



ESC

European Society
of Cardiology

European Heart Journal (2022) **00**, 1–99
<https://doi.org/10.1093/eurheartj/ehac270>

ESC GUIDELINES

2022 ESC Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery

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EPIDEMIOLOGY

Major cardiac complications \longrightarrow 1/3 peri operative death

500.000 à 1 M high risk procedure / year

5000 à 10.000 death / year during 30 days after surgery

Major impact on medical cost

The average age and the risk of cardiac complications are increasing

Decrease intra operative mortality by a factor of 10

POST OPERATIVE MORTALITY REMAINS STABLE

« THE OUTCOME WE WANT TO PREVENT »

decrease cv morbidity & mortality immediate & late

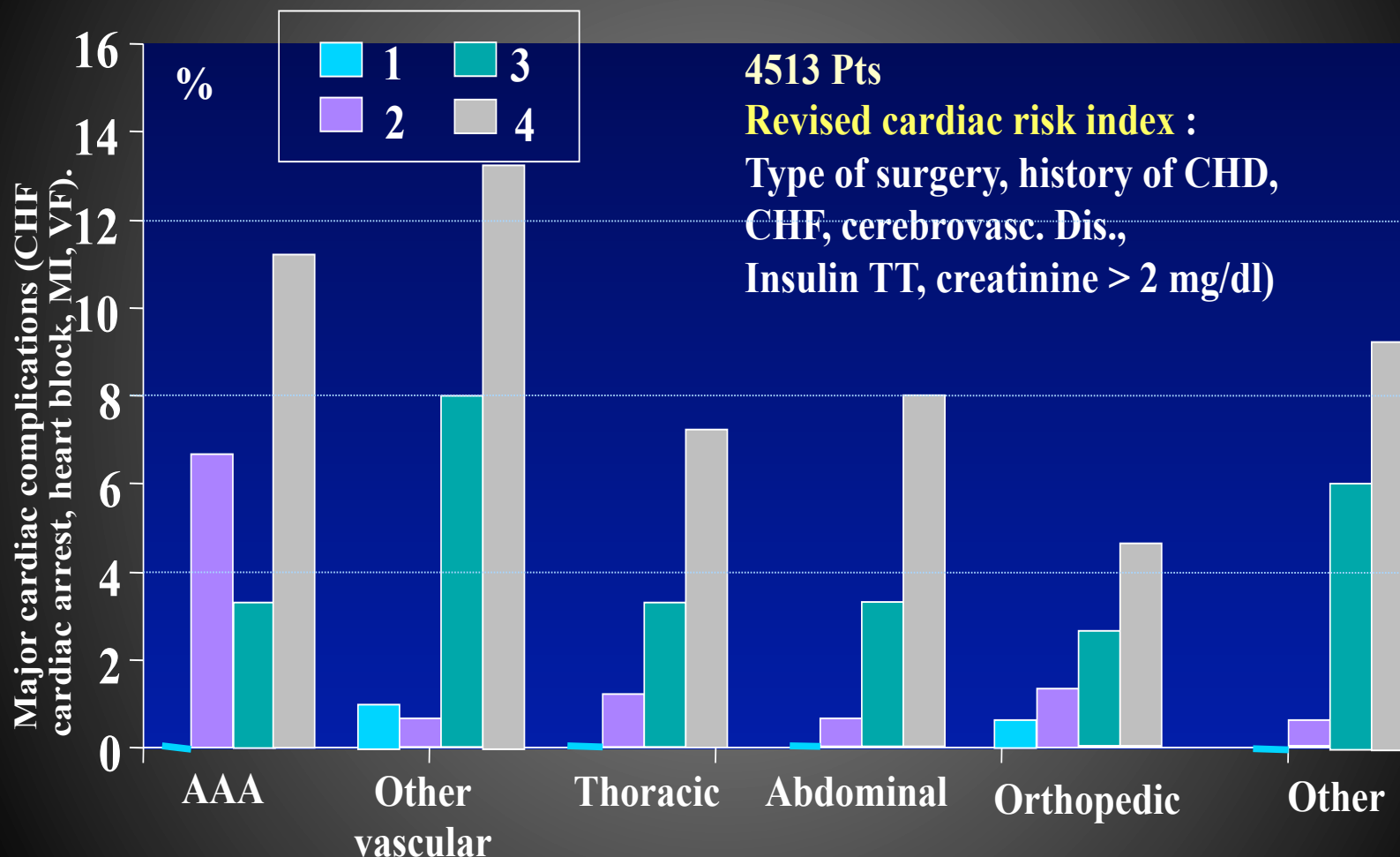
LE RISQUE A PRIORI

1. INTERVENTION A HAUT RISQUE
2. CARDIOPATHIE ISCHEMIQUE
3. INSUFFISANCE CARDIAQUE
4. AVC
5. DIABETE INSULINO REQUERANT
6. INSUFFISANCE RENALE : CREATININE > 177 $\mu\text{mol} / \text{l}$; clairance < 65 ml / mn

Lee T.H Circulation. 1999

Dernier patient inclus 1994.
PAS DE TROPO !!!!!

Incidence of major cardiac complications* according to number of risk factors



major cardiac complications*: CHF cardiac arrest, heart block, MI, VF

Myocardial Injury after Noncardiac Surgery

A Large, International, Prospective Cohort Study Establishing Diagnostic Criteria, Characteristics, Predictors, and 30-day Outcomes

The Vascular events In noncardiac Surgery patients cOhort evaluation (VISION) Writing Group, on behalf of The Vascular events In noncardiac Surgery patients cOhort evaluation (VISION) Investigators

VISION

n = 15065 > 45 y , non cardiac surgery, Troponin T J0-J3, FU 30 D

M.I.N.S = 8 % 42% IDM

Table 4. 30-day Outcomes

Outcome*	Patients without MINS (n = 13,822)	Patients Suffering MINS (n = 1,194)	Unadjusted OR (95% CI)
	n (%)	n (%)	
Nonfatal cardiac arrest	8 (0.06)	10 (0.8)	14.58 (5.75–37.02)
Congestive heart failure	137 (1.0)	112 (9.4)	10.34 (7.99–13.37)
Stroke	58 (0.4)	23 (1.9)	4.66 (2.87–7.58)
Mortality	147 (1.1)	117 (9.8)	10.07 (7.84–12.94)
Composite of major events†	325 (2.4)	224 (18.8)	9.59 (7.99–11.51)

Factors associated with peri-operative cardiovascular complications

Patient-related factors

Chronic:

Age >75 years
Coronary artery disease
Heart failure
Severe aortic stenosis
Peripheral arterial disease
Cerebrovascular disease
Renal insufficiency
Diabetes, anaemia

(Sub)-Acute:

Acute coronary syndrome
Acute aortic syndrome
Acute stroke
Acute trauma (e.g. hip fracture)

