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ESC GUIDELINES

PMK Cardiology Review

2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS

The Task Force for the management of atrial fibrillation of the European Society of Cardiology (ESC)

Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC

Endorsed by the European Stroke Organisation (ESO)

นพ ธรณิศ จันทรารัตน์
Electrophysiology Unit
รพ พระมงกุฎเกล้า

Scope of Presentation

- Diagnosis and screening
- General Management
- Stroke Prevention
- Rate/Rhythm Control
- Special Population
- To Do and Not to Do Messages
- 17 Rules Summary

Event	Association with AF
Death	Increased mortality, especially cardiovascular mortality due to sudden death, heart failure or stroke.
Stroke	20–30% of all strokes are due to AF. A growing number of patients with stroke are diagnosed with 'silent', paroxysmal AF.
Hospitalizations	10–40% of AF patients are hospitalized every year.
Quality of life	Quality of life is impaired in AF patients independent of other cardiovascular conditions.
Left ventricular dysfunction and heart failure	Left ventricular dysfunction is found in 20–30% of all AF patients. AF causes or aggravates LV dysfunction in many AF patients, while others have completely preserved LV function despite long-standing AF.
Cognitive decline and vascular dementia	Cognitive decline and vascular dementia can develop even in anticoagulated AF patients. Brain white matter lesions are more common in AF patients than in patients without AF.

1995

2000

2005

2010

2015

First maze surgery for AF treatment published

VKA superior to aspirin for stroke prevention in AF

PVI can suppress AF

ACE-I/ARBs prevent AF in heart failure

RF based maze maintains SR after cardiovascular surgery

Rate control not inferior to rhythm control

VKA reduces stroke in AF by 2/3

PVI maintains SR better than antiarrhythmic drugs

ARBs prevent AF in hypertension & LVH

Ximelagatran as effective as VKA

Amiodarone not superior to rate control in heart failure

ARBs do not prevent AF or adverse outcomes in patients without hypertension

Dabigatran at least as effective as VKA in AF

Dronedarone improves outcomes in non-permanent AF

Lenient rate control acceptable

AF ablation improves QoL

PUFA do not prevent AF

Rixaroxaban and Apixaban at least as effective as VKA in AF

Dronedarone harms in permanent AF

First-line PVI maintains SR better than antiarrhythmic drugs

Bipolar RF more effective than conventional RF for stand-alone AF surgery

MRA prevent AF in HFrEF patients pre-treated with ACE-I/ beta-blockers

Edoxaban at least as effective as VKA in AF

PVI alone as effective as complex ablation in persistent AF

ACE-I/ARB prevent AF in hypertension

Meta-analysis and healthcare databases: NOACs safer and slightly more effective compared to VKA

Beta-blockers without prognostic benefit in AF patients with HFrEF

Concomitant maze surgery maintains SR but increases risk of permanent pacemaker

Beta-blockers prevent AF in HFrEF patients pre-treated with ACE-I

Cryoenergy as effective as RF for PVI

Inherited cardiomyopathies, channelopathies, and pathways associated with atrial fibrillation

Syndrome	Gene	Functional alteration	AF prevalence
Long QT syndrome	KCNQ1 KCNH2 SCN5A ANK2 others	I_{Ks} ↓ I_{Kr} ↓ I_{Na} ↑ $I_{Na,K}$ ↓ Various effects	5–10%
Brugada syndrome	SCN5A GPDIL SCN1B CACNA1C CACNB2b others	I_{Na} ↓ I_{Na} ↓ I_{Na} ↓ I_{Ca} ↓ I_{Ca} ↓ others	10–20%
Short QT syndrome	KCNQ1 KCNH2 KCNJ2 CACNA1C CACNB2b	I_{Ks} ↑ I_{Kr} ↑ I_{K1} ↑ I_{Ca} ↓ I_{Ca} ↓	Up to 70%
Catecholaminergic VT	RYR2 CASQ2	Abnormal Ca^{2+} release from sarcoplasmic reticulum	Variable but common
Hypertrophic cardiomyopathy	Sarcomeric genes		5–15%
Wolff-Parkinson-White syndrome	PRKAG		Variable
Holt-Oram syndrome	TBX5		Variable
Arrhythmogenic right ventricular cardiomyopathy	Several desmosomal genes, unknown gene loci	reduced mechanical cell-cell contacts	>40% in patients with VTs

