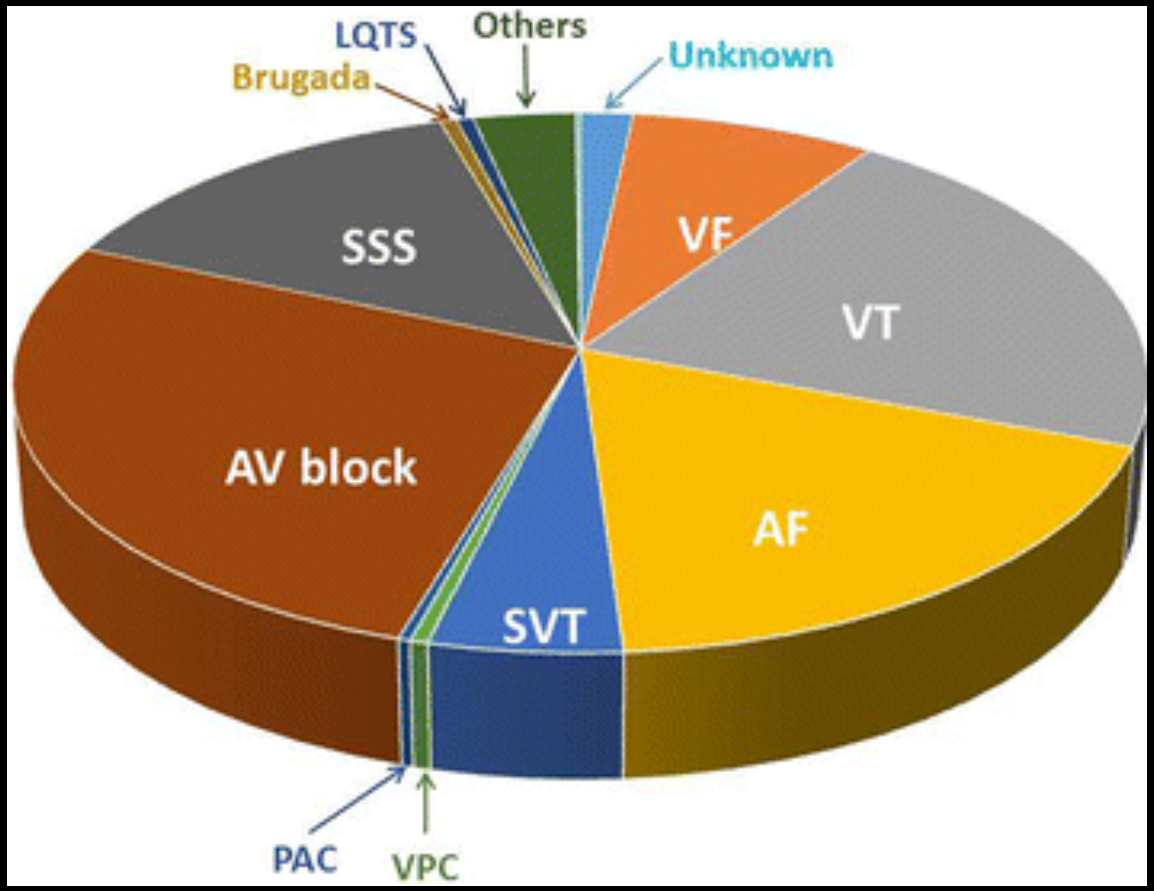
Arrhythmia 341

- Ahmad Hersi

Professor of Cardiology

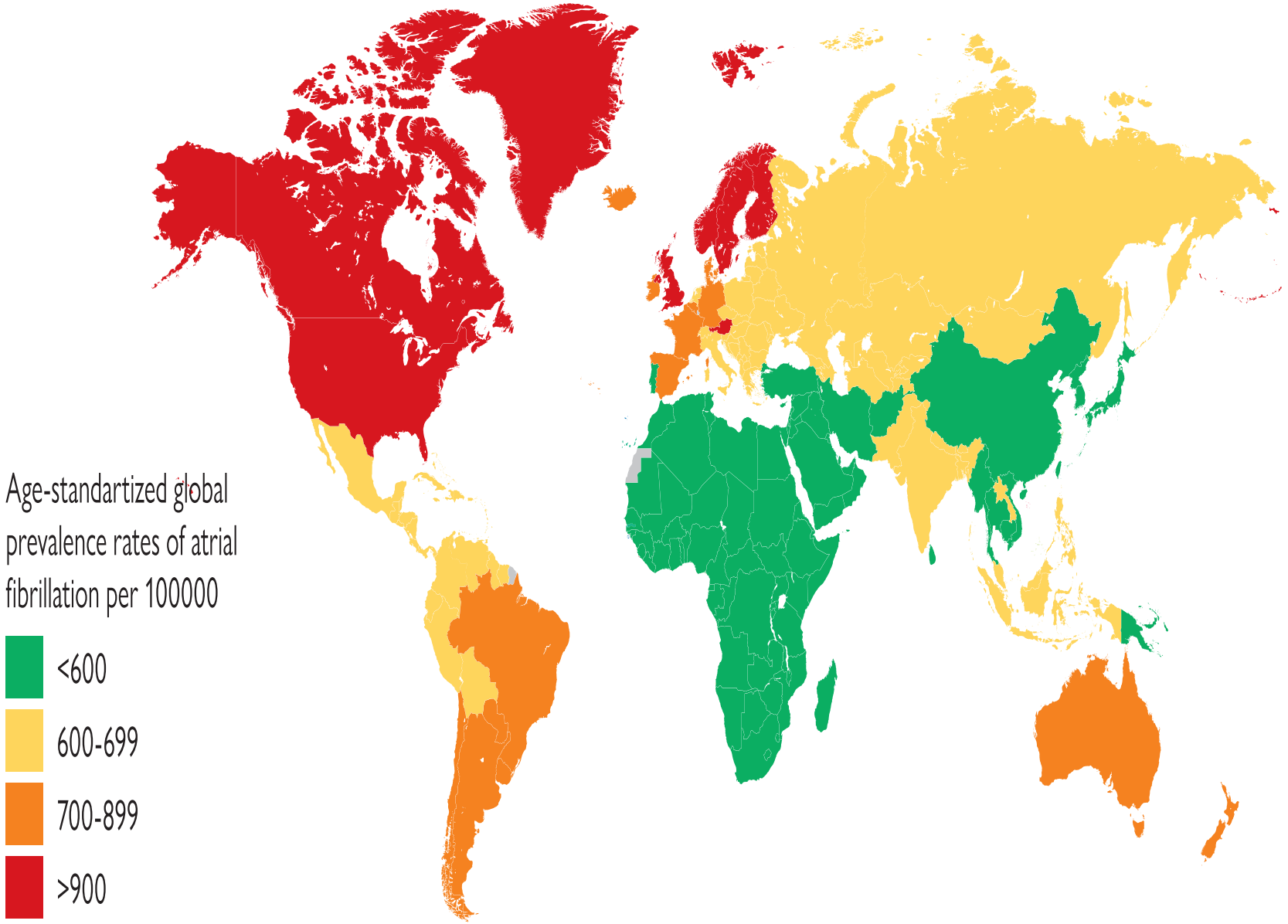
Objectives

- Epidemiology and Mechanisms of AF
- Evaluation of AF patients
- Classification of AF
- Treatment and Risk stratification of AF
- Identify other forms of Arrhythmia

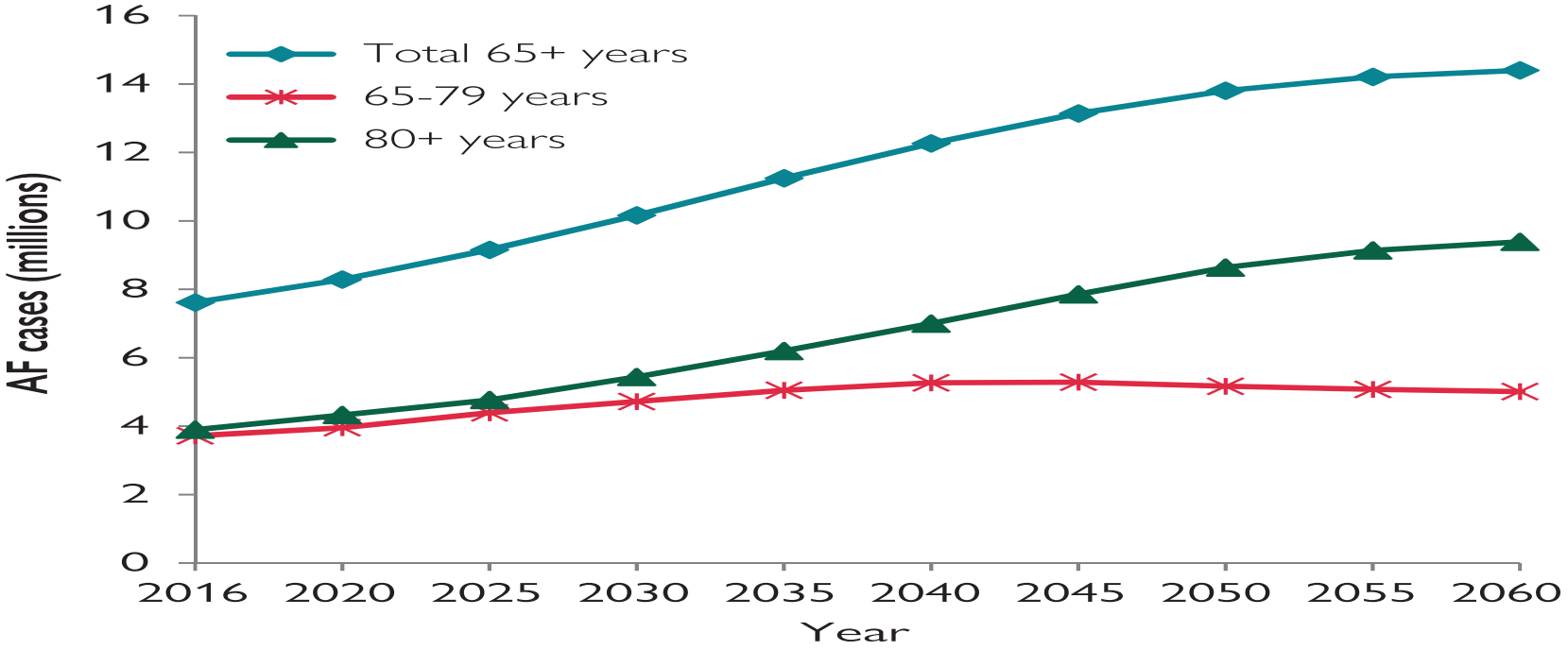

LQTS
Others
Unknown
Brugada
SSS
VF
VT
AV block
AF
SVT
PAC
VPC

GLOBAL PREVALENCE OF AF

(globally, 43.6 million individuals had prevalent AF/AFL in 2016)



