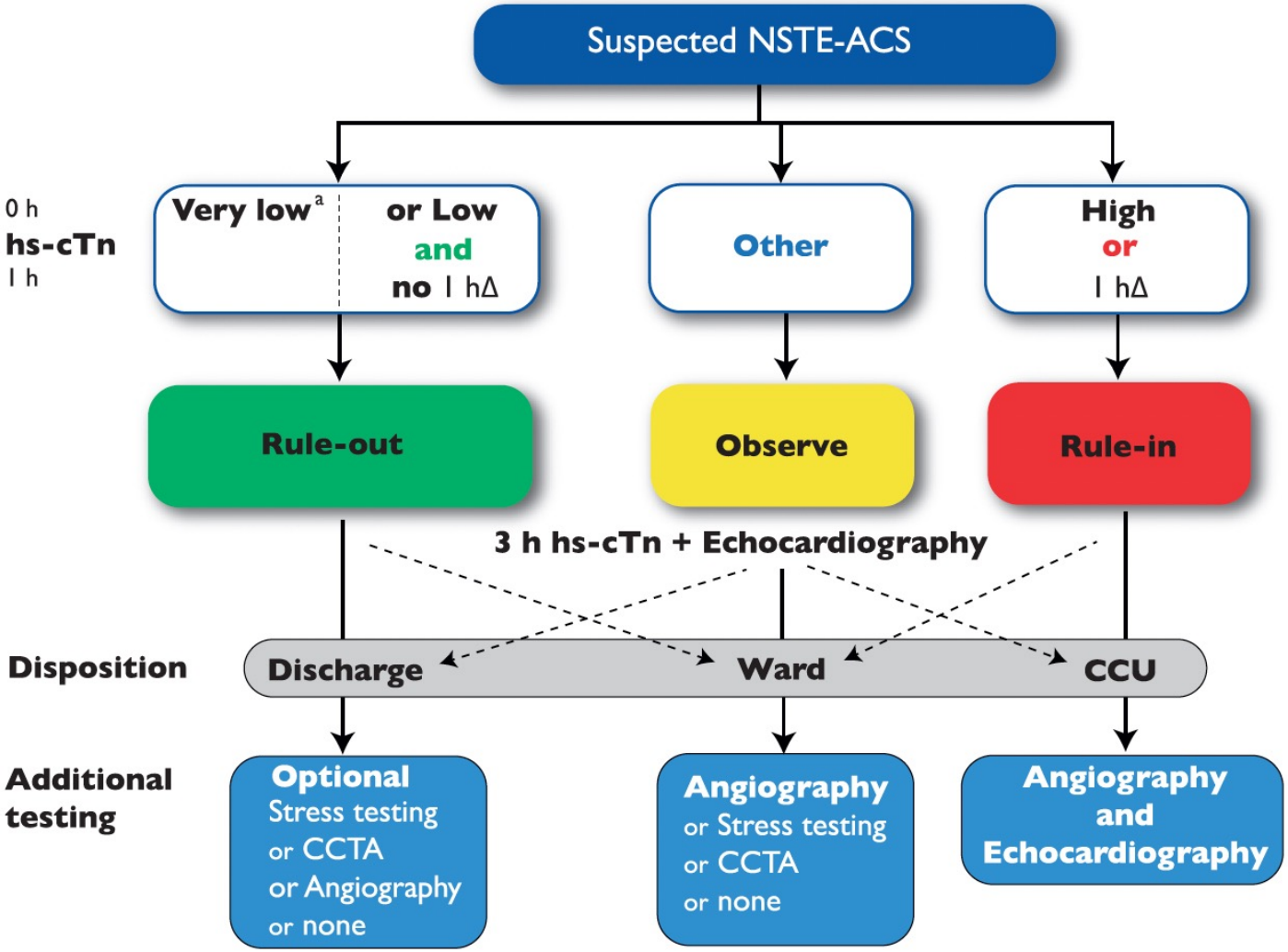
Twerenbold R et al. J Am Coll Cardiol 2017;70:996-1012.

0h/1h ALGORITHM



Twerenbold R et al. J Am Coll Cardiol 2017;70:996-1012.

