

Clinical Update

ADAPTED FROM:

**2023 ACC/AHA/ACCP/HRS
Guideline for the Diagnosis and
Management of Atrial Fibrillation**



American
Heart
Association.

Table 1. Applying Class of Recommendation and Level of Evidence to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care

CLASS (STRENGTH) OF RECOMMENDATION	LEVEL (QUALITY) OF EVIDENCE‡
CLASS 1 (STRONG) Benefit >>> Risk Suggested phrases for writing recommendations: <ul style="list-style-type: none"> • Is recommended • Is indicated/useful/effective/beneficial • Should be performed/administered/other • Comparative-Effectiveness Phrases†: <ul style="list-style-type: none"> – Treatment/strategy A is recommended/indicated in preference to treatment B – Treatment A should be chosen over treatment B 	LEVEL A <ul style="list-style-type: none"> • High-quality evidence‡ from more than 1 RCT • Meta-analyses of high-quality RCTs • One or more RCTs corroborated by high-quality registry studies
CLASS 2a (MODERATE) Benefit >> Risk Suggested phrases for writing recommendations: <ul style="list-style-type: none"> • Is reasonable • Can be useful/effective/beneficial • Comparative-Effectiveness Phrases†: <ul style="list-style-type: none"> – Treatment/strategy A is probably recommended/indicated in preference to treatment B – It is reasonable to choose treatment A over treatment B 	LEVEL B-R (Randomized) <ul style="list-style-type: none"> • Moderate-quality evidence‡ from 1 or more RCTs • Meta-analyses of moderate-quality RCTs
CLASS 2b (Weak) Benefit ≈ Risk Suggested phrases for writing recommendations: <ul style="list-style-type: none"> • May/might be reasonable • May/might be considered • Usefulness/effectiveness is unknown/unclear/uncertain or not well-established 	LEVEL B-NR (Nonrandomized) <ul style="list-style-type: none"> • Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies • Meta-analyses of such studies
CLASS 3: No Benefit (MODERATE) Benefit = Risk Suggested phrases for writing recommendations: <ul style="list-style-type: none"> • Is not recommended • Is not indicated/useful/effective/beneficial • Should not be performed/administered/other 	LEVEL C-LD (Limited Data) <ul style="list-style-type: none"> • Randomized or nonrandomized observational or registry studies with limitations of design or execution • Meta-analyses of such studies • Physiological or mechanistic studies in human subjects
CLASS 3: Harm (STRONG) Risk > Benefit Suggested phrases for writing recommendations: <ul style="list-style-type: none"> • Potentially harmful • Causes harm • Associated with excess morbidity/mortality • Should not be performed/administered/other 	LEVEL C-EO (Expert Opinion) <ul style="list-style-type: none"> • Consensus of expert opinion based on clinical experience.

•COR and LOE are determined independently (any COR may be paired with any LOE).

•A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

•*The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

•†For comparative-effectiveness recommendation (COR 1 and 2a; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

•‡The method of assessing quality is evolving, including the application of standardized, widely-used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

•COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.



Prevalence, Incidence, Morbidity and Mortality of AF

Prevalence and Incidence of AF is increasing and projected to double between 2010 and 2030



50 million

estimated individuals with AF worldwide in 2020



At least **5.6 million** individuals with AF in USA in 2015

- about 11% estimated cases were undiagnosed



Overall lifetime risk:

- 30-40% in White individuals
- 20% in African American individuals
- 15% in Chinese individuals

In Medicare beneficiaries, the most frequent outcome in 5-yr after AF diagnosis was death (19.5% at 1-yr; 48.8% at 5-yr)



AF is associated with increased risks:

- 1.5-to 2-fold risk of death
- 2.4-fold risk of stroke
- 1.5-fold risk of CI/ dementia
- 1.5-fold risk of MI
- 2-fold risk of SCD
- 5-fold risk of HF
- 1.6-fold risk of CKD
- 1.3-fold risk of PAD



AF accounted for **\$28.4 billion/ year** in US healthcare spending in 2016

Abbreviations: AF indicates atrial fibrillation; CI, cognitive impairment; CKD, chronic kidney disease; HF, heart failure; MI, myocardial infarctions; PAD, peripheral arterial disease; SCD, sudden cardiac death; yr, year; and yrs, years.

Risk Factors for Diagnosed Atrial Fibrillation



Demographic, Anthropometric, Cardiovascular Risk Factors

- Advancing Age
- Smoking
- Low Physical Activity
- Elevating Resting Heart Rate
- Obesity
- Increasing Height
- Hypertension
- Diabetes



Cardiovascular Disease

- HF
- CAD
- Atrial inflammation from pericarditis or myocarditis
- Cardiac Surgery
- Valvular Heart Disease
- Systemic Arterial Hypertension
- Structural Heart Diseases



Non-Cardiac Conditions

- CKD
- OSA
- Sepsis
- Pulmonary disease (COPD, PE)
- Metabolic disturbances from alcohol abuse, hypokalemia, hyperthyroidism
- Postoperative state



Biological Markers

- ECG markers (prolonged PR, LVH)
- Biomarkers (elevated BNP, IL6/TNF-alpha, LP(a))
- Imaging markers (increased left atrial size, increased LV wall thickness)



Genetic Markers

- Family history/ heritability
- GWAS (presence of associated loci)

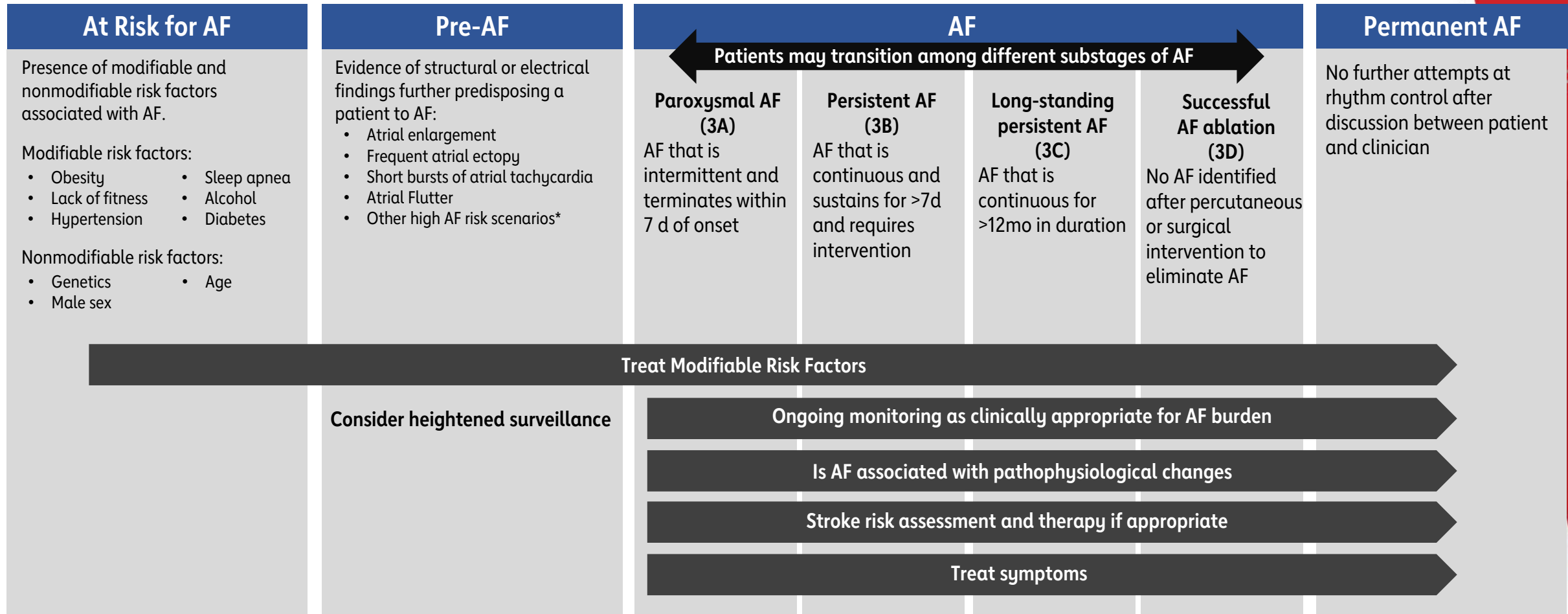


Socioeconomic Determinants of Health

- Education Level
- Income Level
- Socioeconomic status

Abbreviations: BNP indicates brain natriuretic peptide; CAD, coronary artery disease; COPD, chronic obstructive pulmonary disease; CKD, chronic kidney disease; GWAS, genome wide association studies; HF, heart failure; IL6, interleukin 6; LP(a), lipoprotein a; LV, left ventricle; LVH, left ventricular hypertrophy; OSA, obstructive sleep apnea; PE, pulmonary embolism; PR, PR interval; and TNF, tumor necrosis factor.

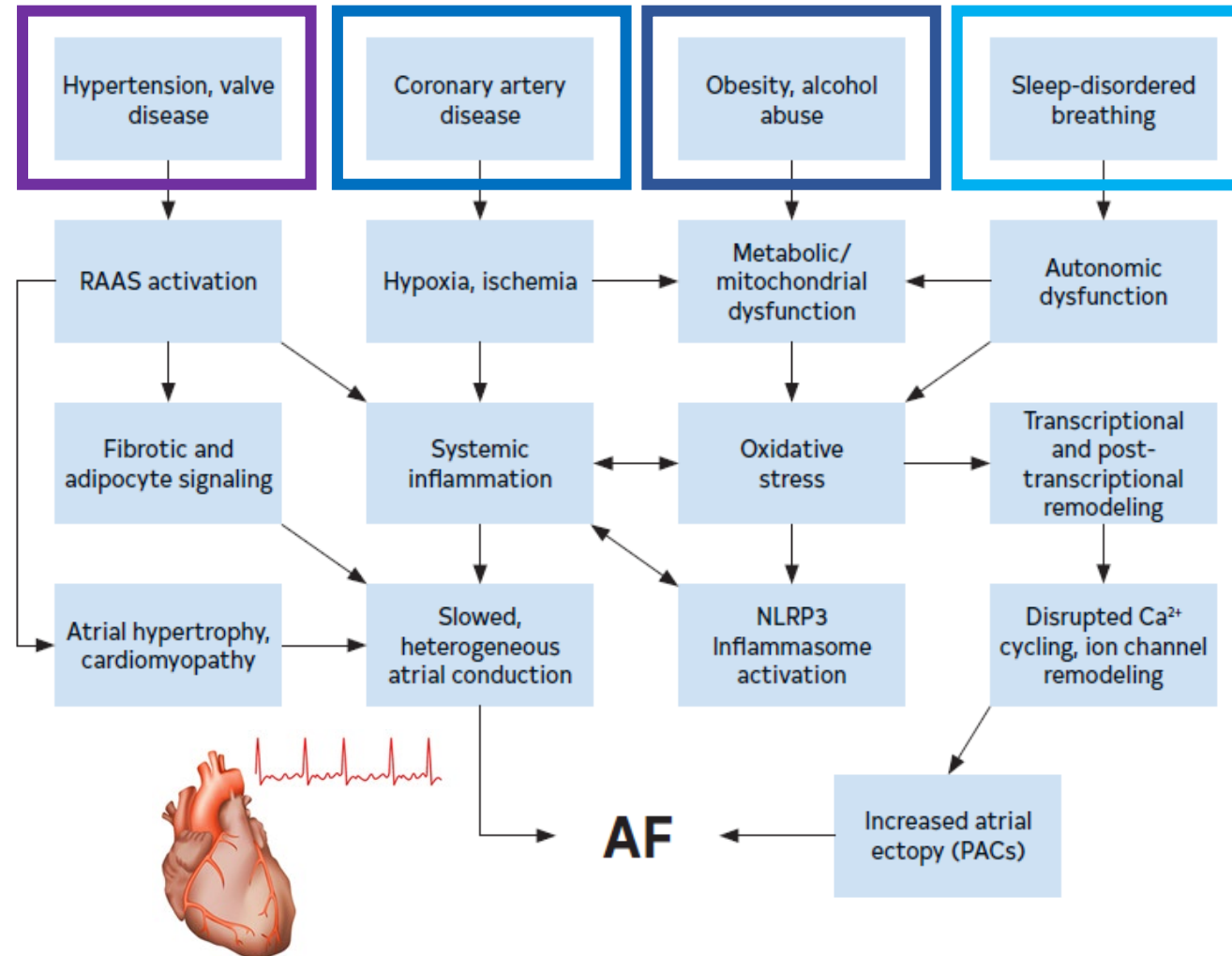
AF Stages: Evolution of Atrial Arrhythmia Progression



