ATRIAL FIBRILLATION

HANA HAGOS, MD

Thomas Memorial/Saint Francis Hospital

35th Annual JOSE I. RICARD, MD FAMILY MEDICINE & SPORTS MEDICINE CONFERENCE

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Objectives

- Define Atrial Fibrillation
- Classification of Atrial Fibrillation
- Prevalence
- Risk Factors
- Clinical Features
- Diagnosis
- EKG findings
- Calculating stroke risk
- Treatment options

Atrial Fibrillation(AF) Definition

- Caused by inappropriate electrical impulses in atria resulting in chaotic rhythm
- Can result in inefficient contractions affecting cardiac output and possible thrombus formation that can result in stroke events

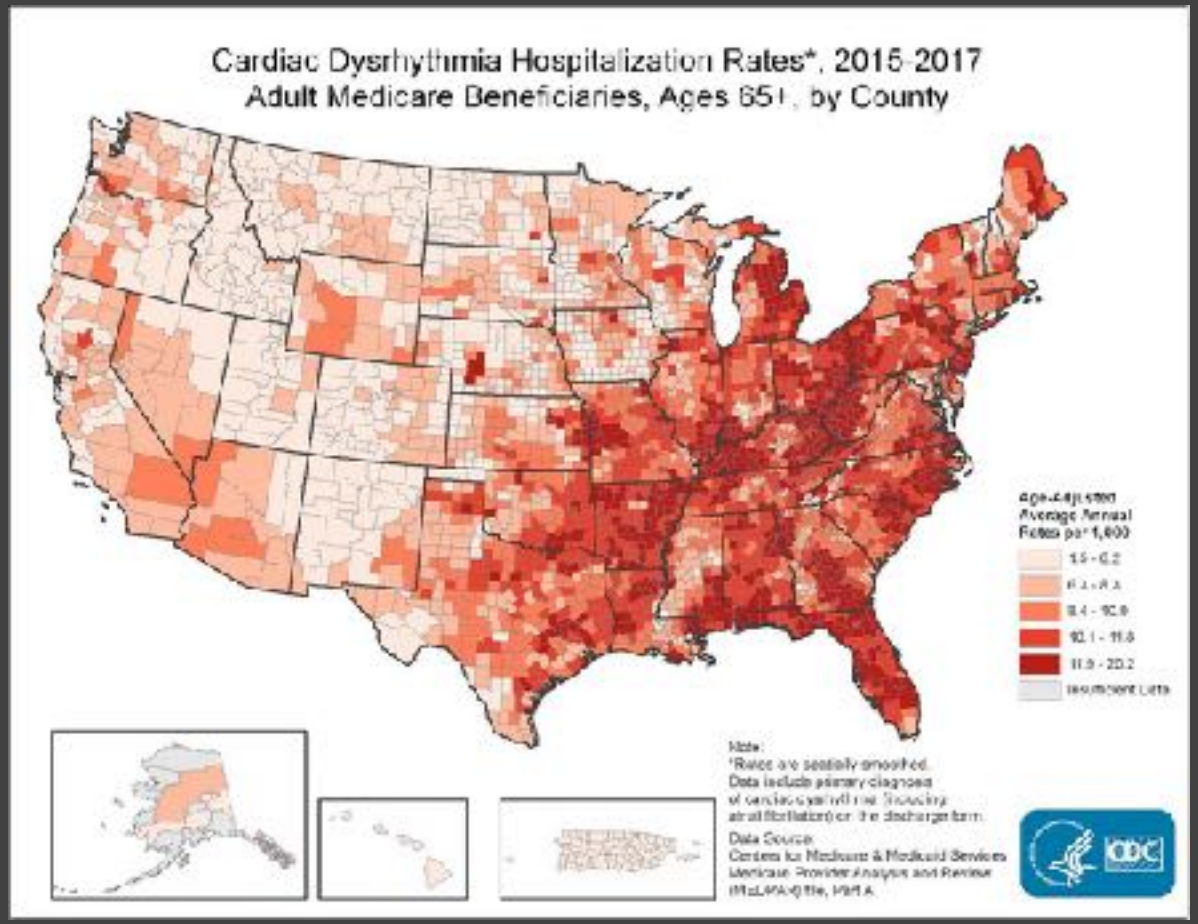
Classification

- **Paroxysmal AF:** Terminates spontaneously or with intervention within 7 days
- **Persistent AF** – Fails self-terminate within 7 days.
- **Long-standing persistent AF** – AF that has lasted for more than 12 months
- **Permanent AF** – persistent atrial fibrillation where a joint decision by the patient and clinician has been made to no longer pursue a rhythm control strategy

Prevalence

- Most common sustained cardiac arrhythmia worldwide
- An estimated 2.7 to 6.1 million people in the United States have Atrial fibrillation with projections to reach nearly 12.1 million in 2030
- AF increases with age, about 10% of the population by 80 years of age. Common in patient that have other structural heart disease, CHF, CAD, valvular heart disease

