Course n°: *(ex: Course 2)*
Sub-category: *(ex: 2.4.)*
Date: *(20-09-2013)*
Language:English/Romanian
City:Bucharest
Country:Romania
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Cardio-vascular Investigation in Thoracic Surgery

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World Federation of Societies of Anaesthesiologists

Is it any special problem?

Thoracic Surgical Procedures: medium cardiac risk (AHA/ACC)

Post-thoracothomy morbidity: 15-30%

Mortality : 3-6%

Cardio-vascular complications:

Second incidence after respiratory complications after thoracic surgery: (~15% vs 21% respiratory)

(Slinger P, In PRINCIPLES AND PRACTICE OF ANESTHESIA FOR THORACIC SURGERY,, 2011, cap 2, p 11-34, Springer ed.)

Risk factors:

Pre-existing coronary disease (smoking, age, etc)

Pulmonary tissue resection and vascular ligature

Co-existing diseases: cardio-vascular and non cardio-vascular (DM, renal)

Thoracic Surgery: intermediate cardiac risk

Boersma E,Perioperative cardiovascular mortality in noncardiac surgery: validation of the Lee cardiac risk index. Am J Med 2005;118:1134–1141.

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

Overall documented incidence of post-thoracotomy cardiac ischemia and arrhythmias (primarily atrial fibrillation) peaks postoperative day 2-3

von Knorring J et al. Cardiac arrhythmias and myocardial ischemia after thoracothomy, Ann Thorac Surg 1992;53:642-647

Which are the actual 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)*et al. *European Heart Journal (2009) 30, 2769–2812*

ACC/AHA Guidelines for the perioperative cardiac assessment of the non-cardiac surgical patient

Joseph W. Szokol, M.D. Vice Chairman, Department of Anesthesiology NorthShore University Health System, Northwestern University, USA.

CONFERENCIAS MAGISTRALES *Vol. 33. Supl. 1, Abril-Junio 2010:S258-S261*

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

… ” the language of the ACC/AHA statement logically collapses into the broader question of whether asymptomatic persons should undergo routine stress testing (possibly followed by revascularization if coronary disease is discovered), independent of a preoperative context…

Recommendations in these guidelines are generally class II (“conflicting evidence and/or divergence of opinion”) and are based primarily on “expert opinion” (level C evidence) rather than empirical evidence; hence, they do not provide definitive guidance…”

Coronary Assessment Before Non-cardiac Surgery: Current Strategies are Flowed, Brett AS, Circulation 2008;117:3145-3151


I TOLD YOU
IT WAS
A HEART
ATTACK!

"The purpose of the preoperative evaluation is not to give «medical clearance» but rather to provide an evaluation of the patient's current medical status and to make recommendations regarding the potential for cardiac risk throughout the perioperative period and any possible interventions that may reduce that risk.

Finally, no test should be performed unless it is likely to influence the perioperative care of the patient"

Szokol WJ, ACC/AHA Guidelines for the perioperative cardiac assessment of the non-cardiac surgical patient, Rev Mex Anesth 2010;S1:S258-S261

First step. Risk stratification

Risk scores:

Framingham Risk Score (FRS)

Goldman (1977)

Detsky (1986)

Lee (1999)

Lee Revised Cardiac Risk Index
History of IHD
History of CCF
History of cerebrovascular disease
DM with insulin therapy
Chronic renal failure (creat>2mg/dl)
Supera-inguinal, intraperitoneal or intra-thoracic surgery
Risk of cardiac death, non-fatal AMI, non-fatal cardiac stop: **0 predictors = 0.4%** **1 predictor = 1%,** **2 predictors = 2.4%** **≥3 predictors = 5.4%**

What's next?

CLASS I RECOMMENDATIONS AHA/ACC:

- Preoperative resting 12-lead ECG is recommended for patients with known coronary heart disease, peripheral arterial disease, or cerebrovascular disease who are undergoing intermediate-risk surgical procedures.
- Patients with active cardiac conditions in whom non-cardiac surgery is planned should be evaluated and treated per ACC/AHA guidelines before non-cardiac surgery.
- Beta-blockers should be continued in patients undergoing surgery who are receiving beta-blockers to treat angina, symptomatic arrhythmias, hypertension, or other ACC/AHA Class I guideline indications.
- For patients currently taking statins and scheduled for non-cardiac surgery, statins should be continued.

