ΙΑΤΡΙΚΟ
ΔΙΑΒΑΛΚΑΝΙΚΟ
ΘΕΣΣΑΛΟΝΙΚΗΣ

ΚΑΡΔΙΟΓΕΝΗ ΣΥΜΒΑΜΑΤΑ ΜΕΤΑ ΑΠΌ ΕΚΤΟΜΕΣ ΠΝΕΥΜΟΝΙΚΟΥ ΠΑΡΕΓΧΥΜΑΤΟΣ

ΔΗΜΗΤΡΙΟΣ Γ. ΚΕΤΙΚΟΓΛΟΥ MD PhD FESC

ΚΑΡΔΙΟΛΟΓΟΣ

ΔΙΔΑΚΤΩΡ Α.Π.Θ.

Δ/ΝΤΗΣ ΣΤΕΦΑΝΙΑΙΑΣ ΜΟΝΑΔΑΣ ΚΑΙ ΗΧΟΚΑΡΔΙΟΓΡΑΦΙΑΣ

ΙΑΤΡΙΚΟ ΔΙΑΒΑΛΚΑΝΙΚΟ ΚΕΝΤΡΟ

ΘΕΣΣΑΛΟΝΙΚΗ 2018

DECLARATION OF INTEREST
NONE

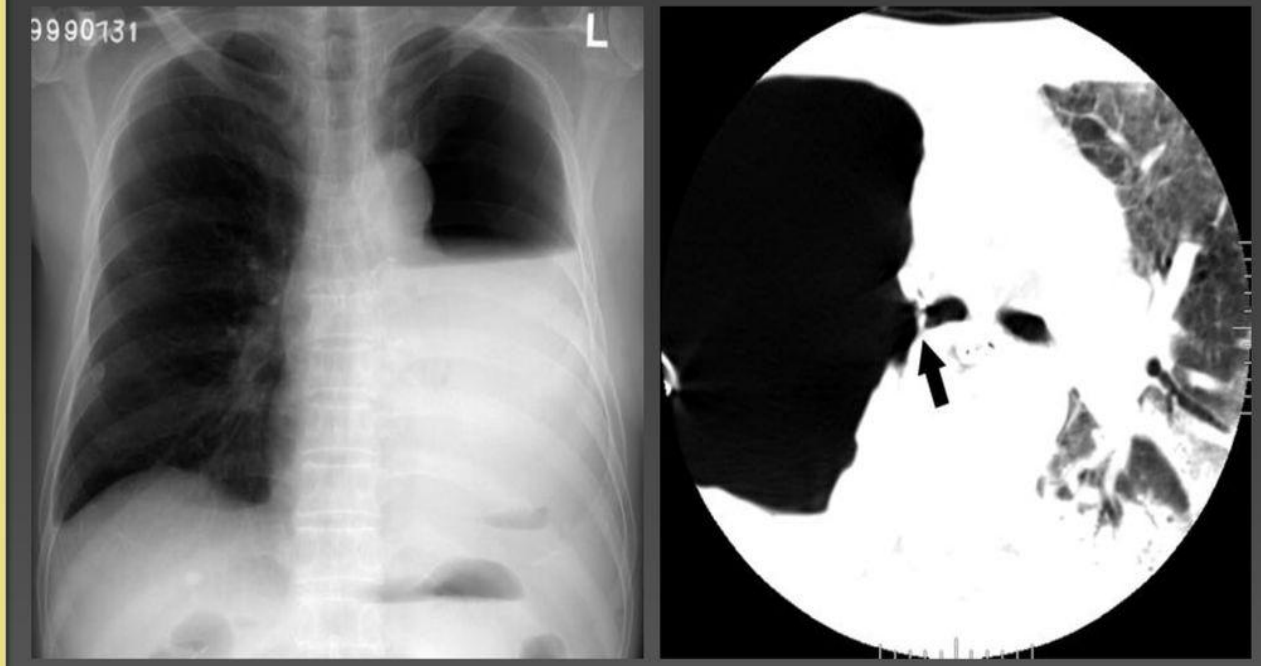
(Not disclosures)

ΕΙΣΑΓΩΓΗ

Χειρουργικές τεχνικές

1. Λοβεκτομή
2. Πνευμονεκτομή
3. Τμηματεκτομή
4. VATS
5. Βρογχοπλαστικές Τεχνικές (Sleeve)
6. Εκτεταμένη Πνευμονική εντομή
7. Σφηνοειδής εκτομή

Πνευμονεκτομή – λοβεκτομή



radiographics.rsna.org

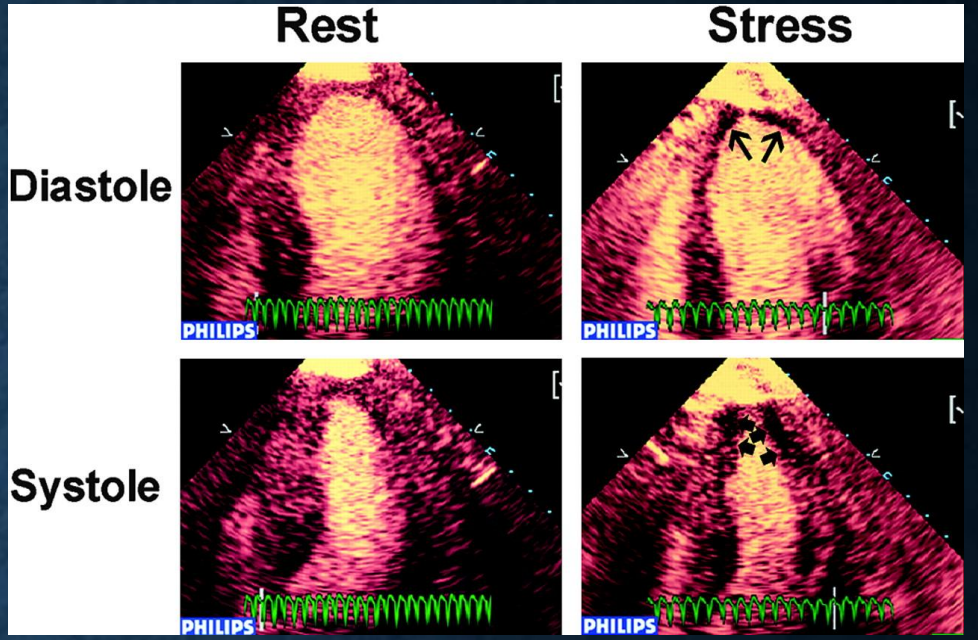
ΕΙΣΑΓΩΓΗ

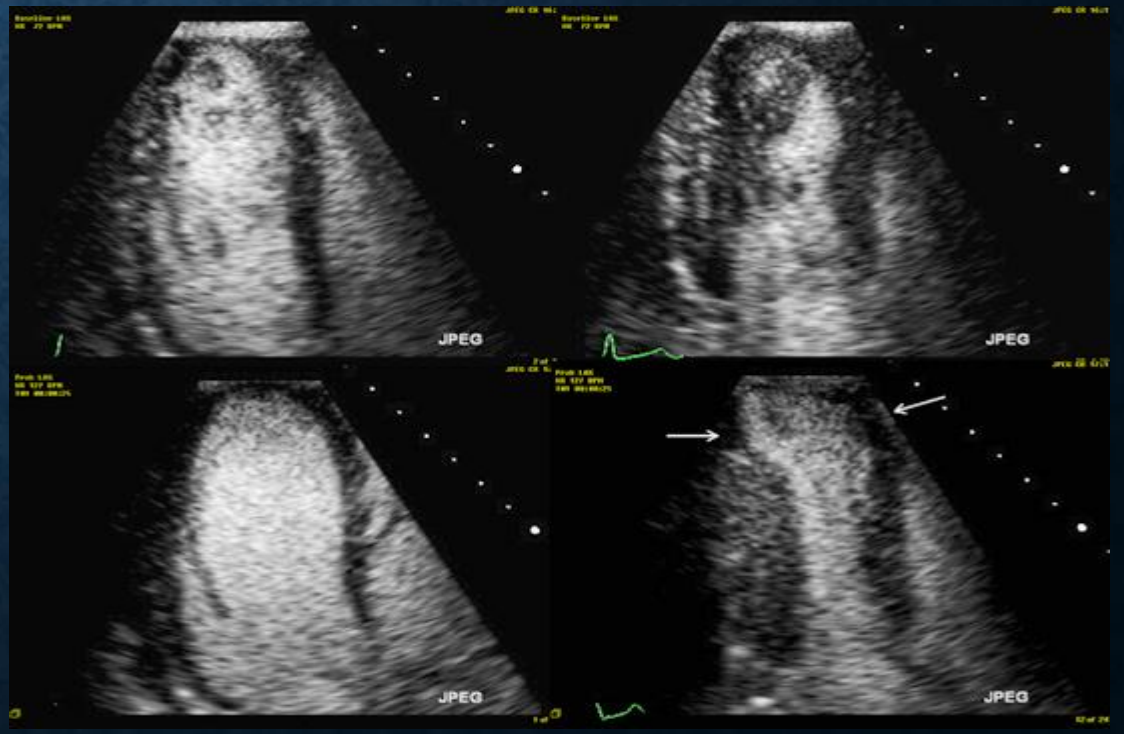
Εκτίμηση καταλληλότητας προς χειρουργείο

- Δοκιμασίες αναπνευστικής επάρκειας
  - ✓FEV1
    - ➢Λοβεκτομή: > 1.5 lt
    - ➢Πνευμονεκτομή: > 2 lt
  - ✓FVC
  - ✓DLCO
  - ✓Δοκιμασία τριών ορόφων
  - ✓Δοκιμασία βάδισης