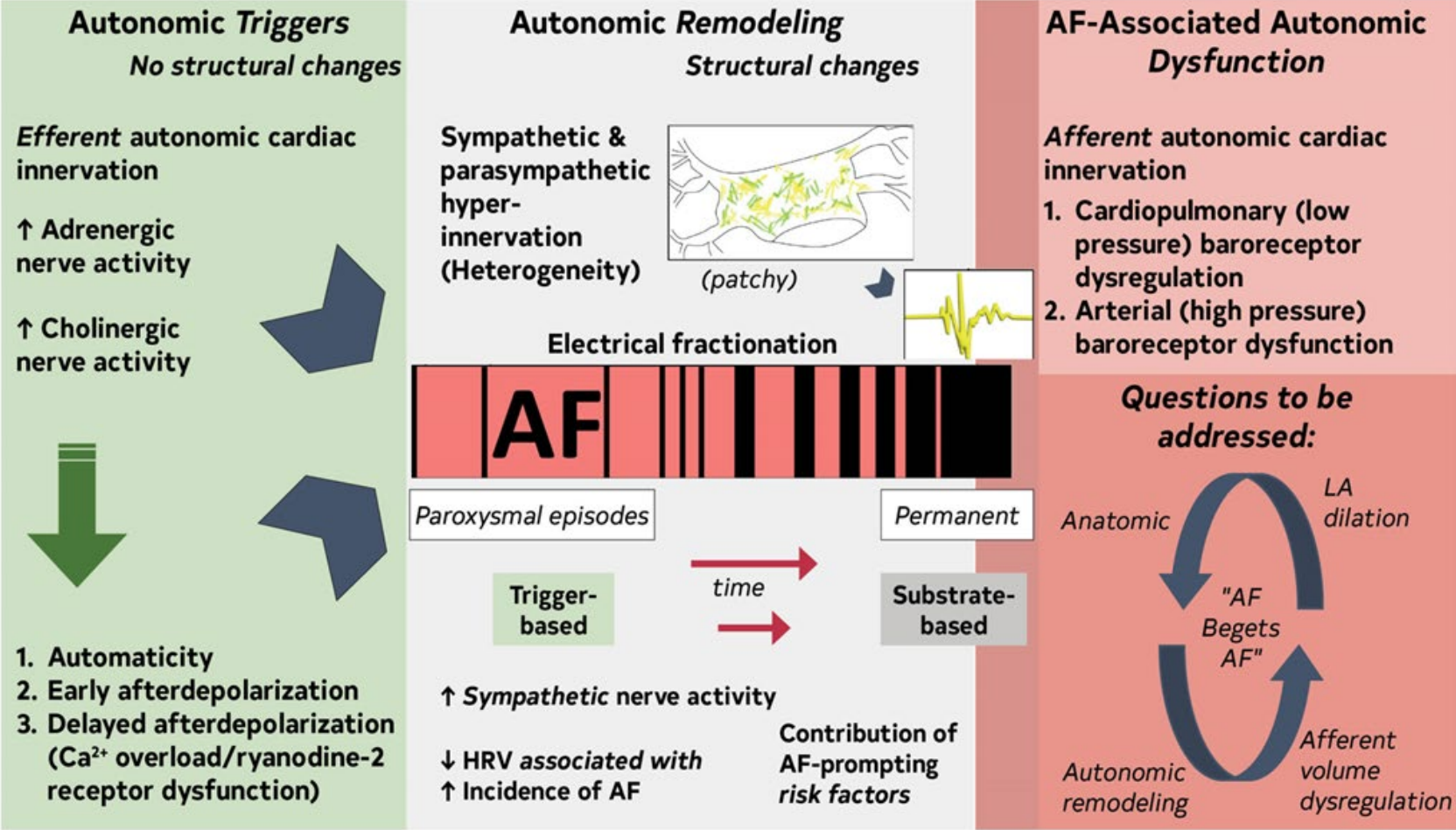
Note: *Heart failure, valve disease, coronary artery disease, hypertrophic cardiomyopathy, neuromuscular disorders, thyroid disease.

Abbreviations: AF indicates atrial fibrillation, d, day; and mo, month.

Mechanisms and Pathways Leading to AF



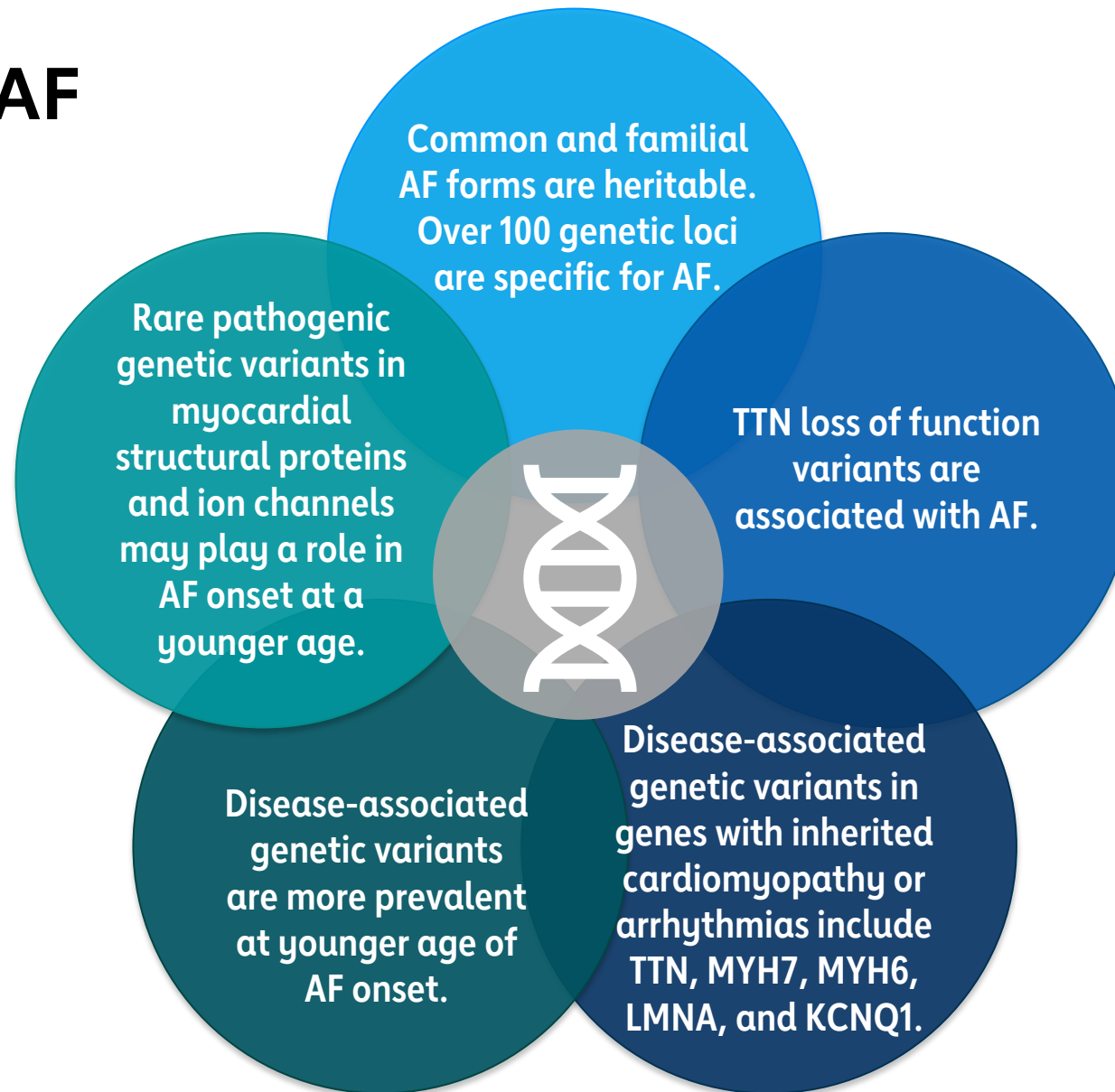
Contemporary Summary of the Role of the Autonomic Nervous System in AF



Abbreviations: AF indicates atrial fibrillation; Ca²⁺, calcium cation; HRV, heart rate variability; and LA, left atrium.

Joglar, J. A. et al., 2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation. *Circulation*.

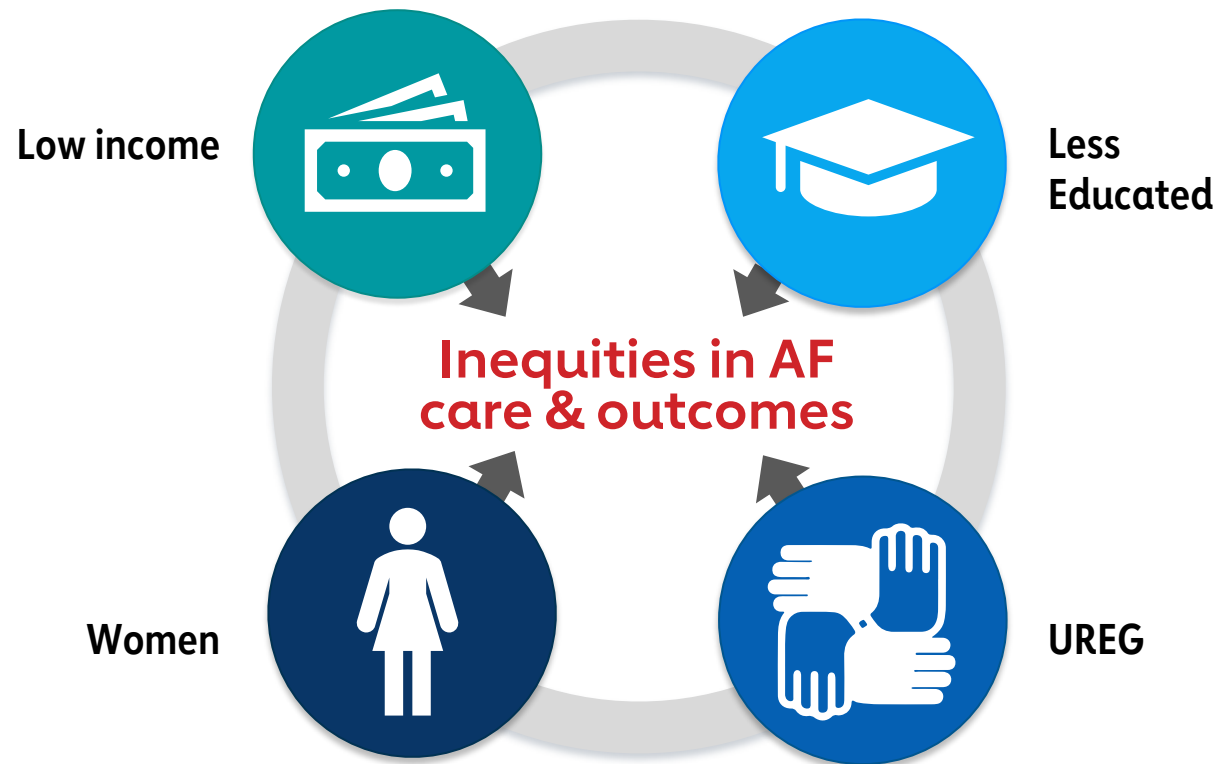
Genetics of AF



Abbreviation: AF indicates atrial fibrillation.

Health Inequities and Barriers to AF Management

Patients with AF, regardless of sex and gender diversity, race and ethnicity, or adverse SDOH, should be equitably offered guideline-directed stroke risk reduction therapies as well as rate or rhythm control strategies and LRFM as indicated to improve QOL and prevent adverse outcomes. (Class 1)



Barriers include:

- Referral for ablation later in disease course
- Less likely to be treated with stroke risk reduction therapies
- More symptomatic and with worse QOL, yet less likely to be referred to EP specialist
- Less likely to receive catheter ablation
- Lower oral anticoagulation rates
- Lower DOAC adherence rates
- Less use of cardioversion
- Increased risk of hospitalization, stroke, HF and death

Abbreviations: AF indicates atrial fibrillation; DOAC, direct oral anticoagulant; EP, electrophysiology; HF, heart failure; LRFM, lifestyle and risk factor modification; QOL, quality of life; SDOH, social determinates of health; and UREG, underrepresented racial and ethnic groups.

Shared Decision Making and Quality of Life in the Management of AF

Shared Decision-Making is essential in AF management



Decision to anticoagulate



Symptom burden and decision to pursue rhythm control





AF ablation



Publicly Available Decision Aids

Agency	Website Link	Focus Area
American College of Cardiology Colorado Program for Patient Centered Decisions	https://patientdecisionaid.org/icd/atrial-fibrillation/	Stroke risk reduction therapies
Anticoagulation Choice Decision Aid	https://anticoagulationdecisionaid.mayoclinic.org/	Stroke risk reduction therapies
Ottawa Hospital Research Institute Developer Healthwise	https://decisionaid.ohri.ca/AZlist.html	AF ablation Stroke Risk Reduction
Stanford	https://afibguide.com/	Stroke risk reduction therapies

Use of evidence-based decision aids might be useful to guide stroke reduction therapy treatment decisions throughout the disease course to improve engagement, decisional quality and patient satisfaction. (Class 2b)

Rhythm Monitoring Tools and Methods





Undiagnosed Atrial fibrillation	
COR	RECOMMENDATIONS
1	 <p>Diagnosis should be made with visual interpretation of ECG or intracardiac signals by a clinician.</p>
2a	 <p>For patients who have had a prior thromboembolic event, implantable cardiac monitors have the highest sensitivity in detecting AF.</p>

Known Atrial fibrillation	
COR	RECOMMENDATIONS
2a	 <p>AF frequency, duration and burden can be inferred using automated algorithms from ECG monitors, implantable cardiac monitors, and cardiac rhythm devices with an atrial lead.</p>
2a	 <p>Consumer-accessible ECG device that provides a high-quality tracing can be used to detect recurrences.</p>

Primary Prevention of Atrial Fibrillation





Secondary prevention: Lifestyle Factors




COR	RECOMMENDATIONS
1	 In overweight or obese (BMI > 27 kg/m ²) patients, 10% weight loss reduces AF symptoms, burden, recurrence, and progression to persistent AF.
1	 Moderate to vigorous exercise training to a target of 210 minutes/week reduces AF symptoms, burden, increases maintenance of SR, increases functional capacity and improves QOL.
1	 Cigarette smokers should be advised to quit smoking . They should receive GDMT for tobacco cessation to mitigate risks of adverse CV outcomes.
2b	 It is reasonable to screen for OSA, given its high prevalence in patients with AF, although the role of tx of sleep disordered breathing to maintain SR is uncertain.

Abbreviations: AF indicates atrial fibrillation; BMI, body mass index; CV, cardiovascular; GDMT, guideline-directed medical therapy OSA, obstructive sleep apnea; QOL, quality of life; SR, sinus rhythm; and tx, treatment.

