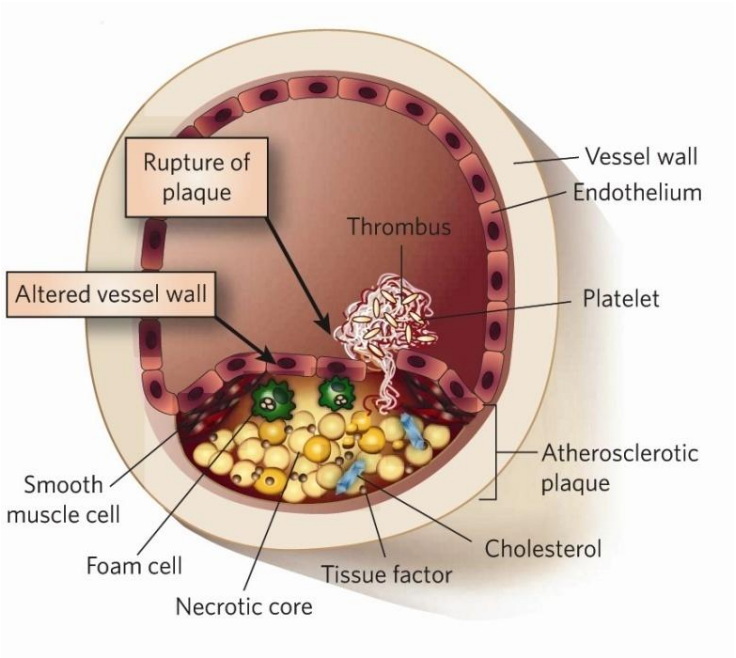
Treatment of Perioperative Myocardial Infarction



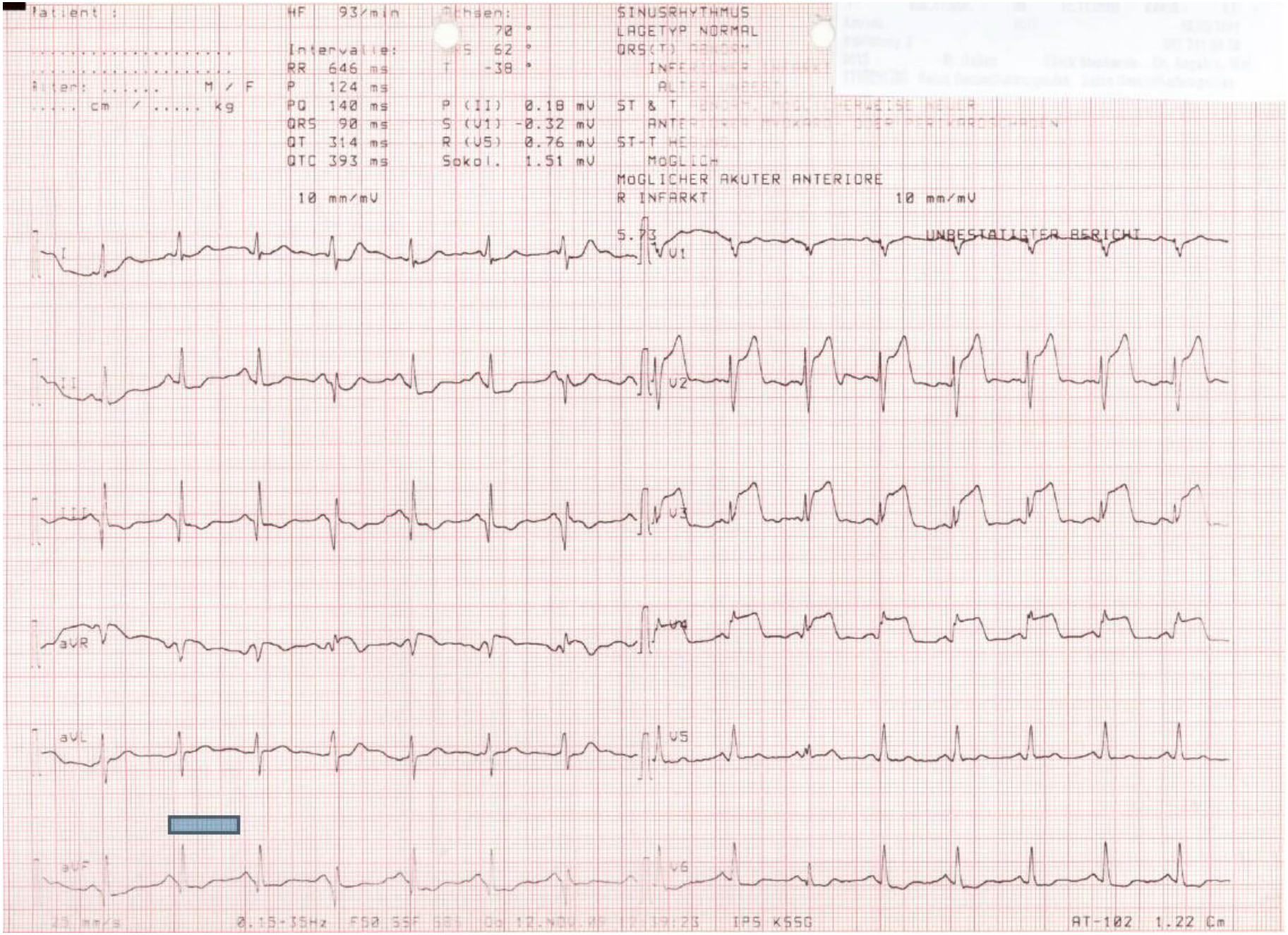
Tightrope walk beetween thrombosis and bleeding

Kantonsspital St.Gallen

Hans Rickli

Pat. history: K.W. ♂,1941

- Elective hip replacement in spinal anaesthesia
  - Arterial hypertension treated with ACE-inhibitor
- 1 hour after uneventful surgery: Ongoing chest pain
- BP left arm: 102/70 mmHg, Pulse 90/‘, reg. SR
  - ECG


Patient :
Alter: ..... M / F
..... cm / ..... kg
HF 93/min
Intervalle:
RR 646 ms
P 124 ms
PQ 140 ms
QRS 90 ms
QT 314 ms
QTC 393 ms
Achsen:
70 °
62 °
T -38 °
P (II) 0.18 mV
S (V1) -0.32 mV
R (V5) 0.76 mV
Sokol. 1.51 mV
10 mm/mV
SINUSRHYTHMUS
LAGETYP NORMAL
INFE
ALTER
ST & T
ANTE
ST-T HE
MOGLICH
MOGLICHER AKUTER ANTERIORE
R INFARKT
10 mm/mV
5.73
UNBESTATIGTER BERICHT
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
0.15-150Hz
IPS K55G
AT-102 1.22 Cm

Perioperative MI

- Size of the problem (epidemiology, prognosis)
- Pathophysiology
- Treatment
- Prevention

Size of the adult non-cardiac surgical cohort and average risk of cardiac complications

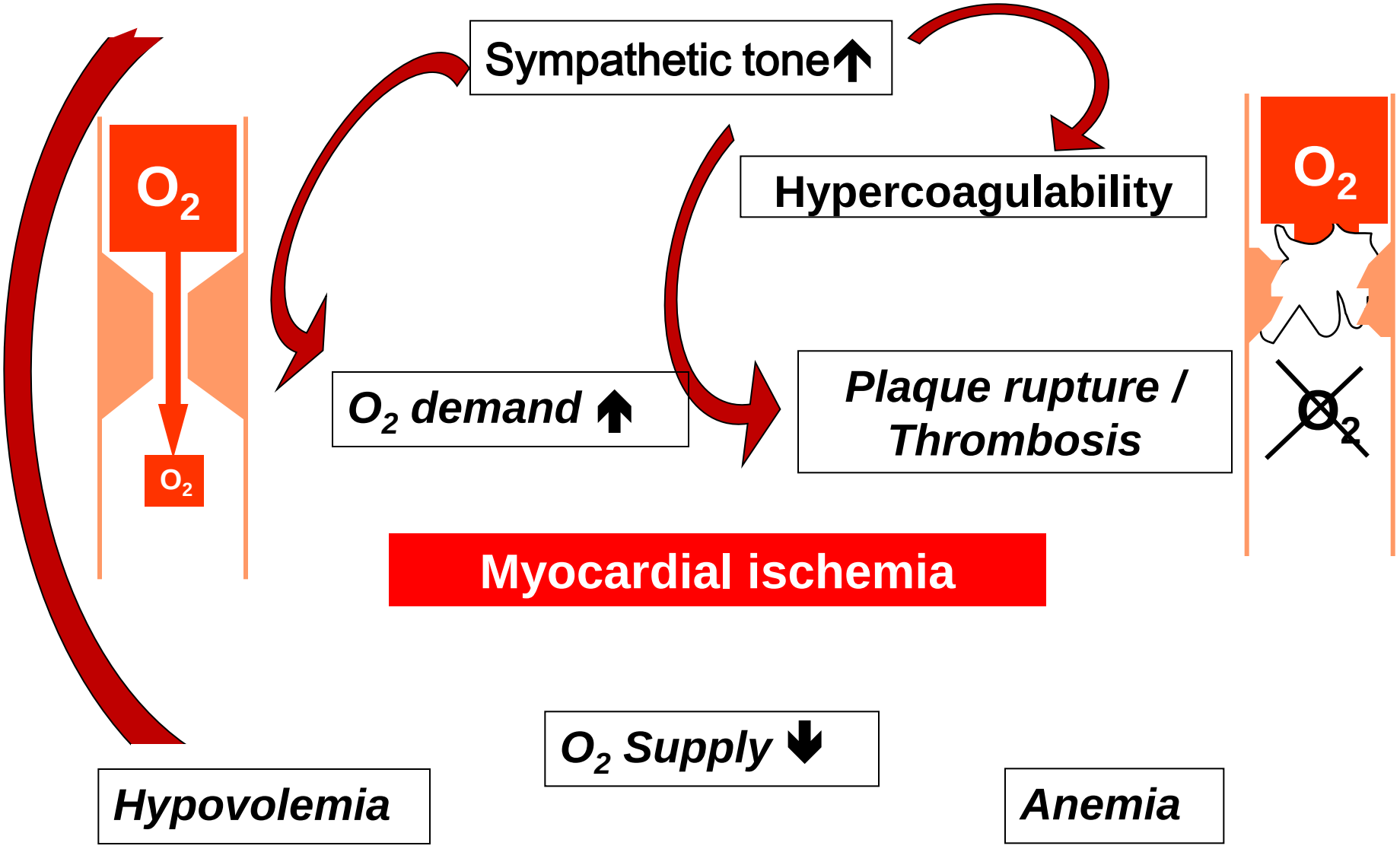
- **Netherlands (16 Mio)[1]** 
  - **250 000 major non-cardiac surgical procedures per year (1991–2005) → annual rate of 1.5%**
- **Europe (500 Mio)** 
  - **estimate of 7 million major non-cardiac surgical procedures annually**
    - **MI = most important perioperative vascular complication (POISE-Study)**
- **major complications rate varying from 1.7 to 3.5%[2]**

1. http://www.prismant.nl/. Ziekenhuisstatistiek—Verrichtingen. 2008, Prismant.

2. Am J Med 2005;118:1134–1141.; Circulation 2003;107:1848–1851. J Am Coll Cardiol 2006;48:964–969; N Engl J Med 1999;341:1789–1794.

Pathophysiology

Lurati Buse G, et al. Schweiz Med Forum 2007; 7: 496 – 503



Lurati Buse G, et al. Schweiz Med Forum 2007; 7: 496 – 503

….. walk beetween thrombosis and bleeding

Definition perioperative MI

Appendix Table 2. **Defining Features of Perioperative MI**

Elevated cardiac biomarker level

✚

Ischemic symptoms
Q waves
ST-segment elevation
ST-segment depression
T-wave inversion
Coronary artery intervention
Cardiac imaging evidence of MI

Devereaux PJ, et al. Ann Intern Med 2011; 154: 523-8

Definition perioperative MI

Appendix Table 2. **Defining Features of Peri… MI**

Elevated cardiac biomarker level

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	…nts With Perioperative MI …Who Had This Feature, *n* (%)*
Ischemic symptoms	144 (34.7)
Q waves	51 (12.3)
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ST-segment depr…	130 (31.3)
T-wave inversion	90 (21.7)
Coronary artery intervention	29 (7.0)
Cardiac imaging evidence of MI	108 (26.0)

65% „asymptomatic“

Devereaux PJ, et al. Ann Intern Med 2011; 154: 523-8

Management perioperative MI

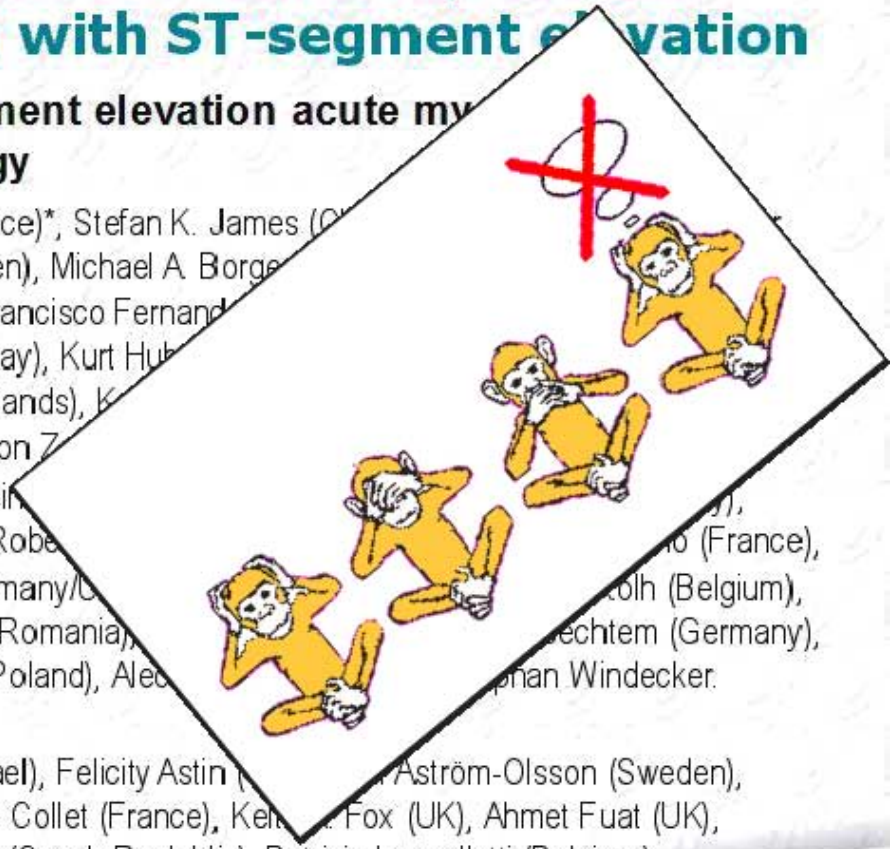
- Perioperative ACS
  - Same management as without non-cardiac surgery ?