  } αποκορεσμός και ταχυκαρδία υποδηλώνουν σημαντικά αυξημένο κίνδυνο επιπλοκών

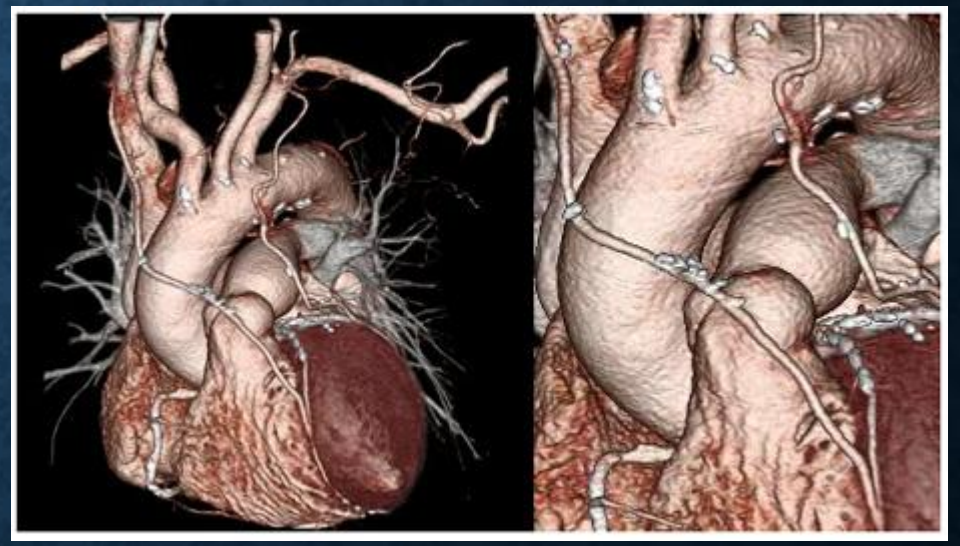
- Αέρια αρτηριακού αίματος
- Σπινθηρογράφημα αερισμού-αιμάτωσης αν FEV1 οριακό
- Triplex καρδιάς
  - ✓stress echo (στεφανιαία νόσος)



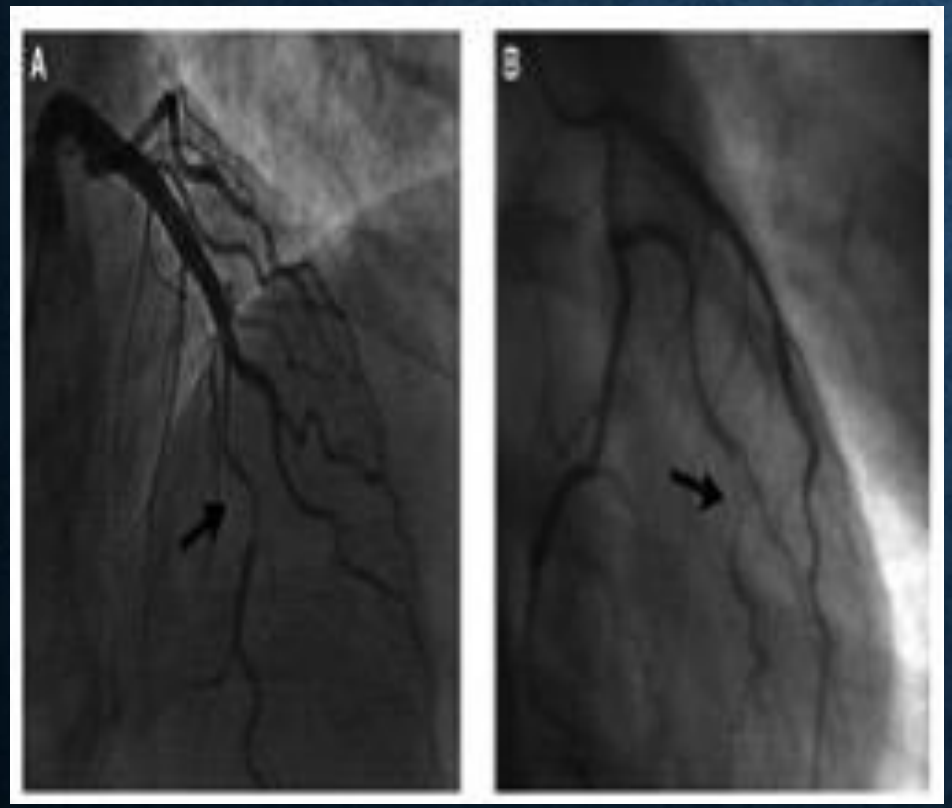


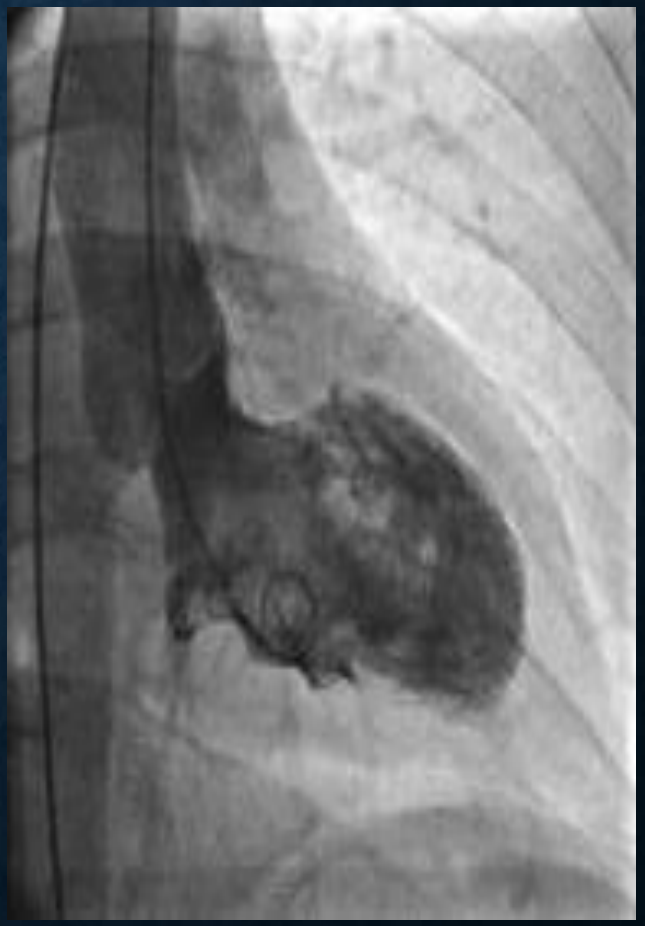
ΕΙΣΑΓΩΓΗ

- Προδιαθεσικούς παράγοντες ή πόνο στο στήθος
- Υψηλή αρτηριακή πίεση
- Καθιστική ζωή
- Οικογενειακό ιστορικό καρδιακών νόσων
- Υπέρβαροι
- Διαβήτη
- Υψηλό επίπεδο χοληστερόλης στο αίμα
- Καπνιστές
- Θετικό τεστ κοπώσεως
- Δυσφορία με φυσιολογικό καρδιογράφημα
- Σε ασθενείς μετά από by-pass



ΣΤΕΦΑΝΙΟΓΡΑΦΙΑ

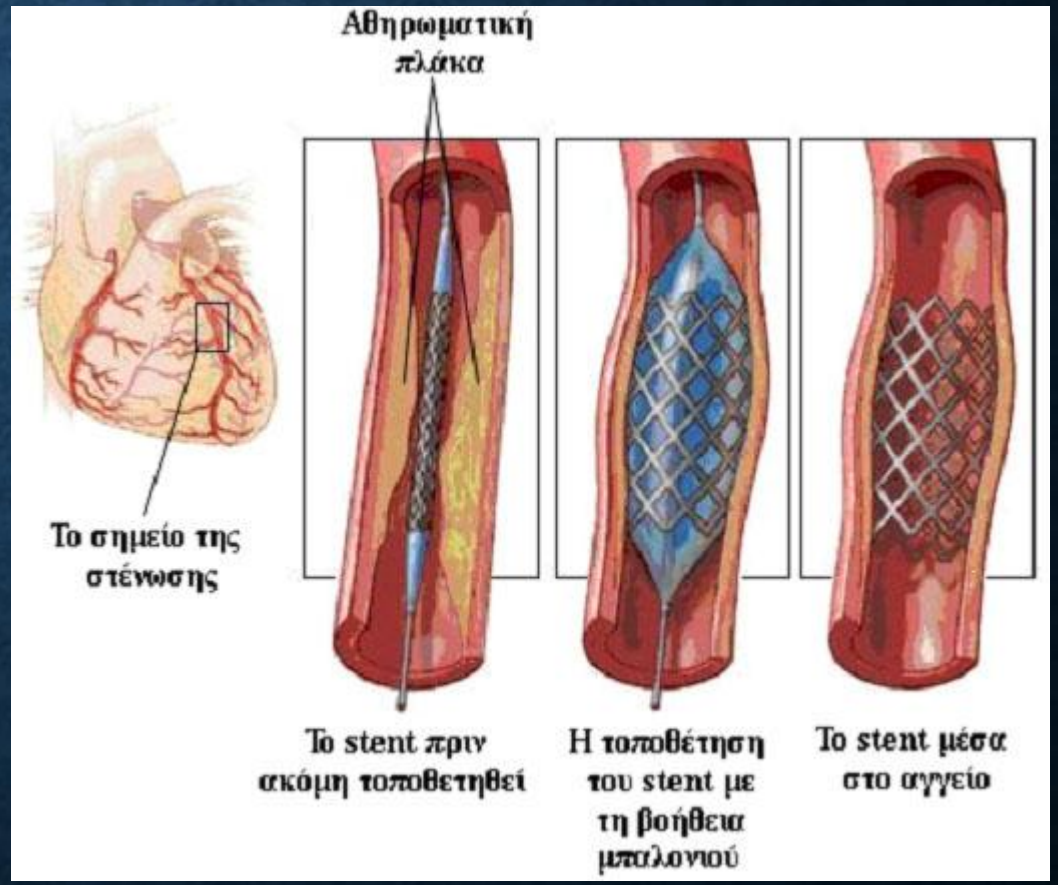




ΣΤΕΦΑΝΙΑΙΑ ΑΓΓΕΙΟΠΛΑΣΤΙΚΗ

Κλινική Διάγνωση

- ΔΙΑΦΟΡΙΚΗ ΔΙΑΓΝΩΣΗ
- ΒΙΟΧΗΜΙΚΟΣ ΕΛΕΓΧΟΣ
- ΗΛΕΚΤΡΟΚΑΡΔΙΟΓΡΑΦΗΜΑ
- ΥΠΕΡΗΧΟΚΑΡΔΙΟΓΡΑΦΗΜΑ
- ΗΛΕΚΤΡΟΚΑΡΔΙΟΓΡΑΦΗΜΑ ΔΟΚΙΜΑΣΙΑ ΚΟΠΩΣΕΩΣ
- ΣΠΙΝΘΗΡΟΓΡΑΦΗΜΑ ΚΟΠΩΣΕΩΣ ΜΕ ΘΑΛΙΟ
- ΣΤΕΦΑΝΙΟΓΡΑΦΙΑ