Projected increase in AF prevalence among elderly in EU 2016-2060

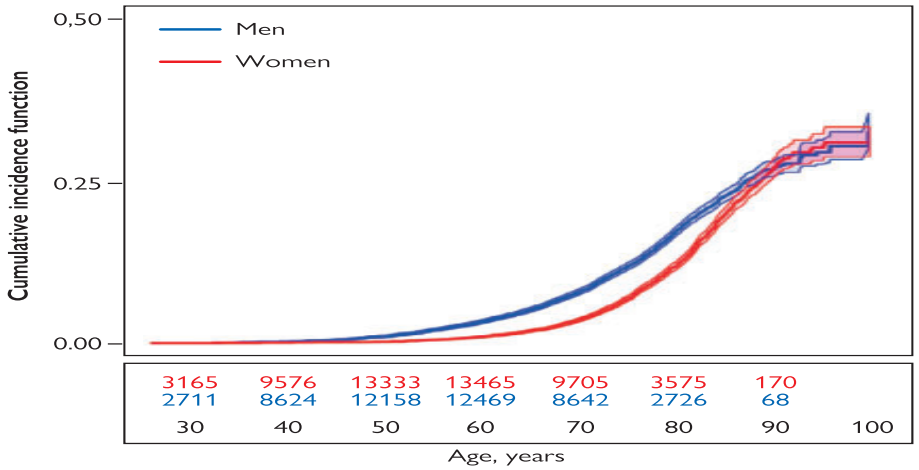


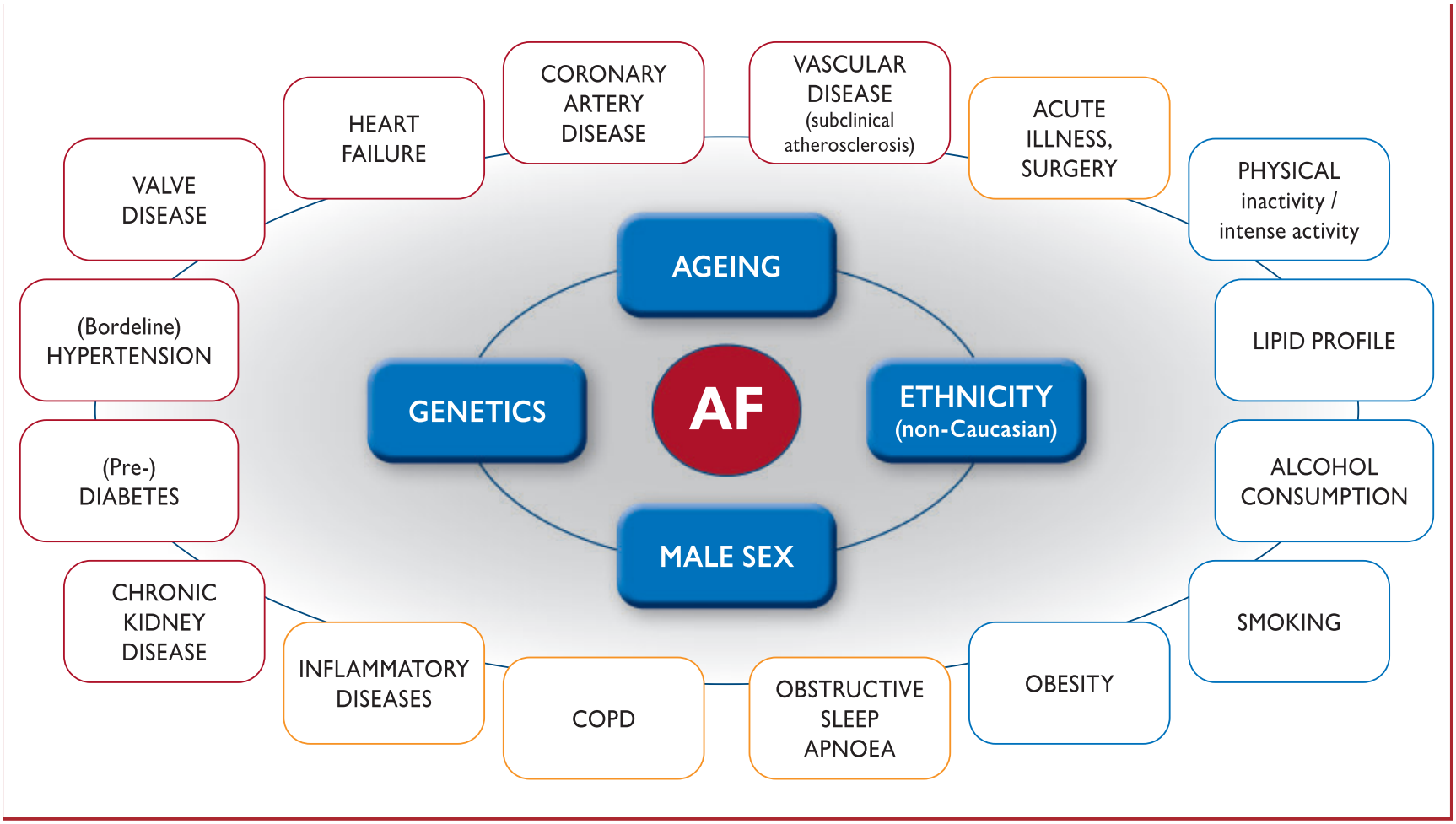
LIFETIME RISK for AF
1 in 3 individuals

of European ancestry
at index age of 55 years
37.0% (34.3% to 39.6%)

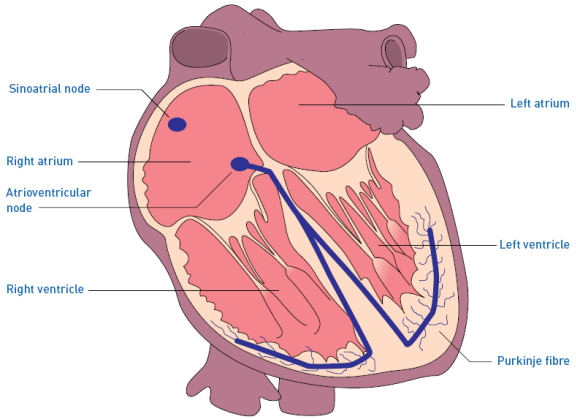
AF is more common in males

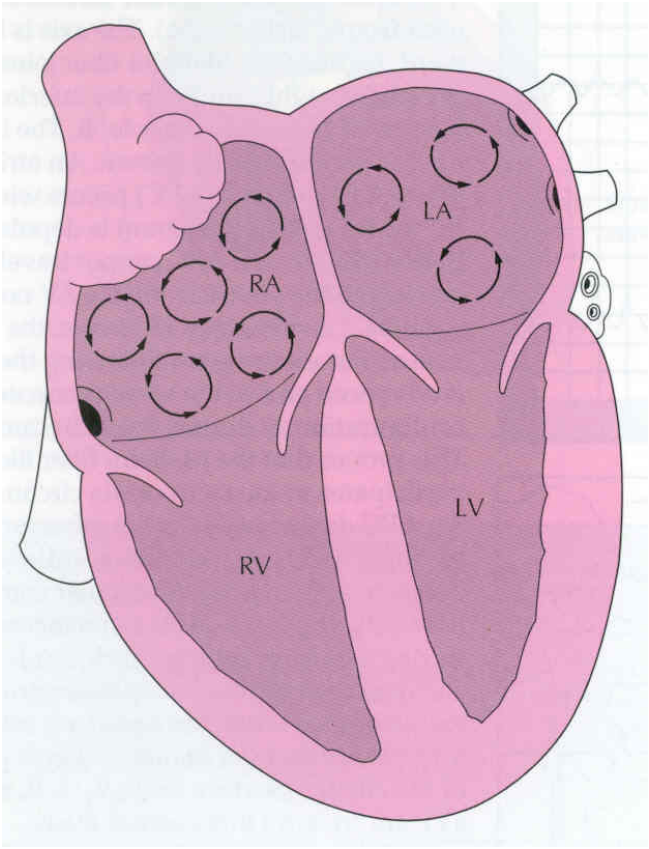
Cumulative incidence curves and 95% CIs
for AF in women and men with death as a competing risk




AF
AGEING
GENETICS
ETHNICITY (non-Caucasian)
MALE SEX
HEART FAILURE
CORONARY ARTERY DISEASE
VASCULAR DISEASE (subclinical atherosclerosis)
ACUTE ILLNESS, SURGERY
PHYSICAL inactivity / intense activity
LIPID PROFILE
ALCOHOL CONSUMPTION
SMOKING
OBESITY
OBSTRUCTIVE SLEEP APNOEA
COPD
INFLAMMATORY DISEASES
CHRONIC KIDNEY DISEASE
(Pre-) DIABETES
(Bordeline) HYPERTENSION
VALVE DISEASE

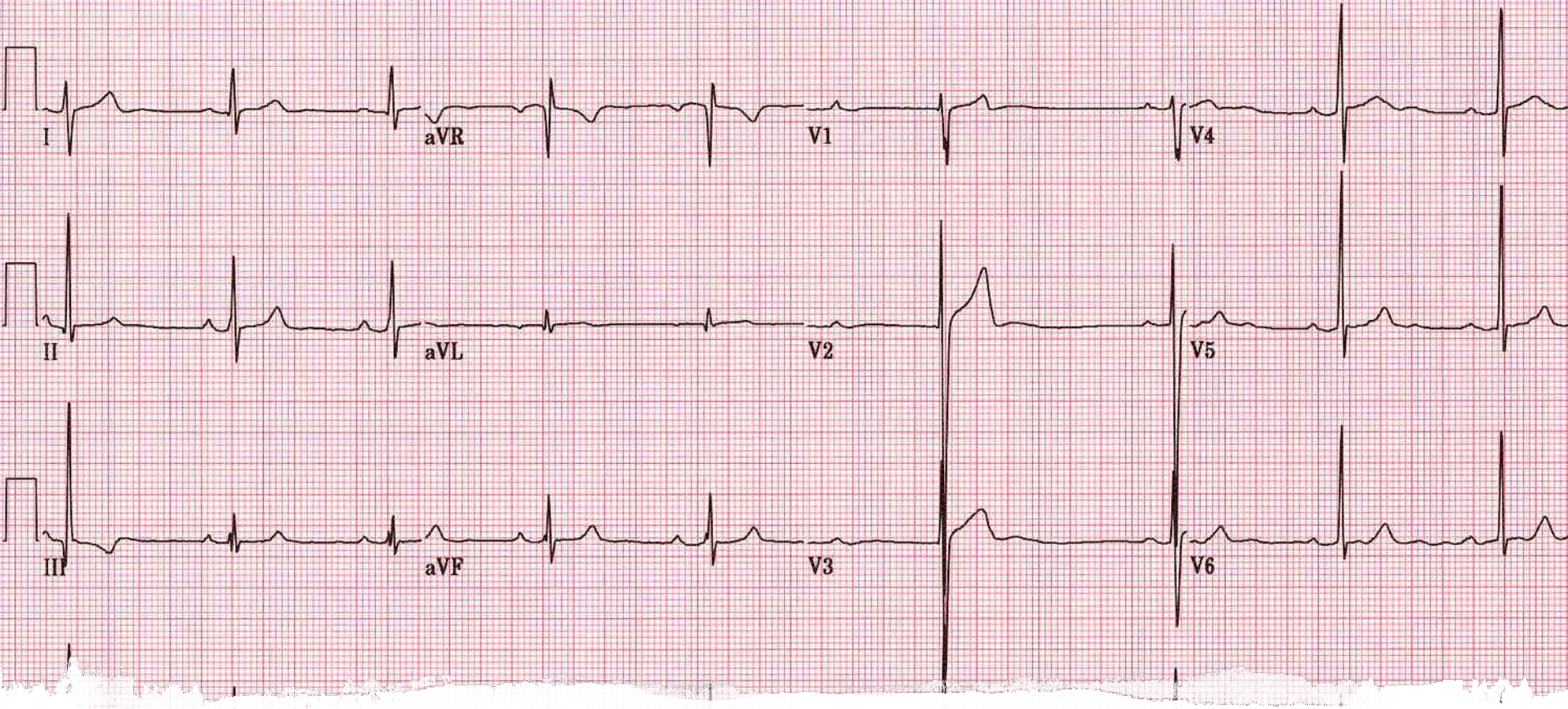
Pathophysiology of Atrial Fibrillation and associated Stroke





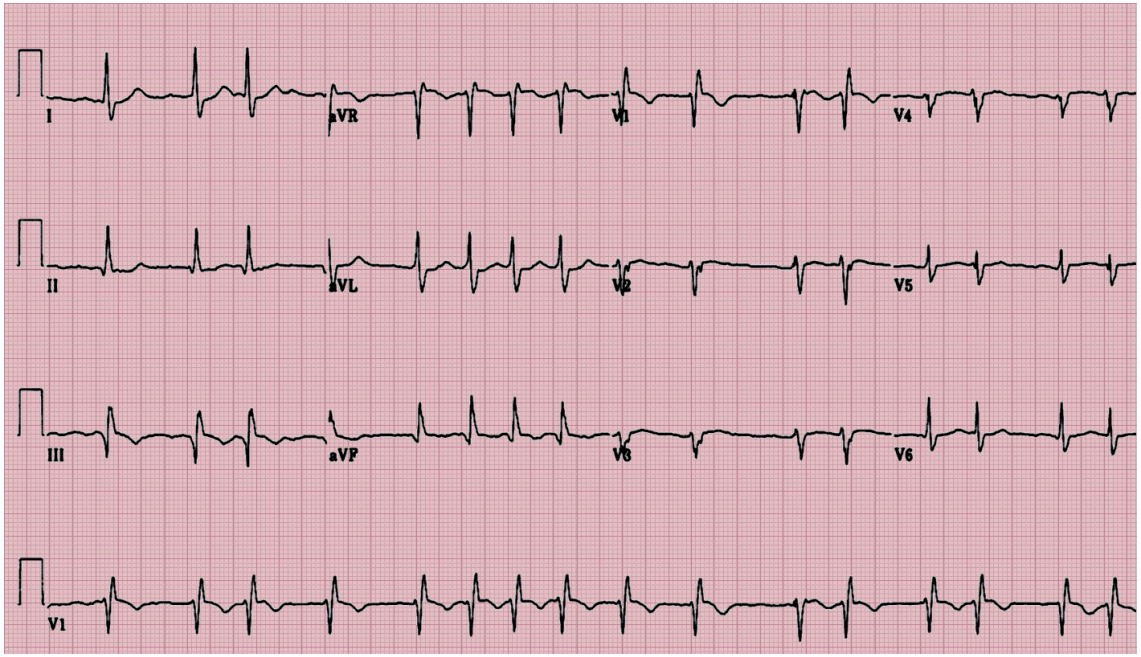
Contraction is controlled by the sinoatrial (SA) n

Normal regulation of hea rate and rhyth



Normal EKG

AF



Normal heart rhythm is disrupted in AF

- AF is characterized by:
  - Rapid (350–600 beats/min) and irregular atrial rhythm
  - Reduced filling of the left and right ventricles
- Conduction of most impulses from the atria to ventricles is blocked at the AV node
- Contraction of the ventricles can be:
  - Irregular and rapid (110–180 beats/min; tachycardia)
  - Irregular and slow (<50 beats/min; bradycardia)
  - Normal
- Cardiac output can be reduced

AF begets AF

- AF causes remodelling:
  - **Electrical**: shortening of refractory period
  - **Structural**: enlargement of atrial cavities
- Many episodes of AF resolve spontaneously
- Over time AF tends to become persistent or permanent.