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Diabetes

Heart failure

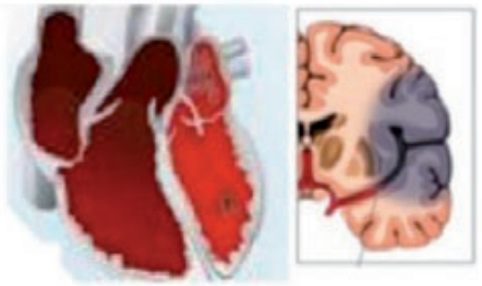
Obesity

Coronary artery disease

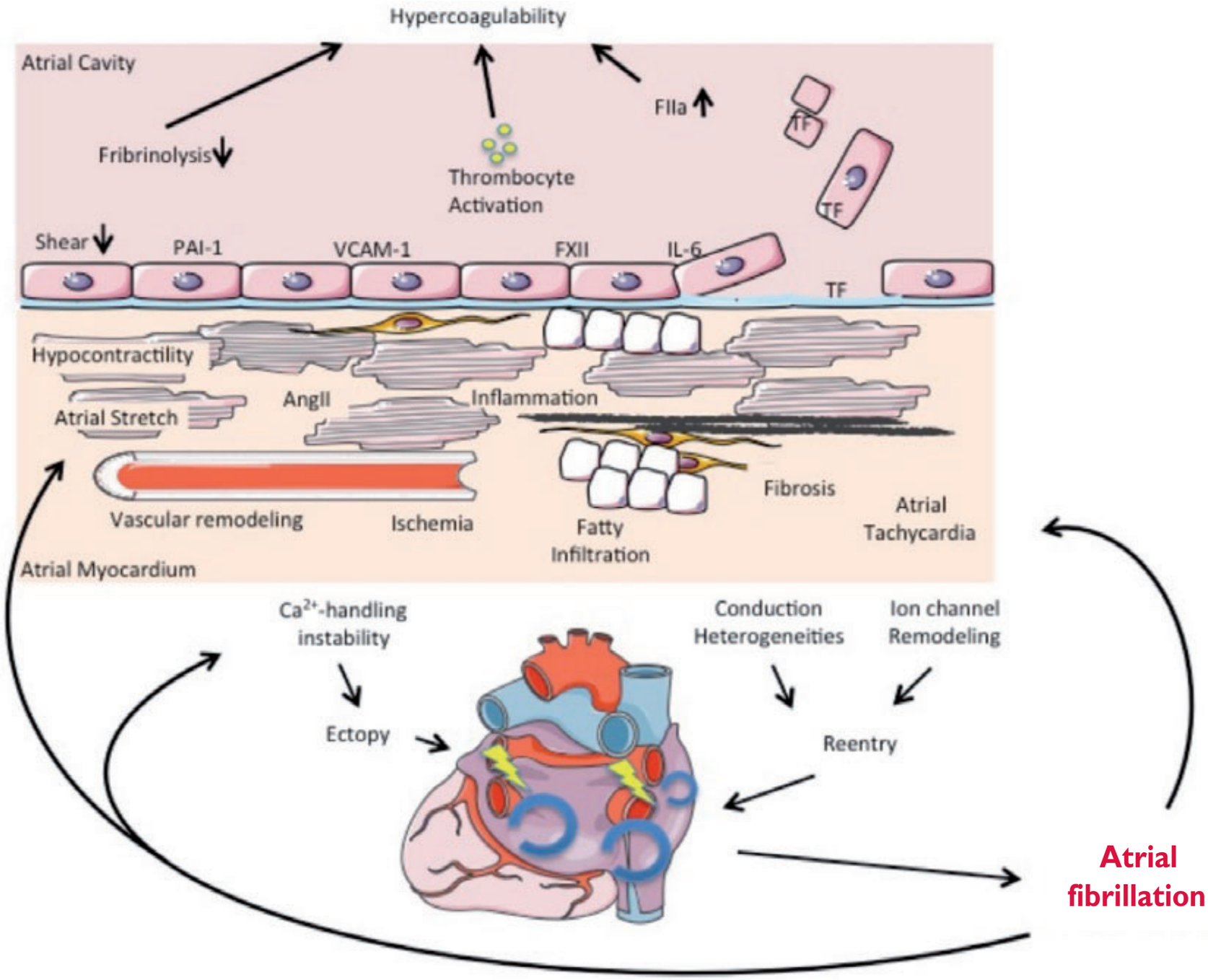
Hypertension

Ageing

Genetic predisposition



Stroke



Atrial fibrillation

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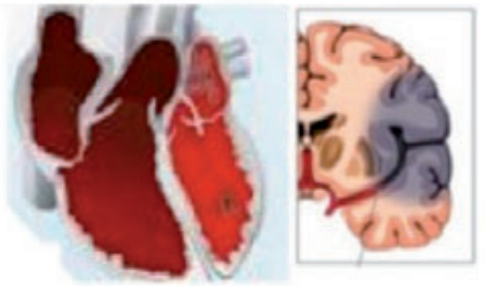

Stroke

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Heart failure

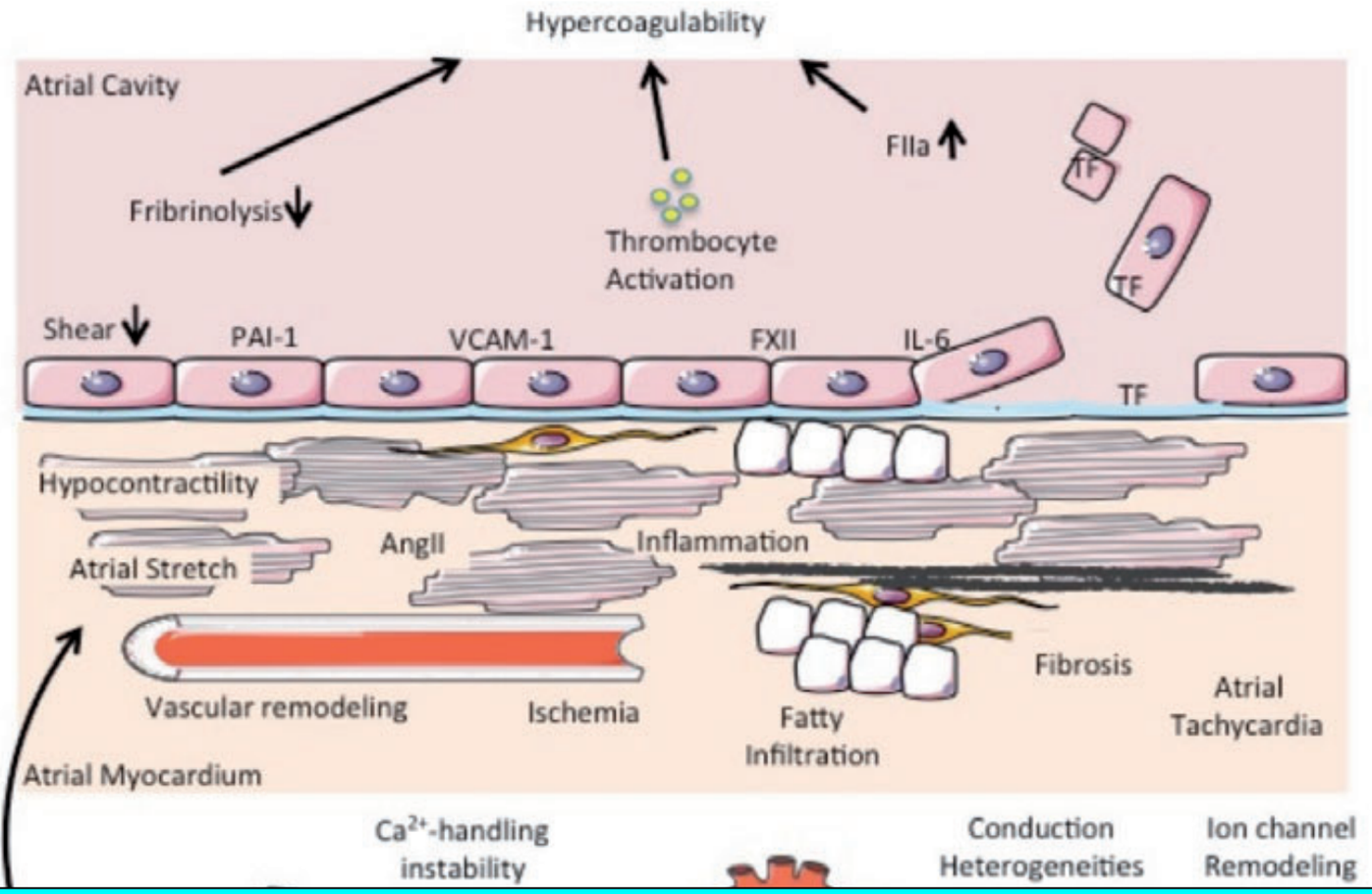
Obesity

Coronary artery disease

Hypertension

Ageing

Genetic predisposition



stretch-induced atrial fibrosis, hypocontractility, fatty infiltration, inflammation, vascular remodelling, ischaemia, ion channel dysfunction, and Ca2+-instability

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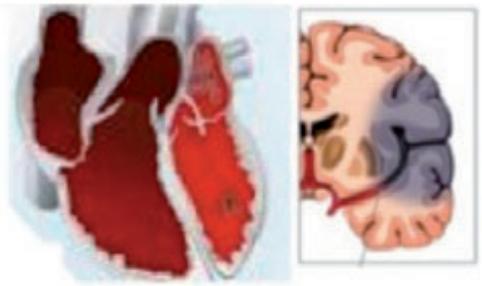