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

ESC GUIDELINES

ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation

The Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology



Authors/Task Force Members: Ph. Gabriel Steg (Chairperson) (France)*, Stefan K. James (Sweden), Dan Atar (Norway), Luigi P. Badano (Italy), Carina Blomstrom Lundqvist (Sweden), Michael A. Borger (United Kingdom), Kenneth Dickstein (Norway), Gregory Ducrocq (France), Francisco Fernandez-Aviles (Spain), John Gershlick (United Kingdom), Pantaleo Giannuzzi (Italy), Sigrun Halvorsen (Norway), Kurt Huber (Austria), Steen Kristensen (United Kingdom), Aleksandra Kastrati (Germany), Juhani Knuuti (Finland), Mattie J. Lenzen (Netherlands), Keith A. A. Mulder (Canada), Marco Roffi (Switzerland), Arnoud van't Hof (Netherlands), Petr Widimsky (Czech Republic), Doron Zahger (Israel)

ESC Committee for Practice Guidelines (CPG): Jeroen J. Bax (Chair), Helmut Baumgartner (Germany), Claudio Ceconi (Italy), Veronica Dean (France), Christi Deaton (UK), Robert Fagard (Belgium), John Gorenek (France), David Hasdai (Israel), Arno Hoes (Netherlands), Paulus Kirchhof (Germany/UK), Keith Mc Donagh (Belgium), Theresa McDonagh (UK), Cyril Moulin (France), Bogdan A. Popescu (Romania), Ph. Gabriel Steg (France), Alec Vahanian (France), David Wood (UK), Jose Luis Zamorano (Spain), Guy De Backer (Belgium), Stephan Achenbach (Germany), Stephan Windecker (Switzerland)

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European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

www.escardio.org/guidelines

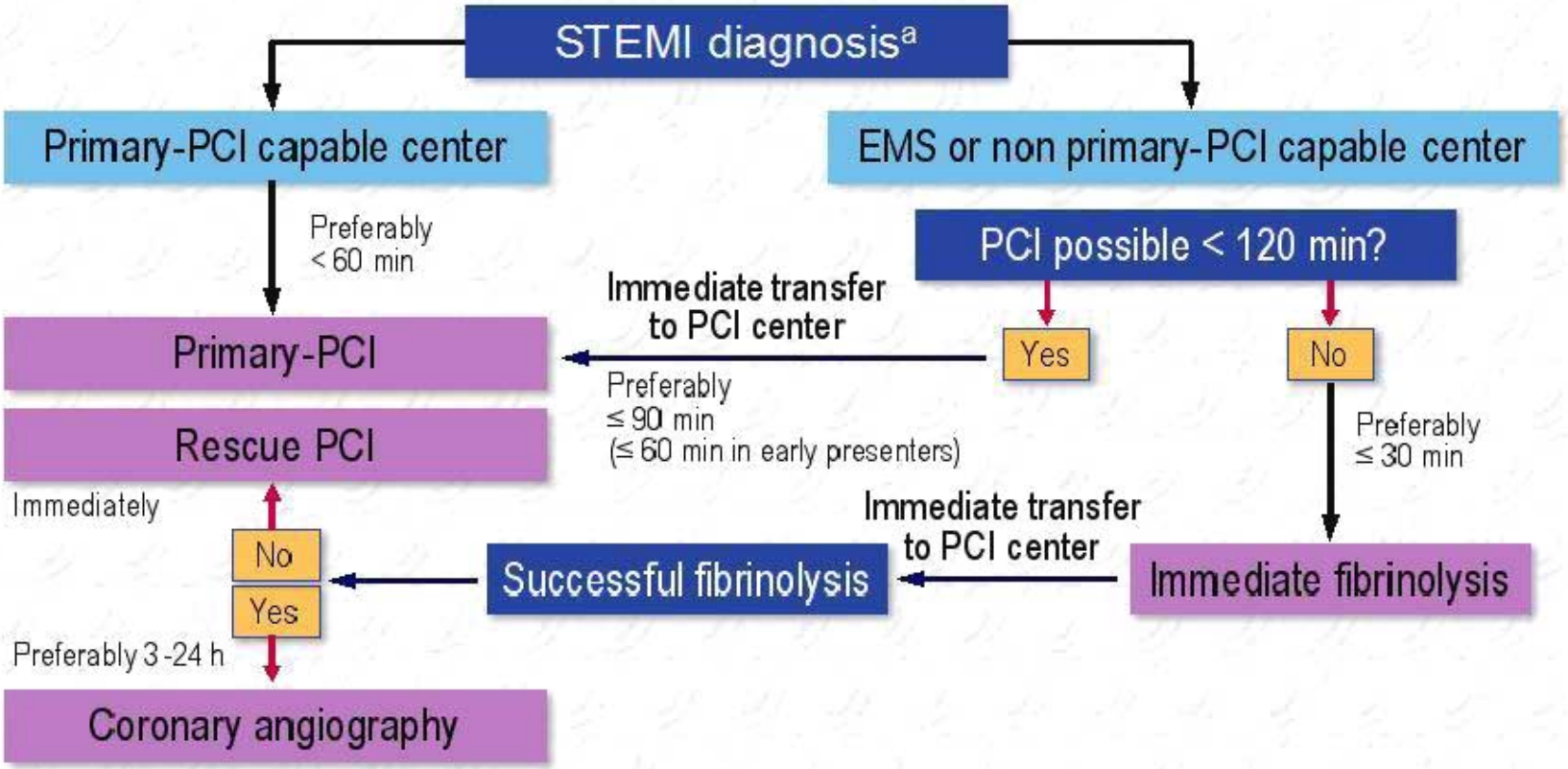
Management perioperative MI

- **Perioperative ACS**
  - **Same management as without non-cardiac surgery**
  - **Modification according to surgical circumstances**
    - **Bleeding risk**
    - **Access (femoral vs radial)**

Kantonsspital St.Gallen

Local Guidelines KSSG 05/2012

Prehospital and in-hospital management, and reperfusion strategies within 24 h of FMC



[a] 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.

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

www.escardio.org/guidelines

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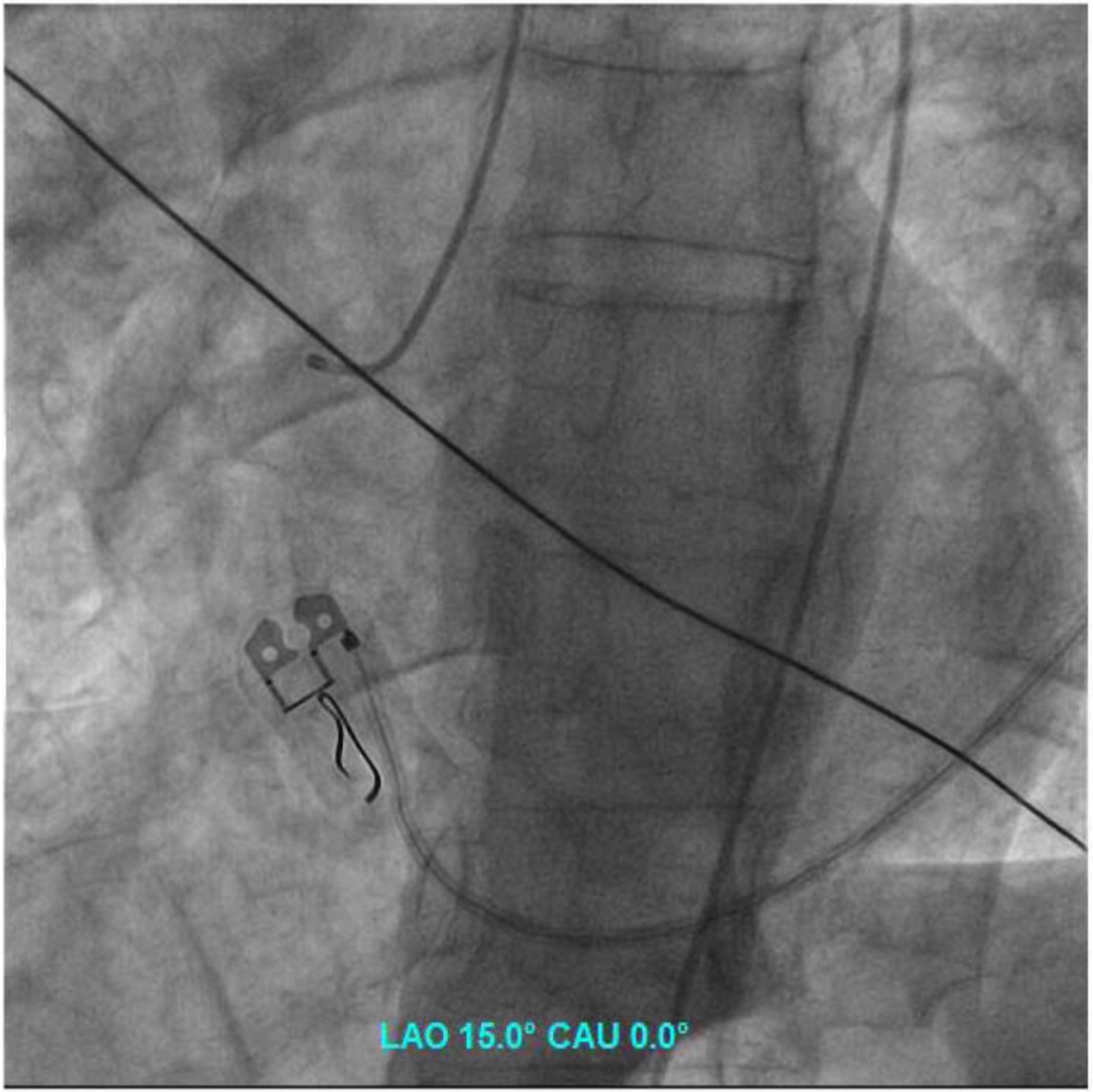
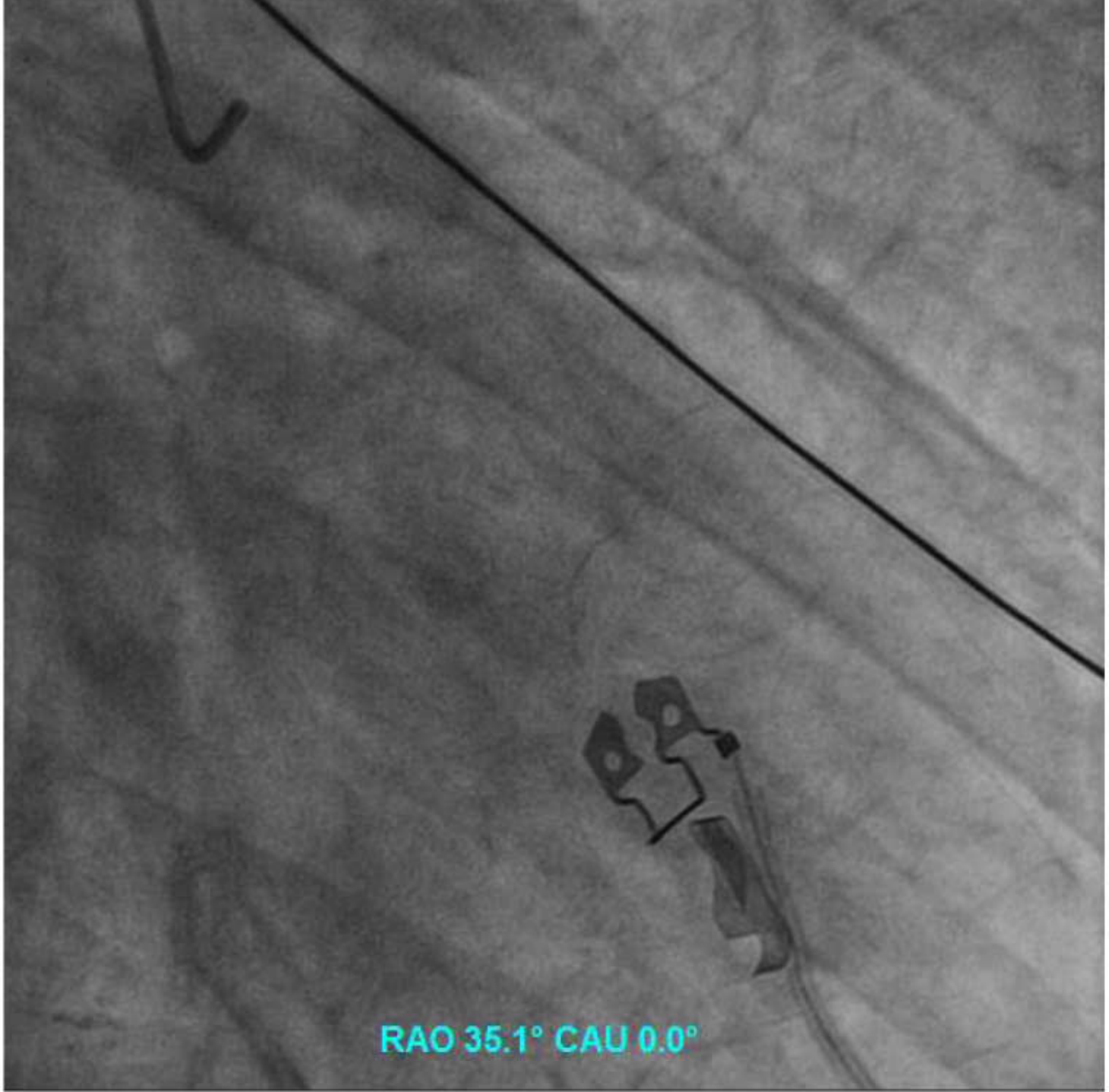
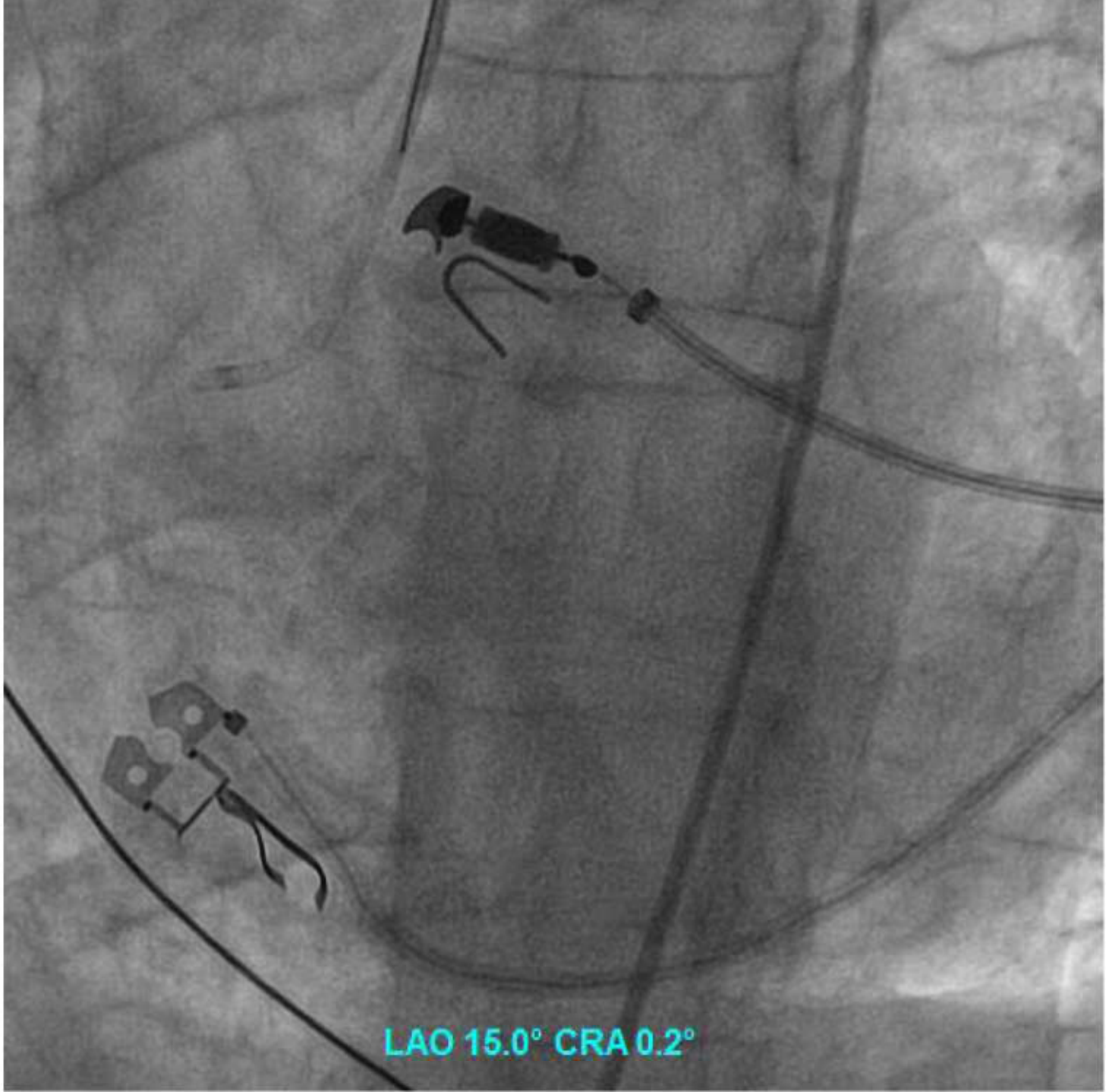

LAO 15.0° CAU 0.0°


RAO 35.1° CAU 0.0°

RAO 12.0° CRA 52.0°


LAO 15.0° CRA 0.2°

Reperfusion therapy

Recommendations	Class	Level
Reperfusion therapy is indicated in all patients with symptom… duration and persistent ST-segment elevation or (presu… …BBB.	I	A
Reperfusion therapy (preferably primary PCI) is i… …here is evidence of ongoing ischaemia, even if symp… …have started > 12 h beforehand or if pain and ECG ch… …been stuttering.	I	C
Reperfusion therapy with primary P… considered in stable patients presenting 12-24 h aft… …onset.	IIb	B
Routine PCI of a totally … …tery > 24 h after symptom onset in stable patients witho… …schaemia (regardless of whether fibrinolysis was given … is not recommended.	III	A

even in 65% „asymptomatic"

ECG = electrocardiogram; i.v. = intravenous; LBBB = left bundle branch block; PCI = percutaneous coronary intervention.

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

Periprocedural anti thrombotic medication in primary PCI

Recommendations	Class	Level
Antiplatelet therapy		
Aspirin oral or i.v. (if unable to swallow) is recommended	I	B
An ADP-receptor blocker is recommended in addi Options are:	I	A
• Prasugrel in clopidogrel-naive patients, if no history age < 75 years.	I	B
• Ticagrelor.	I	B
• Clopidogrel, preferably when prasugrel or ticagrelo contraindicated.	I	C

ADP = adenosine diphosphate.

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

Periprocedural anti thrombotic medication in primary PCI, *con't*

Recommendations	Class	Level
GP IIb/IIIa inhibitors should be considered for bailout therapy if there is angiographic evidence of massive thrombus, slow or no-reflow or a thrombotic complication.	IIa	C
Routine use of a GP IIb/IIIa inhibitor as an adjunct to primary PCI performed with unfractionated heparin may be considered in patients without contraindications.	IIb	B
Upstream use of a GP IIb/IIIa inhibitor (vs. in-lab use) may be considered in high-risk patients undergoing transfer for primary PCI.	IIb	B
Options for GP IIb/IIIa inhibitors are (with LoE for each agent):		
• Abciximab		A
• Eptifibatide (with double bolus)		B
• Tirofiban (with a high bolus dose)		B

GP = glycoprotein; i.v. = intravenous; lab = catheterization laboratory.