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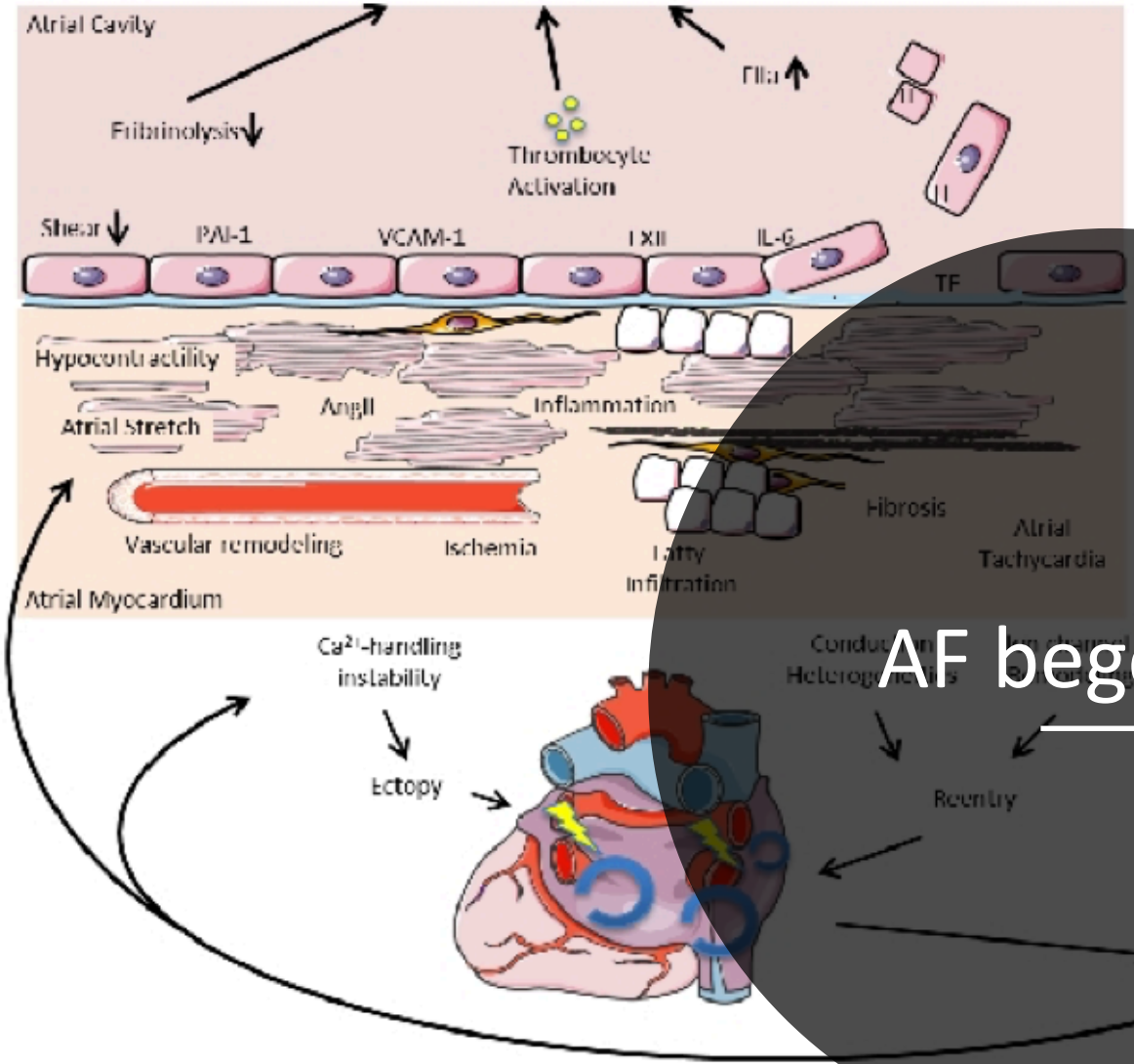
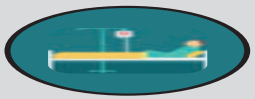
Stroke

Hypercoagulability



AF begets AF

Consequences of AF

AF-Related Outcome	Frequency in AF	Mechanism(s)
Death 	1.5 – 3.5 fold increase	Excess mortality related to: • HF, comorbidities • Stroke
Stroke 	20-30% of all ischaemic strokes, 10% of cryptogenic strokes	• Cardioembolic, or • Related to comorbid vascular atheroma
LV dysfunction / Heart failure 	In 20-30% of AF patients	• Excessive ventricular rate • Irregular ventricular contractions • A primary underlying cause of AF
Cognitive decline / Vascular dementia 	HR 1.4 / 1.6 (irrespective of stroke history)	• Brain white matter lesions, inflammation, • Hypoperfusion, • Micro-embolism
Depression 	Depression in 16-20% (even suicidal ideation)	• Severe symptoms and decreased QoL • Drug side effects
Impaired quality of life 	>60% of patients	• Related to AF burden, comorbidities, psychological functioning and medication • Distressed personality type
Hospitalizations 	10-40% annual hospitalization rate	• AF management, related to HF, MI or AF related symptoms • Treatment-associated complications

Diagnosis of Atrial Fibrillation

Atrial Fibrillation: Cardiac Causes

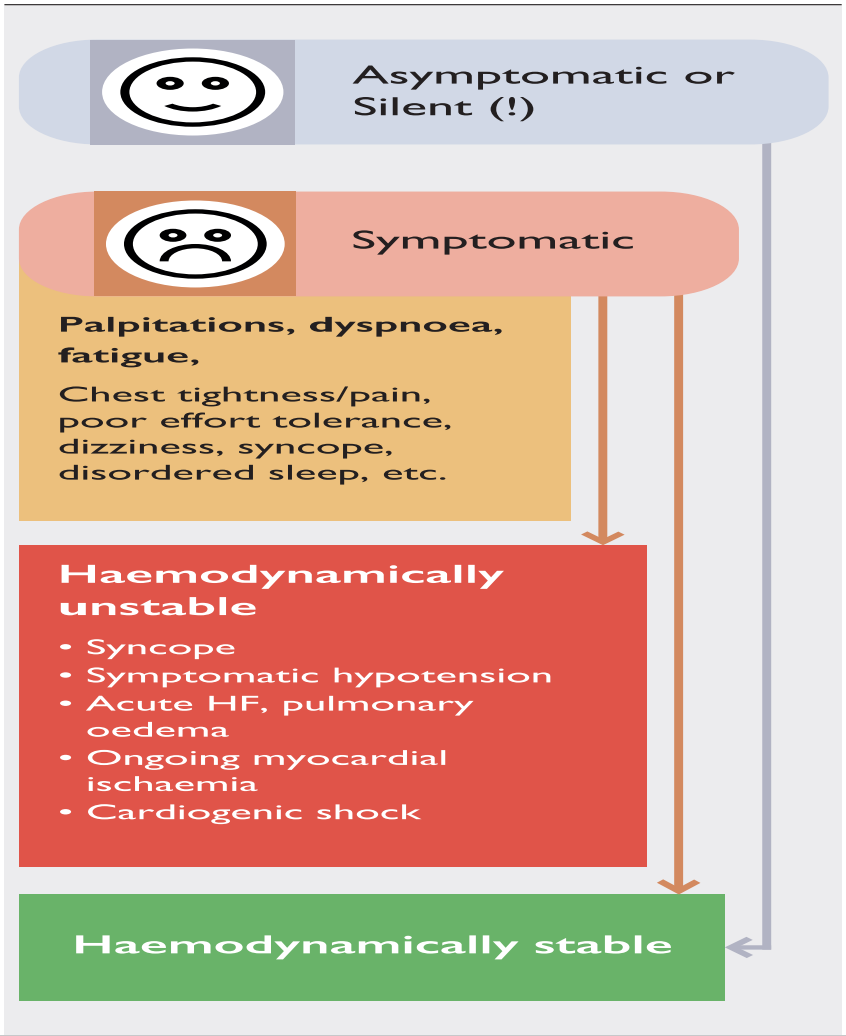
- Hypertensive heart disease
- Ischemic heart disease
- Valvular heart disease
  - Rheumatic: mitral stenosis
  - Non-rheumatic: aortic stenosis, mitral regurgitation
- Pericarditis
- Cardiac tumors: atrial myxoma
- Sick sinus syndrome
- Cardiomyopathy
  - Hypertrophic
  - Idiopathic dilated (? cause vs. effect)
- Post-coronary bypass surgery

Atrial Fibrillation: Non-Cardiac Causes

- Pulmonary
  - COPD
  - Pneumonia
  - Pulmonary embolism
- Metabolic
  - Thyroid disease: hyperthyroidism
  - Electrolyte disorder
- Toxic: alcohol (‘holiday heart’ syndrome)

Clinical presentation of AF

- With or without detectable heart disease
- Episodic
  - Symptoms may be absent or intermittent
  - Up to 90% of episodes may not cause symptoms
- Symptoms vary according to
  - Irregularity and rate of ventricular response
  - Functional status
  - AF duration
  - Patient factors
  - Co-morbidities



Score	Symptoms	Description
1	None	AF does not cause any symptoms
2a	Mild	Normal daily activity not affected by symptoms related to AF
2b	Moderate	Normal daily activity not affected by symptoms related to AF, but patient troubled by symptoms
3	Severe	Normal daily activity affected by symptoms related to AF
4	Disabling	Normal daily activity discontinued

History and physical examination

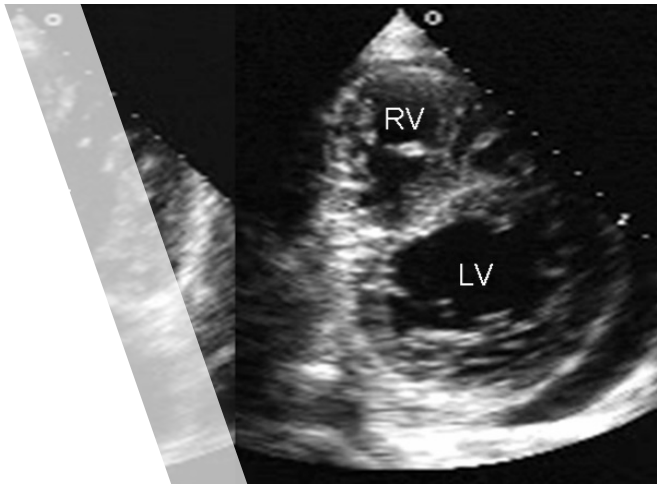
- Clinical conditions associated with AF
  - Underlying heart conditions (e.g. valvular heart disease, heart failure, coronary artery disease, hypertension)
  - Other reversible conditions
- Family history
  - Familial AF (lone AF in a family)
  - AF secondary to other genetic conditions (familial cardiomyopathies)
- Type of AF
  - First episode, paroxysmal, persistent, permanent
  - Triggers – e.g. emotional stress, alcohol, physical exercise, gastroesophageal disease
  - Specific symptoms
  - Response to any treatments administered

EKG: loss of P wave in AF

- AF
  - Heart rate increased (tachyarrhythmia)*
  - Irregular rhythm
  - No P wave
  - Irregular baseline