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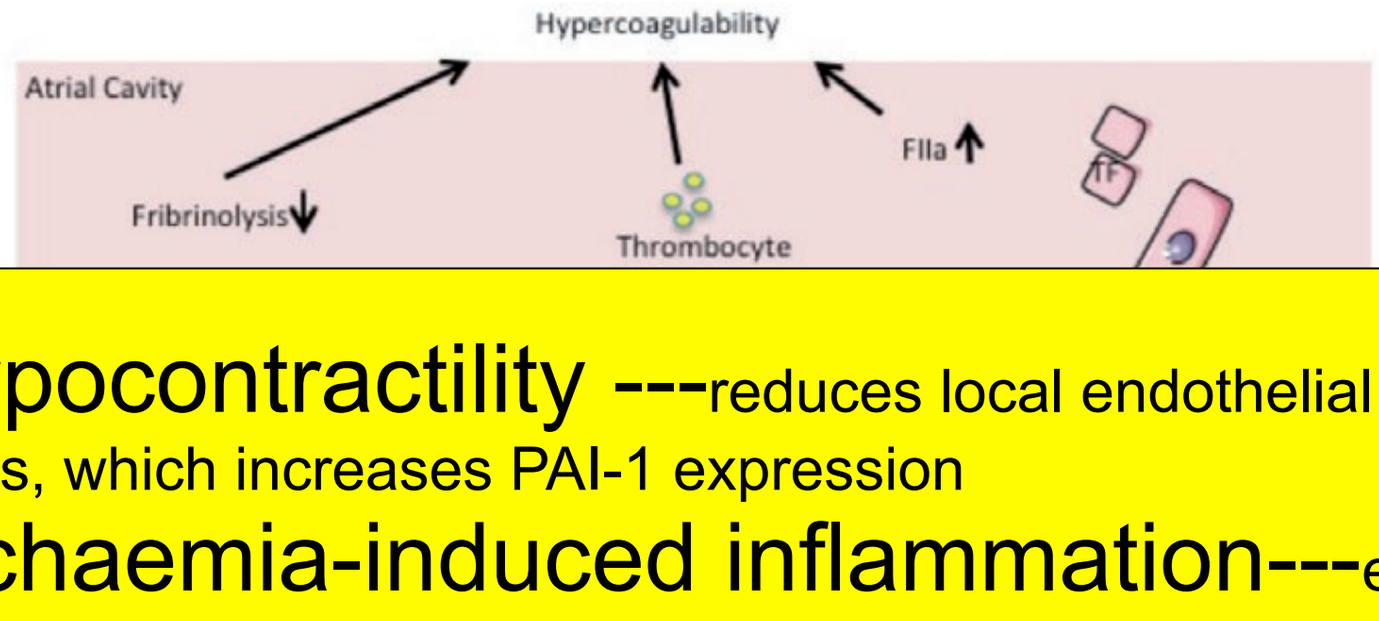

- **Diabetes**
- **Heart failure**
- **Obesity**
- **Coronary artery disease**
- **Hypertension**
- **Ageing**
- **Genetic predisposition**

-hypocontractility ---reduces local endothelial shear stress, which increases PAI-1 expression

-ischaemia-induced inflammation---enhances the expression of endothelial adhesion molecules or promotes shedding of endothelial cells, resulting in tissue factor exposure to the blood stream

stretch-induced atrial fibrosis, hypocontractility, fatty infiltration, inflammation, vascular remodelling, ischaemia, ion channel dysfunction, and Ca2+-instability

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Characteristic/comorbidity	Association with AF
Genetic predisposition (based on multiple common gene variants associated with AF)[64]	HR range 0.4–3.2
Older age[19] 50–59 years 60–69 years 70–79 years 80–89 years	HR: 1.00 (reference) 4.98 (95% CI 3.49–7.10) 7.35 (95% CI 5.28–10.2) 9.33 (95% CI 6.68–13.0)
Hypertension (treated) vs. none[19]	HR 1.32 (95% CI 1.08–1.60)
Heart failure vs. none[19]	HR 1.43 (95% CI 0.85–2.40)
Valvular heart disease vs. none[205]	RR 2.42 (95% CI 1.62–3.60)
Myocardial infarction vs. none[19]	HR 1.46 (95% CI 1.07–1.98)
Thyroid dysfunction[206, 207] Hypothyroidism Subclinical hyperthyroidism Overt hyperthyroidism	(reference: euthyroid) HR 1.23 (95% CI 0.77–1.97) RR 1.31 (95% CI 1.19–1.44) RR 1.42 (95% CI 1.22–1.63)
Obesity[19, 208] None (BMI <25 kg/m^2) Overweight (BMI 25–30 kg/m^2) Obese (BMI ≥31 kg/m^2)	HR: 1.00 (reference) 1.13 (95% CI 0.87–1.46) 1.37 (95% CI 1.05–1.78)

Diabetes mellitus vs. none[19]	HR 1.25 (95% CI 0.98–1.60)
Chronic obstructive pulmonary disease[209]	RR:
FEV1 ≥80%	1.00 (reference)
FEV1 60–80%	1.28 (95% CI 0.79–2.06)
FEV1 <60%	2.53 (95% CI 1.45–4.42)
Obstructive sleep apnoea vs. none[210]	HR 2.18 (95% CI 1.34–3.54)
Chronic kidney disease[211]	OR:
None	1.00 (reference)
Stage 1 or 2	2.67 (95% CI 2.04–3.48)
Stage 3	1.68 (95% CI 1.26–2.24)
Stage 4 or 5	3.52 (95% CI 1.73–7.15)
Smoking[212]	HR:
Never	1.00 (reference)
Former	1.32 (95% CI 1.10–1.57)
Current	2.05 (95% CI 1.71–2.47)
Alcohol consumption[213]	RR:
None	1.00 (reference)
1– 6 drinks/week	1.01 (95% CI 0.94–1.09)
7–14 drinks/week	1.07 (95% CI 0.98–1.17)
15–21 drinks/week	1.14 (95% CI 1.01–1.28)
>21 drinks/week	1.39 (95% CI 1.22–1.58)
Habitual vigorous exercise[214]	RR:
Non-exercisers	1.00 (reference)
<1 day/week	0.90 (95% CI 0.68−1.20)
1−2 days/week	1.09 (95% CI 0.95−1.26)
3−4 days/week	1.04 (95% CI 0.91−1.19)
5−7 days/week	1.20 (95% CI 1.02−1.41)

Exercise

Habitual vigorous exercise[214]	RR:
Non-exercisers	1.00 (reference)
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screening AF

Recommendations	Class[a]	Level[b]
Opportunistic screening for AF is recommended by pulse taking or ECG rhythm strip in patients >65 years of age.	I	B
In patients with TIA or ischaemic stroke, screening for AF is recommended by short-term ECG recording followed by continuous ECG monitoring for at least 72 hours.	I	B
It is recommended to interrogate pacemakers and ICDs on a regular basis for atrial high rate episodes (AHRE). Patients with AHRE should undergo further ECG monitoring to document AF before initiating AF therapy.	I	B
In stroke patients, additional ECG monitoring by long-term non-invasive ECG monitors or implanted loop recorders should be considered to document silent atrial fibrillation.	IIa	B
Systematic ECG screening may be considered to detect AF in patients aged >75 years, or those at high stroke risk.	IIb	B

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Modified European Heart Rhythm Association symptom scale

Modified EHRA score	Symptoms	Description
I	None	AF does not cause any symptoms
2a	Mild	Normal daily activity not affected by symptoms related to AF[a]
2b	Moderate	Normal daily activity not affected by symptoms related to AF, but patient troubled by symptoms[a]
3	Severe	Normal daily activity affected by symptoms related to AF
4	Disabling	Normal daily activity discontinued

Management of AF

Treatment	*Desired outcome*	*Patient benefit*
Acute rate and rhythm control	Haemodynamic stability	
Manage precipitating factors **Lifestyle changes, treatment of underlying cardiovascular conditions**	Cardiovascular risk reduction	**Improved life expectancy**
Assess stroke risk **Oral anticoagulation in patients at risk for stroke**	Stroke prevention	
Assess heart rate **Rate control therapy**	Symptom improvement, preservation of LV function	**Improved quality of lif autonomy, social functioning**
Assess symptoms **Antiarrhythmic drugs, cardioversion, catheter ablation, AF surgery**	Symptom improvement	