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

Periprocedural anti thrombotic medication in primary PCI, *con't*

Recommendations	Class	Level
Anticoagulants		
An injectable anticoagulant must be used in primary PCI.	I	C
Bivalirudin (with use of GP IIb/IIIa blocker restricted to bailout) is recommended over unfractionated heparin and a GP IIb/IIIa blocker.	I	B
Enoxaparin (with or without routine GP IIb/IIIa blocker) may be preferred over unfractionated heparin.	IIb	B
Unfractionated heparin with or without routine GP IIb/IIIa blocker must be used in patients not receiving bivalirudin or enoxaparin.	I	C
Fondaparinux is not recommended for primary PCI.	III	B
The use of fibrinolysis before planned primary PCI is not recommended.	III	A

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

Definition perioperative MI

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65% „asymptomatic“

Devereaux PJ, et al. Ann Intern Med 2011; 154: 523-8

Troponin after non-cardiac surgery: Meta-analysis

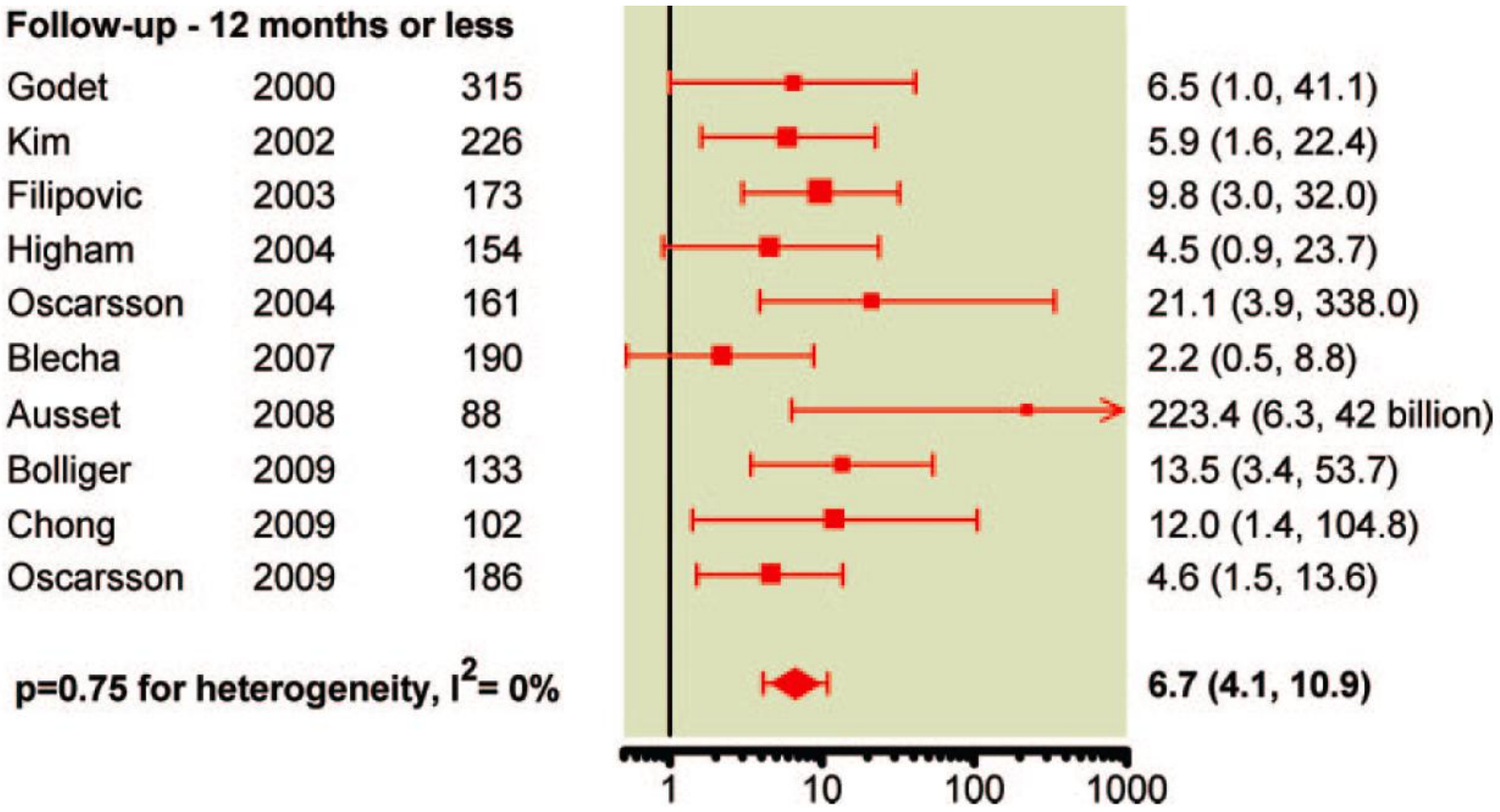
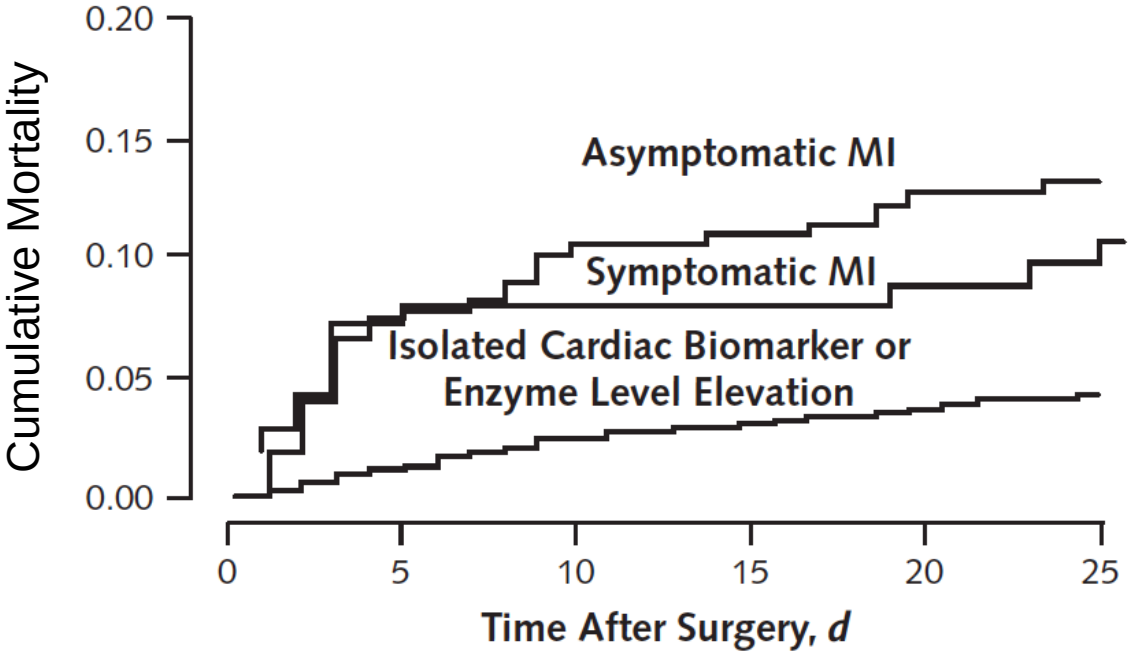


Fig. 4. Adjusted odds ratio for an increased postoperative troponin measurement to predict all-cause mortality based on duration of follow-up.

Levy M, et al. Anesthesiology 2011; 114: 796-806

Characteristics and Short-Term Prognosis of Perioperative Myocardial Infarction in Patients Undergoing Noncardiac Surgery

A Cohort Study



Patients at risk, *n*					
Symptomatic MI	144	130	126	118	106
Asymptomatic MI	271	238	234	226	214
Isolated cardiac biomarker or enzyme level elevation	697	665	658	645	624

Devereaux PJ, et al. Ann Intern Med 2011; 154: 523-8

NSTEMI-Guidelines: What‘s new?

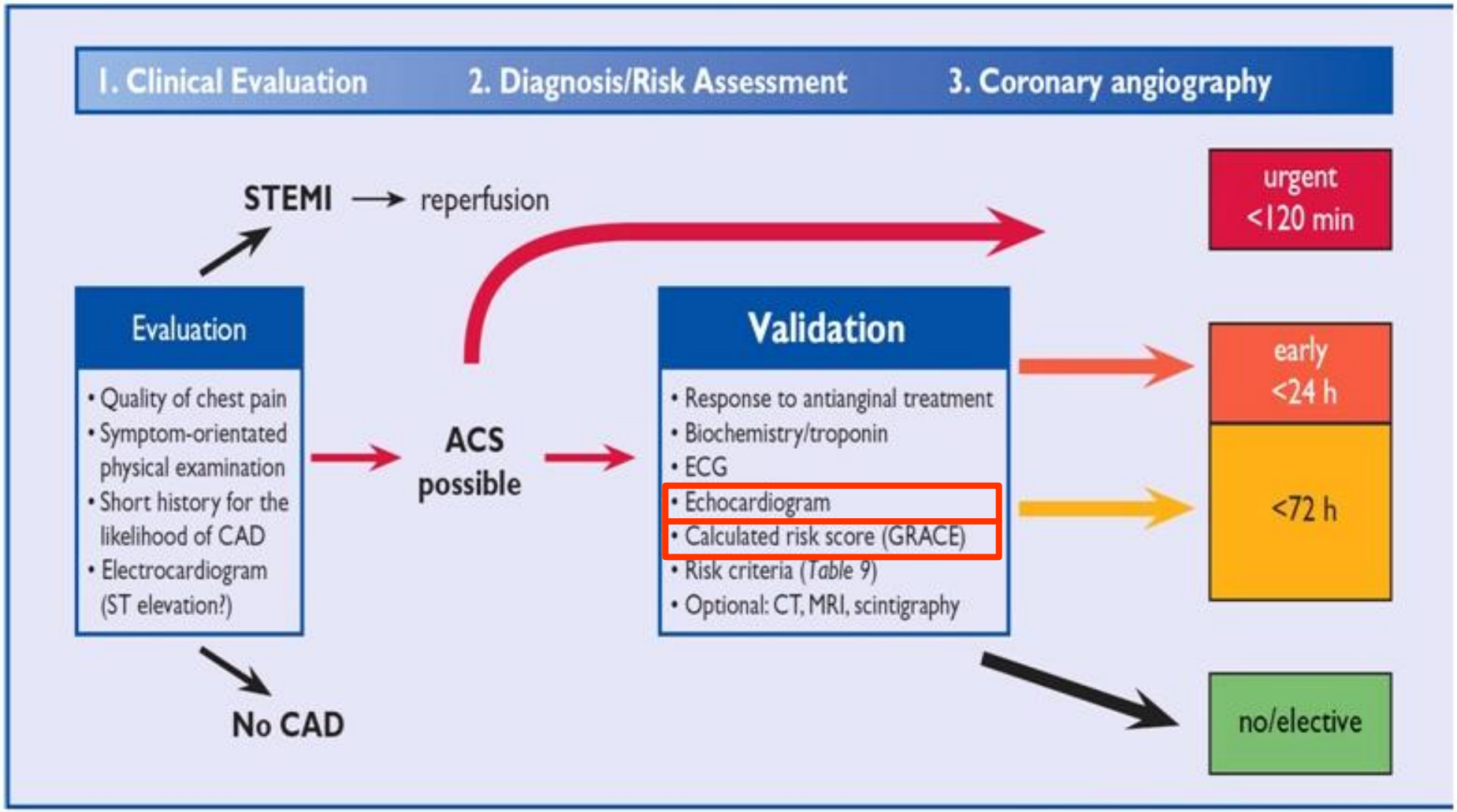
ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation

The Task Force for the management of acute coronary syndromes (ACS) in patients presenting without persistent ST-segment elevation of the European Society of Cardiology (ESC)

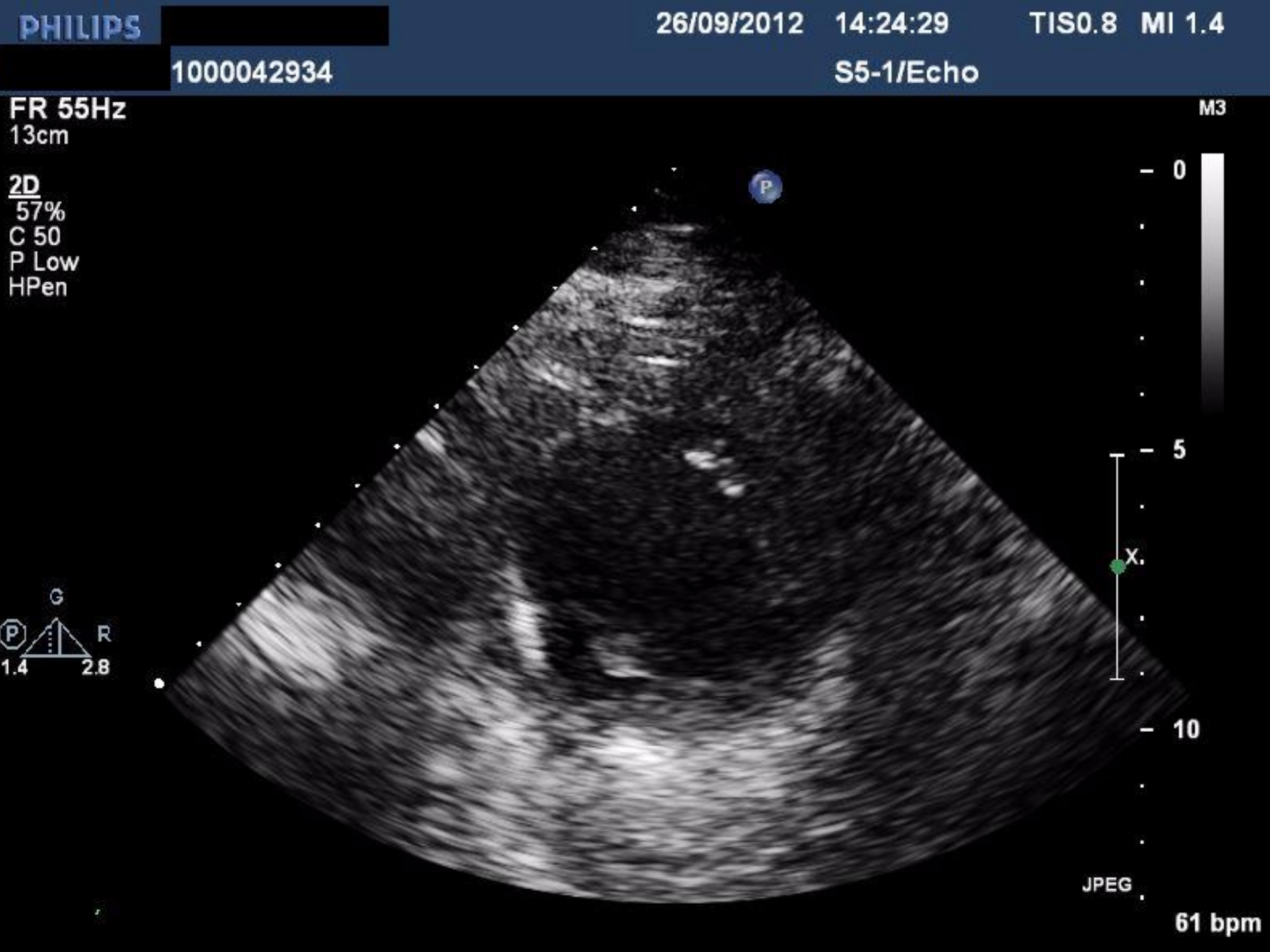
Authors/Task Force Members: Christian W. Hamm (Chairperson) (Germany)*, Jean-Pierre Bassand (Co-Chairperson)*, (France), Stefan Agewall (Norway), Jeroen Bax (The Netherlands), Eric Boersma (The Netherlands), Hector Bueno (Spain), Pio Caso (Italy), Dariusz Dudek (Poland), Stephan Gielen (Germany), Kurt Huber (Austria), Magnus Ohman (USA), Mark C. Petrie (UK), Frank Sonntag (Germany), Miguel Sousa Uva (Portugal), Robert F. Storey (UK), William Wijns (Belgium), Doron Zahger (Israel).