ΚΑΡΔΙΑΓΓΕΙΑΚΕΣ ΕΠΙΠΛΟΚΕΣ

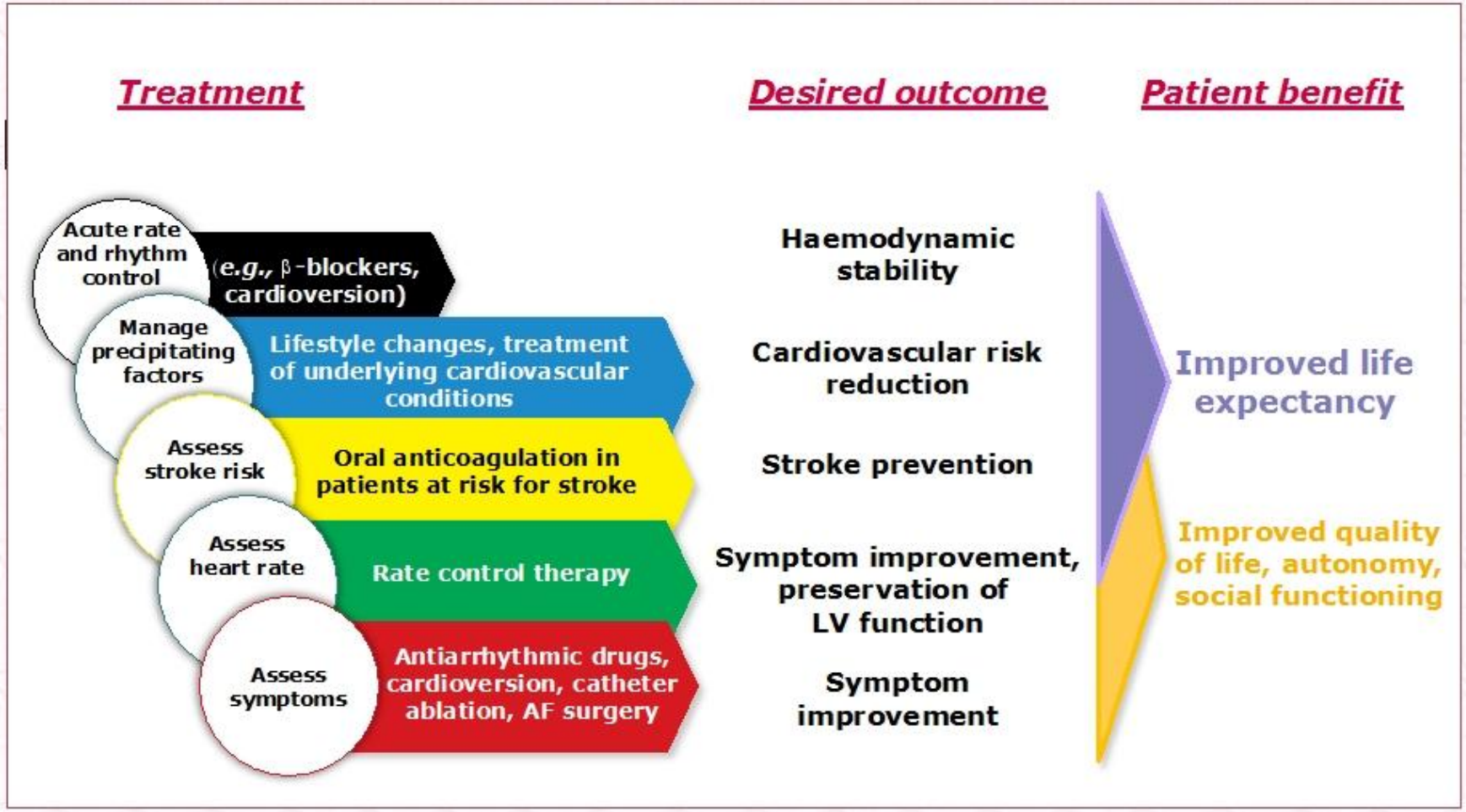
- ΑΡΡΥΘΜΙΕΣ
- ΟΞΥ ΣΤΕΦΑΝΙΑΙΟ ΣΥΝΔΡΟΜΟ
- ΠΝΕΥΜΟΝΙΚΗ ΕΜΒΟΛΗ
- ΚΑΡΔΙΑΚΗ «ΚΗΛΗ»
- ΕΝΔΟΚΑΡΔΙΑΚΗ ΑΝΑΣΤΡΟΦΗ ΤΗΣ ΡΟΗΣ ΤΟΥ ΑΙΜΑΤΟΣ
- ΠΝΕΥΜΟΝΟΠΕΡΙΚΑΡΔΙΟ- ΟΞΕΙΑ ΠΕΡΙΚΑΡΔΙΤΙΔΑ

ΑΡΡΥΘΜΙΕΣ

- ΣΥΧΝΟΤΗΤΑ 20%, ΠΑΡΟΥΣΙΑΖΟΝΤΑΙ 80% ΜΕΣΑ ΣΤΙΣ ΠΡΩΤΕΣ 72 ΩΡΕΣ ΑΠΌ ΤΗΝ ΕΠΕΜΒΑΣΗ
- >65% ΚΟΛΠΙΚΗ ΜΑΡΜΑΡΥΓΗ
- ΠΑΡΑΓΟΝΤΕΣ ΠΟΥ ΕΥΝΟΟΥΝ ΤΙΣ ΑΡΡΥΘΜΙΕΣ:

1. ΗΛΙΚΙΑ> 65 ΕΤΗ
2. ΔΕΞΙΑ ΠΝΕΥΜΟΝΕΚΤΟΜΗ ΛΟΒΕΚΤΟΜΗ
3. ΑΡΤΗΡΙΑΚΗ ΥΠΕΡΤΑΣΗ
4. ΣΤΕΦΑΝΙΑΙΑ ΝΟΣΟΣ (ΠΡΟΥΠΑΡΧΟΥΣΑ).

The Five Domains of Integrated AF Management



European Heart Journal - doi:10.1093/eurheartj/ehw210

Diagnostic workup of atrial fibrillation patients

Recommendations	Class	Level
ECG documentation is required to establish the diagnosis of AF.	I	B
A full cardiovascular evaluation, including an accurate history, careful clinical examination, and assessment of concomitant conditions, is recommended in all AF patients.	I	C
Transthoracic echocardiography is recommended in all AF patients to guide management.	I	C
Long-term ECG monitoring should be considered in selected patients to assess the adequacy of rate control in symptomatic patients and to relate symptoms with AF episodes.	IIa	C

European Heart Journal - doi:10.1093/eurheartj/ehw210

Prediction of stroke and bleeding risk

Recommendations	Class	Level
The CHA_2DS_2-VASc score is recommended for stroke risk prediction in patients with AF.	I	A
Bleeding risk scores should be considered in AF patients on oral anticoagulation to identify modifiable risk factors for major bleeding.	IIa	B
Biomarkers such as high-sensitivity troponin and natriuretic peptide may be considered to further refine stroke and bleeding risk in AF patients.	IIb	B

European Heart Journal - doi:10.1093/eurheartj/ehw210

Clinical risk factors for stroke, transient ischaemic attack, and systemic embolism

CHA_2DS_2-VASc risk factor	Points
Congestive heart failure Signs/symptoms of heart failure or objective evidence of reduced left-ventricular ejection fraction	1
Hypertension Resting blood pressure >140/90 mmHg on at least two occasions or current antihypertensive treatment	1
Age 75 years or older	2
Diabetes mellitus Fasting glucose >125 mg/dL (7 mmol/L) or treatment with oral hypoglycaemic agent and/or insulin	1
Previous stroke, transient ischaemic attack, or thromboembolism	2
Vascular disease Previous myocardial infarction, peripheral artery disease, or aortic plaque	1
Age 65–74 years	1
Sex category (female)	1

European Heart Journal - doi:10.1093/eurheartj/ehw210

Modifiable risk factors for bleeding in anticoagulated patients with atrial fibrillation

Modifiable bleeding risk factors:
Hypertension (especially when systolic blood pressure is >160 mmHg)
Labile INR or time in therapeutic range <60% in patients on vitamin K antagonists
Medication predisposing to bleeding, such as antiplatelet drugs and non-steroidal anti-inflammatory drugs
Excess alcohol (≥8 drinks/week)

European Heart Journal - doi:10.1093/eurheartj/ehw210

Stroke prevention in patients with atrial fibrillation (1)

Recommendations	Class	Level
Oral anticoagulation therapy to prevent thromboembolism is recommended for all male AF patients with a CHA_2DS_2-VASc score of 2 or more.	I	A
Oral anticoagulation therapy to prevent thromboembolism is recommended in all female AF patients with a CHA_2DS_2-VASc score of 3 or more.	I	A
Oral anticoagulation therapy to prevent thromboembolism should be considered in male AF patients with a CHA_2DS_2-VASc score of 1, considering individual characteristics and patient preferences.	IIa	B
Oral anticoagulation therapy to prevent thromboembolism should be considered in female AF patients with a CHA_2DS_2-VASc score of 2, considering individual characteristics and patient preferences.	IIa	B
Vitamin K antagonist therapy (INR 2.0–3.0 or higher) is recommended for stroke prevention in AF patients with moderate-to-severe mitral stenosis or mechanical heart valves.	I	B
When oral anticoagulation is initiated in a patient with AF who is eligible for a NOAC (apixaban, dabigatran, edoxaban, or rivaroxaban), a NOAC is recommended in preference to a Vitamin K antagonist.	I	A