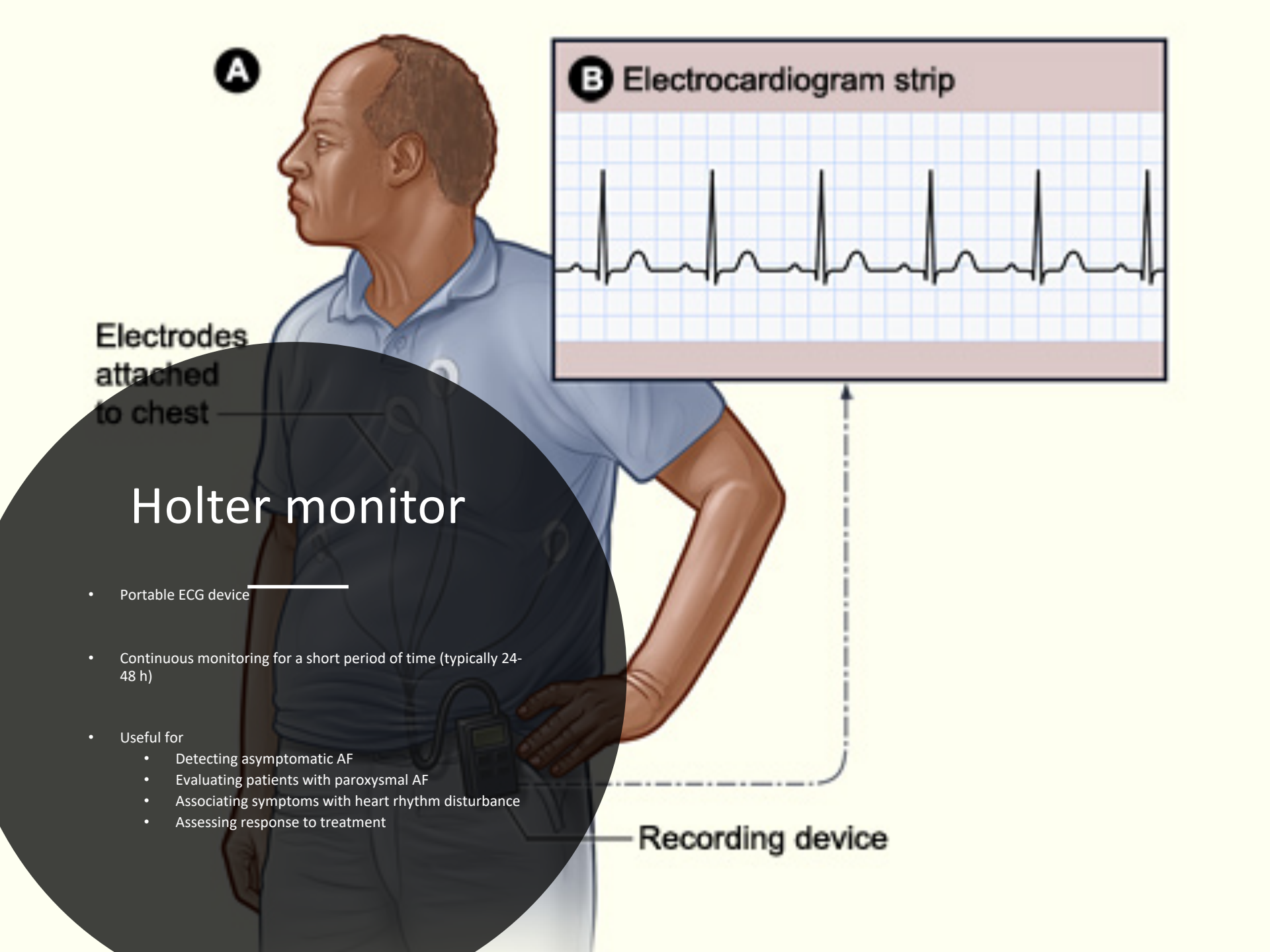
Transthoracic echocardiography (TTE)

- Non-invasive
- Used to identify
  - Size and functioning of atria and ventricles
  - Ventricle hypertrophy
  - Pericardial disease
  - Valvular heart disease



Laboratory tests

- Important parameters to assess include:
  - Thyroid function
  - Renal function
  - Hepatic function
  - Serum electrolytes
  - Complete blood count



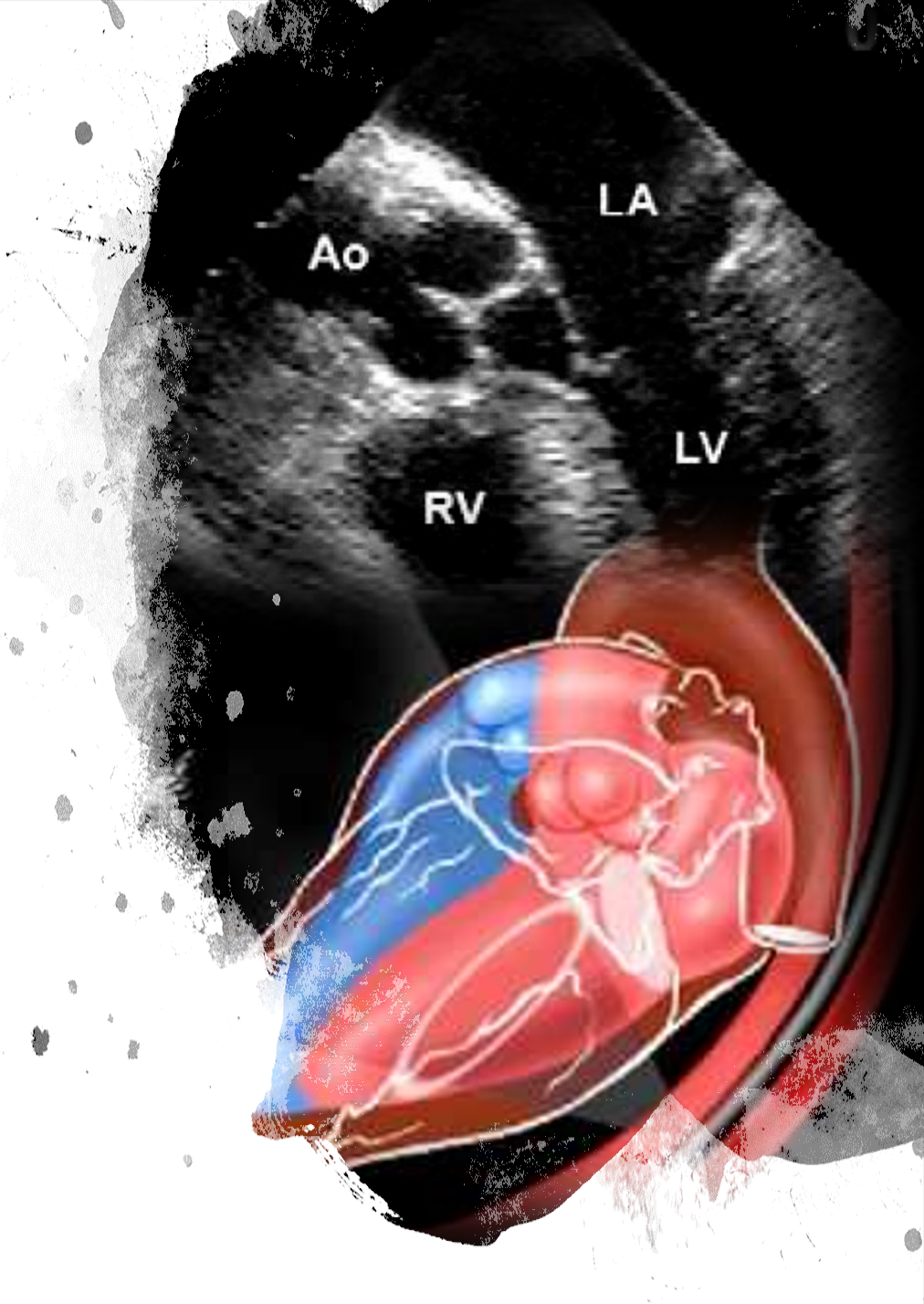
Holter monitor

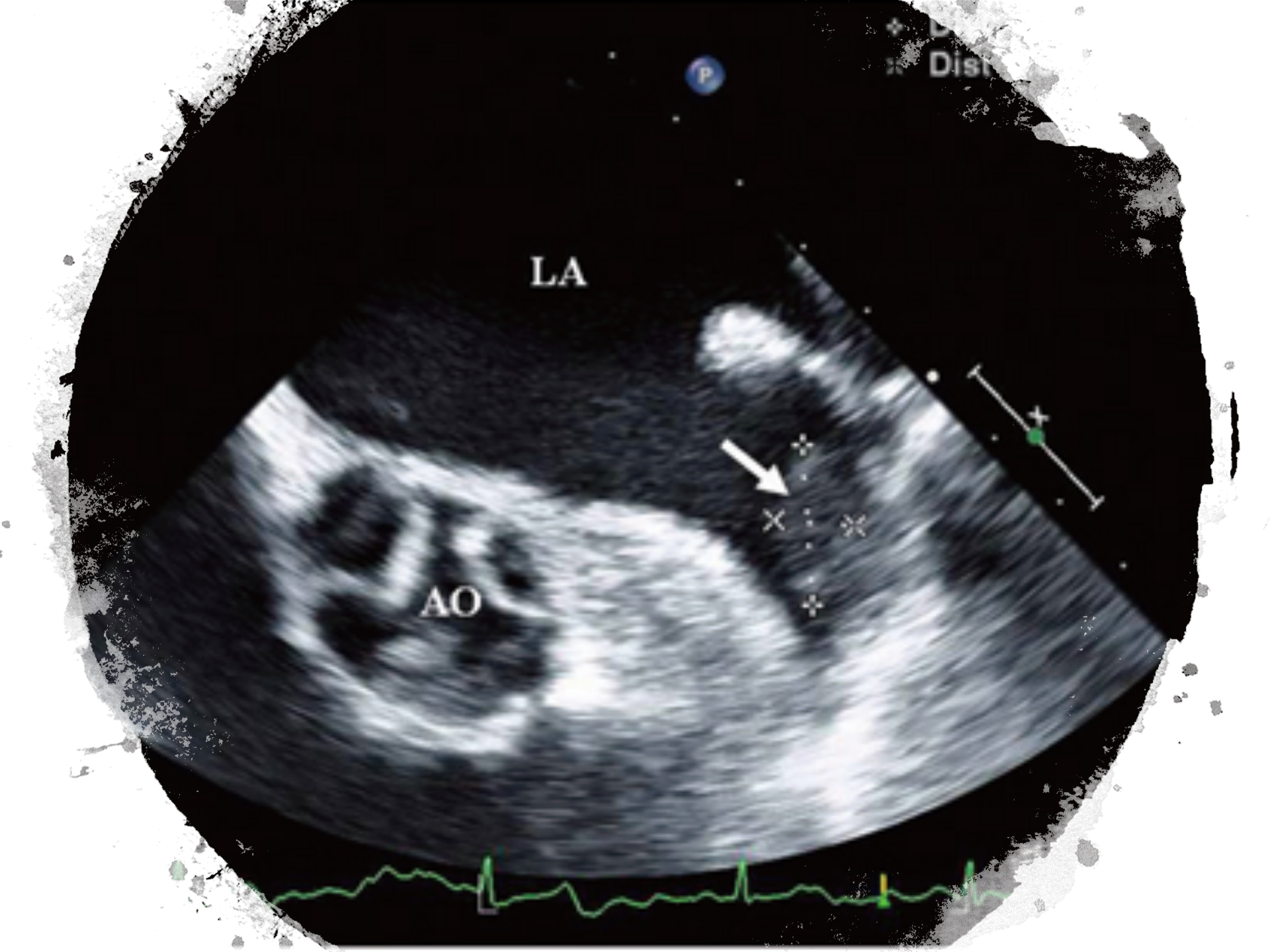
- Portable ECG device
- Continuous monitoring for a short period of time (typically 24-48 h)
- Useful for
  - Detecting asymptomatic AF
  - Evaluating patients with paroxysmal AF
  - Associating symptoms with heart rhythm disturbance
  - Assessing response to treatment

Transoesophageal echocardiogram (TEE)

- Ultrasound transducer positioned close to the heart using an endoscope-like device

- High quality images of cardiac structure and function
  - Particularly the left atrial appendage, the most common site of thrombi in patients with AF

