UT Southwestern Medical Center

Atrial Fibrillation & Stroke Prevention

Spencer V. Carter, MD

Clinical Assistant Professor

Division of Cardiology

Department of Internal Medicine

Clinical Case

- A 77-year-old woman presents to the ER via EMS, found unresponsive by her daughter
- PMH: HTN, T2DM, remote MI requiring PCI, diastolic HF
- Lives alone, has not seen a physician in many years
- Presenting vitals: P 115; BP 74/48; SPO2 82% on 6L NC

Clinical Case

- Patient is intubated for airway protection
- CXR: bilateral infiltrates suggestive of aspiration
- Brain MRI: evidence of acute R MCA stroke
- Last known normal: unknown, tPA not administered

Presenting rhythm

Question 1

What is the estimated annual ischemic stroke risk for a 77-year-old woman with hypertension, type II diabetes, prior myocardial infarction, and diastolic heart failure?

A. 3.2%

B. 4.8%

C. 7.2%

D. 11.2%

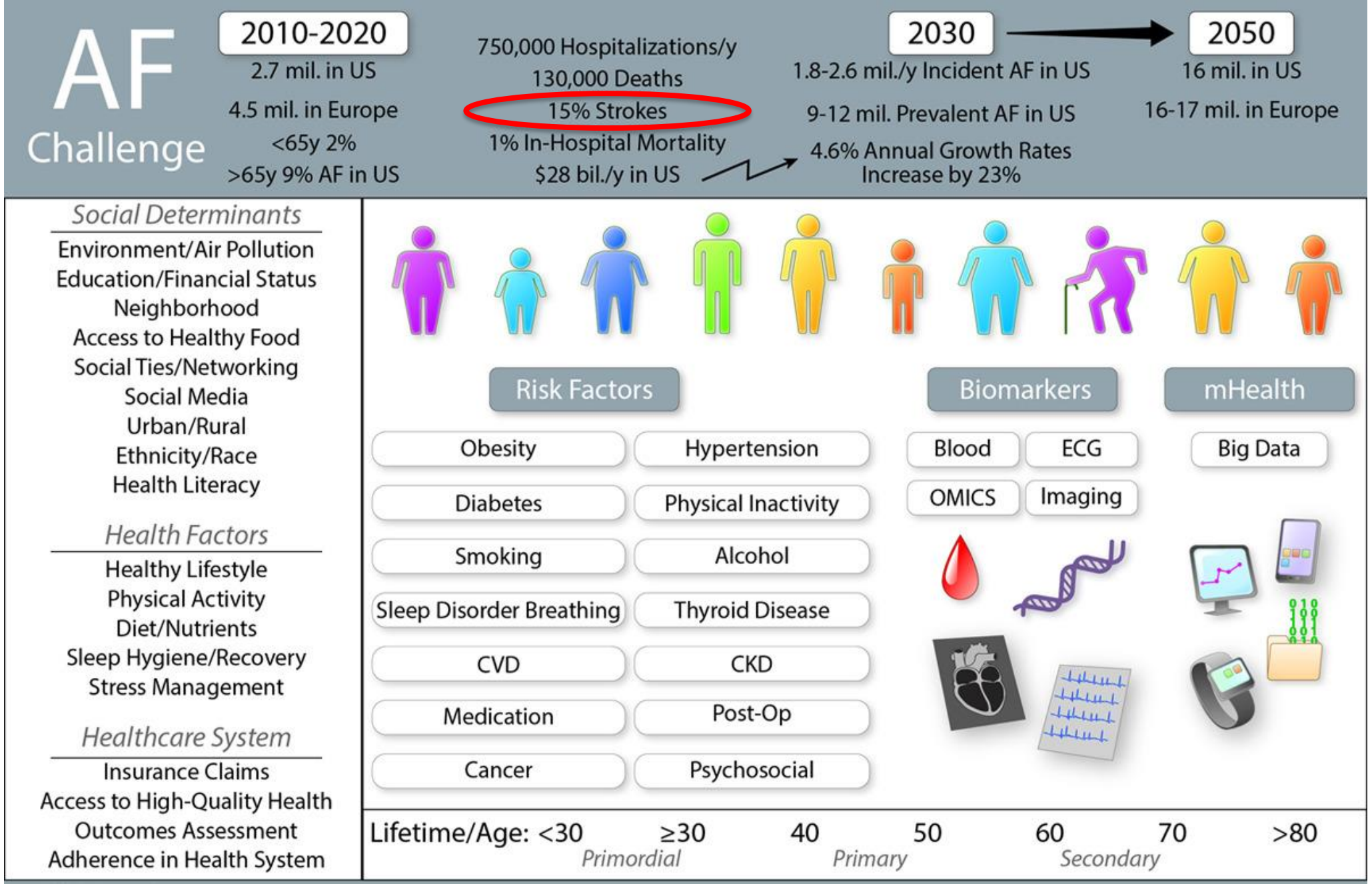
Question 2

A 63-year-old man with ischemic cardiomyopathy (LVEF 35%) and CKD 4 desires rhythm control pharmacotherapy for symptomatic paroxysmal atrial fibrillation. He is not a candidate for ablation. Which medication is most appropriate?