Acute AF

Management of patients presenting acutely with AF and heart failure

Acute management *Chronic management*

Cardiovert if unstable

Anticoagulate according to stroke risk

Normalise fluid balance with diuretics to improve symptoms

Control rate: Initial rate target <110 bpm; stricter if persistent HF/AF symptoms

Inhibit the renin–angiotensin–aldosterone system[a]

Early consideration of rhythm control

Advanced HF therapies, including devices[a]

Treatment of other cardiovascular disease, especially ischaemia and hypertension

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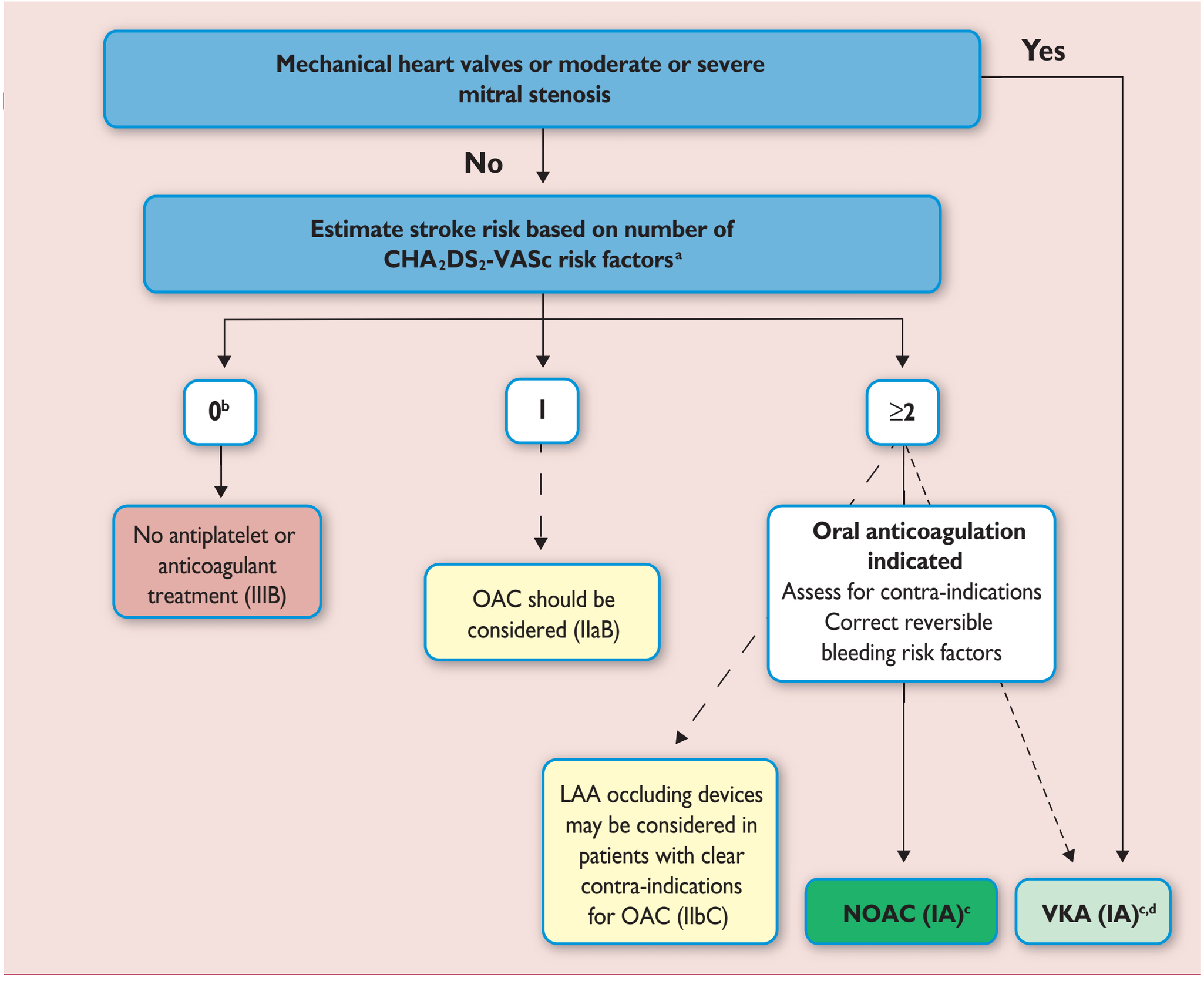
Stroke Prevention



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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

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Patient without known AF presenting with atrial high rate episode (AHRE, >5–6 min and >180 bpm) detected by an implanted device

Assess eligibility for oral anticoagulation using CHA_2DS_2-VASc score

Stroke risk low

Verify presence of AF by ECG documentation

e.g. resting ECG
Ambulatory ECG recorder
Patient-operated devices
Review device electrograms (if available) to determine whether it is AF

No AF detected

AF diagnosed

Consider patient characteristics (e.g. stroke risk score) and patient preference

*

No antithrombotic therapy (IB)

Initiate oral anticoagulation (IA)

Goal-Based Follow up

Category	Intervention	Follow-up aspects	Performance indicator (examples)
Prognostic	Comorbidity control (relevant examples given)	Obesity Arterial hypertension Heart failure Coronary artery disease Diabetes Valvular heart disease	Weight loss Blood pressure control Heart failure therapy and hospitalizations Statin and antiplatelet therapy; revascularization Glycaemic control Valve repair or replacement
Prognostic	Anticoagulation	Indication (risk profile; timing, e.g. post-cardioversion). Adherence (NOAC or VKA) and INR (if VKA). NOAC dosing (co-medications; age; weight; renal function).	Stroke Bleeding Mortality
Mainly symptomatic Partly prognostic	Rate control	Symptoms Average resting heart rate <110 bpm	Modified EHRA score Heart failure status LV function Exercise capacity Hospitalization Therapy complications
Symptomatic at present	Rhythm control	Symptoms vs. side effects Exclusion of pro-arrhythmia (PR; QRS; QTc interval)	
Relevant for implementation of therapy and adherence	Patient education and self-care capabilities	Knowledge (about disease; about treatment; about management goals) Capabilities (what to do if…)	Adherence to therapy Directed evaluation, preferably based on systematic checklists
Relevant for chronic care management	Caregiver involvement	Who? (spouse; GP; home nurse; pharmacist) Clearly spelling out participation roles Knowledge and capabilities	Directed evaluation of task performance (e.g. via patient card) Dispensed medication Log of follow-up visits