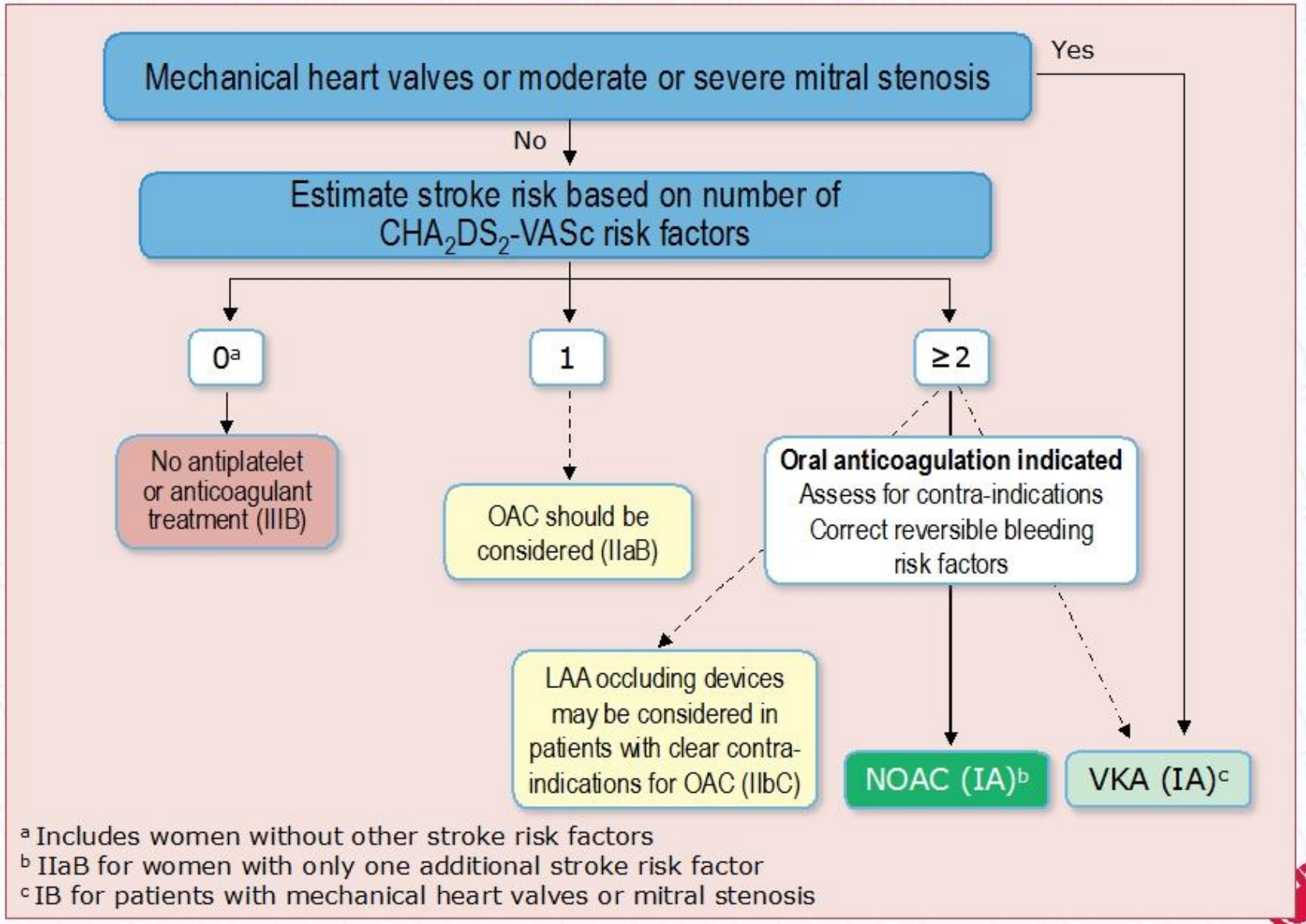
European Heart Journal - doi:10.1093/eurheartj/ehw210

Stroke prevention in patients with atrial fibrillation (2)

Recommendations	Class	Level
When patients are treated with a vitamin K antagonist, time in therapeutic range (TTR) should be kept as high as possible and closely monitored.	I	A
AF patients already on treatment with a vitamin K antagonist may be considered for NOAC treatment if TTR is not well controlled despite good adherence, or if patient preference without contra-indications to NOAC (e.g. prosthetic valve).	IIb	A
Combinations of oral anticoagulants and platelet inhibitors increase bleeding risk and should be avoided in AF patients without another indication for platelet inhibition.	III (harm)	B
In male or female AF patients without additional stroke risk factors, anticoagulant or antiplatelet therapy is not recommended for stroke prevention.	III (harm)	B
Antiplatelet monotherapy is not recommended for stroke prevention in AF patients, regardless of stroke risk.	III (harm)	A
NOACs (apixaban, dabigatran, edoxaban, and rivaroxaban) are not recommended in patients with mechanical heart valves (Level of evidence B) or moderate-to-severe mitral stenosis (Level of evidence C).	III (harm)	B C

European Heart Journal - doi:10.1093/eurheartj/ehw210

Stroke prevention in atrial fibrillation



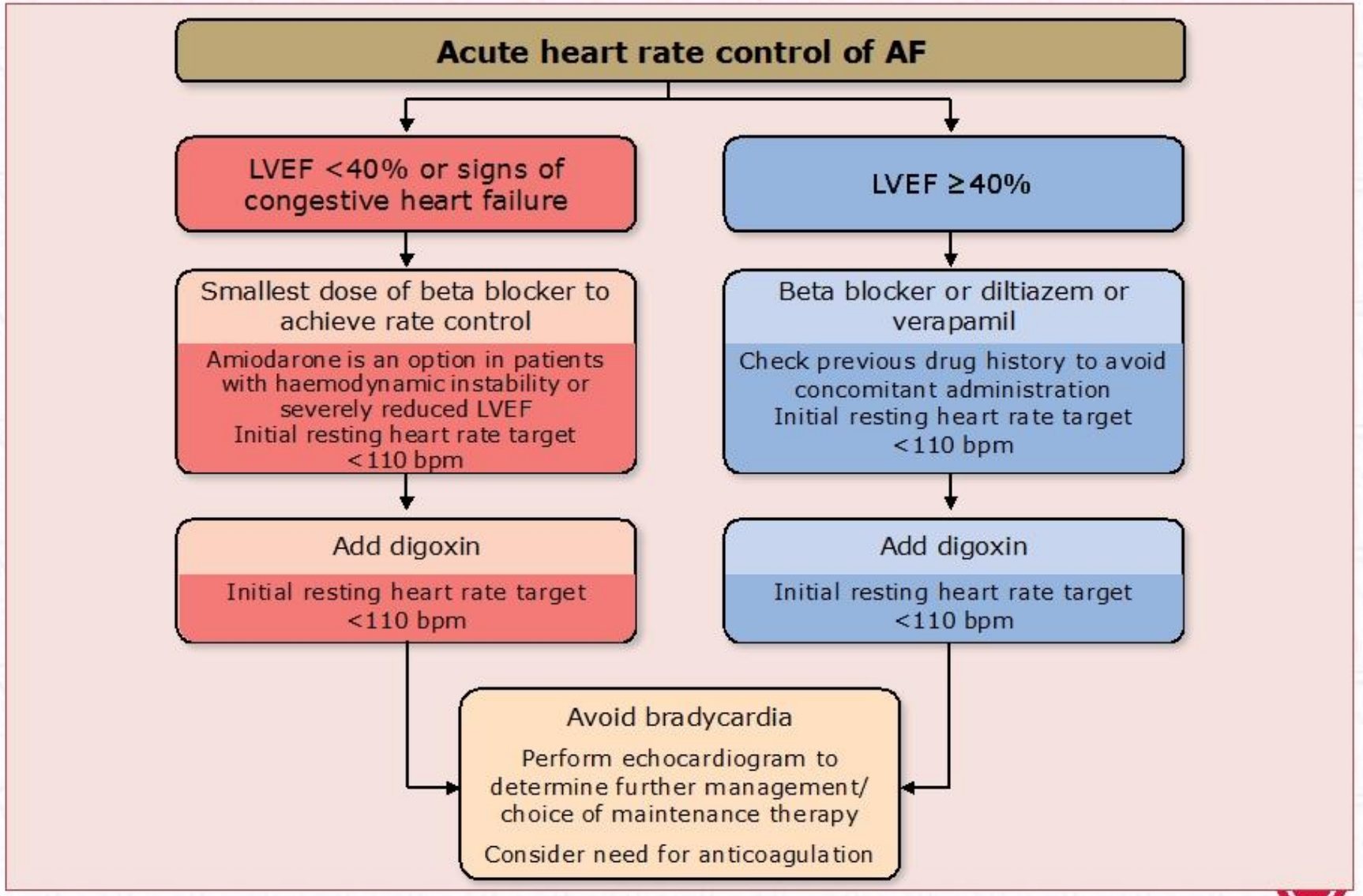
[a] Includes women without other stroke risk factors
[b] IIaB for women with only one additional stroke risk factor
[c] IB for patients with mechanical heart valves or mitral stenosis

European Heart Journal - doi:10.1093/eurheartj/ehw210

Heart rate control in atrial fibrillation

Recommendations	Class	Level
Beta-blockers, digoxin, diltiazem, or verapamil are recommended to control heart rate in AF patients with LVEF ≥40%.	I	B
Beta-blockers and/or digoxin are recommended to control heart rate in AF patients with LVEF <40%.	I	B
Combination therapy comprising different rate controlling agents should be considered if a single agent does not achieve the necessary heart rate target.	IIa	C
In patients with haemodynamic instability or severely depressed LVEF, amiodarone may be considered for acute control of heart rate.	IIb	B
In patients with permanent AF (i.e. where no attempt to restore sinus rhythm is planned), antiarrhythmic drugs should not routinely be used for rate control.	III (harm)	A
A resting heart rate of <110 bpm (i.e. lenient rate control) should be considered as the initial heart rate target for rate control therapy.	IIa	B
Rhythm rather than rate control strategies should be considered as the preferred management in pre-excited AF and AF during pregnancy.	IIa	C
Atrioventricular node ablation should be considered to control heart rate in patients unresponsive or intolerant to intensive rate and rhythm control therapy, accepting that these patients will become pacemaker dependent.	IIa	B

Acute heart rate control in atrial fibrillation



European Heart Journal - doi:10.1093/eurheartj/ehw210

Rhythm control therapy (1) – Cardioversion of AF

Recommendations	Class	Level
General recommendations		
Rhythm control therapy is indicated for symptom improvement in patients with AF.	I	B
Management of cardiovascular risk factors and avoidance of AF triggers should be pursued in patients on rhythm control therapy to facilitate maintenance of sinus rhythm.	IIa	B
With the exception of AF associated with haemodynamic instability, the choice between electrical and pharmacological cardioversion should be guided by patient and physician preferences.	IIa	C
Cardioversion of AF		
Electrical cardioversion of AF is recommended in patients with acute haemodynamic instability to restore cardiac output.	I	B
Cardioversion of AF (either electrical or pharmacological) is recommended in symptomatic patients with persistent or long-standing persistent AF as part of rhythm control therapy.	I	B
Pre-treatment with amiodarone, flecainide, ibutilide, or propafenone should be considered to enhance success of electrical cardioversion and prevent recurrent AF.	IIa	B