Secondary prevention: Dietary Factors

COR	RECOMMENDATIONS
1	 Patients seeking a rhythm control strategy should minimize or eliminate alcohol consumption to reduce AF recurrence and burden.
3: No Benefit	 Caffeine abstinence does not prevent AF episodes. It may reduce symptoms in patients who report caffeine triggers.

Secondary prevention: Medical Conditions

COR	RECOMMENDATIONS
1	 Optimal blood pressure control reduces AF recurrence and AF-related CV events.
1	 Comprehensive care addressing LRFM, AF symptoms, risk of stroke, and associated medical conditions reduces AF burden, progression, and consequences.
2a	 Use of clinical care pathways to promote comprehensive, team-based care enhances adherence to evidence based therapies.

Risk Stratification Schemes to Prevent Thromboembolic Events in AF

COR	RECOMMENDATIONS
1	Evaluate for annual risk of thromboembolic events using a validated clinical risk score, such as CHA ₂ DS ₂ -VASc.
1	Evaluate for factors that indicate a higher risk of bleeding* to identify interventions to prevent bleeding on anticoagulation.
2a	Those at intermediate annual risk of thromboembolic events (eg, equivalent to CHA ₂ DS ₂ -VASc score of 1 in men or 2 in women), who remain uncertain about the benefit of anticoagulation, can benefit from consideration of factors that might modify their risk of stroke to help inform the decision.**
3: No Benefit	Those deemed at high risk for stroke, bleeding risk scores should not be used in isolation to determine eligibility for oral anticoagulation but instead to identify and modify bleeding risk factors and to inform medical decision-making.

Note: *Prior bleeding, use of medication that increase bleeding risk

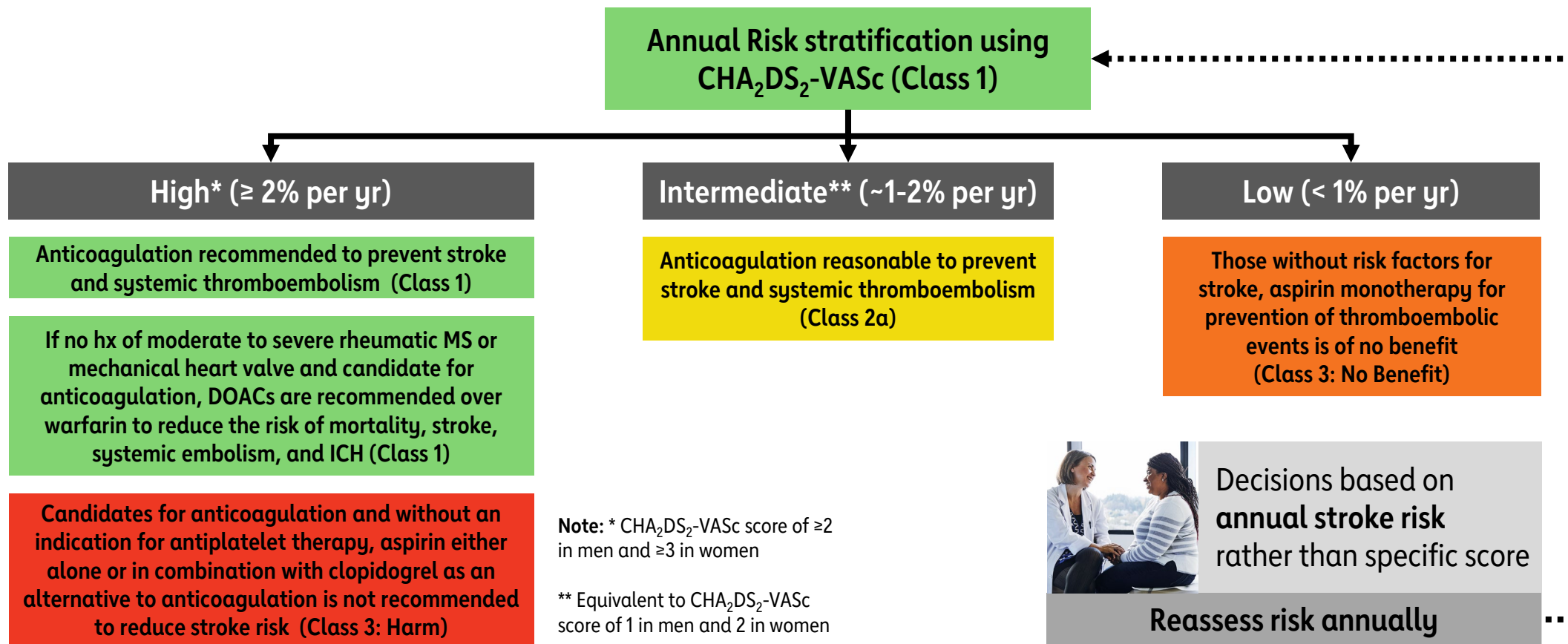
**Higher AF burden/Long duration, persistent/permanent AF vs paroxysmal, obesity (BMI, ≥30 kg/m²), HCM, poorly controlled HTN, eGFR (<45 mL/h), proteinuria (>150 mg/24 h or equivalent), enlarged LA volume (≥73 mL) or diameter (≥4.7 cm)

Abbreviations: AF indicates atrial fibrillation; ATRIA, Anticoagulation and Risk Factors in Atrial Fibrillation; BMI, body mass index; CHA₂DS₂-VASc, congestive heart failure, hypertension, age ≥75 years (doubled), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (doubled), vascular disease, age 65 to 74 years, sex category; cm, centimeter; eGFR, estimated glomerular filtration rate; GARFIELD-AF, Global Anticoagulant Registry in the Field-Atrial Fibrillation; h, hour; HCM, hypertrophic cardiomyopathy; HTN, hypertension; kg, kilogram; LA, left atrium; m², meters squared; mg, milligram; mL, millimeter; and vs, versus.

Key Considerations:

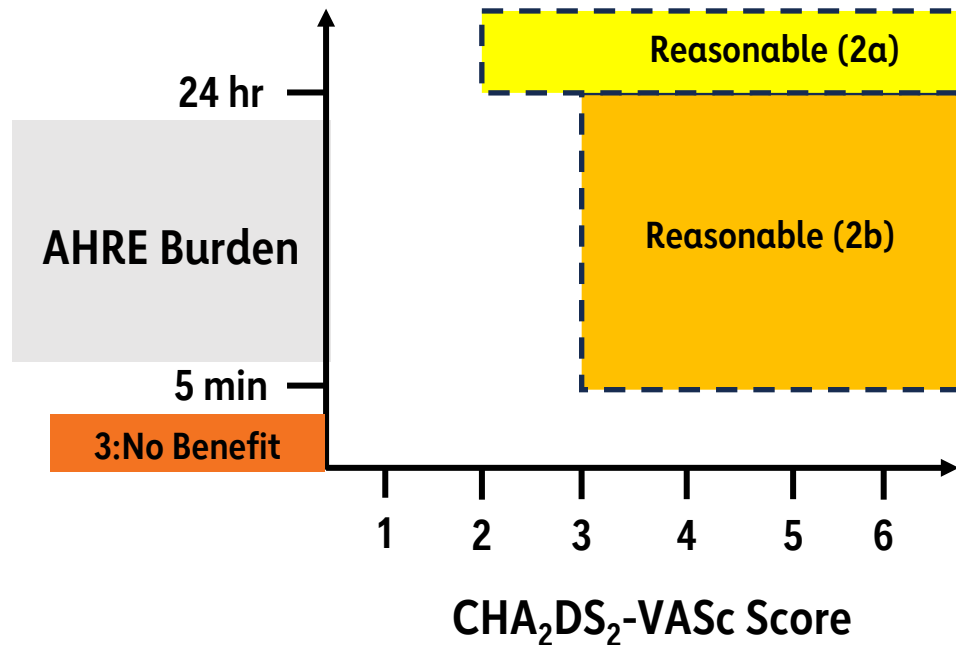
- The CHA₂DS₂-VASc score, is considered the most validated score and most therapies have used that score to prove efficacy, thus is generally the preferred score.
- Newer risk scores, such as the ATRIA and GARFIELD-AF scores may be the better option in selected populations (e.g., renal disease).

Recommendations for Antithrombotic Therapy in AF



Abbreviations: AF indicates atrial fibrillation; CHA₂DS₂-VASc, congestive heart failure, hypertension, age ≥ 75 years (doubled), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (doubled), vascular disease, age 65 to 74 years, sex category; DOACs, direct-acting oral anticoagulants; hx, history; ICH, intracerebral hemorrhage; MS, mitral stenosis; and yr, year.

Oral Anticoagulation for Device-Detected Atrial High-Rate Episodes Among Patients Without a Previous Diagnosis of AF



For patients with a device-detected AHRE lasting:

COR	RECOMMENDATIONS
2a	≥24 hrs and CHA ₂ DS ₂ -VASc score ≥2 or equivalent stroke risk, it is reasonable to initiate oral anticoagulation within a SDM framework that considers episode duration and individual patient risk. (2a)
2b	Between 5 minutes and 24 hrs and CHA ₂ DS ₂ -VASc score ≥3 or equivalent stroke risk, it may be reasonable to initiate anticoagulation within a SDM framework that considers episode duration and individual patient risk. (2b)
3: No Benefit	<5 minutes and without another indication for oral anticoagulation should not receive oral anticoagulation. (3: No Benefit)

Abbreviations: AF indicates atrial fibrillation; AHRE, atrial high-rate episode; CHA₂DS₂-VASc, congestive heart failure, hypertension, age ≥75 years (doubled), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (doubled), vascular disease, age 65 to 74 years, sex category; hr, hour; hrs, hours; and SDM, shared decision-making.

Percutaneous Approaches to Occlude the LAA in AF

**Patients with Moderate to High Stroke Risk
(CHA₂DS₂-VASc score > 2)**

In those who have a contraindication to long-term OAC due to a nonreversible cause, pLAAO is reasonable. (Class 2a)

In those who have a high risk of major bleeding on oral anticoagulation, pLAAO may be a reasonable alternative to oral anticoagulation based on patient preference, with careful consideration of procedural risk and with the understanding that the evidence for OAC is more extensive. (Class 2b)

Long-Term Anticoagulation Contraindicated

- Severe bleeding due to a nonreversible cause involving the gastrointestinal, pulmonary, or genitourinary systems
- Spontaneous intracranial/intraspinal bleeding due to a nonreversible cause
- Serious bleeding related to recurrent falls when cause of falls is not felt to be treatable

Long-Term Anticoagulation Is Still Reasonable

- Bleeding involving the gastrointestinal, pulmonary, or genitourinary systems that is treatable
- Bleeding related to isolated trauma
- Bleeding related to procedural complications

Abbreviations: AF indicates atrial fibrillation; CHA₂DS₂-VASc, congestive heart failure, hypertension, age ≥75 years (doubled), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (doubled), vascular disease, age 65 to 74 years, sex category; LAA, left atrial appendage; OAC, oral anticoagulation; and pLAAO, percutaneous left atrial appendage occlusion.

Cardiac Surgery | LAA Exclusion/Excision in AF Patients

Evidence supports a benefit of surgical removal of the LAA occlusion in patients with AF who undergo or valve surgeries.

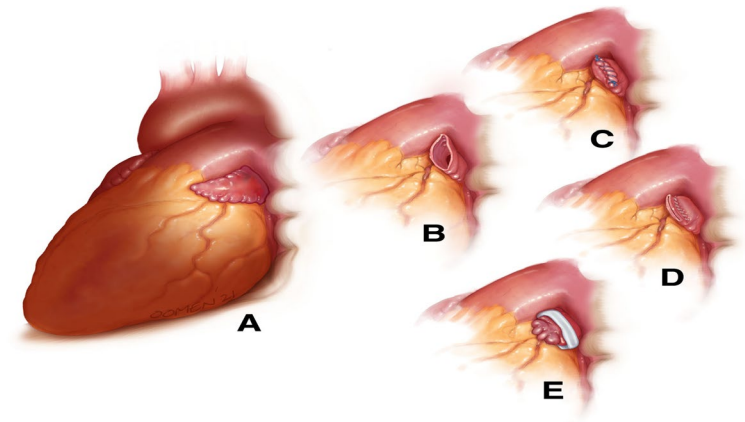
In patients with AF undergoing cardiac surgery with a CHA₂DS₂-VASc score ≥ 2 or equivalent stroke risk:

COR	RECOMMENDATIONS
1	Surgical LAA exclusion, in addition to continued anticoagulation, is indicated to reduce the risk of stroke and systemic embolism.
2b	The benefit of surgical LAA exclusion in the absence of continued anticoagulation to reduce the risk of stroke and systemic embolism is uncertain.

