Regionaal ziekenhuis
Heilig Hart Leuven

Niet cardiale heelkunde
Preoperatieve onderzoeken
Standpunt cardioloog

20/12/2022

Dr. H. Celen
Cardiologie
RZ HHart Leuven

bij volwassenen vóór geplande, niet-cardiothoracale chirurgie

WORDEN NIET AANBEVOLEN:
- RUST-ECHO VAN HET HART
- CARDIOPULMONALE INSPANNINGSTEST
- RÖNTGENOPNAME VAN DE THORAX
- POLYSOMNOGRAFIE
- LONGFUNCTIETESTEN (INCL BLOEDGASANALYSE)
- GEGLYCEERD HEMOGLOBINE
- LEVERFUNCTIETESTEN
- CORONAIRE CT ANGIOGRAFIE

AANBEVOLEN | TE OVERWEGEN

ASA KLASSE PATIËNT	KLEINE OPERATIE bv.: • drainage borstabces • verwijderen huidletsel	INTERMEDIAIRE OPERATIE bv.: • herstellen liesbreuk • verwijderen spataders	GROTE OF COMPLEXE OPERATIE bv.: • colonresectie • volledig vervangen gewricht
1 NORMALE GEZONDHEID	GEEN ROUTINEMATIGE ONDERZOEKEN HEMOSTASETESTEN°°°°	RUST-ECG**** HEMOSTASETESTEN°°°°	VOLLEDIG BLOEDBEELD (COFO)† NIERFUNCTIETESTEN‡ RUST-ECG**** URINECULTUUR°°° HEMOSTASETESTEN°°°°
2 NIET-ERNSTIGE SYSTEMISCHE AANDOENING	RUST-ECG* NIERFUNCTIE-TESTEN***‡ HEMOSTASETESTEN°°°°	RUST-ECG* RUST-ECG**** NIET-INVASIEVE STRESS BEELDVORMING°° NIERFUNCTIETESTEN***‡ HEMOSTASETESTEN°°°°	VOLLEDIG BLOEDBEELD (COFO)† NIERFUNCTIETESTEN‡ RUST-ECG* RUST-ECG**** URINECULTUUR°°° NIET-INVASIEVE STRESS BEELDVORMING°° HEMOSTASETESTEN°°°°
3 ERNSTIGE SYSTEMISCHE AANDOENING 4 ERNSTIGE SYSTEMISCHE AANDOENING CONTINU LEVENS-BEDREIGEND	RUST-ECG* NIERFUNCTIE-TESTEN***‡ HEMOSTASETESTEN°°°°	RUST-ECG* NIERFUNCTIETESTEN‡ RUST-ECG**** NIET-INVASIEVE STRESS BEELDVORMING°° VOLLEDIG BLOEDBEELD (COFO)†** HEMOSTASETESTEN°	VOLLEDIG BLOEDBEELD (COFO)† NIERFUNCTIETESTEN‡ RUST-ECG* RUST-ECG**** URINECULTUUR°°° NIET-INVASIEVE STRESS BEELDVORMING°° HEMOSTASETESTEN°

* bij risicofactoren volgens de hartrisico index
** bij cardiovasculaire of nieraandoeningen, als symptomen niet recent werden onderzocht
*** als een nierfunctiestoornis kan vermoed worden
**** als > 65j

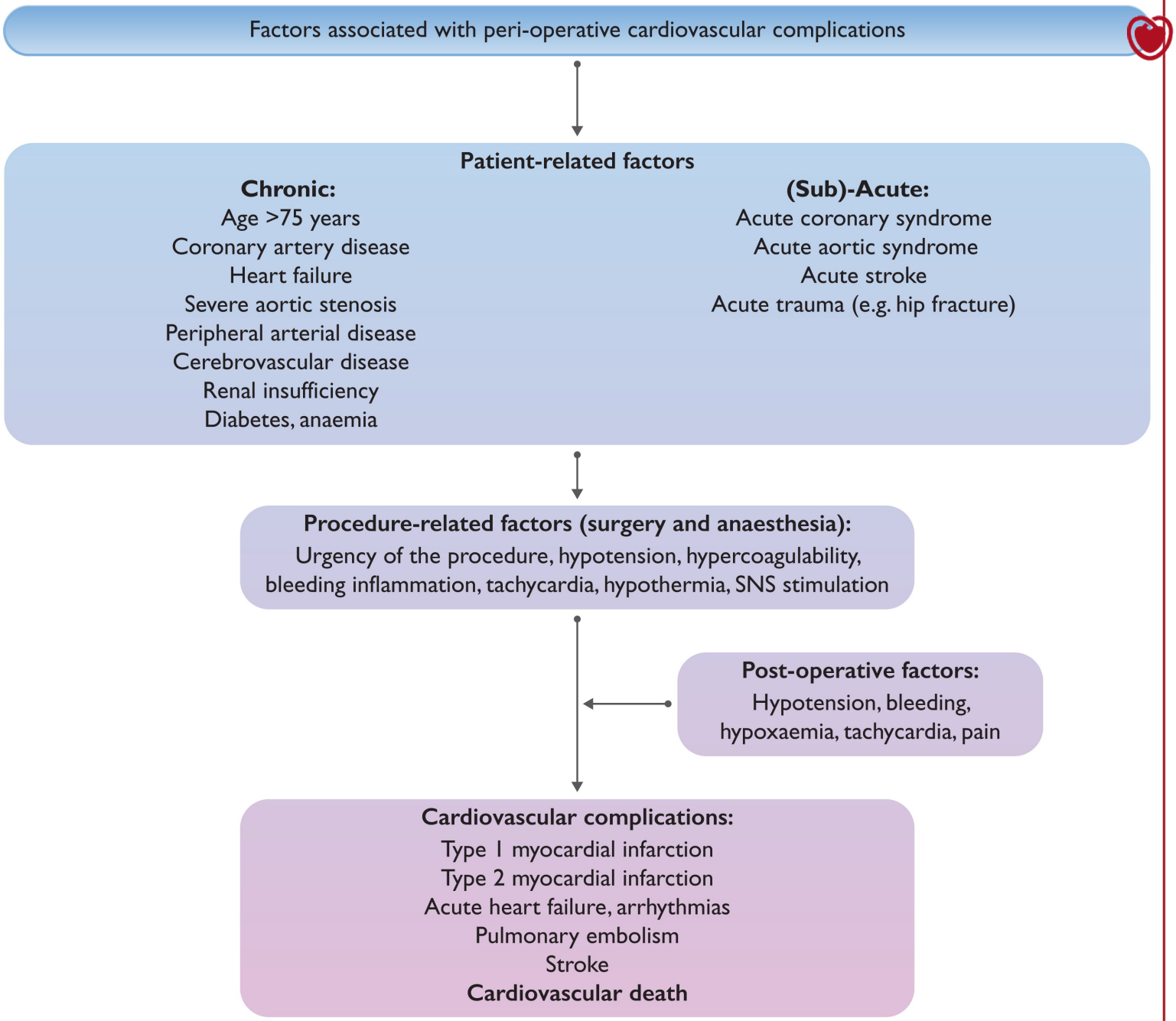
* bij een chronische leveraandoening of bij een gesdhiedenis van abnormale bloedingen, spontaan, of na trauma of chirurgie
** bij risicofactoren volgens de hartrisico index en bij een slechte functionele capaciteit
*** bij urologische of prothesechirurgie
**** bij een gesdhiedenis van abnormale bloedingen, spontaan, of na trauma of chirurgie
† Rode bloedcellen (hemoglobine, hematocriet en telling), witte bloedcellen (telling en formule) en bloedplaatjes.

KCE

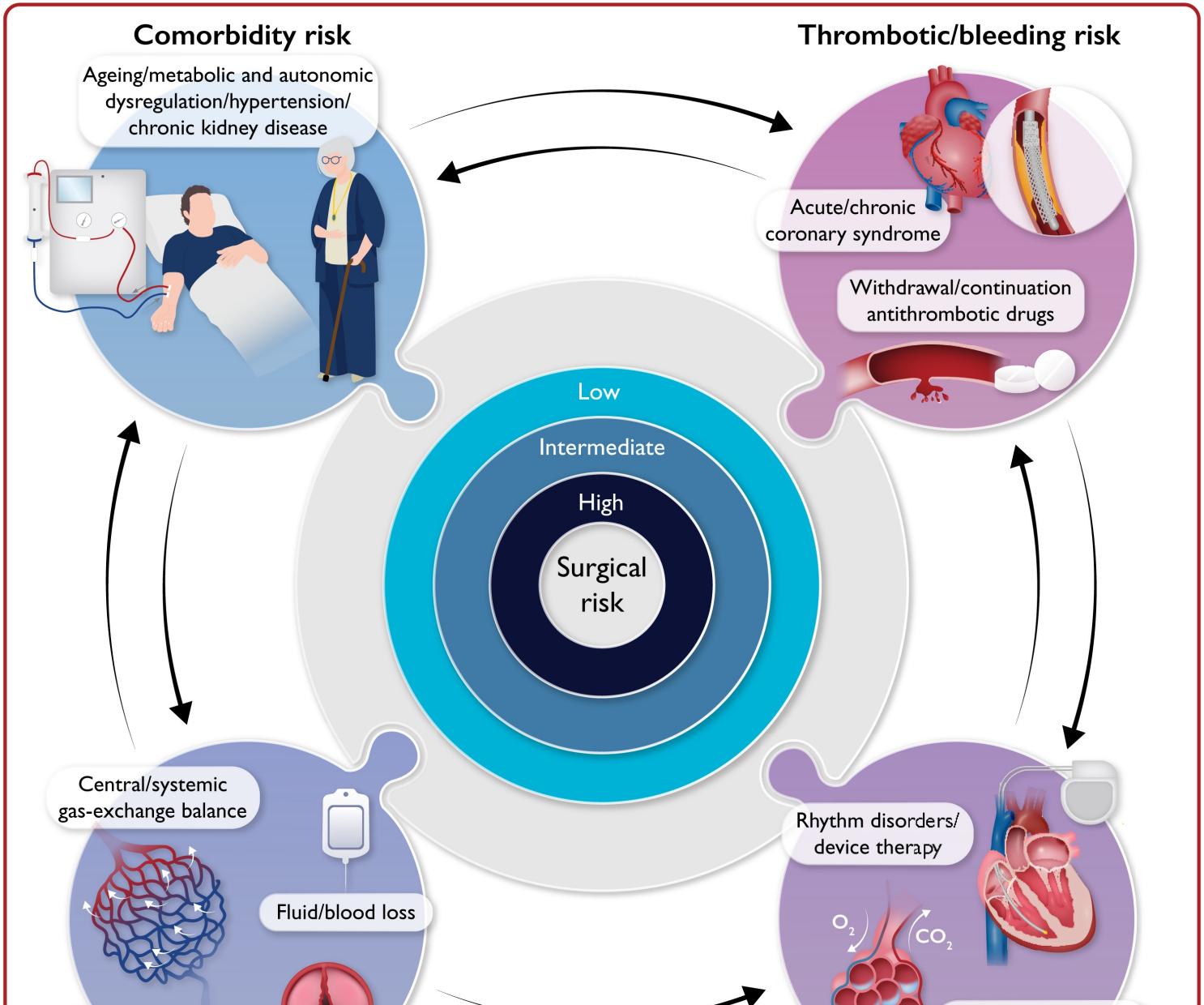
Why would this man's airway be difficult to manage?

Wat kan cardioloog bij brengen aan per en postoperatieve risicostratificatie

- Wat is het nut van een preparatief onderzoek ?
- Update 2022 ESC Guidelines?
- MINS ?
- Casuïstiek (2 x)
- Hoe in de praktijk ?



Interactie heelkunde en patiënt gebonden risico waarbij een cardioloog in advies kan geroepen worden :



ESC European Society of Cardiology

OXFORD UNIVERSITY PRESS

Thrombotisch risico

ACS
Chronische coronaire atheromatose
Antithrombotica start/stop

Richtlijnen voor Perioperatieve Cardiovasculaire Onderzoek voor Niet-cardiale Chirurgie*

A Report of the American College of Cardiology/American Heart AssociationTask Force on Practice Guidelines

*Eagle KA, Brundage BH, Chaitman, BR et al: *Circulation* 1996;93:1278-1317 and *2002;update*

November, 1998 Council on Clinical Cardiology, American Heart Association

Klinische Predictoren van verhoogd perioperatief cardiaal risico

- Majeure
  - **Instabiele coronaire syndromen.**
  - **Hartfalen en CHF.**
  - **Ernstige arrhytmieën.**
  - **Ernstig kleplijden.**

Klinische Predictoren van verhoogd perioperatief cardiaal risico

- Intermediair
  - Stabiele angor pectoris.
  - Voorgeschiedenis MI of Q golven.
  - Gecompenseerde status en hartfalen.
  - Diabetes Mellitus.

Klinische Predictoren van verhoogd perioperatief cardiaal risico

- **Mineure**
  - **Gevorderde leeftijd.**
  - **Abnormaal ECG.**
  - **Ritme anders dan sinus.**
  - **Lage functionele capaciteit.**
  - **Voorgeschiedenis van CVA.**
  - **Ongecontroleerde AHT.**

Type Chirurgie

- Intermediaire chirurgisch risiko:(<5%)
  - Carotis endarterectomie.
  - Hoofd en nekchirurgie.
  - Intraperitoneale en intrathoracale, orthopedische en prostaatchirurgie. (radicale,suprapubische en TURP)

Type Chirurgie

- Laag chirurgisch risiko :(<1%)
  - Endoscopische en oppervlakkige ingrepen.
  - Cataract chirurgie.
  - Borstchirurgie.

Type Chirurgie

- **Hoog chirurgisch risiko:(>5%)**
  - Aortische en andere majeure vasculaire chirurgie.
  - Perifeer vasculair.
  - Lange chirurgische procedures gepaard gaande met grote hoeveelheid vocht-shifts en groot verlies aan bloed.

ESC
European Society of Cardiology
European Heart Journal (2022) **00**, 1–99
https://doi.org/10.1093/eurheartj/ehac270

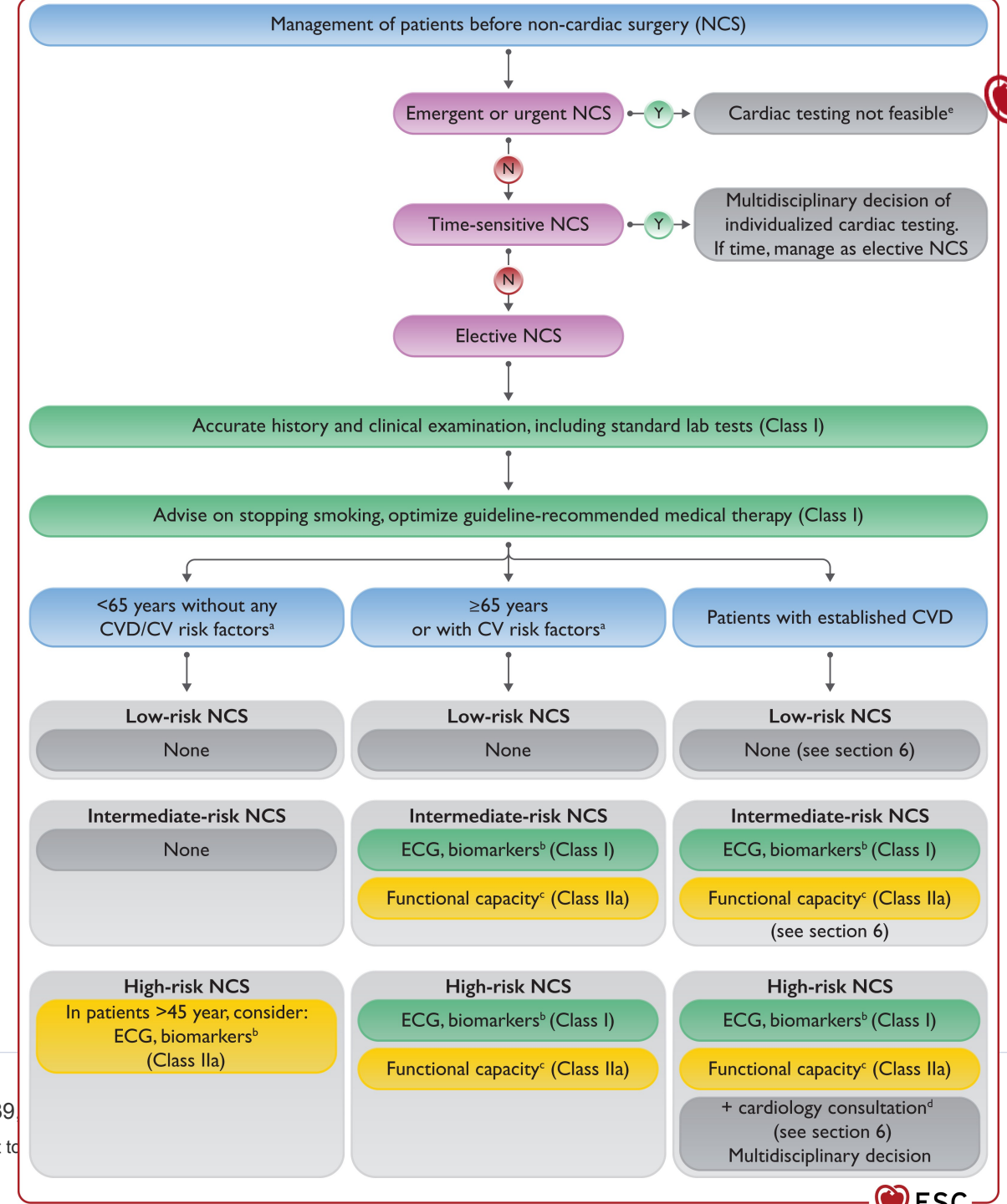
ESC GUIDEL

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

Developed by the task force for cardiovascular assessment and management of patients undergoing non-cardiac surgery of the European Society of Cardiology (ESC)

Endorsed by the European Society of Anaesthesiology and Intensive Care (ESAIC)

Low surgical risk (<1%)	Intermediate surgical risk (1–5%)	High surgical risk (>5%)
• Breast • Dental • Endocrine: thyroid • Eye • Gynaecological: minor • Orthopaedic minor (meniscectomy) • Reconstructive • Superficial surgery • Urological minor: (transurethral resection of the prostate) • VATS minor lung resection	• 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	• 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



Eur Heart J, Volume 43, Issue 39

: De belangrijkste coronaire risicofactoren zijn

Modifiable

- Smoking
- Dyslipidaemia
  - Raised LDL-C
  - Low HDL-C
  - Raised triglycerides
- Raised blood pressure
- Diabetes mellitus
- Obesity
- Dietary factors
- Thrombogenic factors
- Lack of exercise
- Excess alcohol consumption

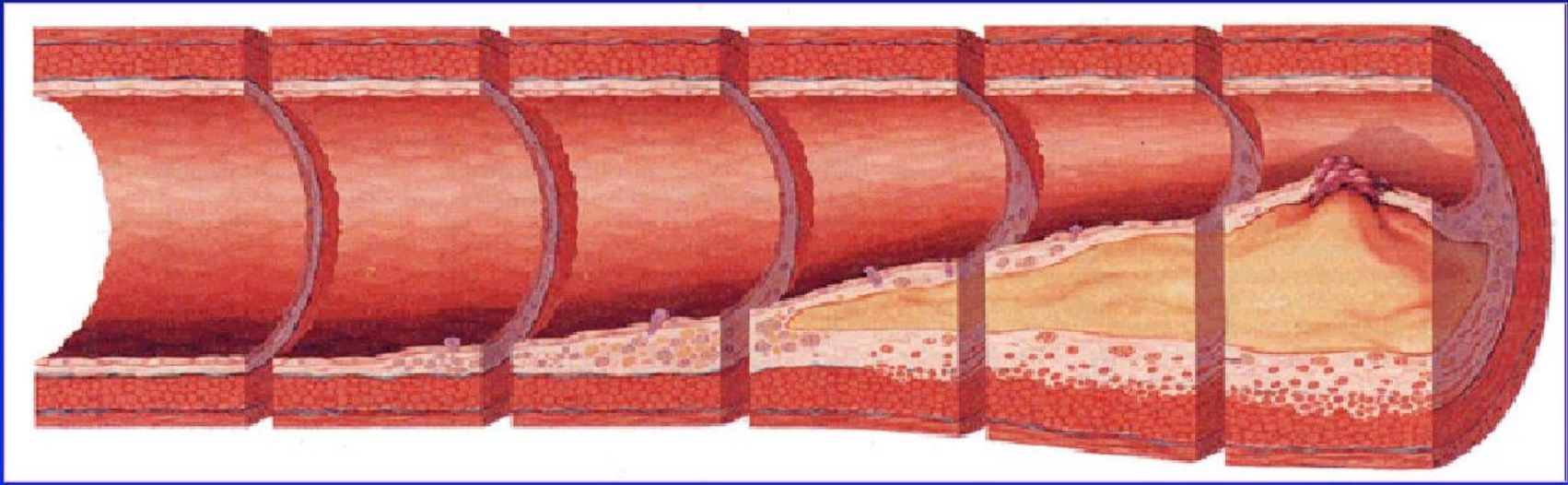
Non-modifiable

- Personal history of CVD
- Family history of CVD
- Age
- Gender

Atherosclerosis Timeline

Endothelial Dysfunction

Foam Cells	Fatty Streak	Intermediate Lesion	Atheroma	Fibrous Plaque	Complicated Lesion/Rupture



From first decade	From third decade	From fourth decade

Growth mainly by lipid accumulation	Smooth muscle and collagen	Thrombosis, hematoma

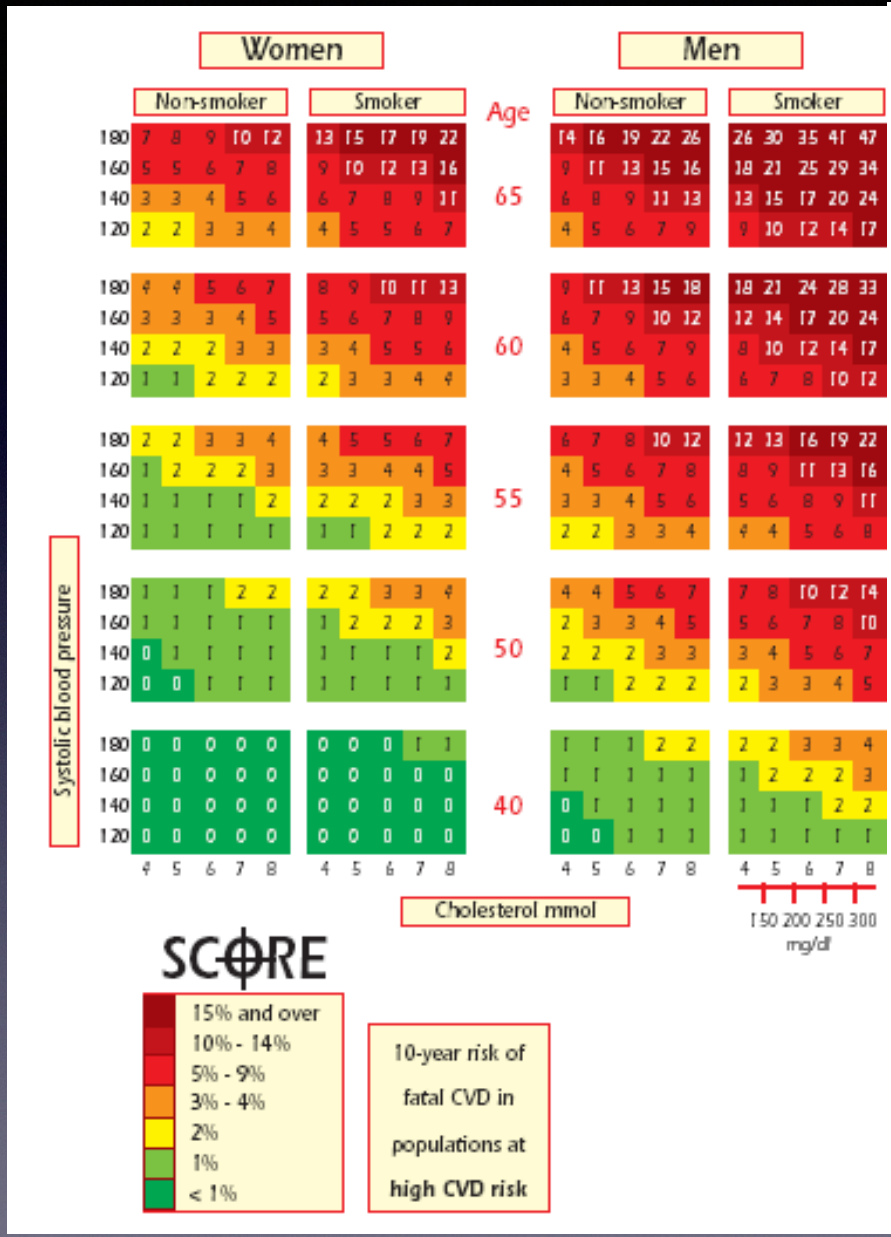
Stary et al. *Circulation*. 1995;92:1355-1374.

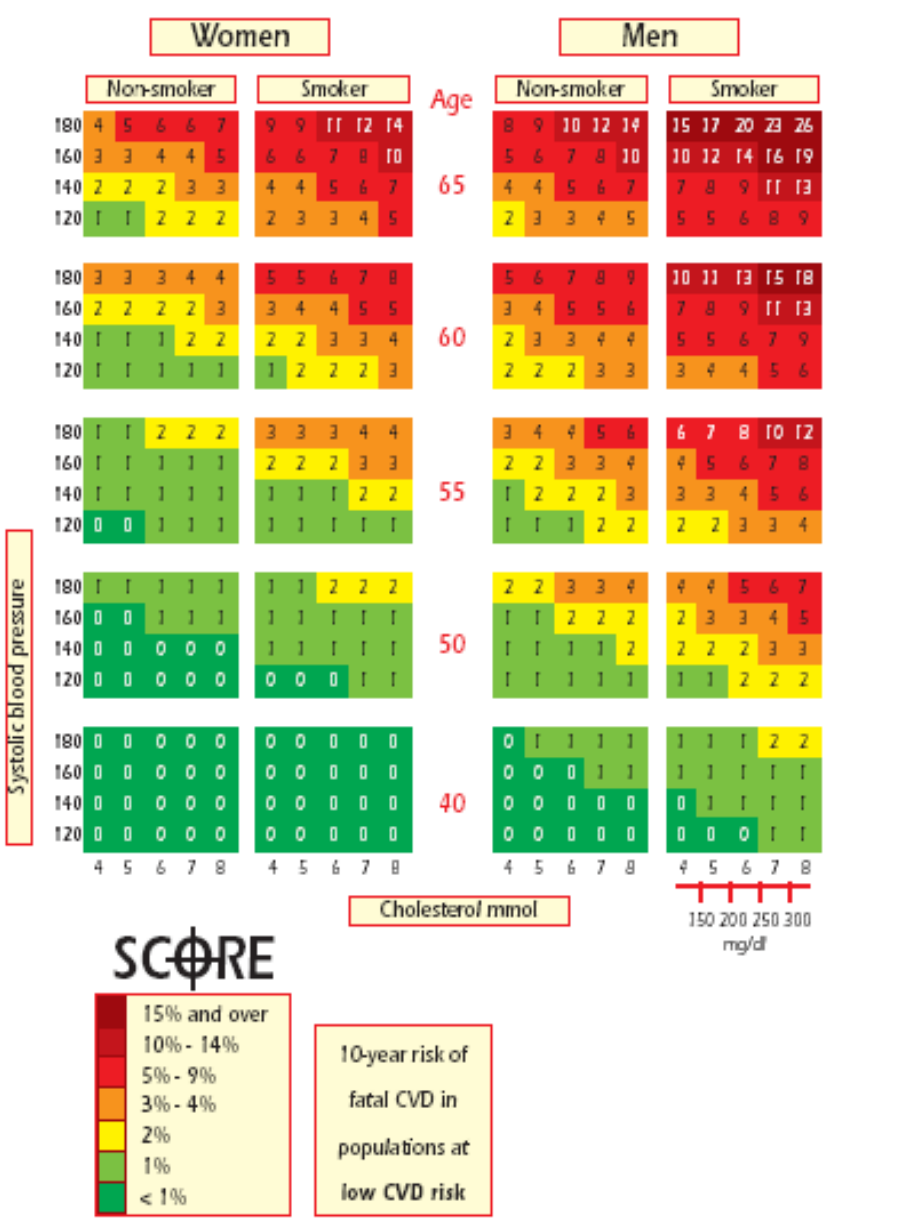
ESC Guidelines on CV prevention

The new Guidelines on prevention in 2016 don't classify prevention as primary or secondary anymore; but consider the level of risk of the patient to recommand the treatment.

"All current guidelines on the prevention of CVD in clinical practice recommend the assessment of total CVD risk since atherosclerosis is usually the product of a number of risk factors. **Prevention of CVD in an individual should be adapted to his or her total CV risk**: the higher the risk, the more intense the action should be".

Recommendation	Class[a]	Level[b]
Total CV risk estimation, using a risk estimation system such as SCORE, is recommended for adults >40 years of age, unless they are automatically categorised as being at *high-risk* or *very high-risk* based on documented CVD, DM (>40 years of age), kidney disease or highly elevated single risk factor (Table 5).	I	C


Women
Men
Non-smoker
Smoker
Age
65
60
55
50
40
Systolic blood pressure
Cholesterol mmol
150 200 250 300
mg/dl
SCORE
15% and over
10% - 14%
5% - 9%
3% - 4%
2%
1%
< 1%
10-year risk of fatal CVD in populations at high CVD risk


Women
Men
Non-smoker
Smoker
Age
65
60
55
50
40
Systolic blood pressure
Cholesterol mmol
150 200 250 300
mg/dl
SCORE
15% and over
10% - 14%
5% - 9%
3% - 4%
2%
1%
< 1%
10-year risk of fatal CVD in populations at low CVD risk

SCORE2-België

NS: 1174/04-09

ESC Guidelines on CV prevention

Table 5 Risk categories

Very high-risk	Subjects with any of the following: • Documented CVD, clinical or unequivocal on imaging. Documented clinical CVD includes previous AMI, ACS, coronary revascularization and other arterial revascularization procedures, stroke and TIA, aortic aneurysm and PAD. Unequivocally documented CVD on imaging includes significant plaque on coronary angiography or carotid ultrasound. It does NOT include some increase in continuous imaging parameters such as intima–media thickness of the carotid artery. • DM with target organ damage such as proteinuria or with a major risk factor such as smoking or marked hypercholesterolaemia or marked hypertension. • Severe CKD (GFR <30 mL/min/1.73 m2) • A calculated SCORE ≥10%.