ESC Guidelines for the management of acutecoronary syndromes in patients presenting without persistent ST-segment elevation; Europ Heart J 2011

Same decision making algorithm in ACS in difficult surgical circumstances



ESC Guidelines for the management of acutecoronary syndromes in patients presenting without persistent ST-segment elevation; Europ Heart J 2011


PHILIPS
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26/09/2012 14:24:29
TIS0.8 MI 1.4
1000042934
S5-1/Echo
FR 55Hz
13cm
M3
2D
57%
C 50
P Low
HPen
0
5
10
G
P
R
1.4
2.8
JPEG
61 bpm

Risikostratifizierung

Recommendations	Class [a]	Level [b]
Blood has to be drawn promptly for troponin (cardiac troponin T or I) measurement. The result sh… within 60 min. The test should be repeated 6–9 h after initial assessment if the first measureme… Repeat testing after 12–24 h is advised if the clinical condition is still suggestive of ACS.	I	A
A rapid rule-out protocol (0 and 3 h) is recommended when highly sensitive tropo… …re 5).	I	B
An echocardiogram is recommended for all patients to evaluate regional a… …ie in or rule out differential diagnoses.	I	C
Coronary angiography is indicated in patients in whom the e… …ion has to be determined (see Section 5.4).	I	C
Coronary CT angiography should be considered… …giography to exclude ACS when there is a low to intermediate likelihood of CAD… …re inconclusive.	IIa	B
In patients without recurrence of p… …tive troponins tests, and a low risk score, a non-invasive stress test for inducible ischa… …efore deciding on an invasive strategy.	I	A

high negative predictive value of hs-Troponin

ESC Guidelines for the management of acutecoronary syndromes in patients presenting without persistent ST-segment elevation; Europ Heart J 2011

Troponin-Erhöhung ≠ ACS

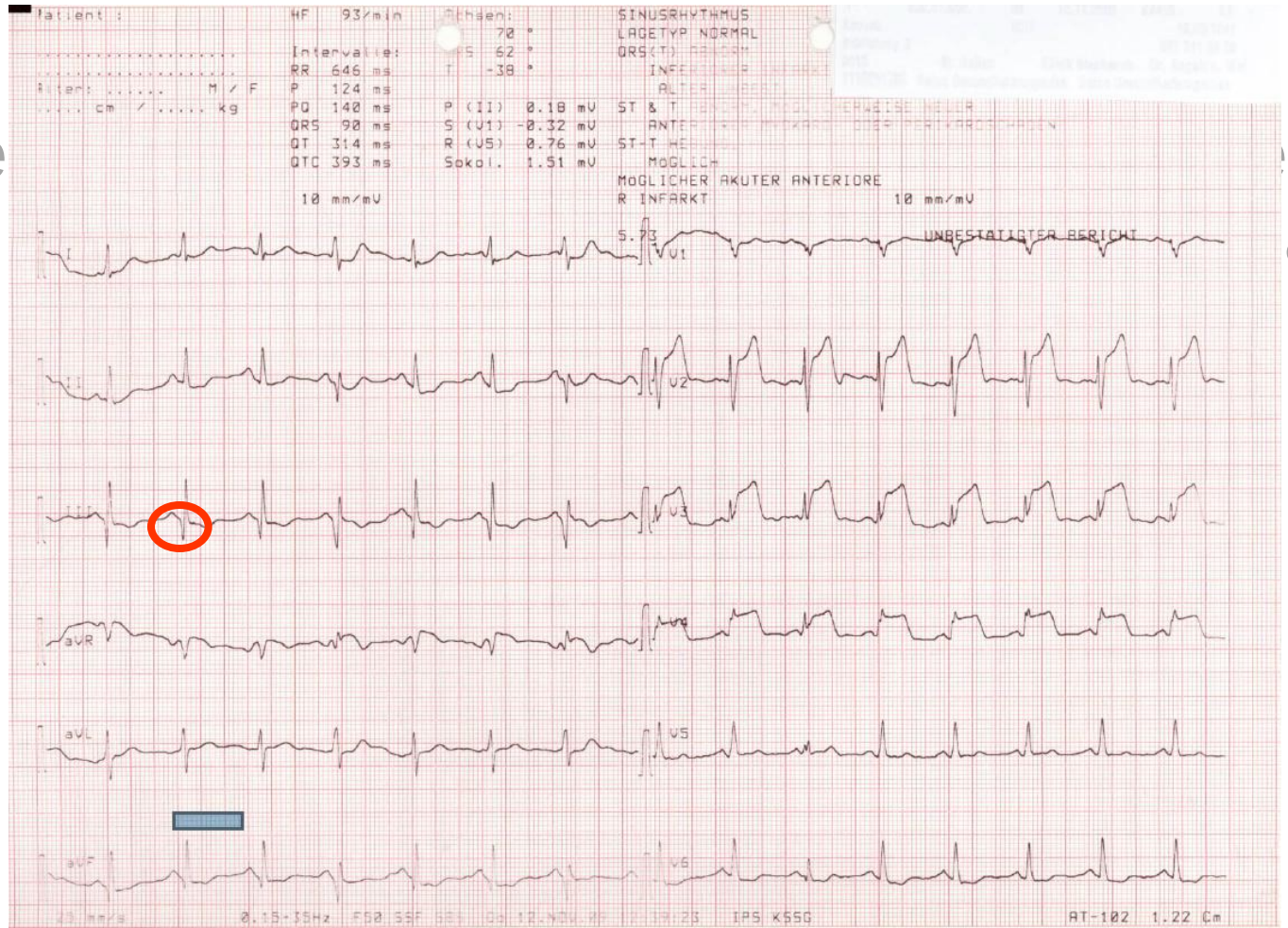
Important examples of Troponin-elevation without ACS

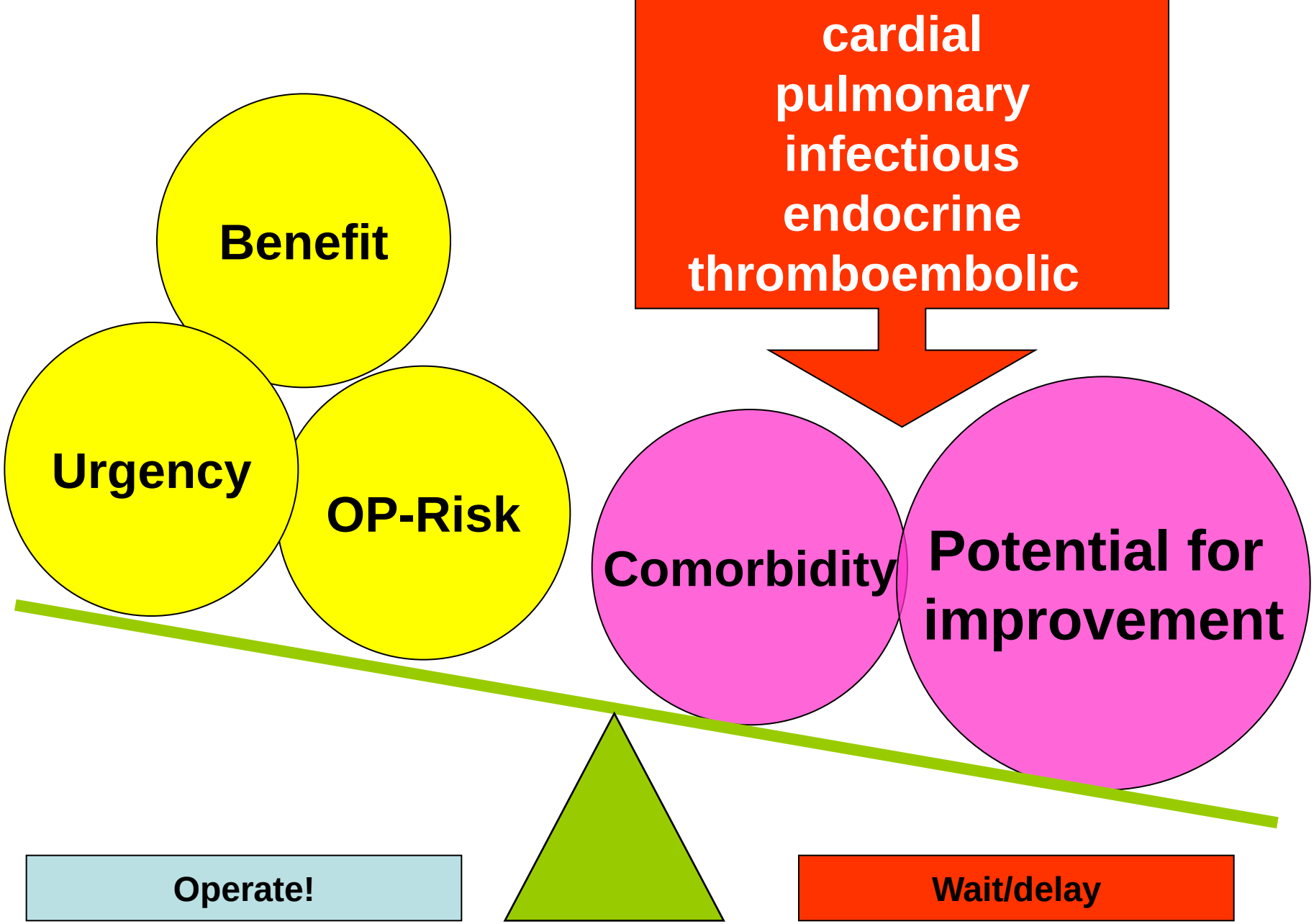
• **Chronic or acute renal dysfunction**
• Severe congestive **heart failure** – acute and chronic
• **Hypertensive crisis**
• **Tachy- or bradyarrhythmias**
• **Pulmonary embolism**, severe pulmonary hypertension
• Inflammatory diseases, e.g. **myocarditis**
• Acute neurological disease, including **stroke**, or subarachnoid haemorrhage
• Aortic dissection, aortic valve disease or hypertrophic cardiomyopathy

ESC Guidelines for the management of acutecoronary syndromes in patients presenting without persistent ST-segment elevation; Europ Heart J 2011

Goal of preoperative evaluation

De ed
card act





Adapted from European Guidelines
Poldermans D, et al; Eur Heart J 2009; 30: 2769-812

A stepwise approach

Step 1: Urgent surgery

Step 2: Active or Unstable cardiac conditions

Step 3: What is the risk of the surgical procedure?

Step 4: What is the functional capacity of the patient?

Step 5: In patients with moderate or low functional capacity consider the risk of surgical procedure

Step 6: Consider cardiac risk factors

Step 7: Consider non invasive tests

Step 3: Risk of surgical produre: 30-day CV death and MI

Low risk < 1%	Intermediate risk < 1-5%	High risk > 5%
• Breast • Dental • Endocrine • Eye • Gynaecology • Reconstructive • Orthopaedic- minor (knee surgery) • Urologic	• Abdominal • Carotid • Peripheral arterial angioplasty • Endovascular aneurysm repair • Head and neck surgey • Neurological • Orthopaedic major (hip & spine) • Pulmonary/renal/ liver transplant • Urologic- major	• Aortic & major vascular surgery • Peripheral vascular surgery

European Heart Journal Advance Access published December 19, 2012

European Heart Journal
doi:10.1093/eurheartj/ehs445

CLINICAL RESEARCH

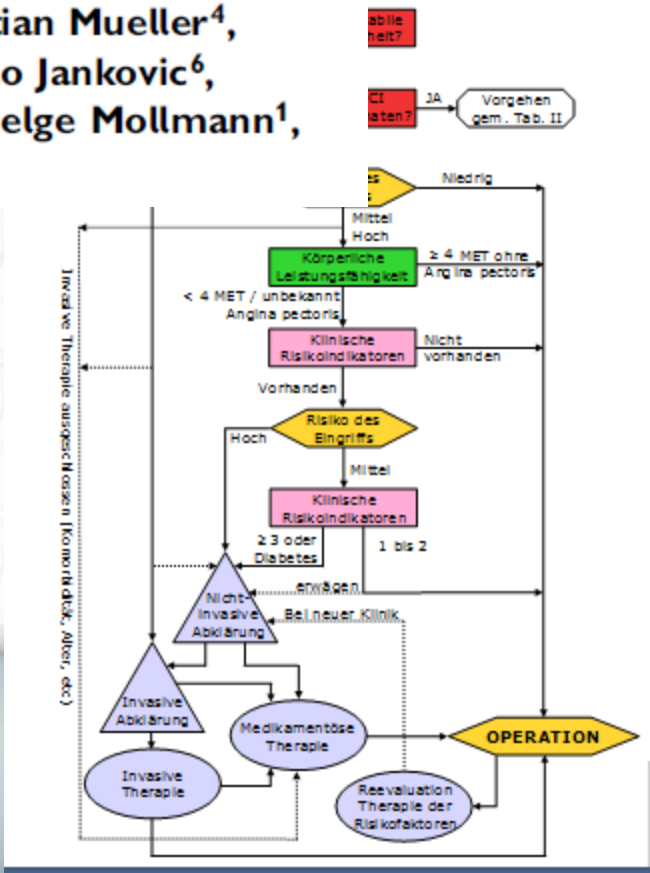
Incremental value of high-sensitive troponin T in addition to the revised cardiac index for peri-operative risk stratification in non-cardiac surgery

Michael Weber[1,2]*, Andreas Luchner[3], Seeberger Manfred[4], Christian Mueller[4], Christoph Liebetrau[1], Axel Schlitt[5], Svetlana Apostolovic[6], Radmilo Jankovic[6], Dragic Bankovic[7], Marina Jovic[7], Veselin Mitrovic[1], Holger Nef[1], Helge Mollmann[1], and Christian W. Hamm[1]

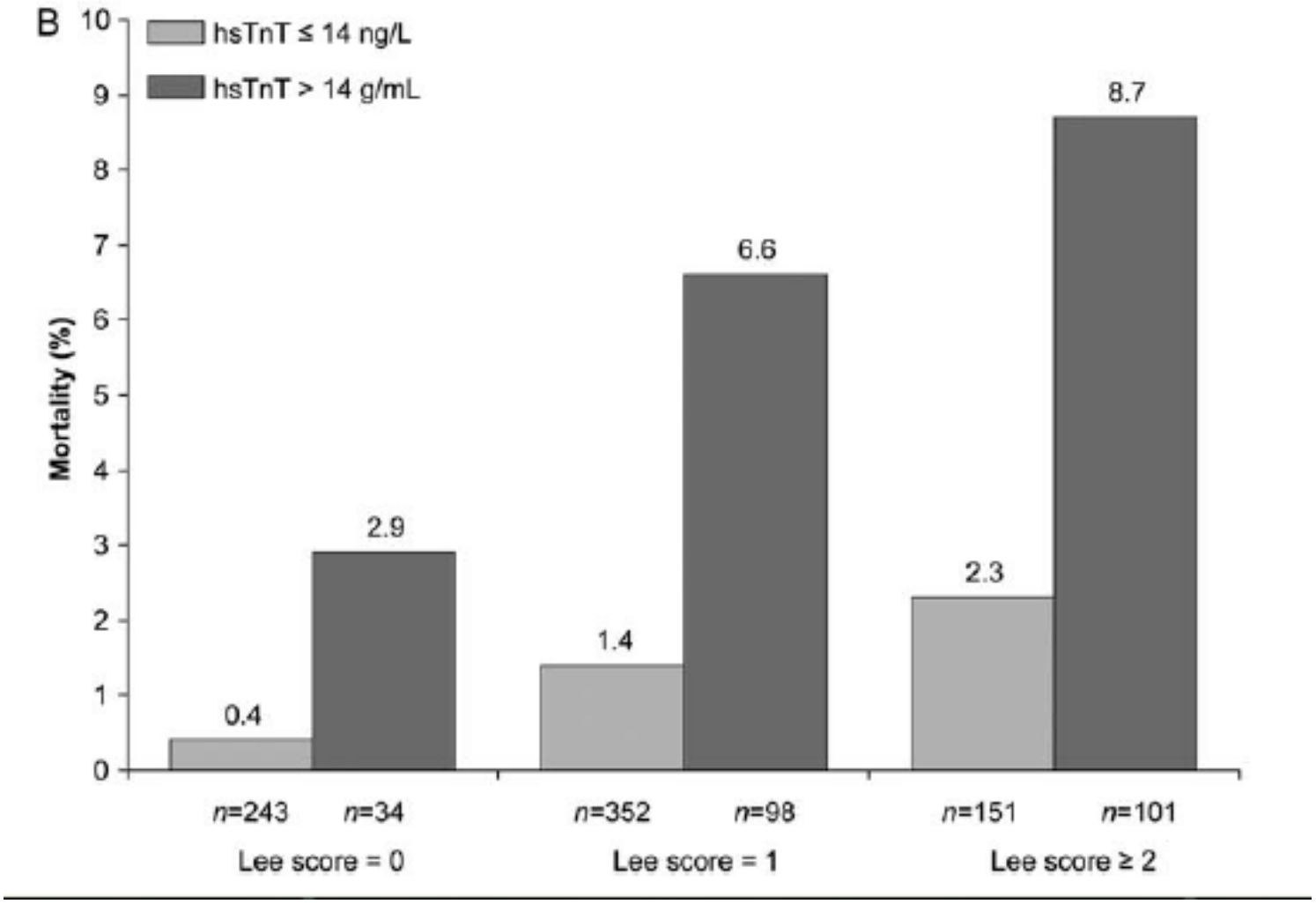
Table 13 Clinical risk factors

Angina pectoris
Prior MI[a]
Heart failure
Stroke/transient ischaemic attack
Renal dysfunction (serum creatinine >170 μmol/L or 2 mg/dL or a creatinine clearance of <60 mL/min)
Diabetes mellitus requiring insulin therapy