In patients with AF undergoing cardiac surgery:

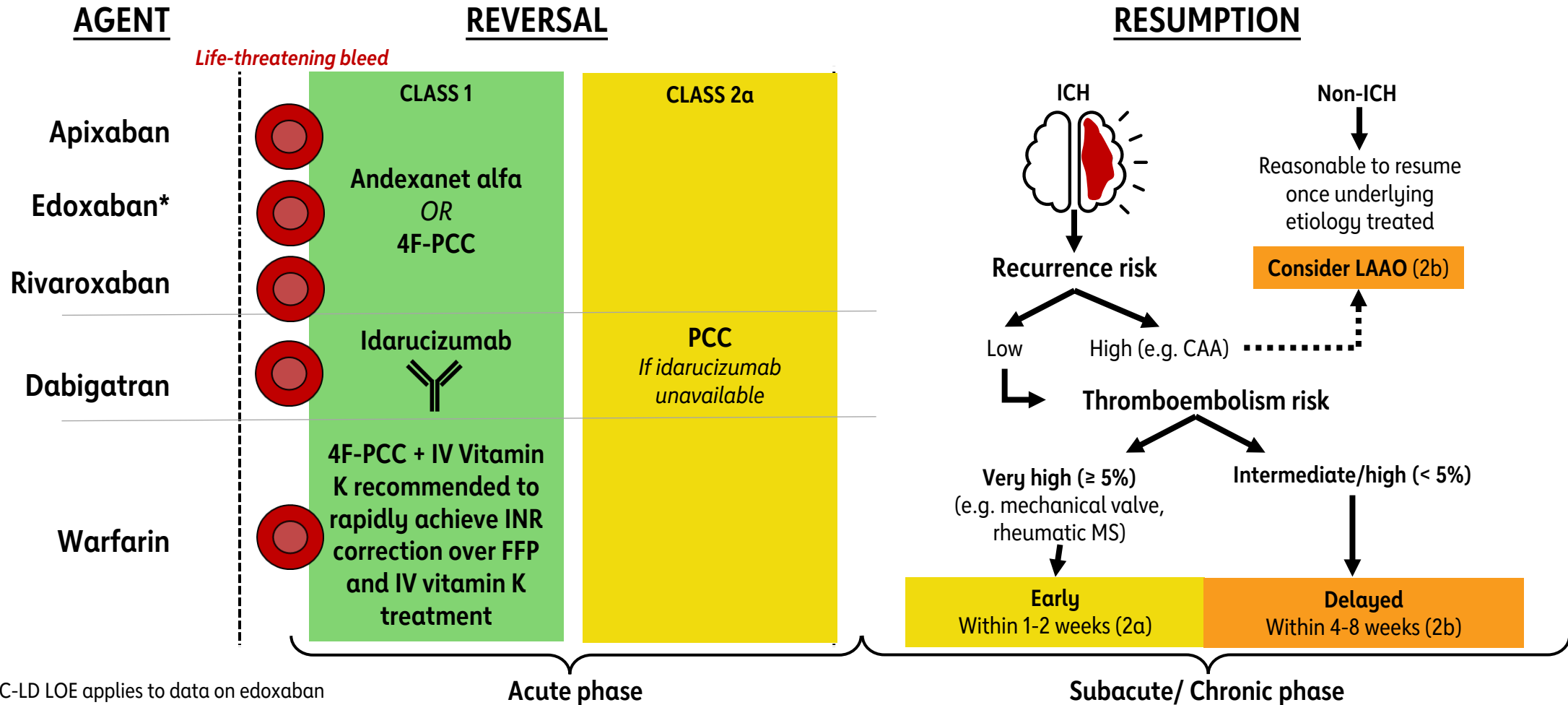
COR	RECOMMENDATIONS
1	And LAA exclusion, a surgical technique resulting in absence of flow across the suture line and a stump of <1 cm as determined by intraoperative transesophageal echocardiography should be used.

Views of the left atrial appendage before and after surgical exclusion. **A**, Intact left atrial appendage. **B**, Resected left atrial appendage before closure. **C**, Left atrial appendage after sutured amputation. **D**, Left atrial appendage after stapled excision. **E**, Left atrial appendage after clip application.



Abbreviations: AF indicates atrial fibrillation; CABG, coronary artery bypass graft surgery; CHA₂DS₂-VASc, congestive heart failure, hypertension, age ≥ 75 years (doubled), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (doubled), vascular disease, age 65 to 74 years, sex category; cm, centimeter; LAA, left atrial appendage; and TEE, transesophageal echocardiography.

Active Bleeding on Anticoagulant Therapy and Reversal Drugs



*C-LD LOE applies to data on edoxaban



Abbreviations: 4F-PCC indicates 4-factor prothrombin complex concentrate; CAA; cerebral amyloid angiopathy; LAAO, left atrial appendage occlusion; ICH, Intracerebral hemorrhage; IV, intravenous; C-LD LOE, Level of evidence C and limited data; MS, mitral stenosis; and PCC, prothrombin complex concentrate.

Joglar, J. A. et al., 2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation. *Circulation*.

Timing of Discontinuation of OACs in AF Pts Scheduled to Undergo an Invasive Procedure or Surgery in Whom Anticoagulation is to be Interrupted

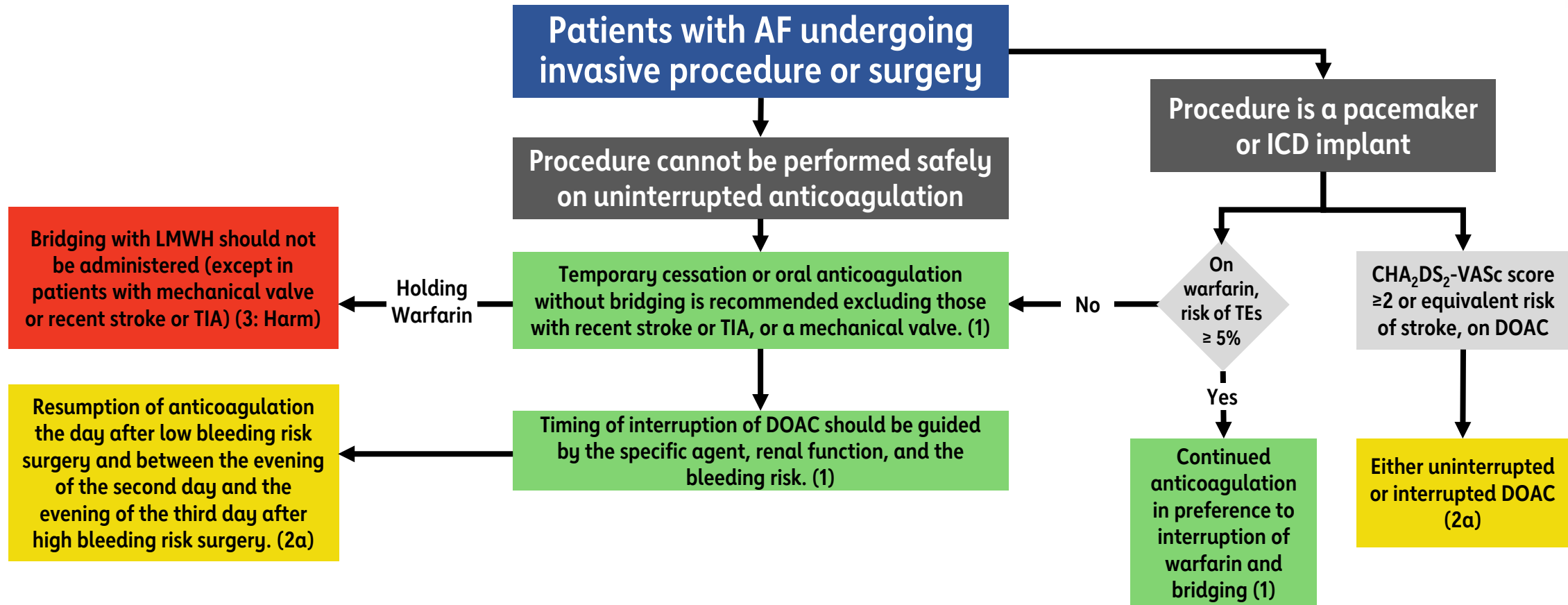
Anticoagulant	Low Bleeding Risk Procedure	High Bleeding Risk Procedure
Apixaban (CrCl >25 mL/min)*	1 d†	2 d
Dabigatran (CrCl >50 mL/min)	1 d	2 d
Dabigatran (CrCl 30-50 mL/min)	2 d	4 d
Edoxaban (CrCl >15 mL/min)	1 d	2 d
Rivaroxaban (CrCl >30 mL/min)	1 d	2 d
Warfarin	5 d for a target INR <1.5 2-3 d for a target INR <2	5 d

Note: *For patients on DOAC with creatinine clearance lower than the values in the table, few clinical data exist. Consider holding for an additional 1 to 3 days, especially for high bleeding risk procedures.

†The number of days is the number of full days before the day of surgery in which the patient does not take any dose of anticoagulant. The drug is also not taken the day of surgery. For example, in the case of holding a twice daily drug for 1 day, if the drug is taken at 8 pm, and surgery is at 8 am, at the time of surgery, it will be 36 hours since the last dose was taken.

Abbreviations: AF indicates atrial fibrillation; CrCl, creatinine clearance; d, day; DOAC, direct oral anticoagulation; INR, international normalized ratio; and OAC, oral anticoagulant.

Management of Periprocedural Anticoagulation in Patients with AF



Abbreviations: AF indicates atrial fibrillation; CHA₂DS₂-VASc, congestive heart failure, hypertension, age ≥75 y (doubled), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (doubled), vascular disease, age 65 to 74 y, sex category; DOAC, direct oral anticoagulant; ICD, implantable cardioverter-defibrillator; LMWH, low-molecular-weight heparin; TE, thromboembolism; and TIA, transient ischemic attack.

Anticoagulation in AF Specific Populations

ACS or PCI	
COR	RECOMMENDATIONS
1	For increased stroke risk in PCI, DOACs preferred over VKAs in combination with APT to reduce risk of clinically relevant bleeding.
1	In those on OAC undergoing PCI, early discontinuation of ASA (1-4 wk) and continuation of dual antithrombotic therapy with OAC and a P2Y12 inhibitor is preferred over triple therapy (OAC, P2Y12 inhibitor, and ASA) to reduce risk of clinically relevant bleeding.

CCD	
COR	RECOMMENDATIONS
1	If beyond 1-y after revascularization or CAD not requiring coronary revascularization, w/o hx of stent thrombosis, OAC monotherapy is recommended over combination therapy of OAC and single APT (aspirin or P2Y12 inhibitor) to decrease risk of major bleeding.

PAD	
COR	RECOMMENDATIONS
2a	With concomitant stable PAD, monotherapy oral anticoagulation is reasonable over dual therapy (anticoagulation plus aspirin or P2Y12 inhibitors) to reduce the risk of bleeding.

Abbreviations: ACS indicates acute coronary syndrome; AF, atrial fibrillation; APT, antiplatelet therapy; ASA, aspirin; CAD, coronary artery disease; CCD, chronic coronary disease; DOACs, direct-acting oral anticoagulant; hx, history; OAC, oral anticoagulant; PAD, peripheral artery disease; PCI, percutaneous coronary intervention; VHD, valvular heart disease; VKAs, vitamin K antagonist; and wk, week.

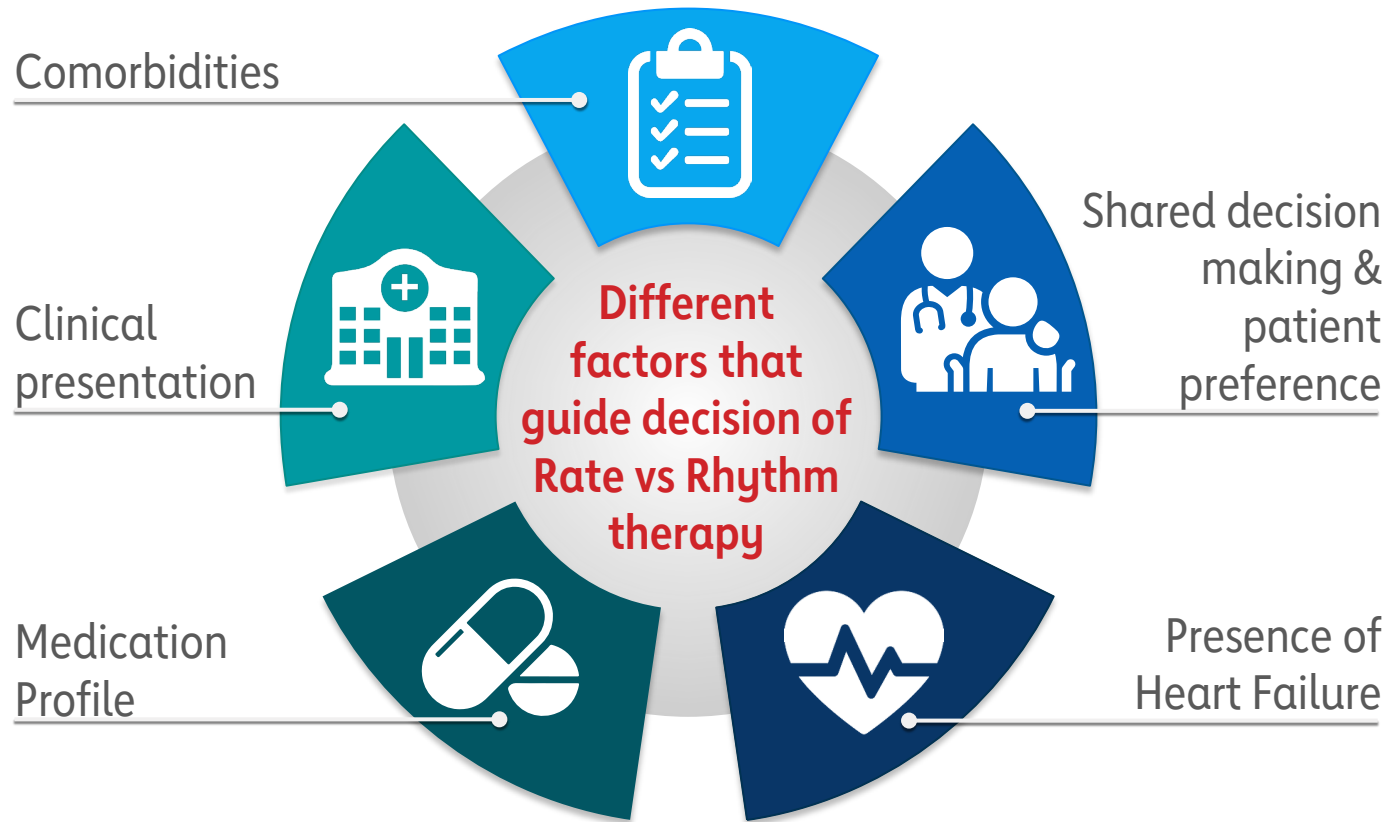
Anticoagulation in AF Specific Populations

CKD/Kidney Failure	
COR	RECOMMENDATIONS
1	If at elevated risk for stroke and CKD stage 3, tx with warfarin or, preferably, evidence-based doses of direct thrombin or factor Xa inhibitors is recommended to reduce stroke risk.
2a	If at elevated risk for stroke and CKD stage 4, tx with warfarin or labeled doses of DOACs is reasonable to reduce stroke risk.
2b	If at elevated risk for stroke & end-stage CKD (CrCl <15 mL/min) or on dialysis, it might be reasonable to prescribe warfarin (INR 2.0-3.0) or an evidence-based dose apixaban for oral anticoagulation to reduce stroke risk.