A. Amiodarone
B. Propafenone
C. Flecainide
D. Sotalol

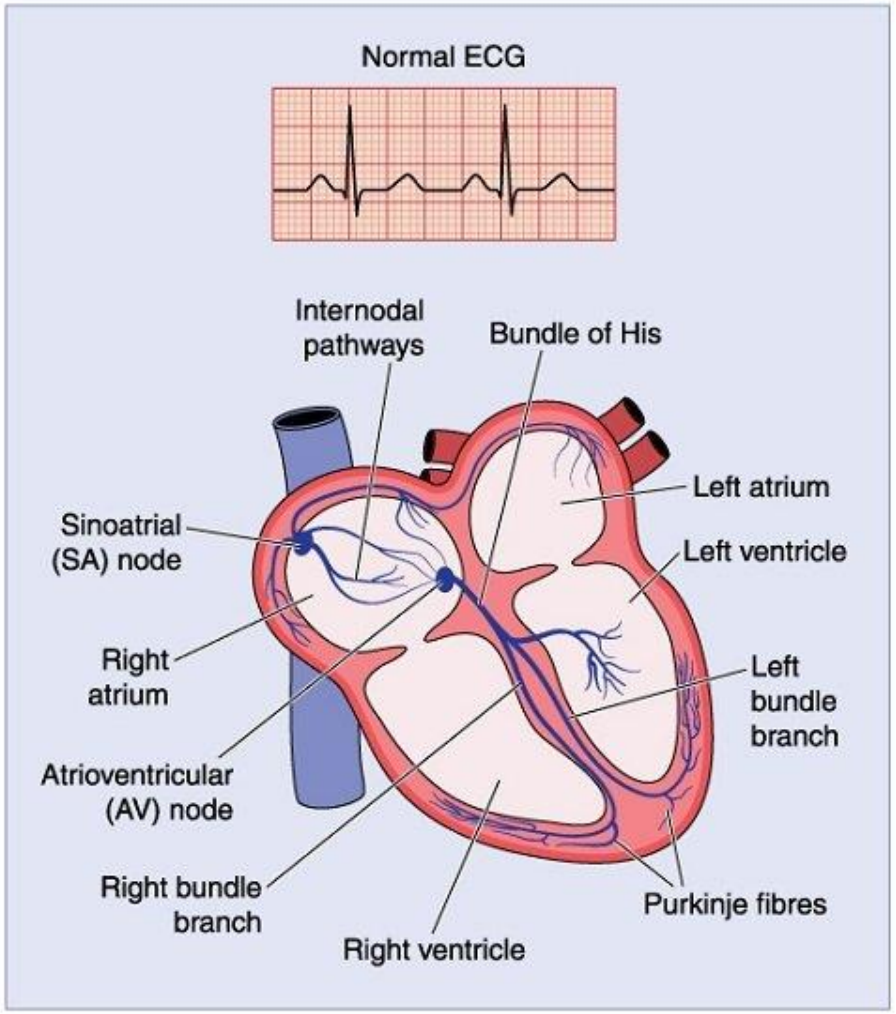
Learning Objectives

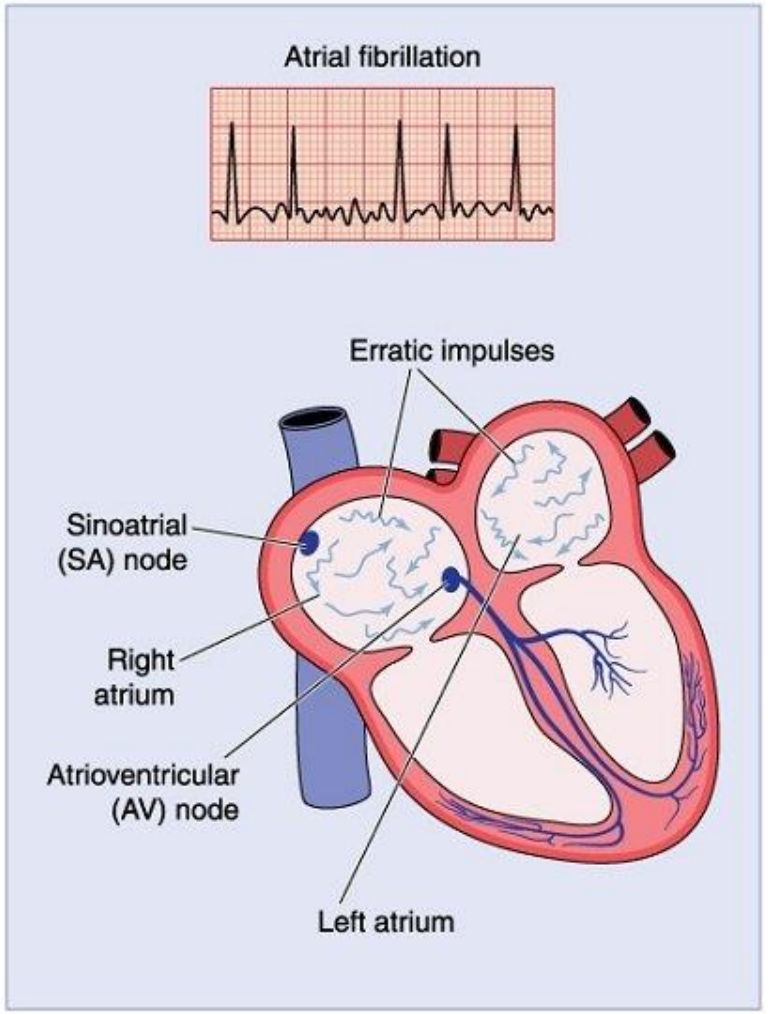
- Discuss the natural course and pathophysiology of atrial fibrillation (AF)
- Recognize AF on electrocardiogram
- Determine the stroke risk associated with AF based on risk factors
- Outline management strategies including anticoagulation, rate control, and rhythm control



Kornej et al., Circulation Research 2020 (PMID: 32716709)