Procedure-related factors (surgery and anaesthesia):

Urgency of the procedure, hypotension, hypercoagulability, bleeding inflammation, tachycardia, hypothermia, SNS stimulation

Post-operative factors:

Hypotension, bleeding, hypoxaemia, tachycardia, pain

Cardiovascular complications:

Type 1 myocardial infarction
Type 2 myocardial infarction
Acute heart failure, arrhythmias
Pulmonary embolism
Stroke
Cardiovascular death

SURGICAL RISK ESTIMATE

30 Days risk of CV death, MI, stroke

Low surgical risk (<1%)	Intermediate surgical risk (1–5%)	High surgical risk (>5%)
<ul style="list-style-type: none"> • Breast • Dental • Endocrine: thyroid • Eye • Gynaecological: minor • Orthopaedic minor (meniscectomy) • Reconstructive • Superficial surgery • Urological minor: (transurethral resection of the prostate) • VATS minor lung resection 	<ul style="list-style-type: none"> • Carotid asymptomatic (CEA or CAS) • Carotid symptomatic (CEA) • Endovascular aortic aneurysm repair • Head or neck surgery • Intraperitoneal: splenectomy, hiatal hernia repair, cholecystectomy • Intrathoracic: non-major • Neurological or orthopaedic: major (hip and spine surgery) • Peripheral arterial angioplasty • Renal transplants • Urological or gynaecological: major 	<ul style="list-style-type: none"> • Adrenal resection • Aortic and major vascular surgery • Carotid symptomatic (CAS) • Duodenal-pancreatic surgery • Liver resection, bile duct surgery • Oesophagectomy • Open lower limb revascularization for acute limb ischaemia or amputation • Pneumonectomy (VATS or open surgery) • Pulmonary or liver transplant • Repair of perforated bowel • Total cystectomy

SURGICAL RISK

> 1 %

Low-risk: < 1%	Intermediate-risk: 1-5%	High-risk: > 5%
<ul style="list-style-type: none"> • Superficial surgery • Breast • Dental • Endocrine: thyroid • Eye • Reconstructive • <u>Carotid asymptomatic</u> (CEA or CAS) • Gynaecology: minor • Orthopaedic: minor (meniscectomy) • Urological: minor (<u>transurethral resection of the prostate</u>) 	<ul style="list-style-type: none"> • Intraperitoneal: splenectomy, hiatal hernia repair, cholecystectomy • Carotid symptomatic (CEA or CAS) • Peripheral arterial angioplasty • Endovascular aneurysm repair • Head and neck surgery • Neurological or orthopaedic: major (hip and spine surgery) • Urological or gynaecological: major • Renal transplant • Intra-thoracic: non-major 	<ul style="list-style-type: none"> • Aortic and major vascular surgery • Open lower limb revascularization or amputation or thromboembolectomy • Duodeno-pancreatic surgery • Liver resection, bile duct surgery • Oesophagectomy • Repair of perforated bowel • Adrenal resection • Total cystectomy • Pneumonectomy • Pulmonary or liver transplant

BLEEDING RISK

Surgery with minor bleeding risk	Surgery with low bleeding risk (infrequent or with low clinical impact)	Surgery with high bleeding risk (frequent or with significant clinical impact)
<ul style="list-style-type: none"> • Cataract or glaucoma procedure • Dental procedures: extractions (1–3 teeth), periodontal surgery, implant positioning, endodontic (root canal) procedures, subgingival scaling/cleaning • Endoscopy without biopsy or resection • Superficial surgery (e.g. abscess incision, small skin excisions/ biopsy) 	<ul style="list-style-type: none"> • Abdominal surgery: cholecystectomy, hernia repair, colon resection • Breast surgery • Complex dental procedures (multiple tooth extractions) • Endoscopy with simple biopsy • Gastroscopy or colonoscopy with simple biopsy • Large-bore needles procedures (e.g. bone marrow or lymph node biopsy) • Non-cataract ophthalmic surgery • Small orthopaedic surgery (foot, hand arthroscopy) 	<ul style="list-style-type: none"> • Abdominal surgery with liver biopsy, extracorporeal shockwave lithotripsy • Extensive cancer surgery (e.g. pancreas, liver) • Neuraxial (spinal or epidural) anaesthesia • Neurosurgery (intracranial, spinal) • Major orthopaedic surgery • Procedures with vascular organ biopsy (kidney or prostate) • Reconstructive plastic surgery • Specific interventions (colon polypectomy, lumbar puncture, endovascular aneurysm repair) • Thoracic surgery, lung resection surgery • Urological surgery (prostatectomy, bladder tumour resection) • Vascular surgery (e.g. AAA repair, vascular bypass)

SURGICAL RISK

« The number of different surgical procedures makes assigning a specific risk of a MACE to each procedure difficult » ACC/AHA 2014

LOW RISK SURGERY AND HIGH RISK SURGERY

Association Between Major Perioperative Hemorrhage and Stroke or Q-Wave Myocardial Infarction

Hooman Kamel, MD; S. Claiborne Johnston, MD, PhD; John C. Kirkham, MD;
Christopher G. Turner, MD, MPH; Jorge R. Kizer, MD, MSc;
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Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION



Bleeding Is Rarely Good for You
Lee Goldman

Management of patients before non-cardiac surgery (NCS)

Emergent or urgent NCS

Cardiac testing not feasible*

Time-sensitive NCS

Multidisciplinary decision of individualized cardiac testing. If time, manage as elective NCS

Elective NCS

Accurate history and clinical examination, including standard lab tests (Class I)

Advise on stopping smoking, optimize guideline-recommended medical therapy (Class I)

<65 years without any CVD/CV risk factors*

≥65 years or with CV risk factors*

Patients with established CVD

Low-risk NCS

None*

Low-risk NCS

None*

Low-risk NCS

None (see section 6)

Intermediate-risk NCS

None*

Intermediate-risk NCS

ECG biomarkers* (Class I)

Functional capacity* (Class IIa)

Intermediate-risk NCS

ECG biomarkers* (Class I)

Functional capacity* (Class IIa)

(see section 6)

High-risk NCS

In patients ≥45 years consider ECG biomarkers* (Class IIa)

High-risk NCS

ECG biomarkers* (Class I)

Functional capacity* (Class IIa)

High-risk NCS

ECG biomarkers* (Class I)

Functional capacity* (Class IIa)

+ cardiology consultation* (see section 6)
Multidisciplinary decision

FOCUS ? PMI monitoring high risk surgery

Benefits / risk ?