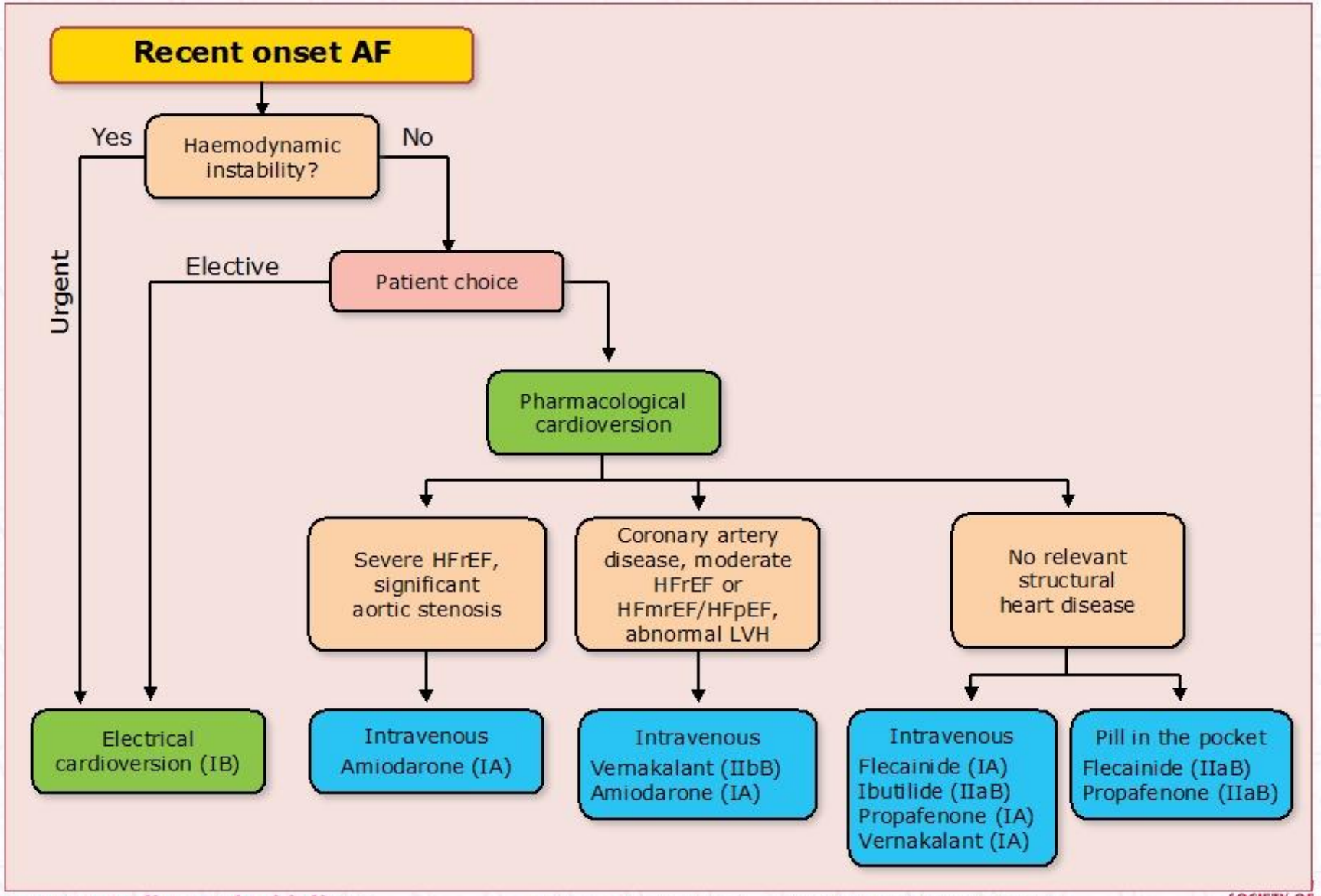
European Heart Journal - doi:10.1093/eurheartj/ehw210

Rhythm control therapy (2) – Cardioversion of AF

Recommendations	Class	Level
Cardioversion of AF *(cont'd)*		
In patients with no history of ischaemic or structural heart disease, flecainide, propafenone, or vernakalant are recommended for pharmacological cardioversion of new-onset AF.	I	A
In patients with no history of ischaemic or structural heart disease, ibutilide should be considered for pharmacological conversion of AF.	IIa	B
In selected patients with recent-onset AF and no significant structural or ischaemic heart disease, a single oral dose of flecainide or propafenone (the 'pill in the pocket' approach) should be considered for patient-led cardioversion, following safety assessment.	IIa	B
In patients with ischaemic and/or structural heart disease, amiodarone is recommended for cardioversion of AF.	I	A
Vernakalant may be considered as an alternative to amiodarone for pharmacological conversion of AF in patients without hypotension, severe heart failure or severe structural heart disease (especially aortic stenosis).	IIb	B

European Heart Journal - doi:10.1093/eurheartj/ehw210

Cardioversion of recent onset of atrial fibrillation



European Heart Journal - doi:10.1093/eurheartj/ehw210

Management of atrial flutter

Recommendations	Class	Level
For patients with atrial flutter, antithrombotic therapy is recommended according to the same risk profile used for AF.	I	B
Overdrive atrial pacing of atrial flutter should be considered as an alternative to electrical cardioversion, depending on local availability and experience.	IIa	B
Management of typical atrial flutter with ablation of the cavotricuspid isthmus is recommended for patients failing antiarrhythmic drug therapy or as first-line treatment considering patient preference.	I	B
If atrial flutter has been documented before AF ablation, ablation of the cavotricuspid isthmus should be considered as part of the AF ablation procedure.	IIa	C

European Heart Journal - doi:10.1093/eurheartj/ehw210

ΑΡΡΥΘΜΙΕΣ

- Η ΠΡΟΦΥΛΑΚΤΙΚΗ ΠΡΟΕΓΧΕΙΡΗΤΙΚΗ ΧΡΗΣΗ ΑΝΤΙΑΡΡΥΘΜΙΚΩΝ ΦΑΡΜΑΚΩΝ ΔΕΝ ΦΑΙΝΕΤΑΙ ΝΑ ΜΕΙΩΝΕΙ ΤΗΝ ΣΥΧΝΟΤΗΤΑ ΤΗΣ ΚΟΛΠΙΚΗΣ ΜΑΡΜΑΡΥΓΗΣ ΜΕ ΕΞΑΙΡΕΣΗ ΙΣΩΣ ΤΗΝ ΑΜΙΩΔΑΡΟΝΗ.
- Ο ΑΣΘΕΝΗΣ ΠΟΥ ΛΑΜΒΑΝΕΙ Β- ΑΝΤΑΓΩΝΙΣΤΕΣ ΠΡΟΕΓΧΕΙΡΗΤΙΚΑ ΔΙΑΤΗΡΕΙ ΤΗΝ ΑΓΩΓΗ ΤΟΥ ΚΑΙ ΜΕΤΕΓΧΕΙΡΗΤΙΚΑ.
- Η ΘΝΗΤΟΤΗΤΑ ΤΩΝ ΜΕΤΕΓΧΕΙΡΗΤΙΚΩΝ ΑΡΡΥΘΜΙΩΝ ΦΘΑΝΕΙ ΤΟ 20%.