Pathophysiology of Atrial Fibrillation

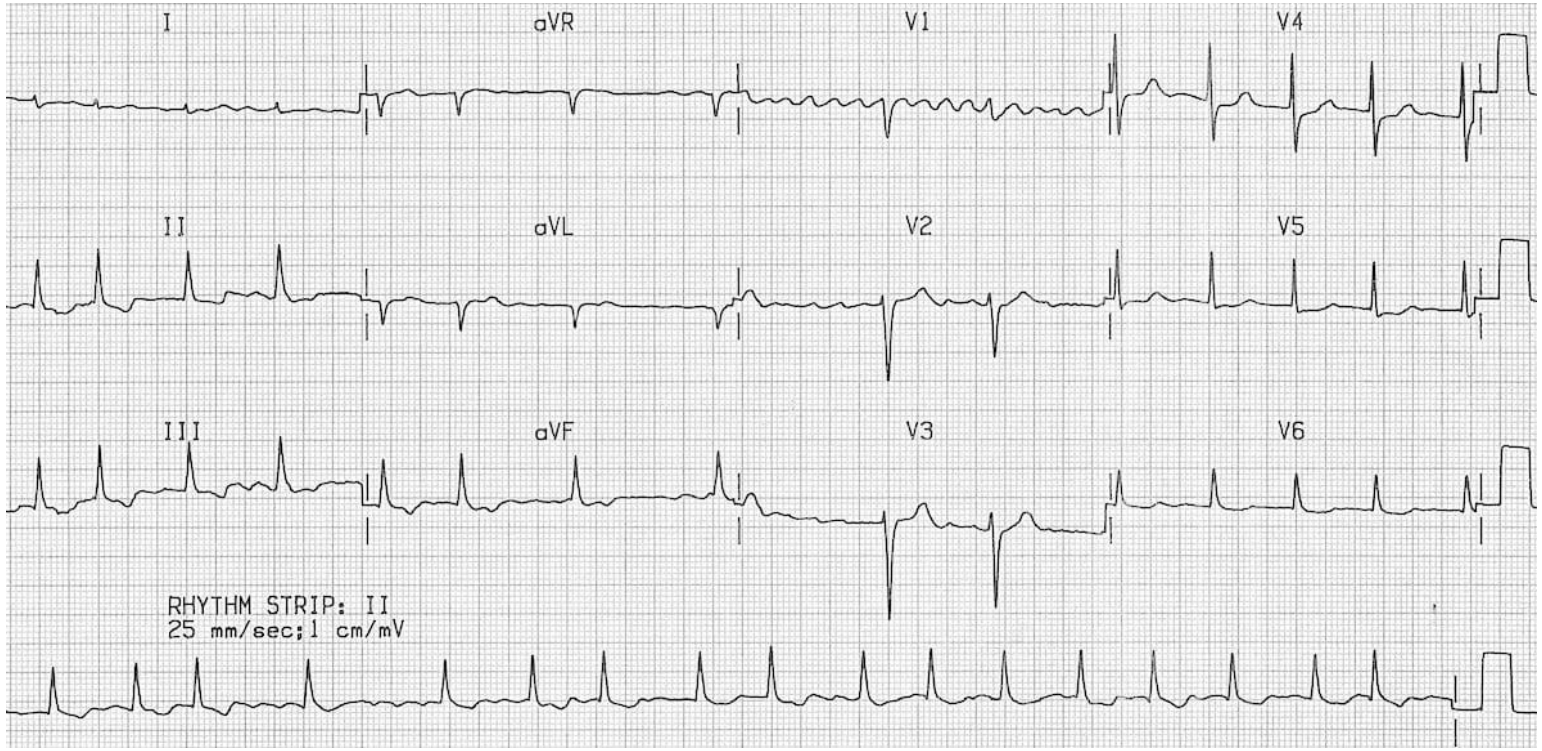




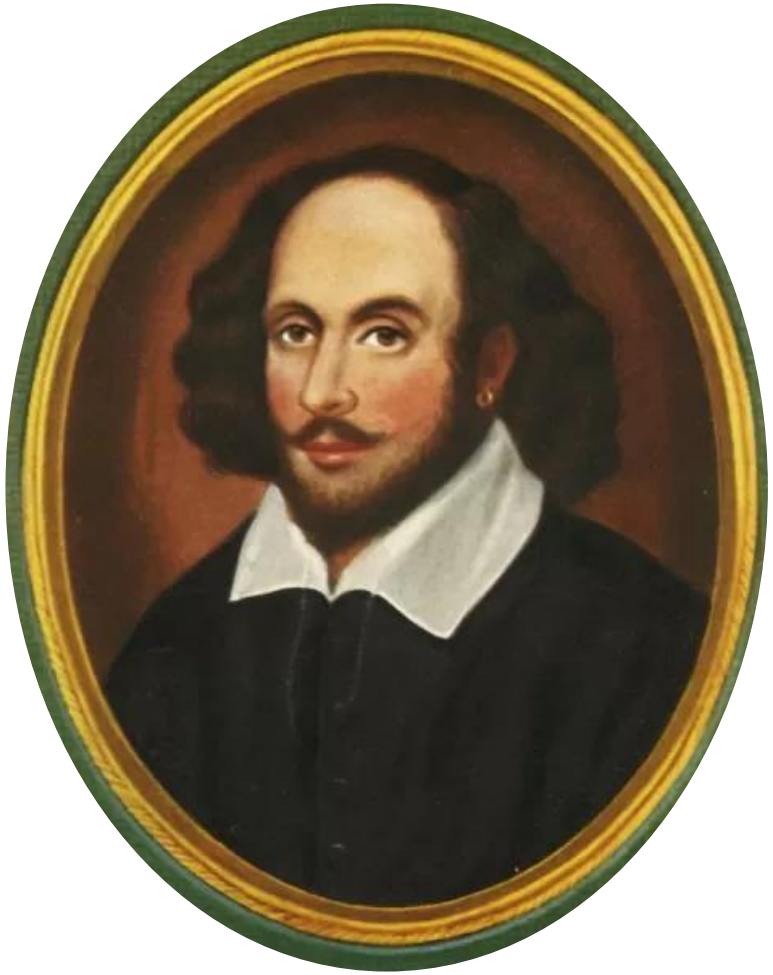
Cardiocare LLC (https://cardiocarellc.com/blog/atrial-fibrillation-the-basics)

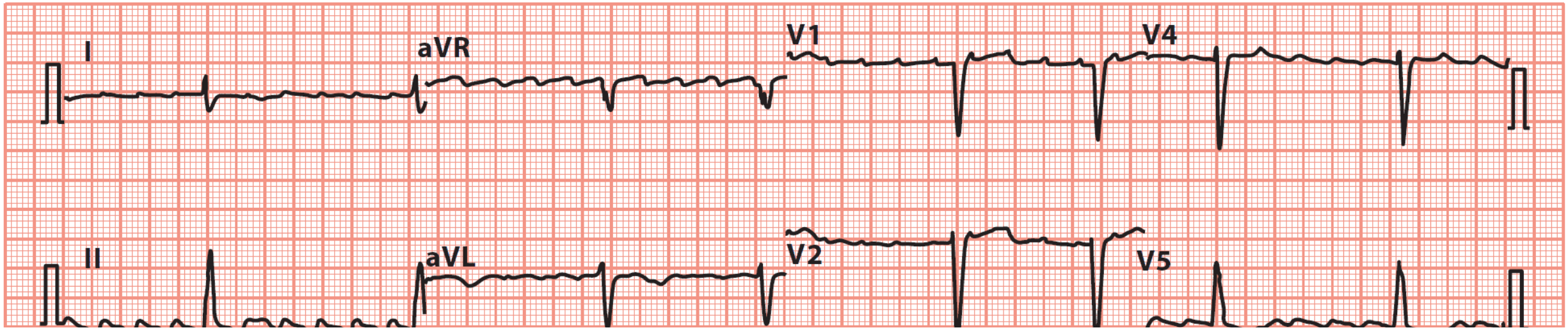
Recognizing Atrial Fibrillation on ECG

- Irregularly irregular ventricular rhythm
- Absence of P waves
- Ventricular rate often > 100 bpm in acute AF
- Ventricular rate frequently <100 bpm in chronic AF
- Course fibrillatory waves sometimes present

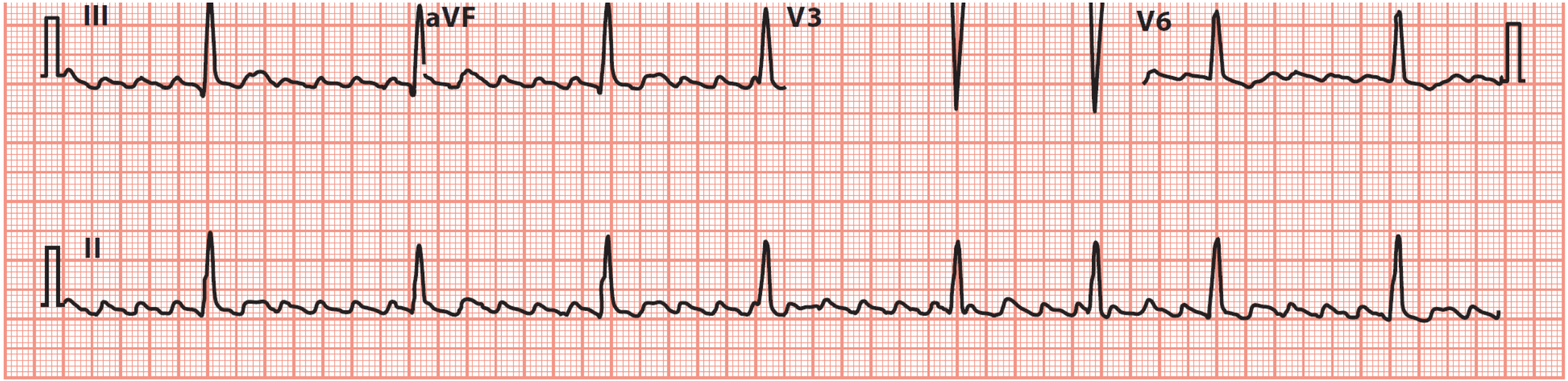


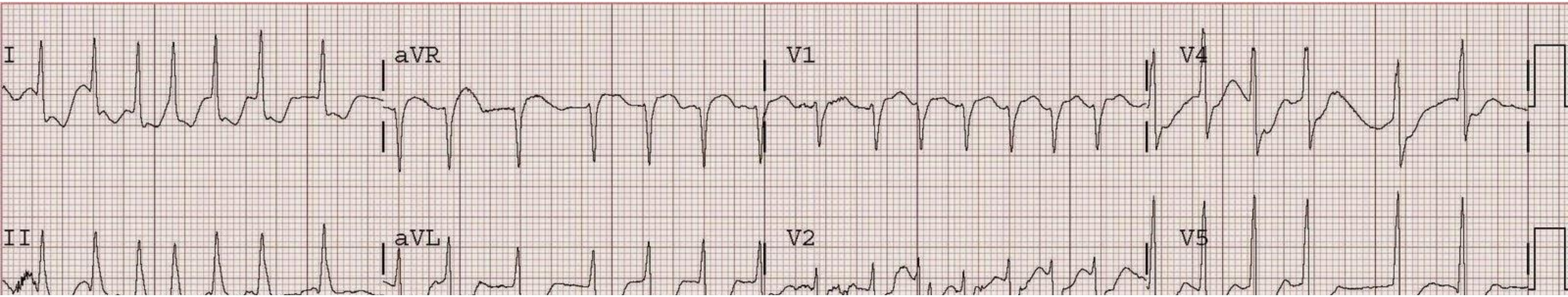
Afib or not Afib?