VHD	
COR	RECOMMENDATIONS
1	In rheumatic mitral stenosis or MS of moderate or greater severity and hx of AF, long-term anticoagulation with warfarin is recommended over DOACs, independent of the CHA ₂ DS ₂ -VASc score to prevent CV events, including stroke or death.
1	In valve disease other than moderate or greater mitral stenosis or a mechanical heart valve, DOACs are recommended over VKAs.

Abbreviations: AF indicates atrial fibrillation; CHA₂DS₂-VASc, congestive heart failure, hypertension, age ≥75 years (doubled), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (doubled), vascular disease, age 65 to 74 years, sex category; CKD, chronic kidney disease; CrCl, creatinine clearance; CV, cardiovascular; DOACs, direct-acting oral anticoagulant; hx, history; INR, international normalized ratio; min, minute; ml, milliliter; MS, mitral stenosis; tx, treatment; VHD, valvular heart disease; and VKAs, vitamin K antagonists.

Treatment: Rate Control in AF



Objectives of Rate Control:

- Resting heart rate < 100-110 bpm
- Reduce symptoms
- Reduce risk of tachycardia-induced cardiomyopathy or improve heart function of patients with tachycardia-induced cardiomyopathy
- Reduce inappropriate shock in patients with implantable defibrillators
- Enhance biventricular pacing in patients with cardiac resynchronization therapy use
- Reduce risk of hospitalization

Pharmacological Agents for Rate Control in AF

Non-DHP CCB	IV	Oral Maintenance dose
Diltiazem	0.25 mg/kg IV over 2 mins. May repeat 0.35 mg/kg over 2 mins; then 5-15 mg/hr continuous infusion	120 – 360 mg daily (ER)
Verapamil	5 to 10 mg over ≥2 minutes (may repeat twice); then 5 mg/hr continuous infusion (max 20 mg/hr)	180 – 480 mg daily (ER)

Agent	IV	Oral Maintenance dose
Amiodarone	150-300 mg IV over 1 hr, then 10-50 mg/h over 24 hrs	100 – 200 mg daily
Digoxin*	0.25 – 0.5 mg over mins; repeat doses of 0.25 mg every 6 hrs (max 1.5 mg/24 hrs)	0.0625 – 0.25 mg daily

*Increased mortality at plasma concentrations exceeding 1.2 ng/mL

Rate Control Agents

Beta-Blockers

- Slows AV nodal conduction
- Block B-1 receptors

Digoxin

- Positive inotropic and vagotonic effects
- Could be useful in HFrEF pts

IV Magnesium

- Blocks slow inward calcium channels of SA and AV node

Amiodarone

- Useful in critical ill pts who cannot tolerate AV nodal slowing agents
- Can result in pharmacologic cardioversion

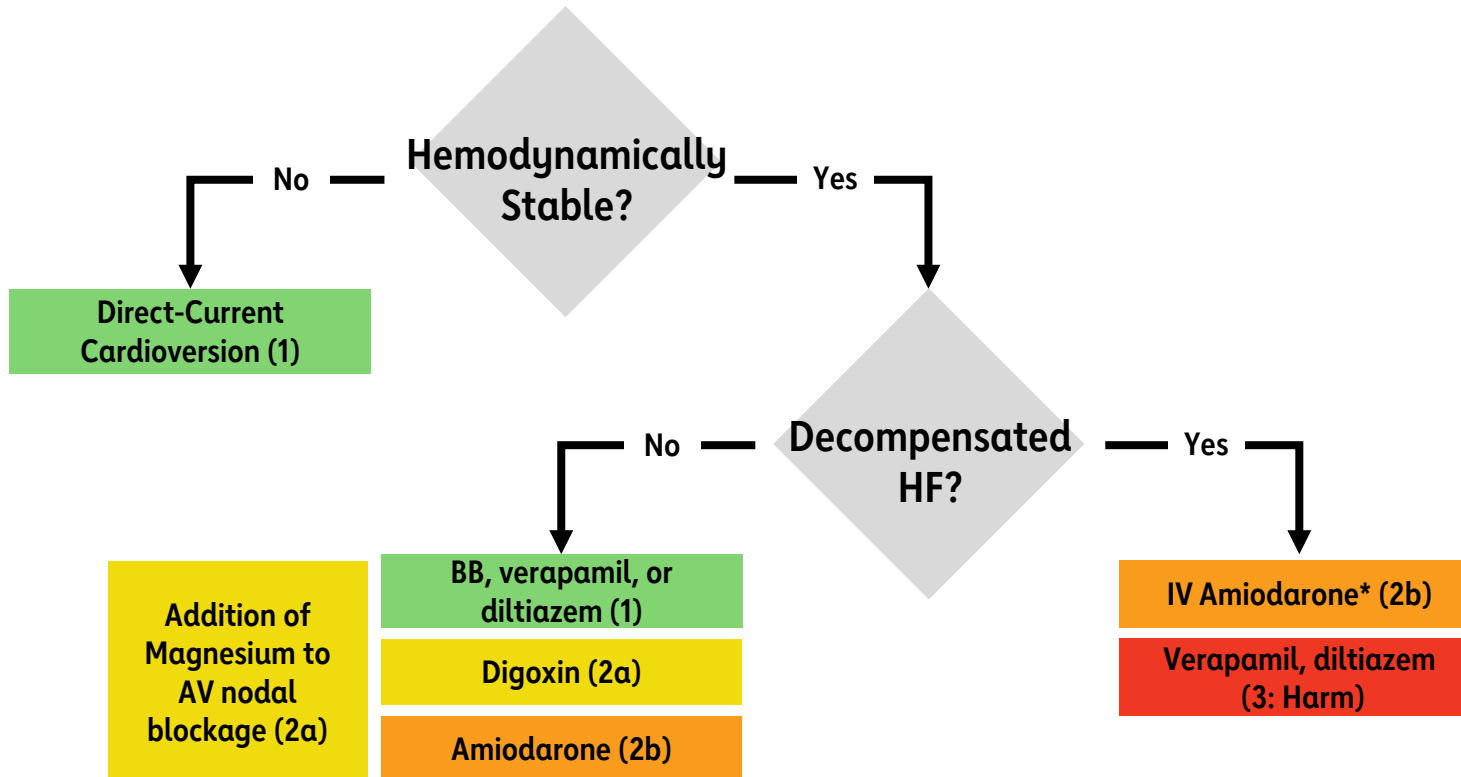
NDCC

- Slow AV nodal conduction
- Negative inotropic and chronotropic effect

Beta-Blocker	IV	Oral Maintenance dose
Metoprolol tartrate	2.5-5 mg bolus over 2 mins; up to 3 doses	25 – 200 mg twice daily
Metoprolol succinate	N/A	50 - 400 mg daily
Atenolol	N/A	25 – 100 mg daily
Bisoprolol	N/A	2.5 – 10 mg daily
Carvedilol	N/A	3.125- 25 mg twice daily
Esmolol	500 mcg/kg bolus over 1 min; then 50 – 300 mcg/kg/min	N/A
Nadolol	N/A	10-240 mg daily
Propranolol	1 mg over 1 min; repeat PRN every 2 mins; up to 3 doses	10-40 mg three to four times daily

Abbreviations: AF indicates atrial fibrillation; AV, atrioventricular; ER, extended release; HFrEF, heart failure with reduced ejection fraction; hr, hour; hrs, hours; IV, intravenous; kg, kilogram; min; minute; mins, minutes; mg, milligram; mcg, microgram; ng, nanogram; NDCC, nondihydropyridine calcium channel blocker; PRN, as needed; pts, patients; and SA, sinoatrial.

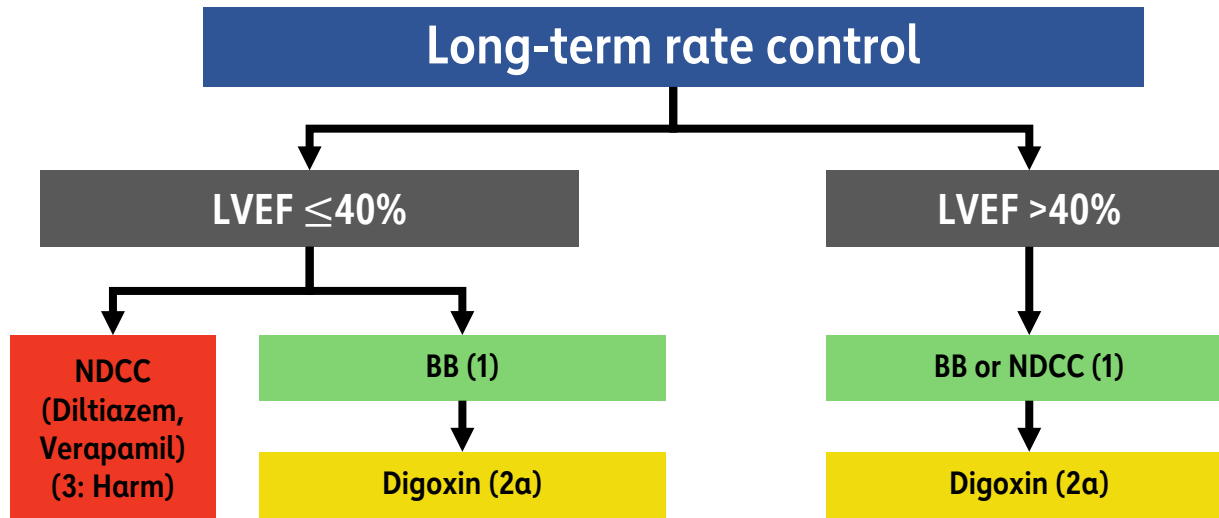
Approach to Acute Rate Control in AF with Rapid Ventricular Response



*Contraindicated in patients with moderate-severe LV dysfunction regardless of decompensated HF.





Abbreviations: AF indicates atrial fibrillation; AV, atrioventricular; BB, beta-blocker; HF, heart failure; IV, intravenous; and LV, left ventricular.

Approach to Long Term Rate Control of AF



Abbreviations: AF indicates atrial fibrillation; BB, beta-blocker; LVEF, left ventricular ejection fraction; and NDCC, nondihydropyridine calcium channel blocker.

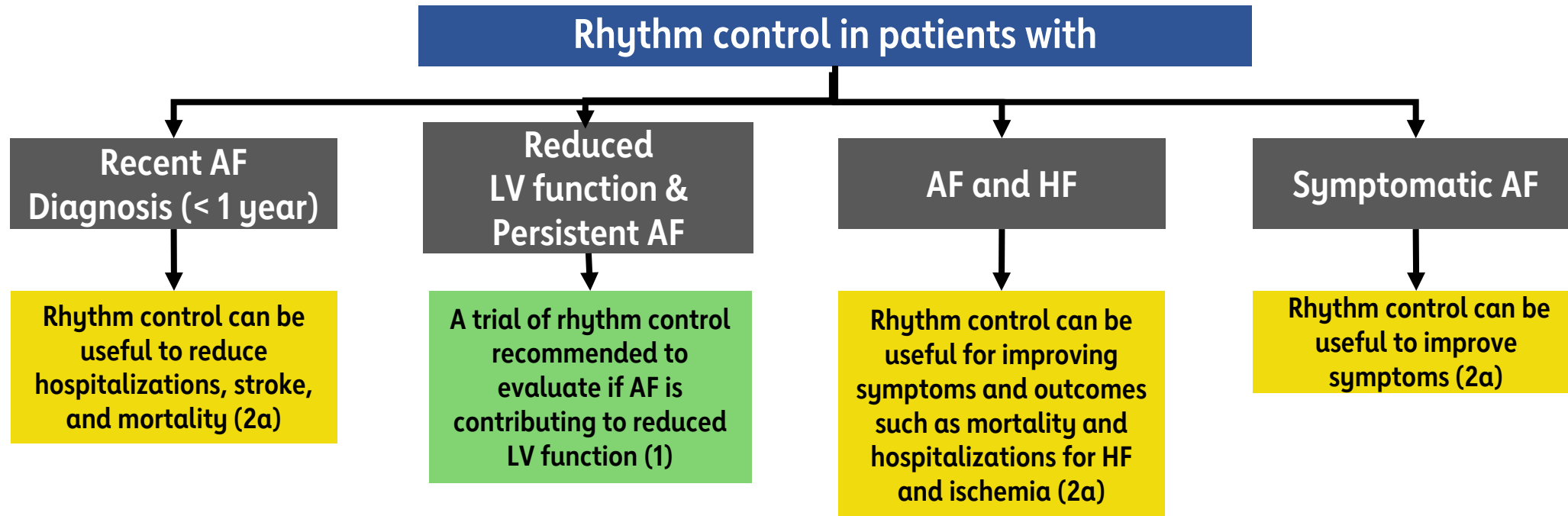
Recommendations for Atrioventricular Nodal Ablation

COR	RECOMMENDATIONS
1	 In patients with AF and a persistently rapid ventricular response who undergo AVNA, initial pacemaker lower rate programming should be 80 to 90 bpm to reduce the risk of sudden death.
2b	 In patients with AF and uncontrolled rapid ventricular response refractory to rate-control medications, AVNA can be useful to improve symptoms and QOL.
1	 In patients with AF scheduled to have an AVNA, implantation of a pacemaker prior to procedure is recommended to ensure adequacy of the pacing leads before performing the ablation.
2b	 In patients with AF and normal EF undergoing AVNA, conduction system pacing of the His bundle or left bundle area may be reasonable.