ESC Guidelines 2020



Risk of	Low risk	Intermediate risk	High risk
MI at index visit	<0.3%	≈10%	>65%
30-day MACE	<0.5%	15–20%	>70%

Collet J P et al. Eur Heart J 2021;42:1289-1367.

Cut-offs for Troponin tests

0 h/1 h algorithm	Very low	Low	No 1hΔ	High	1hΔ
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
0 h/2 h algorithm	**Very low**	**Low**	**No 2hΔ**	**High**	**2hΔ**
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

Collet J P et al. Eur Heart J 2021;42:1289-1367.

Clinical Case I

History: 75 y/o patient, chest pain and dysnea

Diagnosis:

- CHD 3-V with reduced ejection fraction (EF=40%)
  - Anterior MI 2010
  - Bypass 2010 (LIMA-LAD, SVG ad RIM and RPLD)
- Diabetes Type II
- A. carotis Stenosis 60% right
- Art. Hypertension
- Hypercholesterolemia
- Chronic Kidney Disease (GFR 40)

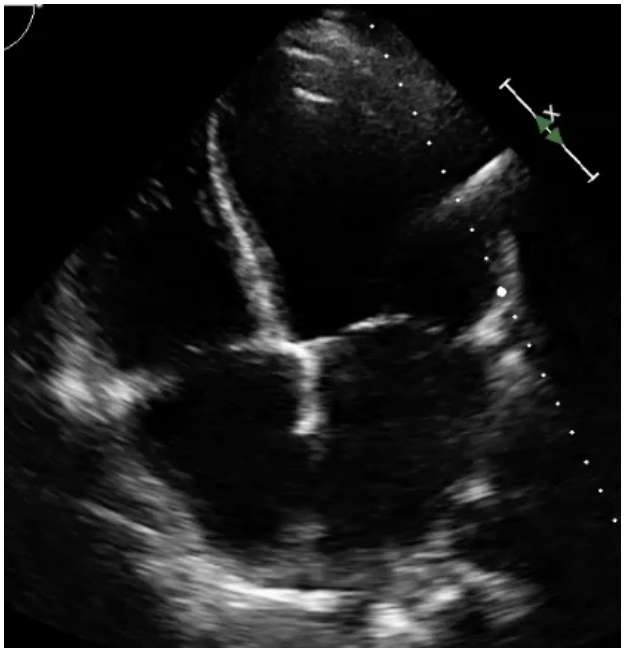
Labor: Hb 9,6; TnT 300; CK 400; Crea 1,4; proBNP 25000; LDL 140, HbA1c 7,5

Medication: Aspirin 100, Ramipril 5mg, Spironolactone 25mg, Bisoprolol 5mg, Sitagliptin 50mg, Ezetimibe/Atorvastatin 10/40mg


Analysiertes EKG HF: 78
(50 mm/s 10 mm/mV 2 Filter)
Kanal
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
00|01
00|02
00|03
00|04
HF: 78 / P: 0 ms / PQ: 0 ms / QRS: 185 ms / QT: 506 ms / QTc: 552 ms (141%) / QTc-Disp.: 102 ms / QRS-Achse: -34°