EXIT risk score prefer individual risk evaluation

Murmur dyspnea, oedema → biomarkers + TTE

Genetic cardiomyopathy → ECG + TTE

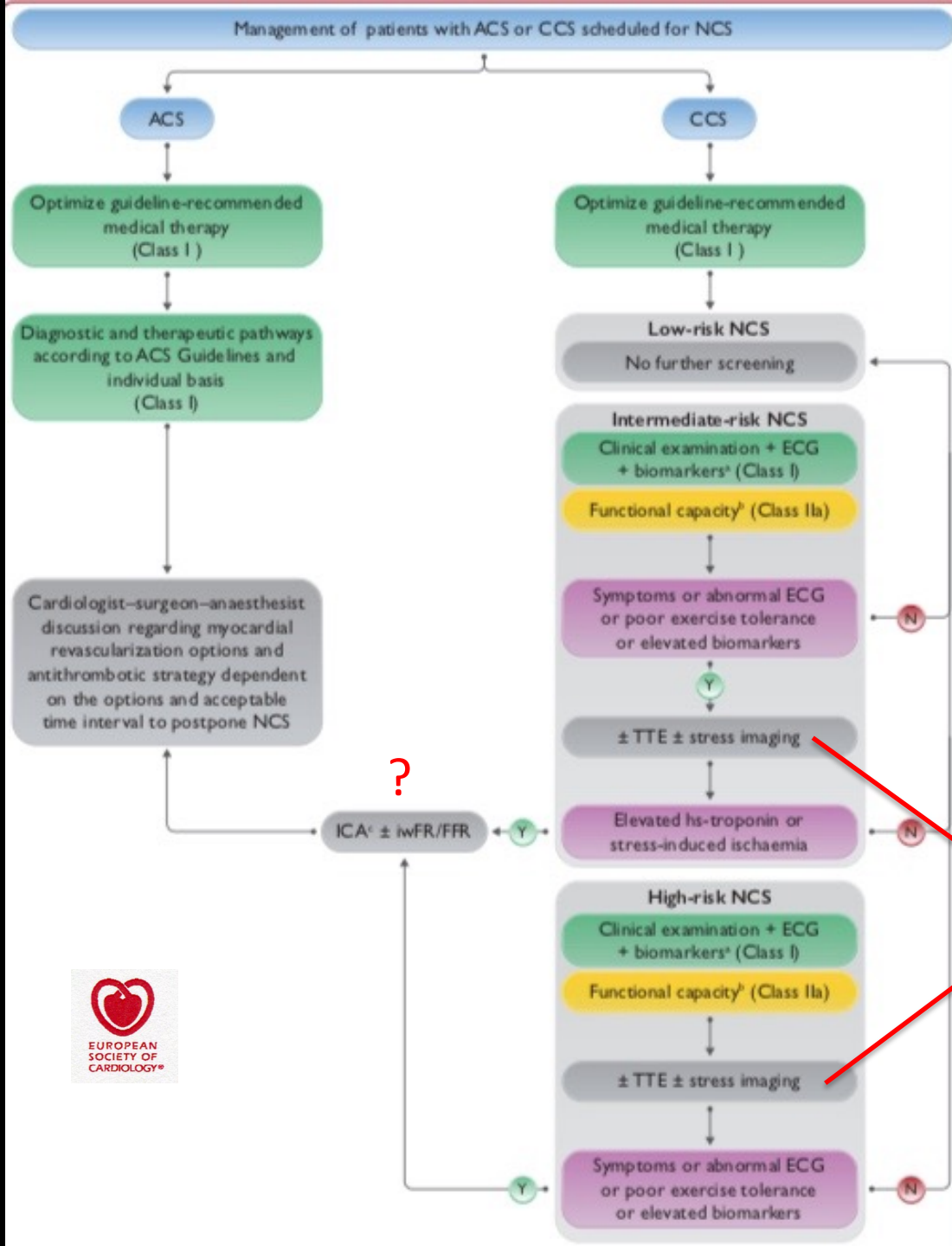
Low risk NCS → No additional assessment

65 Y or CV risk factors +
Intermediate and high risk NCS

→ increase attention

→ ECG + post op troponin monitoring

STRESS IMAGING FOR PRE & POST OP STRATEGY ?





Coronary-Artery Revascularization before Elective Major Vascular Surgery

Edward O. McFall, M.D., Ph.D., Herbert B. Ward, M.D., Ph.D., Thomas E. Moritz, M.S., Steven Goldman, M.D., William C. Krupski, M.D.,* Fred Littooy, M.D., Gordon Pierpont, M.D., Steve Santilli, M.D., Joseph Rapp, M.D., Brack Hattler, M.D., Kendrick Shunk, M.D., Ph.D., Connie Jaenicke, R.N., B.S.N., Lizzy Thottapurathu, M.S., Nancy Ellis, M.S., Domenic J. Reda, Ph.D., and William G. Henderson, Ph.D.

SCREENING
Chir. Vasculaire
N = 5859

CORONAROGRAPHIE
Risque majeur / intermédiaire
N = 1190

CARP study

• Sténose tronc commun
N = 54
• FE du VG \leq 20% N=11

Coronaropathie non-obstructive
N = 363
Coronaropathie non-traitable
N = 215

Randomisation
N = 510 (9%)

≥ 1 Sténose > 70%

Revascularisation
N = 258

Trait. Médical
N = 252

55 %

PCI
N = 141

PAC
N = 99

Morbi-Mortalité ?

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

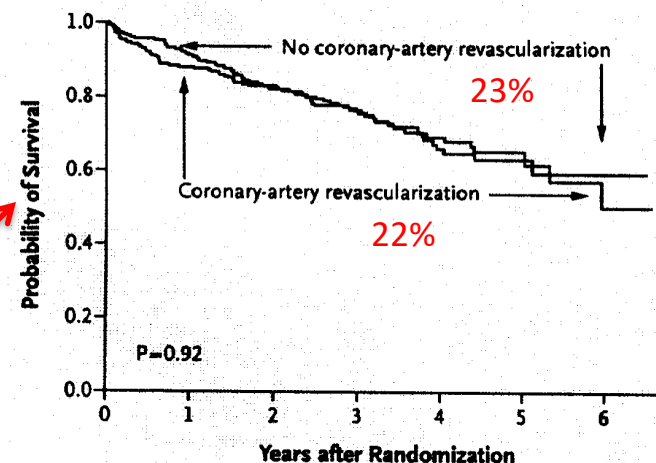
DECEMBER 30, 2004

VOL. 351 NO. 27

Coronary-Artery Revascularization before Elective Major Vascular Surgery

Mc Falls 2004
C.A.R.P.