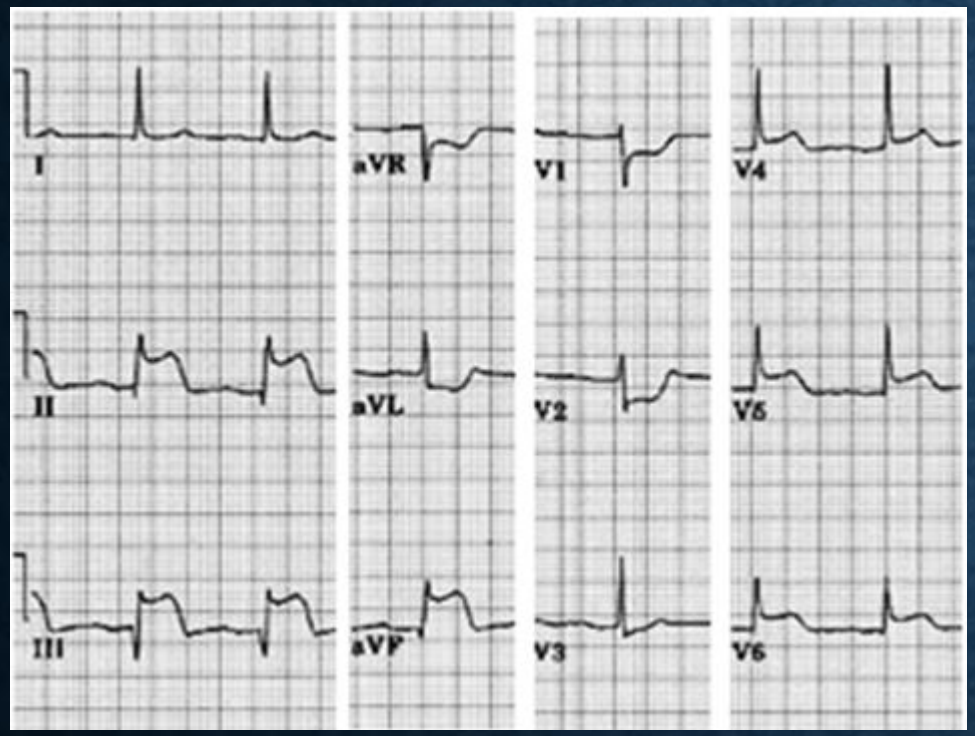
ΟΞΥ ΣΤΕΦΑΝΙΑΙΟ ΣΥΝΔΡΟΜΟ

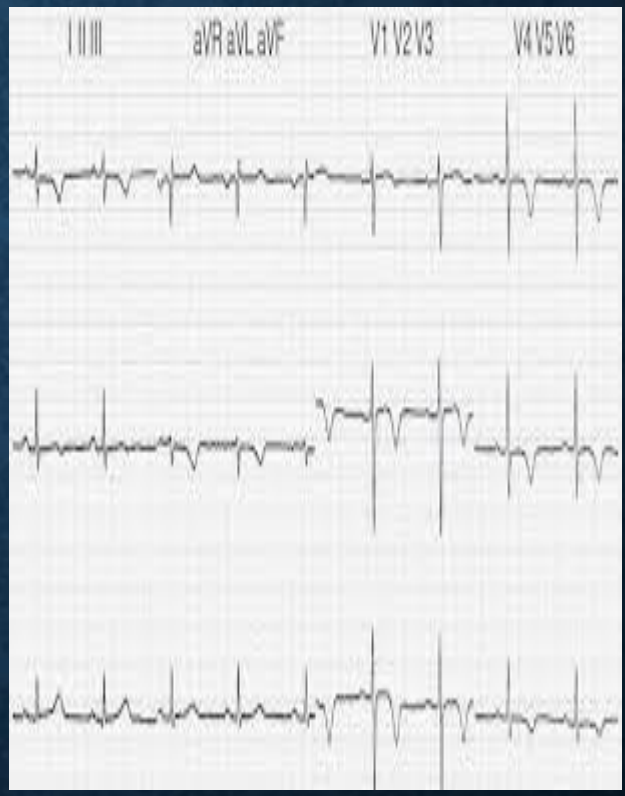
- ΣΥΧΝΟΤΗΤΑ 1,5-5%.
- ΘΝΗΤΟΤΗΤΑ ΥΠΕΡΒΑΙΝΕΙ ΤΟ 50%
- ΧΡΗΖΕΙ ΑΜΕΣΗΣ ΑΝΤΙΜΕΤΩΠΙΣΗΣ ΣΕ ΚΑΡΔΙΟΛΟΓΙΚΟ ΚΕΝΤΡΟ ΜΕ ΔΥΝΑΤΟΤΗΤΑ ΠΡΩΤΟΓΕΝΟΥΣ ΣΤΕΦΑΝΙΑΙΑΣ ΑΓΓΕΙΟΠΛΑΣΤΙΚΗΣ (PCI).
- ΜΕΤΑΦΟΡΑ ΤΟΥ ΑΣΘΕΝΟΥΣ ΣΤΗΝ ΣΤΕΦΑΝΙΑΙΑ ΜΟΝΑΔΑ.

Initial diagnosis

ESC European Society of Cardiology

Recommendations	Class	Level
ECG monitoring		
12-lead ECG recording and interpretation is indicated as soon as possible at the point of FMC, with a maximum target delay of 10 min.	I	B
ECG monitoring with defibrillator capacity is indicated as soon as possible in all patients with suspected STEMI.	I	B
The use of additional posterior chest wall leads (V7–V_9) in patients with high suspicion of posterior myocardial infarction (circumflex occlusion) should be considered.	IIa	B
The use of additional right precordial leads (V_3R and V_4R) in patients with inferior myocardial infarction should be considered to identify concomitant RV infarction.	IIa	B
Blood sampling		
Routine blood sampling for serum markers is indicated as soon as possible in the acute phase but should not delay reperfusion treatment.	I	C


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6


I II III
aVR aVL aVF
V1 V2 V3
V4 V5 V6

Relief of hypoxaemia and symptoms

ESC European Society of Cardiology

Recommendations	Class	Level
Hypoxia		
Oxygen is indicated in patients with hypoxaemia (SaO2 <90% or PaO2 <60 mmHg).	I	C
Routine oxygen is not recommended in patients with SaO2 ≥90%.	III	B
Symptoms		
Titrated i.v. opioids should be considered to relieve pain.	IIa	C
A mild tranquillizer (usually a benzodiazepine) should be considered in very anxious patients.	IIa	C

Cardiac arrest

ESC
European Society of Cardiology

Recommendations	Class	Level
A primary PCI strategy is recommended in patients with resuscitated cardiac arrest and an ECG consistent with STEMI.	I	B
Targeted temperature management is indicated early after resuscitation of cardiac arrest patients who remain unresponsive.	I	B
It is indicated that healthcare systems implement strategies to facilitate transfer of all patients in whom a myocardial infarction is suspected directly to the hospital offering 24/7 PCI-mediated reperfusion therapy via one specialized EMS.	I	C

Reperfusion therapy

ESC European Society of Cardiology

Recommendations	Class	Level
Reperfusion therapy is indicated in all patients with symptoms of ischaemia of ≤12 hours duration and persistent ST-segment elevation.	I	A
A *primary PCI strategy* is recommended over fibrinolysis within indicated time frames.	I	A
If primary PCI cannot be performed timely after STEMI diagnosis, fibrinolytic therapy is recommended within 12 hours of symptom onset in patients without contra-indications.	I	A

Reperfusion therapy *(continued)*

ESC European Society of Cardiology

Recommendations	Class	Level
In the absence of ST-segment elevation, a *primary PCI strategy* is indicated in patients with suspected ongoing ischaemic symptoms suggestive of myocardial infarction and at least one of the following criteria present: – haemodynamic instability or cardiogenic shock, – recurrent or ongoing chest pain refractory to medical treatment, – life-threatening arrhythmias or cardiac arrest, – mechanical complications of myocardial infarction, – acute heart failure, – recurrent dynamic ST-segment or T-wave changes, particularly with intermittent ST-segment elevation.	I	C

Procedural aspects of the primary percutaneous coronary intervention strategy

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Recommendations	Class	Level
IRA strategy		
Primary PCI of the IRA is indicated.	I	A
New coronary angiography with PCI if indicated is recommended in patients with symptoms or signs of recurrent or remaining ischaemia after primary PCI.	I	C
IRA technique		
Stenting is recommended (over balloon angioplasty) for primary PCI.	I	A
Stenting with new-generation DES is recommended over BMS for primary PCI.	I	A
Radial access is recommended over femoral access if performed by an experienced radial operator.	I	A

Periprocedural and postprocedural antithrombotic therapyc in patients undergoing primary percutaneous coronary intervention

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Recommendations	Class	Level
Antiplatelet therapy		
A potent $P2Y_{12}$ inhibitor (prasugrel or ticagrelor), or clopidogrel if these are not available or are contra-indicated, is recommended before (or at latest at the time of) PCI and maintained over 12 months unless there are contra-indications such as excessive risk of bleeding.	I	A
Aspirin (oral or i.v, if unable to swallow) is recommended as soon as possible for all patients without contra-indications.	I	B
GP IIb/IIIa inhibitors should be considered for bailout if there is evidence of no-reflow or a thrombotic complication.	IIa	C
Cangrelor may be considered in patients who have not received $P2Y_{12}$ receptor inhibitors.	IIb	A

Doses of antiplatelet and anticoagulant co-therapies in primary PCI

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Doses of antiplatelet and parenteral anticoagulant co-therapies in primary PCI	
Antiplatelet therapies	
Aspirin	Loading dose of 150-300 mg orally or of 75-250 mg i.v. if oral ingestion is not possible, followed by a maintenance dose of 75-100 mg/day.
Clopidogrel	Loading dose of 600 mg orally, followed by a maintenance dose of75 mg/day.
Prasugrel	Loading dose of 60 mg orally, followed by a maintenance dose of 10 mg/day. In patients with body weight ≤60 kg, a maintenance dose of 5 mg/day is recommended. Prasugrel is contra-indicated in patients with previous stroke. In patients ≥75 years, prasugrel is generally not recommended, but a dose of 5 mg/day should be used if treatment is deemed necessary.

Doses of antiplatelet and anticoagulant co-therapies in primary PCI *(continued)*

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Doses of antiplatelet and parenteral anticoagulant co-therapies in primary PCI	
Antiplatelet therapies *(continued)*	
Ticagrelor	Loading dose of 180 mg orally, followed by a maintenance dose of 90 mg b.i.d.
Abciximab	Bolus of 0.25 mg/kg i.v. and 0.125 µg/kg/min infusion (maximum 10 µg/min) for 12 hours.
Eptifibatide	Double bolus of 180 µg/kg i.v. (given at a 10-min interval) followed by an infusion of 2.0 µg/kg/min for up to 18 hours.
Tirofiban	25 µg/kg over 3 min i.v., followed by a maintenance infusion of 0.15 µg/kg/min for up to 18 hours.

Management of left ventricular dysfunction and acute heart failure in ST-elevation myocardial infarction

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Recommendations	Class	Level
ACE inhibitor (or if not tolerated, ARB) therapy is indicated as soon as haemodynamically stable for all patients with evidence of LVEF ≤40% and/or heart failure to reduce the risk of hospitalization and death.	I	A
Beta-blocker therapy is recommended in patients with LVEF ≤40% and/or heart failure after stabilization, to reduce the risk of death, recurrent MI, and hospitalization for heart failure.	I	A
An MRA is recommended in patients with heart failure and LVEF ≤40% with no severe renal failure or hyperkalaemia to reduce the risk of cardiovascular hospitalization and death.	I	B
Loop diuretics are recommended in patients with acute heart failure with symptoms/signs of fluid overload to improve symptoms.	I	C

Management of left ventricular dysfunction and acute heart failure in ST-elevation myocardial infarction *(continued)*

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Recommendations	Class	Level
Nitrates are recommended in patients with symptomatic heart failure with SBP >90 mmHg to improve symptoms and reduce congestion.	I	C
Oxygen is indicated in patients with pulmonary oedema with SaO2 <90% to maintain a saturation >95%.	I	C
Patient intubation is indicated in patients with respiratory failure or exhaustion, leading to hypoxaemia, hypercapnia, or acidosis, and if non-invasive ventilation is not tolerated.	I	C
Non-invasive positive pressure ventilation (continuous positive airway pressure, biphasic positive airway pressure) should be considered in patients with respiratory distress (respiratory rate >25 breaths/min, SaO2 <90%) without hypotension.	IIa	B

Management of ventricular arrhythmias and conduction disturbances in the acute phase

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Recommendations	Class	Level
Intravenous beta-blocker treatment is indicated for patients with polymorphic VT and/or VF unless contra-indicated.	I	B
Prompt and complete revascularization is recommended to treat myocardial ischaemia that may be present in patients with recurrent VT and/or VF.	I	C
Intravenous amiodarone is recommended for treatment of recurrent polymorphic VT.	I	C
Correction of electrolyte imbalances (especially hypokalaemia and hypomagnesemia) is recommended in patients with VT and/or VF.	I	C

Management of ventricular arrhythmias and conduction disturbances in the acute phase *(continued)*

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Recommendations	Class	Level
In cases of sinus bradycardia with haemodynamic intolerance or high degree AV block without stable escape rhythm:		
• i.v. positive chronotropic medication (epinephrine, vasopressin and/or atropine) is indicated,	I	C
• temporary pacing is indicated in cases of failure to respond to positive chronotropic medication,	I	C
• urgent angiography with a view to revascularization is indicated if the patient has not received previous reperfusion therapy.	I	C

ΠΝΕΥΜΟΝΙΚΗ ΕΜΒΟΛΗ

- ΑΙΤΙΑ:

1. ΕΝ ΤΩ ΒΑΘΕΙ ΦΛΕΒΙΚΗ ΘΡΟΜΒΩΣΗ ΤΩΝ ΚΑΤΩ ΑΚΡΩΝ.
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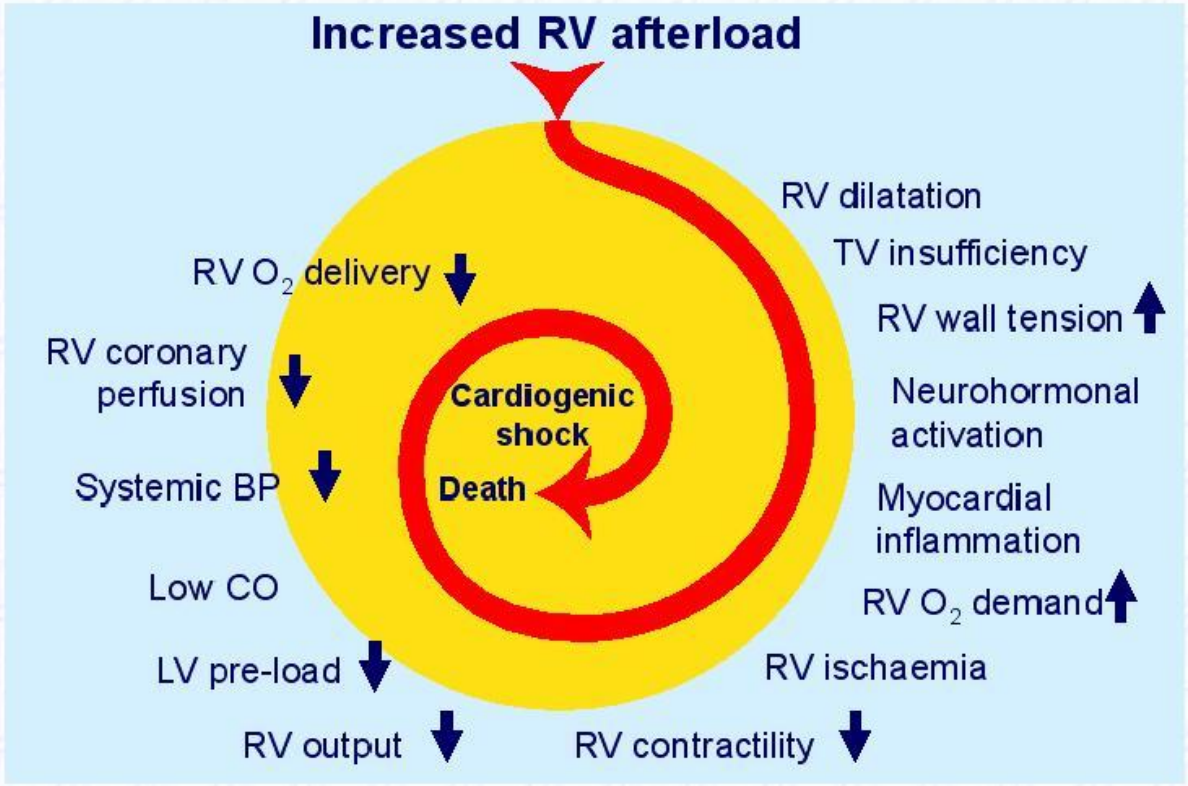
3. ΕΜΒΟΛΗ ΟΓΚΟΥ ΠΟΥ ΔΙΗΘΕΙ ΤΟΝ ΑΡΙΣΤΕΡΟ ΚΟΛΠΟ Η ΤΗΝ ΠΝΕΥΜΟΝΙΚΗ ΑΡΤΗΡΙΑ.

Key factors contributing to haemodynamic collapse in acute pulmonary embolism



BP = blood pressure; CO = cardiac output; LV = left ventricular; RV = right ventricular; TV = tricuspid valve.

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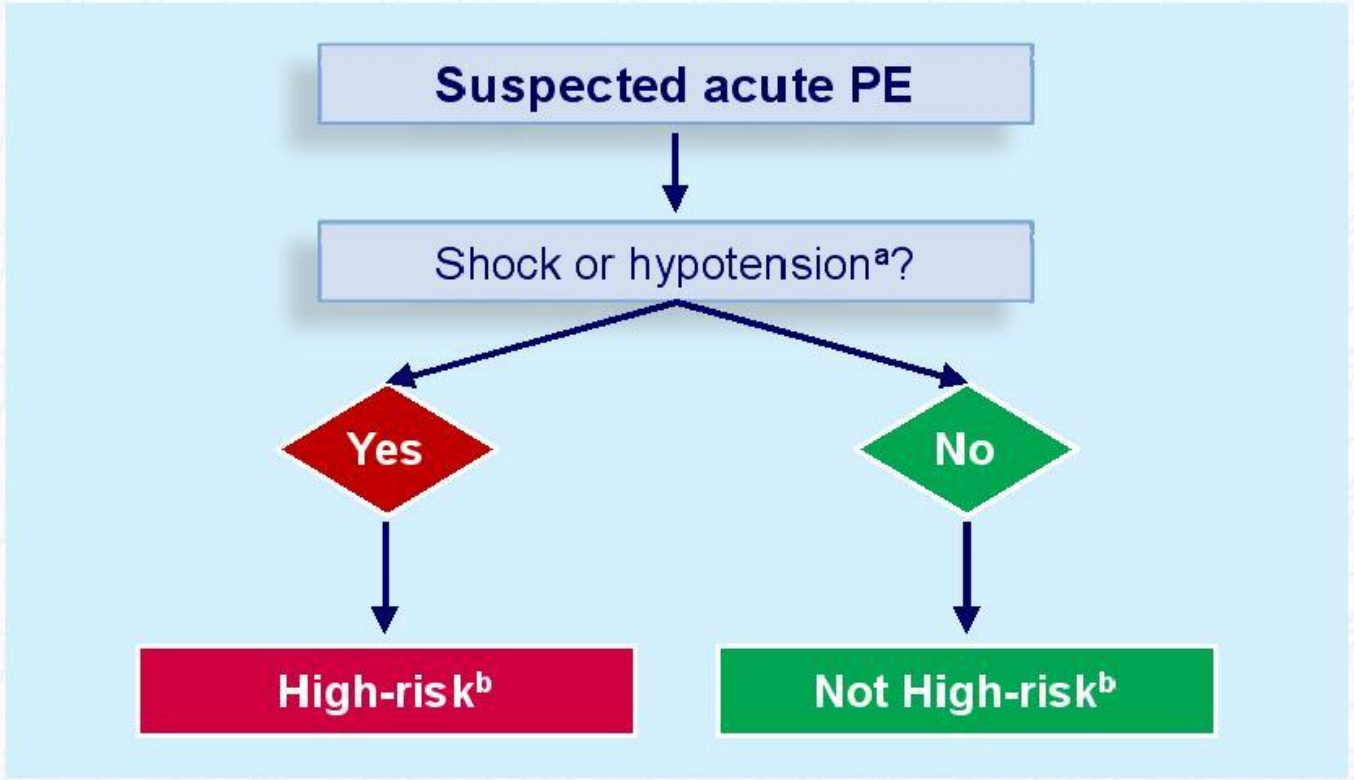
Initial risk stratification of acute PE



[a] Defined as systolic blood pressure <90 mmHg, or a systolic pressure drop by ≥40 mmHg, for >15 minutes, if not caused by new-onset arrhythmia, hypovolaemia, or sepsis.
[b] Based on the estimated PE-related in-hospital or 30-day mortality.

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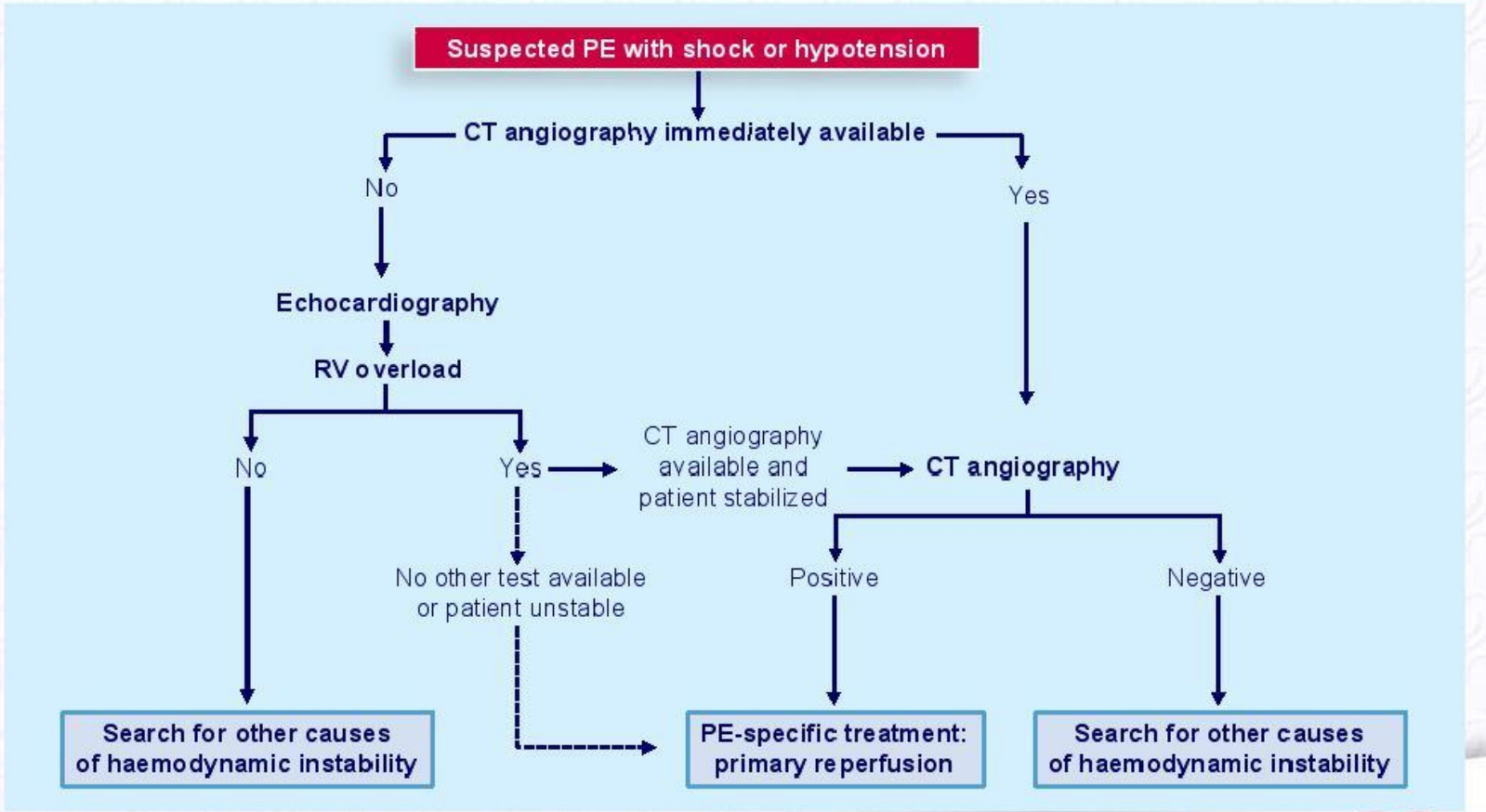
Diagnostic algorithm: high-risk PE