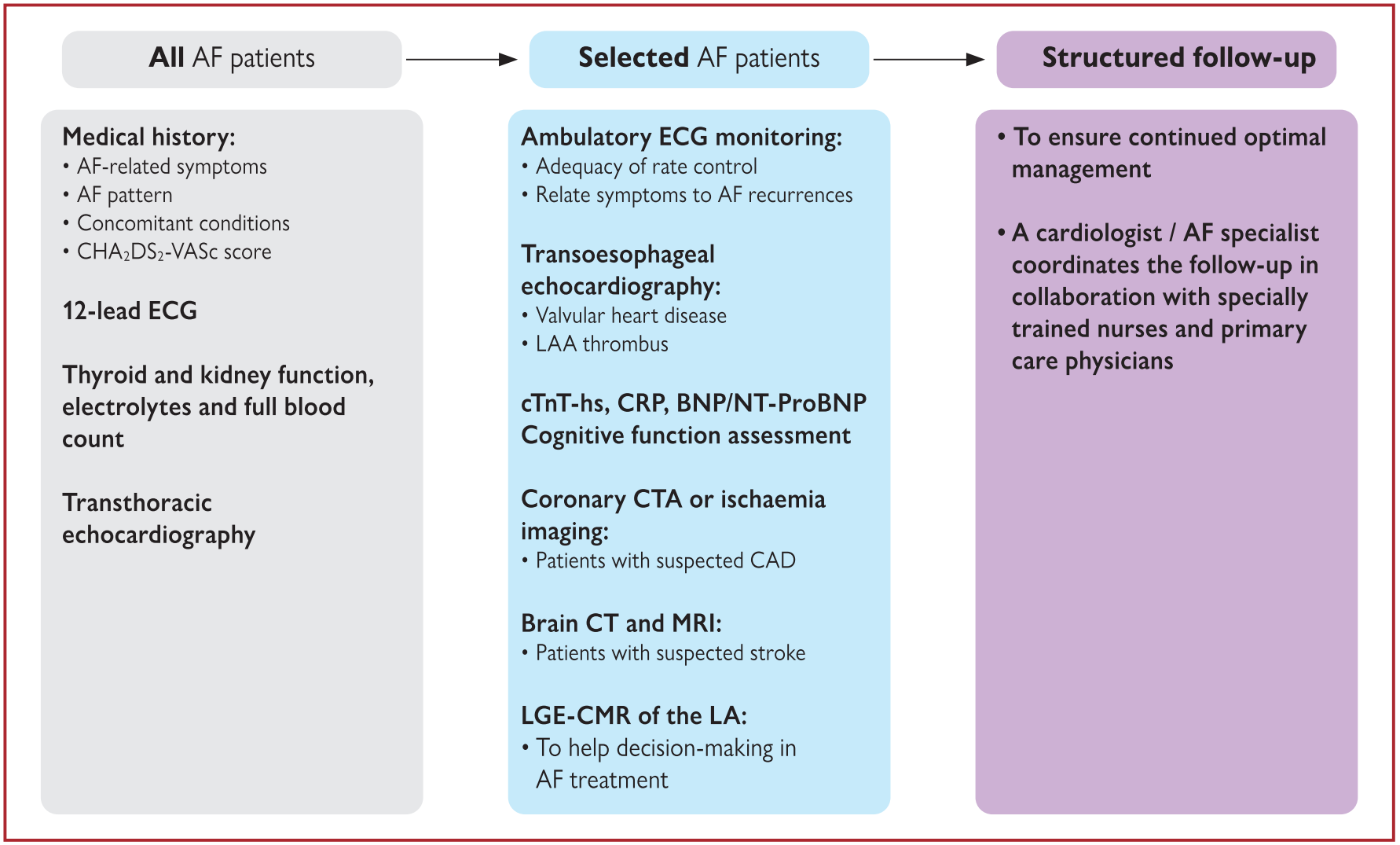



LA
AO

Chest Radiography

- When clinical findings suggest an abnormality chest radiography may be used to
  - Evaluate pulmonary pathology and vasculature
  - Detect congestive heart failure
  - Assess enlargement of the cardiac chambers

Summary for evaluation of AF patient



Classification of Atrial Fibrillation

TABLE 3 Definitions of AF: A Simplified Scheme

Term	Definition
Paroxysmal AF	• AF that terminates spontaneously or with intervention within 7 d of onset. • Episodes may recur with variable frequency.
Persistent AF	• Continuous AF that is sustained >7 d.
Long-standing persistent AF	• Continuous AF >12 mo 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.
Nonvalvular AF	• AF in the absence of rheumatic mitral stenosis, a mechanical or bioprosthetic heart valve, or mitral valve repair.

Classification of AF

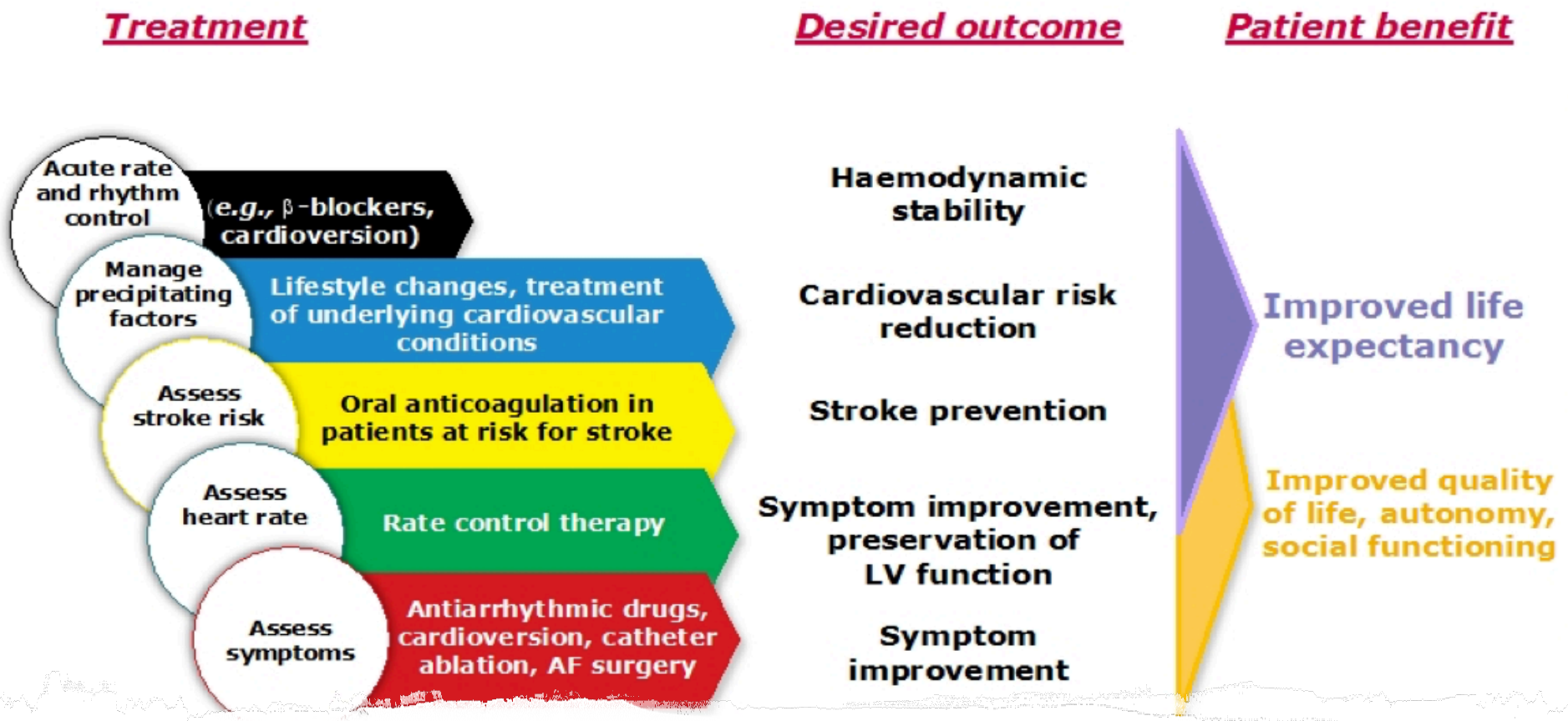
Lone or primary	AF without clinical/ECG evidence of cardiopulmonary disease
Non-valvular	AF that is not associated with damage to the heart valves (e.g. rheumatic mitral valve disease, prosthetic heart valve or mitral valve repair)

Classification of AF

Change in Guideline Recommendations (Only major included)

2014	2019
	The term *"nonvalvular AF"* is no longer used

Treatment Atrial Fibrillation



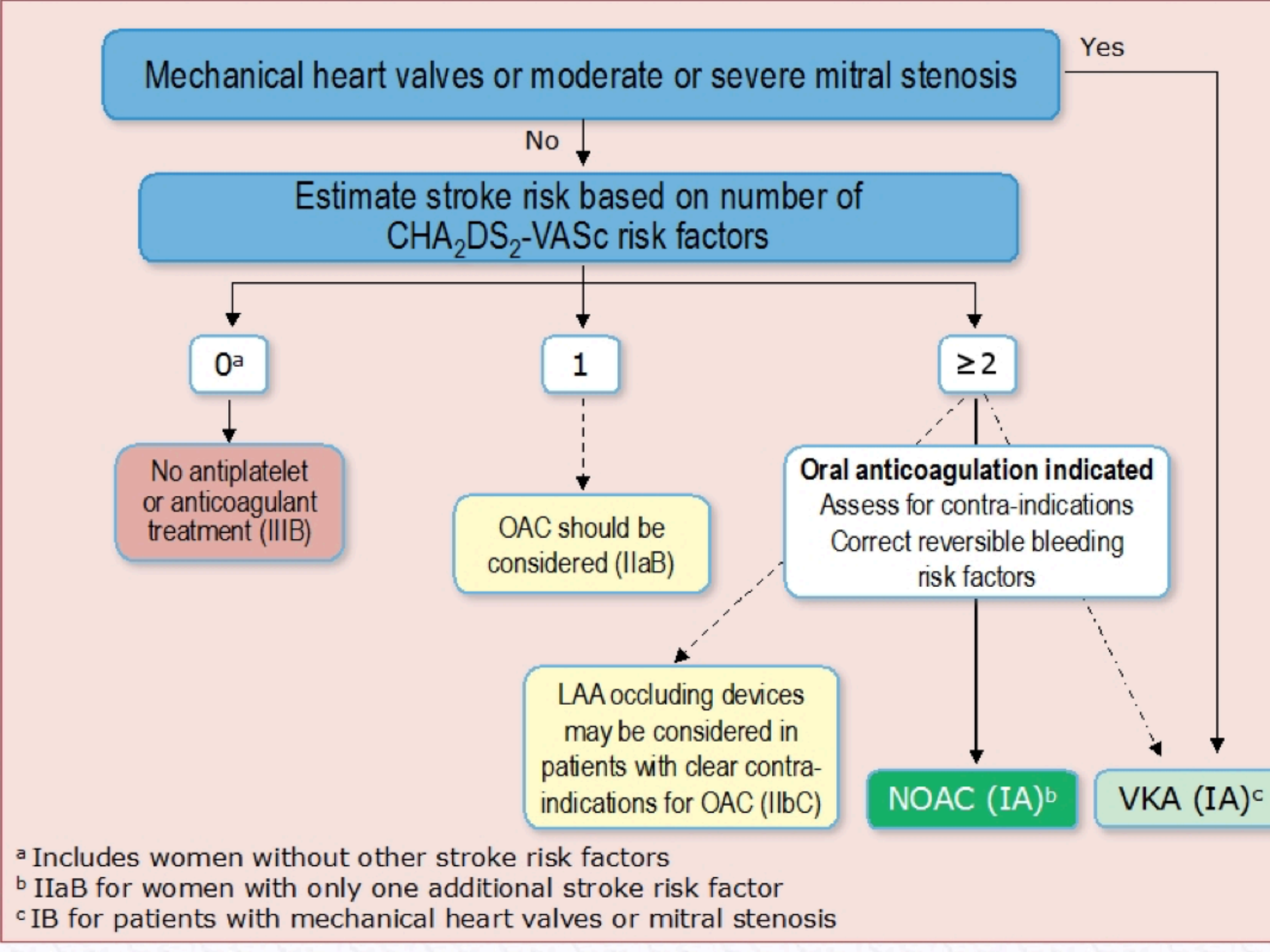
The Five Domains of Integrated AF Management

3 Strategies

- Prevention of thromboembolism
- Rate control
- Restoration and maintenance of sinus rhythm