ECG

Echo



Cath lab

before PCI

post PCI

Clinical Case II

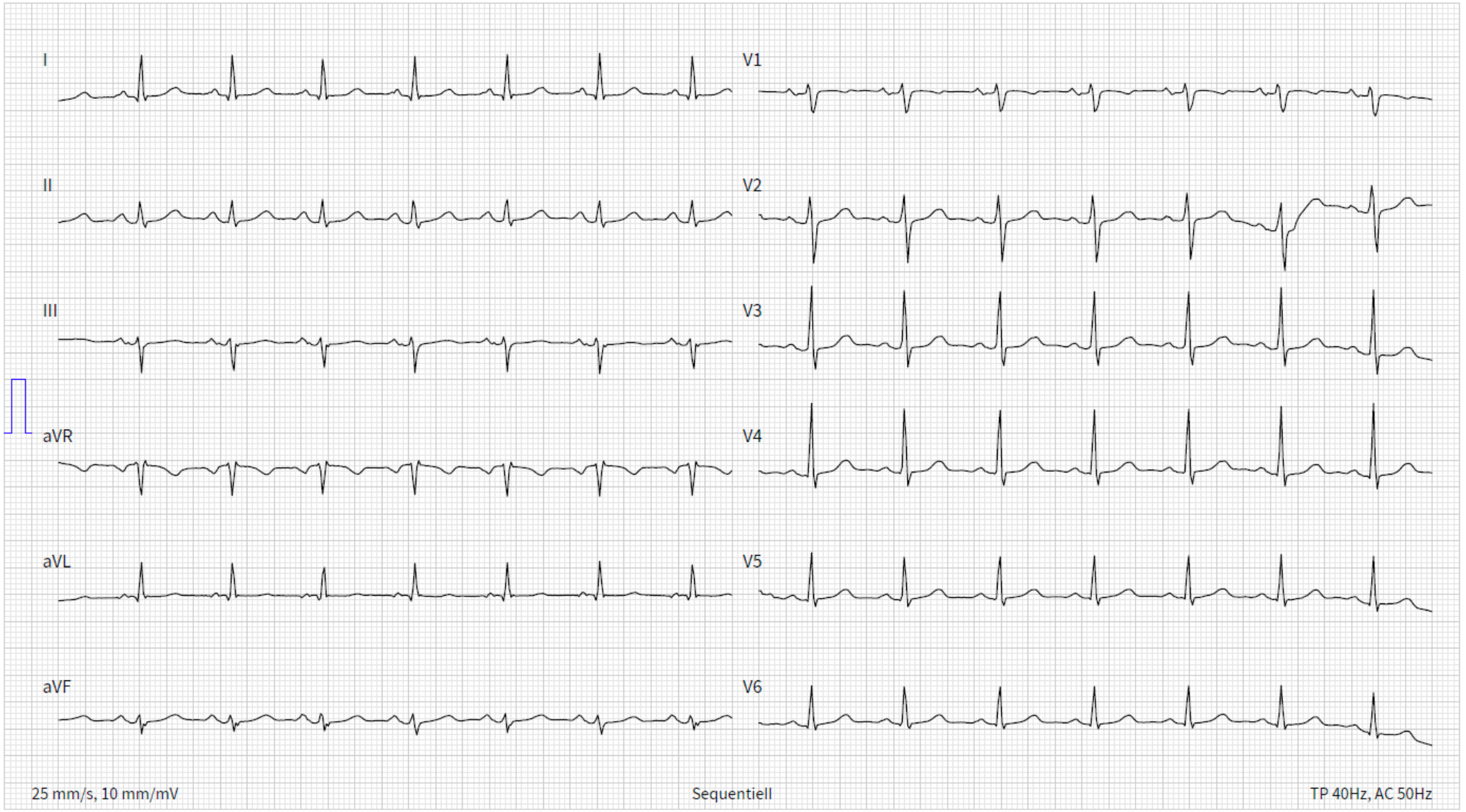
History: 57y/o patient, admitted with angina

Diagnosis:

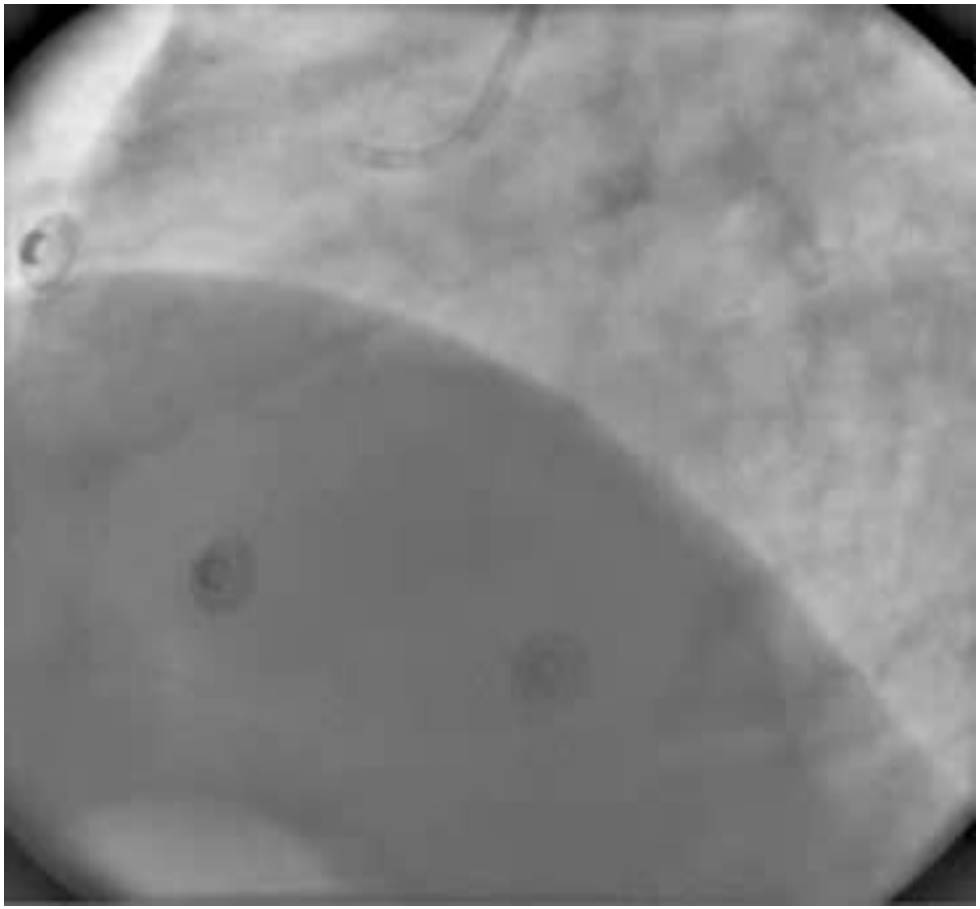
- CHD 2-VD with normal ejection fraction (EF=60%)
  - LAD PCI 2016
  - No new stenoses
- Diabetes Type II
- Obesity, BMI 30
- Art. Hypertension
- Hypercholesterolemia
- Smoker (40py)