[a]According to the universal definition of MI.[34]



hospital mortality in association hsTnT levels and the revised cardiac index



Pre-interventional antithrombotic management

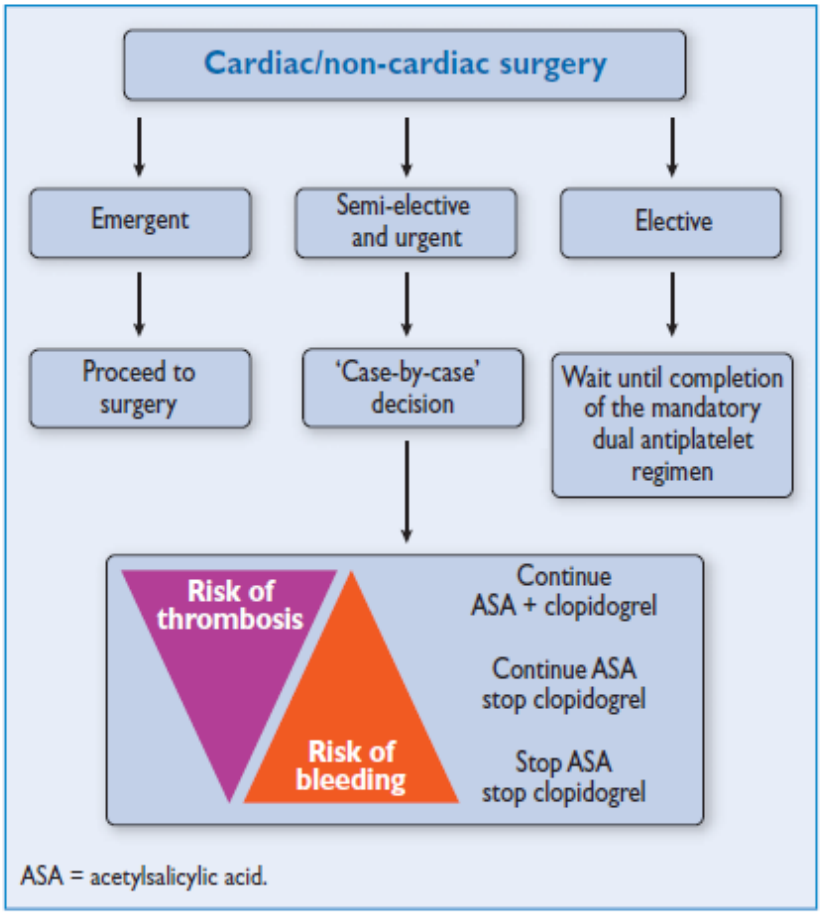
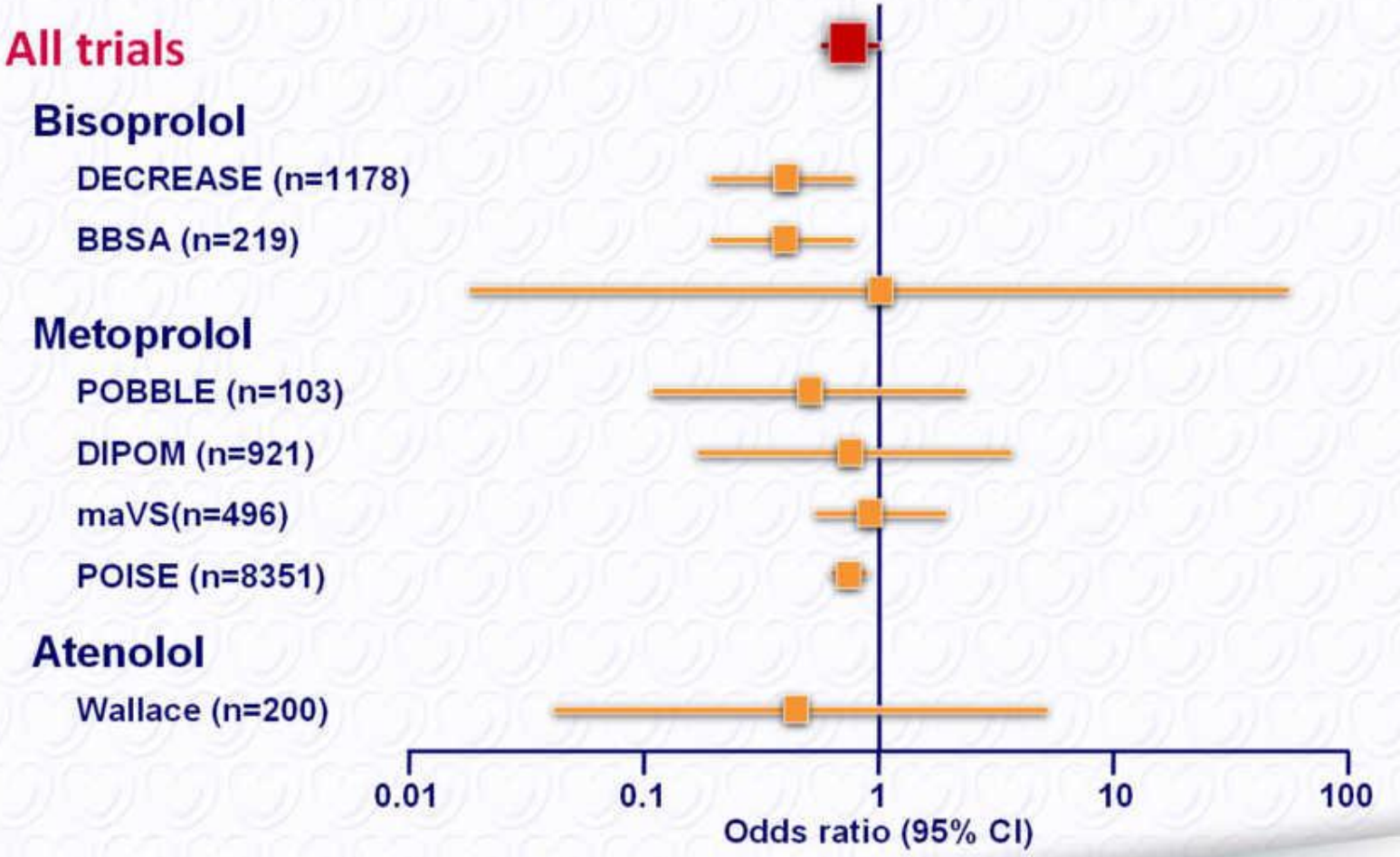


Figure 3 Algorithm for pre-operative management of patients considered for/undergoing surgery treated with dual antiplatelet therapy.

European Heart Journal (2010) 31, 2501–2555

β-Blockers and perioperative cardiac events in randomized trials

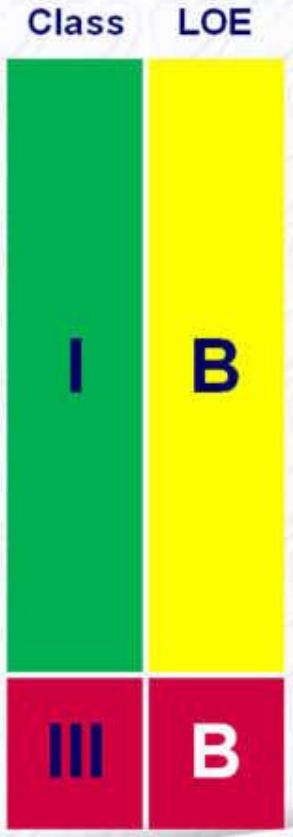


ESC recommendations on perioperative β-blocker use

- **Dose of β-blockers should be titrated, which requires treatment initiation 30 days before (optimal) & at least one week before surgery**

  It is recommended to start with a daily dose of 2.5 mg/d of bisoprolol or 50 mg of metoprolol succinate & to adjust the dose before operation to achieve a resting HR between 60 and 70b/min with SBP >100 mmHg

- **β-blockers are recommended in patients with IHD or myocardial ischaemia according to preoperative stress test**
- **β-blockers *are not recommended* in patients scheduled for low-risk surgery without risk factors**



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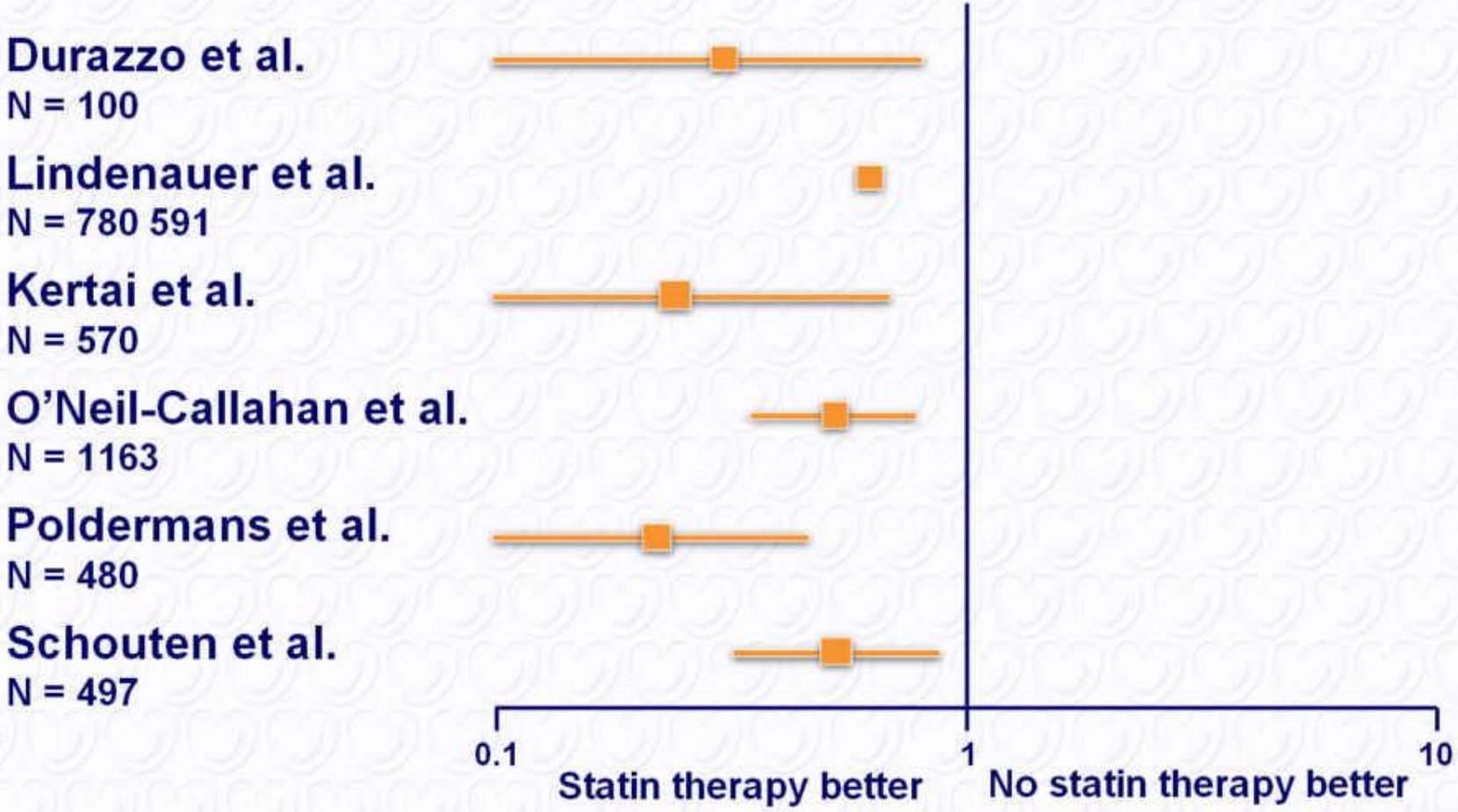
Perioperative statin use



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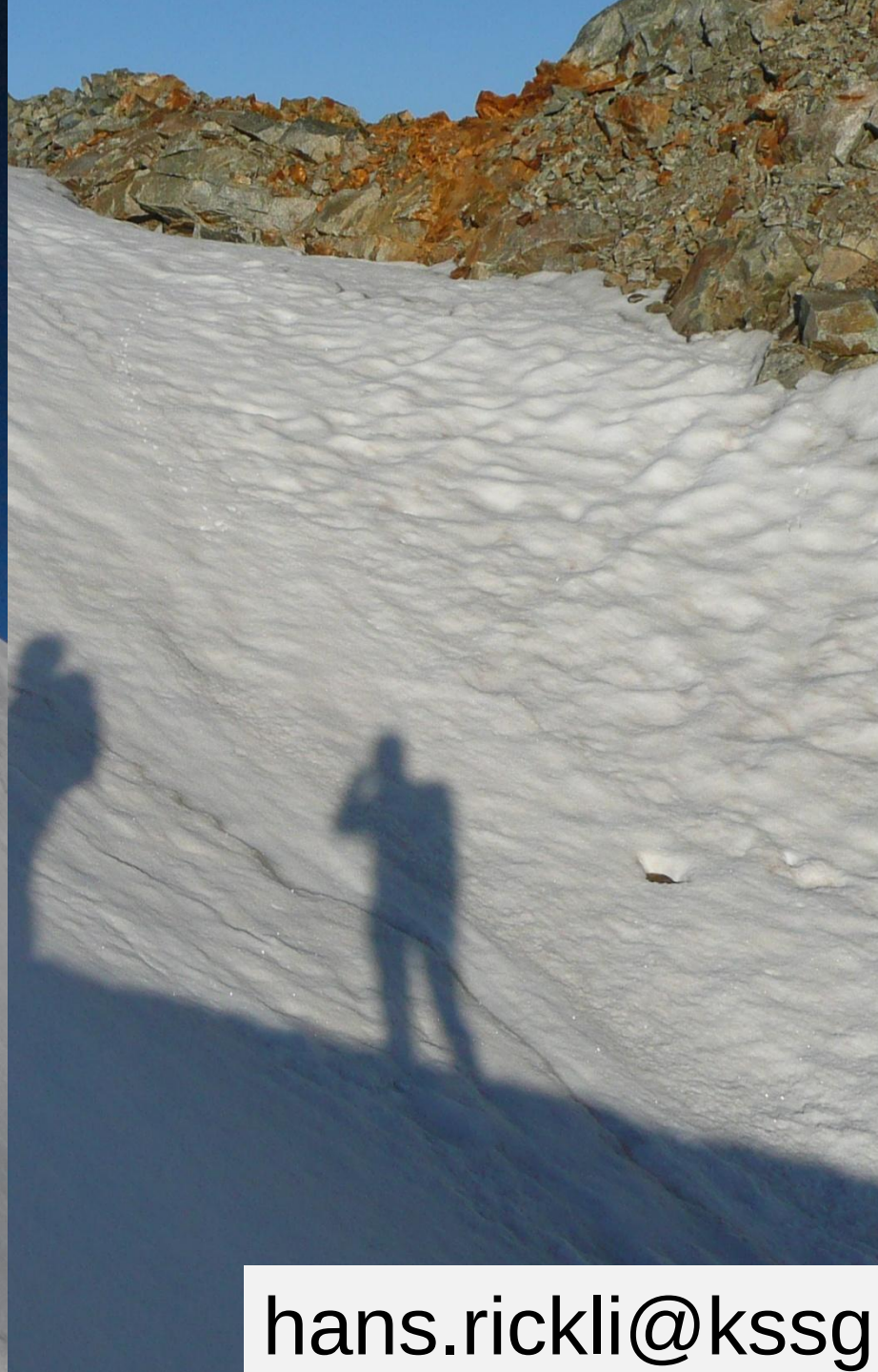
Conclusion

- Treatment of perioperative Myocardial infarction → tightrope walk between reduction of thrombosis and prevention of bleeding
- Diagnosis of perioperative MI may be a challenge due to the lack of symptoms
- The NSTEMI/STEMI guidelines have to be adapted
  - In STEMI patients: the urgency of reopening the vessel dictate the strategy; instead of new P2Y12 inhibitors, Tirofiban may be used
  - In NSTEMI patients the strategy has to be modified Modification according to surgical circumstances

Conclusion

- Preoperative risk assessment:
  - algorithmic form of an evidence-based stepwise approach
  - Detection of unrecognised or underestimated cardiovascular conditions with prognostic impact and therapeutic priority
- However, the physician in charge must make the ultimate judgement regarding the care of an individual patient in a multidisciplinary approach