$CHADS_2$ score	Patients (n = 1733)	Adjusted stroke rate (%/year)[a] (95% confidence interval)
0	120	1.9 (1.2–3.0)
1	463	2.8 (2.0–3.8)
2	523	4.0 (3.1–5.1)
3	337	5.9 (4.6–7.3)
4	220	8.5 (6.3–11.1)
5	65	12.5 (8.2–17.5)
6	5	18.2 (10.5–27.4)

CHA_2DS_2-VASc	Score
C ongestive heart failure/LV dysfunction	1
H ypertension	1
A ge ≥ 75 years	2
D iabetes mellitus	1
S troke/TIA/TE	2
V ascular disease [prior MI, PAD, or aortic plaque]	1
A ge 65-74 years	1
S ex category (female)	1



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

1-STROKE PREVENTION

- Warfarin
- Aspirin
- Dabigatran
- Apixaban
- Rivaroxaba
- Edoxaban
- Removal/isolation of left atrial appendage, e.g. WATCHMAN® device or surgery

2-Rate control

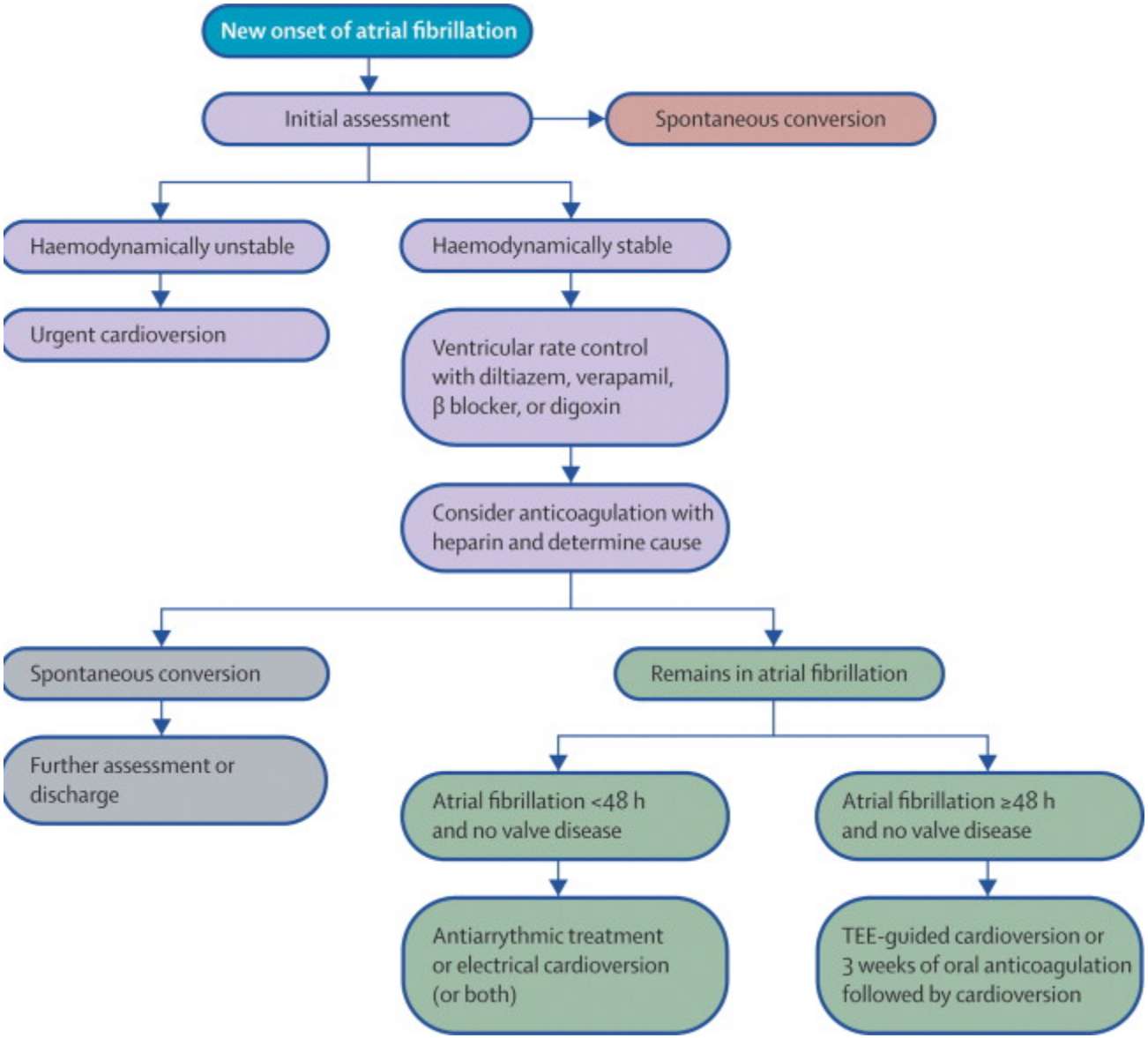
- Ca^{2+}-channel blockers
- β-blockers
- Digoxin
- Ablate/pace

3-MAINTENANCE OF SINUS RHYTHM

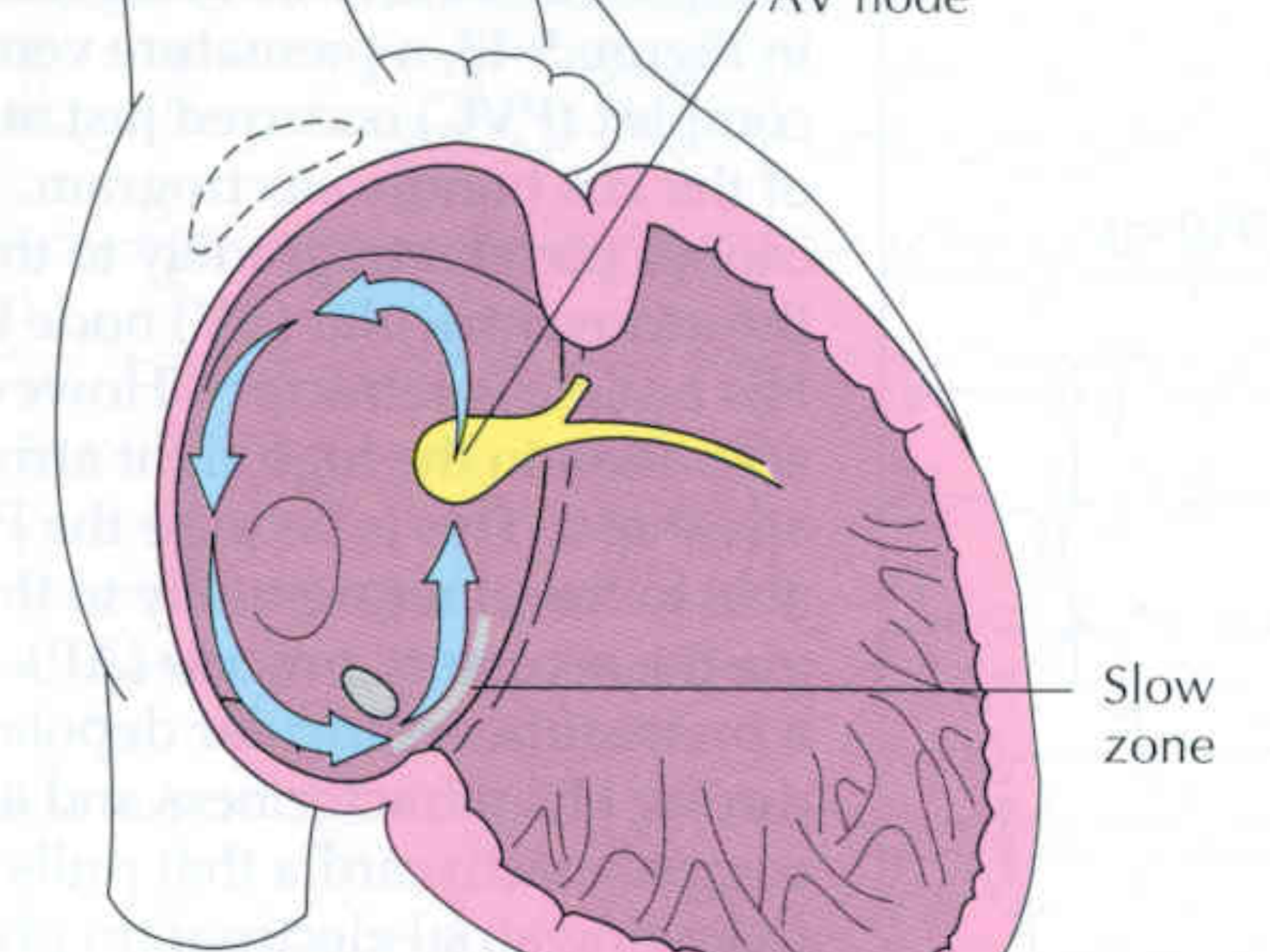
- Antiarrhythmic drugs
- – Class IA
- – Class IC
- – Class III: e.g. amiodarone, dronedarone
- Ablation
- Surgery (MAZE)

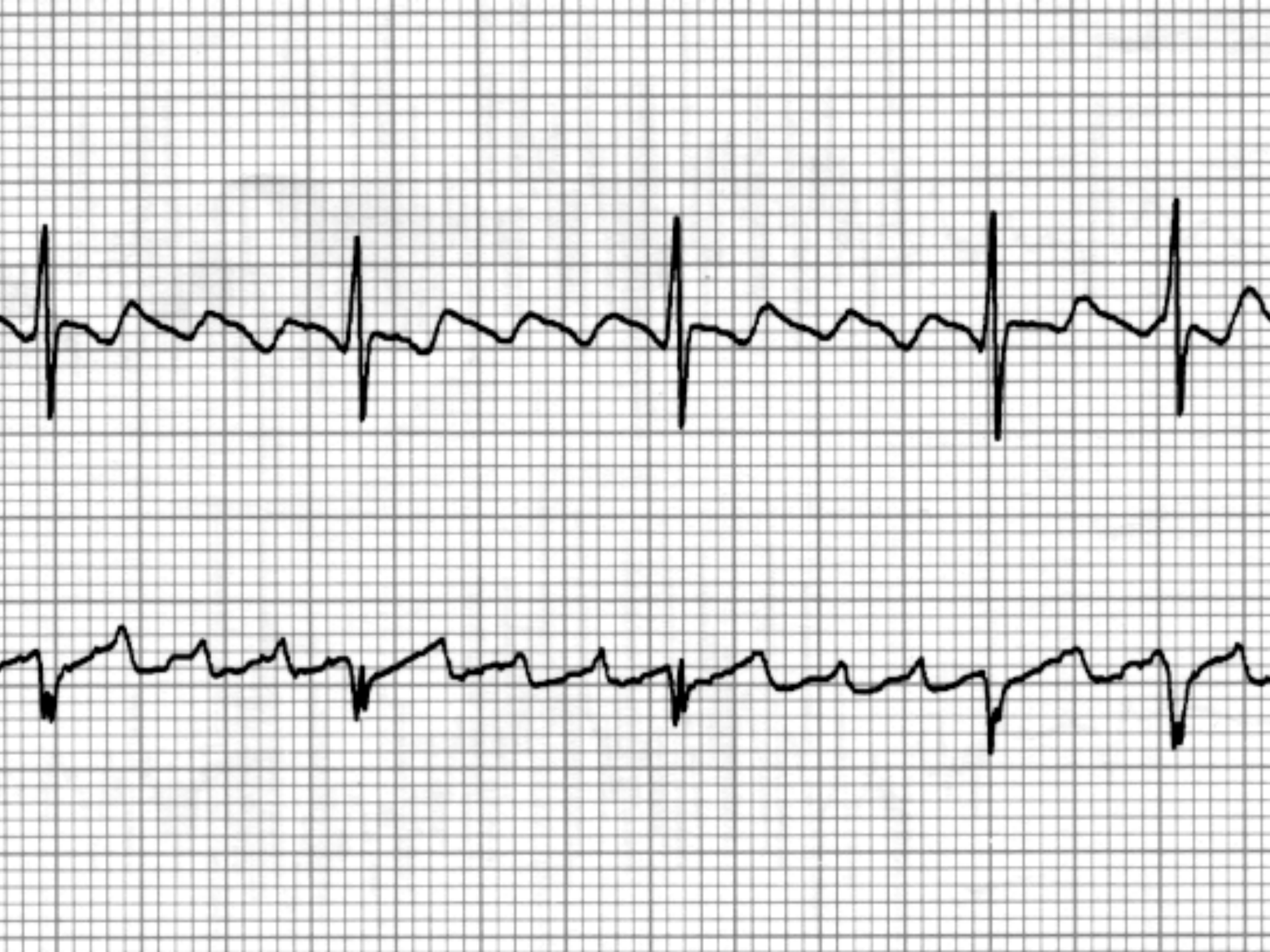
Rhythm-control therapies

- The objective of rhythm-control therapy is to restore (cardioversion) and maintain normal sinus rhythm
- Cardioversion can be achieved by:
  - Pharmacotherapy with antiarrhythmic agents
  - Electrical shocks (direct-current cardioversion)
- Direct-current cardioversion is generally more effective than pharmacotherapy
- Likelihood of successful cardioversion decreases with the duration of AF
  - Pharmacological cardioversion is most effective when initiated within 7 days of AF onset
- Cardioversion can dislodge thrombi in the atria, increasing the risk of stroke
  - Thromboprophylaxis is recommended for ≥3 wk before and for at least 4 wks after cardioversion in patients with AF that has persisted for ≥48 h