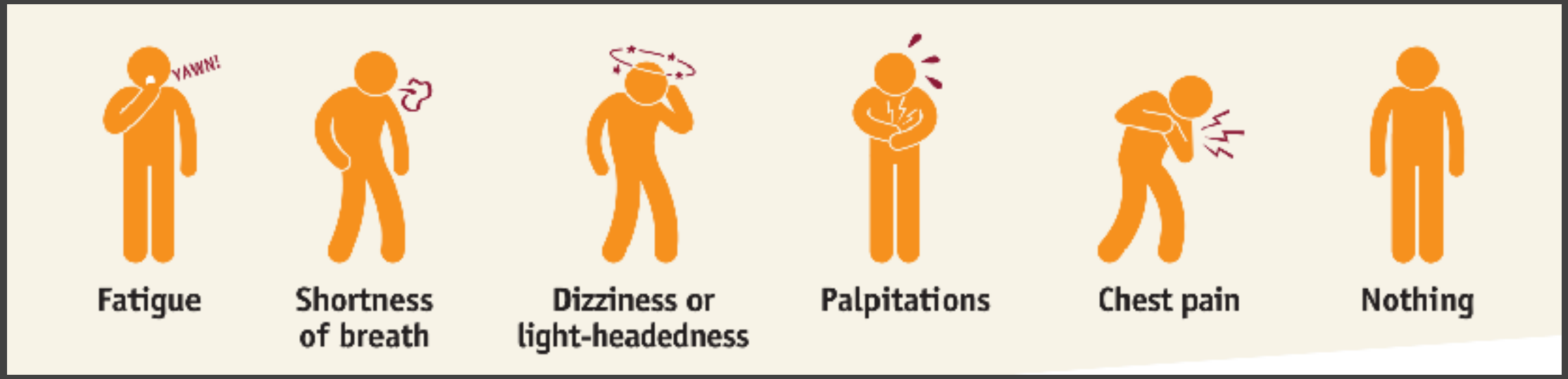
Prevalence


Cardiac Dysrhythmia Hospitalization Rates*, 2015-2017
Adult Medicare Beneficiaries, Ages 65+, by County
Age-Adjusted
Average Annual
Rates per 1,000
Data Source:
Centers for Medicare & Medicaid Services
CDC

Prevalence

- More than 454,000 hospitalizations with A Fib as the primary diagnosis happen each year in the United States.
- Contributes to about 158,000 deaths each year.
- The death rate from A Fib as the primary or a contributing cause of death has been rising for more than two decades

Sign and Symptoms



Sign and Symptoms

- No symptoms (50% of patients have minimal or subtle symptoms)
- Irregular heartbeat
- Heart palpitations (rapid, fluttering, or pounding)
- Lightheadedness
- Extreme fatigue
- Shortness of breath
- Chest pain
- Dyspnea at rest, angina, presyncope, syncope.
- Embolic event or insidious onset of heart failure

Risk Factors

- Obesity
- Moderate to heavy alcohol use
- Smoking, Pulmonary disease
- OSA(obstructive sleep apnea)
- Hypertension
- Advancing age
- European ancestry
- Diabetes
- VTD
- Congenital heart disease
- Heart failure, IHD
- FHx
- Hypomagnesemia, CKD
- Excessive caffeine, Meds
- Cardiac surgery
- Hyperthyroidism
- Enlargement of the chambers on the left side of the heart
- Diet

Diagnosis

- A 12-lead ECG is best to establish the diagnosis
- Transthoracic echocardiogram (TTE)
  -evaluate anatomical and structural function
  -determine normal vs LV dysfunction (changes treatment)
- Trans esophageal echocardiography(TEE)
  -to identify thrombi in the left atrium or left atrial appendage

Diagnosis

- Exercise testing
  - -S/Sx of Ischemic Heart Disease
  - -Pharmacotherapy choices (some antiarrhythmic medications are contraindicated in CAD)
  - -Adequacy of heart rate control during exercise
- Ambulatory cardiac monitoring
  - -Capture the arrhythmia if intermittent and not caught on routine electrocardiography
- 30 day event monitor, Implanted Loop Recorder (ILR) – looking for AF etiology in stroke
- Ambulatory ECG monitoring
  - -Assess symptoms to the arrhythmia, AF burden.
- 24 to 48-hour Holter monitoring
  - -Assess ventricular response rates

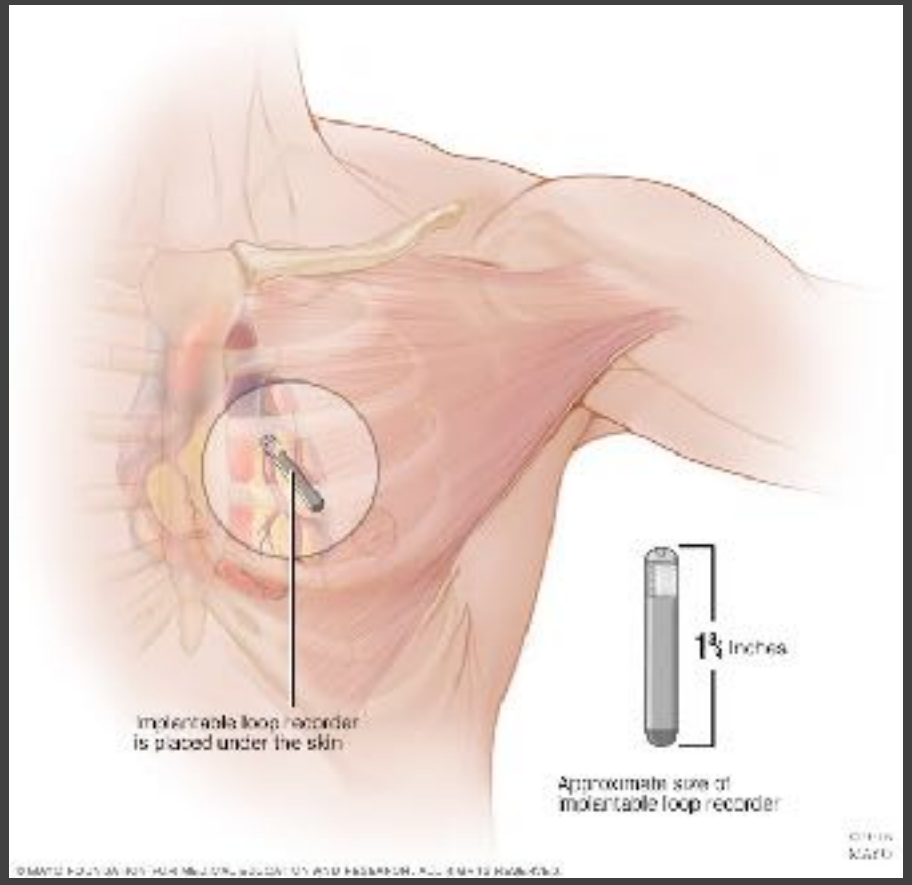
Diagnosis

- Kardia or Apple watch
  -anxious, symptomatic patients
  -may or may not have PAF
- Laboratory