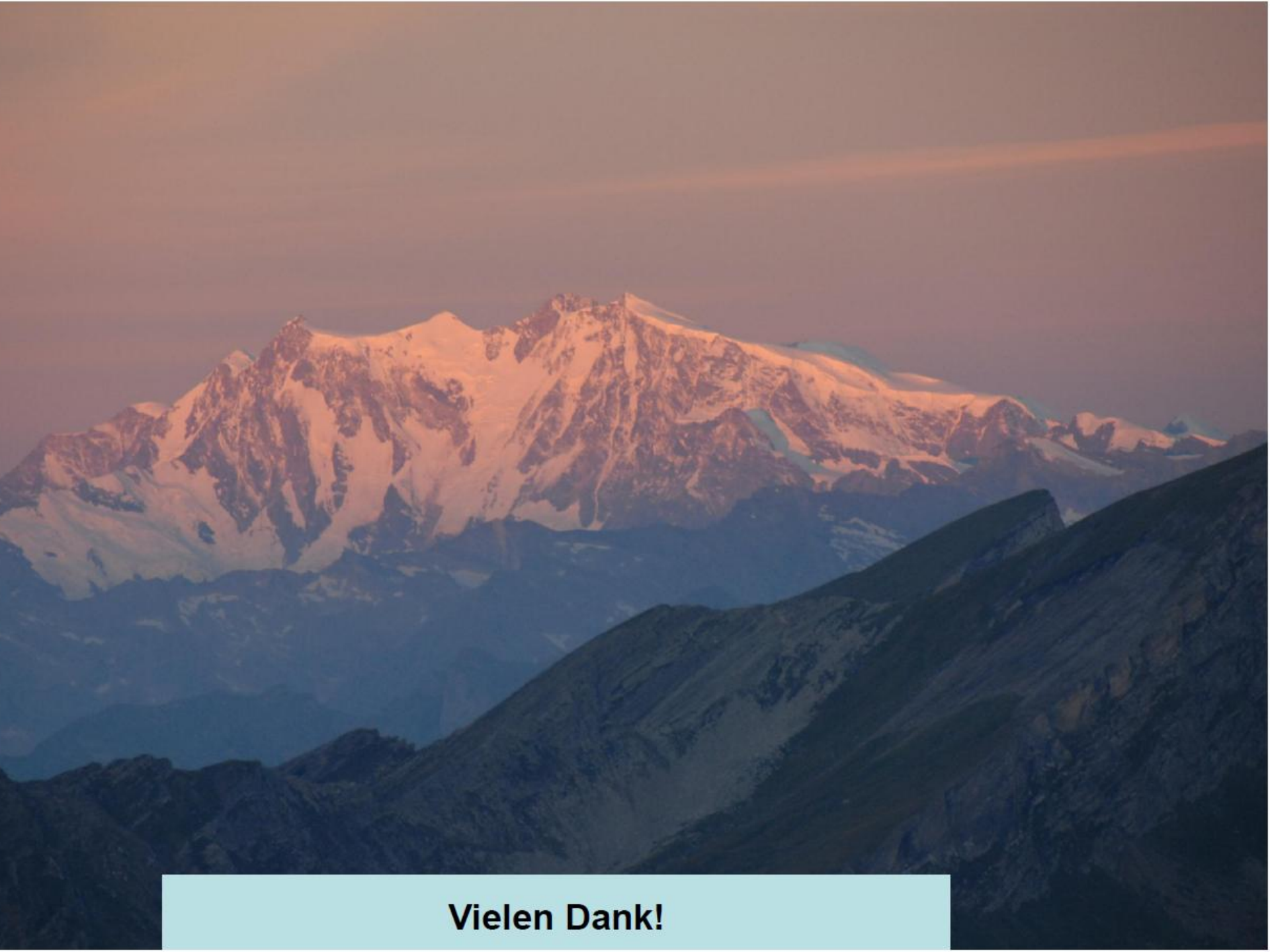


hans.rickli@kssg

Step	Urgency	Cardiac condition	Type of surgery[a]	Functional capacity	Number of clinical risk factors[b]	LV echo	ECG	Stress Testing[c]	ß-Blockers[d]	ACE-inhibitors[d/e]	Aspirin[d]	Statins[d]	Coronary Revascularisation[f]
1	Urgent surgery					III C	IIa C	III C	I C	I C	I C	I C	III C
2	Elective surgery	Unstable				I C	I C	III C					I C
3	Elective surgery	Stable	Low risk (< 1%)		None	III B	III B	III C	III B	IIa C	IIb C	IIa B	III C
					≥ 1	III B	IIa B	III C	IIb B (titration) III A (no titration)	IIa C	IIb C	IIa B	III C
4				Excellent or good		III B	IIa B	III C	IIb B (titration) III A (no titration)	IIa C	IIb C	IIa B	III C
5	Elective surgery		Intermediate risk (1 - 5 %)	Moderate or poor	None	III B	IIb B	IIb C	IIa B (titration) III A (no titration)	I C	IIb C	IIa B	III B
					≥ 1	III B	I B	IIb C	IIa B (titration) III A (no titration)	I C	IIb C	IIa B	III B
6	Elective surgery		High risk (> 5%)	Moderate or poor	≤ 2	IIa C	I B	IIb B	I B (titration) III A (no titration)	I C	IIb C	I B	IIb B
					≥ 3	IIa C	I B	I C	I B (titration) III A (no titration)	I C	IIb C	I B	IIb B

Thank you!

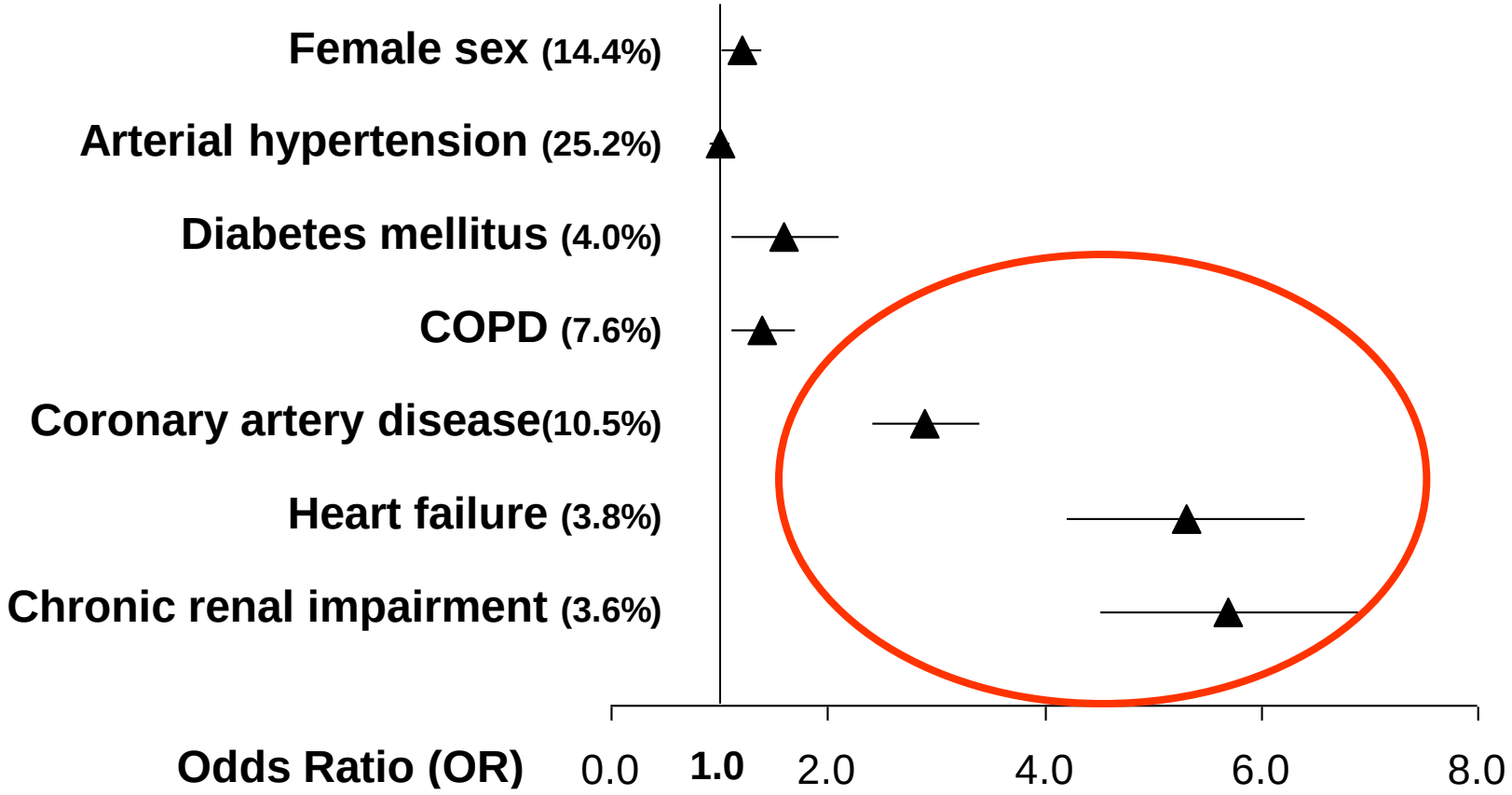
hans.rickli@kssg.ch



Vielen Dank!

Mortality: Influence of comorbidity

11388 elective surgical tx of abdominal aortic aneurysm:



Filipovic M, et al. J Epidemiol Community Health 2007; 61: 226-31

Akutes Koronarsyndrom (ACS)

Zeit ist Myokard → Ziel: ≤10min von Verdacht bis Anmeldung PCI bei STEMI

- 12-Kanal-EKG

→

- ST-Hebung >1 mm in Extremitäten- od. > 2mm in Brustwandableitungen? oder
- (vermutlich) neu aufgetretener Linksschenkelblock?

ja → **STEMI**

- Sofortige PCI: ☎ ACS Hotline 071 494 11 11, 🖷 071 494 63 36, EKG an: ACS@kssg.ch
- Spital ohne Katheterlabor: Verlegung in Zentrumspital

nein →

- Wiederholung 12-Kanal EKG nach 10 Minuten
- Monitoring: EKG, Blutdruck, Puls, SaO_2, Schmerzscore
- Troponin, CK, Kreatinin, Hb, Tc, PTT, Quick/INR, Lipide*

- **Atmung** - O_2 bis $SaO_2 \geq 94\%$, max. 99%; Oberkörper 30° hochlagern
- **Kreislauf** - Bei Tachyarrhythmie oder Hypertonie: Metroprolol 5mg über 1min iv, max. 3x innert 15min (KI: bei Kokain, Schock, BD_{sys} <100mmHg, HF < 45/min, PQ-Intervall >0.24ms, schweres Asthma)
- **Gerinnung** - falls nicht vorbestehend: ASS 500mg iv/po
  - UFH 5000IE iv als Bolus
  - Ticagrelor (Brilique®) 2x90mg po
- **Schmerz** - Bei AP: max. 3 Sprühstösse/Kaukapseln Nitroglyzerin, dann 10-20µg/min iv falls BD_{sys} >100mmHg
  - Morphin 0.1 mg/kgKG iv, (cave bei instabiler Ap resp. NSTEMI), ev. Tropisetron (Navoban®) 2mg in 100ml NaCl 0.9% über 15min iv

→ **STEMI**

→ **Troponin?**

* Lipide: Gesamt-, LDL-, HDL-Cholesterin und Triglyceride

Management in case of periop. ACS

- **O_2; continuous monitoring**
- **12 lead ECG and biomarkers**
- **Echo**
- **In case of angina pectoris/ischemic signs: Nitroglycerin s.l. 0.4 bis 0.8mg, Nitroderm TTS 5-10. Zielblutdruck Syst. 110-130mmHg. Vermeiden von Hypotonie, Hypertonie und Tachykardie**
- **Tx if chest pain with Morphin i.v.**
- **Nausea: Tropisetron (Navoban) 2mg ad KI**
- **Tx of anemia and hypovolemia (Goal of Hb >8g/dl)**

Guidelines KSSG 05/2012

Periop. MI, management: Ongoing Chest pain, ECG-changes or hemodynamic instability

- Hemodyn. stable (BP syst. > 100mmHg)
  - i.v. nitroglycerine (start with 10-20 µg/Min)
  - Betablockade (start with 1mg i.v. max. 5 mg), Goal heart rate 70-80 bpm. No Betablockade in case of heart failure
- Hemodyn. Unstable
  - Echo (TTE, intraop. TEE)

Local guidelines 05/2012

Management periop. ACS

- i.v. Aspirin 100mg/d, no Loading-Dose
- i.v.Heparin : Start mit 10’000 – 15’000 (-20’000) IE/d; no Bolus;Goal pict: maximal 70 bis 105 sec
- Dual antiplatelet therapy if possible
  - Individual and interdisciplinary approach (Cardiologist, Surgeon, Anaesthesiologist)

Guidelines KSSG 05/2012

Periop. MI, management: Ongoing Chest pain, ECG-changes or hemodynamic instability

- **Cardiogenic shock:**
  - **Hemodynamic support (discuss with anesthesiologist)**
- **Risikostratifizierung individually and interdisciplinary approach (Cardiologist, Surgeon, Anaesthesiologist)**
  - **If possible coronary angiography**

Guidelines KSSG 05/2012

Additional measures:
Catheter close to spinal cord

- **Catheter close to spinal cord have to been withdrawn (Plavix), Prasugrel (Efient) or Ticagrelor (Brilique)**
- **Other option to Clopidogrel, Prasugrel or Ticagrelor use of Tirofiban (Aggrastat®) catheter can be left there for analgesia**

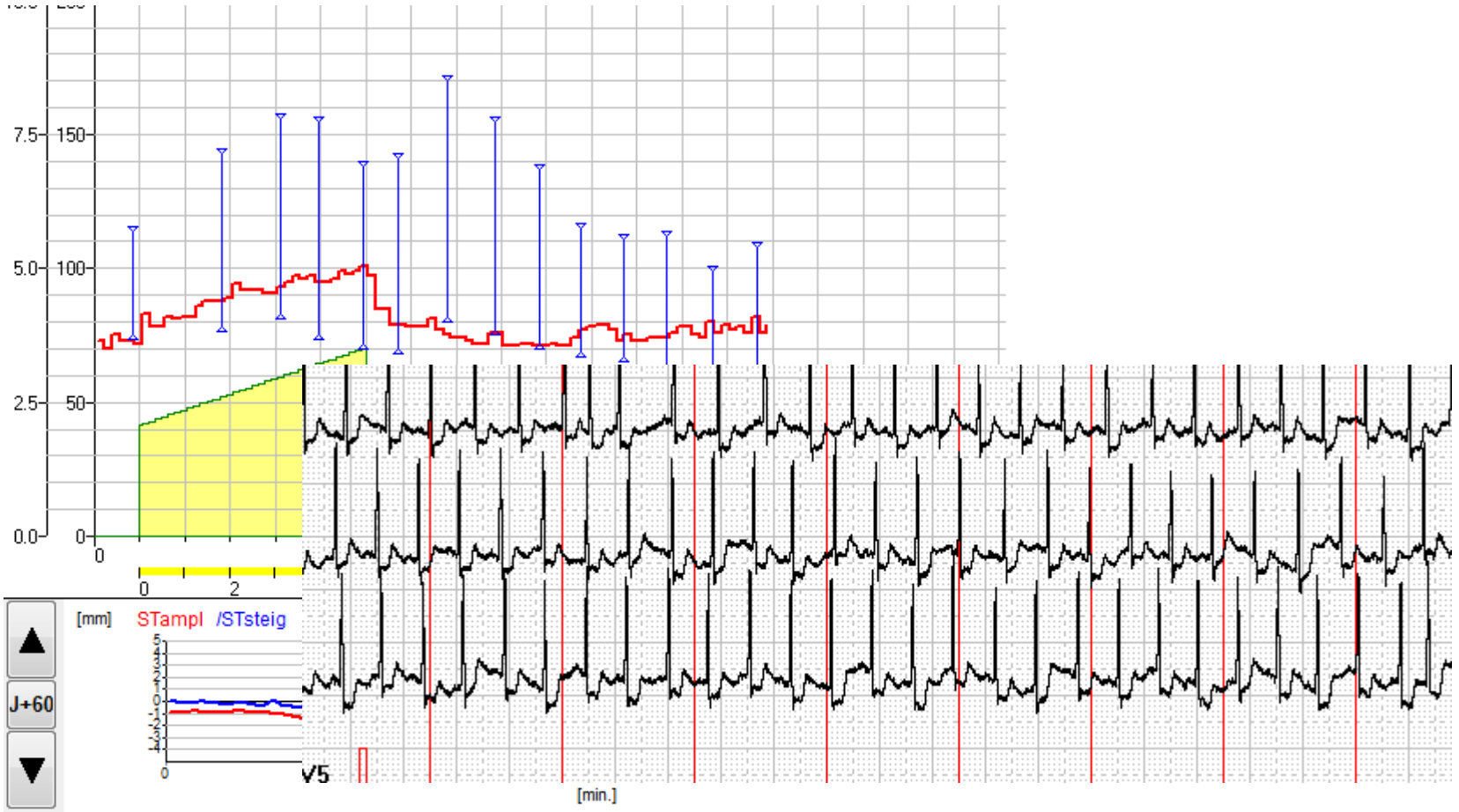
Guidelines KSSG 05/2012

B.H. ♂,1931

- Ossär und pulmonal metastasierendes Prostata-Karzinom
  - Von den Onkologen geschickt zur Standortbestimmung bei AP CCS II
- Bekannte KHK mit
  - Stabiler AP CCS I-II unter Therapie (2 Stockwerke problemlos)
  - Subjektiv und formal pathologischer Fahrradergometrie 18.9.2012

Kantonsspital St.Gallen

Management perioperative MI



Geleistet werden 60 Watt (49%-Soll, 2.8 Mets). HF-Anstieg von 72 auf 101/min (73%-Soll). BDsys von 114/75 auf 170/82. Max DP 17170, DPF 2.0. Abbruch erfolgt wegen ST-Senkungen von 4mm.
Unter max. Belast. leichtes thorakales Druckgefühl (VAS4/10). Kein Schwindel. Keine limitierende Dyspnoe, Häufig SVES u VES.
Vorbestehende horizont. ST-Senkung von 1mm unter V3-6, unter Belastung signifikante Zunahme V2-6 auf 4mm (deszendierend).