ACS = acute coronary syndrome; AMI = acute myocardial infarction; BP = blood pressure; CKD = chronic kidney disease; DM = diabetes mellitus; GFR = glomerular filtration rate; PAD = peripheral artery disease; SCORE = systematic coronary risk estimation; TIA = transient ischaemic attack.

ESC Guidelines on CV prevention

High-risk	Subjects with: • Markedly elevated single risk factors, in particular cholesterol >8 mmol/L (>310 mg/dL) (e.g. in familial hypercholesterolaemia) or BP ≥180/110 mmHg. • Most other people with DM (with the exception of young people with type 1 DM and without major risk factors that may be at low or moderate risk). • Moderate CKD (GFR 30–59 mL/min/1.73 m^2). • A calculated SCORE ≥5% and <10%.

ACS = acute coronary syndrome; AMI = acute myocardial infarction; BP = blood pressure; CKD = chronic kidney disease; DM = diabetes mellitus; GFR = glomerular filtration rate; PAD = peripheral artery disease; SCORE = systematic coronary risk estimation; TIA = transient ischaemic attack.

ESC Guidelines on CV prevention

Moderate risk	SCORE is ≥1% and <5% at 10 years. Many middle-aged subjects belong to this category.
Low-risk	SCORE <1%.

ACS = acute coronary syndrome; AMI = acute myocardial infarction; BP = blood pressure; CKD = chronic kidney disease; DM = diabetes mellitus; GFR = glomerular filtration rate; PAD = peripheral artery disease; SCORE = systematic coronary risk estimation; TIA = transient ischaemic attack.

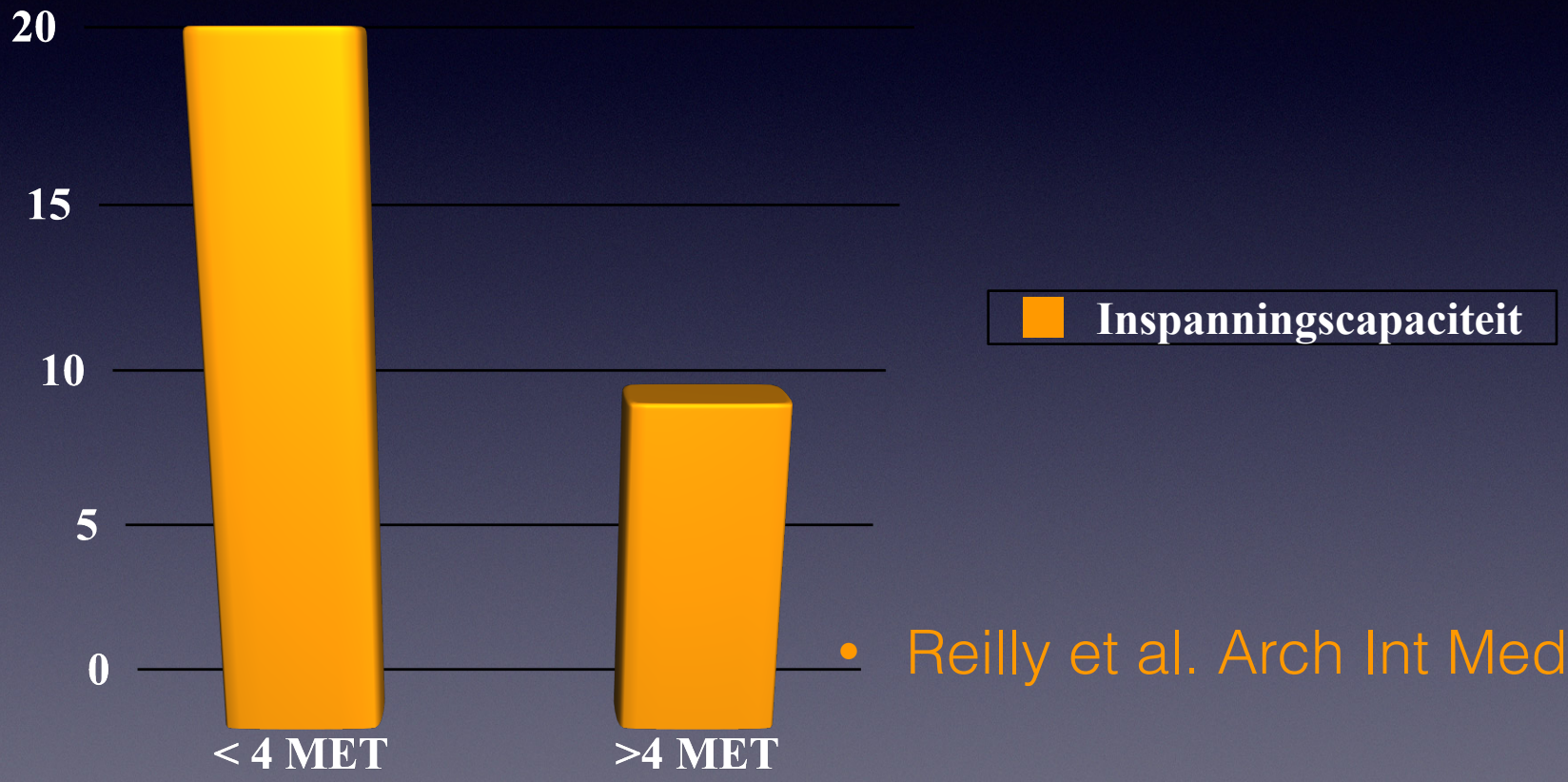
“Functional capacitity” Inspanningscapaciteit

- Goede predictor voor perioperatieve overleving.
- Anamnese :
  - 2 verdiepen stappen ?...
  - Metabole equivalenten of 1 MET =zuurstofverbruik van een man van 70 kg in basale omstandigheden (ml/kg/min)
  - Reilly : poor (<4 MET) versus good

Geschatte energiebehoefte

- 1 tot 4 MET
  - zelfredzaam
  - eten, drinken en toilette
  - stappen binnenhuis
  - “walk a block”
  - licht huishouden
  - 3.4 km/h
- 4 tot 10 MET
  - trappen, heuvel
  - 6.4 km/h
  - korte afstand rennen
  - zwaar huishouden
  - golf, bowling, tennis, zwemmen,…
  - “4 blocks”

Perioperatieve complicaties hoog risicoingreep (N : 600)



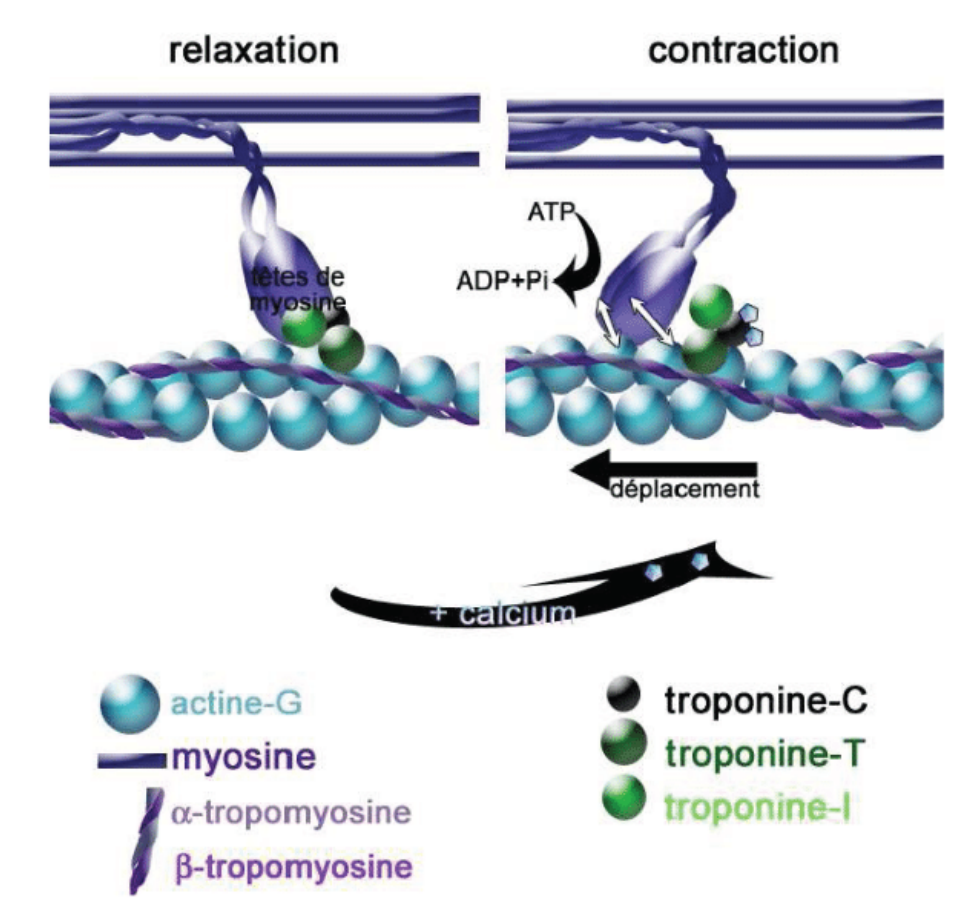
- Reilly et al. Arch Int Med 1999

Biomarkers HHart

HS cTroponine T cut off <14ng/L (of pg/mL)..

NT-pro-BNP: <125 pg/mL (voor leeftijd <75 jaar) en <450 pg/mL (voor leeftijd > 75 jaar). In feite zijn dit geen echte referentiewaarden , maar cut-off waarden voor EXCLUSIE van chronisch hartfalen.

Troponines


relaxation
contraction
ATP
ADP+Pi
têtes de myosine
déplacement
+ calcium
actine-G
myosine
α-tropomyosine
β-tropomyosine
troponine-C
troponine-T
troponine-I

ESC European Society of Cardiology

European Heart Journal (2020) **41**, 3083–3091
doi:10.1093/eurheartj/ehz301

CLINICAL REVIEW
Novel therapeutic concepts

Myocardial injury after non-cardiac surgery: diagnosis and management

P.J. Devereaux [1,2,3,4]* **and Wojciech Szczeklik** [5]

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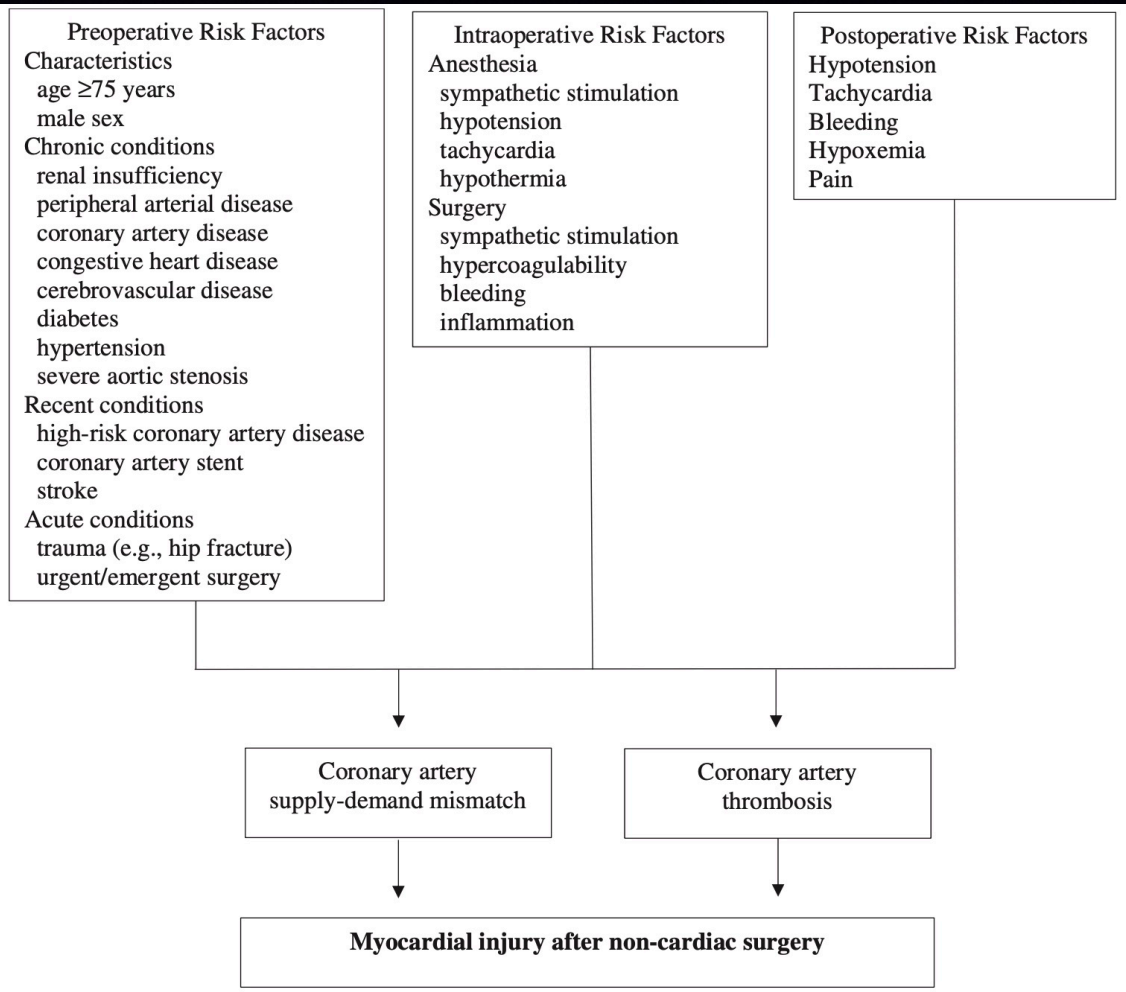
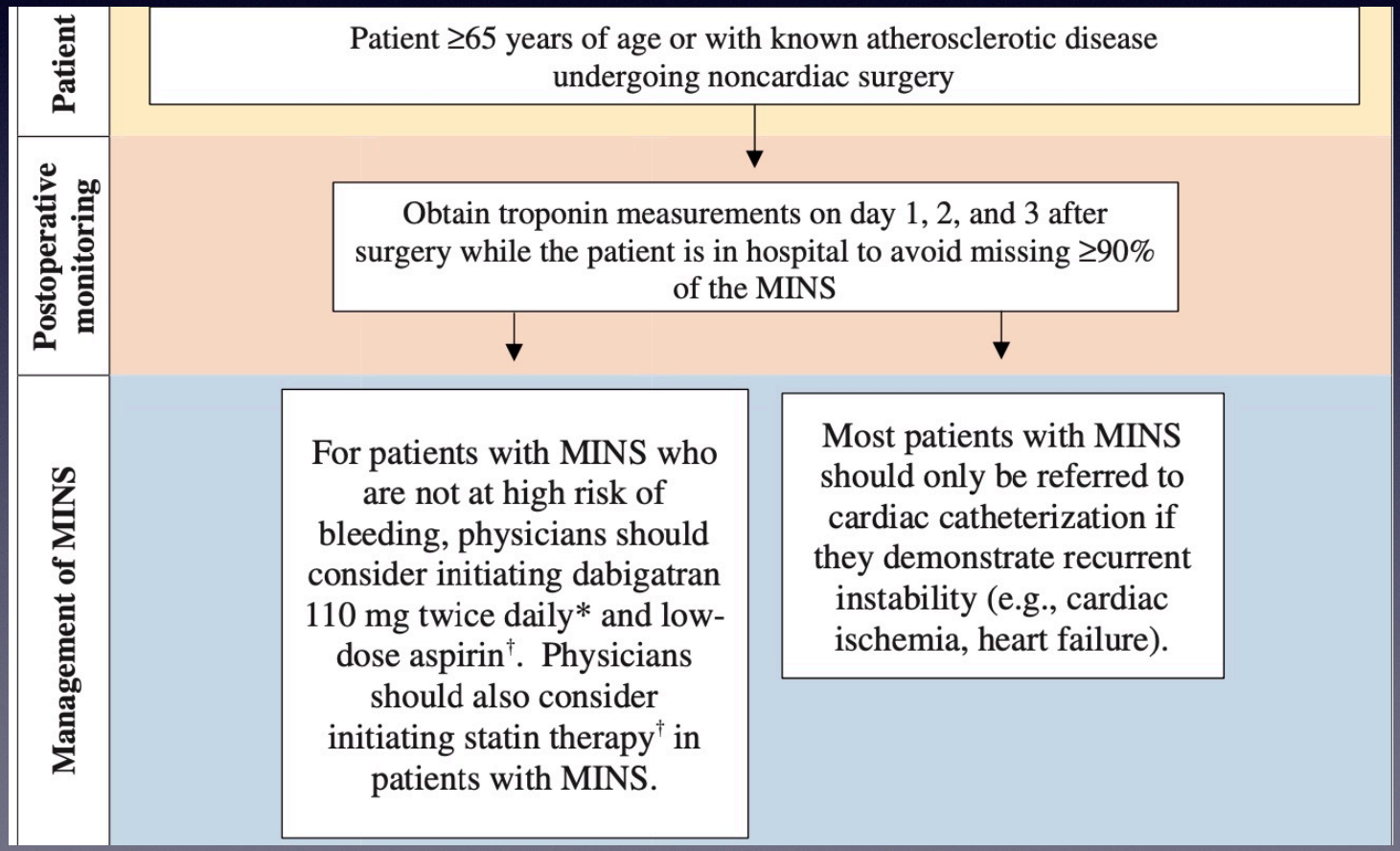
MINS

PMI
Post surgery myocardial infarction

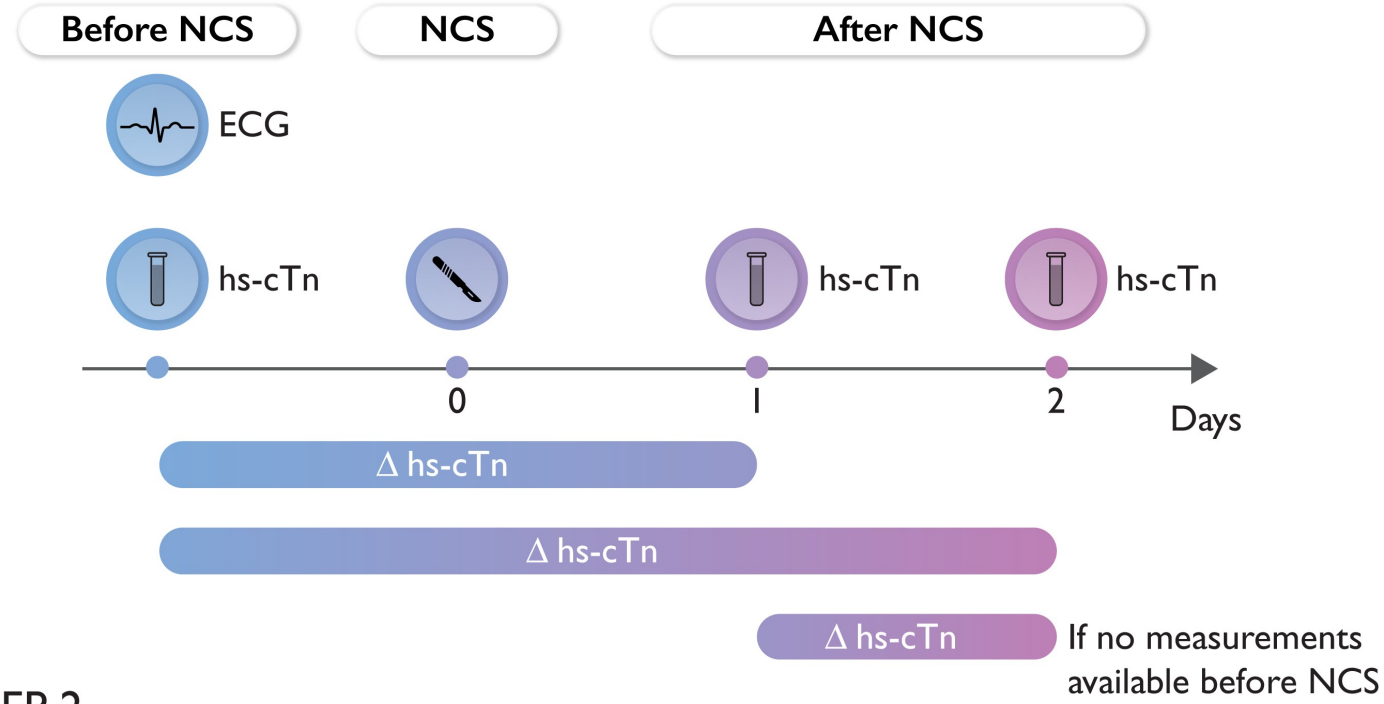


Pathophysiology of myocardial injury after non-cardiac surgery.

Aanbevelingen



STEP 1

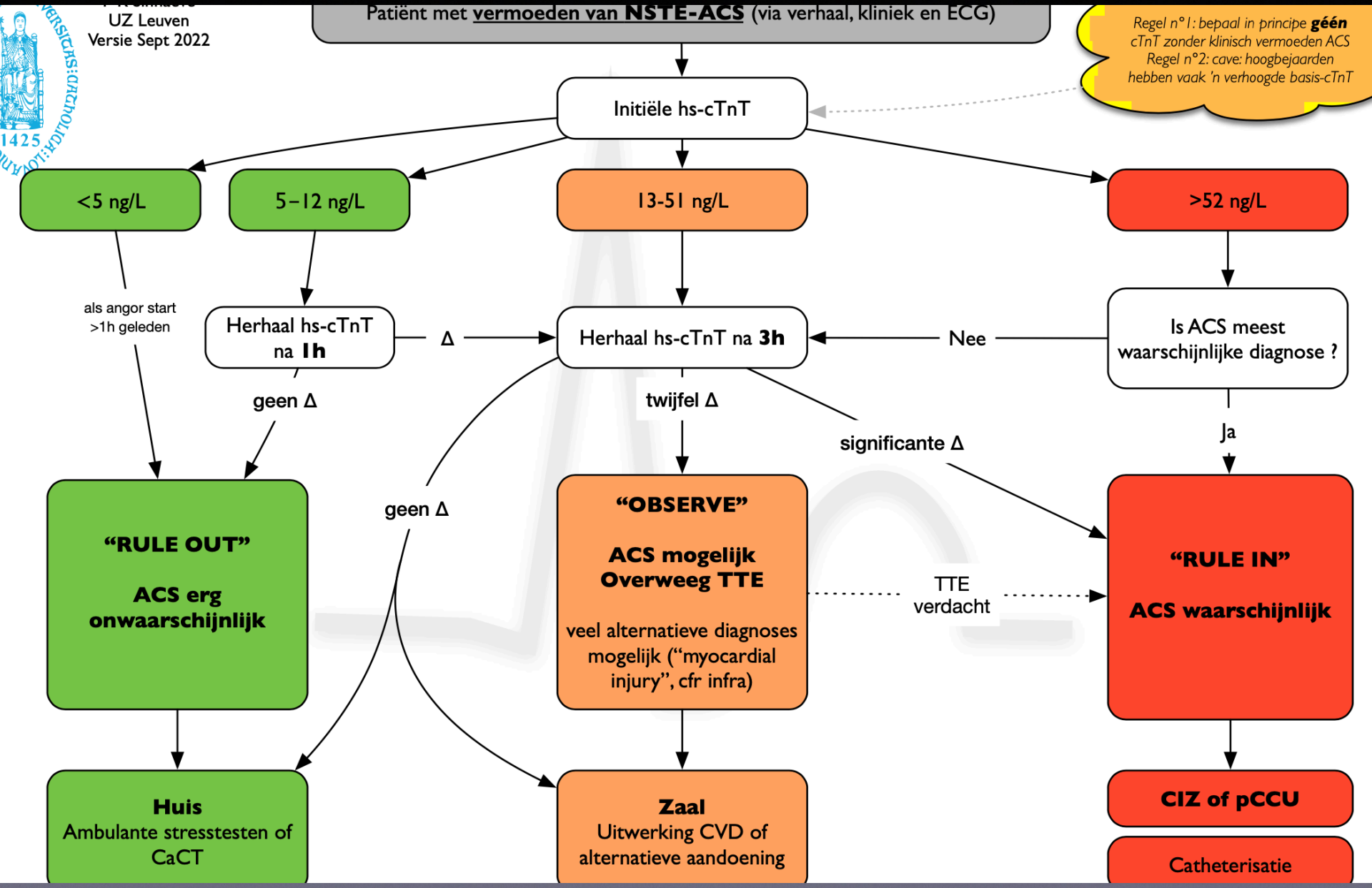


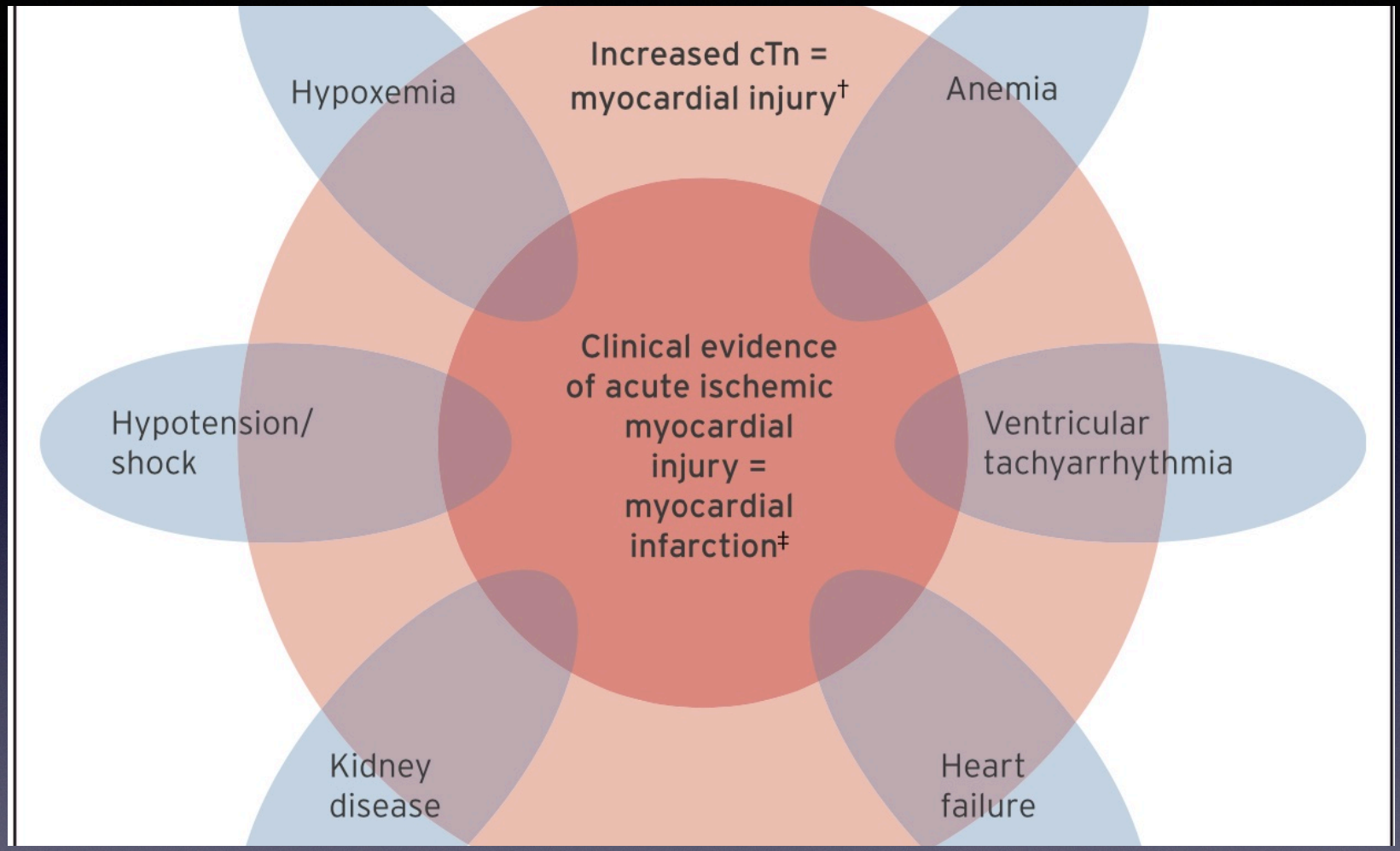
STEP 2

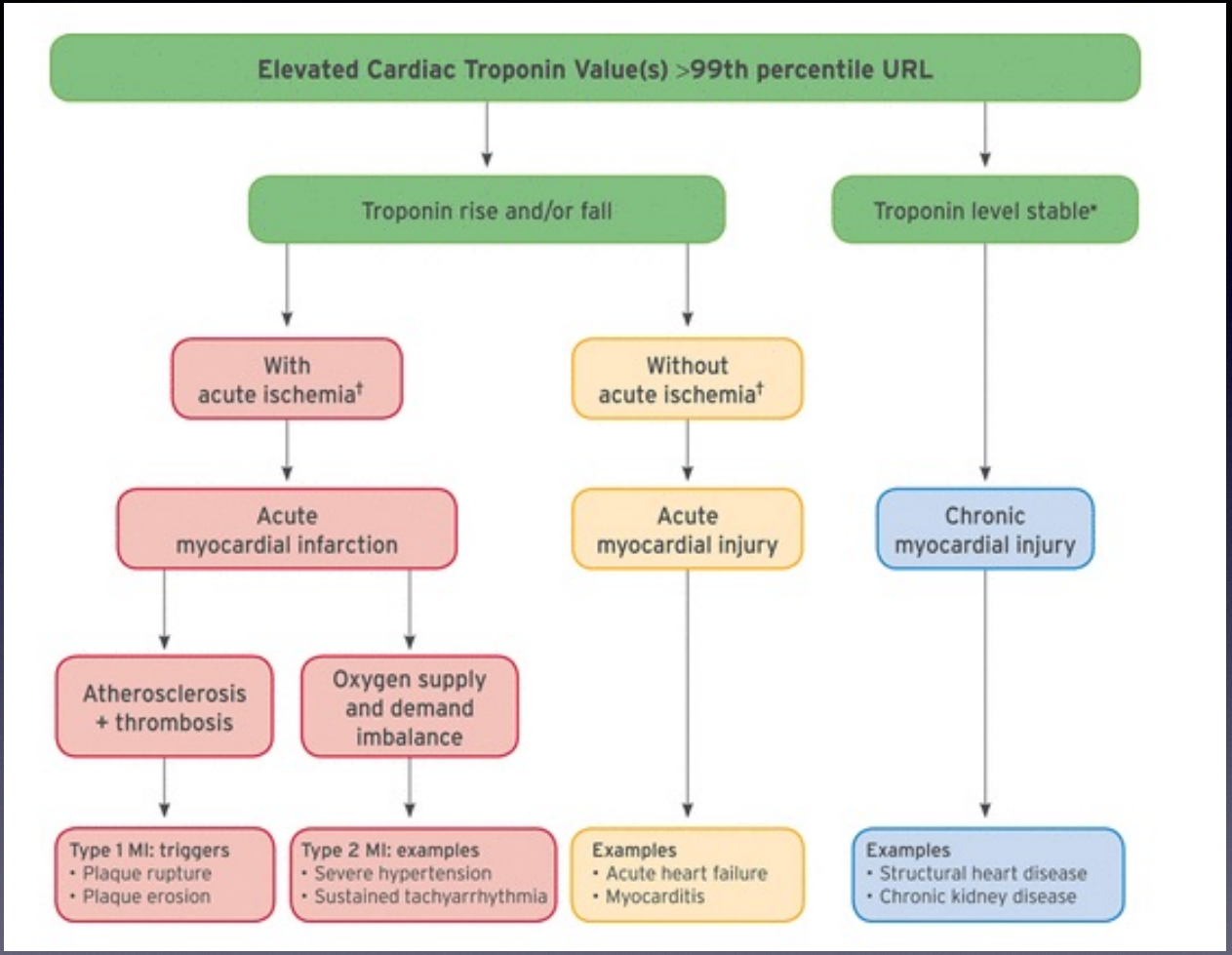
If Δ hs-cTn ≥ ULN = PMI

STEP 3

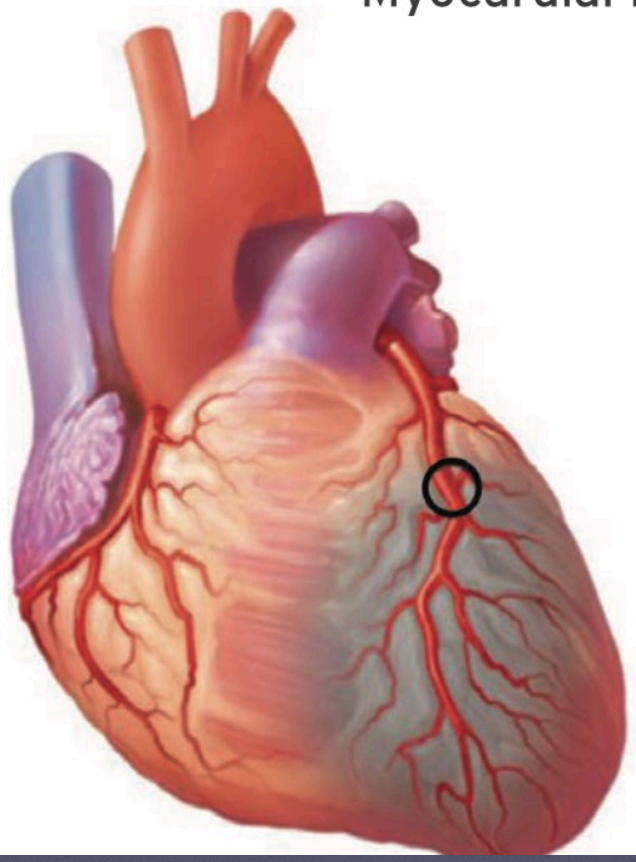
UZ Leuven
Versie Sept 2022




Increased cTn = myocardial injury†
Hypoxemia
Anemia
Clinical evidence of acute ischemic myocardial injury = myocardial infarction‡
Hypotension/ shock
Ventricular tachyarrhythmia
Kidney disease
Heart failure