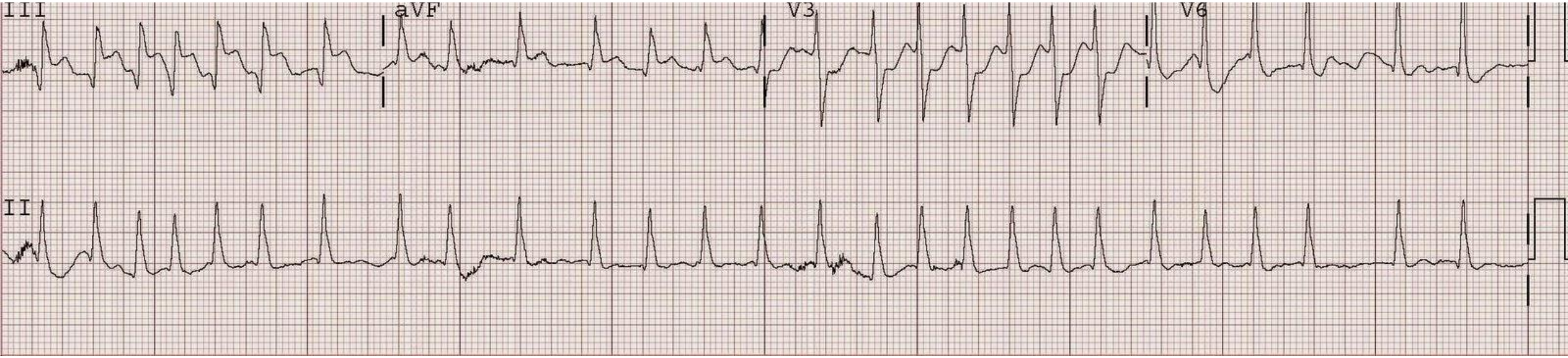


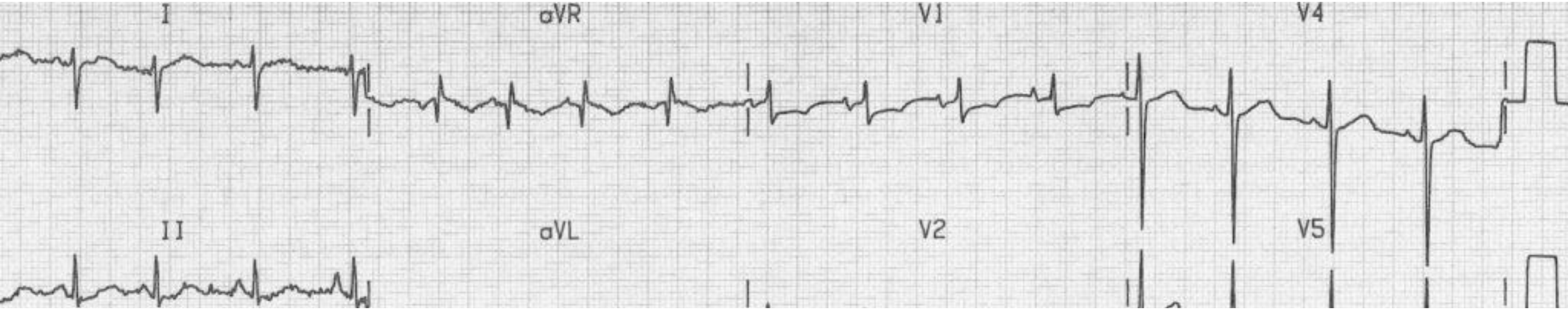
Atrial flutter (with variable conduction)



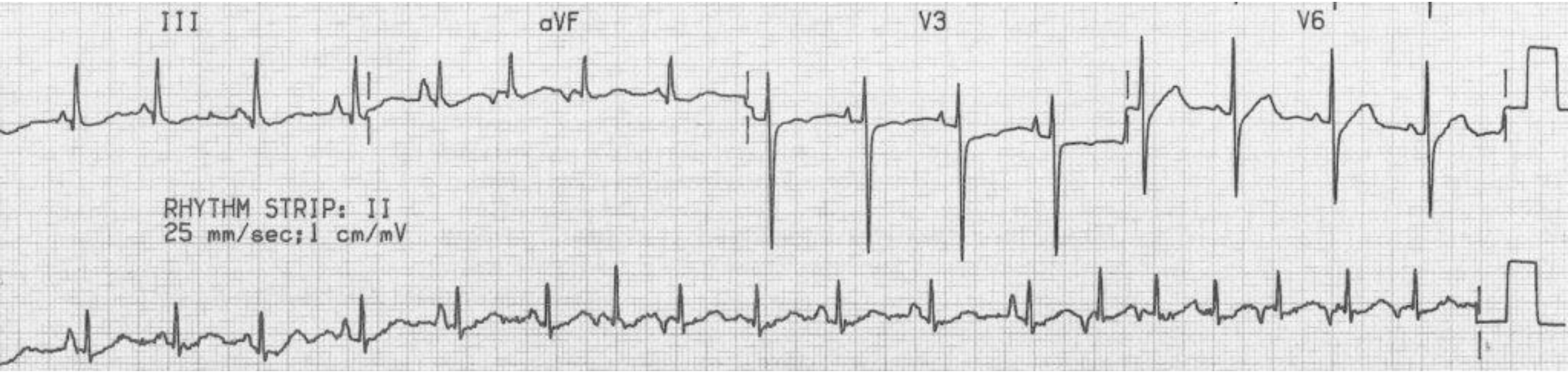


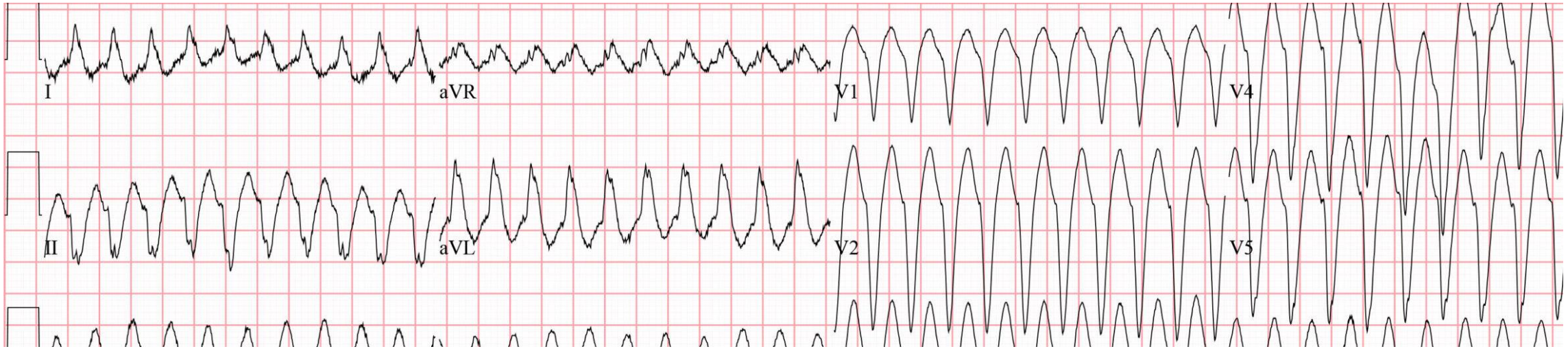
Atrial fibrillation (with inferior MI)