Abbreviations: AF indicates atrial fibrillation; AVNA, atrioventricular nodal ablation; bpm, beats per minute; EF, ejection fraction; and QOL, quality of life.

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Goals of Rhythm Control Therapy in AF



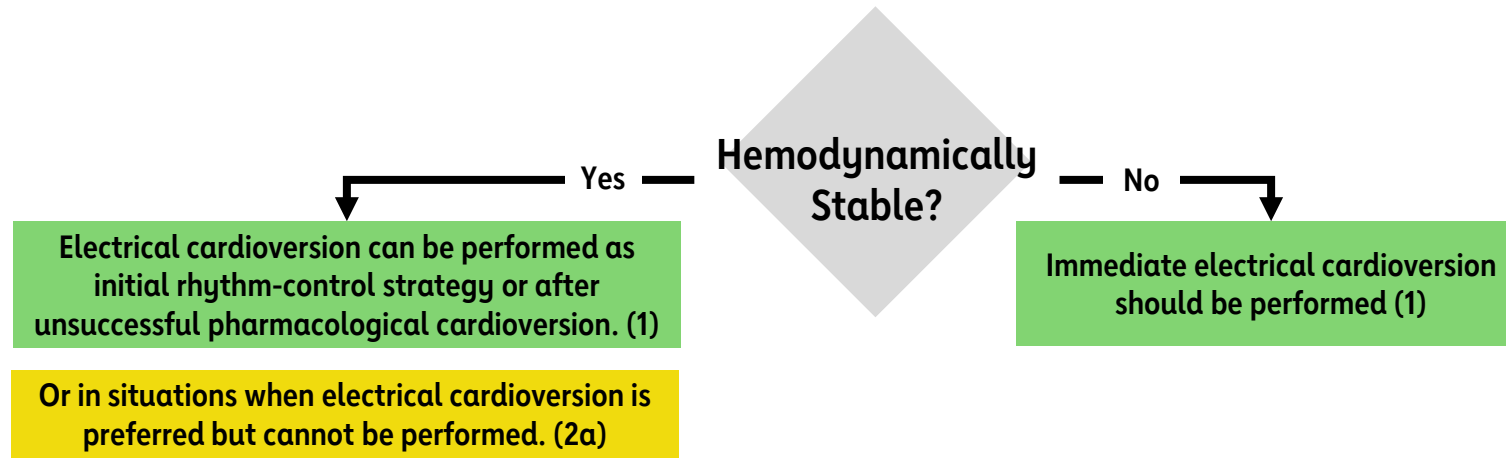
In patients with AF, rhythm-control strategies can be useful to reduce the likelihood of AF progression.(2a)

In patients with AF where symptoms associated with AF are uncertain, a trial of rhythm control (eg, cardioversion or pharmacological therapy) may be useful to determine what if any symptoms are attributable to AF (2b)

In patients with AF, rhythm-control strategies may be useful to reduce the likelihood of development of dementia or worsening cardiac structural abnormalities.(2b)

Abbreviations: AF indicates atrial fibrillation; HF, heart failure; and LV, left ventricular.

Electrical and Pharmacological Cardioversion of AF

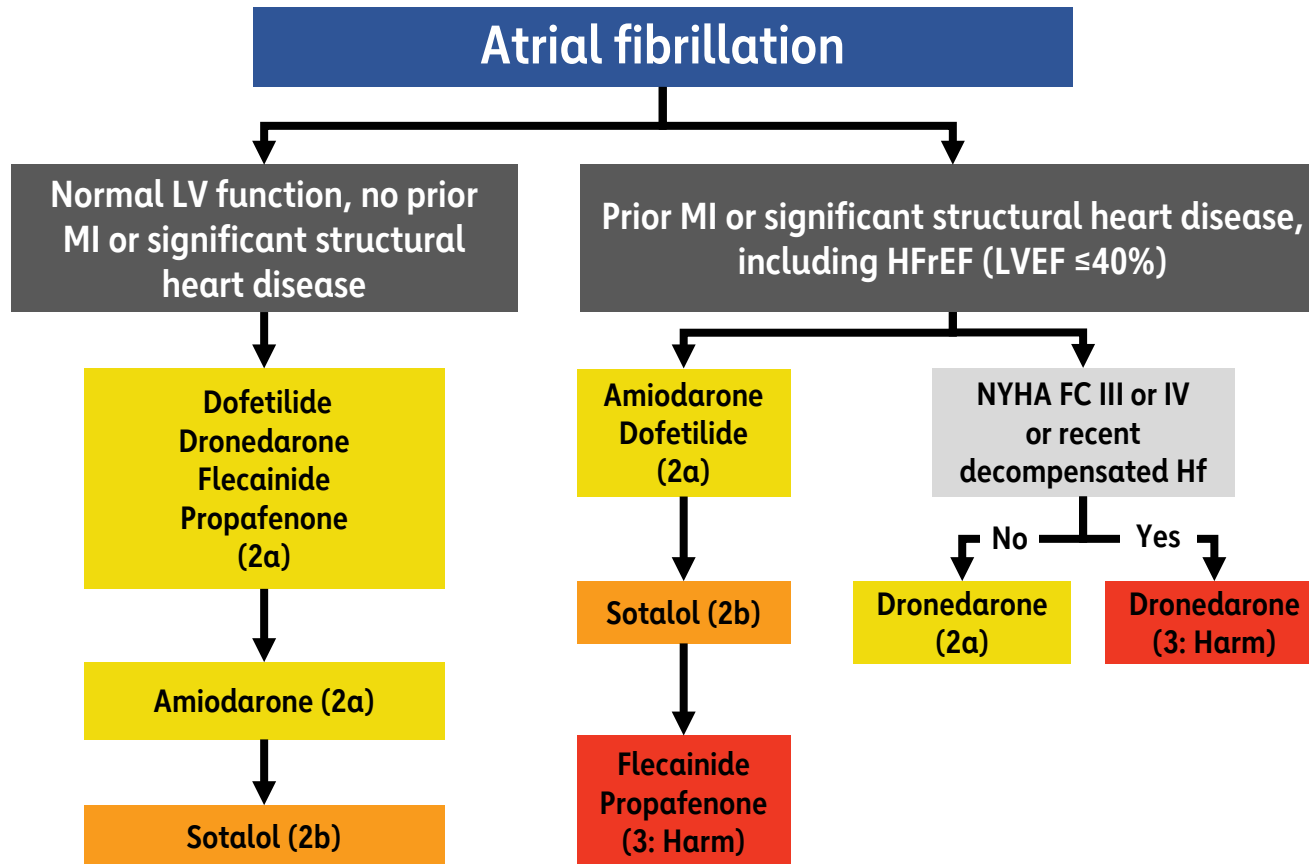


Recommendations for pharmacologic cardioversion	
COR	RECOMMENDATIONS
2a	Ibutilide is reasonable for pharmacological cardioversion for pts w/o depressed LV function (LVEF <40%). (1)
2a	IV amiodarone is reasonable for pharmacological cardioversion, although time to conversion is generally longer than other agents (8-12 hours). (2a)
2a	Recurrent AF occurring outside the hospital, the PITP approach with a single oral dose of flecainide or propafenone, with concomitant AV nodal blocking agent, ¹⁵ is reasonable for pharmacological cardioversion if previously tested in a monitored setting. (2a)
2b	Use of IV procainamide may be considered for pharmacological cardioversion when other intravenous agents are contraindicated or not preferred. (2b)

Recommendations for electrical cardioversion	
COR	RECOMMENDATIONS
1	Electrical cardioversion, energy delivery should be confirmed to be synchronized to the QRS to reduce the risk of inducing VF. (1)
2a	In elective electrical cardioversion, the use of biphasic energy of at least 200 J as initial energy can be beneficial to improve success of initial electrical shock. (2a)
2a	In pts undergoing elective cardioversion, with longer duration of AF or unsuccessful initial shock, optimization of electrode vector, use of higher energy, and pretreatment with antiarrhythmic drugs can facilitate success of electrical cardioversion. (2a)
2b	In pts with obesity and AF, use of manual pressure augmentation and/or further escalation of electrical energy may be beneficial to improve success of electrical cardioversion. (2b)

Abbreviations: AF indicates atrial fibrillation; AV, atrioventricular; IV, intravenous; LV, left ventricular; LVEF, left ventricular ejection fraction; pts, patients; PTP, pill-in-the-pocket; QRS, QRS interval; and VF, ventricular fibrillation.

Antiarrhythmic Drugs for Maintenance of Sinus Rhythm



Considerations:

- Risk of development of MI and structural heart disease
- The need for in-hospital initiation of antiarrhythmic drugs
- Baseline and follow-up tests

Abbreviations: HF indicates heart failure; HFrEF, heart failure reduced ejection fraction; LV, left ventricle; LVEF, left ventricular ejection fraction; MI, myocardial infarction; and NYHA FC, New York Heart Association Functional Class.
















Antiarrhythmic Drug Initiation in Facility

COR	MEDICATION	DURATION OF IN-FACILITY OBSERVATION	FACILITY SHOULD BE CAPABLE OF:
1	Dofetilide (1)	Admission for ≥ 3 days	<ul style="list-style-type: none"> • Continuous ECG monitoring • Periodic CrCl • Cardiac resuscitation
2a	Sotalol (2a)	3 days	<ul style="list-style-type: none"> • Continuous ECG monitoring • Periodic creatinine clearance calculations • Cardiac resuscitation
2a	Flecainide and Propafenone as PTPP (2a)	First dose in a facility	<ul style="list-style-type: none"> • Continuous EG monitoring

Abbreviations: CrCl indicates creatinine clearance; ECG, electrocardiogram; and PTPP, pill-in-the-pocket.

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Antiarrhythmic Drug Follow-up

	BASELINE	WITHIN 6 MONTHS	EVERY 3-6 MONTHS AFTER
Dofetilide	 ECG K and Mg CrCl	 ECG K and Mg CrCl	 ECG K and Mg CrCl
Dronedaronone	 ECG AST and ALT	 AST and ALT	--
Ibutilide	 ECG K and Mg	 Continuous ECG at least 4 hours following infusion	--
Procainamide	 ECG BP	 ECG BP during infusion	--
Sotalol	 ECG K and Mg CrCl	 ECG K and Mg CrCl	 ECG K and Mg CrCl
Amiodarone	 TSH AST, ALT CXR ECG	 TSH AST, ALT	 TSH AST, ALT If symptoms -> Assess for ILD, epithelial keratopathy Annual dermatologic and neurologic exam

Abbreviations: ALT indicates alanine transaminase; AST, aspartate aminotransferase; BP, blood pressure; CrCl, creatinine clearance; CXR, chest x-ray; ECG, electrocardiogram; ILD, interstitial lung disease; K, potassium; Mg, magnesium; and TSH, thyroid stimulating hormone.

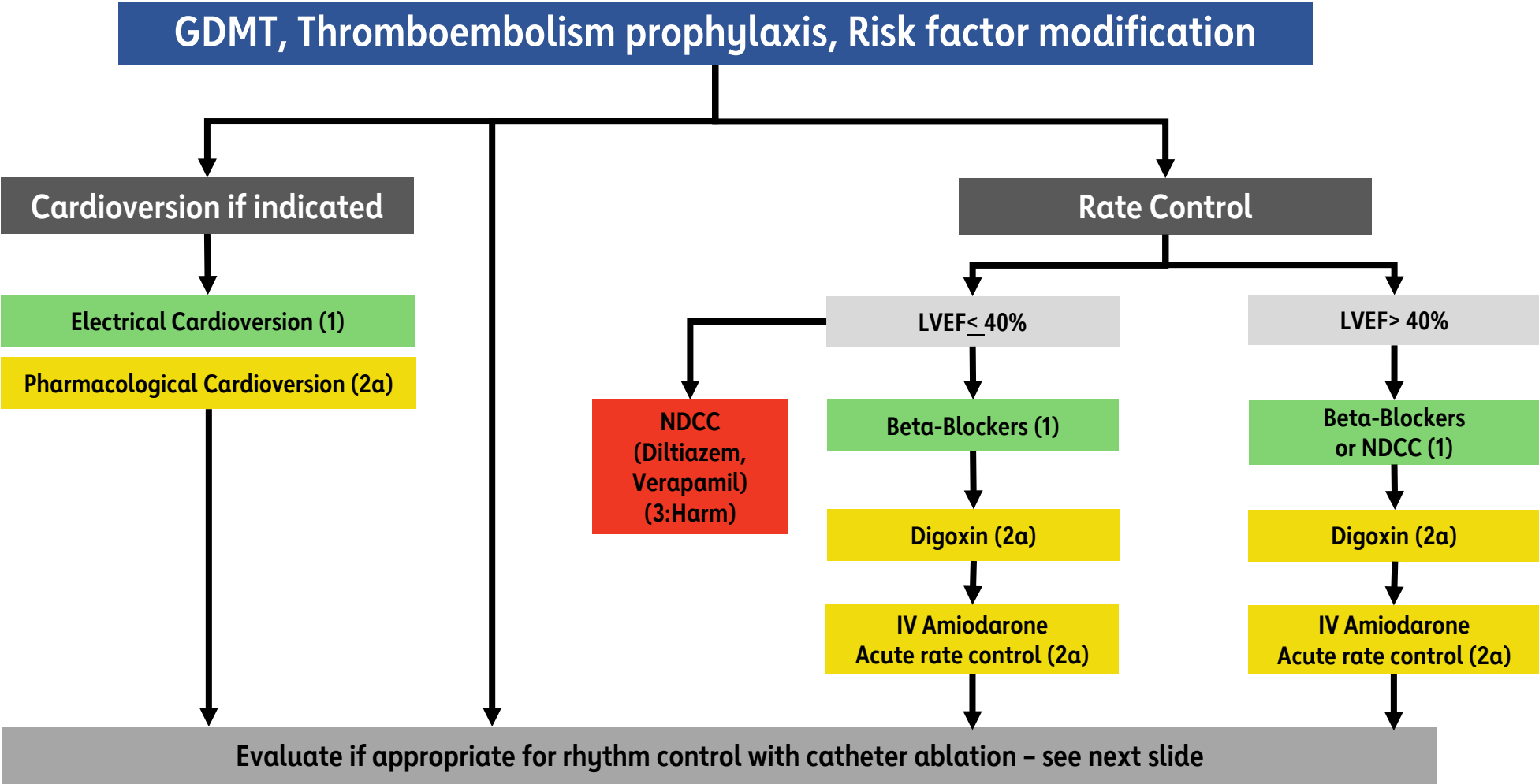
Anticoagulation Management Strategy Before & After AF Ablation

Prior to ablation	
COR	RECOMMENDATIONS
1	Catheter ablation should be performed on uninterrupted therapeutic anticoagulation with a goal INR of 2.0 to 3.0.
1	If patient on a DOAC, catheter ablation should be performed with either continuous or minimally interrupted oral anticoagulation.