Elevated Cardiac Troponin Value(s) >99th percentile URL
Troponin rise and/or fall
Troponin level stable*
With acute ischemia†
Without acute ischemia†
Acute myocardial infarction
Acute myocardial injury
Chronic myocardial injury
Atherosclerosis + thrombosis
Oxygen supply and demand imbalance
Type 1 MI: triggers
• Plaque rupture
• Plaque erosion
Type 2 MI: examples
• Severe hypertension
• Sustained tachyarrhythmia
Examples
• Acute heart failure
• Myocarditis
Examples
• Structural heart disease
• Chronic kidney disease

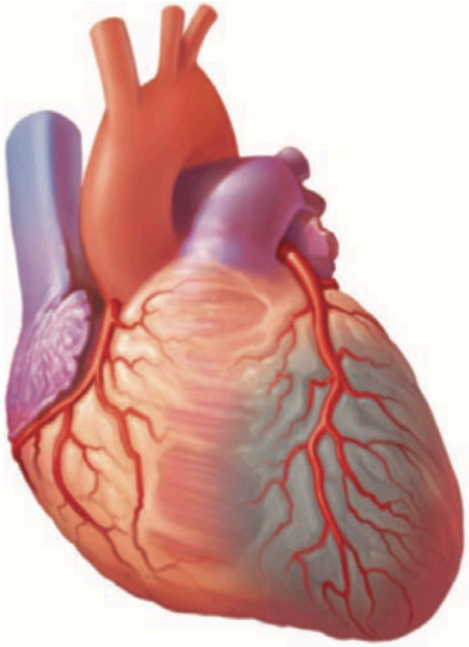
Myocardial Infarction Type 1

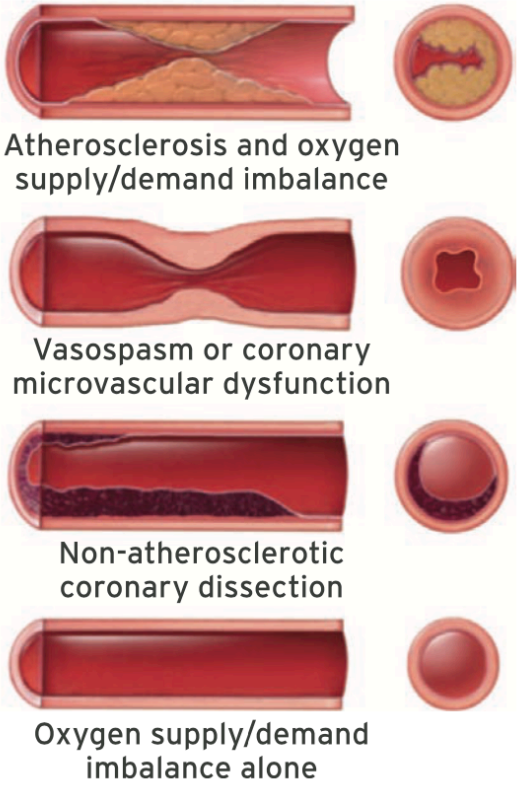


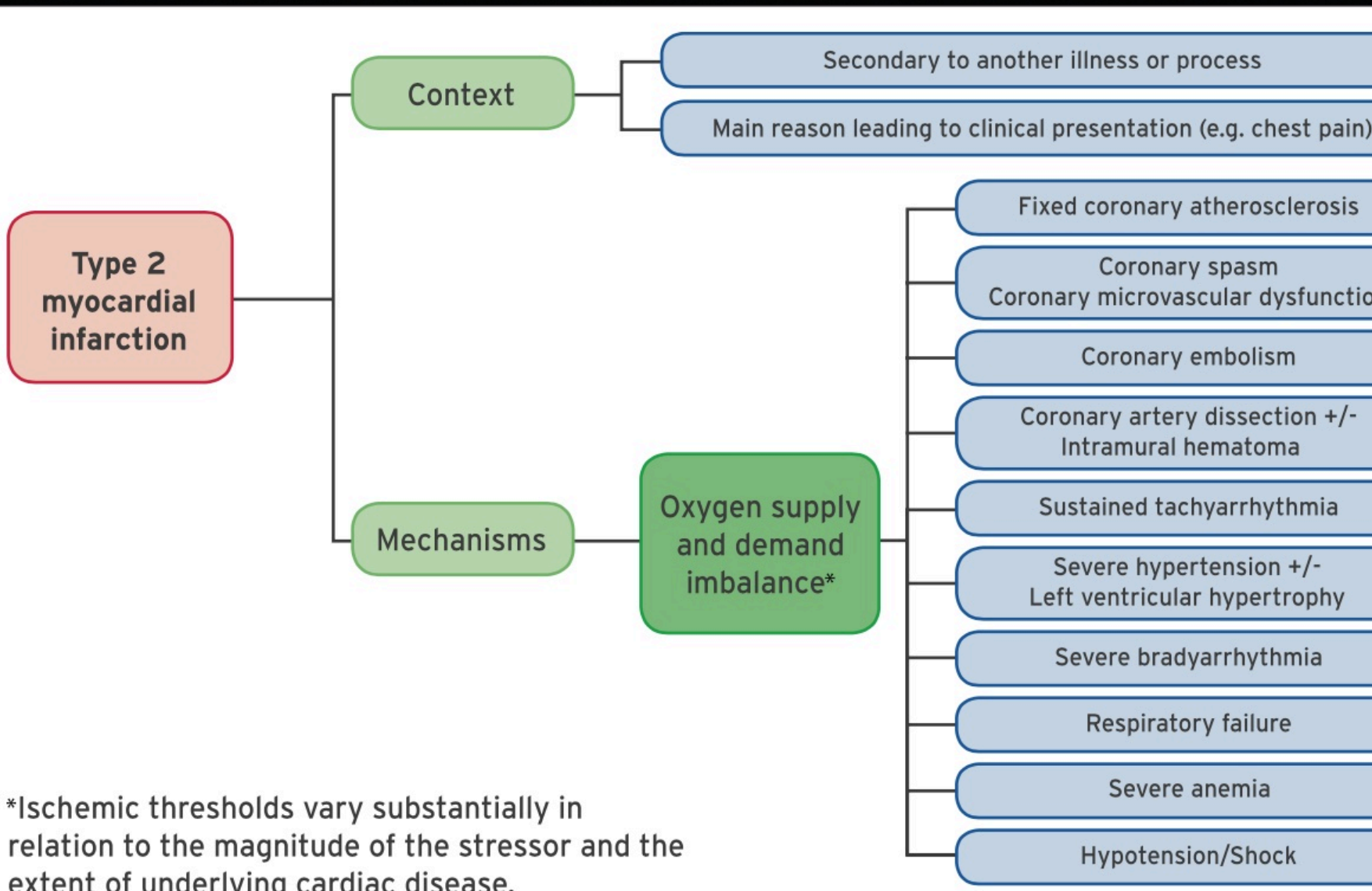
Plaque rupture/erosion with occlusive thrombus

Plaque rupture/erosion with non-occlusive thrombus

Myocardial Infarction Type 2






Type 2 myocardial infarction
Context
Secondary to another illness or process
Main reason leading to clinical presentation (e.g. chest pain)
Mechanisms
Oxygen supply and demand imbalance*
Fixed coronary atherosclerosis
Coronary spasm
Coronary microvascular dysfunctio
Coronary embolism
Coronary artery dissection +/-
Intramural hematoma
Sustained tachyarrhythmia
Severe hypertension +/-
Left ventricular hypertrophy
Severe bradyarrhythmia
Respiratory failure
Severe anemia
Hypotension/Shock
*Ischemic thresholds vary substantially in relation to the magnitude of the stressor and the extent of underlying cardiac disease.

TYPE 1 MYOCARDIAL INFARCTION
Spontaneous related to primary atherothrombotic event

TYPE 2 MYOCARDIAL INFARCTION
Secondary to increased oxygen demand or reduced supply

TYPE 3 MYOCARDIAL INFARCTION
Sudden cardiac death likely due to ischaemia

TYPE 4 MYOCARDIAL INFARCTION
Associated with percutaneous coronary intervention (a-c)

TYPE 5 MYOCARDIAL INFARCTION
Associated with cardiac surgery

ACUTE MYOCARDIAL INJURY
Acute troponin elevation above 99th Centile in absence of ischaemia

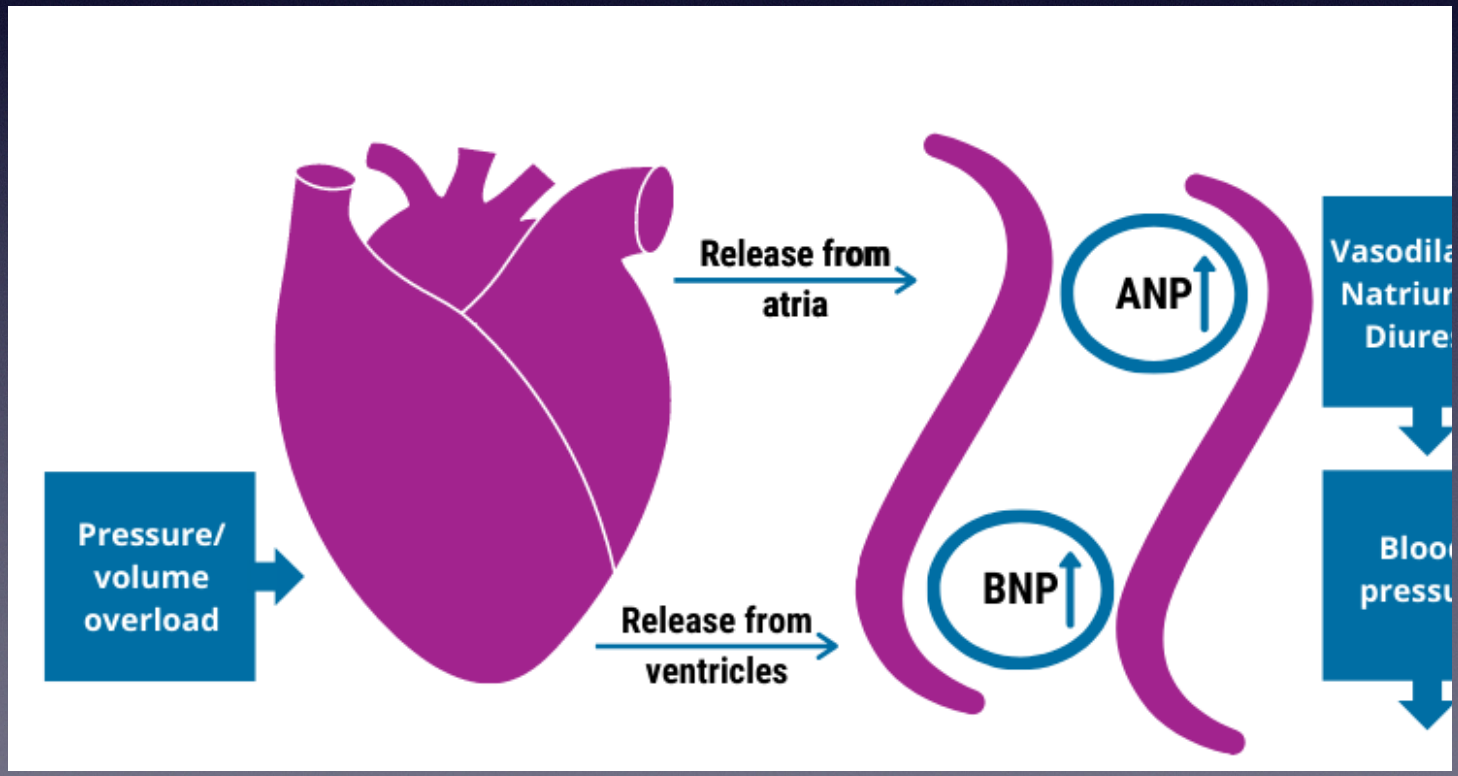
CHRONIC MYOCARDIAL INJURY
Chronically elevated troponin above 99th Centile absence of ischaemia

Table 2 Recommended natriuretic peptide cut-offs for acute heart failure diagnosis[a] [1,12,16,39]

	Cut-off levels (pg/mL)					
	NT-proBNP			BNP		
	Age < 50	Age 50–75	Age > 75	Age < 50	Age 50–75	Age > 75
Acute setting, patient with acute dyspnoea						
HF unlikely	<300			<100		
'Grey zone'	300–450	300–900	300–1800	100–400		
HF likely	>450	>900	>1800	>400		
Non-acute setting, patient with mild symptoms						
HF unlikely	<125			<35		
'Grey zone'	125–600			35–150		
HF likely	>600			>150		

BNP, B-type natriuretic peptide; HF, heart failure; NT-proBNP, N-terminal proBNP.
[a]Consider reducing the cut-off levels in obese patients by 50%.

ntProBNP


Pressure/
volume
overload
Release from
atria
Release from
ventricles
ANP
BNP
Vasodila
Natriur
Diure
Blooc
pressu

ntProBNP

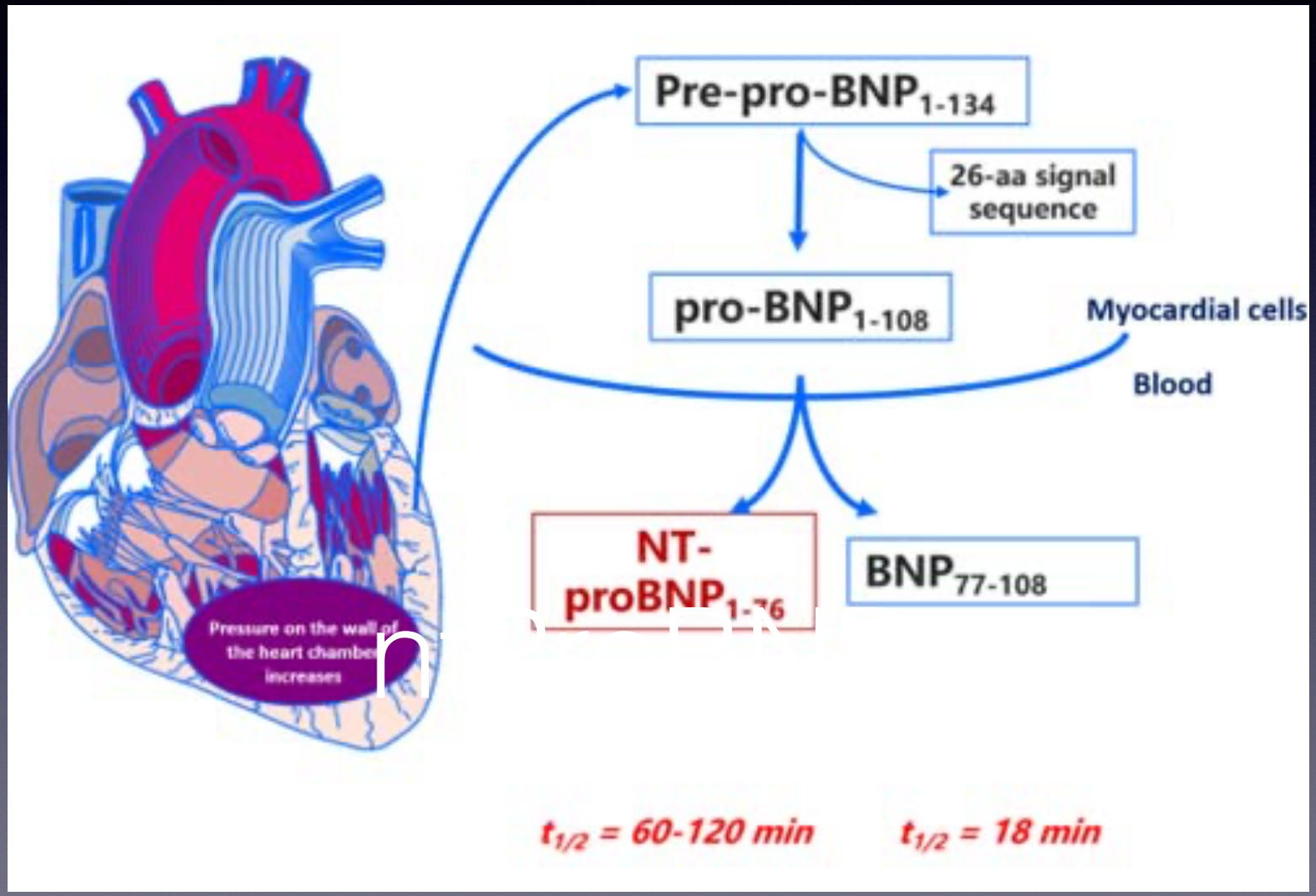

Pre-pro-BNP1-134
26-aa signal sequence
pro-BNP1-108
Myocardial cells
Blood
NT-proBNP1-76
BNP77-108
Pressure on the wall of the heart chamber increases
t1/2 = 60-120 min
t1/2 = 18 min

Table 1 Classes of recommendations

Classes of recommendations	Definition	Wording to use
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.	Is recommended or is indicated
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.	
Class IIa	Weight of evidence/opinion is in favour of usefulness/efficacy.	Should be considered
Class IIb	Usefulness/efficacy is less well established by evidence/opinion.	May be considered
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended

Table 2 **Levels of evidence**

Level of evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

TTE

Recommendation Table 8 — Recommendations for transthoracic echocardiography

Recommendations	Class[a]	Level[b]
TTE is recommended in patients with poor functional capacity[c] and/or high NT-proBNP/BNP,[d] or if murmurs are detected before high-risk NCS, in order to undertake risk-reduction strategies.[121,124,127,141–143]	I	B
TTE should be considered in patients with suspected new CVD or unexplained signs or symptoms before high-risk NCS.[59,124,125]	IIa	B
TTE may be considered in patients with poor functional capacity, abnormal ECG, high NT-proBNP/BNP,[d] or ≥1 clinical risk factor before intermediate-risk NCS.[126–128]	IIb	B
To avoid delaying surgery, a FOCUS exam performed by trained specialists may be considered as an alternative to TTE for	IIb	B

Stress test/beeldvorming : Afhankelijk van de ervaring van de onderzoekers van de instelling.

Recommendation Table 9 — Recommendations for stress imaging

Recommendations	Class[a]	Level[b]
Stress imaging is recommended before high-risk elective NCS in patients with poor functional capacity[c] and high likelihood of CAD[d] or high clinical risk.[e,146,156–158]	I	B
Stress imaging should be considered before high-risk NCS in asymptomatic patients with poor functional capacity,[d] and previous PCI or CABG.[147]	IIa	C
Stress imaging may be considered before intermediate-risk NCS when ischaemia is of concern in patients with clinical risk factors and poor functional capacity.[d,152,157,158]	IIb	B
Stress imaging is not recommended routinely before NCS.	III	C

Coronarografie/CCTA

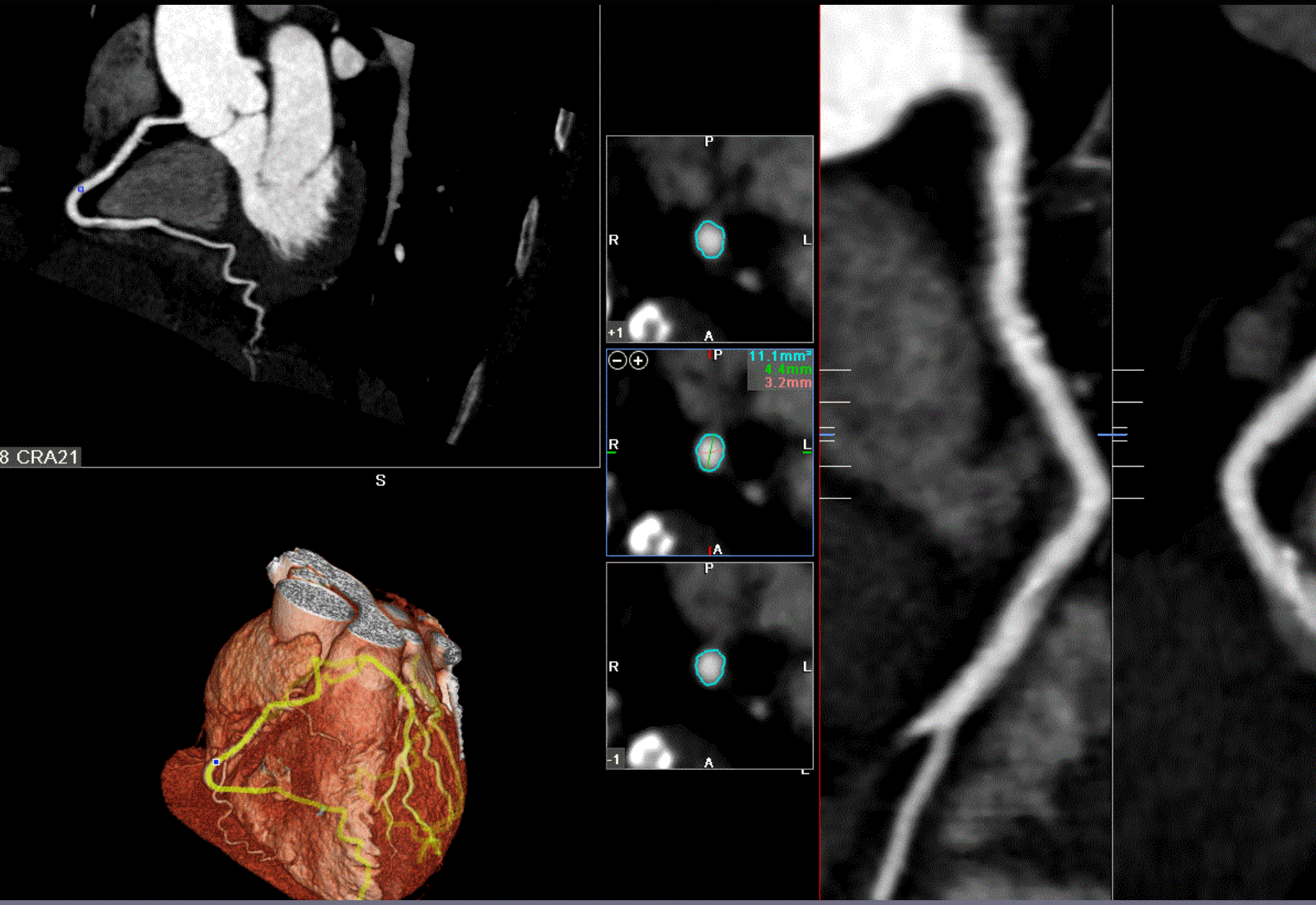
Recommendation Table 10 — Recommendations for coronary angiography

Recommendations	Class[a]	Level[b]
It is recommended to use the same indications for ICA and revascularization pre-operatively as in the non-surgical setting.[98,146]	I	C
CCTA should be considered to rule out CAD in patients with suspected CCS or biomarker-negative NSTE-ACS in case of low-to-intermediate clinical likelihood of CAD, or in patients unsuitable for non-invasive functional testing undergoing non-urgent, intermediate-, and high-risk NCS.	IIa	C

Sensitiviteit en specificiteit

Technology	Sensitivity	Specificity
Exercise Treadmill/CYCLO	0.68	0.77
Gated SPECT/ MIBI scintigrafie	0.84	0.78
Exercise or Pharmacologic Stress Echocardio	0.79	0.84
CT coronarografie	0.96	0.82

Adapted from Gianrossi et al Circulation 1989; 80:87-98, *Medical Advisory Secretariat* 2010; 10:1-40, and McArdle et al *J Am Coll Cardiol* 2012;60:1828-3


8 CRA21
S
P
R
L
+1
A
11.1mm²
4.4mm
3.2mm
P
R
L
A
P
R
L
-1
A

Date of Birth: 21 Jun 1946
Gender: F

Scan Date: 11 Apr 2017
Report Date: 11 Apr 2017-02:39PM

Indications: INDICATIONS
History/Risk Factors: PATIENT RISK FACTORS

CT Calcium Scoring

Coronary calcium is a marker for plaque (fatty deposits) in a blood vessel or atherosclerosis (hardening of the arteries). The presence and amount of calcium detected in a coronary artery by the CT scan, indicates the presence and amount of atherosclerotic plaque. These calcium deposits appear years before the development of heart disease symptoms such as chest pain and shortness of breath.

A calcium score is computed for each of the coronary arteries based upon the volume and density of the calcium deposits. This can be referred to as your **calcified plaque burden**. It does not correspond directly to the percentage of narrowing in the artery but does correlate with the severity of the underlying coronary atherosclerosis.