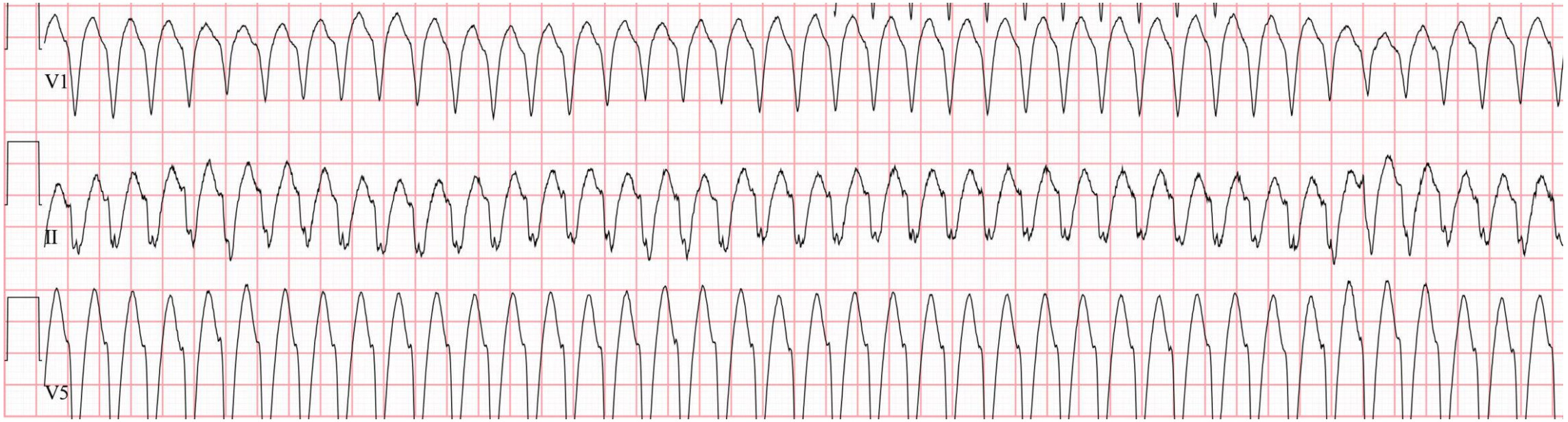


Multifocal atrial tachycardia (MAT)





Ventricular tachycardia



Chronicity and Definitions

Table 1. AHA/ACC/HRS AF Guidelines 2014

Definitions of AF: A Simplified Scheme	
Term	**Definition**
Paroxysmal AF	• AF that terminates spontaneously or with intervention within 7 days of onset • Episodes may recur with variable frequency
Persistent AF	• Continuous AF that is sustained >7 days
Long-standing persistent AF	• Continuous AF >12 months in duration
Permanent AF	• The term "permanent AF" is used when the patient and clinician make a joint decision to stop further attempts to restore and/or maintain sinus rhythm • Acceptance of AF represents a therapeutic attitude on the part of the patient and clinician rather than an inherent pathophysiological attribute of AF • Acceptance of AF may change as symptoms, efficacy of therapeutic interventions, and patient and clinician preferences evolve

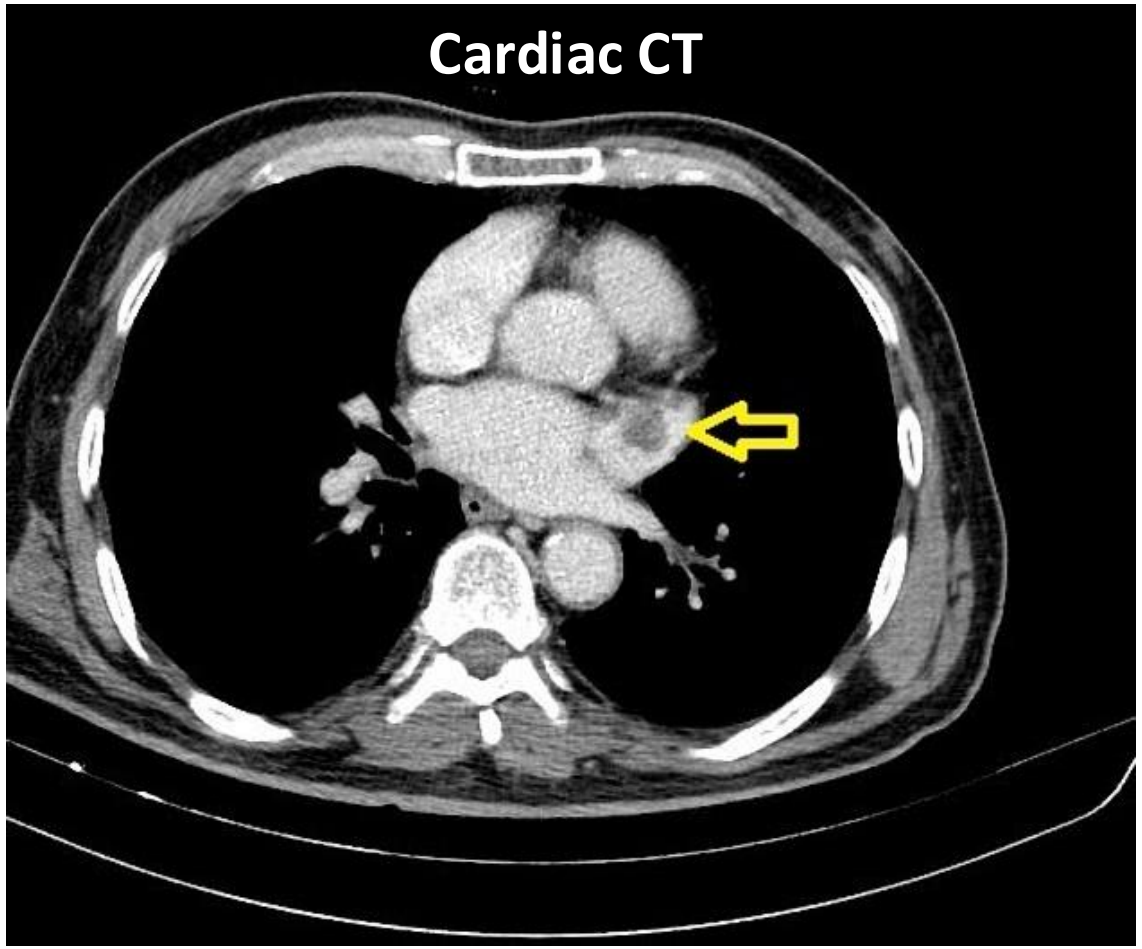
Adapted from January et al., 2014[15]