Coronary revascularization before non-cardiac surgery is **useful** in patients with:

- stable angina who have significant left main coronary artery stenosis, 3-vessel disease, stable angina who have 2-vessel disease with significant proximal left anterior descending stenosis and either ejection fraction less than 0.50 or demonstrable ischemia on non-invasive testing.

Coronary revascularization before non-cardiac surgery is **recommended** for patients with:

high-risk unstable angina or non-ST-segment elevation myocardial infarction and in patients with acute ST-elevation MI.

"Beyond the standard history, physical examination and 12-led electrocardiogram, further routine testing for cardiac disease does not appear to be cost-effective for all pre-thoracotomy patients"

Slinger P, Darling G, Preanesthetic Assessment for Thoracic surgery.
In PRINCIPLES AND PRACTICE OF ANESTHESIA FOR THORACIC SURGERY, P Slinger editor, 2011, cap 2, p11-34, Springer ed.

What about other patients?

- Patients with “intermediate” predictors of increased perioperative risk (eg, diabetes or renal insufficiency), plus either poor functional capacity or high-risk upcoming surgery (eg, some pulmonary resection, or an anticipated prolonged surgical procedure)
- Patients with “minor” predictors of perioperative risk (eg, advanced age, abnormal ECG), plus both poor functional capacity and high-risk upcoming surgery.
- Asymptomatic patients with ”intermediate” predictors of cardio-vascular risk

Pre-operative cardio-vascular testing:

- Needs to be adapted to the patient pathology (!lung cancer)

-“consider testing if it will change management” ?!

(AHA/ACC guidelines)

Solution: adapted algoritm

The decision whether to perform noninvasive testing is based on the presence of clinical risk factors, the patient's functional status, and the type of surgery scheduled.

I

Asymptomatic patients or with stable angina or other "intermediate" predictors(DM) of cardio-vascular risk (adequate functional capacity):

Do not need further investigation prior to pulmonary surgery

Functional capacity in METs (>4METs or climb two flights of stairs)

CPET: VO_2 > 15 ml/kg/min (climb two flights of stairs)

II

Patients with intremediate predictors of cardio-vascular complications and poor functional status

Non-invasive assessement of Myocardial perfusion:

Normal or < 20% areas of myocardial perfusion reversibility

Operating Room

III

Patients with intremediate predictors of cardio-vascular complications and poor functional status

Non-invasive assessement of Myocardial perfusion:

> **20% areas of myocardial perfusion reversibility**

- ***Proceed if low risk surgery (mediastinoscopy, etc)***
- ***Tight haemodinamic control and surgery***

or

Cardiac catheterisation

Non-invasive assessement of myocardial perfusion

Ecocardiography (rest) for LV assessment should be considered in patients undergoing high-risk surgery (failure to detect severe underlying IHD).

Valvulopaty

In thoracic surgery: Pulmonary HT

Stress ecocardiography:

- high negative predictive value (>90%)
- positive predictive value is low (between 25 and 45%)

CT angyography

- *Normal CT can proceed to surgery*
- If abnormal needs pulmonary catheterisation

Cardiac catheterisation...

- Angioplasty: delay thoracic surgery > 2 weeks
- Cardiac surgery or stent: delay thoracic surgery >6 weeks
- Combined cardiac and thoracic surgery

Ischemic Heart Disease

Routine complex coronary tests

- Expensive
- **Study**: 184 pacients with thoracotomy, with at least one complex test (dobutamine stress echo, treadmil test, nuclear stress test, angiografie).
- **Rezultate**: 43% with evident IHD

10% Coronary revascularization

7 pacients (2,4%) postoperative AMI, 4 deaths.