Procedure

TECHNIQUE - Enter calcium scoring technique -, Slice thickness: 3mm.
Density threshold (HU): 130 , Pixel threshold: 3 , Algorithm: Discrete

Results

Region	Calcium Score (Agatston)	Volume (mm^3)
LM	---	---
RCA	214	178
LAD	158	123
CX	---	---
PDA	---	---
Other1	---	---
Other2	---	---
Other3	---	---
Total	372	301

Total Calcium Score 372

501

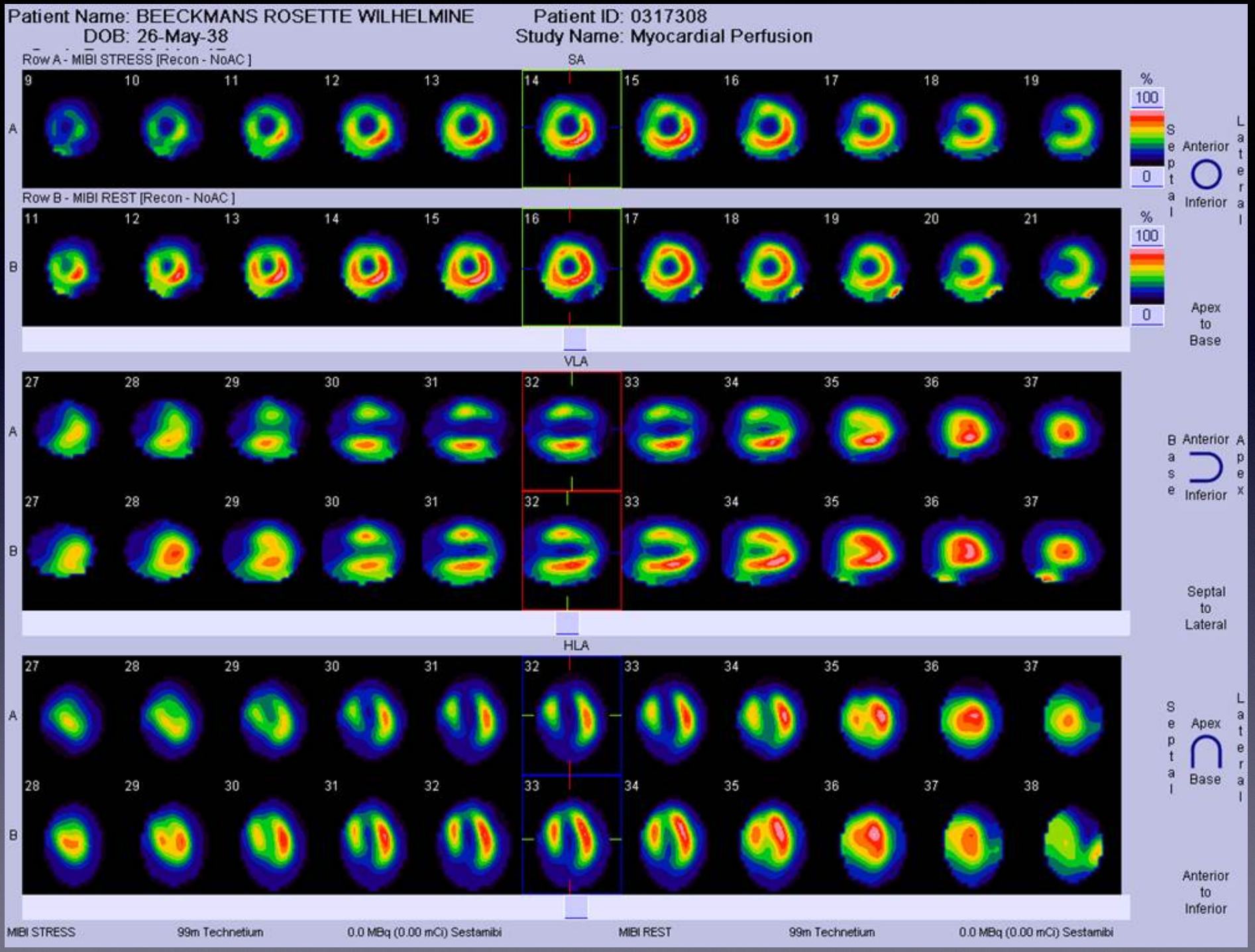
0

W-/L-

Zoom: 87,0%

12:42:36
Study Quality: - Enter study quality -
Comments: - Please enter conclusions here -


IMPLANTABLE CARDIAC DEVICES


Patient Name: BEECKMANS ROSETTE WILHELMINE
DOB: 26-May-38
Patient ID: 0317308
Study Name: Myocardial Perfusion
Row A - MIBI STRESS [Recon - NoAC]
SA
Row B - MIBI REST [Recon - NoAC]
%
100
0
Septal
Lateral
Anterior
Inferior
Apex to Base
VLA
Base
Apex
Septal to Lateral
HLA
Apex to Base
Anterior to Inferior
MIBI STRESS
99m Technetium
0.0 MBq (0.00 mCi) Sestamibi
MIBI REST
99m Technetium
0.0 MBq (0.00 mCi) Sestamibi

Regionaal ziekenhuis
Heilig Hart Leuven

Voorwaarden van een goed uitgevoerde inspanningstest

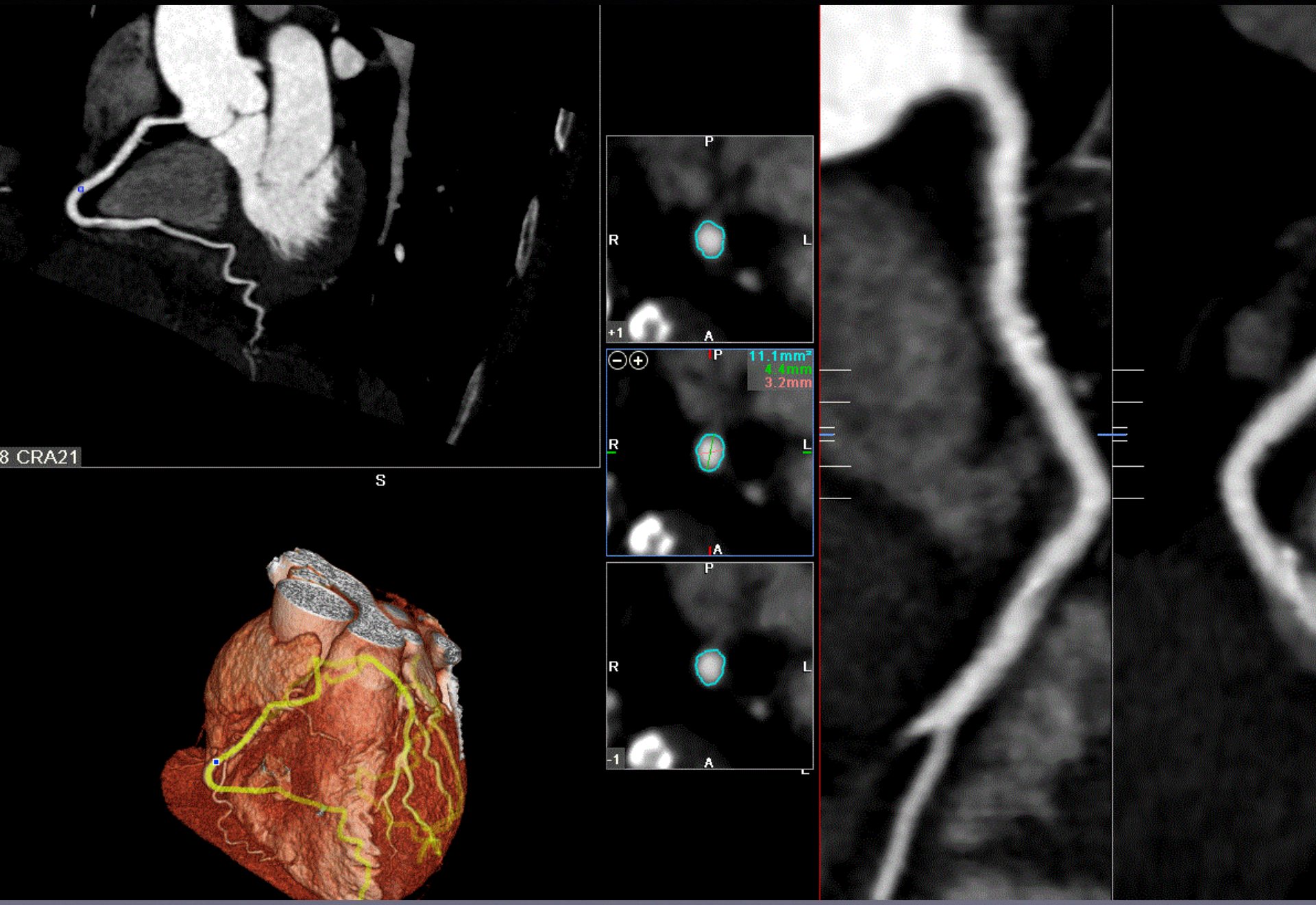
- Kunnen fietsen, bij voorkeur geen loopband (interpretatie ECG)
- 85 % maximale waarde (220-leeftijd)
- intraventriculaire geleidingsstoornissen, repolarisatiestoornissen

Table 1(b) Coronary artery disease post-test likelihood (%) based on age, sex, symptom classification exercise-induced electrocardiographic ST-segment depression

Age (years)	ST depression (mV)	Typical angina		Atypical angina		Non-anginal chest pain		Asymptomatic	
		Male	Female	Male	Female	Male	Female	Male	Fem
30–39	0·00–0·04	25	7	6	1	1	<1	<1	<1
	0·05–0·09	68	24	21	4	5	1	2	4
	0·10–0·14	83	42	38	9	10	2	4	<1
	0·15–0·19	91	59	55	15	19	3	7	1
	0·20–0·24	96	79	76	33	39	8	18	3
	>0·25	99	93	92	63	68	24	43	11
40–49	0·00–0·04	61	22	16	3	4	1	1	<1
	0·05–0·09	86	53	44	12	13	3	5	1
	0·10–0·14	94	72	64	25	26	6	11	2
	0·15–0·19	97	84	78	39	41	11	20	4
	0·20–0·24	99	93	91	63	65	24	39	10
	>0·25	>99	98	97	86	87	53	69	28
50–59	0·00–0·04	73	47	25	10	6	2	2	1
	0·05–0·09	91	78	57	31	20	8	9	3
	0·10–0·14	96	89	75	50	37	16	19	
	0·15–0·19	98	94	86	67	53	28	31	1
	0·20–0·24	99	98	94	84	75	50	54	2
	>0·25	>99	99	98	95	91	78	81	5
60–69	0·00–0·04	79	69	32	21	8	5	3	1
	0·05–0·09	94	90	65	52	26	17	11	
	0·10–0·14	97	95	81	72	45	33	23	1
	0·15–0·19	99	98	89	83	62	49	37	2
	0·20–0·24	99	99	96	93	81	72	61	4
	>0·25	>99	99	99	98	94	90	85	7

Onderzoek	RIZIV	Contrast	Bedrag	Bestraling
CT coro	458570	iodium 80 ml	128,89	1-3 mSv
SPECT (^{99m}Tc-MIBI) +CT	442396		214,76	<1mSv
cyclo	475810	-	32,91	-
Stress Echo	469814	-	153	-
NMR Hart	?		?	-
coro	453574	Iodium 60 ml	480,68	10-14 mSv
CT calciumscoreer	-	-	(50-100)	<1mSV

Onderzoek	Afwijkingen
CT coro	hoofdstam meertaksziekte
SPECT (^{99m}Tc-MIBI) +CT	LVEF<35% 10 % perfusiedefect in een segment
cyclo	ST depressie, elevatie, VT, BD val
Stress Echo	induceerbare contractiliteitsvermindering
NMR Hart	Perfusiedefecten Viabilitiestesten
CT calciumscore	cumulatie pixels ; agatston >100


8 CRA21
S
P
R
L
+1
A
11.1mm²
4.4mm
3.2mm
P
R
L
A
P
R
L
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A

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PDA	---	---
Other1	---	---
Other2	---	---
Other3	---	---
Total	372	301

Total Calcium Score 372

501

0

W-/L-

Zoom: 87,0%

12:42:36
Study Quality: - Enter study quality -
Comments: - Please enter conclusions here -


IMPLANTABLE CARDIAC DEVICES

Casus 58 j

- Gezien diabetes : duplex halsvaten screening
- Asymptomatische hooggradige stenose rechts
- CT angio bevestiging
- Dus electieve carotisendarteriectomie

ESC Guidelines on CV prevention

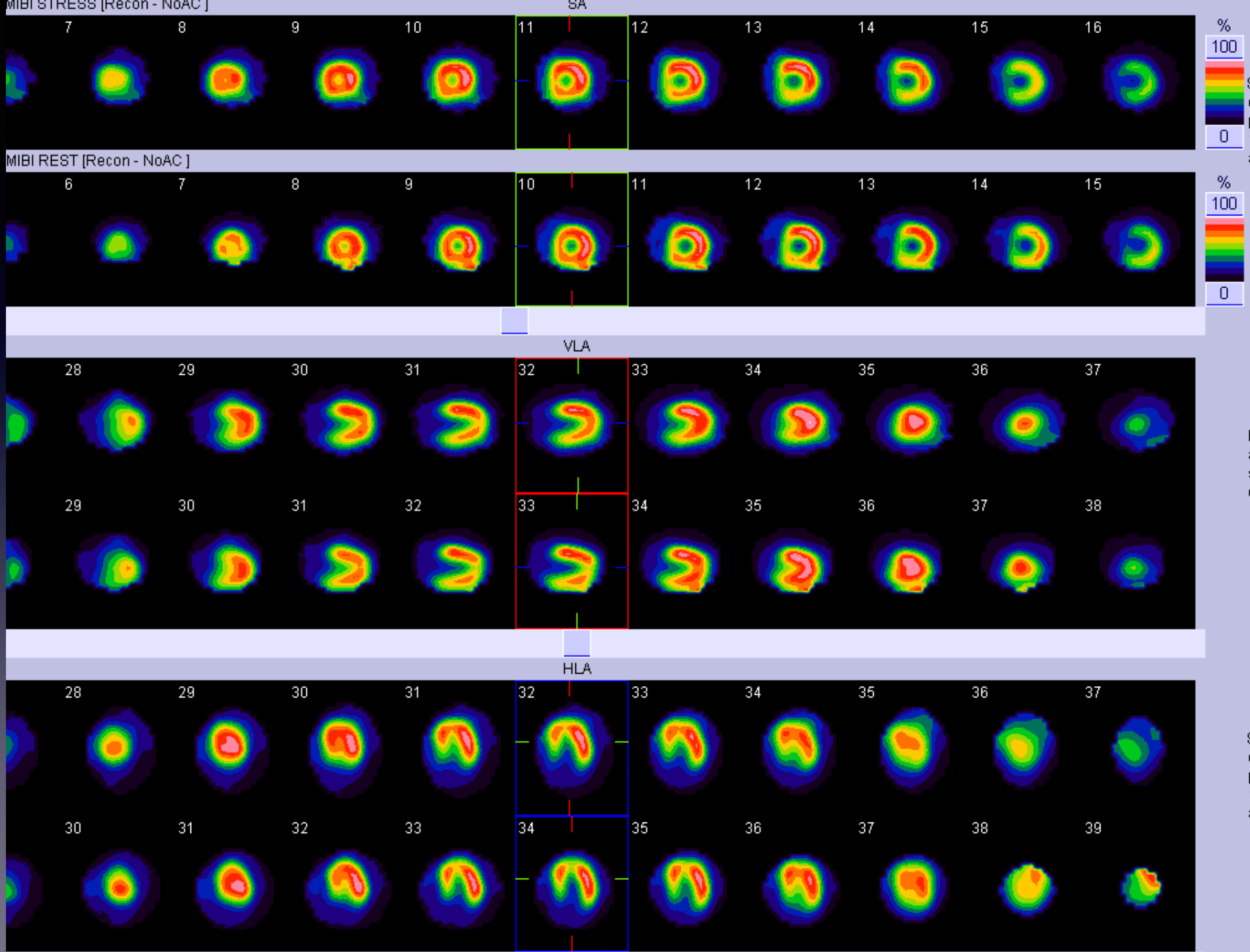
High-risk	Subjects with: • Markedly elevated single risk factors, in particular cholesterol >8 mmol/L (>310 mg/dL) (e.g. in familial hypercholesterolaemia) or BP ≥180/110 mmHg. • Most other people with DM (with the exception of young people with type 1 DM and without major risk factors that may be at low or moderate risk). • Moderate CKD (GFR 30–59 mL/min/1.73 m^2). • A calculated SCORE ≥5% and <10%.

ACS = acute coronary syndrome; AMI = acute myocardial infarction; BP = blood pressure; CKD = chronic kidney disease; DM = diabetes mellitus; GFR = glomerular filtration rate; PAD = peripheral artery disease; SCORE = systematic coronary risk estimation; TIA = transient ischaemic attack.

Casus 58j
Planning Carotis ingreep

- Diabetes > 10 jaar, SCORE2 > 5 %
- Trop 0,030 , ntProBNP 377 ; ECG normaal
- echocardiografie normaal
- cyclo : 75 W, polsfrequentie tot 95 /min ; stop wegens pijn in de benen ; METS 5
- ECG normaal, inspanningstest klinisch en electrocardiografisch negatief
- MIBI. : geen significante eredistributie

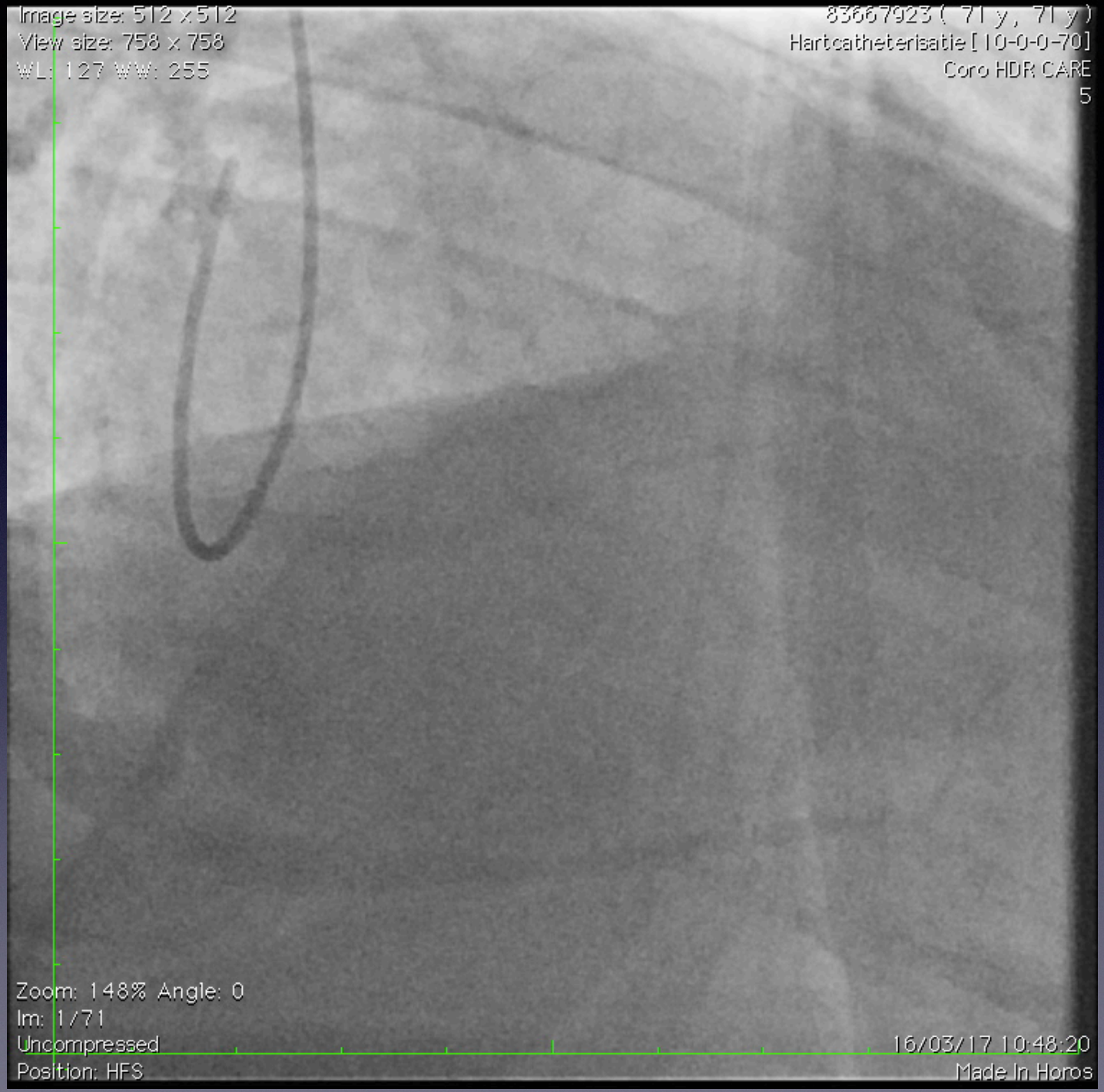
Wat nu ? Zijn we gerust ? Operatie uitstellen ?


MIBI STRESS [Recon - NoAC]
SA
7 8 9 10 11 12 13 14 15 16
%
100
0
MIBI REST [Recon - NoAC]
6 7 8 9 10 11 12 13 14 15
%
100
0
VLA
28 29 30 31 32 33 34 35 36 37
29 30 31 32 33 34 35 36 37 38
HLA
28 29 30 31 32 33 34 35 36 37
30 31 32 33 34 35 36 37 38 39

Threshold = 100 mg/cm³ CaHA
(130 HU)
Consortium mode, Patient size: small

Artery	Number of Lesions (1)	Volume [mm³] (3)	Equiv. Mass [mg CaHA] (4)	Calcium Score (2)
LM	0	0.0	0.00	0.0
LAD	7	441.2	105.77	540.3
CX	1	142.5	30.87	174.0
RCA	4	198.4	30.45	169.6
Total	12	782.1	167.09	883.8