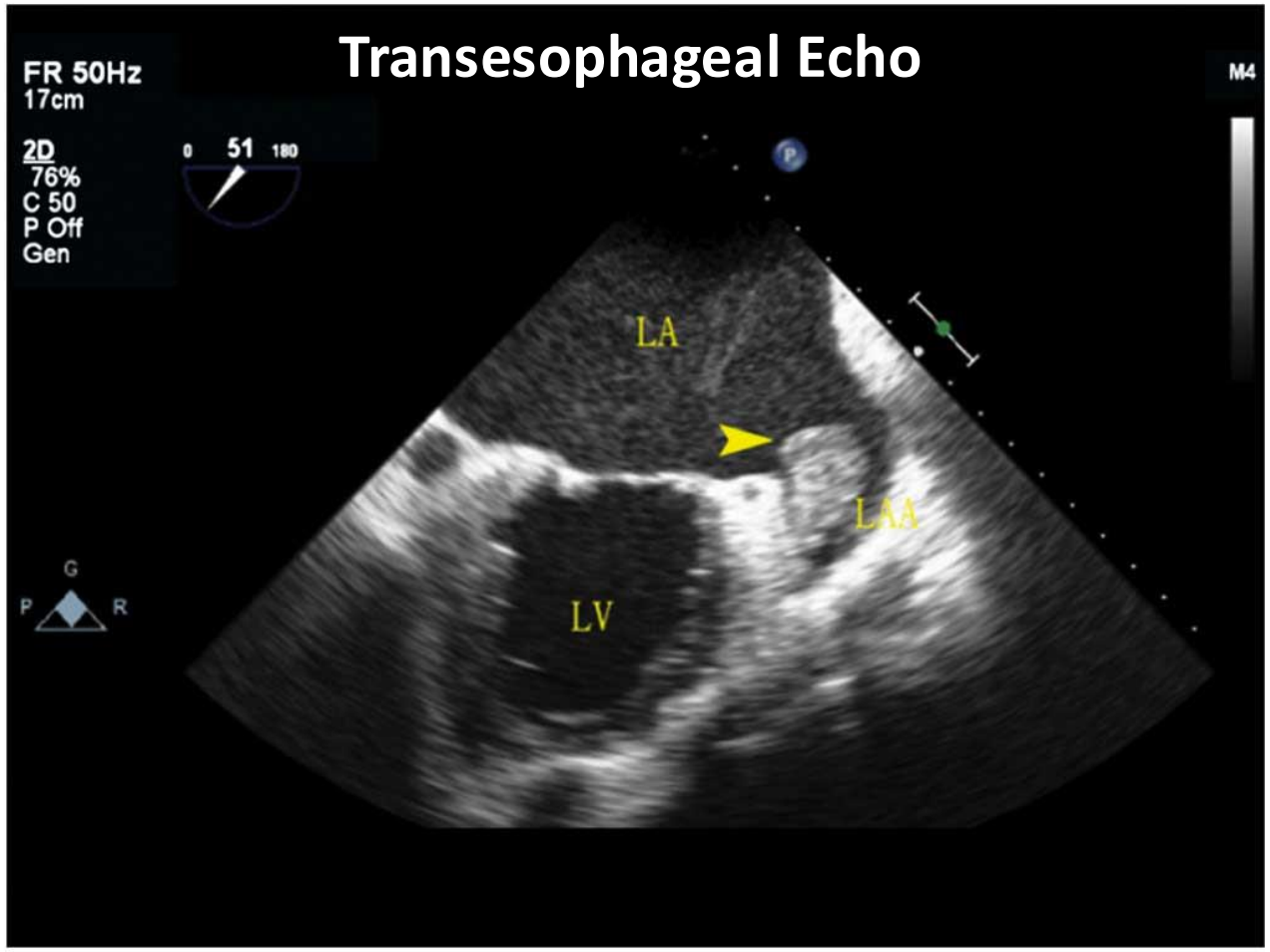
Electrical remodeling occurs

Structural remodeling occurs (atrial fibrosis and dilation)

"Afib begets Afib"

Stroke Risk Stems from Atrial Thrombus





Kahveci S, Radiopaedia.org

Gan et al., 2016

Stroke Risk Stratification in AF

	CHA_2DS_2-VASc risk factor	Points
C	Congestive heart failure	+1
H	Hypertension	+1
A_2	Age 75 years or older	+2
D	Diabetes mellitus	+1
S_2	Previous stroke, transient ischaemic attack or thromboembolism	+2
V	Vascular disease	+1
A	Age 65–74 years	+1
Sc	Sex category (female)	+1

bartsaf.com

CHA_2DS_2-VASc Score	Risk of ischemic stroke	Risk of stroke/TIA/systemic embolism
0	0.2%	0.3%
1	0.6%	0.9%
2	2.2%	2.9%
3	3.2%	4.6%
4	4.8%	6.7%
5	7.2%	10.0%
6	9.7%	13.6%
7	11.2%	15.7%
8	10.8%	15.2%
9	12.2%	17.4%

Friberg et al., 2012 (PMID: 22246443)

Anticoagulation for AF >24 Hours

Drug	Standard Dose	Modified Dose
Apixaban	5 mg by mouth twice daily	2.5 mg twice daily if meet 2 of the 3: Weight ≤ 60 kg or Age ≥ 80 years or Cr ≥ 1.5 mg/dL
Dabigatran	150 mg by mouth twice daily	75 mg twice daily if CrCL 15-30 mL/min
Edoxaban	60 mg by mouth once daily	30 mg once daily if: Weight ≤ 60 kg or CrCl 15-49 mL/min
Rivaroxaban	20 mg by mouth once daily	15 mg once daily if: CrCl ≤ 15-49 mL/min

- Warfarin (second line therapy): INR 2.5
- Heparin: PTT 60-80 (LMWH 1/mg/kg BID)
- ***Aspirin monotherapy is not recommended***

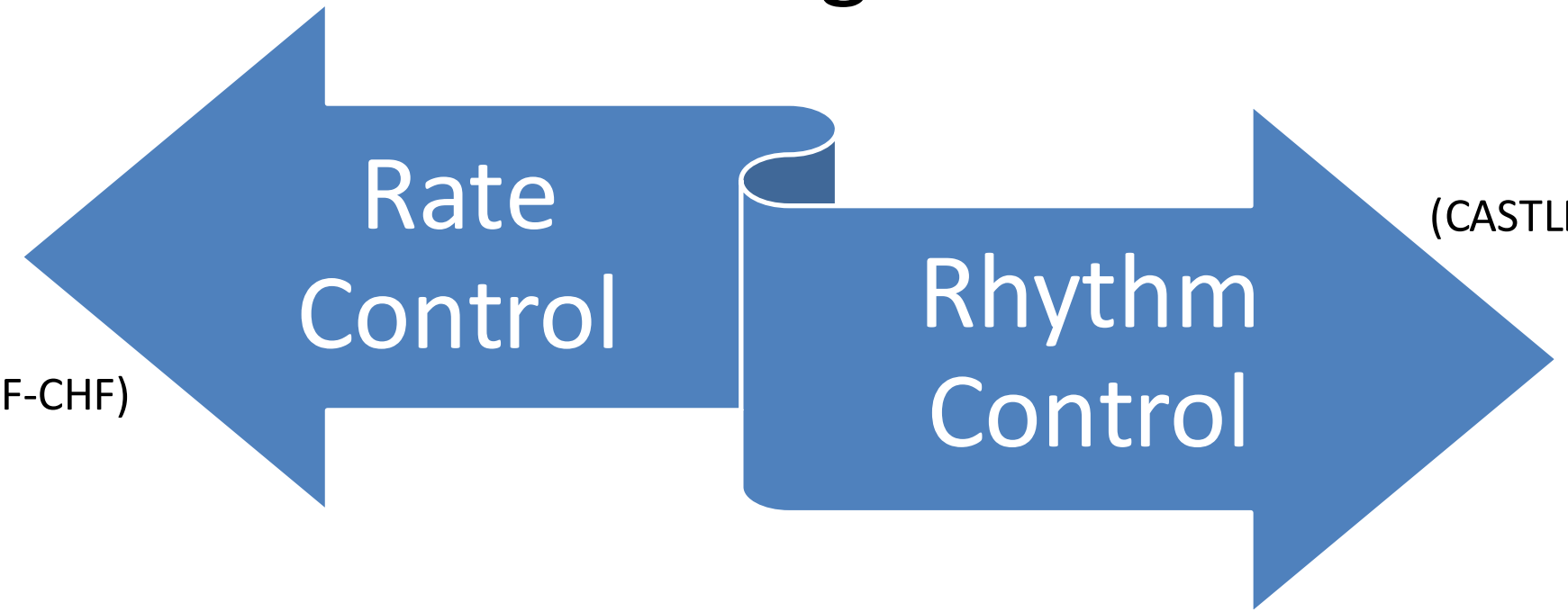
AF Management: Lifestyle Changes

Recommendation for Primary Prevention
Referenced studies that support the recommendation are summarized in the Online Data Supplement.