PCI : 59 %



No. at Risk

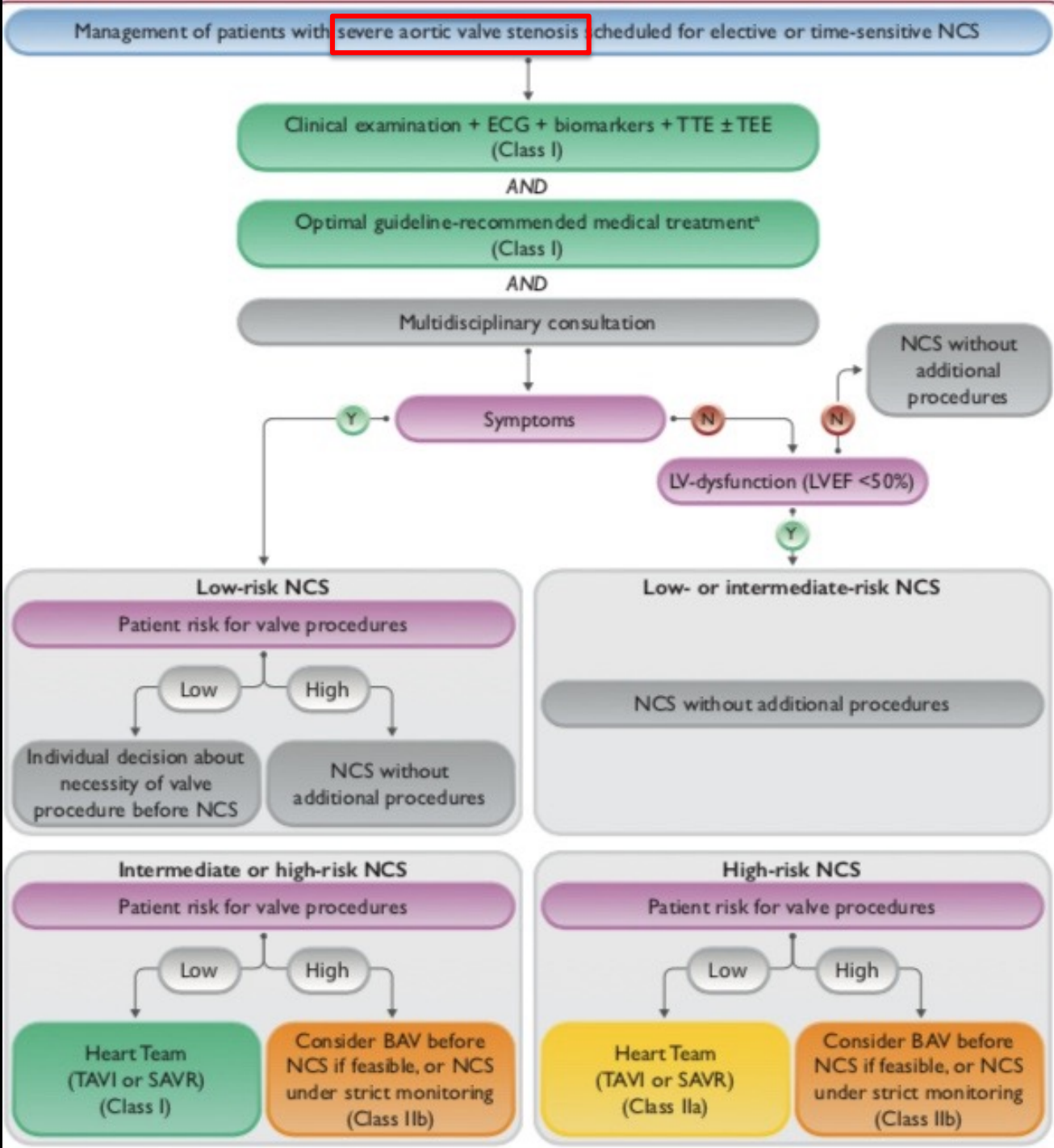
Revascularization	226	175	113	65	18	7
No revascularization	229	172	108	55	17	12

Figure 1. Long-Term Survival among Patients Assigned to Undergo Coronary-Artery Revascularization or No Coronary-Artery Revascularization before Elective Major Vascular Surgery.

Kaplan-Meier estimates were used to generate survival curves, from the time of randomization, for all study patients.

Postoperative events (within 30 days)

	R	NR	
Death — no. (%)	7 (3.1)	8 (3.4)	0.87
Myocardial infarction			
Enzymes — no. (%)	26 (11.6)	34 (14.3)	0.37
Enzymes and ECG — no. (%)	19 (8.4)	20 (8.4)	0.99
Stroke — no. (%)	1 (0.4)	2 (0.8)	0.59
Loss of leg — no. (%)	1 (0.4)	5 (2.1)	0.11
Renal dialysis — no. (%)	1 (0.4)	1 (0.4)	0.97
Reoperation — no. (%)	17 (7.6)	18 (7.6)	0.99



Recommendations	Class ^a	Level ^b
Clinical and echocardiographic evaluation (if not recently performed) is recommended in all patients with known or suspected VHD who are scheduled for elective intermediate- or high-risk NCS.	I	C
Aortic valve stenosis		
AVR (SAVR or TAVI) is recommended in symptomatic patients with severe AS who are scheduled for elective intermediate- or high-risk NCS.	I	C
In asymptomatic patients with severe AS who are scheduled for elective high-risk NCS, AVR (SAVR or TAVI) should be considered after Heart Team discussion.	IIa	C
In patients with severe symptomatic AS in need of time-sensitive NCS or in whom the TAVI and SAVR are unfeasible, BAV may be considered before NCS as a bridge to definitive aortic valve repair.	IIb	C

ESTIMATE BLEEDING RISK

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Patients on dual antiplatelet therapy

NCS-related bleeding risk

High bleeding risk
related to NCS

Y

Thrombotic risk

High thrombotic risk:
PCI <1 month or
ACS <3 months or
High risk of stent thrombosis¹

Y

Recommendations

Time-sensitive NCS

N

Continue aspirin
(Class I)