(1) Lesion is volume based
(2) Equivalent Agatston score
(3) Isotropic interpolated volume
(4) Calibration Factor: 0.769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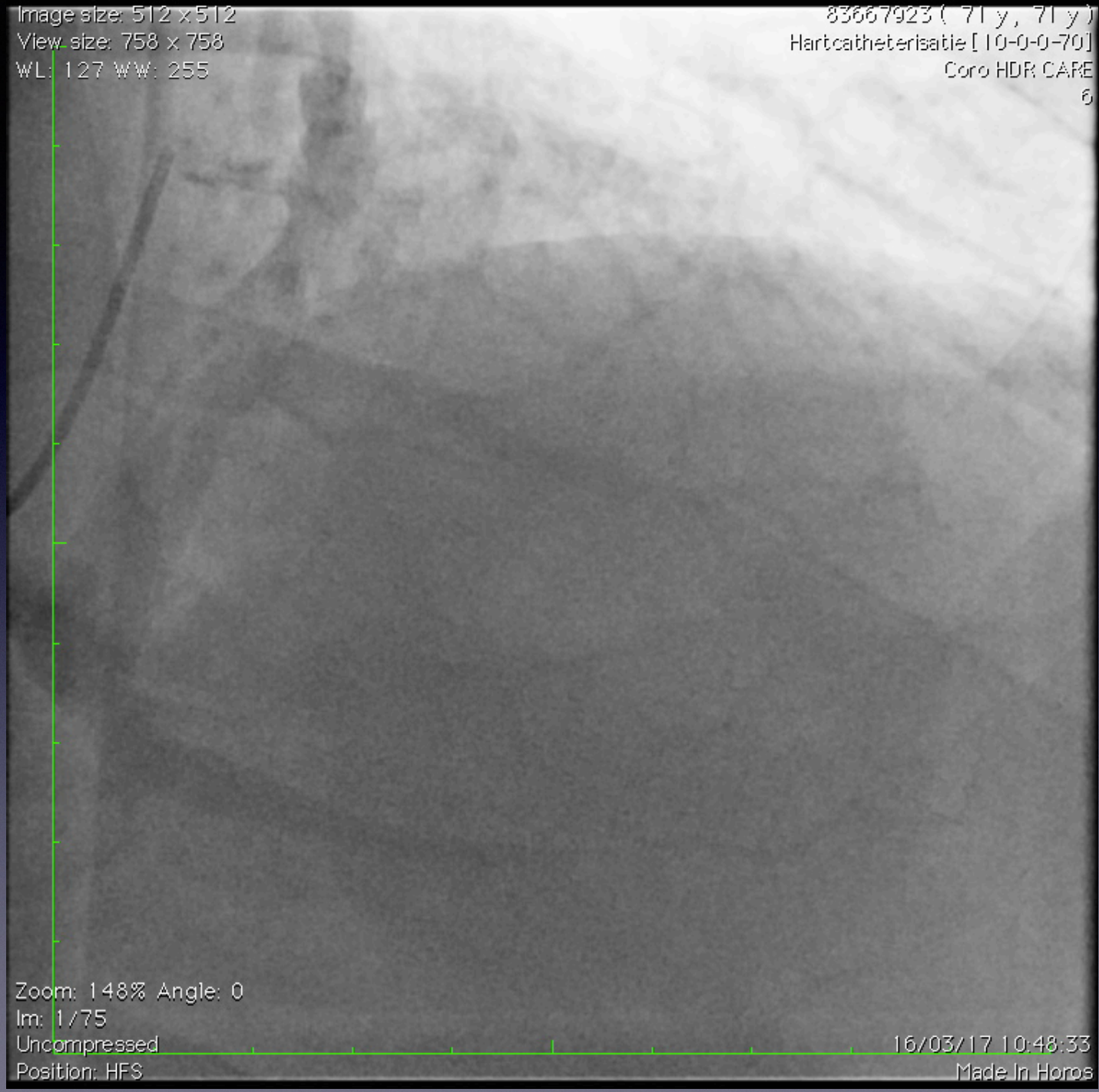
83667923 (71 y , 71 y)
Hartcatheterisatie [10-0-0-70]
Coro HDR CARE
5
Zoom: 148% Angle: 0
Im: 1/71
Uncompressed
Position: HFS
16/03/17 10:48:20
Made In Horos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Hartcatheterisatie [10-0-0-70]
Coro HDR CARE
6
Zoom: 148% Angle: 0
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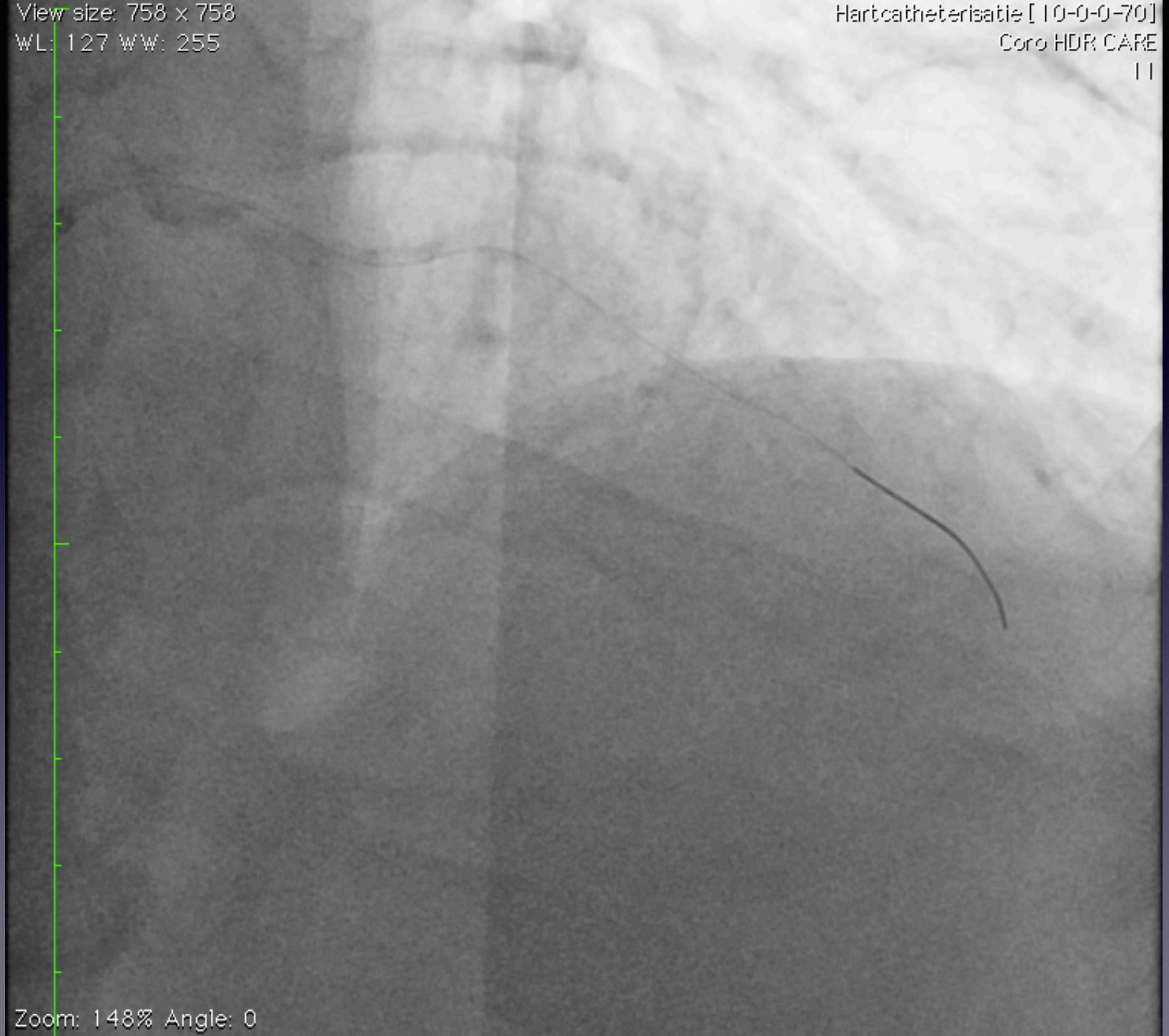
Made In Horos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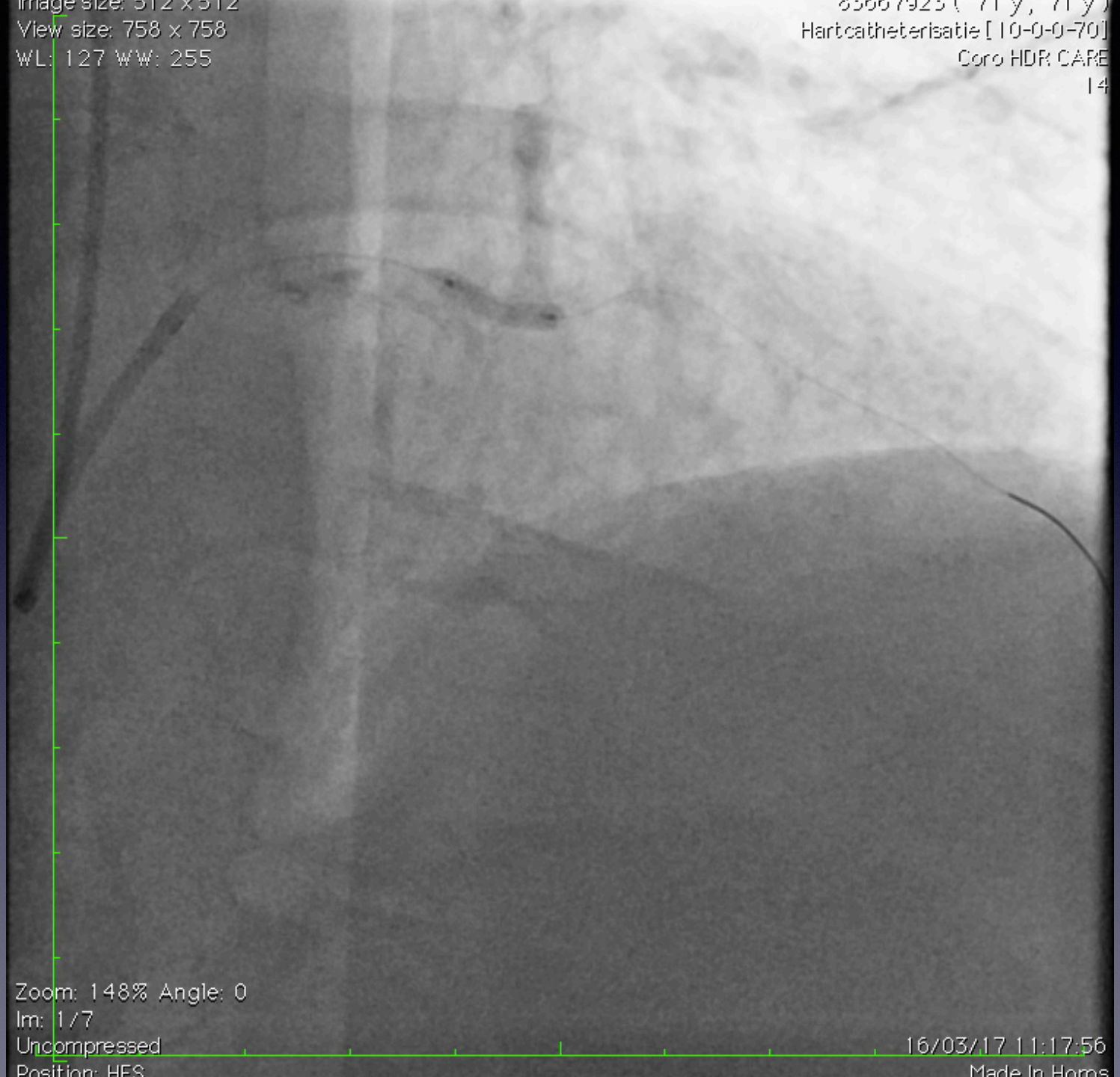
Coro HDR CARE
11
Zoom: 148% Angle: 0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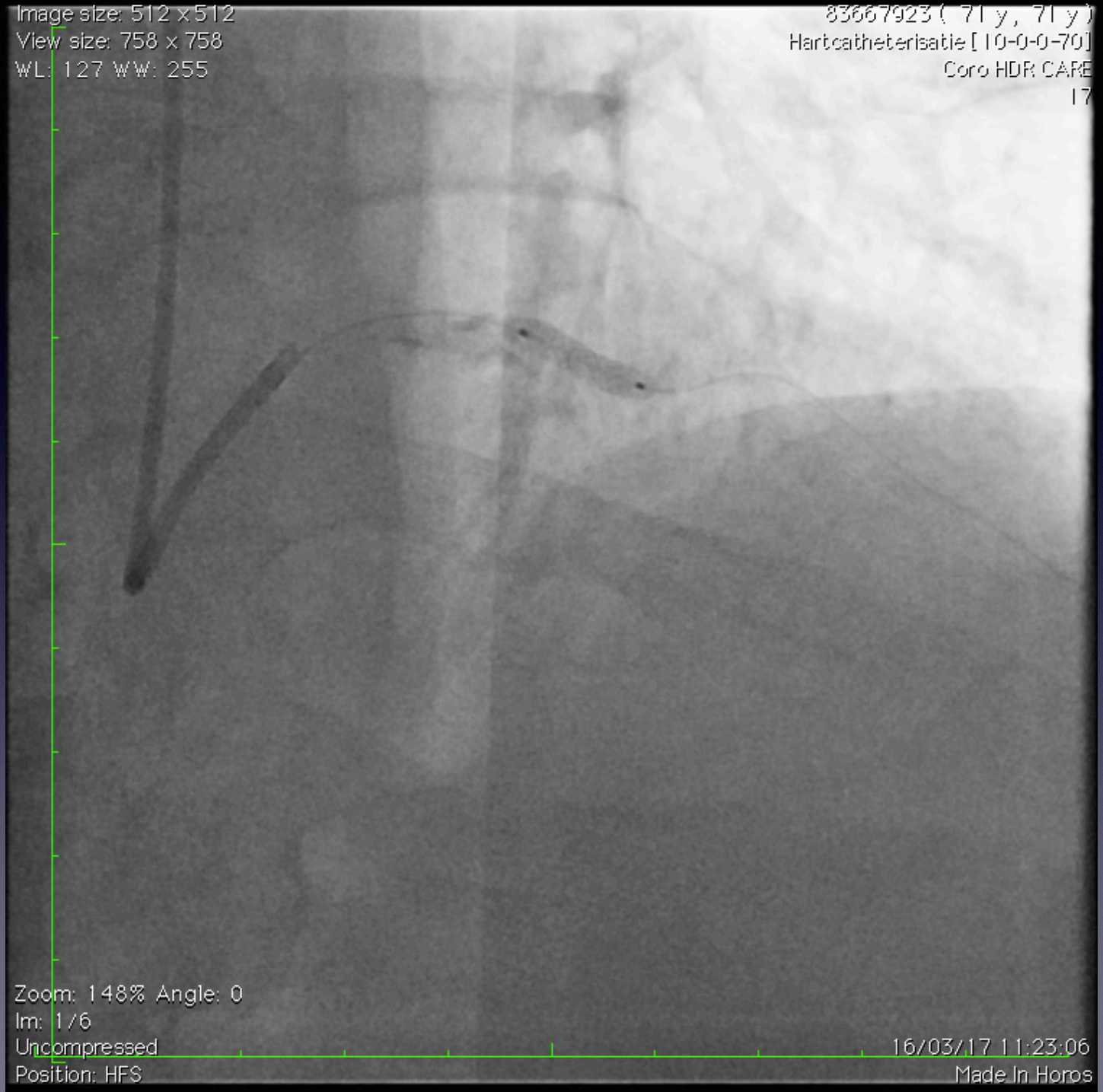
WL: 127 WW: 255
Hartcatheterisatie [10-0-0-70]
Coro HDR CARE
14
Zoom: 148% Angle: 0
Im: 1/7
Uncompressed
16/03/17 11:17:56
Made In Horns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View size: 758 x 758
WL: 127 WW: 255
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Hartcatheterisatie [10-0-0-70]
Coro HDR CARE
17
Zoom: 148% Angle: 0
Im: 1/6
Uncompressed
Position: HFS
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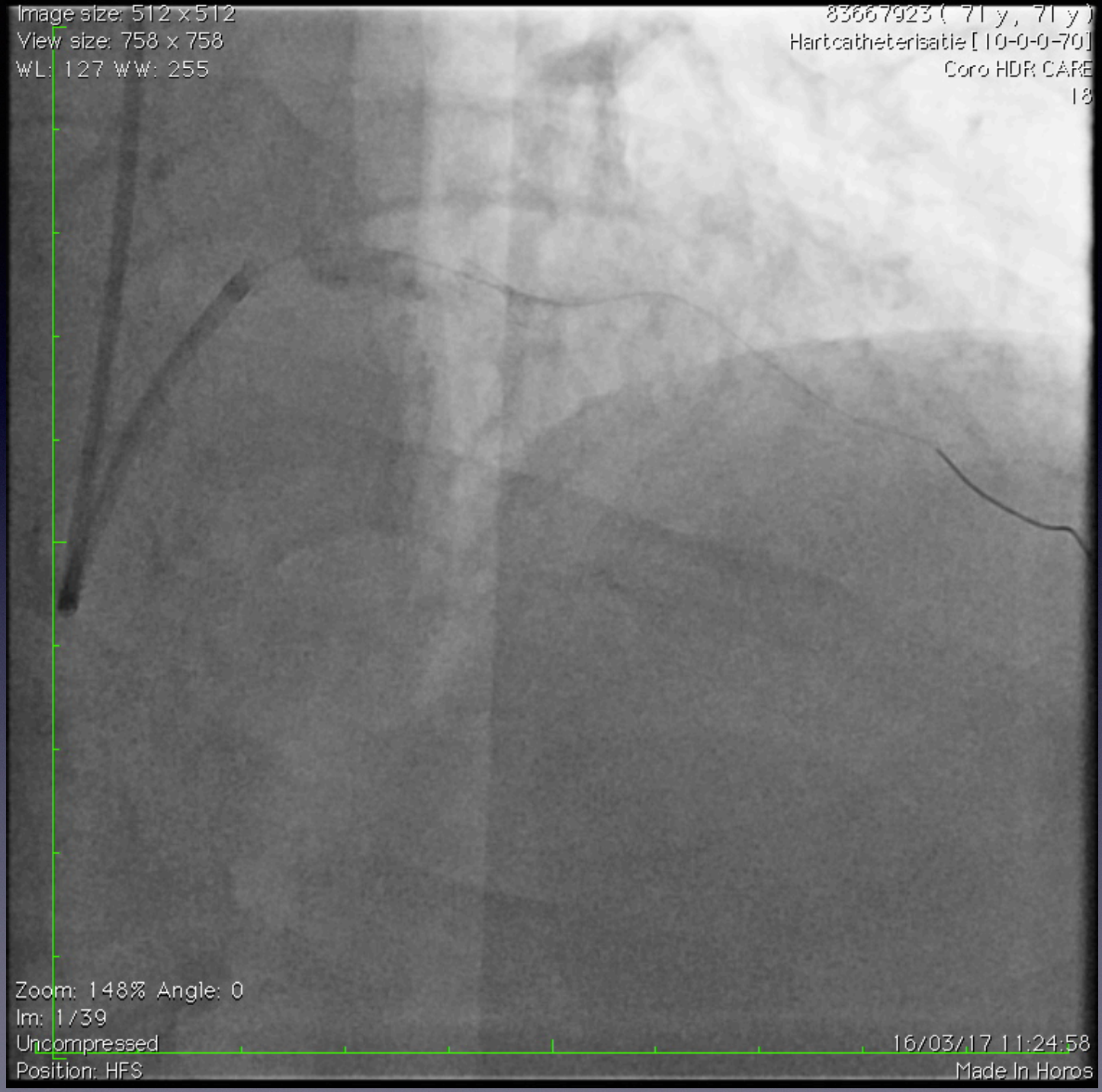
Made In Horos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View size: 758 x 758
WL: 127 WW: 255
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Hartcatheterisatie [10-0-0-70]
Coro HDR CARE
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Zoom: 148% Angle: 0
Im: 1/39
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Position: HFS
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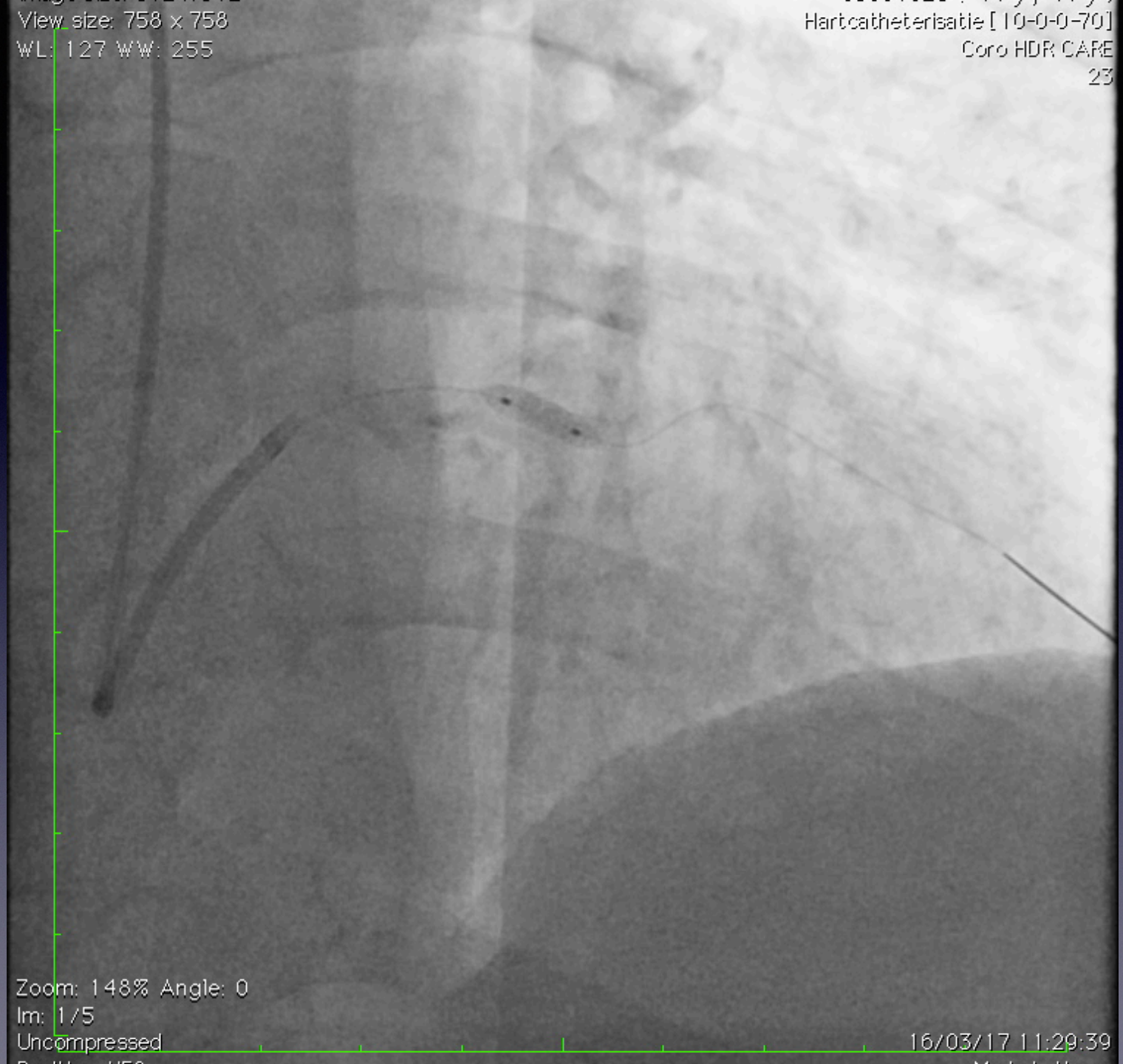
Made In Horos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Hartcatheterisatie [10-0-0-70]
Coro HDR CARE
23
Zoom: 148% Angle: 0
Im: 1/5
Uncompressed
16/03/17 11:29:39

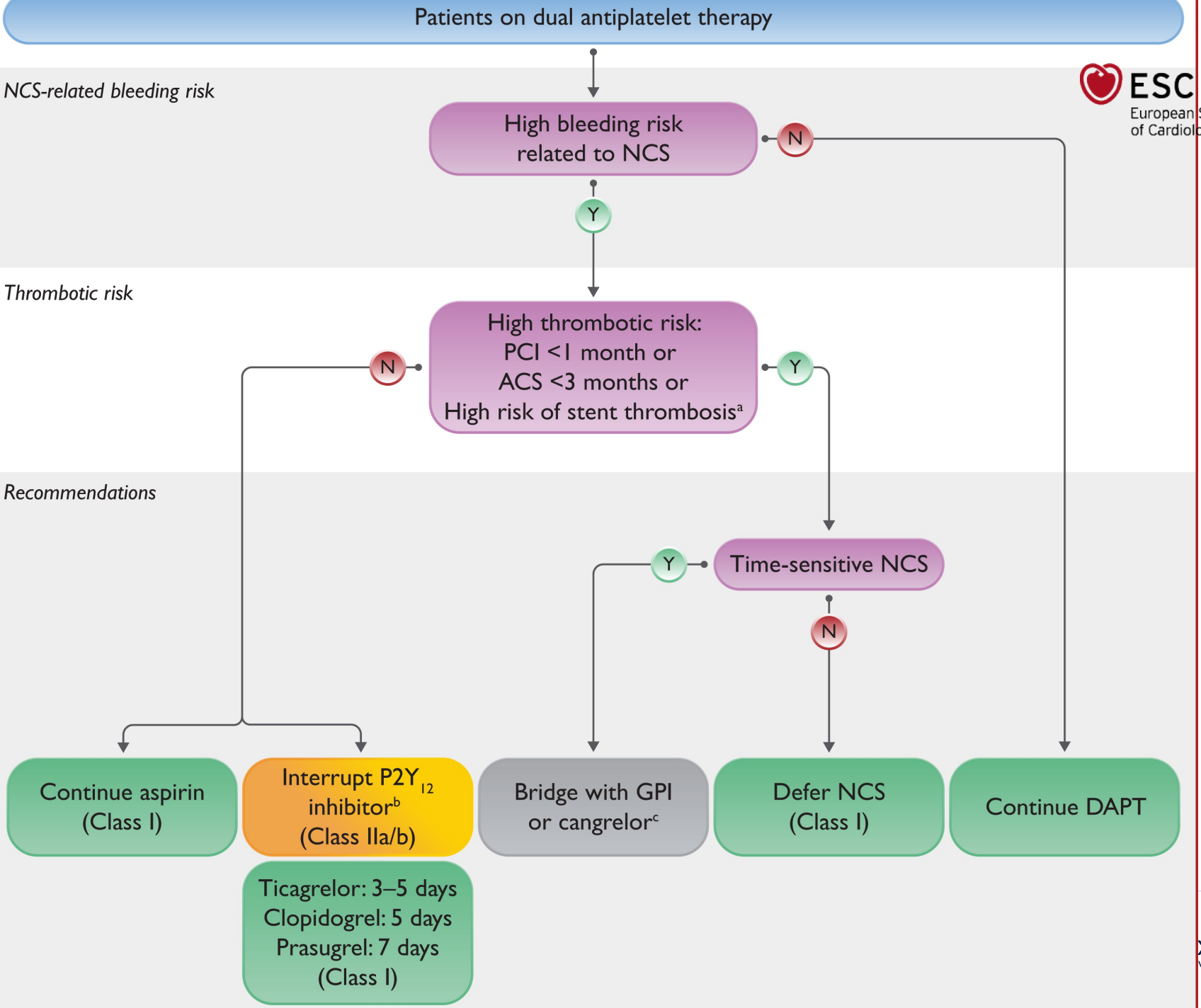

View size: 756 x 756
WL: 127 WW: 255
Coro HDR CARE
26
Zoom: 148% Angle: 0
Im: 1/44
Uncompressed
16/03/17 11:32:21

Regionaal ziekenhuis
Heilig Hart Leuven

Casus 58j

- Agatston Calciumscore ernstig verhoogd, vooral LAD
- Myocardperfusiescintigrafie : <10% redistributie, geen significante ischaemie,
- coronarografie: proximaal LAD letsel, PCI en plaatsen DES

Had de ingreep uitgesteld moeten worden?
Hoe lang ?


Patients on dual antiplatelet therapy
NCS-related bleeding risk
High bleeding risk related to NCS
N
Y
Thrombotic risk
High thrombotic risk: PCI <1 month or ACS <3 months or High risk of stent thrombosis[a]
N
Y
Recommendations
Y
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
ESC
European Society of Cardiology

ESC European Society of Cardiology

European Heart Journal (2020) **41**, 3083–3091
doi:10.1093/eurheartj/ehz301

CLINICAL REVIEW
Novel therapeutic concepts

Myocardial injury after non-cardiac surgery: diagnosis and management

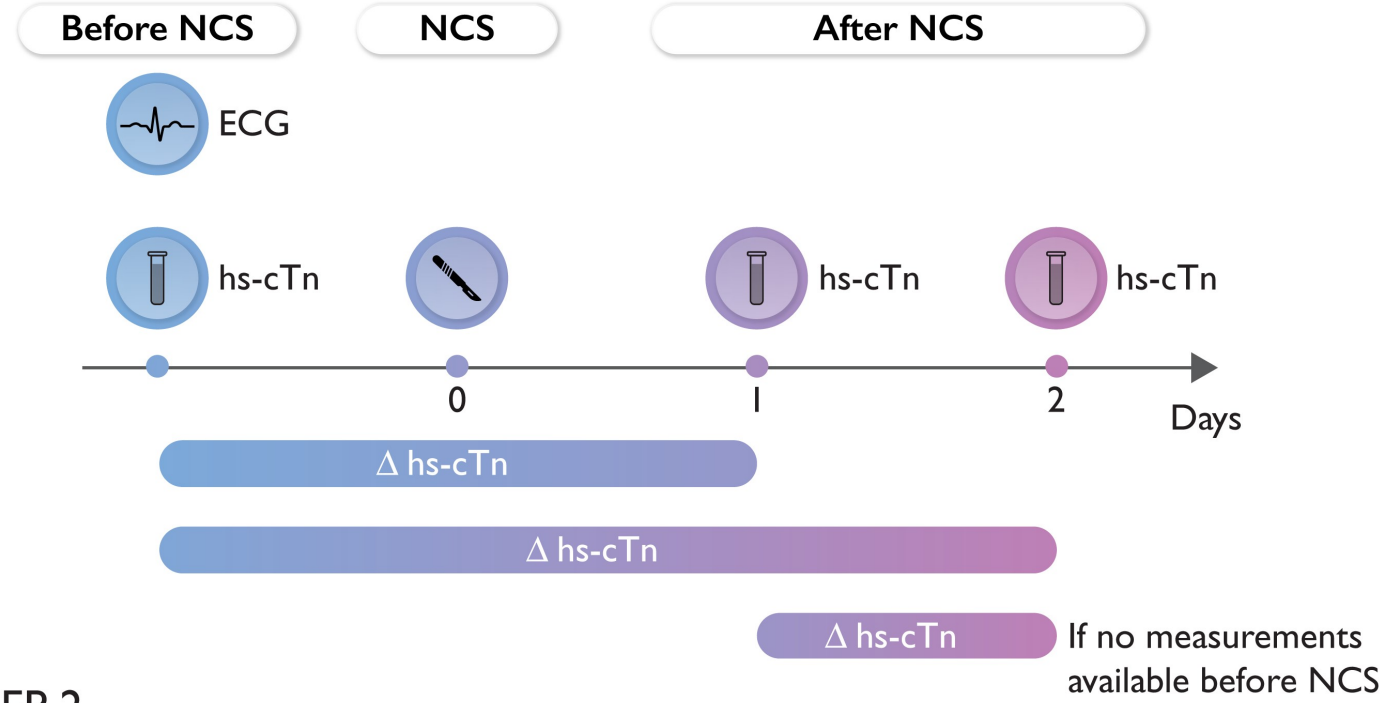
P.J. Devereaux [1,2,3,4]* and Wojciech Szczeklik [5]

[1]Department of Health Research Methods, Evidence, and Impact, McMaster University, David Braley Research Building, c/o Hamilton General Hospital, 237 Barton Street East, Hamilton, ON L8L 2X2, Canada; [2]Population Health Research Institute, David Braley Research Building, c/o Hamilton General Hospital, 237 Barton Street East, Hamilton, ON L8L 2X2, Canada; [3]Department of Medicine, McMaster University, David Braley Research Building, c/o Hamilton General Hospital, 237 Barton Street East, Hamilton, ON L8L 2X2, Canada; [4]Outcomes Research Consortium, 109 Partridge Lane, Hunting Valley, Cleveland, OH 44022, USA; and [5]Department of Intensive Care and Perioperative Medicine, Jagiellonian University Medical College, ul. Skawinska 8, 31-066 Krakow, Poland

Received 3 January 2019; revised 21 February 2019; editorial decision 27 March 2019; accepted 6 May 2019; online publish-ahead-of-print 16 May 2019

MINS

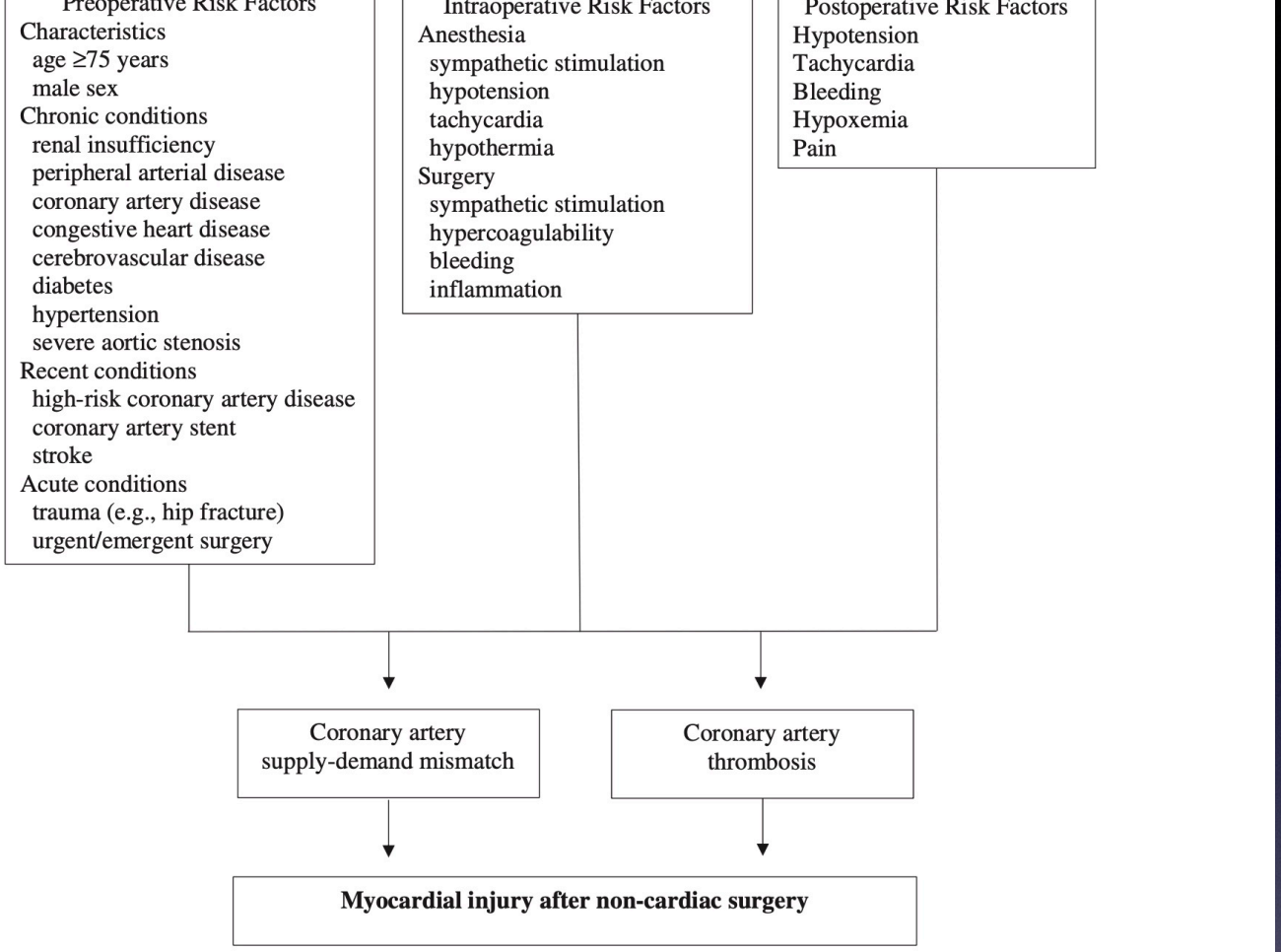
STEP 1



STEP 2

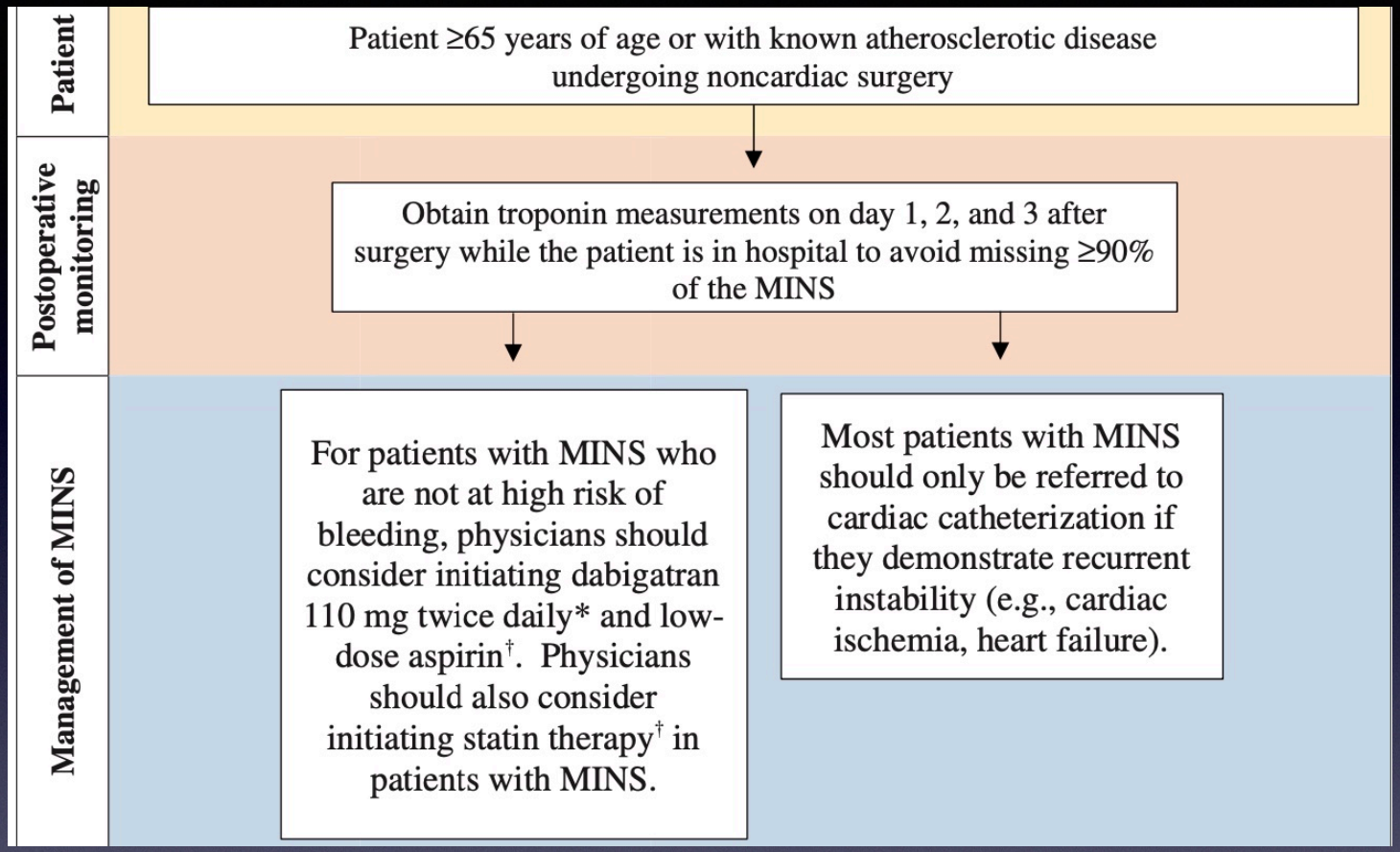
If Δ hs-cTn ≥ ULN = PMI

STEP 3



Pathophysiology of myocardial injury after non-cardiac surgery.