  -TSH, FT4 in all patients with a first episode of AF or increase in AF frequency

  -Other baseline tests include CBC, Cr, FBG/A1C,lipid

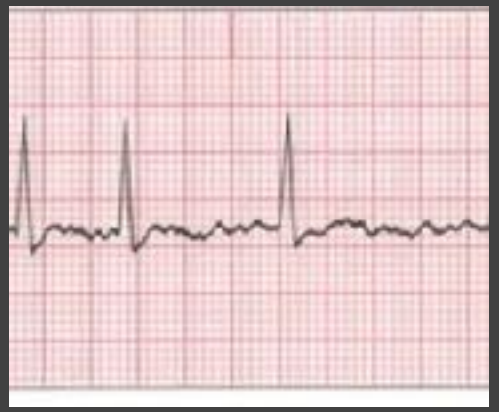
Diagnosis

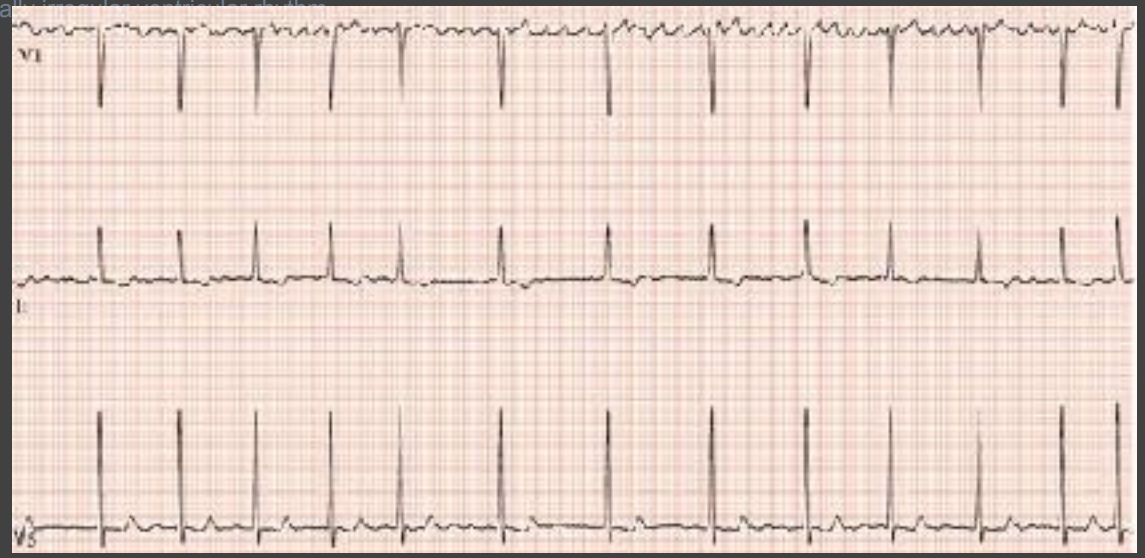


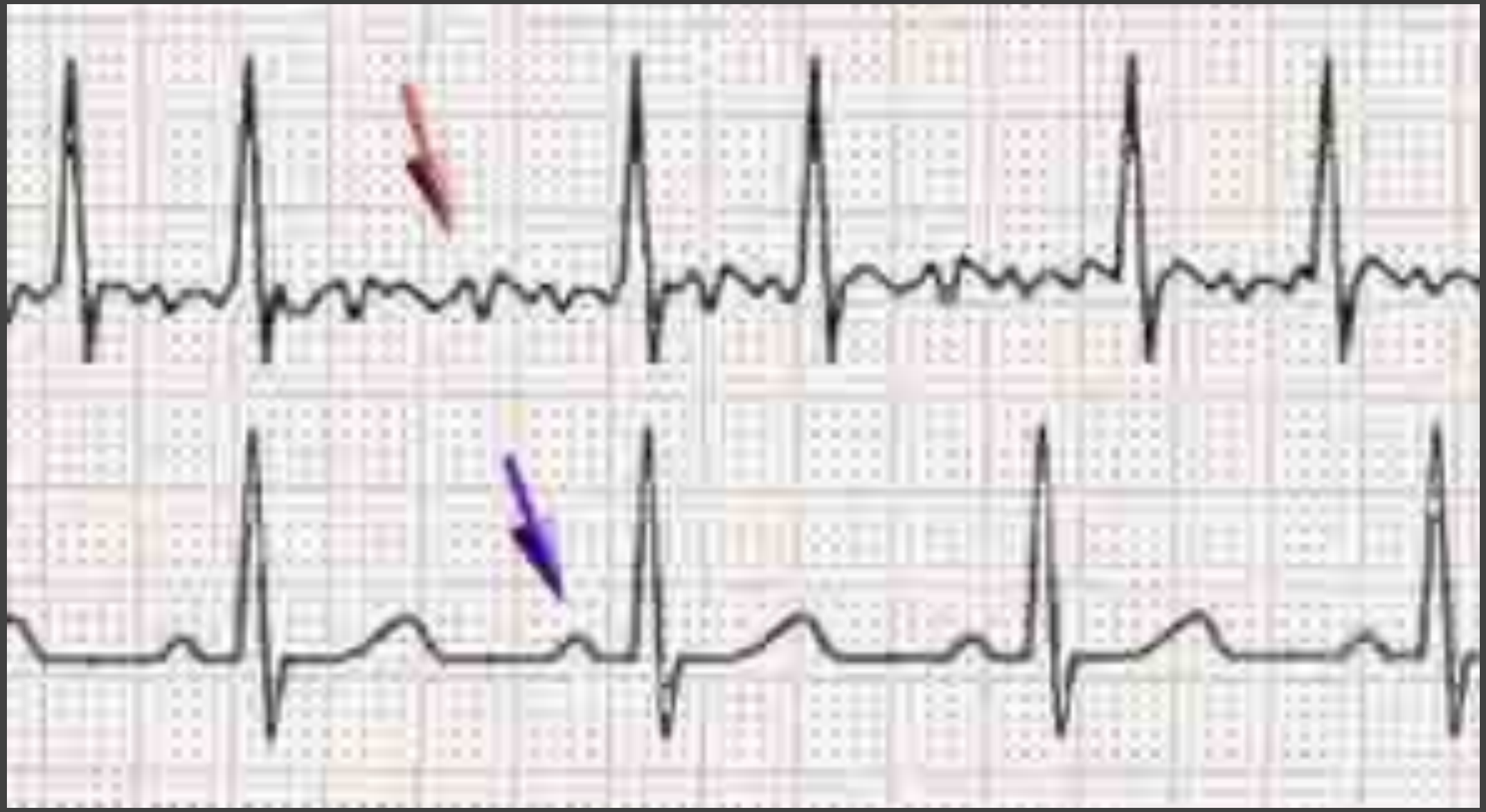
ECG Finding

- The RR intervals follow no repetitive pattern
- Irregularly, irregular narrow complex rhythm
- There are no distinct P waves
- Baseline is characterized by fibrillary waves(f-waves)
- F waves vary in size and frequency
- Atrial rate >300bpm and erratic activation of ventricle