Beurteilung: Subjektiv positive und formal elektrisch positive

B.H. ♂,1931

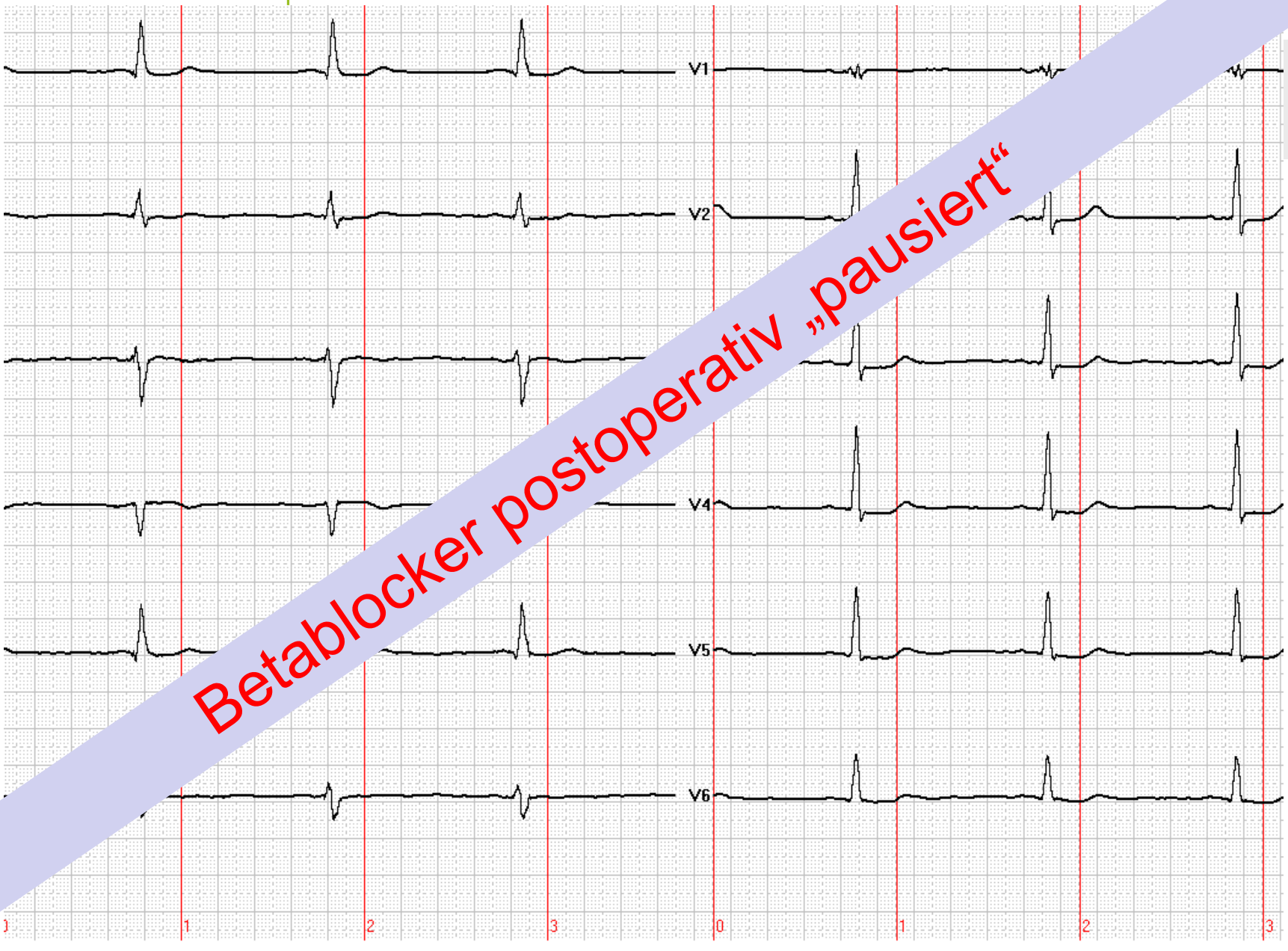
- **Ossär und pulmonal metastasierendes Prostata-Karzinom**
  - **Von den Onkologen geschickt zur Standortbestimmung bei AP CCS II (keine Frage einer Op)**
- **Bekannte KHK mit**
  - **Stabiler AP CCS I-II unter Therapie (2 Stockwerke problemlos)**
  - **Subjektiv und formal pathologischer Fahrradergometrie 18.9.2012**
- **Medikamente:**
  - **OAK wegen St.n.LE 8/2010 + ASS 100 mg 1xtgl**
  - **Bilol 5mg 1-0-0**
  - **Nitroderm TTS 10 (8-20h)**
  - **Atorvastatin 20 mg ½- 0 - 0**
  - **Prednison 5 mg 1-0-0**

B.H. ♂,1931

- Ossär und pulmonal metastasierendes Prostata-Karzinom
  - Von den Onkologen geschickt zur Standortbestimmung bei AP CCS II
- Bekannte KHK mit
  - Stabiler AP CCS I-II unter Therapie (2 Stockwerke problemlos)
  - Subjektiv und formal pathologischer Fahrradergometrie 18.9.2012
- Am 21.9. eingetreten auf Urologie für TUR‘P am 24.9. (Urlaub)

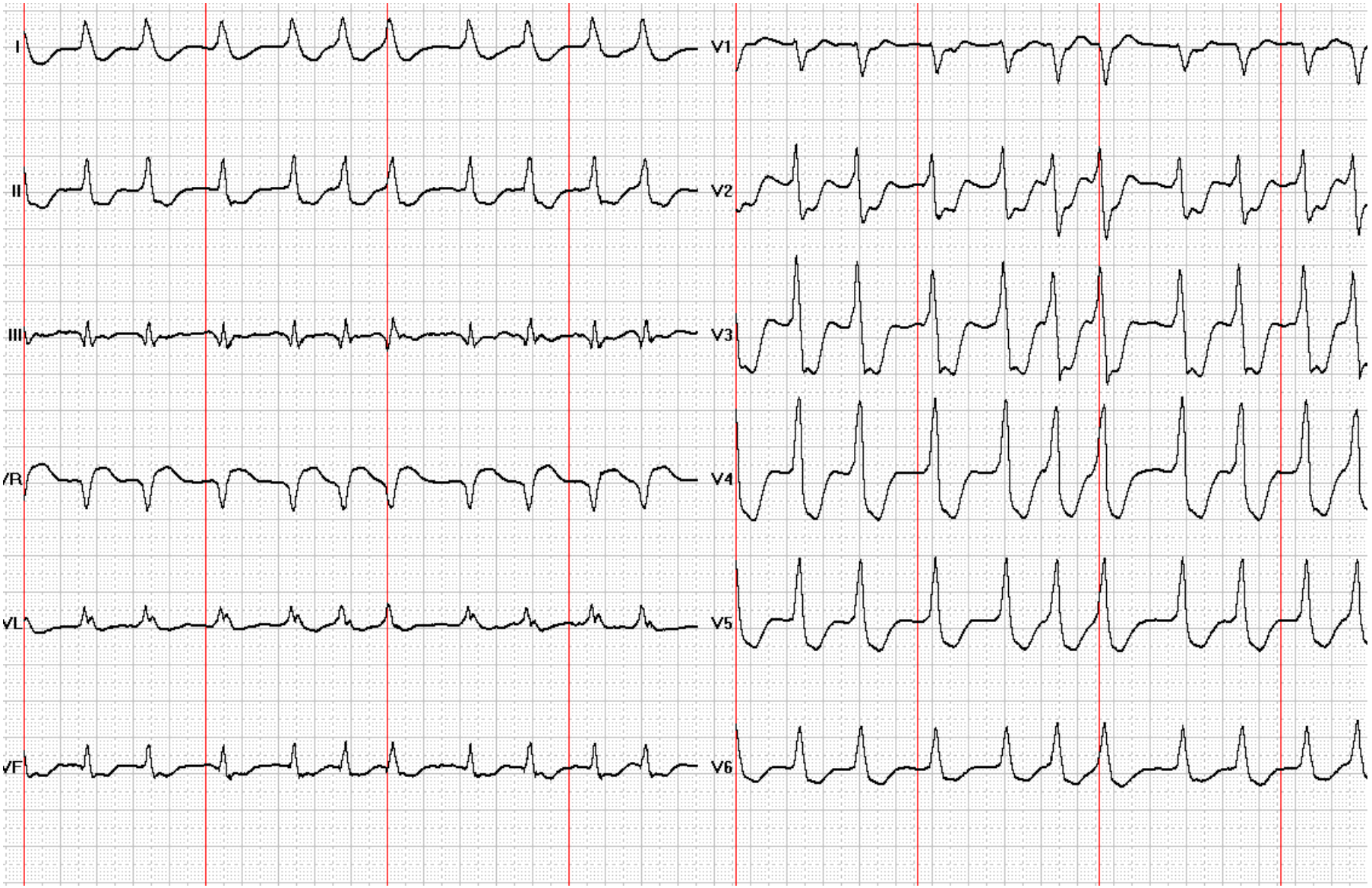
Kantonsspital St.Gallen

Management perioperative MI



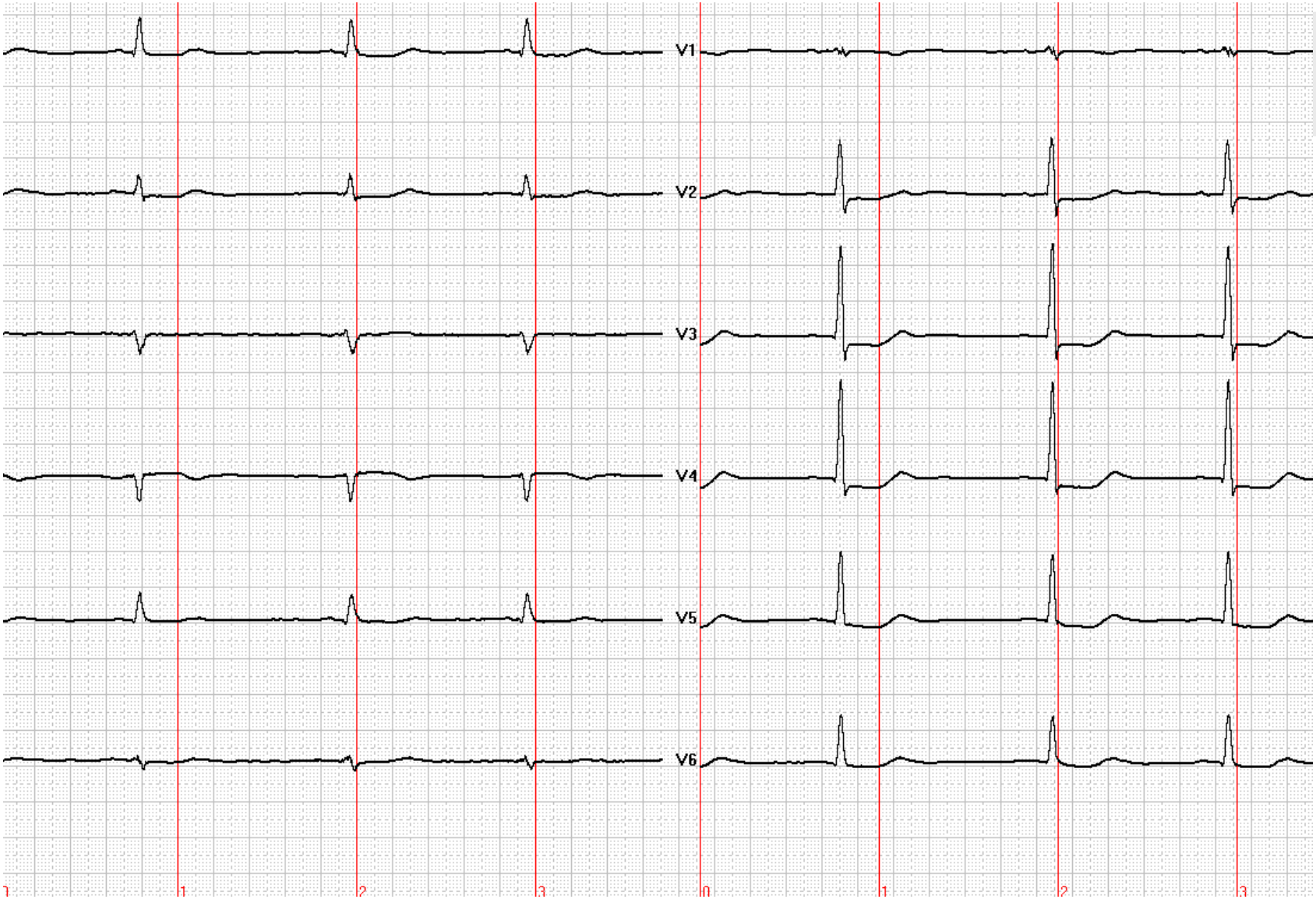
Kantonsspital St.Gallen

Management perioperative MI



Kantonsspital St.Gallen

Management perioperative MI



…ative MI

BLUT-CHEMIE

Probeneingang	6114 1000682… 05.03.2012 1…	6077 100071… 02.04.2012 1…	27. 4.2012 5931 100073… 27.04.2012 0…	30. 5.2012 5996 100076… 30.05.2012 1…	29. 6.2012 5876 100080… 29.06.2012 1…	6093 100083… 06.08.2012 0…
Datum	5.Mrz	2.Apr	27.Apr	30.Mai	29 Jun	6.A…
Zeit	11:51	10:47	09:47	10:52	14:59	11:…
Probenmaterial/Präanalytik:						
EDTA-Plasma						
Heparin-Plasma				x		
Serum	x	x	x		x	x
Störfaktoren:						
hämolytisch						
Natrium [130-145 mmol/l]	137					
Kalium [3.5-5.1 mmol/l]	4.5	3.5	3.8		4.3	4.…
Chlorid [95-113 mmol/l]						
Calcium [2-2.6 mmol/l]	2.3			2.4		2.…
Phosphat [0.8-1.5 mmol/l]						
Harnstoff [2-8 mmol/l]						
Creatinin [<115 µmol/l]	92	91	87		93	
Harnsäure [210-430 µmol/l]	174					
Bilirubin gesamt [<20 µmol/l]	7	7	8			
AST [<40 U/l]	14	13	13			
ALT [<55 U/l]	14	17				
ALP [53-128 U/l]	48					
GGT [<65 U/l]						
LDH [<265 U/l]						
CK [<170 U…						
CK-MB Masse [0.6-6…						
a-Amylase Pancreas						
Total Protei…						
Albumi…				37.0		33.…
CR…						
…]	5.4					
… mU/l]						
….0 mmol/l]						
[<1.7 mmol/l]						
…terin [>1.0 mmol/l]						
…holesterin [<2.6 mmol/l]						
PSA [<2 µg/l]	2.22	1.88	2.09		1.39	1.4

Additional PSA values in further columns: 1.63 | 1.85

30116-

BLUT-C…

P…	613… 26.09.2…	6126 100… 26.09.2012 …
	26 Sep	26 Sep
	06:26	06:26
…aterial/Präanalytik:		
…eparin-Plasma	x	x
Harnstoff [2-8 mmol/l]		3.0
Creatinin [<115 µmol/l]		91
Magnesium [0.7-1.1 mmol/l]	1.7	
CK [<170 U/l]		1200
CK-MB Masse [0.6-6.3 µg/l]		211.8
Troponin I [<0.5 µg/l]		43.87

Konservatives Vorgehen bei hämodynamisch stabilem Patienten in palliativer Situation

Troponin ≠ Myokardinfarkt

Non-cardiac diseases

Critically ill patients[w23 w24]

High dose chemotherapy[w25 w26]

Primary pulmonary hypertension[w27]

Pulmonary embolism[w28 w29]

Renal failure[w30-36]

Subarachnoid haemorrhage[w37 w38]

Scorpion envenoming[w39]

Sepsis and septic shock[w40-42]

Stroke[w43 w4]

Ultra-endurance exercise (marathon)[w45-47]

Ammann P et al. *BMJ* 2004

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doi:10.1016/j.jacc.2009.07.004

PRACTICE GUIDELINE: FOCUSED UPDATE

2009 ACCF/AHA Focused Update on Perioperative Beta Blockade

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine, and Society for Vascular Surgery

2009 Writing Group to Review New Evidence and Update the 2007 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery

2009 ACCF/AHA Focused Update on Perioperative Beta Blockade. J Am Coll Cardiol 2009; 54:2102-28. Circulation 2009:120:e169-276

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION
American Heart Association®
Learn and Live℠

ACC/AHA 2007 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery): Developed in Collaboration With the American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, and Society for Vascular Surgery

Circulation 2007;116;e418-e499;

European Heart Journal Advance Access published August 27, 2009

European Heart Journal
doi:10.1093/eurheartj/ehp337

ESC GUIDELINES

Guidelines for pre-operative cardiac risk assessment and perioperative cardiac management in non-cardiac surgery

The Task Force for Preoperative Cardiac Risk Assessment and Perioperative Cardiac Management in Non-cardiac Surgery of the European Society of Cardiology (ESC) and endorsed by the European Society of Anaesthesiology (ESA)

Authors/Task Force Members: Don Poldermans; (Chairperson) (The Netherlands)*; Jeroen J. Bax (The Netherlands); Eric Boersma (The Netherlands); Stefan De Hert (The Netherlands); Erik Eeckhout (Switzerland); Gerry Fowkes (UK); Bulent Gorenek (Turkey); Michael G. Hennerici (Germany); Bernard Iung (France); Malte Kelm (Germany); Keld Per Kjeldsen (Denmark); Steen Dalby Kristensen (Denmark); Jose Lopez-Sendon (Spain); Paolo Pelosi (Italy); François Philippe (France); Luc Pierard (Belgium); Piotr Ponikowski (Poland); Jean-Paul Schmid (Switzerland); Olav F. M. Sellevold (Norway); Rosa Sicari (Italy); Greet Van den Berghe (Belgium); Frank Vermassen (Belgium)

7.2. Perioperative Medical Therapy (UPDATED)

7.2.1. Recommendations for Perioperative Beta-Blocker Therapy (UPDATED)

Class I

1. **Beta blockers should be continued in patients undergoing surgery who are receiving beta blockers for treatment of conditions with ACCF/AHA Class I guideline indications for the drugs.** ***(Level of Evidence: C)***

Class IIa

1. **Beta blockers titrated to heart rate and blood pressure are probably recommended for patients undergoing vascular surgery who are at high cardiac risk owing to coronary artery disease or the finding of cardiac ischemia on preoperative testing.[88,246]** ***(Level of Evidence: B)***
2. **Beta blockers titrated to heart rate and blood pressure are reasonable for patients in whom preoperative assessment for vascular surgery identifies high cardiac risk, as defined by the presence of more than 1 clinical risk factor.‡‡** ***(Level of Evidence: C)***
3. **Beta blockers titrated to heart rate and blood pressure are reasonable for patients in whom preoperative assessment identifies coronary artery disease or high cardiac risk, as defined by the presence of more than 1 clinical risk factor,‡‡ who are undergoing intermediate-risk surgery.[369]** ***(Level of Evidence: B)***

Class IIb

1. **The usefulness of beta blockers is uncertain for patients who are undergoing either intermediate-risk procedures or vascular surgery in whom preoperative assessment identifies a single clinical risk factor in the absence of coronary artery disease.‡‡** ***(Level of Evidence: C)***
2. **The usefulness of beta blockers is uncertain in patients undergoing vascular surgery with no clinical risk factors‡‡ who are not currently taking beta blockers.[370]** ***(Level of Evidence: B)***

Class III

1. **Beta blockers should not be given to patients undergoing surgery who have absolute contraindications to beta blockade.** ***(Level of Evidence: C)***
2. **Routine administration of high-dose beta blockers in the absence of dose titration is not useful and may be harmful to patients not currently taking beta blockers who are undergoing noncardiac surgery.[371]** ***(Level of Evidence: B)***

2009 ACCF/AHA Focused Update on Perioperative Beta Blockade. J Am Coll Cardiol 2009; 54:2102-28. Circulation 2009:120:e169-276

…should be continued…..