Pathofysiologie



Aanbevelingen

Casus :man 68j

- Voorgeschiedenis
  - - prostatitis
  - - GERD graad B oesophagitis
  - - maagulcera
  - - bilateraal liesbreukherstel
  - - 05/2014: kleine sliding hernia van de maag met randnormale motoriek van de slokdarm
  - - 12-09-2014: Laparoscopisch Nissen Fundoplicatie
  - - invaliditeit wegens rugproblemen
  - - 2017: Neuritis facialis rechts (Bell's palsy)

Casus man 68 j

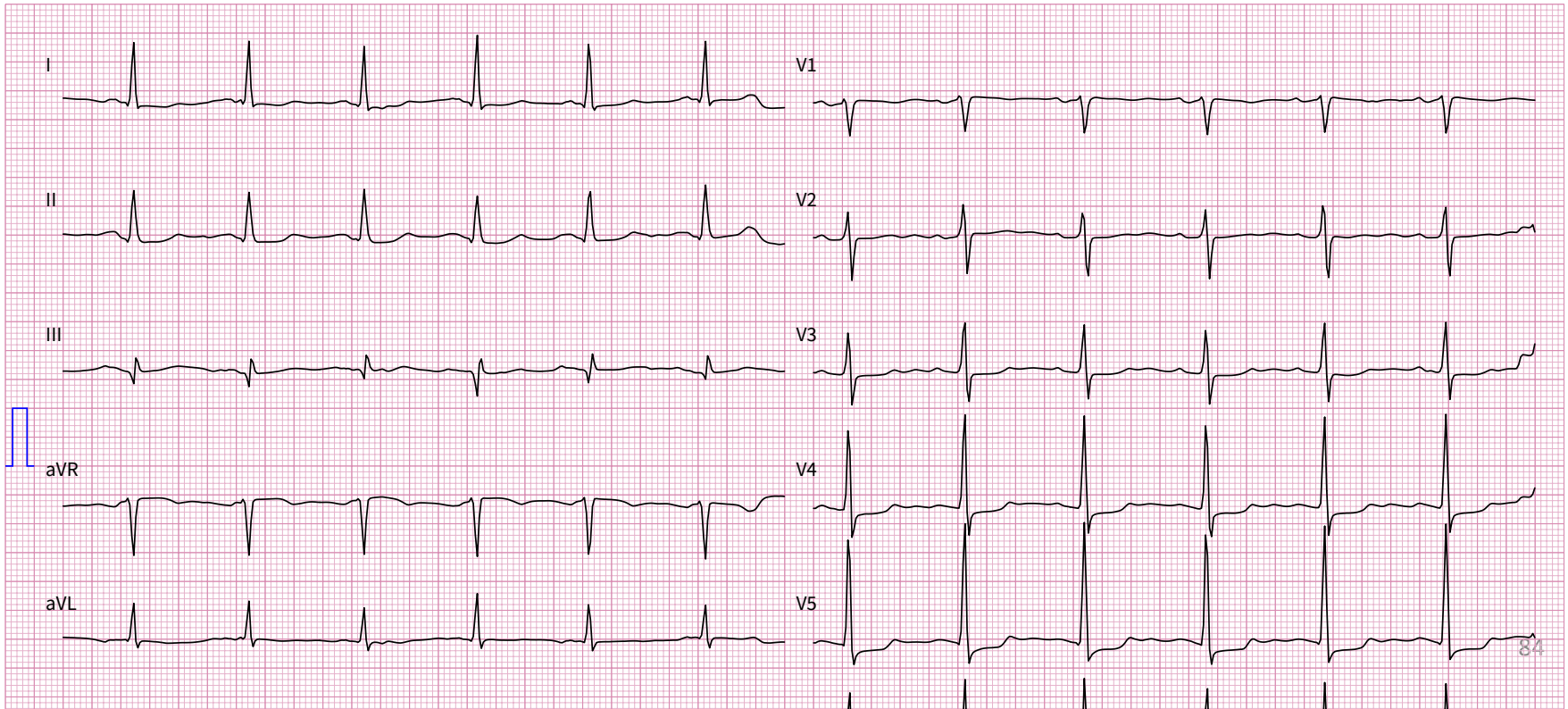
- Risicofactoren
  - Nicotine abusus: ex-roker (25 pakjaren)
  - Familiaal (vader <65 moeder <55j) : moeder CABG, vader CMP
  - Arteriele hypertensie: +, onder behandeling met Nobiten en Coversyl
  - Dyslipidaemie : laatste LDLchol : 119 mg/dl in 2022.
  - Diabetes mallitus: bij opname HbA1c 10.1

Casus man 68 j

- Totale knieprothese
- CV risico +++
- ECG STT afwijkingen
- Onverwikkelde heelkunde 1/12
- MINS

Naam	**ROLAND GEORGES ELSEVIERS**			**02.12.2022 08:47:08**					
Patiënt-ID	**73101784**			**Rust-ECG**					
Geboortedat...	15.03.1955	**Bezoek-ID**	1544489730	**HF**	**74 spm**	**RR**	809 ms	SINUS RHYTHM	
Leeftijd	067Y	**Kamer**	HHL-6928			**P**	146 ms		
Geslacht	Man	**Order-ID**				**PR**	188 ms	NON SPECIFIC ST DEPRESSION	
Etniciteit	Niet-gedefinieerd	**Best. zorgve...**		**P-as**	41 °	**QRS**	90 ms	NON SPECIFIC T ABNORMALITY	
Lengte		**Verw. arts**		**QRS-as**	19 °	**QT**	418 ms		
Gewicht		**Apparaat-ID**	HHL-6928	**T-as**	57 °	**QTcB**	465 ms	**Gevalideerd door** schurman - 02.12.2022 12:22:14	

Medicatie
Opmerking



Datum	30/11	1/12	2/12
Trop	11	12	19
ntProBNP	279		

TTE

Transthoracale echocardiografie - 01/12/2022:

Echogeniciteit: normaal

Linker ventrikel:

- **globaal aspect: normaal.**
- **regionaal aspect: hypocontractiliteit inferolateraal basaal.**
- **wanddikte: normaal ; tot 11mm**
- **systolische functie: normaal ; LVEF=60%**
- **diastolische functie (doppler): normaal.E/é 13**

Rechter ventrikel:

- **globaal aspect: normaal.**

Atria: links normaal rechts normaal.

Aorta ascendens: normaal; pericardvocht: afwezig.

Arteria pulmonalis: normaal; pulmonale hypertensie: geen betrouwbaar TI signaal.

Klepmorfologie en -excursie 4 natieve kleppen: normaal.

Klepinsufficiënties (doppler): geen

Myocardscintigrafie met MIBI - 02/12/2022:

Tomogrammen na inspanning (belasting):
Er is een normale tracerverdeling.

Tomogrammen in rust:
Er is verminderde tracerstapeling over de voorwand.

BESLUIT:
Geen argumenten voor ischemie op dit onderzoek.

Ca-score:
Agatston-score = 248,3 (matig verhoogd)

Verslag orthopedie

Omwille van een invaliderende gonarthrose rechts werd een totale knieprothese geplaatst.
Er waren geen majeure peri-operatieve complicaties.
Pat. werd op 02 dec. 2022 overgenomen op de afdeling cardiologie voor verdere diagnostiek van zijn cardiale toestand waarvan het verslag separaat volgt.
Hij kon op 05 dec. 2022 het ziekenhuis verlaten.

Revalidatie

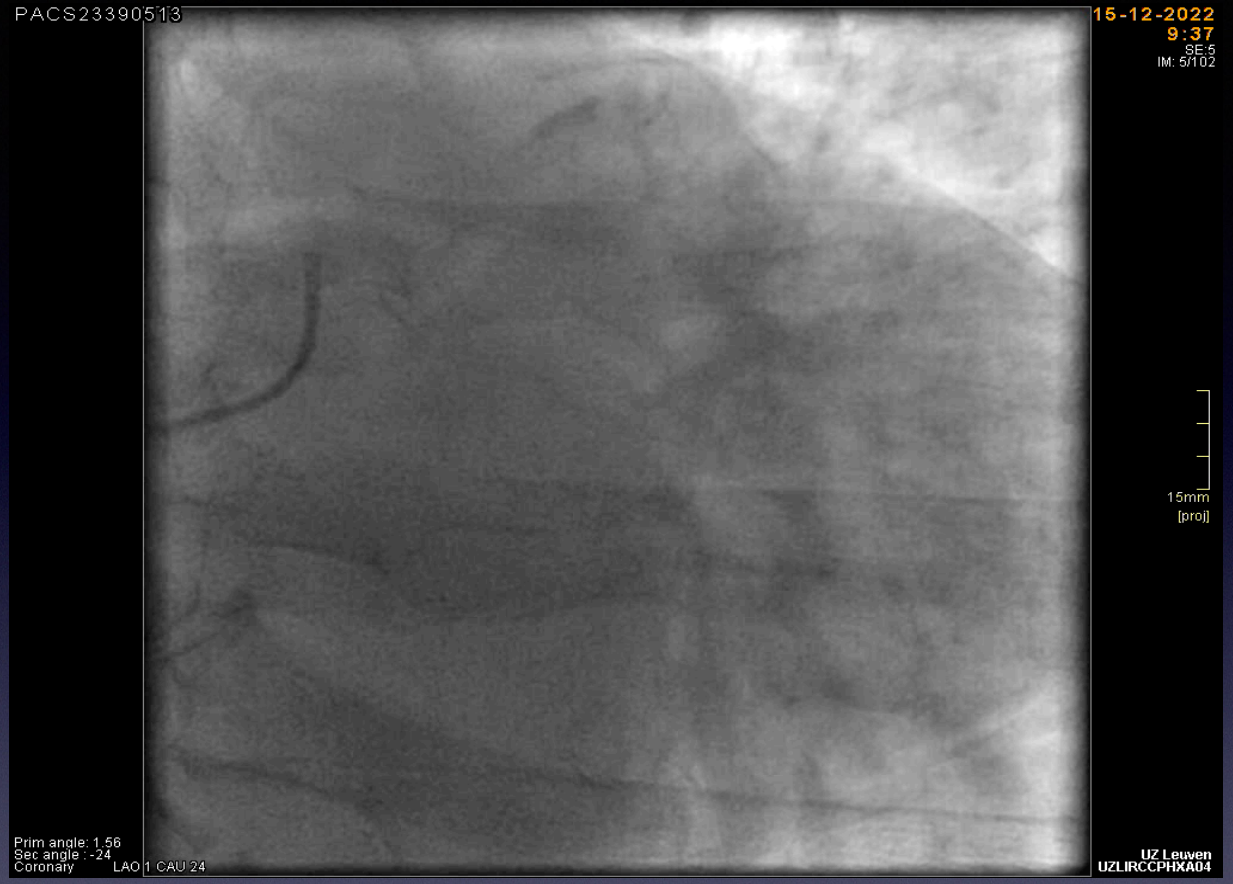
Bij ontslag stapt pat. met een rollator of wandelstok.

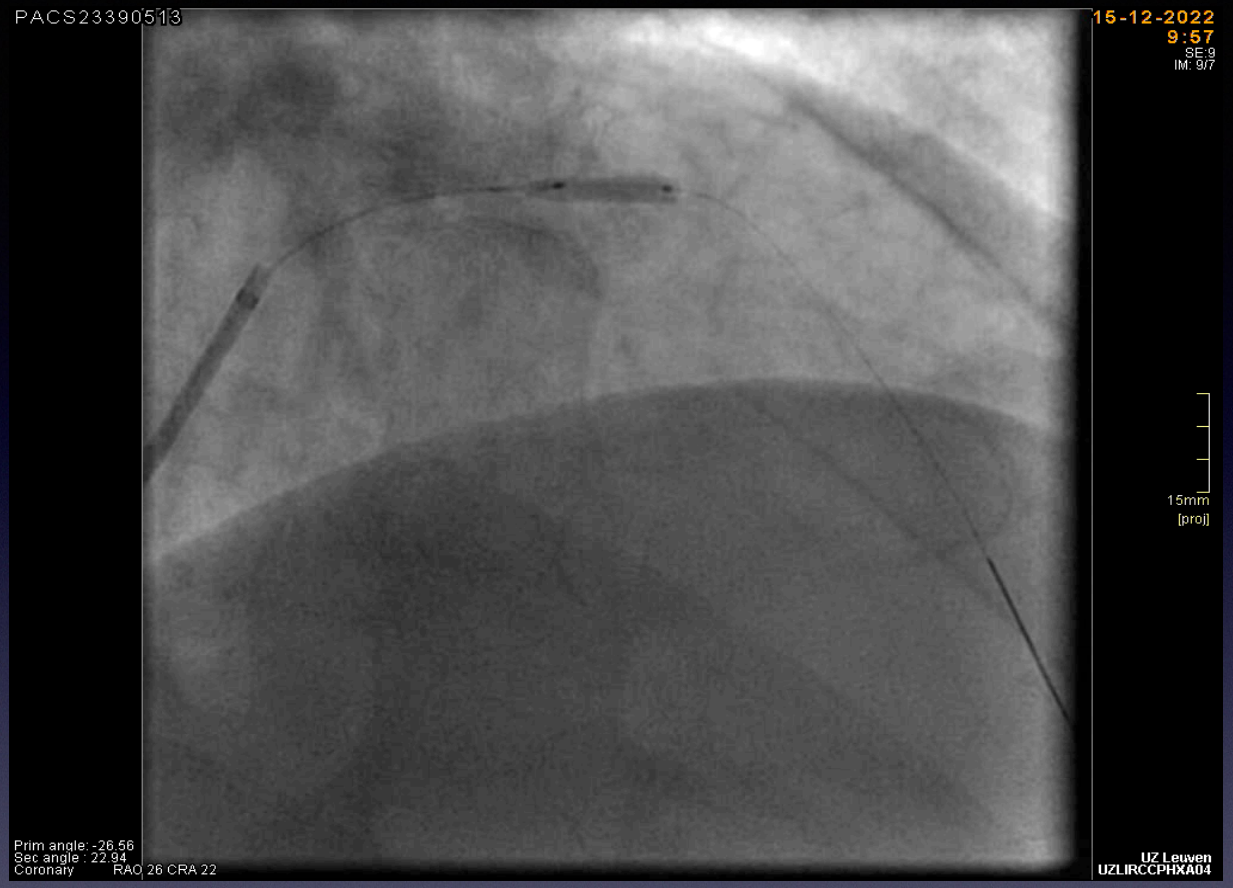
Nabehandeling

- Verder progressieve gangrevalidatie onder leiding van een kinesitherapeut met aandacht voor quadricepstonificatie, flexie-oefeningen en extensiepostuur (met 3 kg gewicht: 2 maal 20' per dag).

Ontslag naar huis

- Electieve opname voor coronarografie 2 weken later
- Clexane en ASA
- IRCC


PACS23390513
15-12-2022
9:37
SE:5
IM: 5/102
15mm
[proj]
Prim angle: 1.56
Sec angle : -24
Coronary LAO 1 CAU 24
UZ Leuven
UZLIRCCPHXA04


PACS23390513
15-12-2022
9:57
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IM: 9/7
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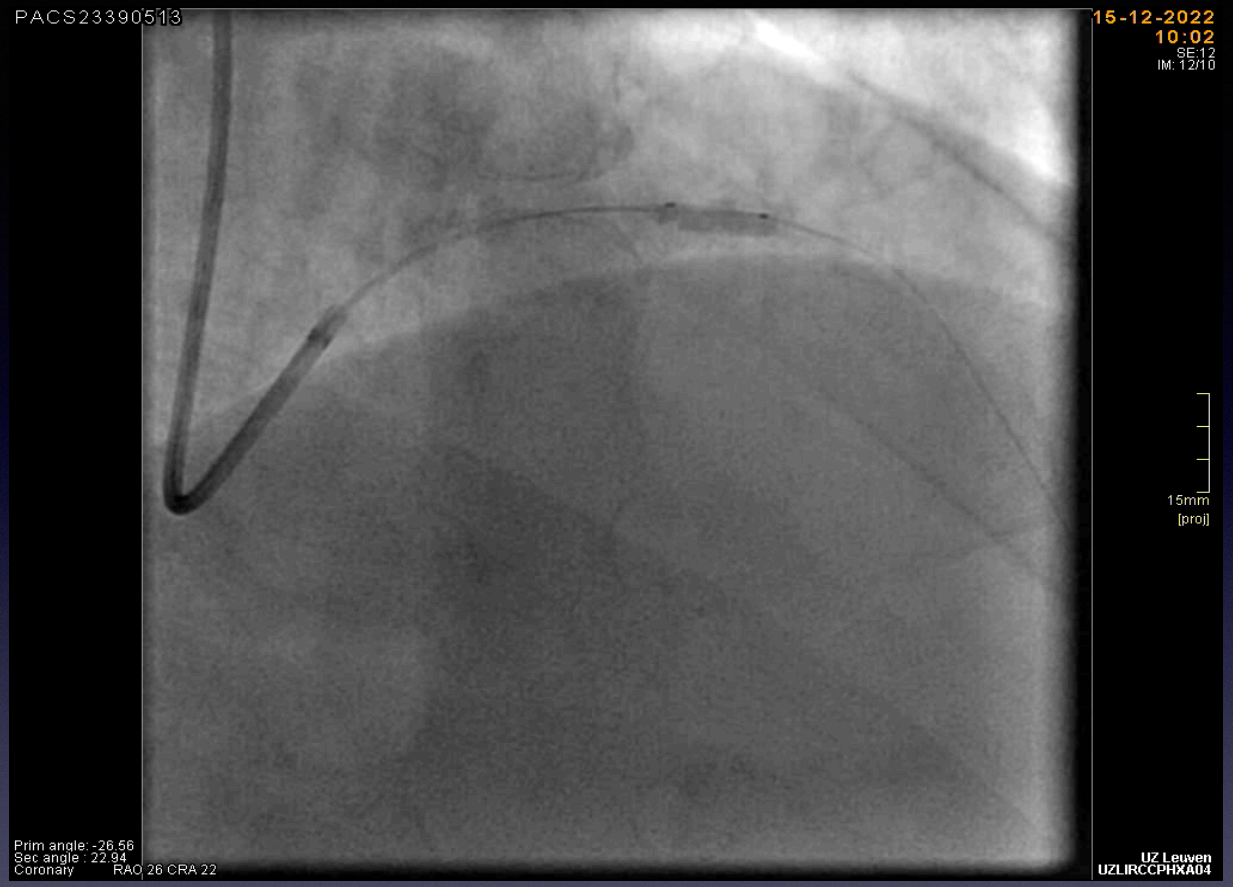
[proj]
Prim angle: -26.56
Sec angle : 22.94
Coronary RAO 26 CRA 22
UZ Leuven
UZLIRCCPHXA04

Coro


PACS23390513
15-12-2022
10:02
SE:12
IM: 12/10
15mm
[proj]
Prim angle: -26.56
Sec angle : 22.94
Coronary RAO 26 CRA 22
UZ Leuven
UZLIRCCPHXA04


CS23390513
15-12-2022
10:25
SE:34
IM: 34/8
15mm
[proj]
angle: -27.94
ngle : -24.65
nary
RAO 27 CAU 24
UZ Leuven
UZLIRCCPHXA04

Coronarografie

ernstig tweevatslijden met aanwezigheid van proximale stenose in de LAD en een stenose in de tweede lateraaltak circumflex.
Er is dan ook geopteerd voor onmiddellijke PCI met 2 drug eluting stens: een Abbott XienceSkypoint Drug-eluting stent geïmplanteerd met een diameter van 3.5 mm en een lengte van 15.0 mm en een Abbott XienceSkypoint Drug-eluting stent geïmplanteerd met een diameter van 2.75 mm en een lengte van 23.0 mm.

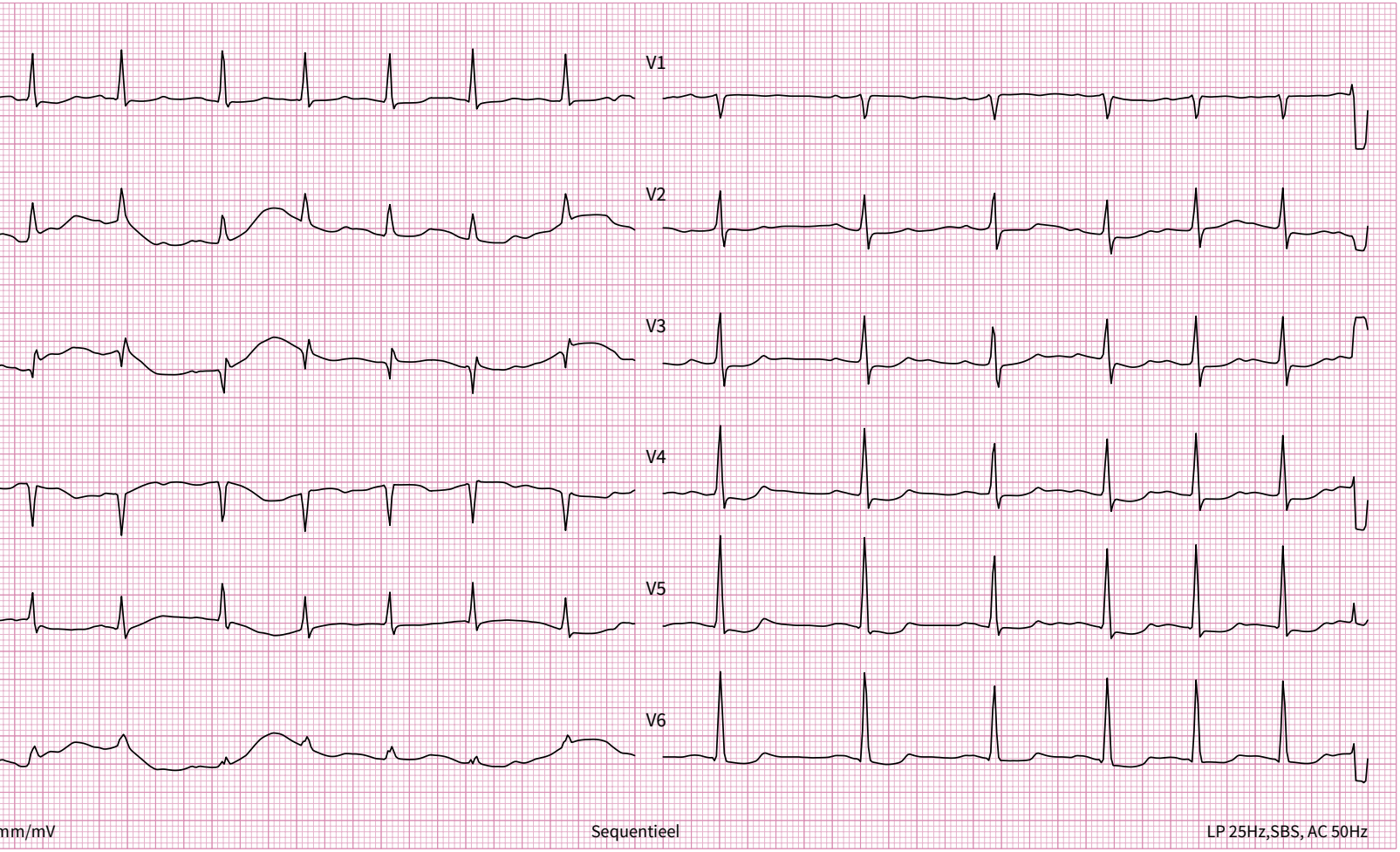
Dubbele antiplaatjestherapie van 6 maanden is aangewezen.

OLAND GEORGES ELSEVIERS
3101784

16.12.2022 11:04:54
Rust-ECG

SCHILLER
The Art of Diagnostics

6.03.1955	**Bezoek-ID**	1545083131	**HF**	**83 spm**	**RR**	722 ms	SINUS ARRHYTHMIA
67Y	**Kamer**	HHL-0289			**P**	78 ms	NON SPECIFIC ST DEPRESSION
an	**Order-ID**				**PR**	212 ms	NON SPECIFIC T ABNORMALITY
iet-gedefinieerd	**Best. zorgve...**		**P-as**	90 °	**QRS**	88 ms	PROLONGED QT INTERVAL
	Verw. arts		**QRS-as**	20 °	**QT**	416 ms	
	Apparaat-ID	HHL-0289	**T-as**	65 °	**QTcB**	490 ms	**Onbevestigd rapport**



mm/mV | Sequentieel | LP 25Hz,SBS, AC 50Hz

- Asaflow, 80 mg, 1/d, 8u
- Clopidogrel eg, 75 mg, 1/d, 8u
- Coversyl, 5 mg, 1/d, 8u
- Dafalgan, 1 g, 3/d, 8u 14u 20u
- Metformine mylan, 850 mg, 2/d, 8u 17u
- Nobiten, 5 mg, 1/d, 8u
- Tradonal, 50 mg

>\# bij pijn (max 4)

- Uni diamicron (tabl retard 60 mg), 120 mg, 1/d, 8u

Bloedingsrisico

Anti plaatjes therapie
Antithrombotica

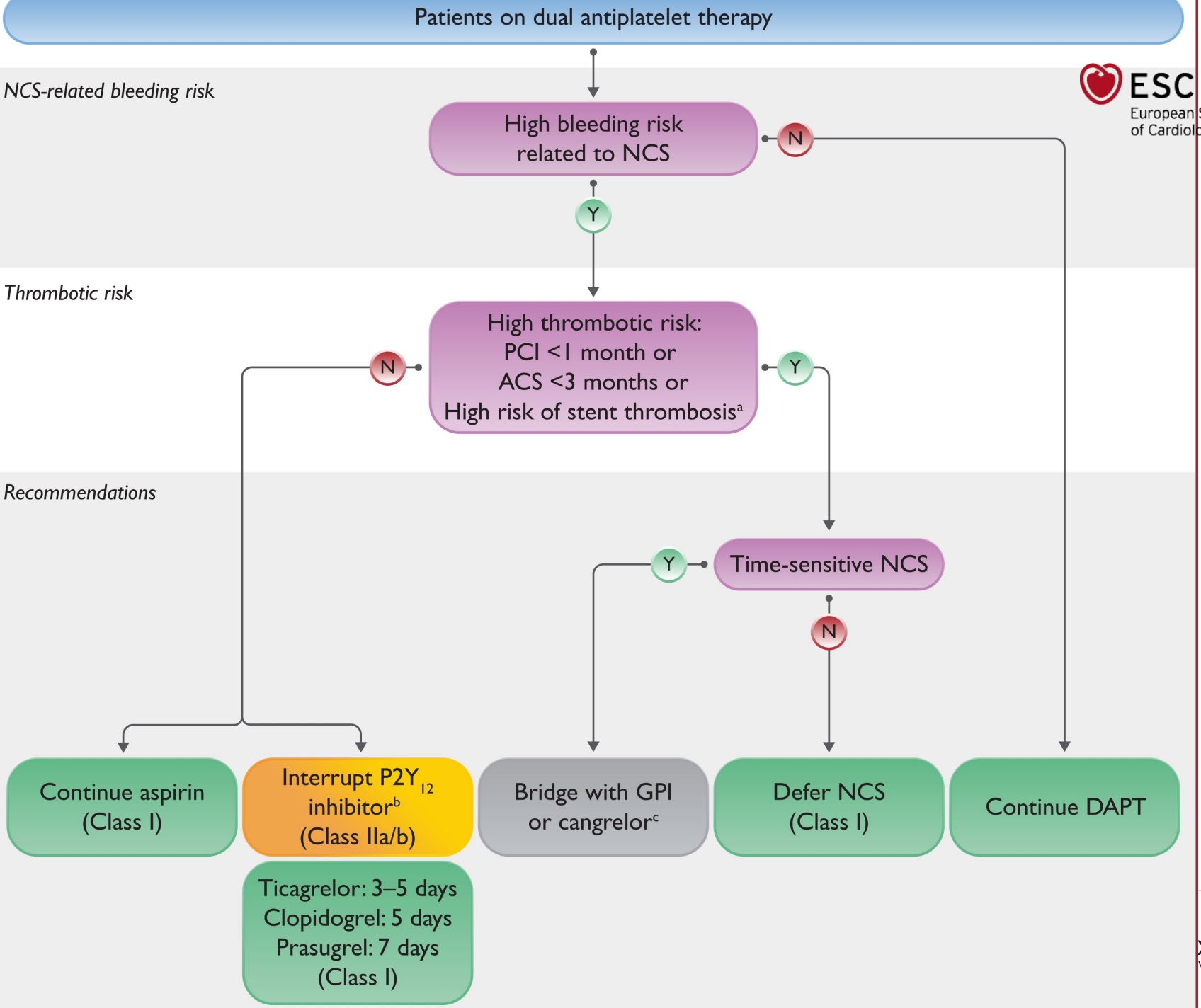
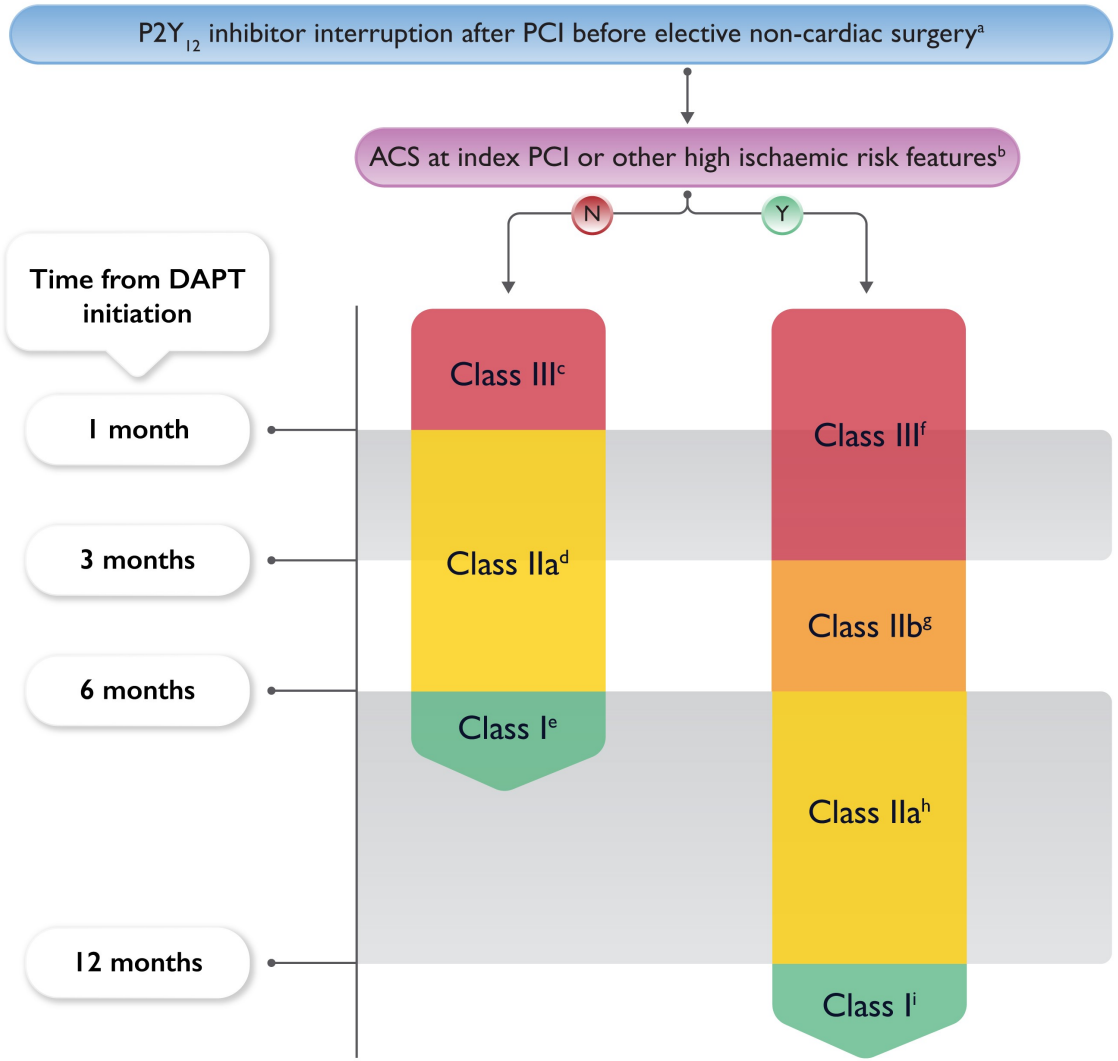
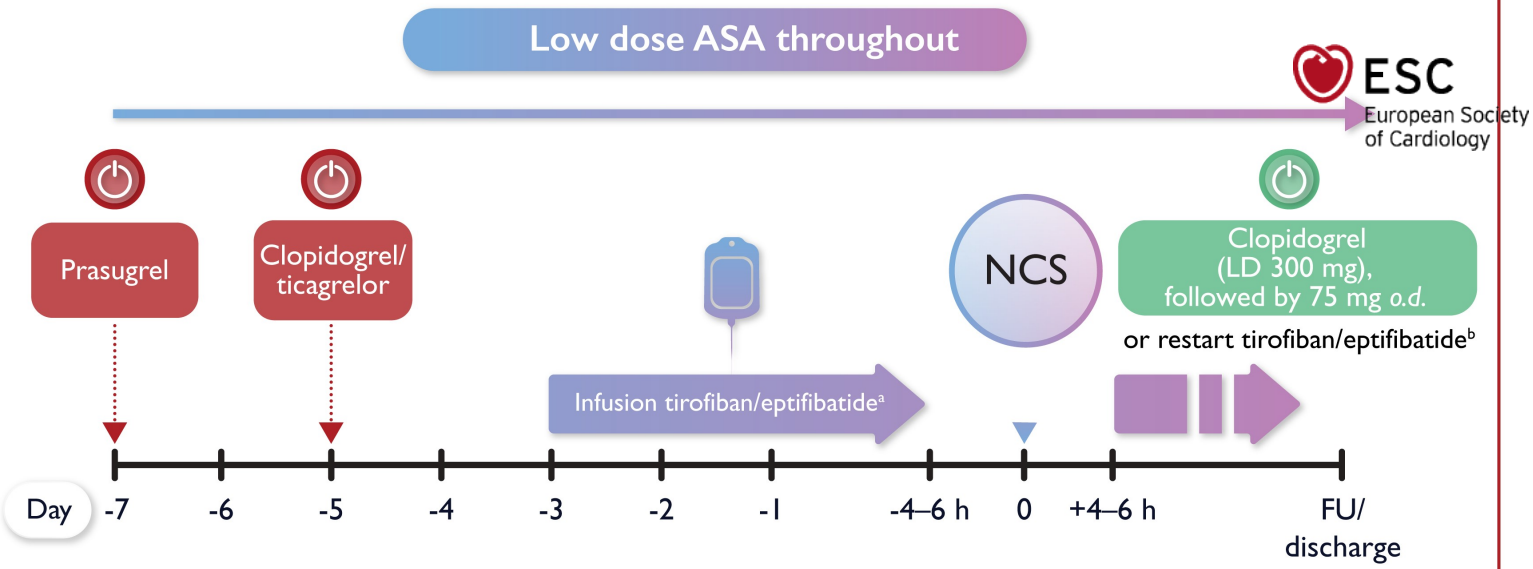