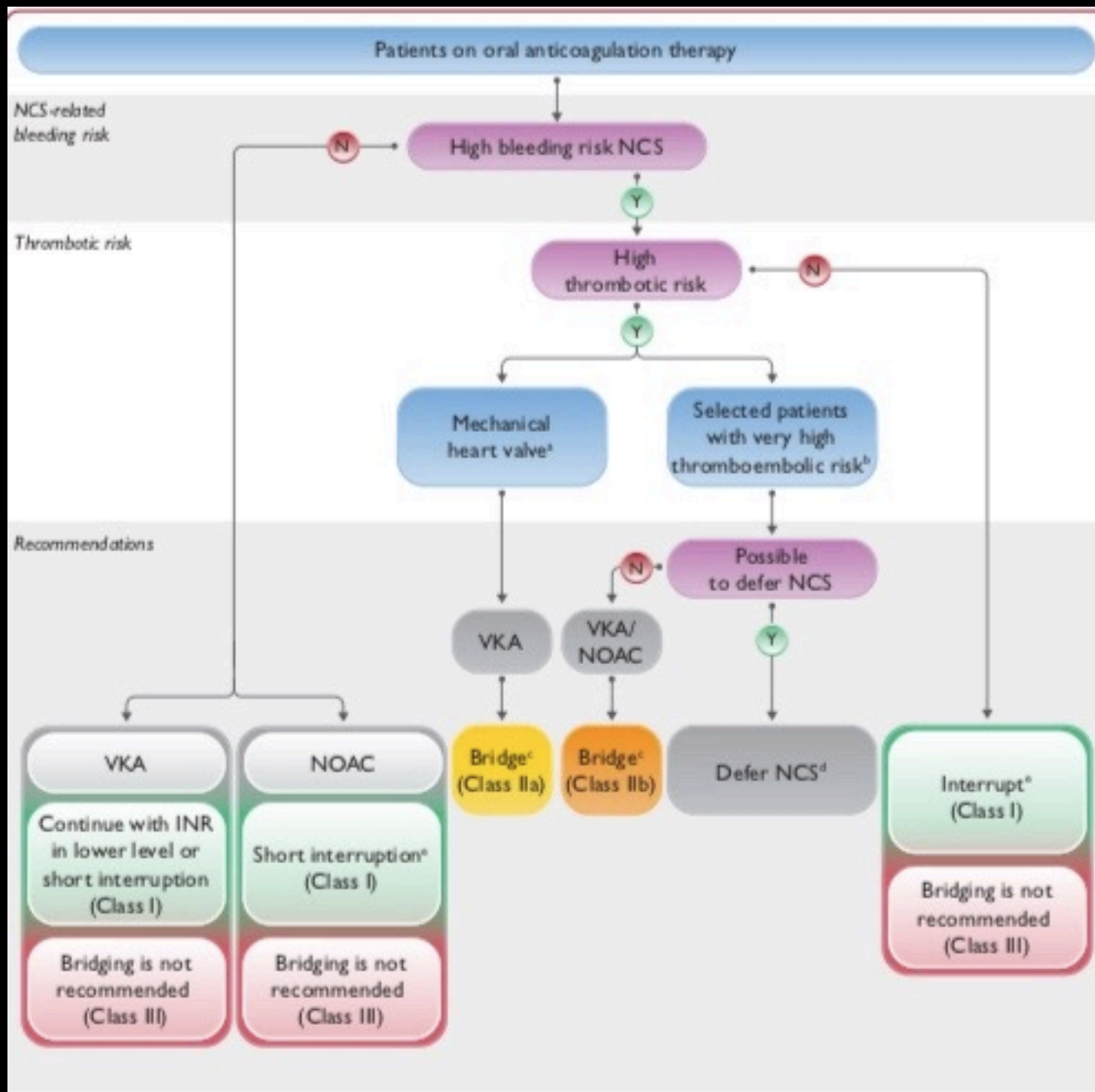
Interrupt P2Y₁₂
inhibitor^b
(Class IIa/b)

Ticagrelor: 3–5 days
Clopidogrel: 5 days
Prasugrel: 7 days
(Class I)

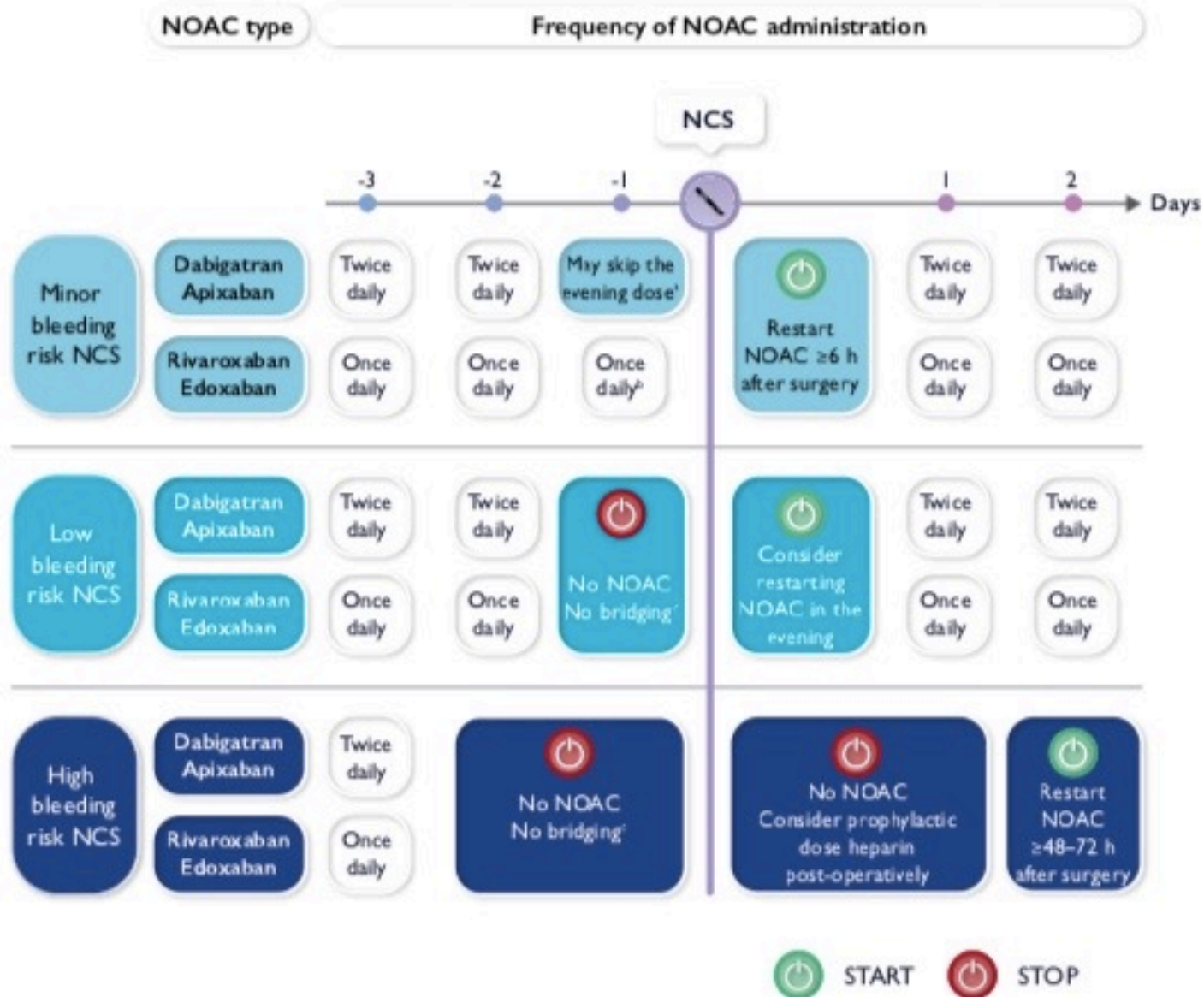
Bridge with GPI
or cangrelor^c

Defer NCS
(Class I)