Labor: Hb 12,2; TnT 20; CK 82; Crea 0,7; proBNP 100; LDL 234, TG 178, HbA1c 7,9.

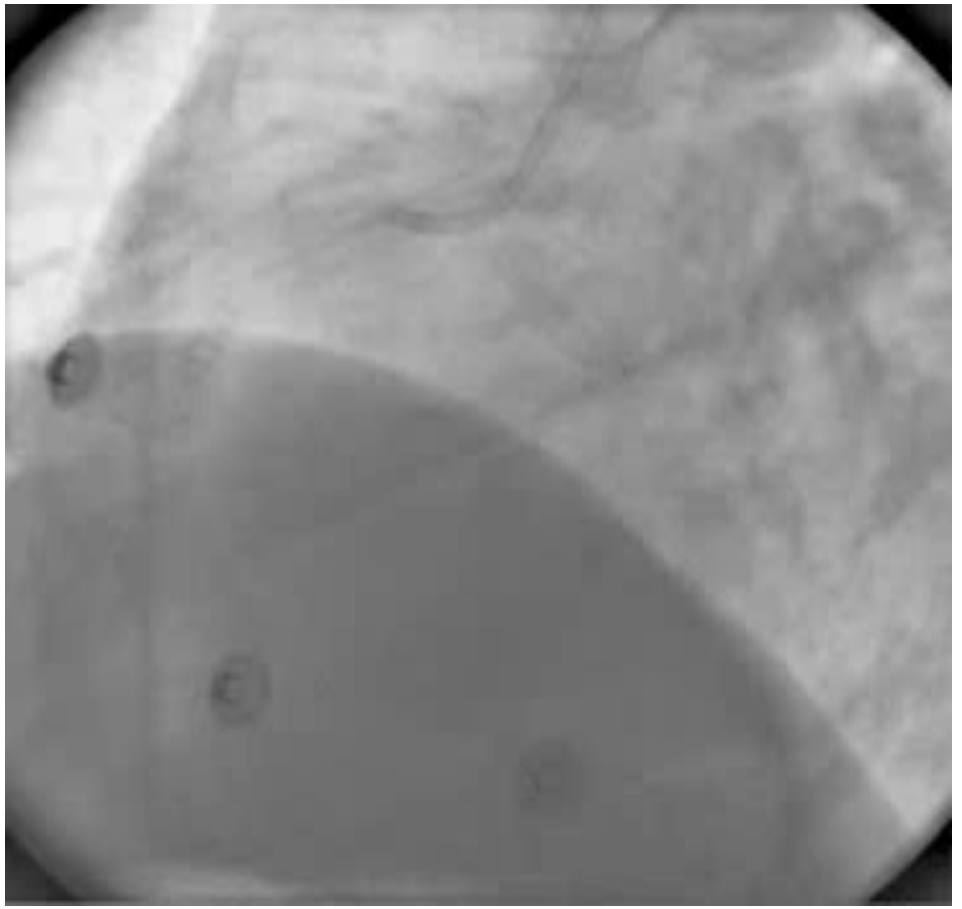
Medication: Aspirin 100mg od, Metformin 1000mg od, Diovan 80mg od, Simvastatin 10mg od.