COR	LOE	Recommendation
1	B-NR	1. Patients at increased risk of AF should receive comprehensive guideline-directed LRFM for AF, targeting obesity,[1] physical inactivity,[2] unhealthy alcohol consumption,[3] smoking,[4] diabetes,[5] and hypertension.[6]

Joglar et al., 2024 (PMID: 38033089)

AF Management



(AFFIRM, RACE, AF-CHF)

(CASTLE AF, EAST-AFNET)

- Consider for asymptomatic patients without heart failure
- Generally more straightforward
- Fewer risks of therapy

- Preferred if symptomatic or structural heart disease
- More nuanced
- Risk of unintended arrhythmia

Rate Control: Guidelines and LOE

Recommendations for Broad Considerations for Rate Control
Referenced studies that support the recommendations are summarized in the Online Data Supplement.

COR	LOE	Recommendations
1	B-NR	1. In patients with AF, SDM with the patient is recommended to discuss rhythm- versus rate-control strategies (taking into consideration clinical presentation, comorbidity burden, medication profile, and patient preferences), discuss therapeutic options, and for assessing long-term benefits.[1–3]
2a	B-R	2. In patients with AF without HF who are candidates for select rate-control strategies, heart rate target should be guided by underlying patient symptoms, in general aiming at a resting heart rate of <100 to 110 bpm.[2,4–6]

- Discuss rate/rhythm control in context of comorbidities
- Aim for HR <110 bpm

Recommendations for Acute Rate Control
Referenced studies that support the recommendations are summarized in the Online Data Supplement.

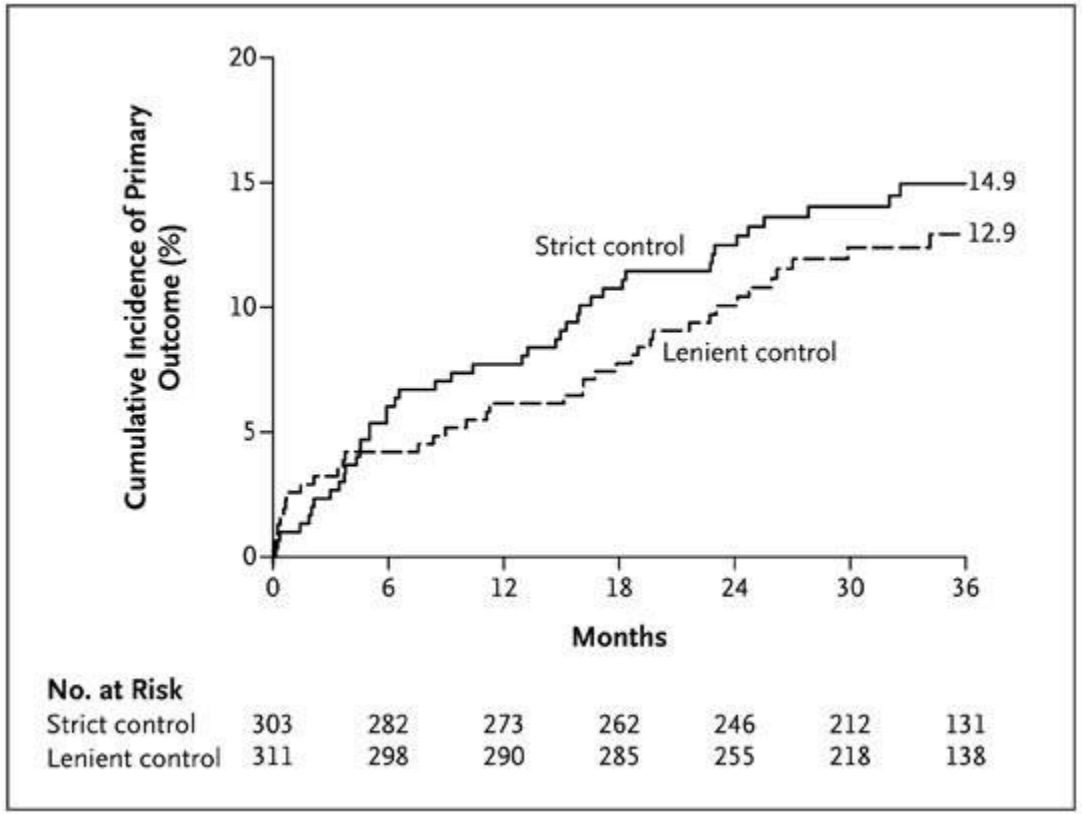
COR	LOE	Recommendations
1	B-R	1. In patients with AF with rapid ventricular response who are hemodynamically stable, beta blockers or nondihydropyridine calcium channel blockers (verapamil, diltiazem; provided that EF >40%) are recommended for acute rate control (Figure 17).[1–4]
2a	B-R	2. In patients with AF with rapid ventricular response in whom beta blockers and nondihydropyridine calcium channel blockers are ineffective or contraindicated, digoxin can be considered for acute rate control, either alone or in combination with the aforementioned agents.[5–9]
2a	A	3. In patients with AF with rapid ventricular response, the addition of intravenous magnesium to standard rate-control measures is reasonable to achieve and maintain rate control.[10,11]

- Use BB, CCB, digoxin, and/or magnesium in the acute setting

Joglar et al., 2024 (PMID: 38033089)

AF Rate Control: Target HR <110

- 614 patients randomized to lenient (HR <110) or strict (HR <80) rate control strategy
- Primary outcome: composite including CV death, HF hospitalization, CVA
- Lenient control non-inferior to strict control (p<0.001)



Van Gelder et al., N Engl J Med. 2010 PMID: 20231232.

Rate Control: Pharmacology

Drug	Intravenous Dose	Oral Maintenance Dose
Metoprolol Tartrate	2.5 – 5.0 mg Bolus	25 – 100 mg twice daily
Metoprolol Succinate	------	50 – 400 mg once daily
Bisoprolol	------	1.25 – 20 mg once daily
Atenolol	------	25 – 100 mg once daily
Esmolol	500 µgm/kg Bolus	------
Nebivolol	------	2.5 – 10 mg once daily
Carvedilol	------	3.125 – 50 mg twice daily

Drug	Intravenous Dose	Oral Maintenance Dose
Verapamil	2.5 – 10 mg Bolus	40 mg twice daily to 480 mg (extended release) once daily
Diltiazem	0.25 mg/kg Bolus	60 mg thrice daily to 360 mg (extended release) once daily
Digoxin	0.5 mg Bolus	0.0625 – 0.25 mg once daily
Amiodarone	300 mg diluted in 250 mL 5% Dextrose over 30-60 min; Then 900-1200 mg over 24 hrs diluted in 500-1000 mL	200 mg thrice daily for 4 weeks 200 mg daily thereafter

- Avoid verapamil and diltiazem if LVEF is reduced
- Avoid beta blockers if cardiogenic shock is suspected
- Treat the underlying cause

Rhythm Control: Guidelines and LOE

Recommendations for Goals of Therapy With Rhythm Control
Referenced studies that support the recommendations are summarized in the Online Data Supplement.