Continue DAPT

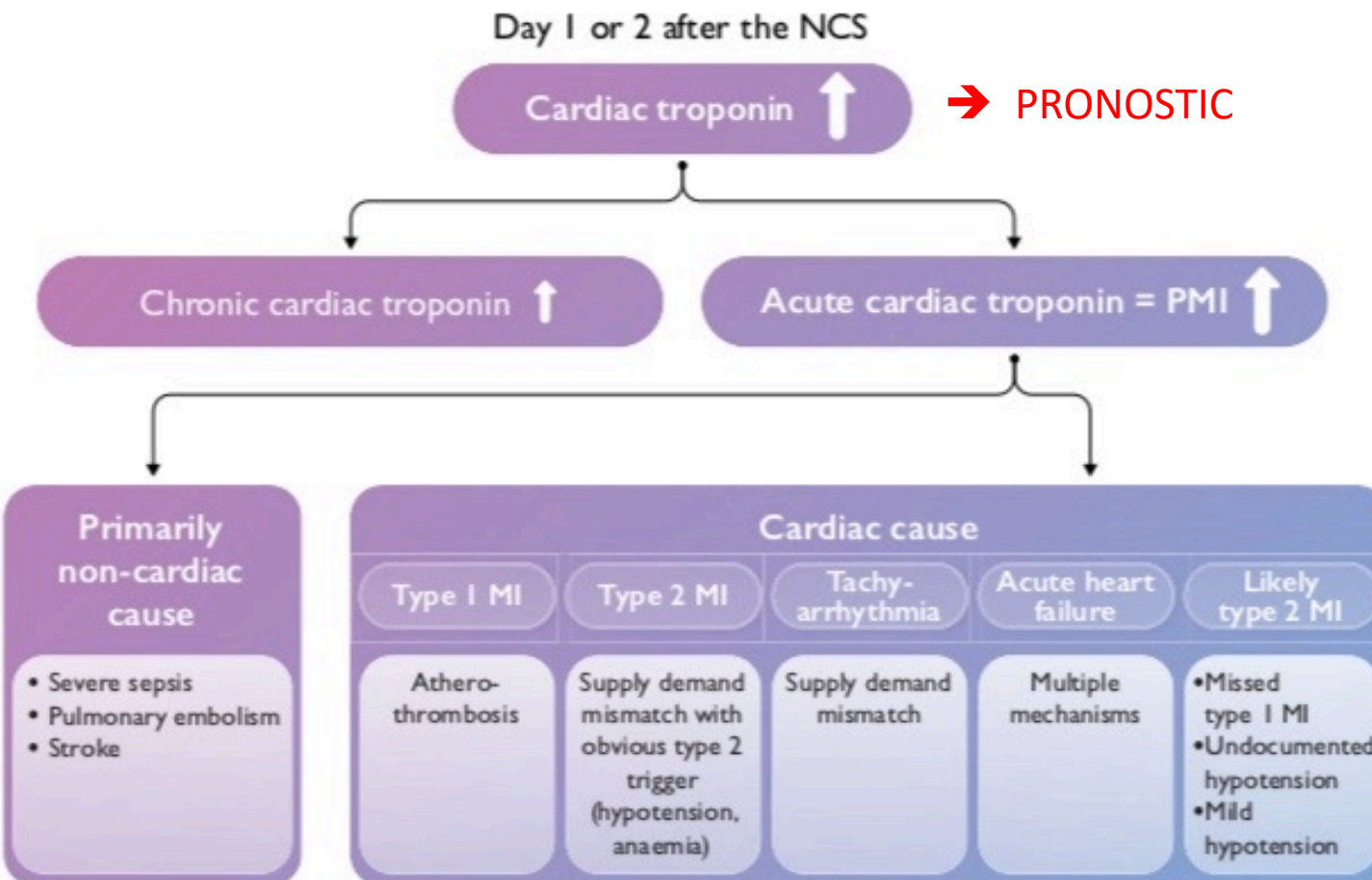


Stopping and re-initiation of NOAC therapy in elective NCS according to the periprocedural risk of bleeding in patients with normal renal function