After ablation	
COR	RECOMMENDATIONS
1	OAC should be continued for at least 2 to 3 months after the procedure with a longer duration determined by underlying risk.
1	Continuation of longer-term OAC should be dictated according to the patients' stroke risk (eg, CHA ₂ DS ₂ -VASc score ≥2).

Abbreviations: AF indicates atrial fibrillation; CHA₂DS₂-VASc, congestive heart failure, hypertension, age ≥75 years (doubled), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (doubled), vascular disease, age 65 to 74 years, sex category; DOAC, direct oral anticoagulant; INR, international normalized ratio; and OAC, oral anticoagulant.

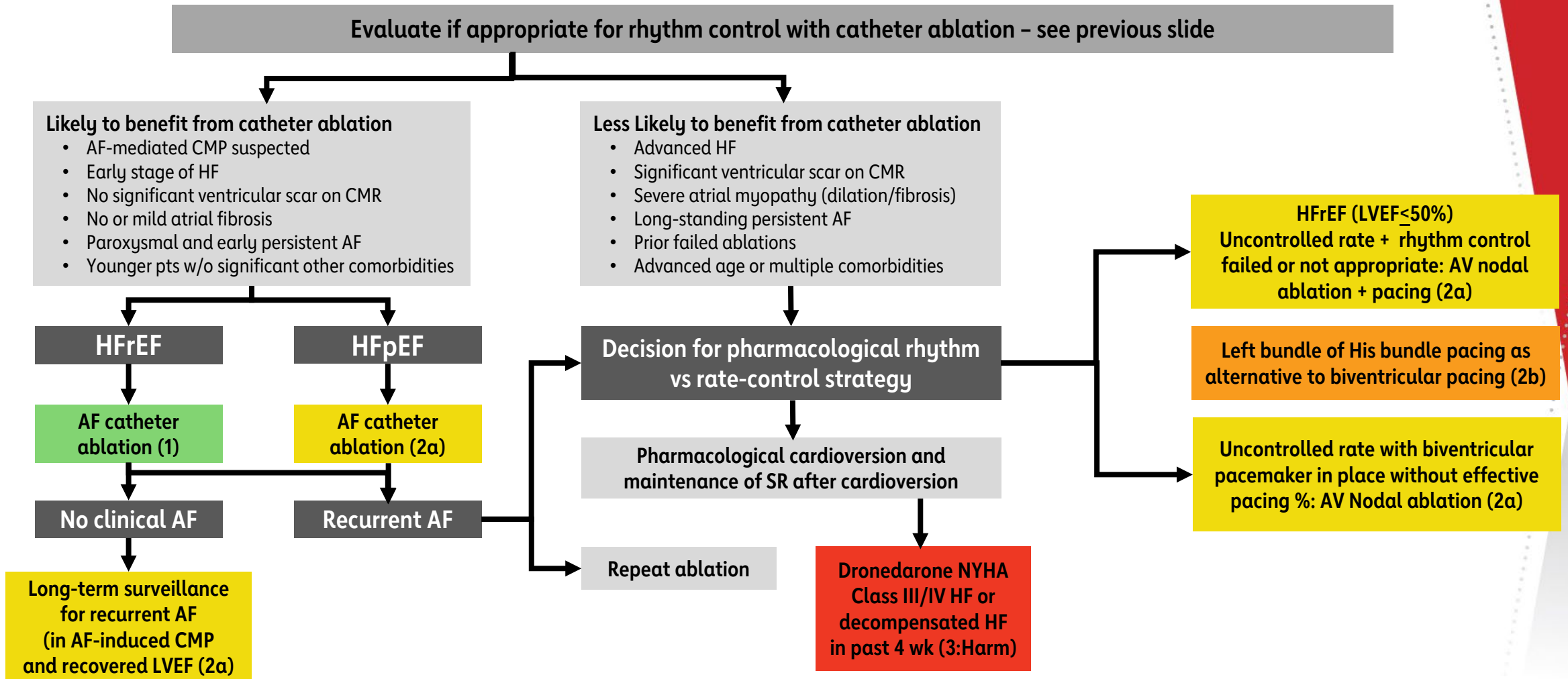
AF Management in Patients with HF



Abbreviations: AF indicates atrial fibrillation; HF, heart failure; IV, intravenous; and NDCC, non-dihydropyridine calcium channel blockers.

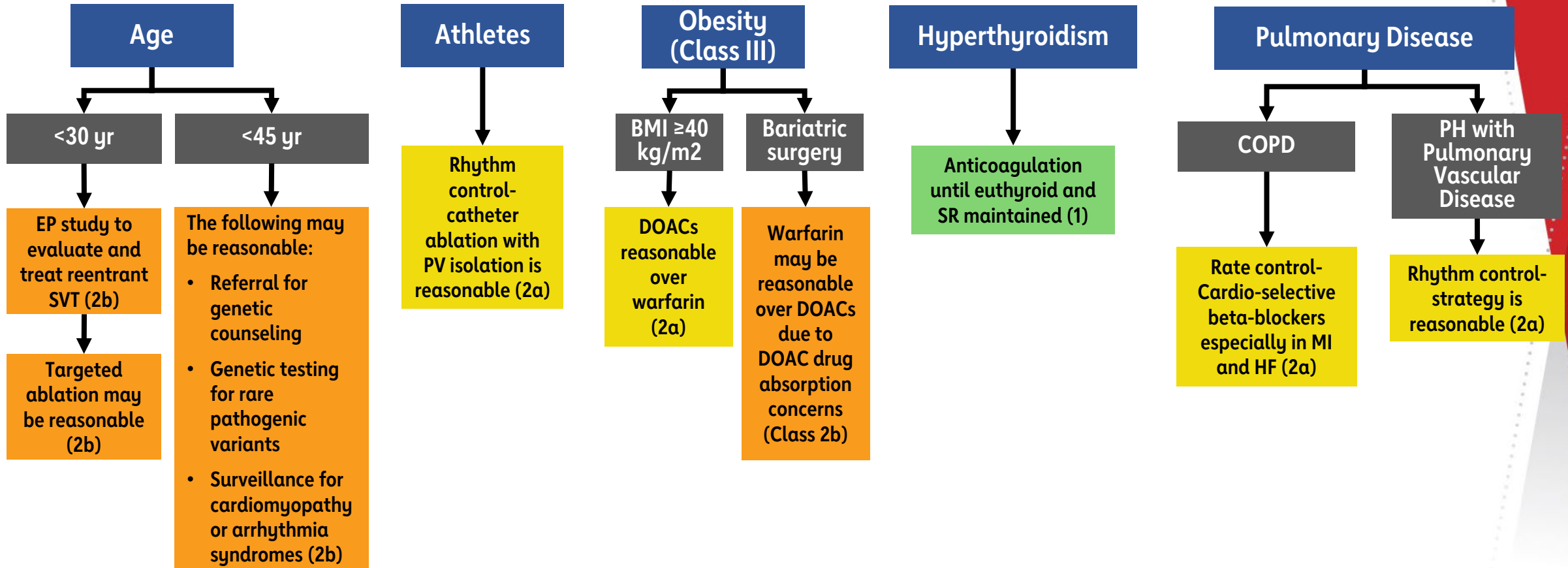


AF Management in Patients with HF



Abbreviations: AF indicates atrial fibrillation; AV, atrioventricular; CMP, cardiomyopathy; CMR, cardiac magnetic resonance; GDMT, guideline-directed medical therapy; HF, heart failure; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; IV, intravenous; LVEF, left ventricular ejection fraction; NYHA, New York Heart Association; and wk, week.

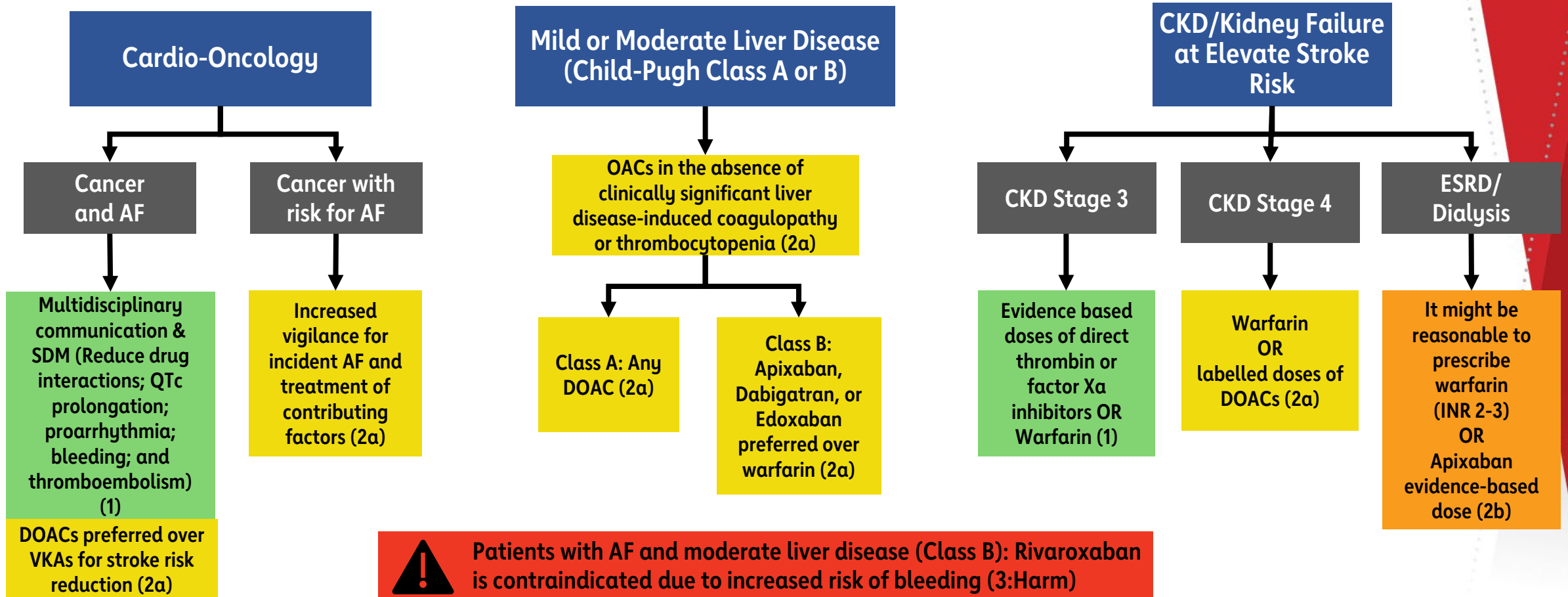
Management of Early Onset AF, Athletes, Obesity, Hyperthyroidism, Pulmonary disease