ECG

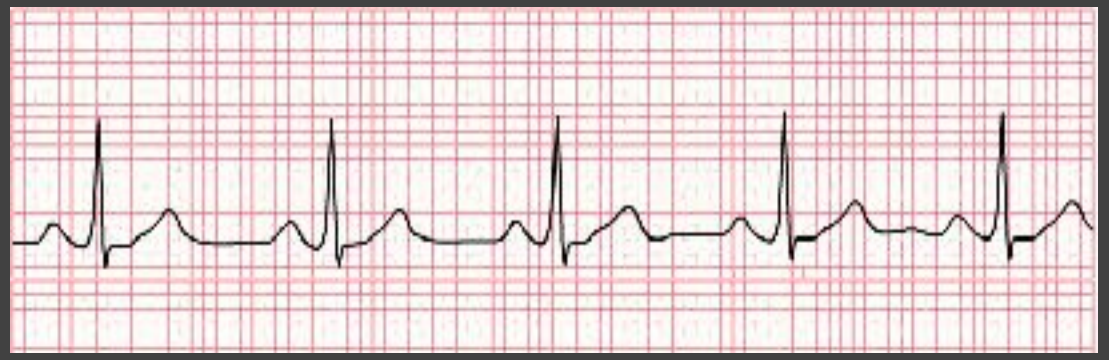




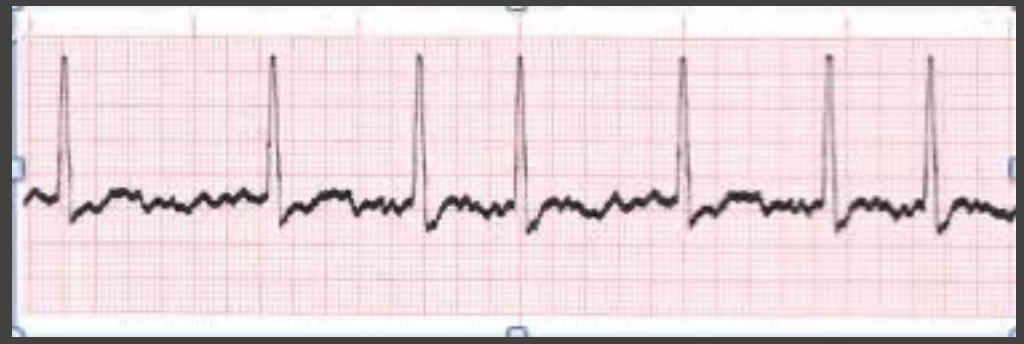


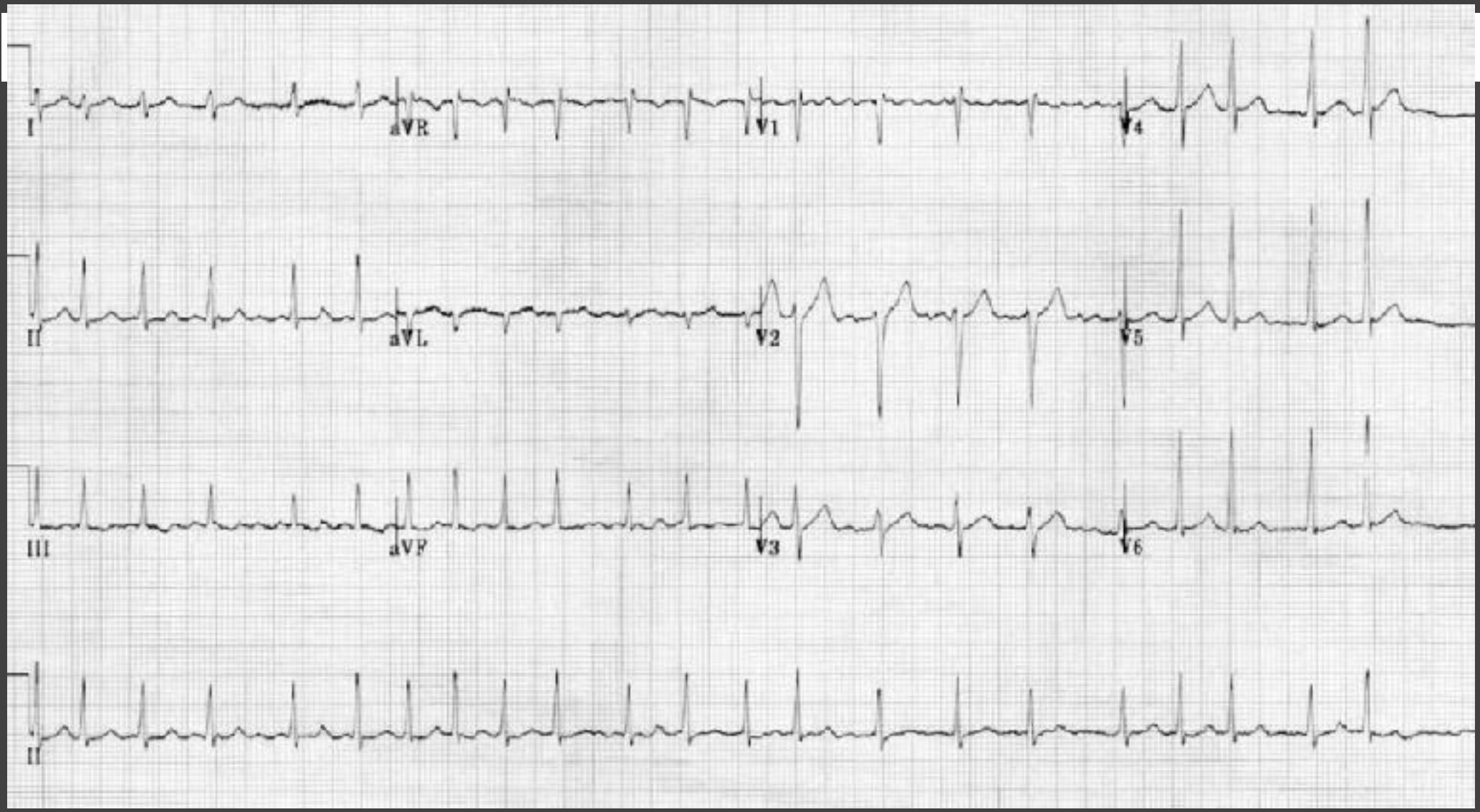
ECG

Normal



AF

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