No difference in postoperative AMI between those with or without complex coronary tests

(Jaroszewski DE et al., Utility of detailed preoperative cardiac testing and incidence of post-thoracotomy myocardial infarction, *J Thorac Cardiovasc Surg,* ***2008*****;** 135:648-655)

Recent AMI

4-6 weeks if pacient is medically stable and fully inestigated from the cardiologist point of vue

Age

Mortality 3% in a group of patients 80-92 years

Osaki T, et al. Surgical treatement of lung cancer in the octogenarian. Ann Thorac Surg, 1994;57:188-192

Risc of cardiac complications (arrhythmias) 40%

Thoracothomy a high risk procedure

Right pneumonecthomy high risk of mortality

Cardiac evaluation by the specialist (ACC/AHA guides)

Ahrrythmias

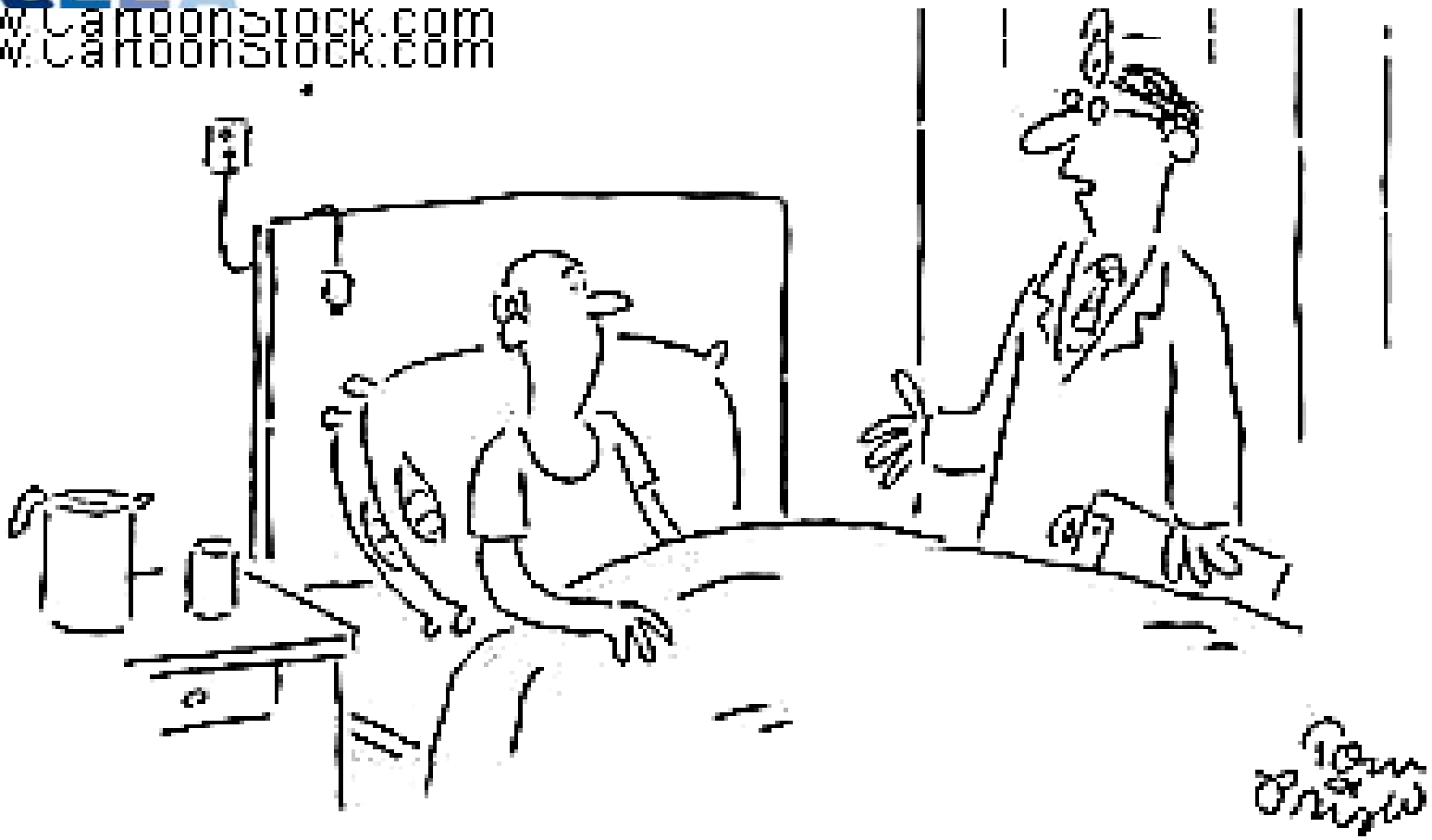
Post-thoracotomy supraventricular ahrrythmias are frequent