New onset of atrial fibrillation
Initial assessment
Spontaneous conversion
Haemodynamically unstable
Haemodynamically stable
Urgent cardioversion
Ventricular rate control with diltiazem, verapamil, β blocker, or digoxin
Consider anticoagulation with heparin and determine cause
Spontaneous conversion
Remains in atrial fibrillation
Further assessment or discharge
Atrial fibrillation <48 h and no valve disease
Atrial fibrillation ≥48 h and no valve disease
Antiarrythmic treatment or electrical cardioversion (or both)
TEE-guided cardioversion or 3 weeks of oral anticoagulation followed by cardioversion

Atrial Flutter

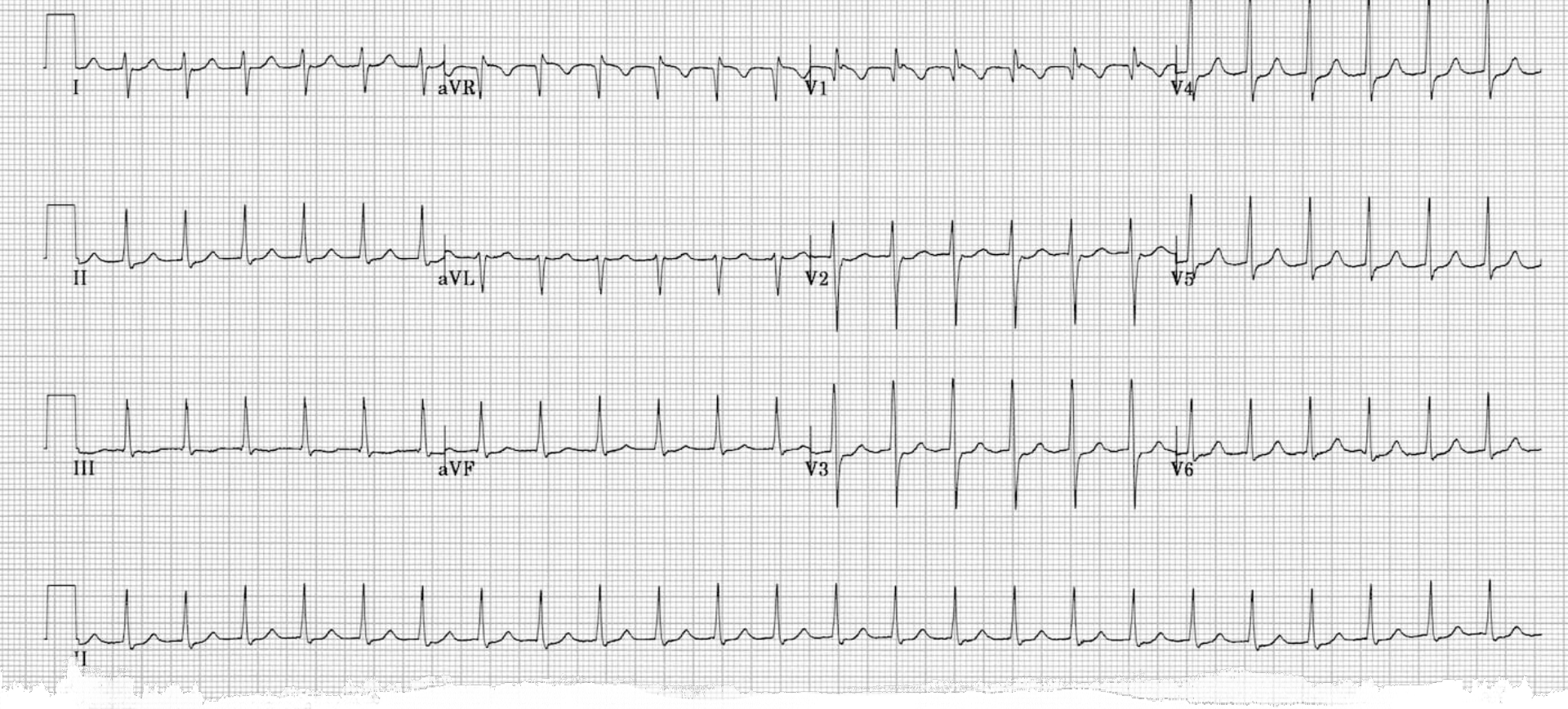

AV node
Slow zone



Atrial Flutter

- ***Unstable*** pt:
  - Synchronized cardioversion as per ACLS
- ***Stable*** pt:
  - Rate control :just like atrial fibrillation AF
  - Elective cardioversion :just like AF
  - Anti-coagulation :just like AF
  - Refer for Ablation