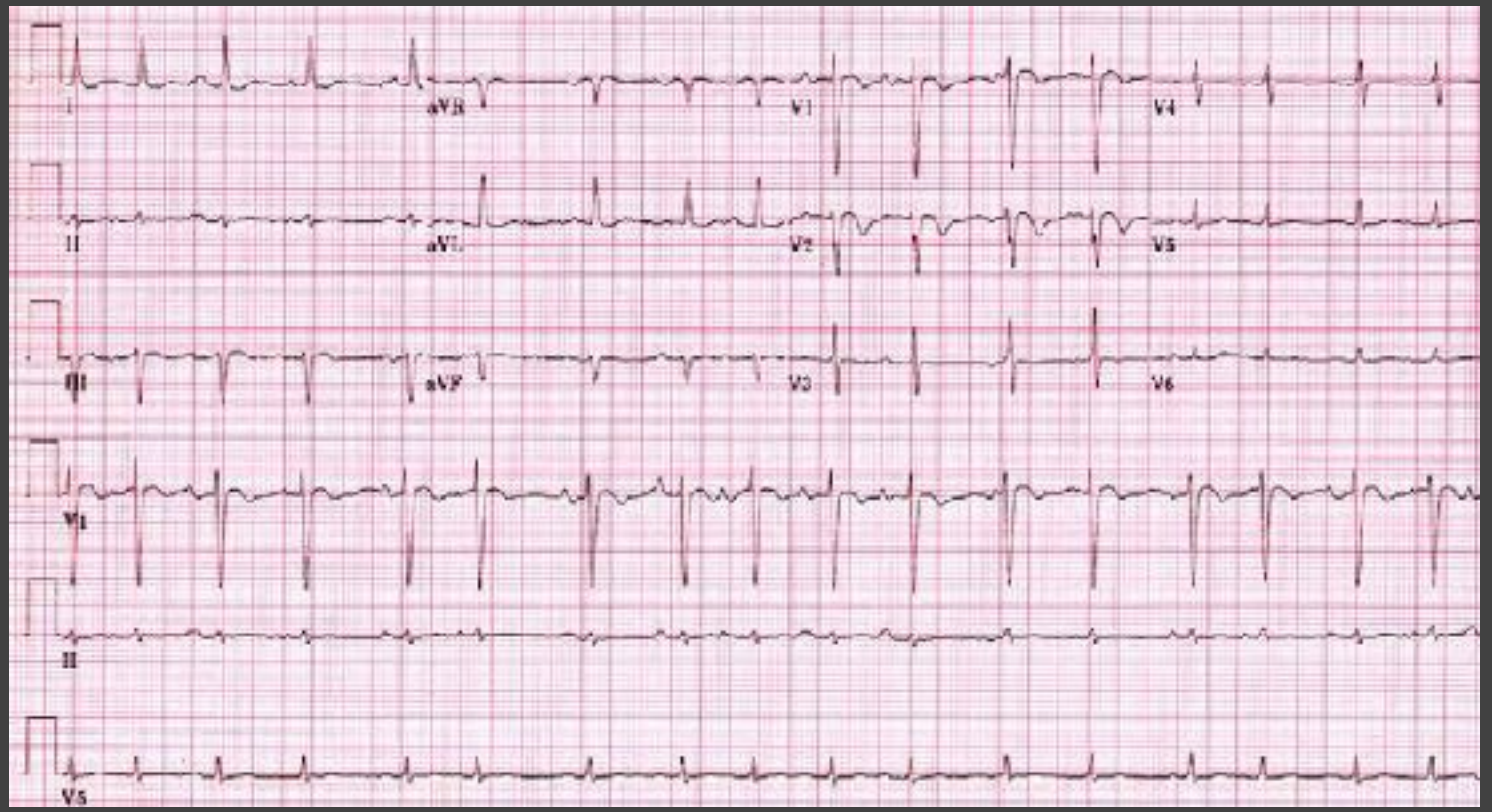
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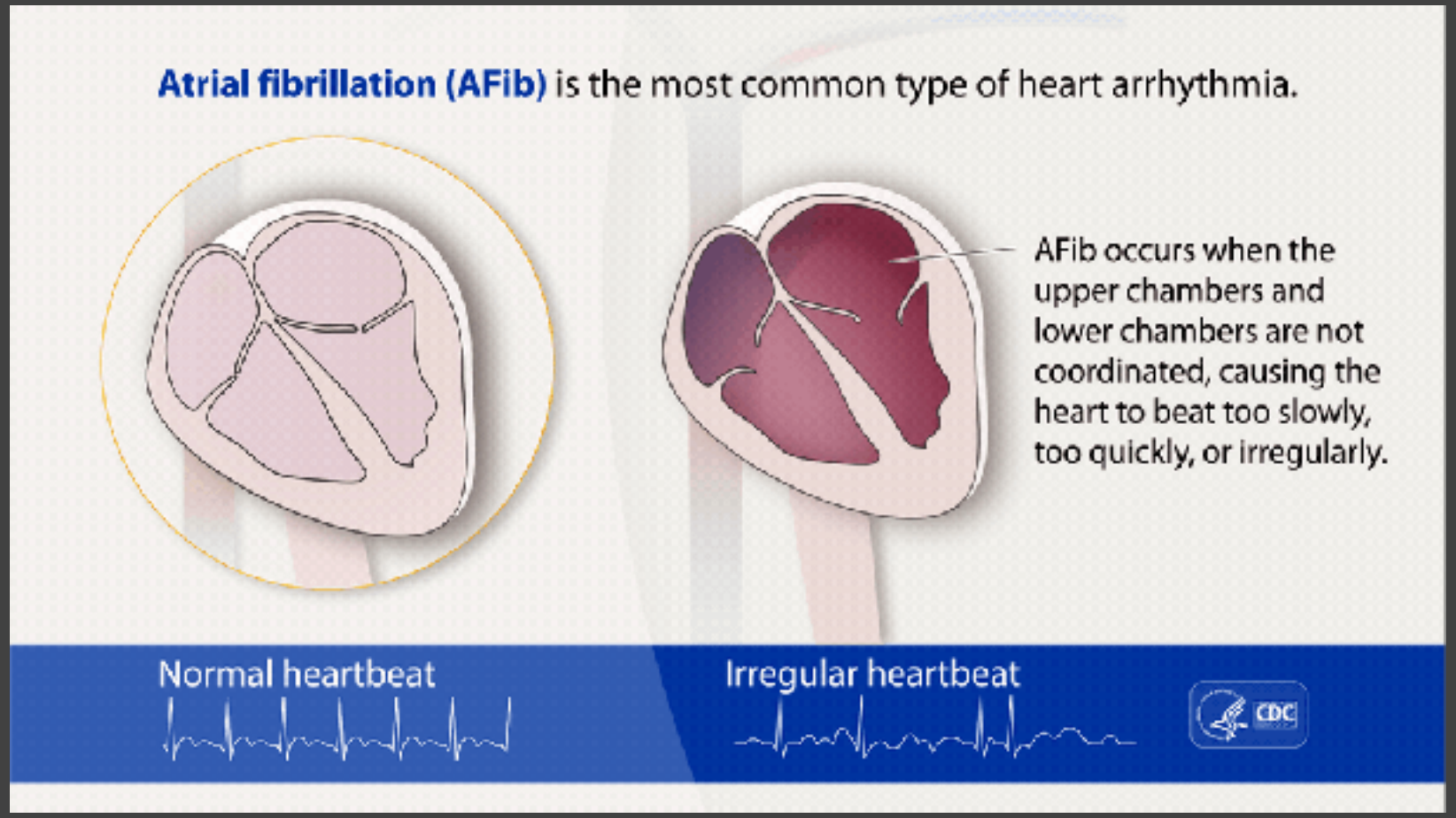
Atrial Fibrillation