Atrial fibrilation (AF) : 12-20% after lobectomy up to 40% after extrapleural pneumonectomy for mezothelioma

Multifactorial ethiology

(Amar D., Postthoracotomy Arrhythmias, in *Progress in Thoracic Anesthesia*, PD Slinger ed., Lippincot Williams & Wilkins, **2004**; Cap 11:247-266)

www.CartoonStock.com



"Your left ventricle doesn't know what your right ventricle is doing."

AF Preoperative treatment

Digoxin. Best known. Doesn' t prevent arrhythmias after pneumonectomy or other intrathoracic procedures. **Not indicated**

B-blockers, verapamil, magnesium, thoracic epidural analgesia (TEA) dosen' t prevent AF

Amidarone efficacy if administrated 7 days before surgery. Lung toxicity (?). Indication not proved. **Diltiazem only antiarrhythmic useful in AF prophylaxis**

(Amar D et al., Effects of diltiazem prophhylaxis and clinical outcome of atrial arrhythmias after thoracic surgery, *J Thorac Cardiovasc Surg 2000*; 120:790)

Oxigen administration: FiO_2 deacresed from 35% to 21% in the first postop day rise RVEDP

Ventricular ahrrythmias

412 pacients, 169 pneumonectomies:

15% not-sustained VT and no episod of sustained VT (>30s)

Frequent postoperative association LBB with AF Benefic effect of Calcium chanel blockers (Diltiazem)

Etiology: increased sympathetic stimuli in the second postoperative day or parasimpatic tonus amputation

No prevention. Good prognosis

*(Amar D et al, The Incidence and Outcome of Ventricular Arrhithmyas After NoncardiacThoracic Surgery, Anesth Analg **2002**; 95:537)*