OAC

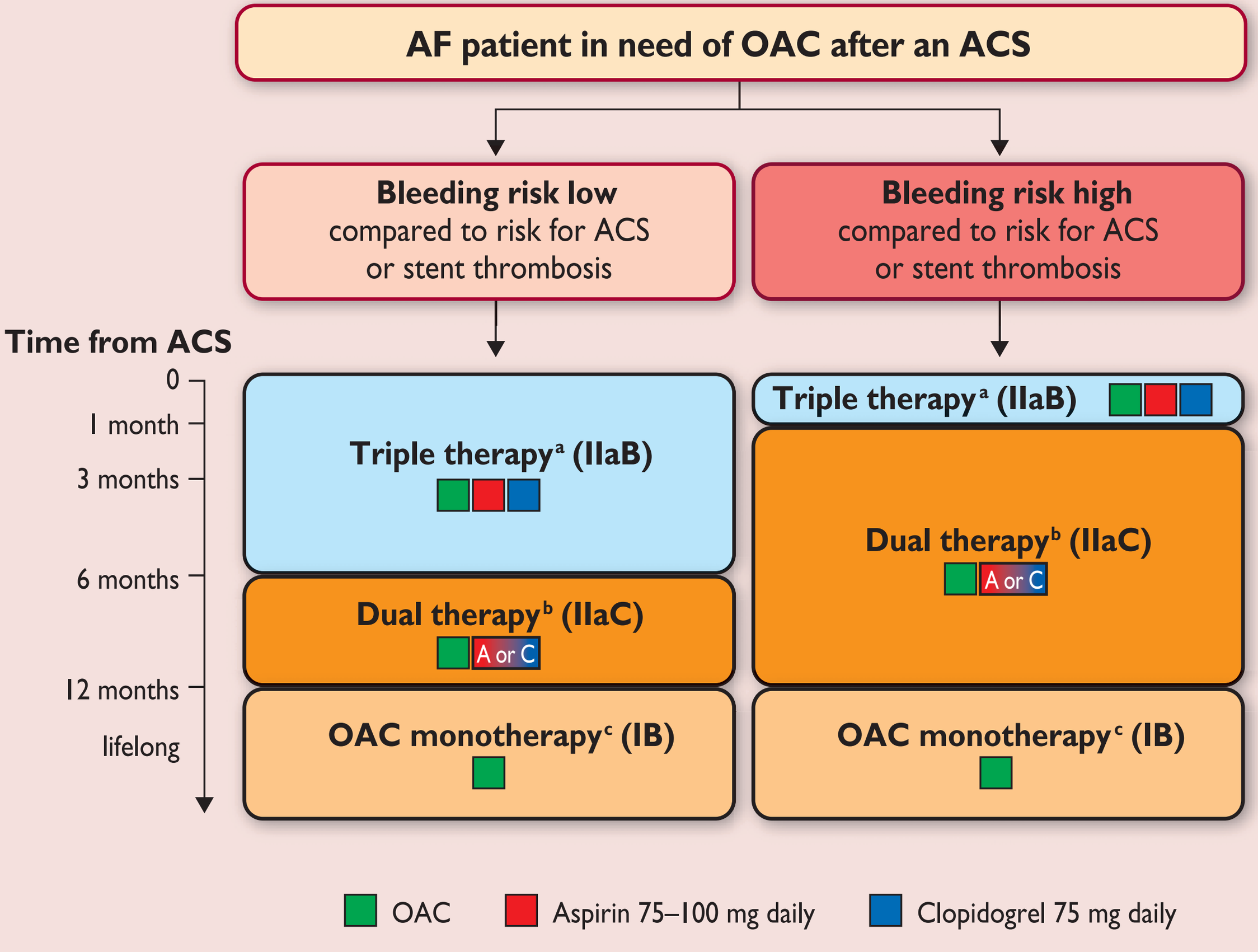
Oral anticoagulation therapy to prevent thromboembolism is recommended for all male AF patients with a CHA_2DS_2-VASc score of 2 or more.	I
Oral anticoagulation therapy to prevent thromboembolism is recommended in all female AF patients with a CHA_2DS_2-VASc score of 3 or more.	I
Oral anticoagulation 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
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

OAC

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
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
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
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

OAC

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)**
In male or female AF patients without additional stroke risk factors, anticoagulant or antiplatelet therapy is not recommended for stroke prevention.	**III (harm)**
Antiplatelet monotherapy is not recommended for stroke prevention in AF patients, regardless of stroke risk.	**III (harm)**
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)**


AF patient in need of OAC after an ACS
Bleeding risk low
compared to risk for ACS
or stent thrombosis
Bleeding risk high
compared to risk for ACS
or stent thrombosis
Time from ACS
0
1 month
3 months
6 months
12 months
lifelong
Triple therapy[a] (IIaB)
Dual therapy[b] (IIaC)
A or C
OAC monotherapy[c] (IB)
Triple therapy[a] (IIaB)
Dual therapy[b] (IIaC)
A or C
OAC monotherapy[c] (IB)
OAC
Aspirin 75–100 mg daily
Clopidogrel 75 mg daily

AF patient in need of OAC after elective PCI with stent

Bleeding risk low
compared to risk for ACS
or stent thrombosis

Bleeding risk high
compared to risk for ACS
or stent thrombosis

Time from PCI

0

1 month

3 months

6 months

12 months

lifelong

Triple therapy[a] (IIaB)

Dual therapy[b] (IIaC)
A or C

OAC monotherapy[c] (IB)

Dual therapy[b] (IIaC)
A or C

OAC monotherapy[c] (IB)

OAC

Aspirin 75–100 mg daily

Clopidogrel 75 mg daily

Stroke prevention for Cardioversion

Stroke prevention in patients designated for cardioversion of AF	
Anticoagulation with heparin or a NOAC should be initiated as soon as possible before every cardioversion of AF or atrial flutter.	**IIa**
For cardioversion of AF/atrial flutter, effective anticoagulation is recommended for a minimum of 3 weeks before cardioversion.	**I**
Transoesophageal echocardiography (TOE) is recommended to exclude cardiac thrombus as an alternative to preprocedural anticoagulation when early cardioversion is planned.	**I**
Early cardioversion can be performed without TOE in patients with a definite duration of AF <48 hours.	**IIa**
In patients at risk for stroke, anticoagulant therapy should be continued long-term after cardioversion according to the long-term anticoagulation recommendations, irrespective of the method of cardioversion or the apparent maintenance of sinus rhythm. In patients without stroke risk factors, anticoagulation is recommended for 4 weeks after cardioversion.	**I**
In patients where thrombus is identified on TOE, effective anticoagulation is recommended for at least 3 weeks.	**I**
A repeat TOE to ensure thrombus resolution should be considered before cardioversion.	**IIa**

Cardioversion

ectrical cardioversion of AF is recommended in patients with acute haemodynamic instability to restore cardiac output.	I
ardioversion of AF (either electrical or pharmacological) is recommended in symptomatic patients with persistent or ng-standing persistent AF as part of rhythm control therapy.	I
e-treatment with amiodarone, flecainide, ibutilide, or propafenone should be considered to enhance success of electrical rdioversion and prevent recurrent AF.	IIa
patients with no history of ischaemic or structural heart disease, flecainide, propafenone, or vernakalant are commended for pharmacological cardioversion of new-onset AF.	I
patients with no history of ischaemic or structural heart disease, ibutilide should be considered for pharmacological nversion of AF.	IIa
selected patients with recent-onset AF and no significant structural or ischaemic heart disease, a single oral dose of cainide or propafenone (the 'pill in the pocket' approach) should be considered for patient-led cardioversion, following fety assessment.	IIa
patients with ischaemic and/or structural heart disease, amiodarone is recommended for cardioversion of AF.	I
rnakalant may be considered as an alternative to amiodarone for pharmacological conversion of AF in patients without potension, severe heart failure or severe structural heart disease (especially aortic stenosis).	IIb

Patient with active bleeding

Compress bleeding sites mechanically

Assess haemodynamic status, blood pressure, basic coagulation parameters, blood count, and kidney function

Obtain anticoagulation history (last NOAC / VKA dose)

VKA		**NOAC**
Delay VKA until INR <2	**Minor**	Delay NOAC for 1 dose or 1 day
Add symptomatic treatment: Fluid replacement Blood transfusion Treat bleeding cause (e.g. gastroscopy) Consider to add Vitamin K (1–10 mg) i.v.	**Moderate - severe**	Add symptomatic treatment: Fluid replacement Blood transfusion Treat bleeding cause (e.g. gastroscopy) Consider to add oral charcoal if recently ingested NOAC
Consider PCC and FFP Consider replacement of platelets where appropriate	**Severe or life-threatening**	**Consider specific antidote, *or* PCC if no antidote available Consider replacement of platelets where appropriate**