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Diagnosis

Recommendations	Class	Level
Suspected PE without shock or hypotension		
The use of validated criteria for diagnosing PE is recommended.	I	B
Clinical evaluation		
It is recommended that the diagnostic strategy be based on clinical probability assessed either by clinical judgement or a validated prediction rule.	I	A
D-Dimer		
Plasma D-dimer measurement is recommended in outpatients / emergency department patients with low or intermediate clinical probability, or PE-unlikely, to reduce the need for unnecessary imaging and irradiation, preferably using a highly sensitive assay.	I	A
In low clinical probability or PE-unlikely patients, normal D-dimer level using either a highly or moderately sensitive assay excludes PE.	I	A
Further testing may be considered in intermediate probability patients with a negative moderately sensitive assay.	IIb	C
D-dimer measurement is not recommended in patients with high clinical probability, as a normal result does not safely exclude PE, even when using a highly sensitive assay.	III	B

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Diagnosis

Recommendations	Class	Level
CT angiography		
Normal CT angiography safely excludes PE in patients with low or intermediate clinical probability or PE-unlikely.	I	A
Normal CT angiography may safely exclude PE in patients with high clinical probability or PE-likely.	IIa	B
CT angiography showing a segmental or more proximal thrombus confirms PE.	I	B
Further testing to confirm PE may be considered in case of isolated sub-segmental clots.	IIb	C
Scintigraphy		
Normal perfusion lung scintigram excludes PE.	I	A
High probability V/Q scan confirms PE.	IIa	B
A non-diagnostic V/Q scan may exclude PE when combined with a negative proximal CUS in patients with low clinical probability or PE-unlikely.	IIa	B

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Original and simplified pulmonary embolism severity index (PESI)

Parameter	Original version	Simplified version
Age	Age in years	1 point (if age >80 years)
Male sex	+10	–
Cancer	+30	1
Chronic heart failure	+10	1
Chronic pulmonary disease	+10	
Pulse rate ≥110 b.p.m.	+20	1
Systolic blood pressure <100 mmHg	+30	1
Respiratory rate >30 breaths per minute	+20	–
Temperature <36°C	+20	–
Altered mental status	+60	–
Arterial oxyhaemoglobin saturation <90%	+20	1

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Original and simplified pulmonary embolism severity index (PESI)

Parameter	Original version	Simplified version
	Risk strata	
	Class I: ≤65 points very low 30-day mortality risk (0-1.6%) **Class II: 66-85 points** low mortality risk (1.7-3.5%) **Class III: 86-105 points** moderate mortality risk (3.2-7.1%) **Class IV: 106-125 points** high mortality risk (4.0-11.4%) **Class V: >125 points** very high mortality risk (10.0-24.5%)	**0 points** = 30-day mortality risk 1.0% (95% CI 0.0%-2.1%) **≥1 point(s)** = 30-day mortality risk 10.9% (95% CI 8.5%-13.2%)

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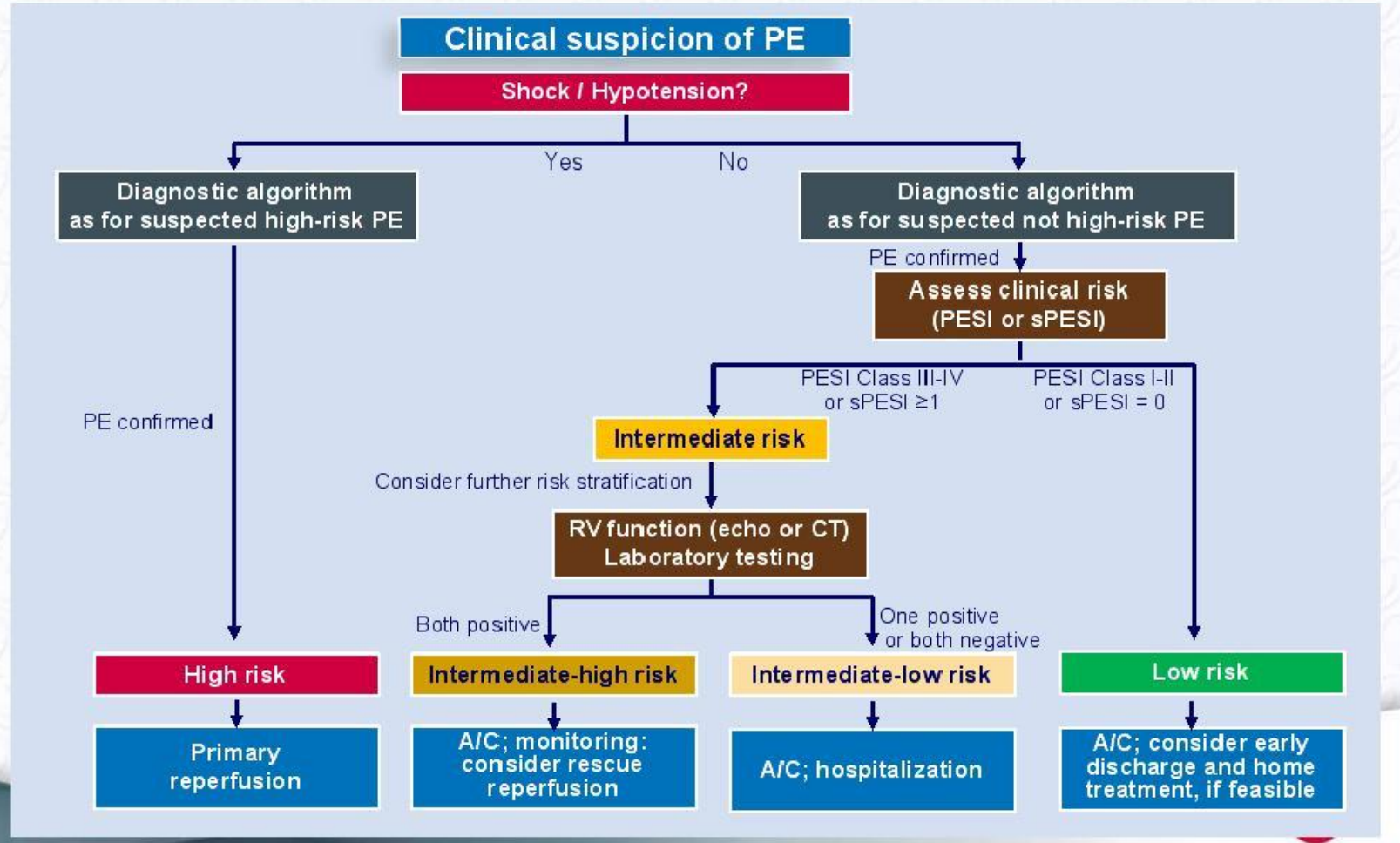
Risk-adjusted management algorithm



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Thrombolytic treatment of PE

Approved thrombolytic regimens for pulmonary embolism	
Streptokinase	250 000 IU as a loading dose over 30 minutes, followed by 100 000 IU/h over 12-24 hours.
	Accelerated regimen: 1.5 million IU over 2 hours.
Urokinase	4400 IU/kg as a loading dose over 10 min, followed by 4400 IU/kg per hour over 12-24 hours.
	Accelerated regimen: 3 million IU over 2 hours.
rtPA	100 mg over 2 hours; or
	0.6 mg/kg over 15 minutes (maximum dose 50 mg).

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Parenteral anticoagulation for PE

LMWHs and pentasaccharide (fondaparinus) approved for the treatment of pulmonary embolism		
	Dosage	Interval
Enoxaparin	1.0 mg/kg or 1.5 mg/kg	Every 12 hours Once daily
Tinzaparin	175 U/kg	Once daily
Dalteparin	100 IU/kg or 200 IU/kg	Every 12 hours Once daily
Nadroparin	86 IU/kg or 171 IU/kg	Every 12 hours Once daily
Fondaparinux	5 mg (body weight <50 kg); 7.5 mg (body weight 50-100 kg); 10 mg (body weight >100 kg)	Once daily

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Acute phase treatment

Recommendations	Class	Level
PE with shock or hypotension (high risk)		
It is recommended to initiate intravenous anticoagulation with UFH without delay in patients with high-risk PE.	I	C
Thrombolytic therapy is recommended.	I	B
Surgical pulmonary embolectomy is recommended for patients in whom thrombolysis is contraindicated or has failed.	I	C
Percutaneous catheter-directed treatment should be considered as an alternative to surgical pulmonary embolectomy for patients in whom full-dose systemic thrombolysis is contraindicated or has failed.	IIa	C

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Acute phase treatment

Recommendations	Class	Level
PE without shock or hypotension (intermediate or low risk)		
Anticoagulation - new oral anticoagulants		
As an alternative to the combination of parenteral anticoagulation with a VKA, anticoagulation with rivaroxaban (15 mg twice daily for 3 weeks, followed by 20 mg once daily) is recommended.	I	B
As an alternative to the combination of parenteral anticoagulation with a VKA, anticoagulation with apixaban (10 mg twice daily for 7 days, followed by 5 mg twice daily) is recommended.	I	B
As an alternative to VKA treatment, administration of dabigatran (150 mg twice daily, or 110 mg twice daily for patients >80 years of age or those under concomitant verapamil treatment) is recommended following acute-phase parenteral anticoagulation.	I	B
As an alternative to VKA treatment, administration of edoxaban is recommended following acute-phase parenteral anticoagulation.	I	B
New oral anticoagulants (rivaroxaban, apixaban, dabigatran, edoxaban) are not recommended in patients with severe renal impairment.	III	A

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ΠΝΕΥΜΟΝΟΠΕΡΙΚΑΡΔΙΟ

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