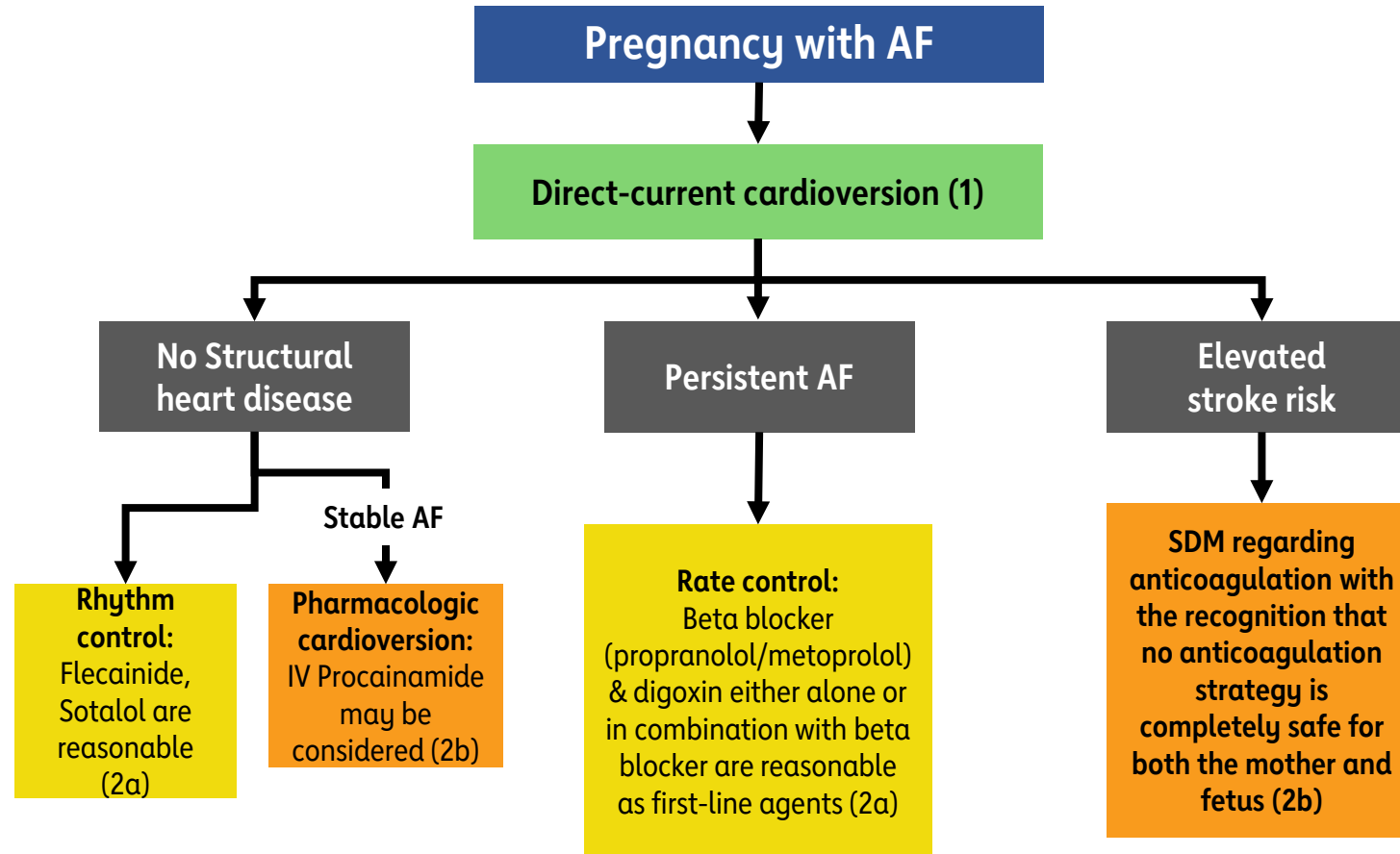
Abbreviations: AF indicates atrial fibrillation; COPD, chronic obstructive pulmonary disease; DOACs, direct-acting oral anticoagulants; EP, electrophysiologic; HF, heart failure; HTN, hypertension; kg/m², kilogram per meters squared; MI, myocardial ischemia; PH, pulmonary hypertension; PV, pulmonary vein; SR, sinus rhythm; and SVT, supraventricular tachyarrhythmias.

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Management of AF in Cardio-Oncology, Liver disease, and CKD



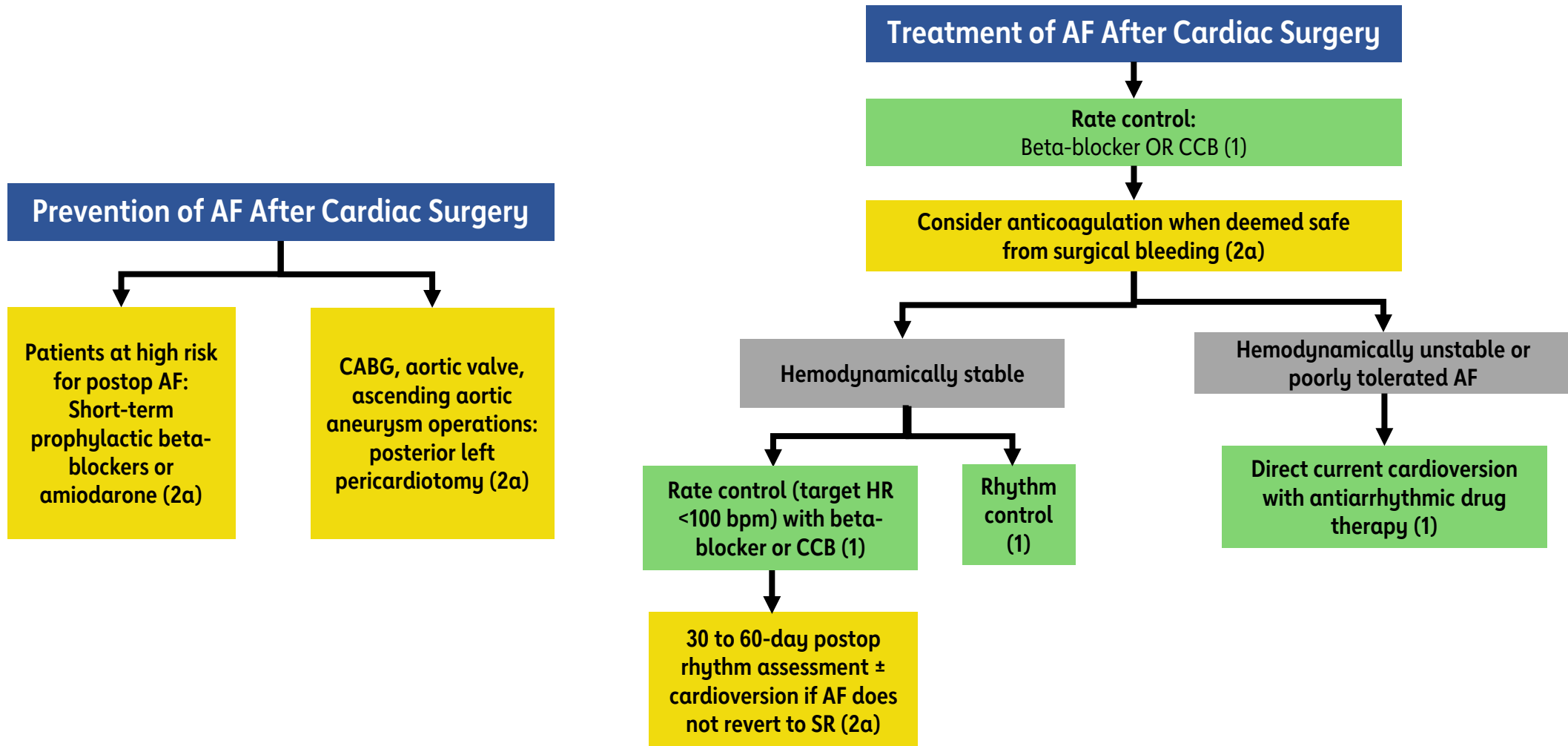
Pregnancy and the AF Patient



Abbreviations: AF indicates atrial fibrillation; IV, intravenous; and SDM, shared decision-making.

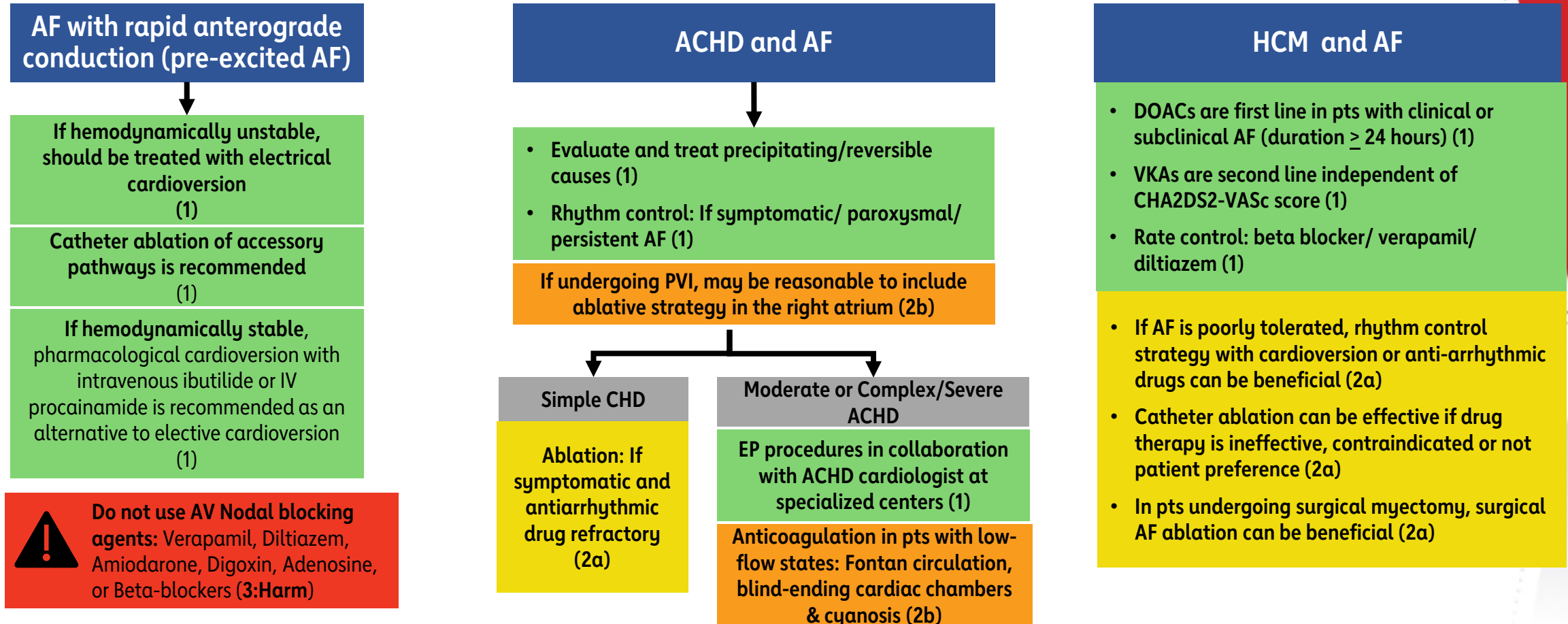
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Prevention and Treatment of AF After Cardiac Surgery



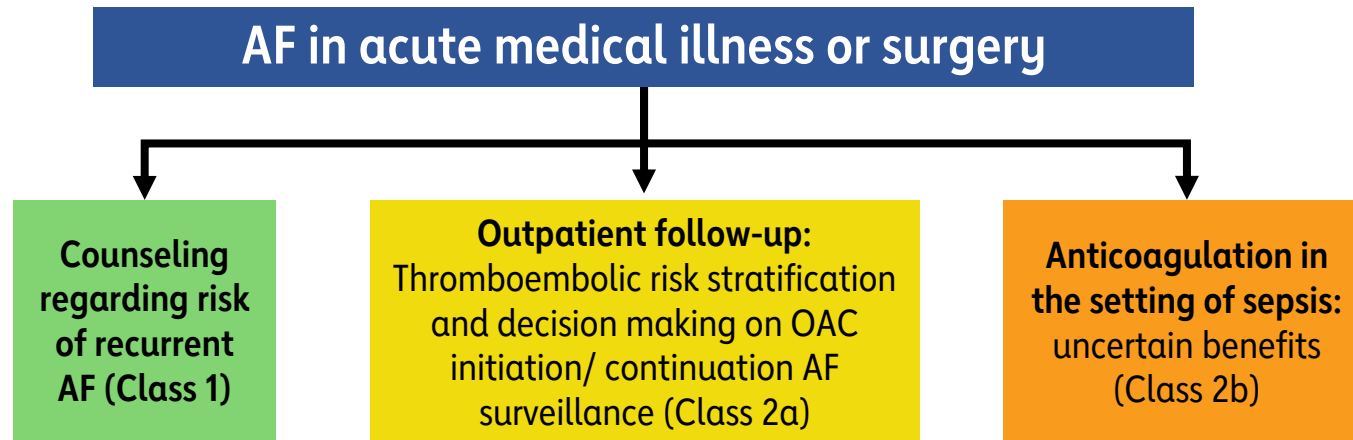
Abbreviations: AF indicates atrial fibrillation; bpm, beats per minute; CABG, coronary artery bypass graft surgery; CCB, calcium channel blocker; HR, heart rate; pts, patients; and SR, sinus rhythm.

Wolff-Parkinson-White and Pre-Excitation syndromes, ACHD, and HCM



Abbreviations: ACHD indicates adult congenital heart disease; AF, atrial fibrillation; AV, atrioventricular; CHA2DS2-VASc, congestive heart failure, hypertension, age \geq 75 years (doubled), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (doubled), vascular disease, age 65 to 74 years, sex category; CHD, congenital heart disease; DOACs, direct-acting oral anticoagulants; EP, electrophysiologic; HCM, hypertrophic cardiomyopathy; IV, intravenous; pts, patients; PVI, pulmonary vein isolation; VKA, vitamin K antagonists; and WPW, Wolff-Parkinson-White.

AF in the setting of Acute Medical Illness or Surgery



Future Research Needs



Evaluation of the AF Patient:

- AF as a disease continuum
- Individualization of AF and stroke risk
- Race, gender and sex differences
- Incorporating other stroke risk scores
- Standardized measures
- Social determinants of health
- Genetic testing
- Subclinical AF
- Sleep



Management of the AF Patient:

- Wearable heart monitoring devices
- Strategies for anticoagulation
- Downstream consequences of AF
- Standardization of ablation procedures
- Surgical exclusion and occlusion of LAA
- Candidates for ablation
- Role of risk modifiers in AF stroke prevention
- Shared decision making
- AI for AF management
- Better goal and outcome definition

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<https://professional.heart.org/en/science-news>.