Treatment

Pharmacologic Therapy

- Rate control
- Rhythm control
- Anticoagulation

Cardioversion

Electrical

Pharmacological

Surgery

Catheter Ablation

Pharmacological therapy
Rate Control

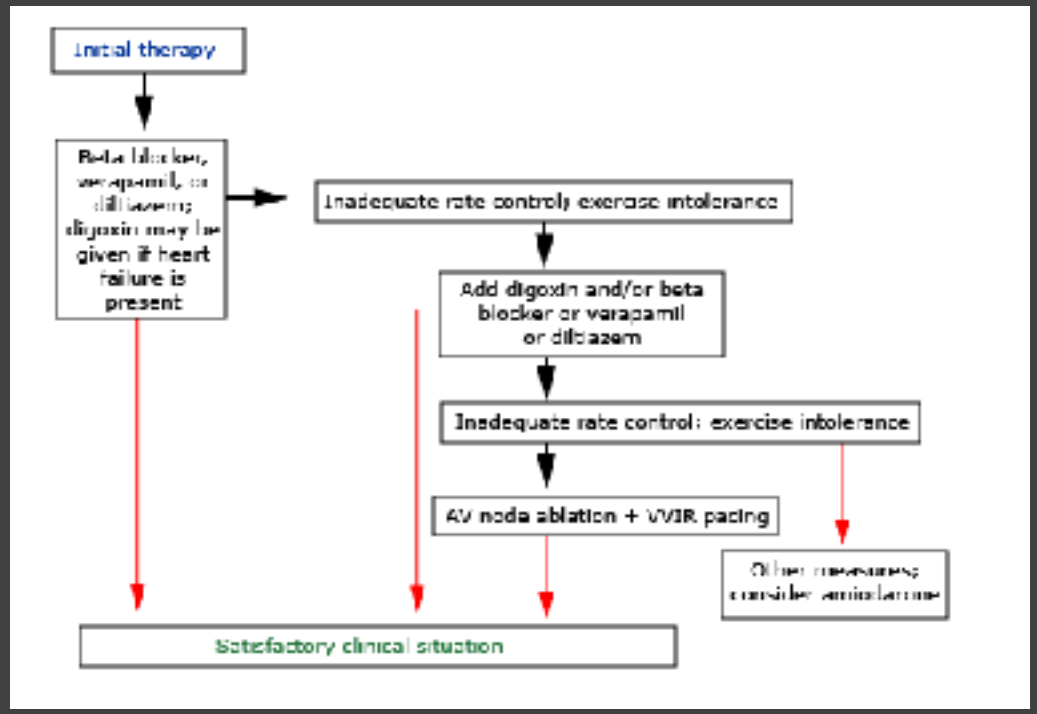
- Goal = reduce symptoms and improve quality of life by decreasing ventricular rate at rest and during exertion
- Ventricular slowing via medications affecting the AV node
- Most commonly used drug classes are beta blockers and calcium channel blockers
- Beta blockers - 1st choice, most effective control for heart rate both at rest and during exercise
- Second generation beta blockers (Metoprolol, Carvedilol, Bisoprolol) are beta 1 selective (caution higher dose) - COPD
- Non-dihydropyridine CCB (eg Diltiazem) do not affect B2 receptor in lungs - COPD
- Digoxin - not monotherapy, may add to BB, CCB

Pharmacological therapy
Rate Control

- Rate control: in most elderly with no symptoms/normal LV function; often try CV one time in younger patients even with “no sx” and normal LV – many realize retrospectively that they have subtle symptoms

Pharmacological therapy - Rhythm control

- Rhythm control approach -- patients with symptoms and/or LV dysfunction:
    1) CV without meds.
    2) CV with AAD for recurrence.
    3) Offer CV with second AAD for second recurrence, vs ablation – educated patient choice



Pharmacologic Cardioversion

- Success rate 40% to 90%.
- Success more likely for patients with AF of shorter duration.
- Intravenous pharmacological agents for cardioversion of AF are procainamide, amiodarone, defetilide, ibutilide
- Most commonly Amiodarone in ED and ICU

  -Hypothyroid, bronchiolitis obliterans organizing pneumonia(BOOP)

- In the U.S planned electrical cardioversion under sedation with appropriate airway management is superior to pharmacological cardioversion

Stroke

- AF increases a person's risk for stroke
- The culprit for 1 in 7 strokes
- Fivefold increased risk of ischemic stroke when compared to standard risk
- Strokes caused by complications from Afib tend to be more severe than strokes with other underlying causes.