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Patient with atrial fibrillation and acute TIA or ischaemic stroke
Exclusion of intracerebral bleeding by CT or MRI

TIA

Mild stroke (NIHSS <8)

Moderate stroke (NIHSS 8–15)

Severe stroke (NIHSS ≥16)

Consider additional clinical factors favouring early / delayed initiation of OAC

Factors favouring early initiation of OAC:

Low NIHSS (<8):
Small/no brain infarction on imaging
High recurrence risk, e.g. cardiac thrombus on echo
No need for percutaneous endoscopic gastrostomy
No need for carotid surgery
No haemorrhagic transformation
Clinically stable
Young patient
Blood pressure is controlled

Factors favouring delayed initiation of OAC:

High NIHSS (≥8):
Large/moderate brain infarction on imaging
Needs gastrostomy or major surgical intervention
Needs carotid surgery
Haemorrhagic transformation
Neurologically unstable
Elderly patient
Uncontrolled hypertension

Evaluate haemorrhagic transformation by CT or MRI at day 6

Evaluate haemorrhagic transformation by CT or MRI at day 12

Start OAC

1 day after acute event

3 days after acute event

6 days after acute event

12 days after acute event

Systemic thrombolysis with rtPA is not recommended if the INR is above 1.7 (or, for patients on dabigatran, if aPTT is outside normal range).	**III (harm)**
NOACs are recommended in preference to VKAs or aspirin in AF patients with a previous stroke.	**I**
After TIA or stroke, combination therapy of OAC and an antiplatelet is not recommended.	**III (harm)**

Rhythm-Rate Control Strategies

- Electrical
- Pharmacological
- Radiofrequency ablation
- Upstream therapy

PMK Cardio

Acute heart rate control of AF

LVEF <40% or signs of congestive heart failure

Smallest dose of beta-blocker to achieve rate control

Amiodarone is an option in patients with haemodynamic instability or severely reduced LVEF

Initial resting heart rate target <110 bpm

Add digoxin

Initial resting heart rate target <110 bpm

LVEF ≥40%

Beta-blocker or diltiazem or verapamil

Check previous drug history to avoid concomitant administration

Initial resting heart rate target <110 bpm

Add digoxin

Initial resting heart rate target <110 bpm

Avoid bradycardia

Perform echocardiogram to determine further management/ choice of maintenance therapy

Consider need for anticoagulation

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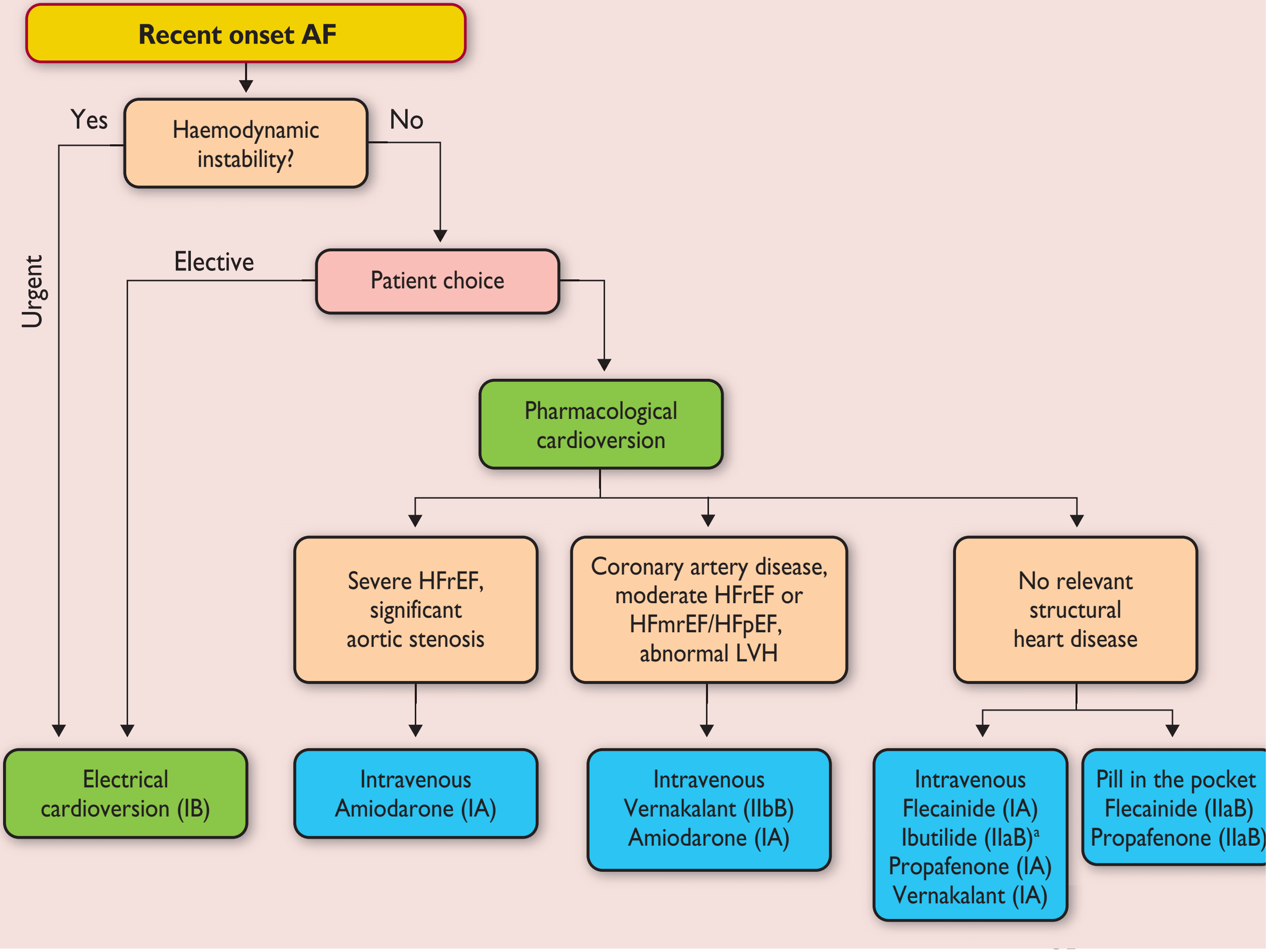
Drug	Route	1st dose	Follow-up dose
Flecainide	Oral	200–300 mg	N/A
	IV	1.5–2 mg/kg over 10 min	
Amiodarone	IV[a]	5–7 mg/kg over 1–2 hours	50 mg/hour to a maximum of 1.0 g over 24 hours
Propafenone	IV	1.5–2 mg/kg over 10 min	
	Oral	450–600 mg	
Ibutilide[b]	IV	1 mg over 10 min	1 mg over 10 min after waiting for 10 min
Vernakalant	IV	3 mg/kg over 10 min	2 mg/kg over 10 min after waiting for 15 min


Recent onset AF
Haemodynamic instability?
Yes
No
Urgent
Elective
Patient choice
Pharmacological cardioversion
Severe HFrEF, significant aortic stenosis
Coronary artery disease, moderate HFrEF or HFmrEF/HFpEF, abnormal LVH
No relevant structural heart disease
Electrical cardioversion (IB)
Intravenous Amiodarone (IA)
Intravenous Vernakalant (IIbB) Amiodarone (IA)
Intravenous Flecainide (IA) Ibutilide (IIaB)[a] Propafenone (IA) Vernakalant (IA)
Pill in the pocket Flecainide (IIaB) Propafenone (IIaB)