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
25 mm/s, 10 mm/mV
Sequentiell
TP 40Hz, AC 50Hz

Cath lab:



before PCI



post PCI

Clinical Case III

History: 81y/o patient, admitted with dynea and blood pressure of 180/100mmHg

Diagnosis:

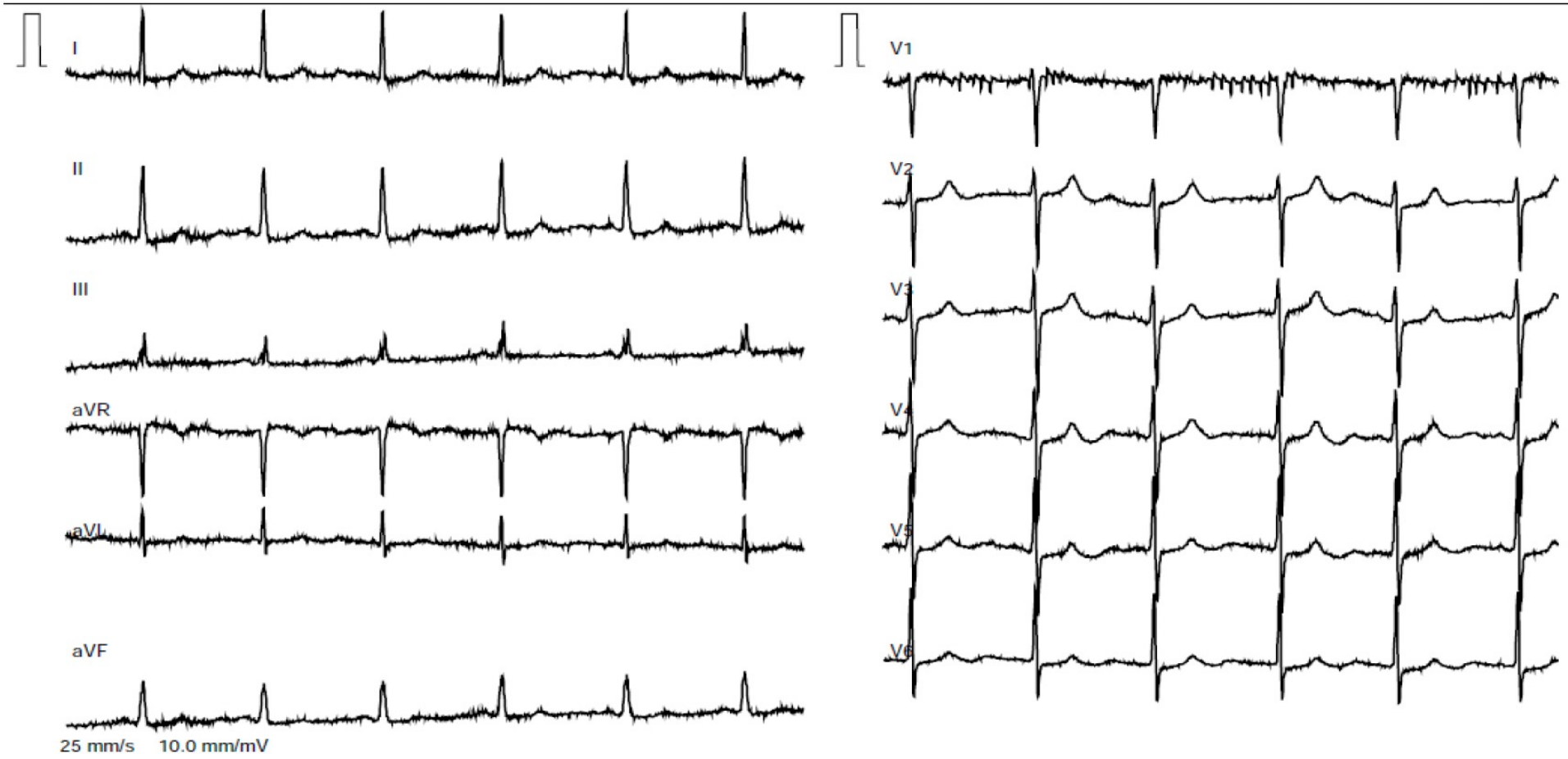
- Hypertensive heart failure (EF=30%)
  - No CHD (cath 2019)
  - Several decompensations
- Art. Hypertension
- Hypercholesterolemia
- CKD