COR	LOE	Recommendations
1	B-R	1. In patients with reduced LV function and persistent (or high burden) AF, a trial of rhythm control should be recommended to evaluate whether AF is contributing to the reduced LV function.[1–6]
2a	B-R	2. In patients with symptomatic AF, rhythm control can be useful to improve symptoms.[7–11]
2a	B-R	3. In patients with a recent diagnosis of AF (<1 year), rhythm control can be useful to reduce hospitalizations, stroke, and mortality.[12–14]
2a	B-R	4. In patients with AF and HF, rhythm control can be useful for improving symptoms and improving outcomes, such as mortality and hospitalizations for HF and ischemia.[15–19]
2a	B-NR	5. In patients with AF, rhythm-control strategies can be useful to reduce the likelihood of AF progression.[20–27]
2b	C-LD	6. 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.[28–32]
2b	B-NR	7. In patients with AF, rhythm-control strategies may be useful to reduce the likelihood of development of dementia or worsening cardiac structural abnormalities.[33–45]

Joglar et al., 2024 (PMID: 38033089)

Rhythm Control: Medical Management

Class IA and 1C (sodium channels)

- Use dependent
- Prolongs PR and QRS, risk of reentry
- Use a beta blocker concurrently
- Avoid in structural heart disease

- Procainamide (accessory pathway)
- Flecainide
- Propafenone

Class III (potassium channels)

- Reverse use dependent
- Risk of polymorphic VT
- Require inpatient QT monitoring
- Avoid in severe renal impairment

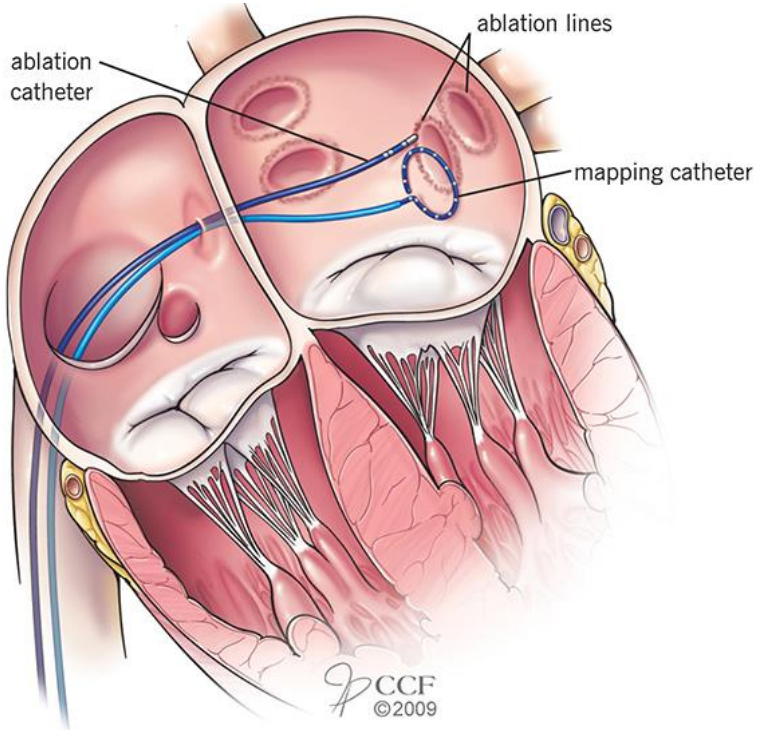
- Dofetilide
- Sotalol
- Amiodarone*

*Hepatic clearance, multiple mechanisms, requires thyroid, liver, lung monitoring

25

Rhythm Control: Procedural Management

Catheter ablation



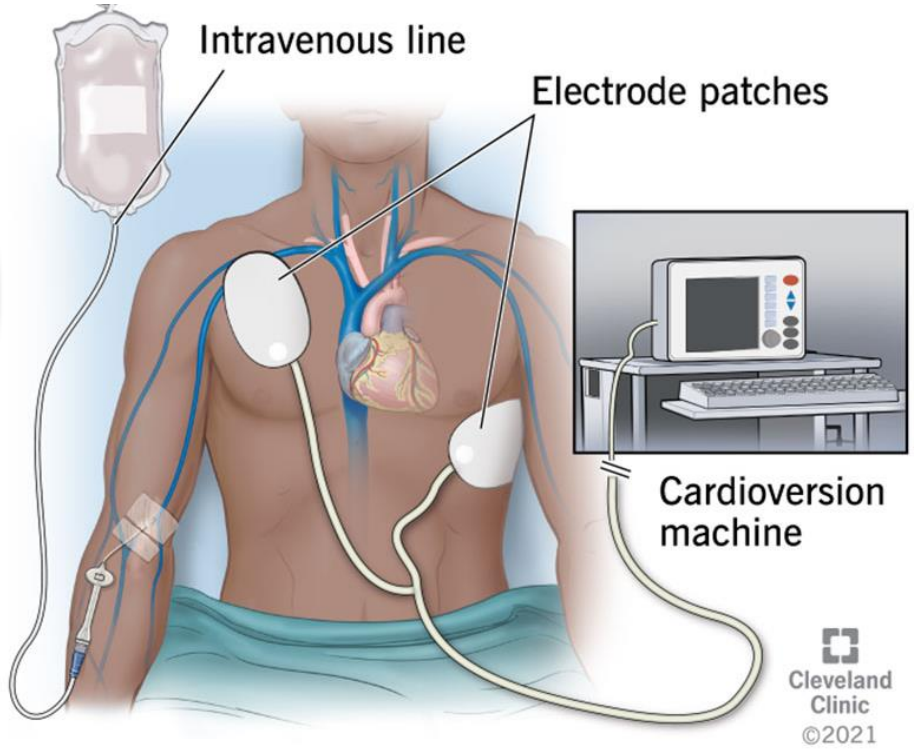
Transesophageal echocardiography

OR

At least 3 weeks of anticoagulation

30 day stroke risk: 0.3-0.7%
(slightly higher with ablation)

Electrical cardioversion



Question 1

What is the estimated annual ischemic stroke risk for a 77-year-old woman with hypertension, type II diabetes, prior myocardial infarction, and diastolic heart failure?

A. 3.2%

B. 4.8%

C. 7.2%

D. 11.2%

Question 2

A 63-year-old man with ischemic cardiomyopathy (LVEF 35%) and CKD 4 desires rhythm control pharmacotherapy for symptomatic paroxysmal atrial fibrillation. He is not a candidate for ablation. Which medication is most appropriate?

A. Amiodarone
B. Propafenone
C. Flecainide
D. Sotalol

Takeaway Points

- AF is a progressive illness that causes electrical and structural remodeling (AF begets AF)
- AF accounts for 15% of strokes worldwide (and growing)
- Anticoagulate for AF >24 hours (DOAC preferred)
- Use CHADSVASc to estimate long-term stroke risk
- Manage with rate or rhythm control based on patient's goals
- AF has many mimickers on ECG. Be vigilant!

Thank You!

spencer.carter2@utsouthwestern.edu

@spencercartermd

@utswheart

UT Southwestern: Frisco

Division of Cardiology

Department of Internal Medicine