Patients on dual antiplatelet therapy
NCS-related bleeding risk
High bleeding risk related to NCS
N
Y
Thrombotic risk
High thrombotic risk: PCI <1 month or ACS <3 months or High risk of stent thrombosis[a]
N
Y
Recommendations
Y
Time-sensitive NCS
N
Continue aspirin (Class I)
Interrupt P2Y12 inhibitor[b] (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
ESC
European Society of Cardiology

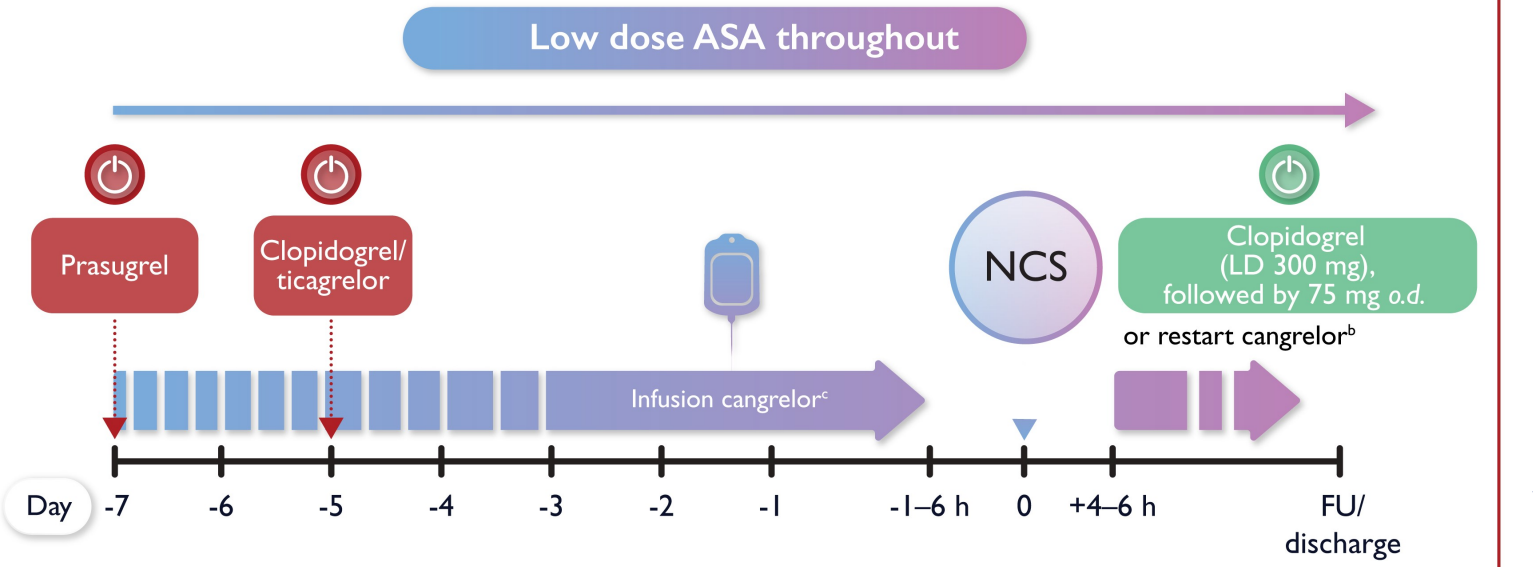
Figure
interver



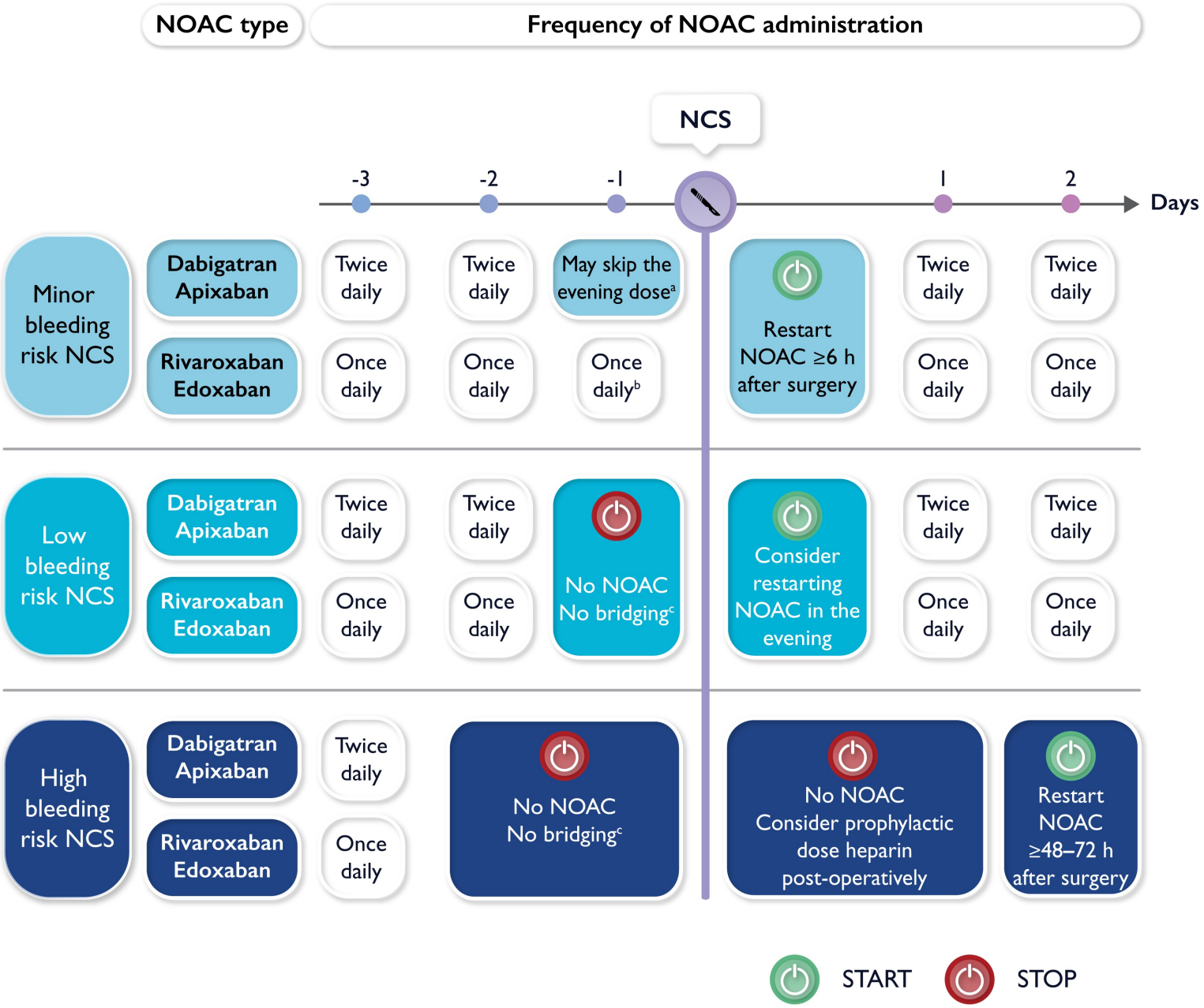
Eur Heart J, Volu

Figure 7
acetylsa





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



Day -4
Day -3
Day -2
Day -1
Day of surgery
Day +1
Day +2
Minor bleeding risk
Dabi
Apix
Edo / Riva (AM intake)
Edo / Riva (PM intake)
No bridging
Restart ≥ 6h post surgery
Low bleeding risk
Dabi
Apix
Edo / Riva (AM intake)
Edo / Riva (PM intake)
(if CrCl ≥ 30)
(if CrCl ≥ 50)
(if CrCl ≥ 80)
No bridging
High bleeding risk
Dabi
Apix
Edo / Riva (AM intake)
Edo / Riva (PM intake)
(if CrCl ≥ 30)
(if CrCl ≥ 50)
(if CrCl ≥ 80)
No bridging (heparin / LMWH)
Consider plasma level measurements (in special situations *)
No bridging
Consider postoperative thrombo-prophylaxis per hospital protocol
Restart ≥ 48h (-72h) post surgery

TROMBO-EMBOLISCH RISICO

▪ Hartklepprothese

Hoog risico (>10%)	▪ Mitralisklepprothese ▪ Oude aortaklepprothese (monoleaflet of bal-klepprothese)
Matig risico (5-10%)	▪ Bileaflet aortaklepprothese

▪ Voorkamerfibrillatie

Hoog risico (>10%)	▪ Voorgeschiedenis CVA/TIA ▪ CHA_2DS_2-VASc-score > 5 ▪ Reumatisch kleplijden
Matig risico (5-10%)	▪ CHA_2DS_2-VASc-score 4-5
Laag risico (2-5%)	▪ CHA_2DS_2-VASc-score ≤ 3

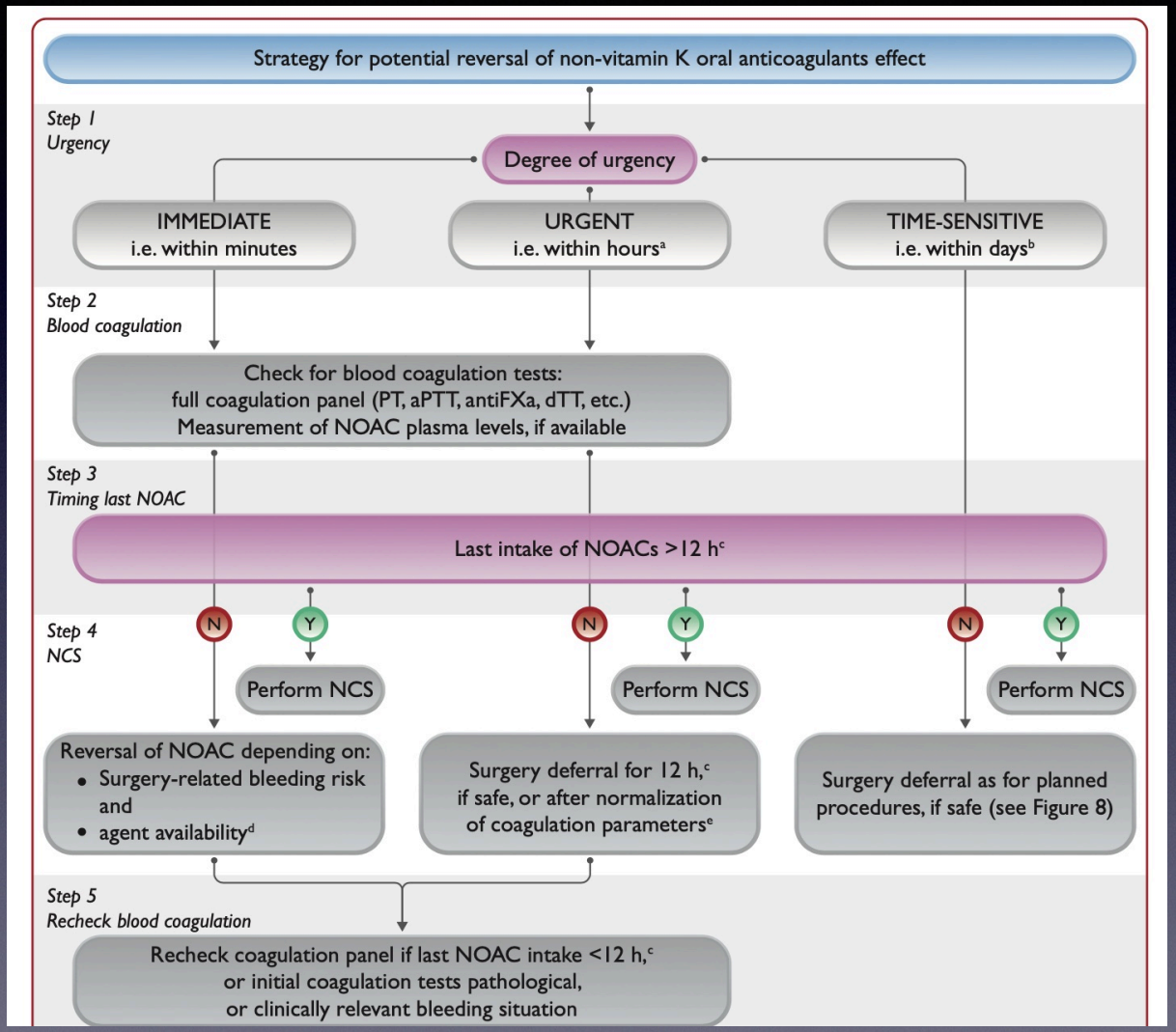
▪ Veneuze trombo-embolie

Hoog risico (>10%)	▪ Recente (< 3 maanden) DVT/LE ▪ Antifosfolipidensyndroom
Matig risico (5-10%)	▪ DVT of LE tussen 3-12 maanden geleden ▪ Recidiverende DVT of LE ▪ Actieve kanker ▪ Trombofilie
Laag risico (2-5%)	▪ Eenmalig DVT of LE > 12 maanden geleden en geen trombofilie

Overbruggingsschema VKA ⟷ LMWH

	HOOG trombo-embolisch risico	**MATIG en LAAG** trombo-embolisch risico**
Stop VKA	▪ Marcoumar® 7-10 dagen vóór de ingreep ▪ Marevan® 5-7 dagen vóór de ingreep ▪ Sintrom® 3-4 dagen vóór de ingreep	
Pre-operatief	LMWH starten als INR < 2	
Dosis LMWH	**Therapeutisch** enoxaparine **(Clexane®) 1 mg/kg 2x/dag**	**Intermediair** enoxaparine **(Clexane®) 1 mg/kg 1x/dag**
Laatste pre-operatieve dosis LMWH	▪ 24u vóór de ingreep indien therapeutische of intermediaire dosis LMWH ▪ 12u vóór de ingreep indien profylactische dosis LMWH** ** Bij patiënten met laag trombo-embolisch risico of verhoogd bloedingsrisico is een profylactische dosis te overwegen (Clexane® 0.5 mg/kg 1x/dag)	
Controle INR dag vóór de ingreep Indien INR > 1.5 dan ≥ 5 mg Konakion® per os toedienen		
Post-operatief herstarten LMWH **Uitgesteld in geval van hemostase-problemen**	▪ Profylactische dosis mag 6-8u na de ingreep herstart worden. ▪ Vanaf 24u na de ingreep kan, indien nodig, de dosis LMWH verhoogd worden tot intermediaire dosis (zo geen PCEA). ▪ Vanaf 48-72u na de ingreep kan, indien nodig, de dosis LMWH verhoogd worden tot therapeutische dosis.	
Post-operatief herstarten VKA	▪ In functie van type ingreep, algemene toestand, bloedingsrisico, risico op heringreep, aanwezigheid van drainagesysteem: 12-24u na de ingreep ▪ LMWH overbruggingstherapie aan-houden tot therapeutische INR onder VKA	

Halveer de dosis in geval van Creatinine Klaring < 30 ml/min



Onder NOAC heelkunde


NDC 0597-0197-05
℞ only
Praxbind®
(idarucizumab)
Injection
2.5 g/50 mL
(50 mg/mL)
For Intravenous Use Only
Discard Unused Portion.
Administer both vials in carton for complete dose of 5 g
Contents: contains TWO -
2.5 g/50 mL single-dose vials


ANDEXXA
coagulation factor Xa
(recombinant), inactivated-zhzo
ANDEXXA
coagulation factor Xa
(recombinant), inactivated-zhzo
200 mg/vial
℞ Only

Specialiteiten [Idarucizumab als antidotum van dabigatran]

PER MERKNAAM | PER GROEPSNAAM | plaatsbepaling | alles samenvouwen

Praxbind (Boehringer Ingelheim)

idarucizumab [biosynthetisch]

inj./inf. oploss. i.v. [flac.]

2 x 2,5 g / 50 ml H.G. *[€ 2 687]*

Verwante publicaties

Doeltreffendheid van idarucizumab (Praxbind®, het antidotum van dabigatran) in noodsituaties

0.1.1.5. Andexanet alfa als antidotum van apixaban en rivaroxaban

Plaatsbepaling

- Andexanet alfa, een specifiek antidotum voor apixaban en rivaroxaban (zie 2.1.2.1.2. Directe orale anticoagulantia (DOAC'
  gebruikt om de antistollingseffecten van deze geneesmiddelen te neutraliseren in geval van ongecontroleerde of levensb
  bloedingen. De gegevens over werkzaamheid en veiligheid zijn beperkt (zie Recente infos oktober 2022).

Specialiteiten [Andexanet alfa als antidotum van apixaban en rivaroxaban]

PER MERKNAAM | PER GROEPSNAAM | plaatsbepaling | alles samenvouwen

Ondexxya (AstraZeneca)

andexanet alfa [biosynthetisch]

inj./inf. oploss. (pdr.) i.v. [flac.]

4 x 200 mg H.G. *[€ 13 568]*

Verwante publicaties

Recente informatie oktober 2022 (21 oktober 2022)

Overbruggingsschema NOACs

Bloedingsrisico ingreep of patiënt

Ambulante beperkte procedure	Ingreep EN patiënt LAAG Bloedingsrisico	Ingreep OF patiënt HOOG bloedingsrisico

Laatste pre-operatieve dosis NOAC

Geen pre-operatieve LMWH

STOP NOAC

Xarelto® (Rivaroxaban) **of Eliquis®** (Apixaban)
- ≥ 24u vóór de ingreep zo CrCl > 30 ml/min
- ≥ 48u vóór de ingreep zo CrCl 15-30 ml/min

Pradaxa® (Dabigatran)
- ≥ 24u vóór de ingreep zo CrCl > 50 ml/min
- ≥ 48u vóór de ingreep zo CrCl 30-50 ml/min

STOP NOAC

Xarelto® of Eliquis®
- ≥ 48u vóór de ingreep

Pradaxa®
- ≥ 48u zo CrCl > 50 ml/min
- ≥ 96u zo CrCl 30- 50 ml/min

INGREEP

Post-operatief herstarten LMWH bij gehospitaliseerde patiënten

- Start profylactische dosis LMWH vanaf 6-8u na de ingreep
- Vanaf 24u na de ingreep kan de dosis LMWH verhoogd worden tot intermediaire dosis: **enkel zo hoog en matig trombo-embolisch risico en zo geen PCEA** (PatientgeControleerdeEpiduraleAnesthesie).
- Vanaf 48-72u na de ingreep kan de dosis LMWH verhoogd worden tot therapeutische dosis **(enkel zo hoog trombo-embolisch risico)**
- *Post-operatief LMWH uitstellen bij hemostaseproblemen*

STOP CLEXANE alvorens NOAC TE HERSTARTEN

Post-operatief herstarten NOAC

Herstart NOAC
- vanaf >8u na de procedure
- indien volledige hemostase bereikt

- NOAC kan herstart worden vanaf 48-72u na de ingreep indien: - volledige hemostase bereikt
  - geen risico op heringreep
- *Eerste dosis NOAC toedienen op tijdstip dat de eerstvolgende dosis LMWH gepland was*

Regionaal ziekenhuis
Heilig Hart Leuven

Peri-operatieve overbruggingstherapie bij patënten onder anti-aggregantia

MONOTHERAPIE PLAATJESREMMERS

Patiënt onder **ASA**

(80-100 mg/dag)

- **Primaire preventie** → ASA stoppen 5 dagen pre-op
- **Secundaire preventie**
  - **Hoog bloedingsrisico** → ASA stoppen 5 dagen pre-op
    - Chirurgie
      - Neurochirurgie
      - Prostaatchirurgie
      - Amygdalectomie
      - Posterieure oogkamerchirurgie
    - Gekende bloedingsneiging
    - Voorgeschiedenis bloedingscomplicaties
  - **Andere** → ASA verdergeven

Deze aanbeveling geldt eveneens voor patiënten onder ASA + Dipyridamole

Patiënt zonder stent onder P2Y12-inhibitor

ticlopidine, clopidogrel, prasugrel, ticagrelor
(Ticlid®*, Plavix®*, Efient®, Brilique®)

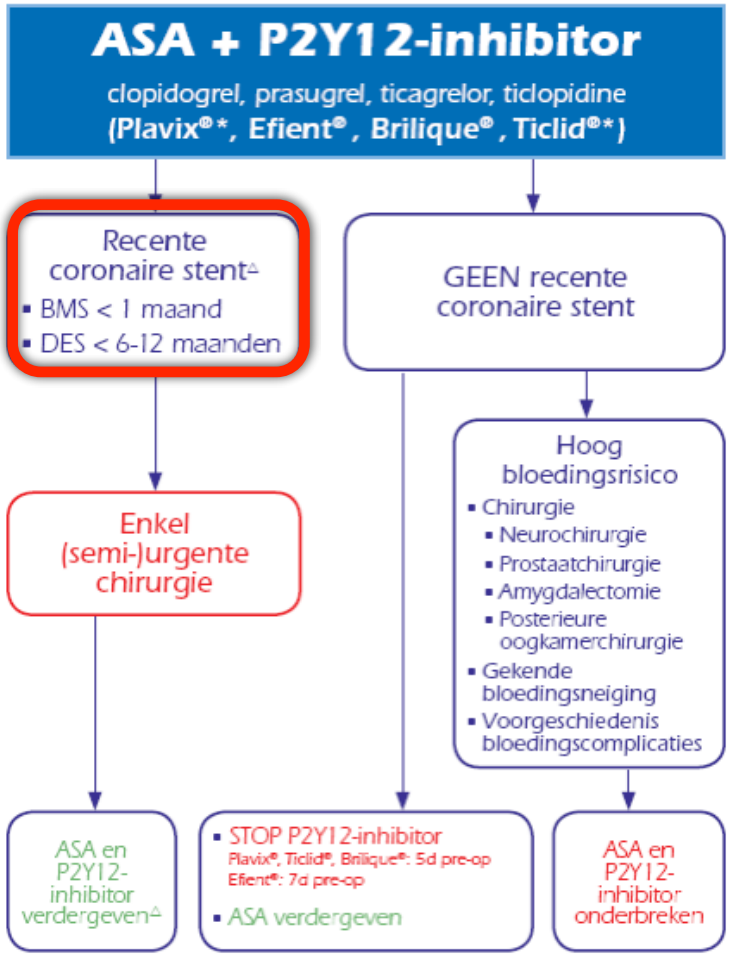
- **Primaire preventie**
- **Secundaire preventie** → STOP P2Y12-inhibitor
  - Ticlid®, Plavix®, Brilique®: 5d pre-op
  - Efient®: 7d pre-op
  - Overweeg switch naar ASA indien geen contra-indicatie**

Na de ingreep of invasieve procedure:
Herstart plaatjesremmers zodra de haemostase bereikt is, meestal ≤ 24u na de ingreep.

Regionaal ziekenhuis
Heilig Hart Leuven

Peri-operatieve overbruggingstherapie bij patënten onder anti-aggregantia

COMBI-THERAPIE PLAATJESREMMERS



△ Na overleg met behandelende cardioloog

Indien combinatie van P2Y12-inhibitor en orale anticoagulantia: raadpleeg behandelende cardioloog

Heelkunde

bloedingsrisico ifv procedure

Beperkte procedures met gering bloedingsrisico

→ VKA niet onderbreken - in overleg. Ken recente INR!