Labor: Hb 12,6; TnT 36; CK 50; Crea 1,4; proBNP 2118; LDL 90, TG 110, HbA1c 6,0.

Medication: Apixaban 2,5mg, Metoprolol 100mg, Valsartan/Sacubitril 98/102mg, Torasemid 10mg, Spironolacton 25mg, Atorvastatin 10mg

Geb:	25.05.1928	HF	77 /min	Intervalle		Interpretation	
Alter:	84 Jahre	Achsen		RR	784 ms		
Geschl:	W	P	91 °	P	106 ms		
Grösse:	-.- cm	QRS	33 °	PQ	130 ms		
Gewicht:	-.- kg	T	3 °	QRS	82 ms		
BD:	- / - mmHg			QT	366 ms		
				QTc	415 ms		
Med:							
Bem:							

Validiert von



Clinical Case IV

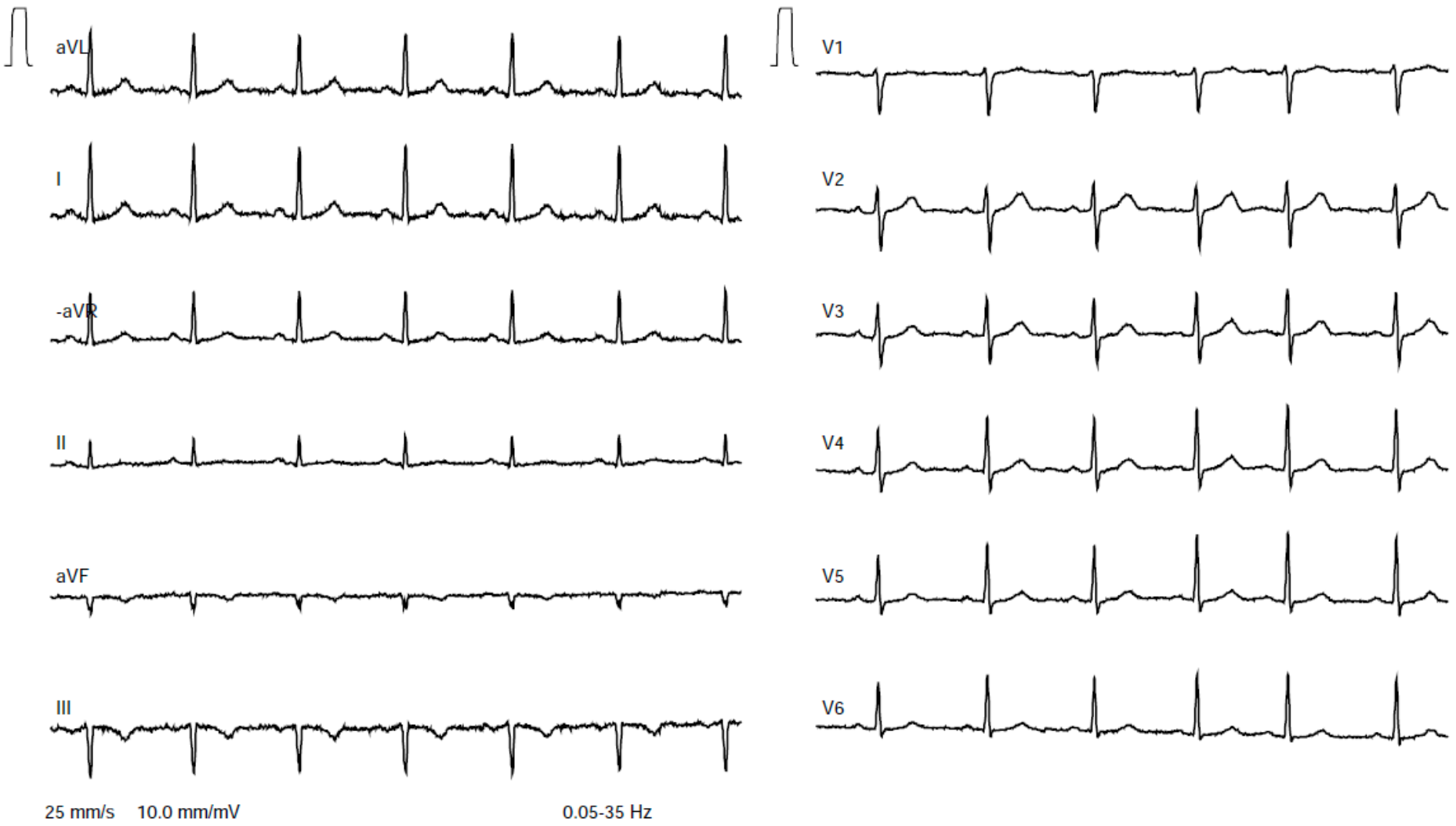
History: 61y/o patient, admitted with chest pain at night, currently no symptoms

Diagnosis:

- Art. Hypertension
- Hypercholesterolemia
- Nicotin abuse (30py)

Labor: Hb 13,2; TnT 5; CK 60; Crea 0,9; proBNP 100; LDL 70, TG 105, HbA1c 5,8.