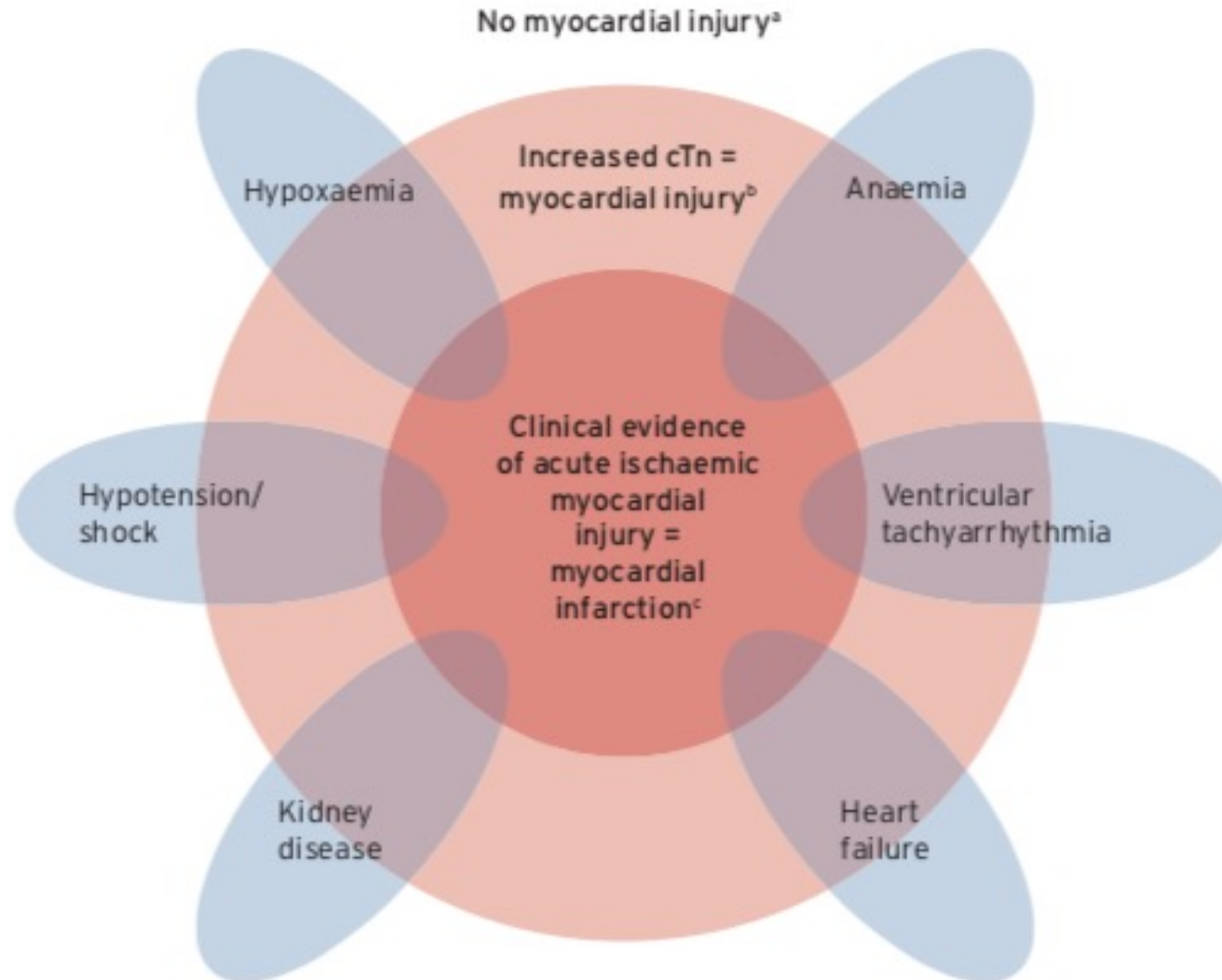




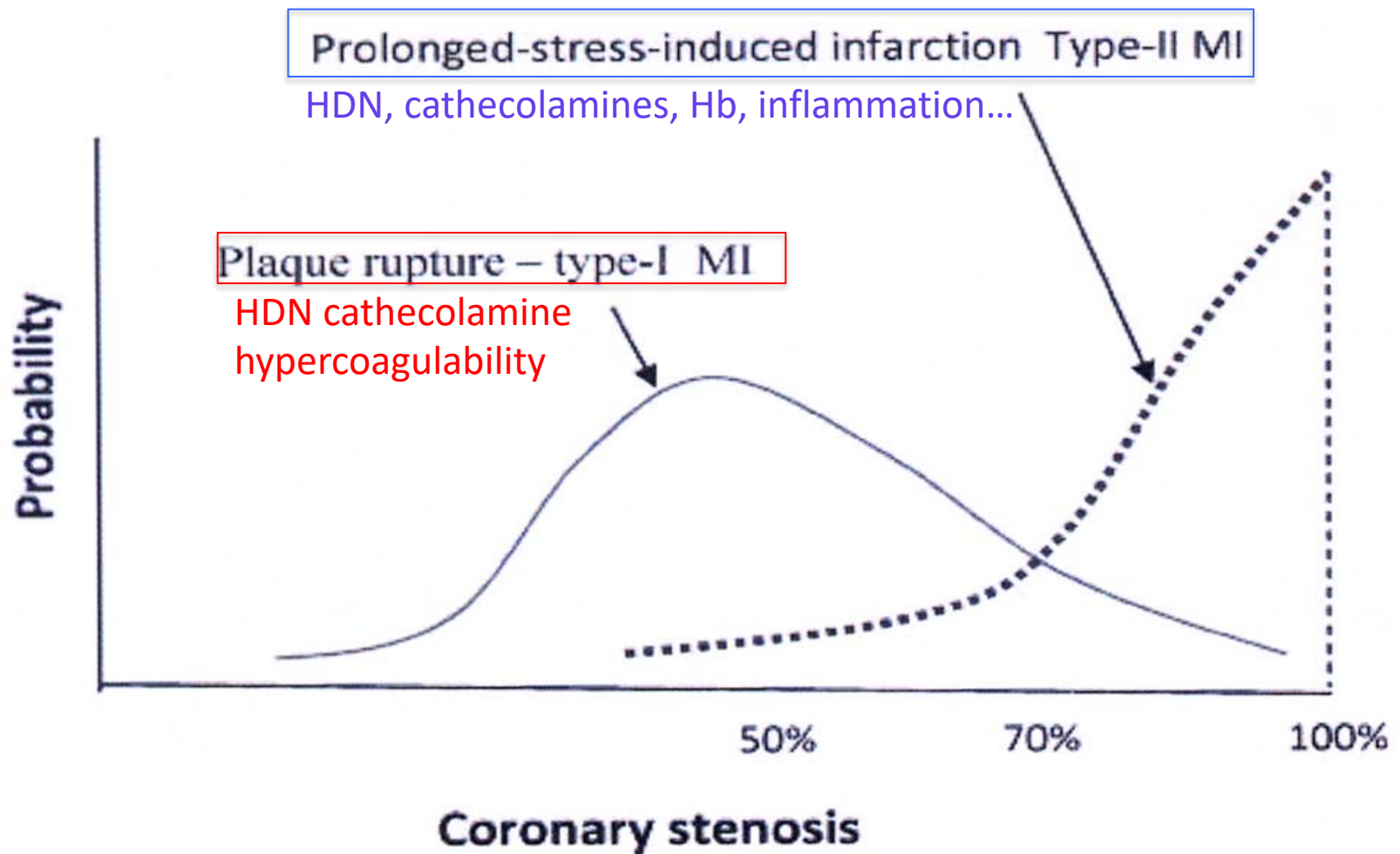
Troponin does not increase after surgery !!