Long-term heart rate control of AF

Perform echocardiogram (IC)
Choose initial rate control therapy (IB) and combination therapy if required (IIaC)
Target initial resting heart rate <110 bpm (IIaB), avoiding bradycardia

LVEF <40%

- Beta-blocker
- Digoxin

Consider early low-dose combination therapy

- Add digoxin
- Add beta-blocker

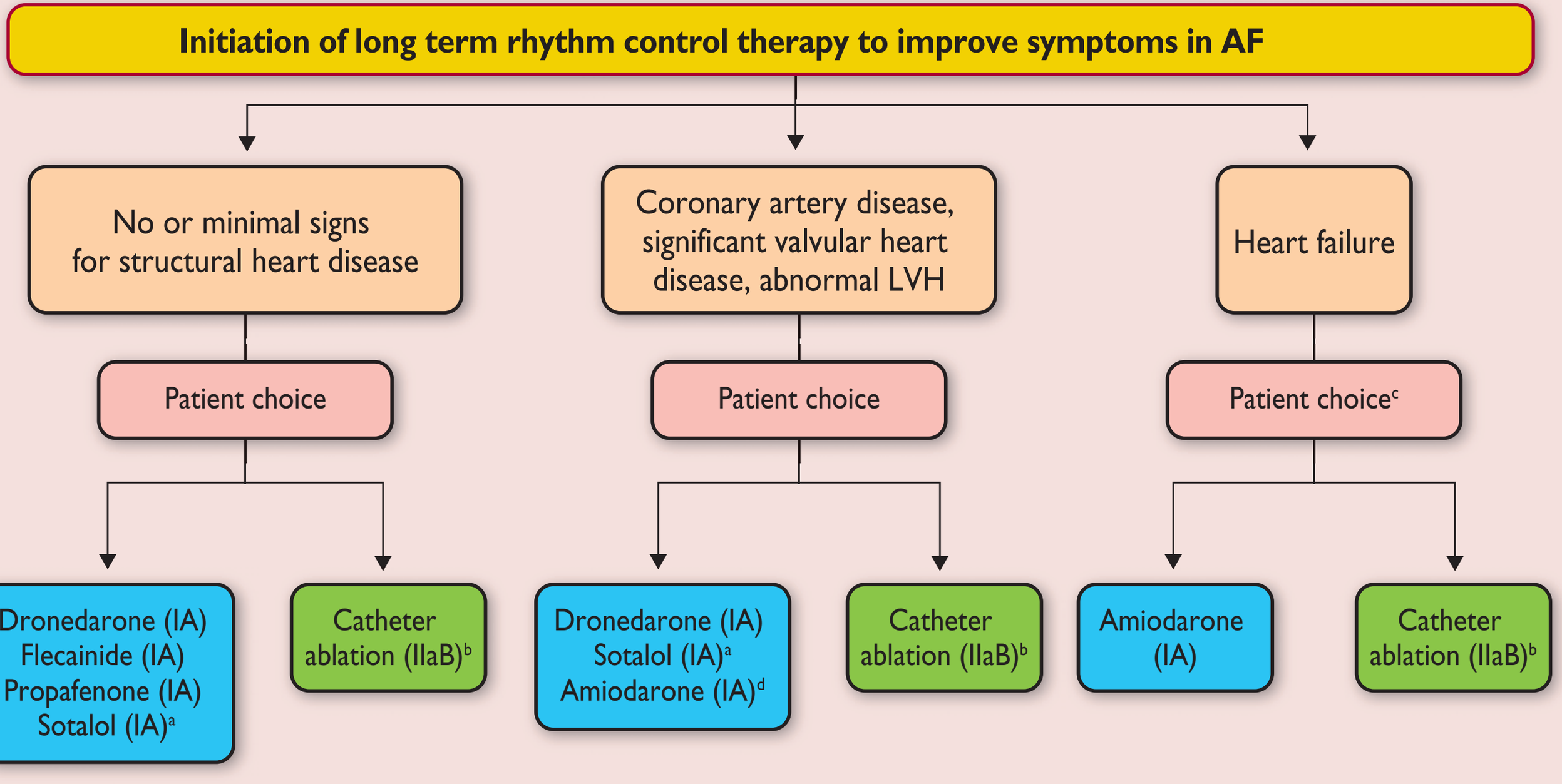
LVEF ≥40%

- Diltiazem/ verapamil
- Beta-blocker
- Digoxin

Add therapy to achieve target heart rate or if ongoing symptoms

- Add digoxin
- Add digoxin
- Add diltiazem, verapamil or beta-blocker

AAD for the long-term maintenance of sinus rhythm/prevention of recurrent AF	
The choice of AAD needs to be carefully evaluated, taking into account the presence of comorbidities, cardiovascular risk and potential for serious proarrhythmia, extracardiac toxic effects, patient preferences, and symptom burden.	I
Dronedarone, flecainide, propafenone, or sotalol are recommended for prevention of recurrent symptomatic AF in patients with normal left ventricular function and without pathological left ventricular hypertrophy.	I
Dronedarone is recommended for prevention of recurrent symptomatic AF in patients with stable coronary artery disease, and without heart failure.	I
Amiodarone is recommended for prevention of recurrent symptomatic AF in patients with heart failure.	I
Amiodarone is more effective in preventing AF recurrences than other AAD, but extracardiac toxic effects are common and increase with time. For this reason, other AAD should be considered first.	IIa
Patients on AAD therapy should be periodically evaluated to confirm their eligibility for treatment.	IIa


Initiation of long term rhythm control therapy to improve symptoms in AF
No or minimal signs for structural heart disease
Coronary artery disease, significant valvular heart disease, abnormal LVH
Heart failure
Patient choice
Patient choice
Patient choice[c]
Dronedarone (IA)
Flecainide (IA)
Propafenone (IA)
Sotalol (IA)[a]
Catheter ablation (IIaB)[b]
Dronedarone (IA)
Sotalol (IA)[a]
Amiodarone (IA)[d]
Catheter ablation (IIaB)[b]
Amiodarone (IA)
Catheter ablation (IIaB)[b]

Monitoring

PMK Cardi

Drug	Dose	Main contra-indications and precautions	Warning signs warranting discontinuation	AV nodal slowing	Suggested ECG monitoring during initiation
Amiodarone	600 mg in divided doses for 4 weeks, 400 mg for 4 weeks, then 200 mg once daily	Caution when using concomitant therapy with QT-prolonging drugs and in patients with SAN or AV node and conduction disease. The dose of VKAs and of digitalis should be reduced. Increased risk of myopathy with statins. Caution in patients with pre-existing liver disease.	QT prolongation >500 ms	10–12 bpm in AF	Baseline, 1 week, 4 weeks
Dronedarone	400 mg twice daily	Contra-indicated in NYHA Class III or IV or unstable heart failure, during concomitant therapy with QT-prolonging drugs, or powerful CYP3A4 inhibitors (e.g. verapamil, diltiazem, azole antifungal agents), and when CrCl <30 mg/mL. The dose of digitalis, beta-blockers, and of some statins should be reduced. Elevations in serum creatinine of 0.1–0.2 mg/dL are common and do not reflect a decline in renal function. Caution in patients with pre-existing liver disease.	QT prolongation >500 ms	10–12 bpm in AF	Baseline, 1 week.
Flecainide Flecainide slow release	100–150 mg twice daily 200 mg once daily	Contra-indicated if CrCl <50 mg/mL, liver disease, IHD or reduced LV ejection fraction. Caution in the presence of SAN or AV node or conduction disease. CYP2D6 inhibitors (e.g. fluoxetine or tricyclic antidepressants) increase plasma concentration.	QRS duration increases >25% above baseline	None	Baseline, day 1, day 2–3
Propafenone Propafenone SR	150–300 mg three times daily 225–425 mg twice daily	Contra-indicated in IHD or reduced LV ejection fraction. Caution in the presence of SAN or AV node and conduction disease, renal or liver impairment, and asthma. Increases concentration of digitalis and warfarin.	QRS duration increase >25% above baseline	Slight	Baseline, day 1, day 2–3
d,l sotalol	80–160 mg twice daily	Contra-indicated in the presence of significant LV hypertrophy, systolic heart failure, asthma, pre-existing QT prolongation, hypokalaemia, CrCl<50 mg/mL. Moderate renal dysfunction requires careful adaptation of dose.	QT interval >500 ms, QT prolongation by >60 ms upon therapy initiation	Similar to high dose blockers	Baseline, day 1, day 2–3