UPDATED)

Beta-Blocker

Therapy (UPDATED)

Class I

1. Beta blockers should be continu in patients undergoing surgery who are receiving beta blockers for treatment of conditions with ACCF/AHA Class I guideline indications for the drugs. *(Level of Evidence: C)*

Class IIa

1. Beta blockers titrated to heart rate and blood pressure are probably recommended for patients undergoing vascular surgery who are at high cardiac risk owing to coronary artery disease or the finding of cardiac ischemia on preoperative testing.[88,246] *(Level of Evidence: B)*
2. Beta blockers titrated to heart rate and blood pressure are reasonable for patients in whom preoperative assessment for vascular surgery identifies high cardiac risk, as defined by the presence of more than 1 clinical risk factor.‡‡ *(Level of Evidence: C)*
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Class IIb

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Class III

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2. Routine administration of high-dose beta blockers in the absence of dose titration is not useful and may be harmful to patients not currently taking beta blockers who are undergoing noncardiac surgery.[371] *(Level of Evidence: B)*

2009 ACCF/AHA Focused Update on Perioperative Beta Blockade. J Am Coll Cardiol 2009; 54:2102-28. Circulation 2009:120:e169-276

…should be continued…..

…titrate patients at risk…

UPDATED)

Beta-Blocker

Therapy (UPDATED)

Class I

1. Beta blockers should be continu in patients undergoing surgery who are receiving beta blockers for treatment of conditions with ACCF/AHA Class I guideline indications for the drugs. *(Level of Evidence: C)*

Class

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2. Beta blockers titrated to heart rate and blood pressure are reasonable for patients in whom preoperative assessment for vascular surgery identifies high cardiac risk, as defined by the presence of more than 1 clinical risk factor.‡‡ *(Level of Evidence: C)*
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2009 ACCF/AHA Focused Update on Perioperative Beta Blockade. J Am Coll Cardiol 2009; 54:2102-28. Circulation 2009:120:e169-276

…should be continued…..

UPDATED)

Beta-Blocker

Therapy (UPDATED)

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…titrate patients at risk…

Class

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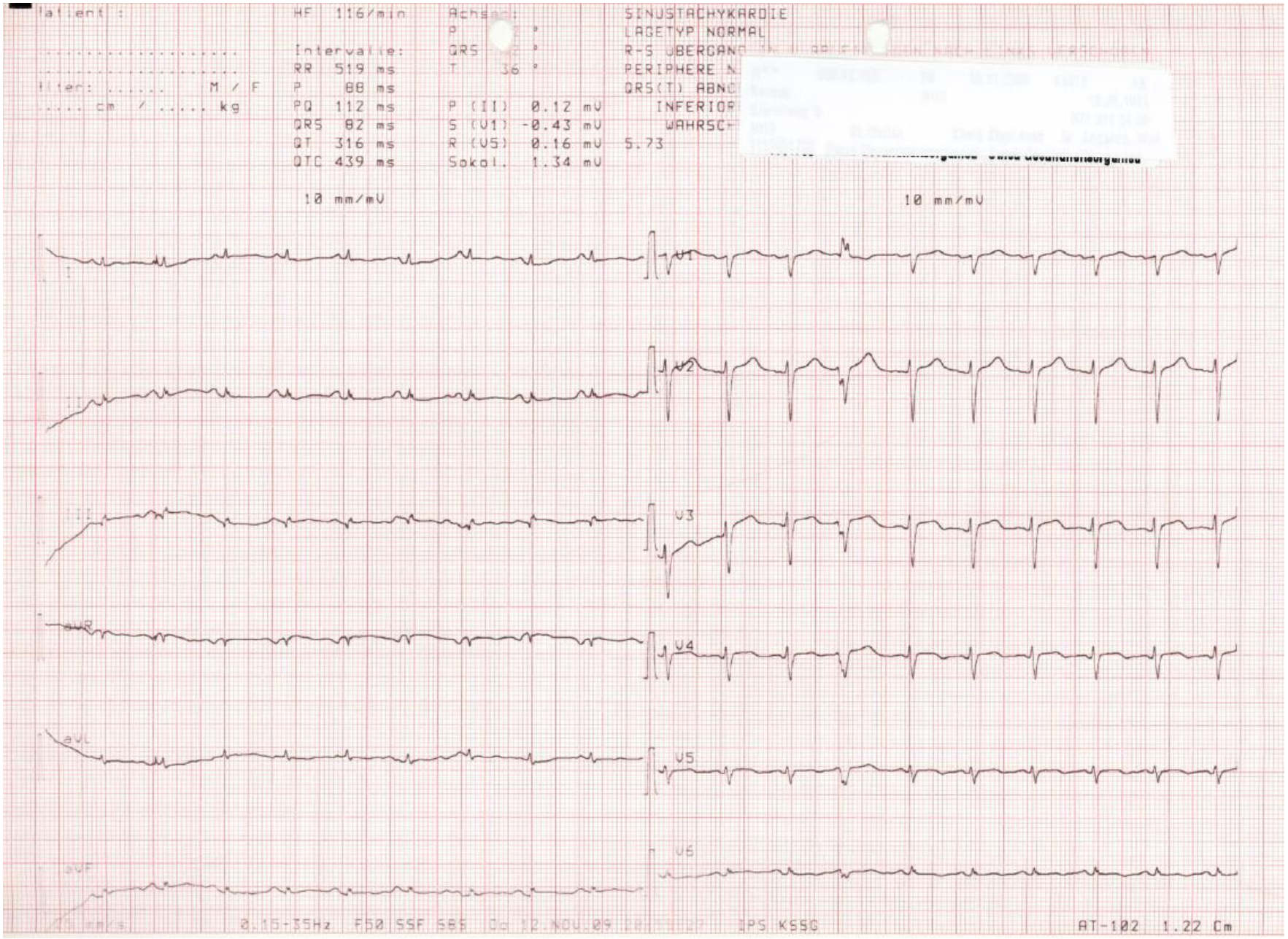
2. Routine administration of high-dose beta blockers in the abse ce of dose titration is not useful and may be harmful t ients not currently taking beta blockers who are u noncardiac surgery.[371] *(Level of Evid*

Without titration= contraindication

2009 ACCF/AHA Focused Update on Perioperative Beta Blockade. J Am Coll Cardiol 2009; 54:2102-28. Circulation 2009:120:e169-276

Pathophysiology of perioperative ischemia

1. **chronic mismatch in the supply-to-demand ratio of blood flow response to metabolic demand,** which clinically resembles stable IHD due to a flow limiting stenosis in coronary conduit arteries
2. **Coronary plaque rupture due to vascular inflammatory processes presenting as acute coronary syndromes**


HF 116/min
Intervalle:
RR 519 ms
P 88 ms
PQ 112 ms
QRS 82 ms
QT 316 ms
QTC 439 ms
Achsen:
P °
QRS °
T 36 °
P (II) 0.12 mV
S (V1) -0.43 mV
R (V5) 0.16 mV
Sokol. 1.34 mV
SINUSTACHYKARDIE
LAGETYP NORMAL
10 mm/mV
10 mm/mV
V1
V2
V3
V4
V5
V6
AT-102 1.22 Cm

04.03.2013

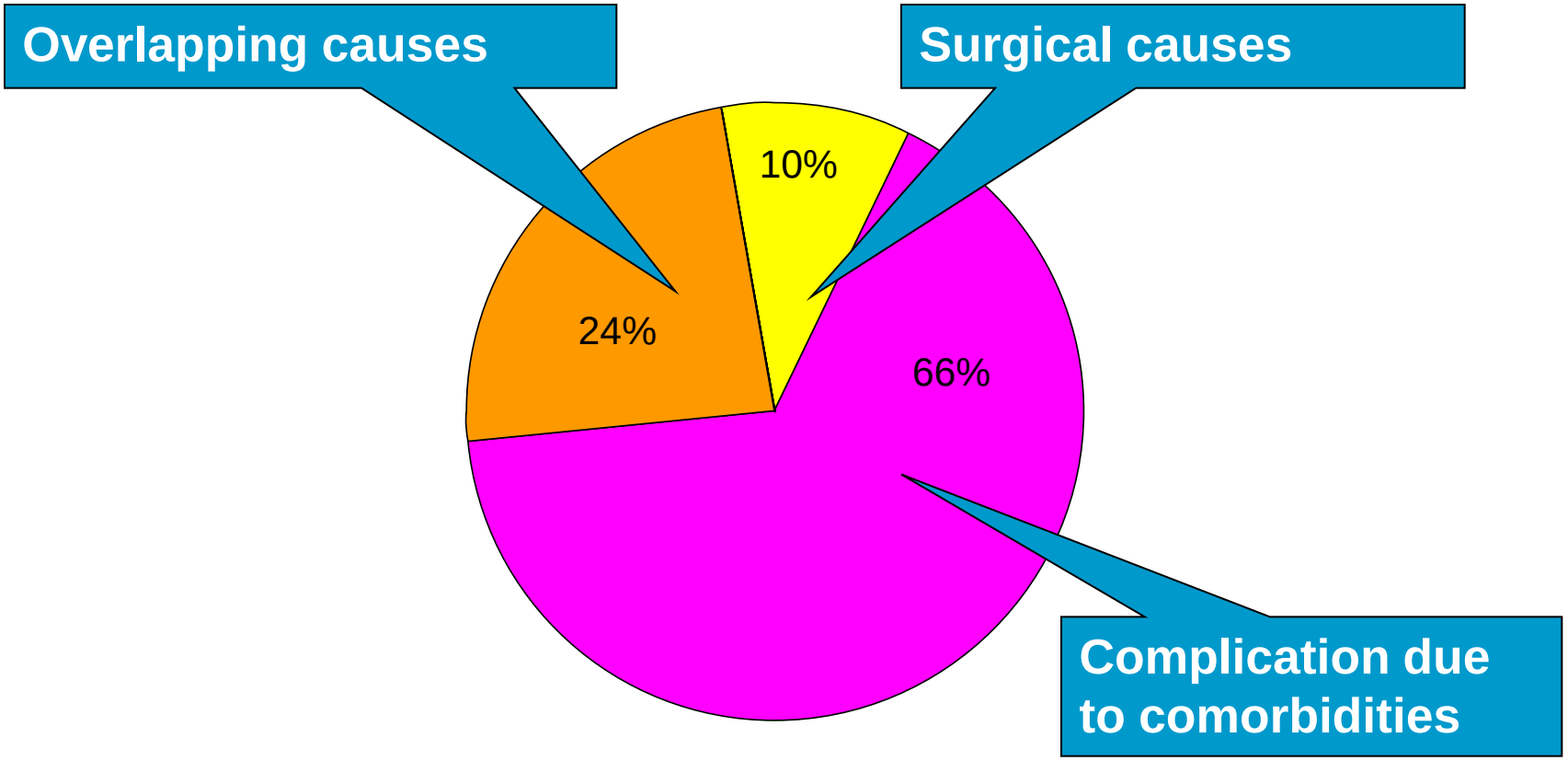
Reperfusion therapy

Recommendations	Class	Level
Reperfusion therapy is indicated in all patients with symptoms of <12 h duration and persistent ST-segment elevation or (presumed) new LBBB.	I	A
Reperfusion therapy (preferably primary PCI) is indicated if there is evidence of ongoing ischaemia, even if symptoms may have started > 12 h beforehand or if pain and ECG changes have been stuttering.	I	C
Reperfusion therapy with primary PCI may be considered in stable patients presenting 12-24 h after symptom onset.	IIb	B
Routine PCI of a totally occluded artery > 24 h after symptom onset in stable patients without signs of ischaemia (regardless of whether fibrinolysis was given or not) is not recommended.	III	A

ECG = electrocardiogram; i.v. = intravenous; LBBB = left bundle branch block; PCI = percutaneous coronary intervention.

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

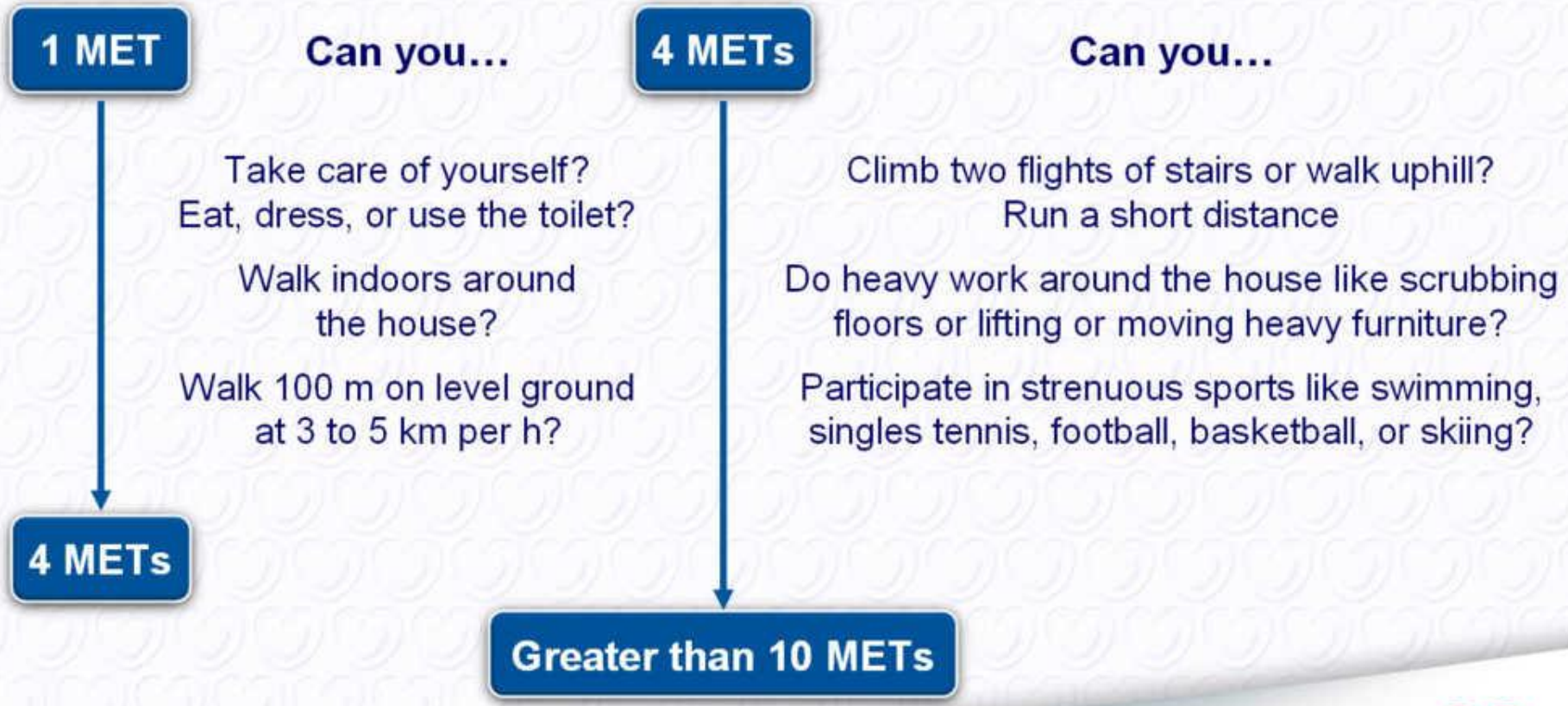
Mortality: Causes (after surgical tx of abdominal aortic aneurysm)



Modified Brady AR, et al. Brit J Surg 2000; 87: 742-9

Step 4: Functional capacity of the patient scheduled for intermediate or high-risk surgery

Functional Capacity



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