Recommandations on anaesthesia

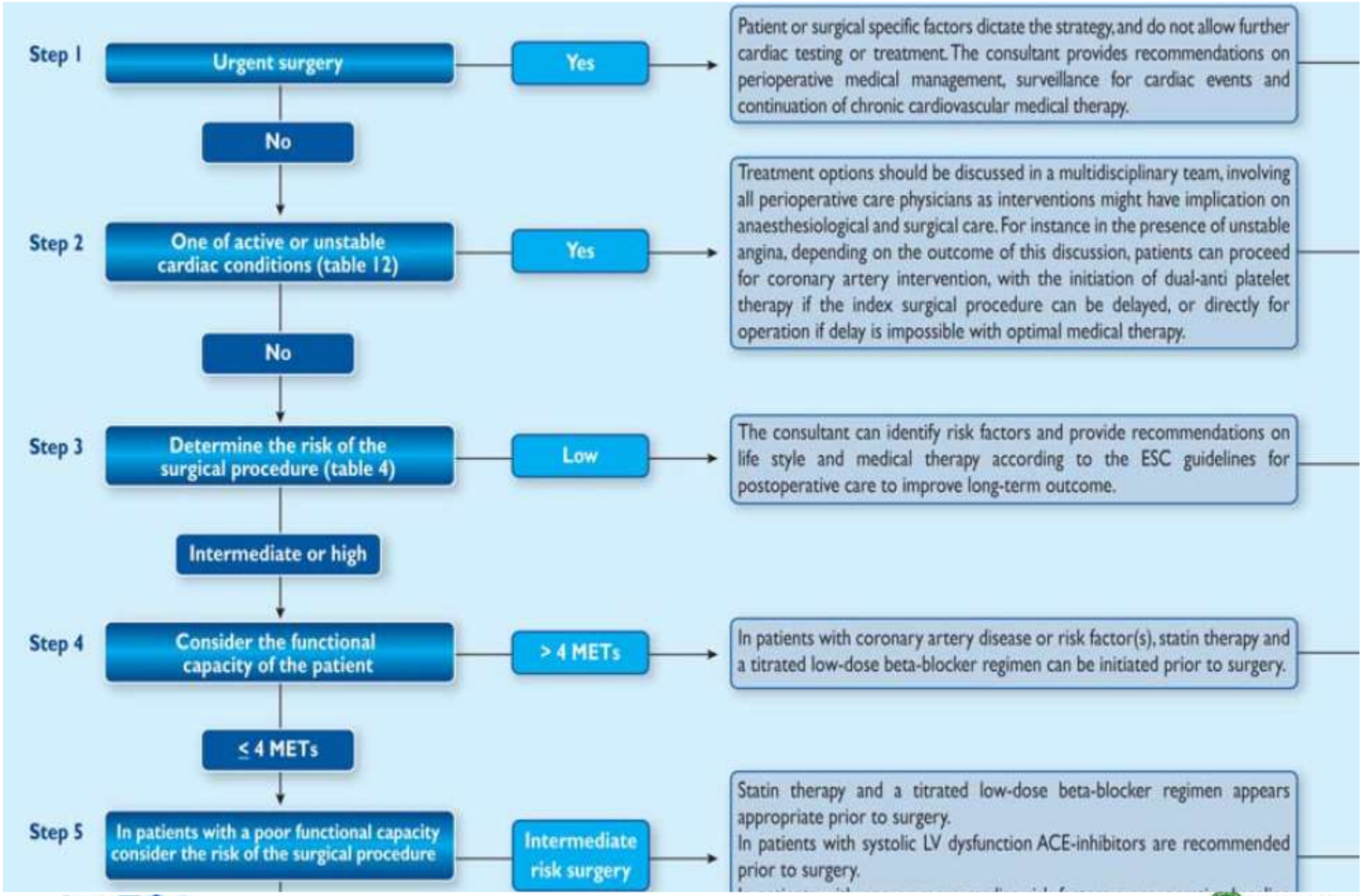
Recommendations	Class*	Level**
Consideration should be given to Performing thoracic epidural anaesthesia in high-risk surgery for patients with cardiac disease	II	A
Use of NSAID”s drugs and COX-2 inhibitors for post-operative pain control is not recommended in patients with renal and heart failure, myocardial ischaemia, elderly patients, as well as in patients taking diuretics or having unstable haemodynamics	III	B