→ NOACs overbruggingsschema beperkte procedure

- Mineure tandheelkundige procedures
  - Vullingen, kanaalvullingen, tandsteen verwijderen
  - Enkelvoudige tandextractie:
    - VKA titreren tot INR 2.0-2.5
    - evt. Tranexaminezuur(Exacyl®) mondspoelingen
- Mineure dermatologische procedures
- Oftalmologische procedures: cataractheelkunde
- Diagnostische gastroscopie
- Diagnostische bronchoscopie zonder biopsiename of naaldaspiratie
- Coronarografie of percutane coronaire interventie via radiale weg
- Vervanging van pacemaker en ICD (INR < 2,5)

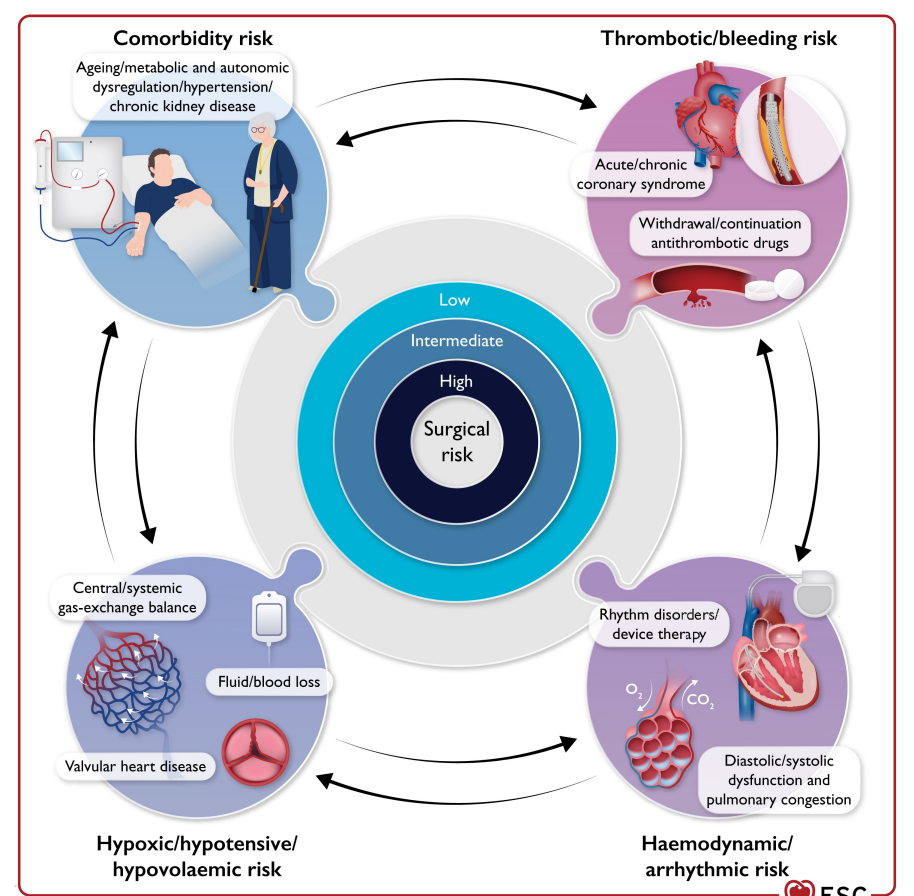
Procedures met laag bloedingsrisico

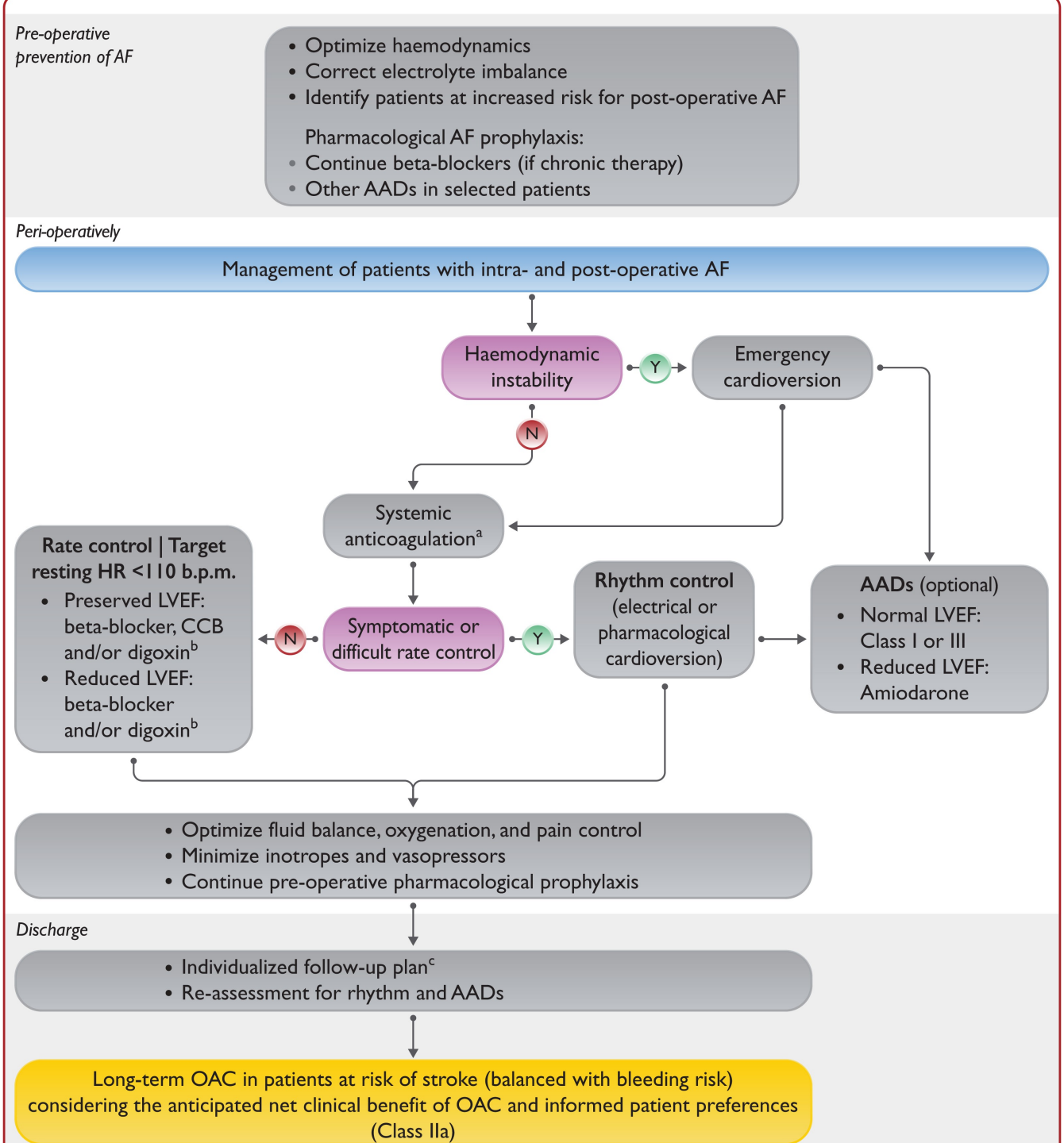
- Endoscopie met biopsie
- Prostaat-en blaasbiopsie
- Flebologische procedures
- Angiografie
- Implantatie van pacemaker of ICD (hoogrisico zo complexe anatomie)
- Electrofysiologische studie of radiofrequente catheter ablatie

Procedures met hoog bloedingsrisico

- Cardiale heelkunde
- Intracraniële of spinale heelkunde
- Neuraxiale anesthesie, lumbaalpunctie
- Thoraxheelkunde en majeure abdominale heelkunde
- Perifere en andere majeure vaatheelkunde
- Heup– en kniearthroplastie, kruisbandherstel
- Reconstructieve plastische heelkunde
- Majeure oncologische / abdominale heelkunde
- Prostaat– of blaaschirurgie
- Resectie van colonpoliepen (zo basis ≥ 2cm Ø)
- Prostaat- , nier– of leverbiopsie
- Endoscopische sfincterotomie

Haemodynamisch en arrhytmisch risico





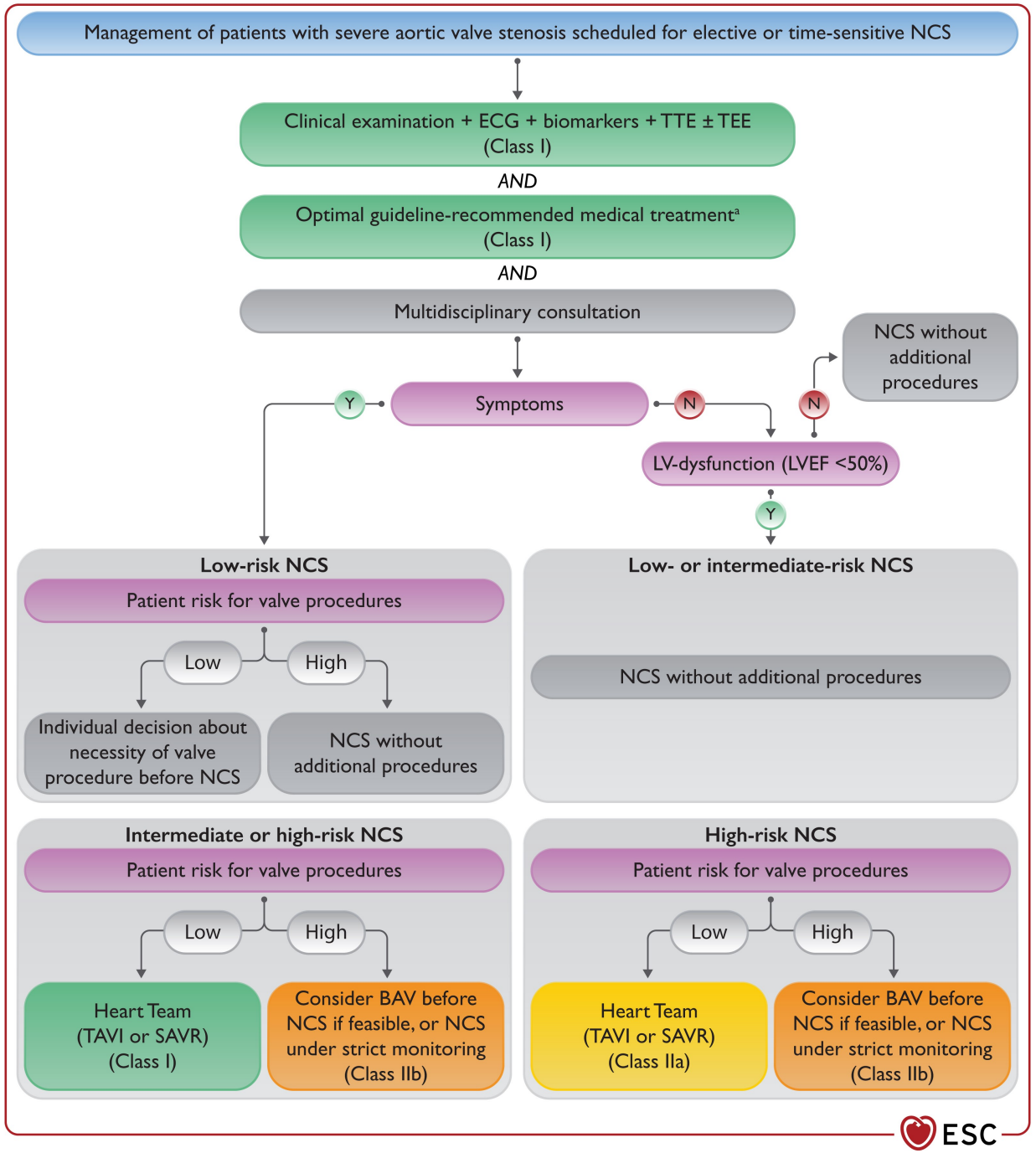
Eur Heart J, Vc

Table 12 **Peri-operative management of patients with arrhythmias**

Type of arrhythmia	SVT	Idiopathic VT in structurally/functionally normal heart	VT in structural heart disease
Diagnostics	• ECG ± TTE[a]	• ECG ± TTE	• ECG + TTE + biomarkers[b] • ± Coronary angiography • ± Cardiac CT/MRI
Acute management	• Vagal manoeuvres • I.v. adenosine, beta-blocker, CCB • Electrical cardioversion if unstable	• Vagal manoeuvres • I.v. beta-blockers/ verapamil • Electrical cardioversion if unstable	• Treatment of underlying heart disease • I.v. beta-blocker (uptitration), amiodarone • Electrical cardioversion if unstable
Prevention of recurrence	• Per oral beta-blocker, CCB • Catheter ablation if recurrent despite OMT (only before high-risk NCS)	• No treatment or • Per oral beta-blocker, CCB, class I AAD • Catheter ablation in case of recurrence despite AADs or drug-intolerance before high-risk NCS	• Per oral beta-blocker, amiodarone • Catheter ablation if recurrent despite OMT

Haemodynamisch risico

- Hartfalen : HFpEF/ HFmrEF/ HFrEF
- Kleplijden : Stenose veel ernstiger als insufficientie :
  - stenose : shock per en postoperatief
  - insufficientie : hartfalen postoperatief



Eur Heart J, Volume 43,

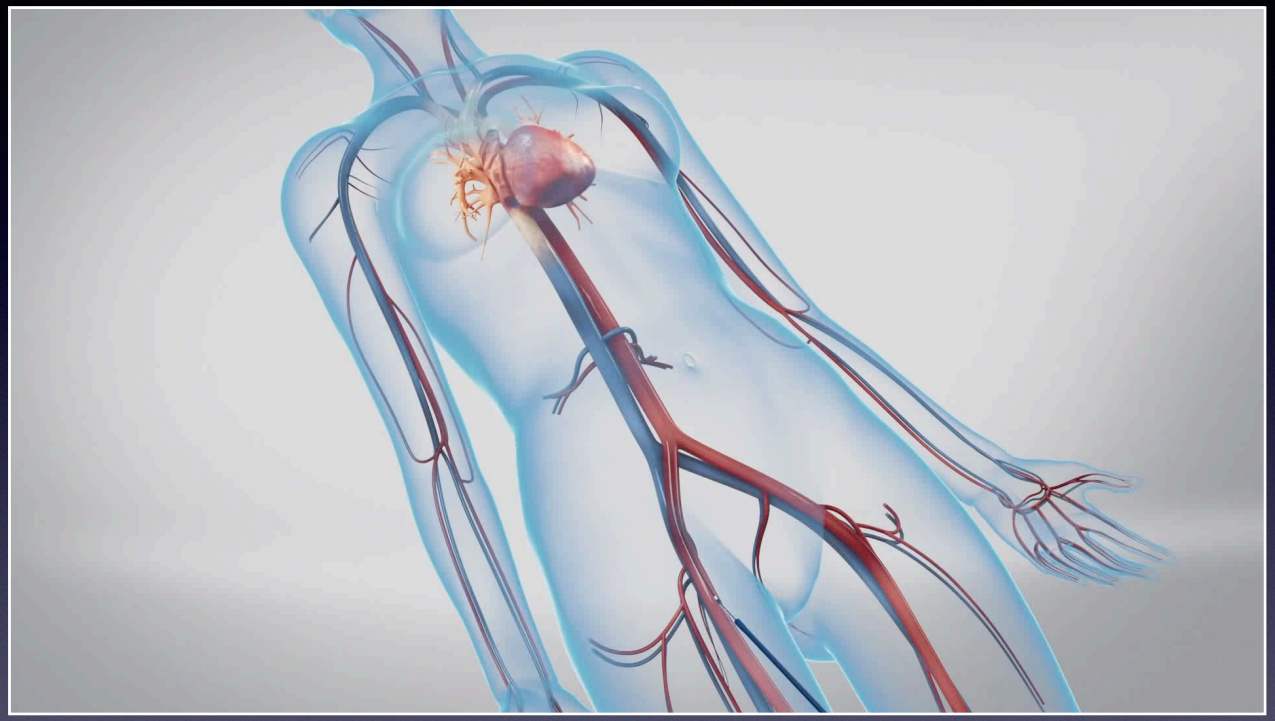
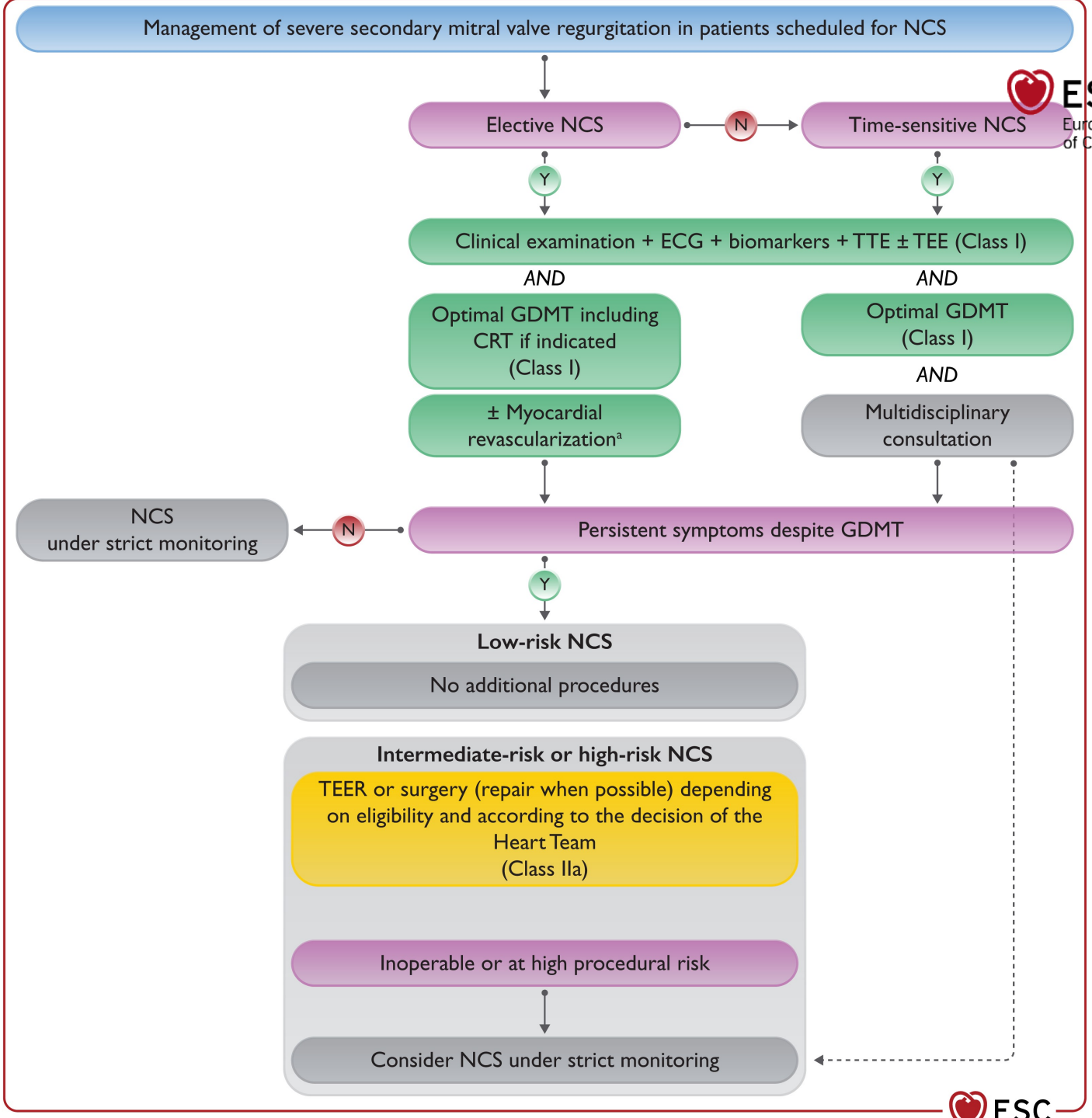
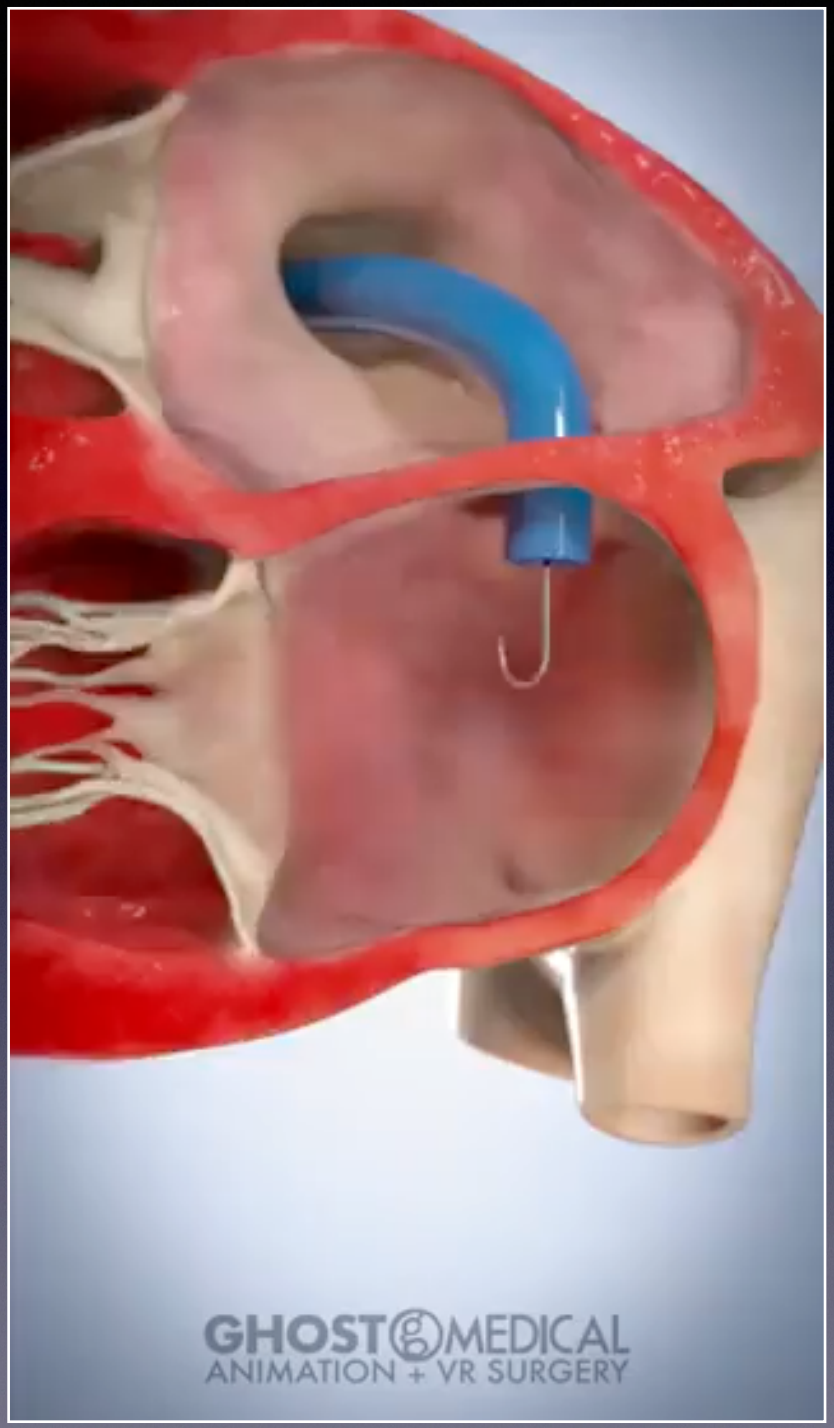
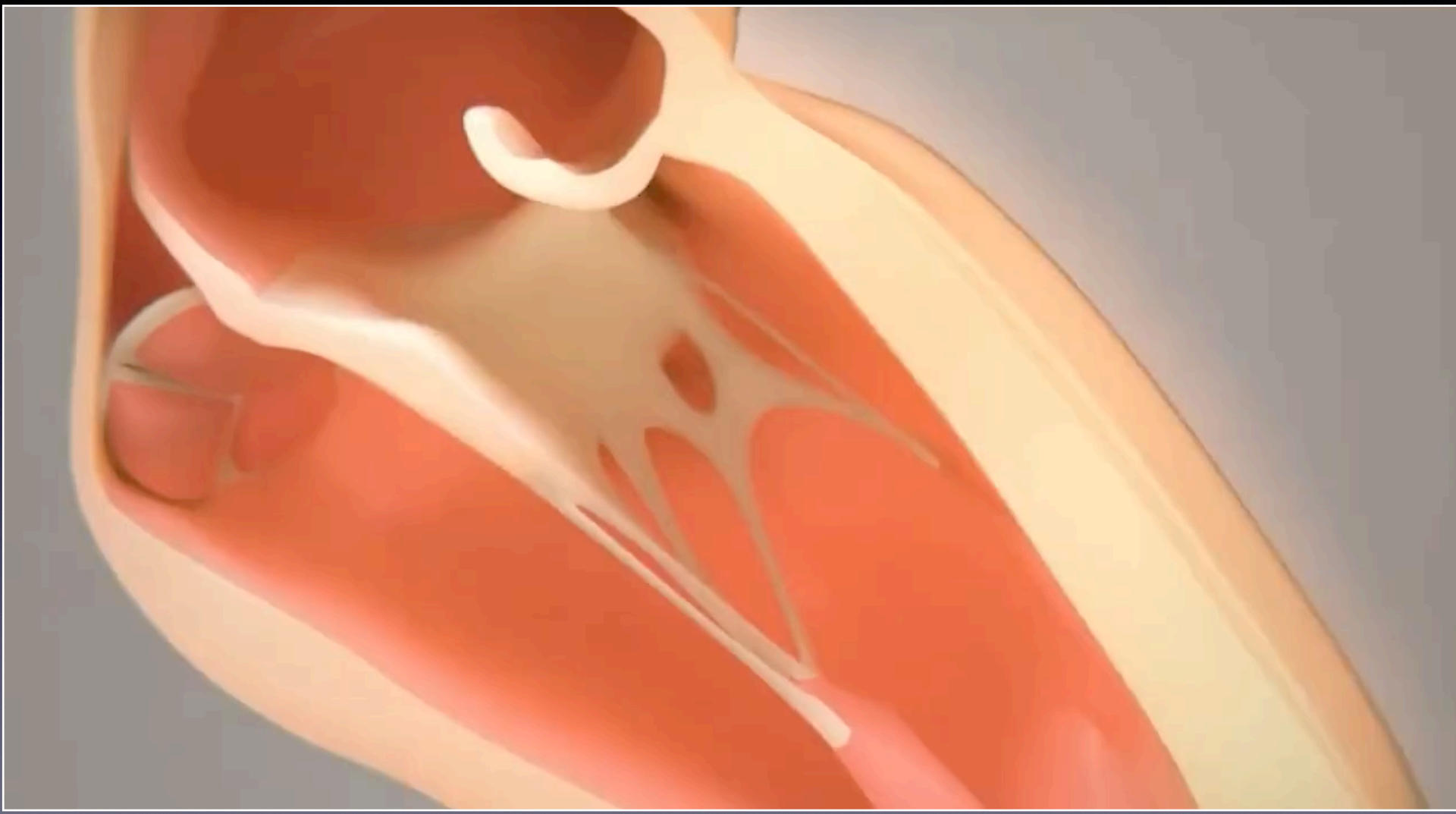


Figure 14 regurgitat ECG, ...



Eur Heart J, Volume


GHOST MEDICAL
ANIMATION + VR SURGERY



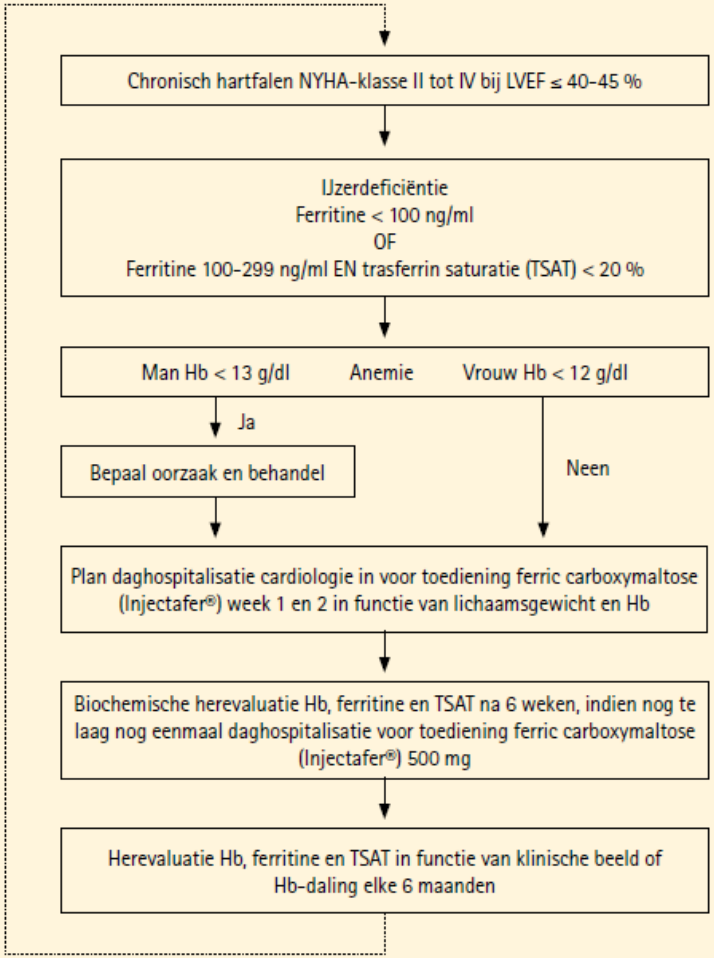
Anemie

Wat is de beste manier om chirurgische patiënten *met anemie* preoperatief te behandelen met het doel om een bloedtransfusie te beperken?

oorzaak ?
Wie?(ferritine < 30ug/l; bij CRP > 5 mmol/l en/of transferrineverzadiging < 20%, ferritine < 100ug/l).

Hoe ?
Oraal ijzer: 2 tot 3 x 200 mg IV ijzer: 1000 tot 1500 mg (7-10 d voor operatie)
?EPO

Figuur 1. Flowchart protocol timing ijzersubstitutie in hartfalen



Hypovolemisch risico

- Pre en postoperatief verder zetten van cardiomedicatie

Betablokkers

Verder zetten !

Recommendation Table 12 — Recommendation pharmacological treatment

Recommendations	Class[a]	L
Initiation		
In patients with an indication for statins, it should be considered to initiate statins peri-operatively.	IIa	
Pre-operative initiation of beta-blockers in advance[c] of high-risk NCS may be considered in patients who have two or more clinical risk factors,[d] in order to reduce the incidence of peri-operative myocardial infarction.[188,190–192]	IIb	
Pre-operative initiation of beta-blocker in advance of NCS may be considered in patients who have known CAD or myocardial ischaemia.[e,230–232]	IIb	
Routine initiation of beta-blocker peri-operatively is not recommended.[185,187,189,233,234]	III	
Continuation		
Peri-operative continuation of beta-blockers is recommended in patients currently receiving this medication.[190,196–199]	I	
In patients already on statins, it is recommended to continue statins during the peri-operative period.[235]	I	
In patients with stable HF, peri-operative continuation of RAAS inhibitors may be considered.	IIb	

RAAS en diuretica

Onderbreken

Interruption		
In patients without HF, withholding RAAS inhibitors on the day of NCS should be considered to prevent peri-operative hypotension.[215,216]	IIa	B
For patients on diuretics to treat hypertension, transient discontinuation of diuretics on the day of NCS should be considered.[236]	IIa	B
It should be considered to interrupt SGLT-2 inhibitor therapy for at least 3 days before intermediate- and high-risk NCS.	IIa	C

Andere

- Statines, ivabradine verder….
- Calciumblokker :
  - Bij vasopastische angor , non DHP calciumblokkers : verder zetten
  - Onderbreken aanbevolen IIb

Cardioloog

- TTE ?
- Stress test ?
- ICD
- Per en postoperatieve verwikkelingen
  - Hypotensie
  - Arrhytmieën
- Antistollingsbeleid
- Endocarditis preventie

Chirurg

- Inschatten bloedingsrisico/ cardiaal risico ingreep
- Voorgeschiedenis en medicatieinname :
  - ACS ? PCI ?
  - ICD ?
  - Antistolling

Anesthesie

- Risico inschatten thrombotische verwikkelingen
- ASA klassificatie
- Verwijzing Cardioloog ?
    - Thrombotisch risico versus bloedingsrisico
    - Hartfalen
    - Hartgeruis
    - Abnormaal ECG
    - Verhoogde biomarkers
    - ICD
- Medicatiebeleid voor ingreep : bètablokkers, RAAS-I, antistolling , diuretica ?

Voorstel HHart

- Preoperatieve raadpleging anaesthesie
  - R/
  - Voorgeschiedenis , ASA, CV risico profiel
- Labo en zo nodig ECG HHart
- Afwijkingen : contacteer cardiologie rdplg
- Cardio : TTE? Stress test ? Uitstel?

Voorstel tot tekst :

- Type Ingreep : ###
- ###Mineur (1%)/majeur(>5%) /intermediair(1-5%) risico voor peri-en postoperatieve cardiale morbiditeit.
- Timing van de ingreep is ### electief, relatief dringend en ###of tijdstip mag niet worden uitgesgteld.

- Predictoren voor peri-en postoperatieve cardiale morbiditeit bij deze patiënt:
  - ###Laag : <65 jaar zonder CVD of CV risicofactoren
  - ###matig : > 65 jaar zonder CVD maar met CV risicofactoren met name SCORE2 ###%
  - ###hoog : aanwezigheid van cardiovasculair lijden.
- De functionele capaciteit wordt geschat / gemeten als > 4 MET's. Patiënt heeft een ASA score ###.
- ECG is ###normaal en Biomarkers zijn ###.

- TTE toont### geen ernstige klepafwijkingen en een ###bewaarde systolische functie.
- Preoperatieve stress test is ### niet geindiceerd.
- De ingreep moet niet worden uitgesteld.

- Bijkomende maatregelen preoperatief :
  - Controle HS troponine is na 1 en 2 dagen postoperatief ### niet aangewezen.
  - Stollingstherapie met plaatjes mag ### dagen worden gestopt voor ingreep.
  - Bridging is ### niet aangewezen.
  - Endocarditis preventie is ### niet aangewezen.
  - ### RAAS-I moet 24 uur voor ingreep worden gestopt.
  - ### Calciumblokkers moeten 24 uur voor ingreep worden gestopt.
  - ###Betablokkers moeten zo snel mogelijk na de ingreep worden herstart.
  - ###Haematologie en ijzerreserves zijn normaal ; geen indicatie voor IV ijzer(III)carboxymaltose

HOE RUZIES ONTSTAAN...