PMK Card

Selection of further rhythm control therapy after therapy failure to improve symptoms of AF

- Failure of dronedarone flecainide propafenone or sotalol
  - Patient choice
    - Amiodarone (IA)
    - another AAD (IIa)
    - Catheter ablation (IA/IIaB)[a]
- Failure of amiodarone
  - Patient choice
    - Catheter ablation (IA/IIaB)[a]
    - Hybrid therapy (IIaC)[c]
- Failure of catheter ablation
  - Patient choice
    - Repeat ablation (IA/IIaB)[a]
    - another AAD (IIa)
    - Hybrid therapy (IIaC)[c]

All → Patient choice informed by AF Heart Team

- AF surgery (IIaC)[b]
- Rate control (IB)
- Hybrid therapy (IIaC)[c]

Ablation

Catheter ablation of symptomatic paroxysmal AF is recommended to improve AF symptoms in patients who have symptomatic recurrences of AF on antiarrhythmic drug therapy (amiodarone, dronedarone, flecainide, propafenone, sotalol) and who prefer further rhythm control therapy, when performed by an electrophysiologist who has received appropriate training and is performing the procedure in an experienced centre.	**I**
Ablation of common atrial flutter should be considered to prevent recurrent flutter as part of an AF ablation procedure if documented or occurring during the AF ablation.	**IIa**
Catheter ablation of AF should be considered as first-line therapy to prevent recurrent AF and to improve symptoms in selected patients with symptomatic paroxysmal AF as an alternative to antiarrhythmic drug therapy, considering patient choice, benefit, and risk.	**IIa**
All patients should receive oral anticoagulation for at least 8 weeks after catheter (IIaB) or surgical (IIaC) ablation.	**IIa**
Anticoagulation for stroke prevention should be continued indefinitely after apparently successful catheter or surgical ablation of AF in patients at high-risk of stroke.	**IIa**
When catheter ablation of AF is planned, continuation of oral anticoagulation with a VKA (IIaB) or NOAC (IIaC) should be considered during the procedure, maintaining effective anticoagulation.	**IIb**

Hypertrophic cardiomypathy

Lifelong oral anticoagulation to prevent stroke is recommended in HCM patients who develop AF.
Restoration of sinus rhythm by electrical or pharmacological cardioversion to improve symptoms is recommended in HCM patients with symptomatic new-onset AF.
In haemodynamically stable HCM patients with AF, ventricular rate control using beta-blockers and diltiazem/verapamil is recommended.
Treatment of LV outflow tract obstruction should be considered in AF patients with HCM to improve symptoms.
Amiodarone should be considered to achieve rhythm control and maintain sinus rhythm in HCM patients with recurrent symptomatic AF.

Sports

Recommendations	Class[a]
Moderate regular physical activity is recommended to prevent AF, while athletes should be counselled that long-lasting intense sports participation can promote AF.	I
AF ablation should be considered to prevent recurrent AF in athletes.	IIa
The ventricular rate while exercising with AF should be evaluated in every athlete (by symptoms and/ or by monitoring), and titrated rate control should be instituted.	IIa
After ingestion of pill-in-the-pocket flecainide or propafenone, patients should refrain from sports as long as AF persists and until two half-lives of the antiarrhythmic drug have elapsed.	IIa

Postoperative AF

Recommendations	Class[a]	Level[b]
Peri-operative oral beta-blocker therapy is recommended for the prevention of postoperative AF after cardiac surgery.	I	B
Restoration of sinus rhythm by electrical cardioversion or antiarrhythmic drugs is recommended in postoperative AF with haemodynamic instability.	I	C
Long-term anticoagulation should be considered in patients with AF after cardiac surgery at risk for stroke, considering individual stroke and bleeding risk.	IIa	B
Antiarrhythmic drugs should be considered for symptomatic postoperative AF after cardiac surgery in an attempt to restore sinus rhythm.	IIa	C
Peri-operative amiodarone should be considered as prophylactic therapy to prevent AF after cardiac surgery.	IIa	A

(1) Use ECG screening in at-risk populations for AF, especially stroke survivors and the elderly.
(2) Document AF by ECG before starting treatment.
(3) Evaluate all AF patients by clinical evaluation, ECG, and echocardiogram for underlying cardiovascular conditions such as hypertension, heart failure, valvular heart disease, and others.
(4) Provide tailored information and education to AF patients to empower them to support AF management.
(5) Propose lifestyle changes to all suitable AF patients to make their management more effective.
(6) Treat underlying cardiovascular conditions adequately, e.g. valve repair or replacement in AF patients with significant valvular heart disease, treatment of heart failure, or management of hypertension, among others.
(7) Use oral anticoagulation in all AF patients unless they are at low risk for stroke based on the CHA_2DS_2VASc score or have true contraindications for anticoagulant therapy.
(8) Anticoagulate patients with atrial flutter similar to AF. Offer isthmus ablation to symptomatic flutter patients.
(9) Reduce all modifiable bleeding risk factors in all AF patients on oral anticoagulation, e.g. by treating hypertension, minimizing the duration and intensity of concomitant antiplatelet and non-steroidal anti-inflammatory drug therapy, treating anaemia and eliminating causes for blood loss, maintaining stable INR values in patients on VKAs, and moderating alcohol intake.
(10) Check ventricular rate in all AF patients and use rate control medications to achieve lenient rate control.
(11) Evaluate AF-related symptoms in all AF patients using the modified EHRA symptoms scale. Whenever patients have AF-related symptoms, aim to improve symptoms by adjustment of rate control therapy and by offering antiarrhythmic drugs, cardioversion, or catheter or surgical ablation.
(12) Select antiarrhythmic drugs based on their safety profile and consider catheter or surgical ablation when antiarrhythmic drugs fail.
(13) Do not offer routine genetic testing in AF patients unless there is suspicion of an inherited cardiac condition.
(14) Do not use antiplatelet therapy for stroke prevention in AF.
(15) Do not permanently discontinue oral anticoagulation in AF patients at increased risk of stroke unless such a decision is taken by a multidisciplinary team.
(16) Do not use rhythm control therapy in asymptomatic AF patients, nor in patients with permanent AF.
(17) Do not perform cardioversion or catheter ablation without anticoagulation, unless an atrial thrombus has been ruled out transoesophageal echocardiogram.

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Anticoagulant
Rate control

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