Preventing Thromboembolism and Stroke Risk

- The AHA/ACC/HRS guidelines recommend the CHA2DS2-VASc score to identify patients with AF at low, moderate, or high risk for thromboembolism.
- No longer use CHAD2 score
- HAS-BLED scoring tool
  - -(hypertension, abnormal renal function and liver function, stroke, bleeding, labile INR, elderly [older than 65 years], drugs and alcohol)
  - -To determine risk of bleed
  - -ACCP and AAFP recommended

Clinical risk factors for stroke, transient ischemic attack, and systemic embolism in the CHA_2DS_2-VASc score

(A) The risk factor-based approach expressed as a point based scoring system, with the acronym CHA_2DS_2-VASc
(NOTE: maximum score is 9 since age may contribute 0, 1, or 2 points)

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 2 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 hypoglycemic agent and/or insulin	+1
Previous stroke, transient ischemic attack, or thromboembolism	+2
Vascular disease Previous myocardial infarction, peripheral artery disease, or aortic plaque	+1
Age 65 to 74 years	+1
Sex category (female)	+1

(B) Adjusted stroke rate according to CHA_2DS_2-VASc score

CHA_2DS_2-VASc score	Patients (n = 73,538)	Stroke and thromboembolism event rate at 1-year follow-up (%)
0	6369	0.78
1	8203	2.01
2	12,771	3.71
3	17,371	5.92
4	13,887	9.27
5	8942	15.26
6	4244	19.74
7	1420	21.50
8	285	22.38
9	46	23.64

CHA_2DS_2-VASc: Congestive heart failure, Hypertension, Age (≥75; doubled), Diabetes, Stroke (doubled), Vascular disease, Age (65 to 74), Sex.

Risk factor	Score
Hypertension	1
Abnormal renal/liver function	1 or 2
Stroke	1
Bleeding tendency	1
Labile INR	1
Age (eg. >65)	1
Drugs (eg. concomitant aspirin, NSAIDs, etc) or alcohol	1 or 2
Maximum score	9

Notes: A score of 0–2 indicates low risk of bleeding; a score of ≥3 indicates high risk of bleeding. Hypertension is defined as a systolic blood pressure >160 mmHg. 1 point is awarded for each of abnormal renal or liver function, and drugs or alcohol.

How to calculate risk of Stroke in AF

- https://www.mdcalc.com/cha2ds2-vasc-score-atrial-fibrillation-stroke-risk
- https://www.mdcalc.com/has-bled-score-major-bleeding-risk
- Best algorithm which combines CHADS2VASC and HASBLED, with specific AC effect on stroke risk: https://www.sparctool.com

ANTICOAGULATION: CHA2DS2- Vas SCORE

- 0 for men and 1 for women= No anticoagulation
- 1 for men and 2 for women= shared decision making regarding anticoagulation
- 2 for men and 3 for women=Anticoagulation

Anticoagulation

- Warfarin, a vitamin K antagonist (VKA) oral anticoagulant, has been the gold standard for many years.
- Non-VKA oral anticoagulants (NOACs) also know as direct oral anticoagulant(DOACs) are preferred for certain patient populations

  -AF without moderate or severe mitral stenosis or a mechanical valve.

  -Warfarin is still recommended for severe mitral stenosis and mechanical valves

  -Goal INR between 2.0-3.0

Direct Oral Anticoagulation

- NOAC –(Non-vitamin K oral anticoagulation). Adopted by the CHEST 2016 guidelines, the concern regarding the meaning of “N” and safety implication limited this terminology
- DOAC- (direct oral anticoagulation) -International Society on Thrombosis and Homeostasis (ISTH) endorsed the DOAC acronym in a 2015). Seems to be the term gaining popularity to describe these new oral anticoagulants and oral coagulants with similar direct mechanisms that haven’t yet been released

Direct Oral Anticoagulation

DOAC benefits

- no routine blood monitoring
- no dose adjustments
- fewer drug-food and drug-drug interactions than warfarin
- lower rates of intracranial bleeding, compared with warfarin
- shorter half-life
- fixed dosing based on indication

Direct Oral Anticoagulation

DOAC Drawbacks

- higher cost
- lack (so far) of data relating to efficacy and safety in those with severe chronic kidney disease
- its inadvisability of use in AF patients with a mechanical heart valve

Direct Oral Anticoagulation

Four direct oral anticoagulants (DOACs)

- **Dabigatran (Pradaxa)**
- **Rivaroxaban (Xarelto)**
- **Apixaban (Eliquis)**
- **Edoxaban (Savaysa)**

Direct Oral Anticoagulation

Dabigatran (Pradaxa)

-binds directly to clotting factor IIa (thrombin)

-only DOAC with superior efficacy in the reduction of ischemic stroke, compared to warfarin

-150 mg po BID

-avoid if dyspepsia or PUD it can make symptom worse

-contraindicated in those with a creatinine clearance of <30 ml/min

Rivaroxaban (Xarelto)

- binds directly to clotting factor Xa (the clotting factor responsible for activating prothrombin to thrombin)

Apixaban (Eliquis)

- direct clotting factor Xa inhibitors

Edoxaban (Savaysa)