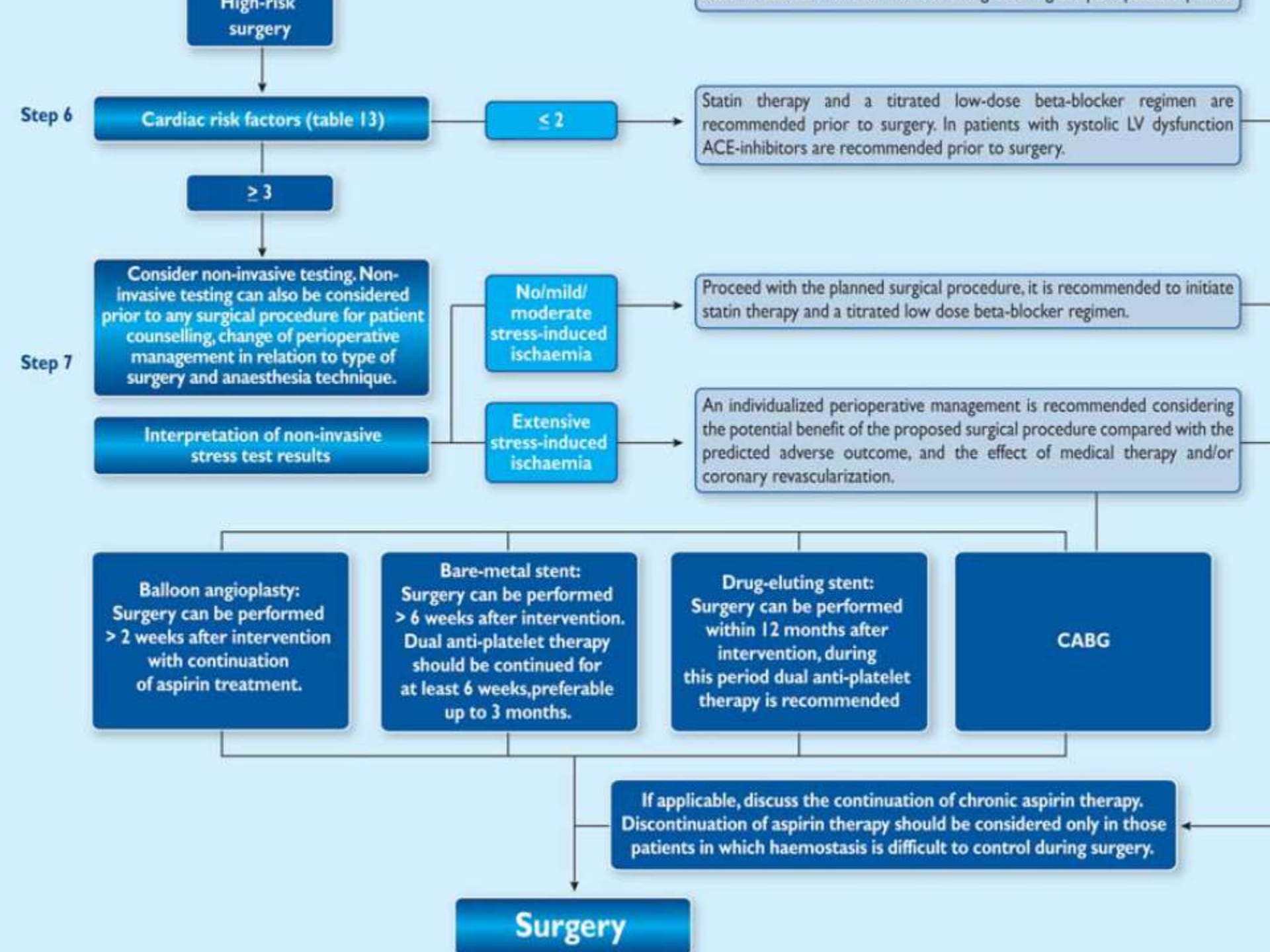
*Class of recommendation.

**Level of evidence.

CONCLUSIONS

*European task force... Don Poldermans; (Chairperson) (The Netherlands)*et al. European Heart Journal (2009) 30, 2769–2812*




High-risk surgery
Step 6
Cardiac risk factors (table 13)
≤ 2
Statin therapy and a titrated low-dose beta-blocker regimen are recommended prior to surgery. In patients with systolic LV dysfunction ACE-inhibitors are recommended prior to surgery.
≥ 3
Step 7
Consider non-invasive testing. Non-invasive testing can also be considered prior to any surgical procedure for patient counselling, change of perioperative management in relation to type of surgery and anaesthesia technique.
Interpretation of non-invasive stress test results
No/mild/ moderate stress-induced ischaemia
Proceed with the planned surgical procedure, it is recommended to initiate statin therapy and a titrated low dose beta-blocker regimen.
Extensive stress-induced ischaemia
An individualized perioperative management is recommended considering the potential benefit of the proposed surgical procedure compared with the predicted adverse outcome, and the effect of medical therapy and/or coronary revascularization.
Balloon angioplasty: Surgery can be performed > 2 weeks after intervention with continuation of aspirin treatment.
Bare-metal stent: Surgery can be performed > 6 weeks after intervention. Dual anti-platelet therapy should be continued for at least 6 weeks,preferable up to 3 months.
Drug-eluting stent: Surgery can be performed within 12 months after intervention, during this period dual anti-platelet therapy is recommended
CABG
If applicable, discuss the continuation of chronic aspirin therapy. Discontinuation of aspirin therapy should be considered only in those patients in which haemostasis is difficult to control during surgery.
Surgery

- Oncologic Pathology in Thoraco-pulmonary surgery is frequent
- ***"Beyond the standard history, physical examination and 12-led electrocardiogram, further routine testing for cardiac disease does not appear to be cost-effective for all pre-thoracotomy patients"***

Slinger P

- **No test should be performed unless it is likely to influence the perioperative care of the patient**

ACC/AHA Guidelines

- Current quidelines for cardio-vascular preoperative investigation are frequently “by-passed”!
- The medical team adapt algoritm and take decision!

Thank you!