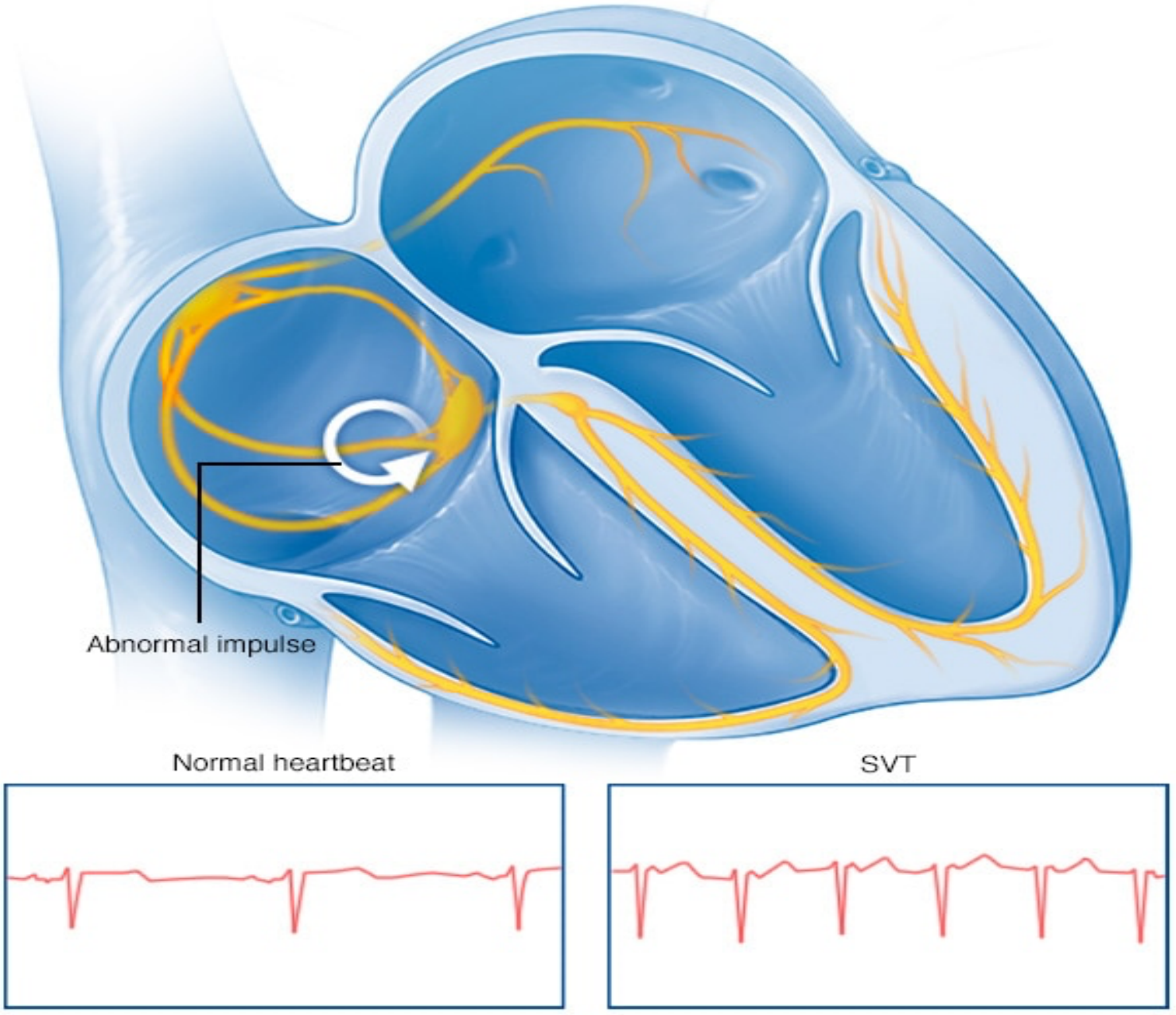
SVT

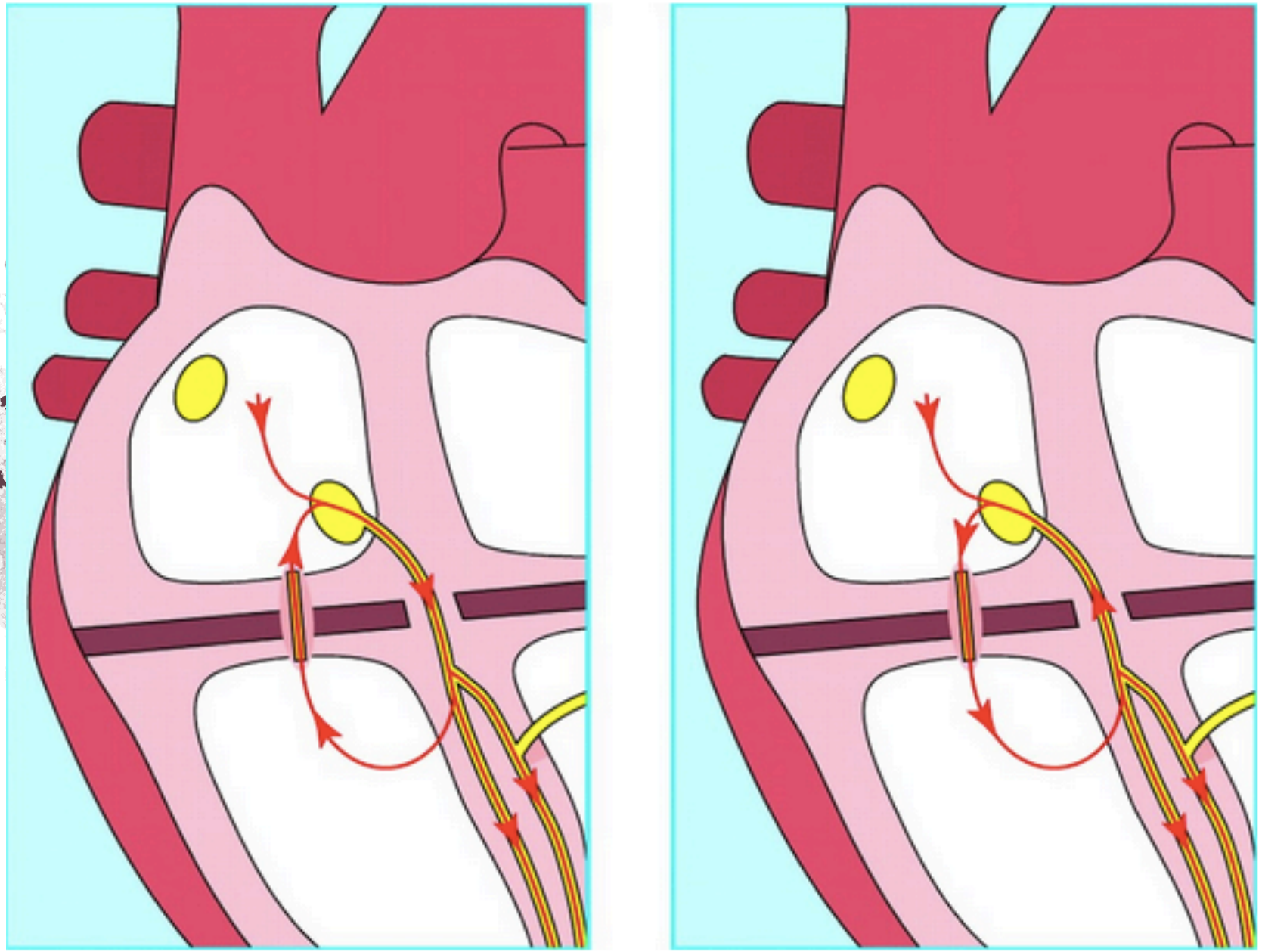


- AVNRT

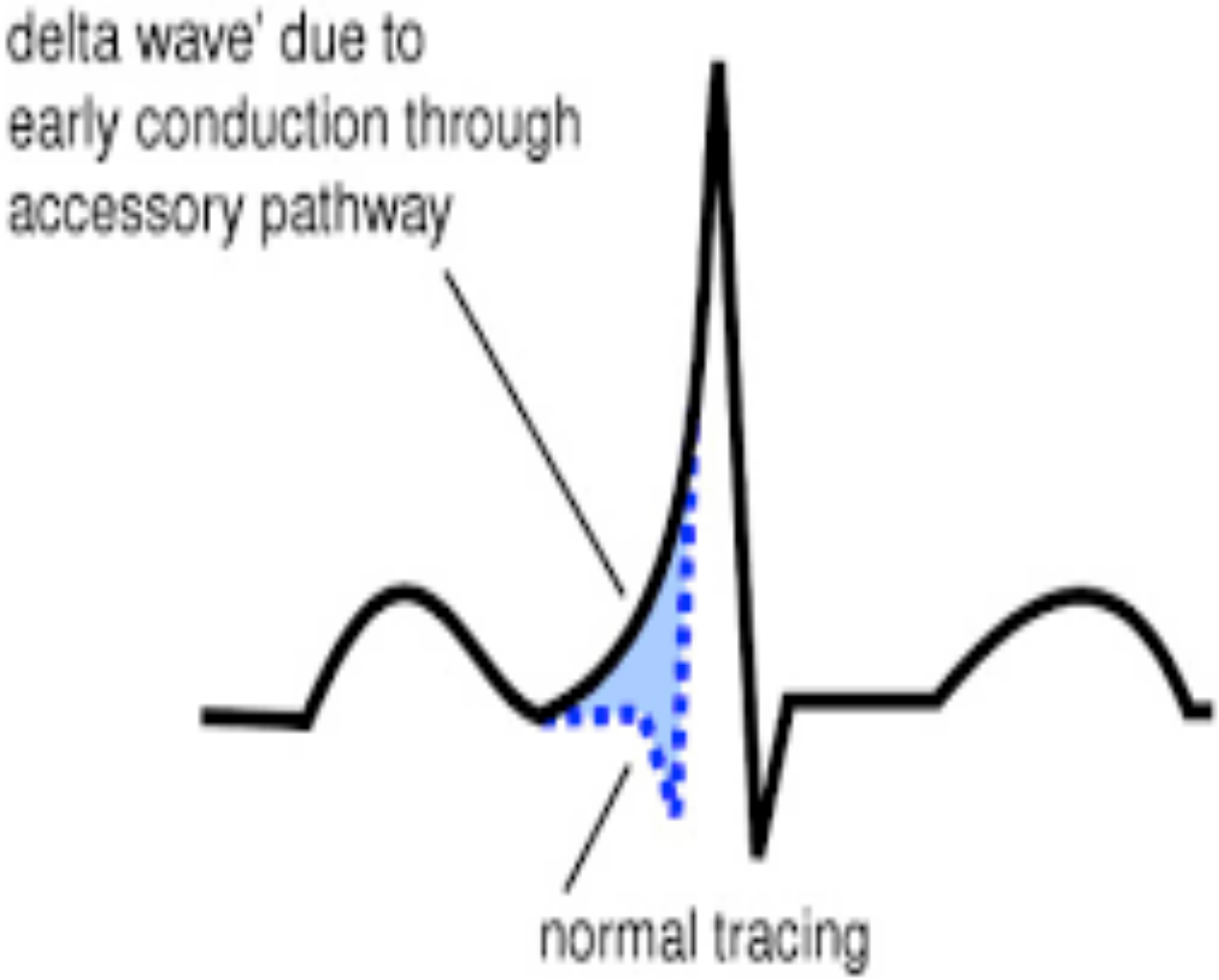
SVT

- AVNRT (60%)
- AVRT (30%)
- Atrial tachycardia (10%)





AVRT with orthodromic (left) and antidromic (right) AV nodal conduction


delta wave' due to
early conduction through
accessory pathway
normal tracing

Treatment options

- Medical therapy
- Radio Frequency Ablation

Other Arrhythmias

- Ventricular Tachycardia
- Ventricular Fibrillation

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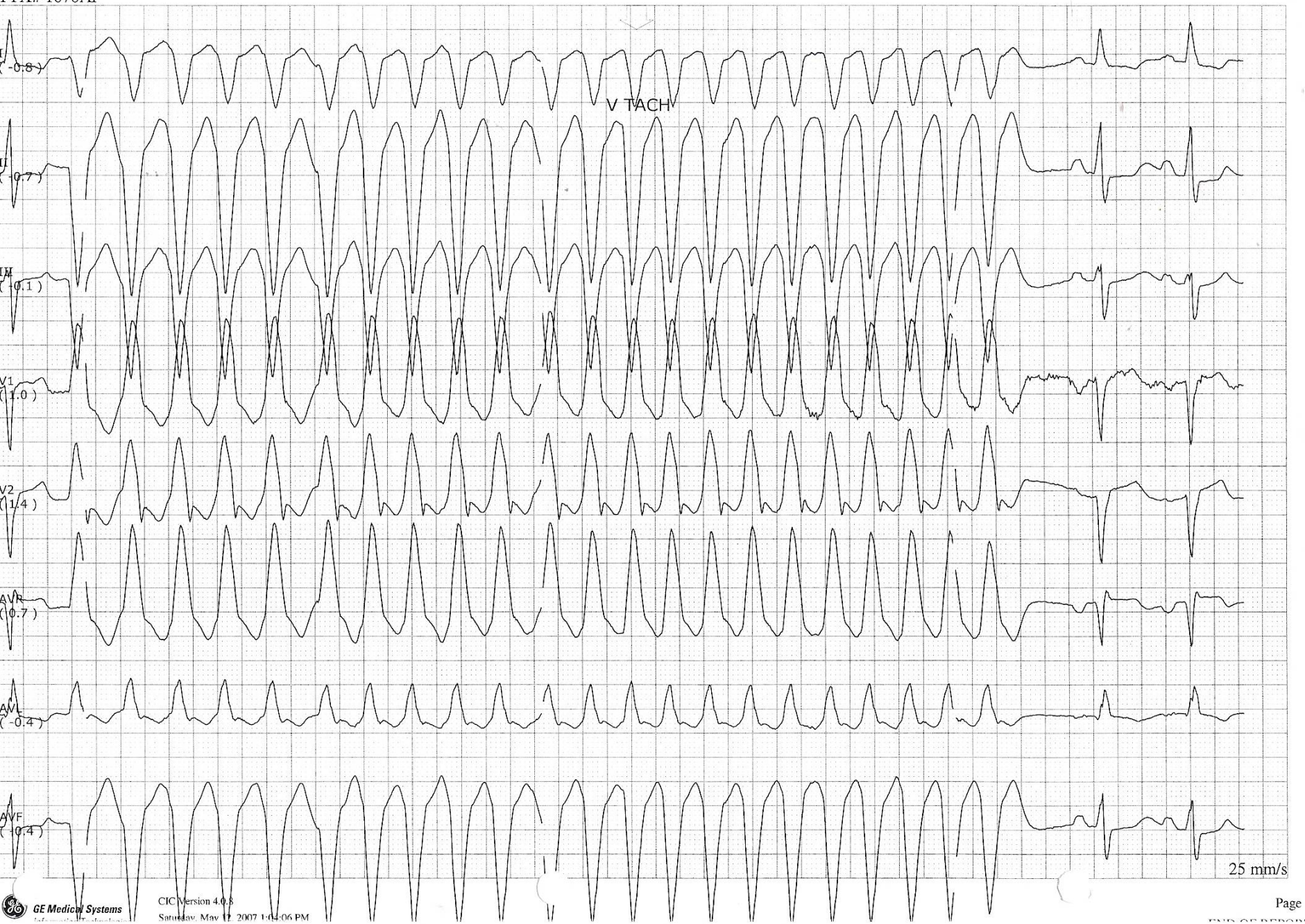
V TACH HR 130 PVC 7 ST V1 1.0 mm

TTX# 1070AP



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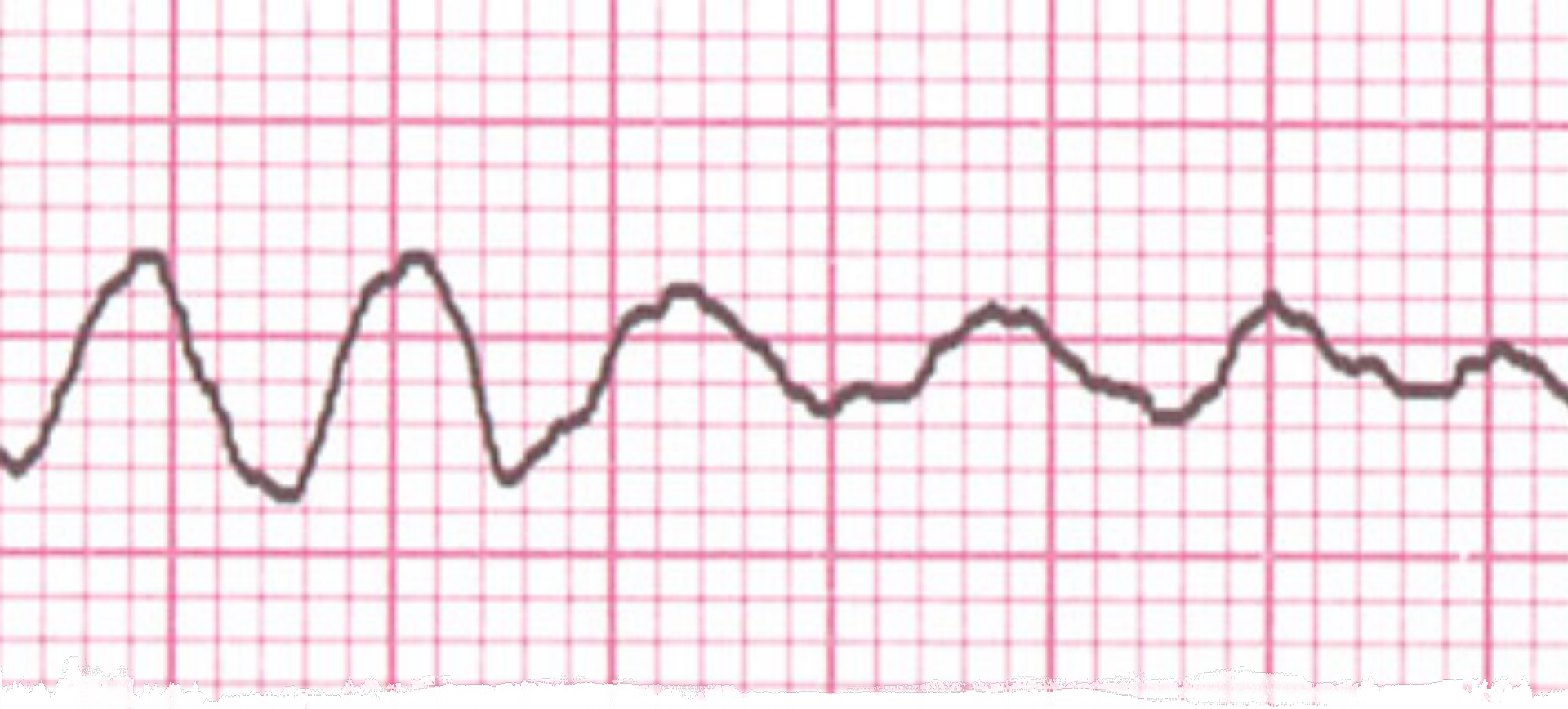

VF

Treatment options

- Treat the underlying cause
- Automatic Implantable defibrillators

Thank You