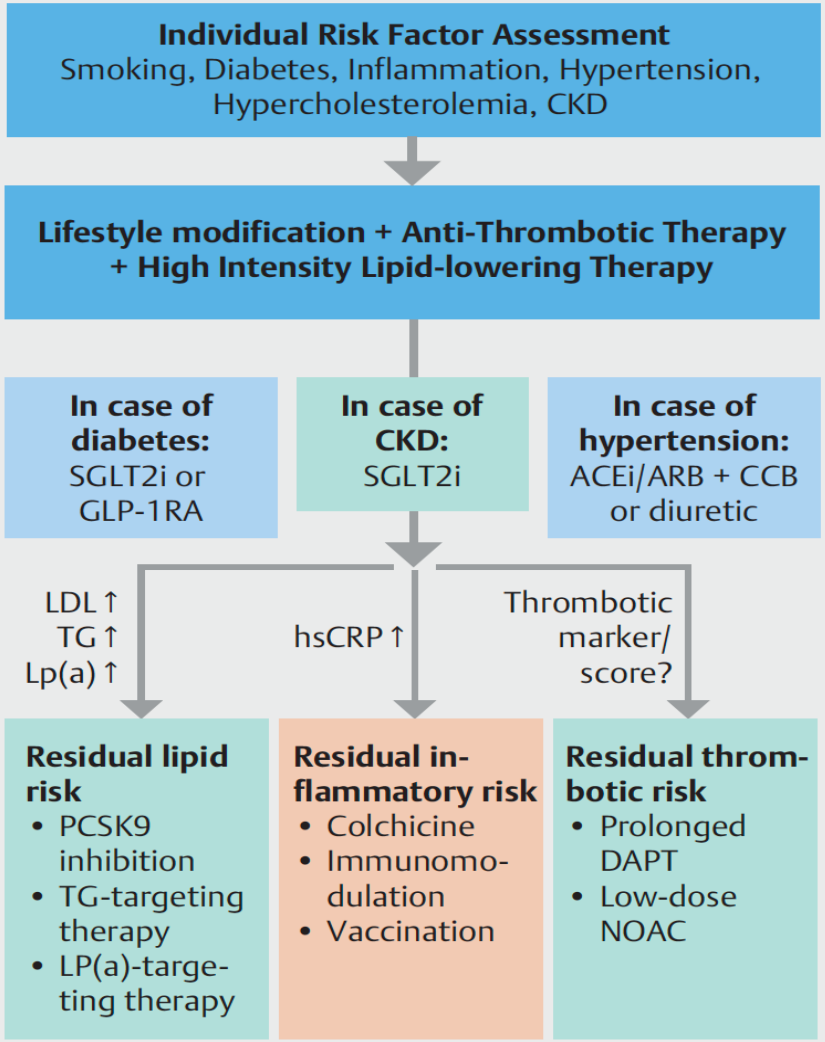
Medication: Valsartan 160mg


aVL
I
-aVR
II
aVF
III
V1
V2
V3
V4
V5
V6
25 mm/s
10.0 mm/mV
0.05-35 Hz

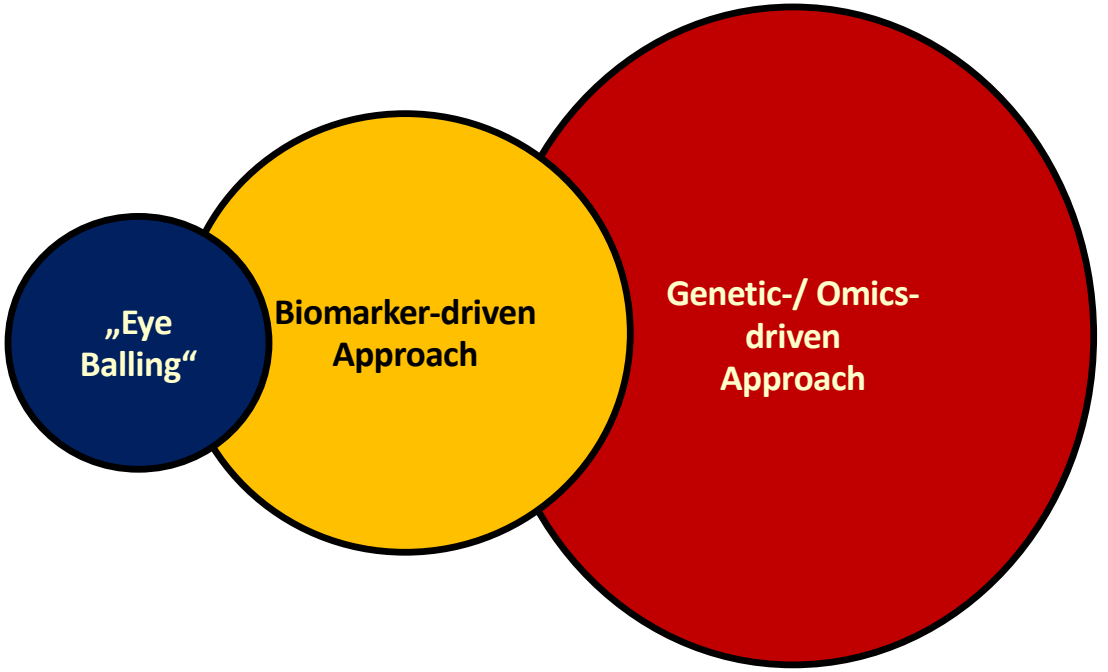
PRECISION MEDICINE in the light of a silent revolution of NEW THERAPIES mitigating RESIDUAL…

- inflammatory risk
- lipid risk
- thrombotic risk
- diabetic risk
- heart failure risk

High Risk management today and tomorrow



Precision Medicine - What is precise?



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HEART-FLOW
HERZ~FLUSS

Universitäres Herzzentrum Graz


HERZLICHEN
DANK!
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ZMF
Medizinische
Universität
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