FROM MYOCARDIAL INJURY TO MYOCARDIAL INFARCTION

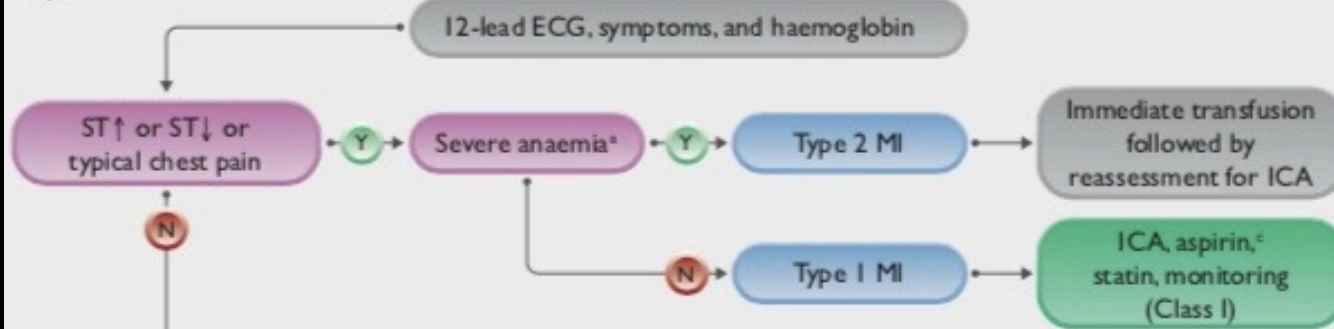


2 MECHANISMS OF PMI

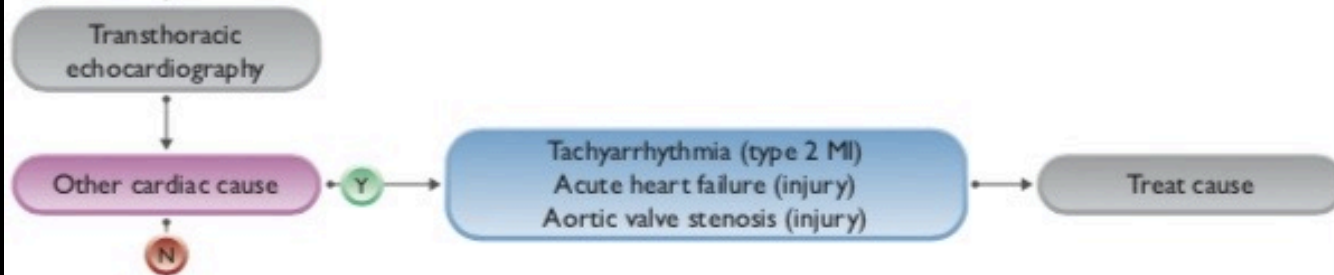


Systematic work-up and treatment of peri-operative myocardial injury/infarction

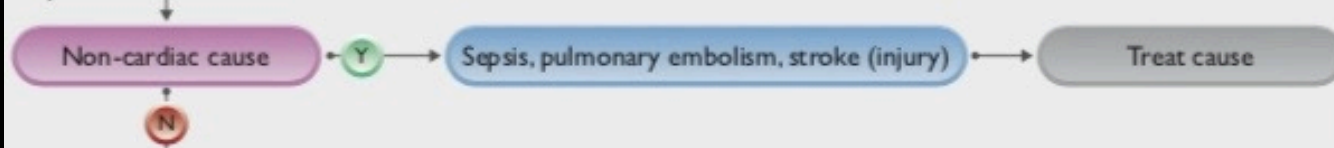
Step 1



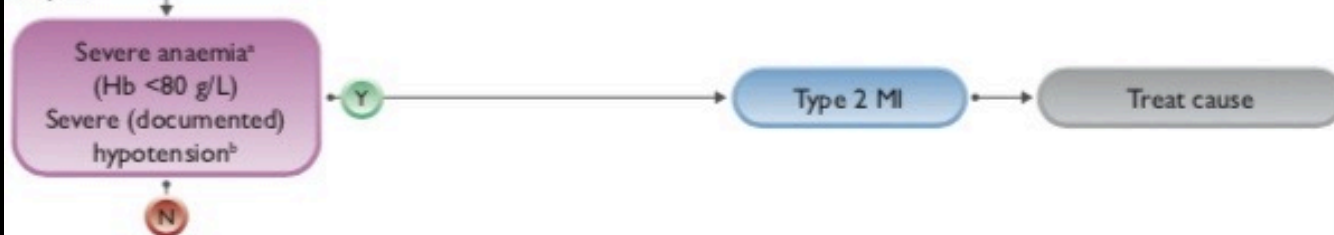
Step 2



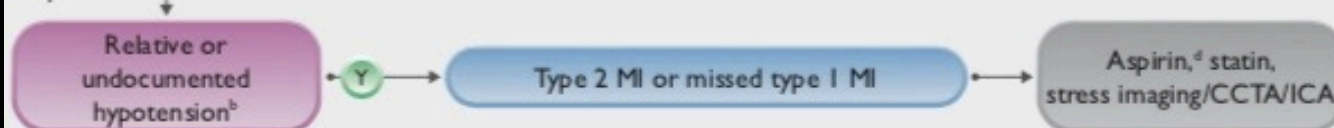
Step 3



Step 4



Step 5



Recommendations	Class ^a	Level ^b
<p>It is recommended to have <u>high awareness</u> of peri-operative CV complications, combined with surveillance for PMI in patients undergoing intermediate- or high-risk NCS.^{41,101,109–111,118,413,636–639}</p>	I	B
<p>Systematic PMI work-up is recommended to <u>identify the underlying pathophysiology and define therapy.</u>^{41,101,109–111,118,413,636–639}</p>	I	B
<p>It is recommended to treat post-operative STEMI, NSTEMI-ACS, acute HF, and tachyarrhythmias in <u>accordance with guidelines for the non-surgical</u> setting, after interdisciplinary discussion with the surgeon about bleeding risk.^{98,99,171,651,652}</p>	I	C

TAKE HOME MESSAGES

PREVENT THE OUTCOMES: DECREASE INCIDENCE OF PMI AND SO MORTALITY & MORBIDITY

PATIENT RELATED RISK : AGE > 75Y CAD CVD PAD DB CKD

MORE CARDIOLOGIST IMPLICATION IN PRE & POST OPERATIVE PERIOD

RISK REDUCTION STRATEGY FOR PATIENTS WITH SIGNIFICANT CARDIAC DISEASE

CCS : Define the better strategy to limit the incidence of PMI

AS : Define the right indications of pre operative AVR

Management of DAPT, NOAC, OAC : Decrease bleeding risk

MANAGEMENT OF PMI : ICU with anesthesiologist, cardiologist and surgeon discussion

LONG TERM FU AFTER PMI : Cardiologist post operative consultation

GAPS IN EVIDENCE : Additive value of biomarkers for stratification ? impact of stress imaging ?

« NO SINGLE INTERVENTION HAS YET BEEN PROVEN TO BE BENEFICIAL IN PMI PREVENTION »

« MORE RESEARCH IS NEEDED »

10 TAKE HOME MESSAGES AND QUESTIONS

MINS complex pathophysiology not only related to coronary stenosis

Risk stratification : prevent myocardial injury decrease short and long term mortality

Emergency surgery : Very high risk, clinical ECG stratification +/- TTE

Low risk surgery : OR

High risk surgery : New paradigm ? Pre op BNP ? Post op troponin monitoring ?

Vascular surgery needs a specific pre and post operative assessment

DSE high NPV , improve stratification, changes management, influences outcome **BUT**

DSE for who ? RCRI > 1 , CAD , DB, major risk factors,

Post operative troponin monitoring: For who ? OR events ? Which management ?

Long term follow up after MINS with or without PMI


USE YOUR BRAIN FOR PERI OPERATIVE MEDICINE

Timing of last NOAC dose before elective NCS according to renal function

Minor bleeding risk NCS

Perform intervention at NOAC trough level (i.e. 12 h or 24 h after last intake for twice or once daily regimens, respectively). Resume same day or latest next day.

Low and high bleeding risk NCS

 Renal function (estimated GFR, mL/min)	Low bleeding risk NCS	High bleeding risk NCS	Low bleeding risk NCS	High bleeding risk NCS
	Dabigatran		Apixaban, rivaroxaban, edoxaban	
≥80	≥24 h	≥48 h	≥24 h	≥48 h
50–79	≥36 h	≥72 h		
30–49	≥48 h	≥96 h		
15–29	Not indicated	Not indicated	≥36 h	
<15	No formal indication for use			

No peri-operative bridging with UFH/LMWH