- direct clotting factor Xa inhibitors

Direct Oral Anticoagulation

- High CH2DS2VASc score + Low bleeding risk= Dabigatran 150mg BID
  This is the only DOAC with superior efficacy in the reduction of ischemic stroke, compared to warfarin
- High bleeding risk- avoid 150 mg Dabigatran, Rivaroxaban and 60 mg Edoxaban, as these are associated with higher GI bleeding rates compared to warfarin
- Dose reductions of Rivaroxaban, Apixaban and Edoxaban is required, depending on the creatinine clearance,

Direct Oral Anticoagulation

- They are all contraindicated in creatinine clearance is <15 ml/min
- Because of it rapid onset and offset, important to counsel patient if they miss even one day they are their risk of not be anticoagulated
- **All DOACs are associated with a lower risk of ICH compared with warfarin.**

Direct Oral Anticoagulation

Table 3: Recommended Timing of Discontinuation of Direct Oral Anticoagulants Pre-procedure[35]

	CrCl (ml/min)	Half-life (h)	Risk of bleeding (h)	
			Low	High
Dabigatran	≥80	13	24	48
	≥50 to <80		24–48	48–72
	≥30 to <50		48–72	96
Rivaroxaban	>30	9	24	48
	<30		48	72
Apixaban	>30	8	24	48
	<30		48	72
Edoxaban	≥30	10–14	24	48
	<30		48	72

CrCl = creatinine clearance using Cockroft Gault method.

Direct Oral Anticoagulation

Table 1: Drug Interactions with Direct Oral Anticoagulants

	Dabigatran	Rivaroxaban	Apixaban	Edoxaban
Increased concentration	Strong p-gp inhibitors: ketoconazole, ciclosporin, tacrolimus, ritonavir, dronedarone Caution with: amiodarone, verapamil, clarithromycin, quinidine, ticagrelor	Strong CYP3A4 and p-gp inhibitors: ketoconazole, ritonavir, dronedarone Caution with: ciclosporin, tacrolimus	Strong CYP3A4 and p-gp inhibitors: ketoconazole, ritonavir, dronedarone	Strong p-gp inhibitors: reduce dose with ketoconazole, ciclosporin, dronedarone Caution with: ritonavir
Reduced concentration	Strong p-gp inducers: rifampicin, St John's wort, carbamazepine, phenytoin, barbiturates, dexamethasone	Strong CYP3A4 and p-gp inducers: rifampicin, St John's wort, carbamazepine, phenytoin, barbiturates	Strong CYP3A4 and p-gp inducers: rifampicin, St John's wort, carbamazepine, phenytoin, barbiturates	Strong p-gp inducers: rifampicin, St John's wort, carbamazepine, phenytoin, barbiturates, dexamethasone

p-gp = P-glycoprotein.

Anticoagulation Reversals

- Andexanet alfa (**Andexxa**)
  -Reverse the anticoagulant effects of **Rivaroxaban (Xarelto)** and **Apixaban (Eliquis)** in patients with life-threatening or uncontrolled bleeding
- Idarucizumab(**Praxbind**)
  -monoclonal antibody fragment
  -binds to free and thrombin-bound **dabigatran (Pradaxa)**, which neutralizes dabigatran's activity
  -88% to 98% of patients having concentrations of unbound dabigatran in safe levels within 15 minutes of administration and hemostasis restoration after approximately 11 hours

Preventing Thromboembolism and Stroke Risk

- Adequate anticoagulation for **3 weeks prior** to electrical or pharmacologic cardioversion
- Continue anticoagulation until sinus rhythm maintained for at least **4 weeks**
- When cardioversion method cannot be postponed (TEE)-guided electrical cardioversion is preferred.
- TEE may be performed to exclude the presence of an intracardiac thrombus
- The decision to initiate and continue anticoagulation for AF shorter than a duration of 48 hours should be based on the presence of other risk factors for thromboembolism

Preventing Thromboembolism and Stroke Risk

- Left Atrial appendage occluding device (Watchman) approved for patients with high stroke risk but contraindications to long term anticoagulation (can be placed by interventional cardiologists or electrophysiologists)

Direct-Current Electrical Cardioversion

- Electrical cardioversion is more effective than pharmacologic cardioversion
- Done under deep sedation, with monitoring, and in the presence of personnel skilled in airway management.
- Antiarrhythmic drug(AAD) may promote more successful direct current cardioversion and subsequent maintenance of sinus rhythm
- Also in those who develops an early AF recurrence after direct-current electrical cardioversion and to consider a repeat attempt after the drug has been initiated and reaches steady-state blood levels

Implantable Devices

- There is a substantial incidence of sinus node and AV node dysfunction in the AF population that might require pacemakers support

Catheter Ablation

- Safe and effective alternative to antiarrhythmic drug therapy for the maintenance of sinus rhythm.
- No demonstration of reduced risk of mortality, stroke, or heart failure as is the case with antiarrhythmic drug therapy
- Therefore not regarded as a substitute for stroke prevention strategies

Surgical Approaches

- Cox-Maze surgical procedure involves a series of incisions or lesions in the atria. Prevent the re-entry required for the maintenance of AF.
- Non-incisional lesions may be placed using bipolar radiofrequency, cryothermy, or microwave energy.
- Outcomes associated with surgical approaches are comparable with catheter ablation and offer the advantage of concomitant exclusion of the left atrial appendage.
  - However, more invasive than catheter ablation and requires either a sternotomy or a thoracotomy, plus general anesthesia and a longer postoperative recovery.
- The invasiveness of surgery is a less desirable option for patients with AF alone, but it might be option for patients undergoing cardiac surgery for another indication (eg, valve replacement or coronary bypass surgery) or for patients with a particularly strong indication for exclusion of the left atrial appendage (ie, recurrent thrombus despite antithrombotic therapy).

Prevention

- There are studies that show weight loss can reverse the progression or type of AF
- Dietary modification(olive oil or n-2 PUFA)-weak evidence
- Lowering/abstinence from alcohol=decrease risk of recurrent AF or time of AF
- Treating the underline problem
  - Hyperthyroid, infection, PE, cardiac surgery, just to name some

Triggers

- Personal triggers
  -alcohol, caffeine, stress, illness, hormonal fluxes such as pre-menstrual and perimenopause, new medications, large meals, very cold beverages
- Patients do not need to limit everything only the one’s that affects them

Reference

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THANK YOU