Atrial fibrillation (AF) is a supraventricular tachyarrhythmia characterized by

- Uncoordinated atrial activation → deterioration of mechanical function

- Most common sustained cardiac rhythm disturbance, increasing in prevalence with age

- Is often associated with structural heart disease

- Hemodynamic impairment and TE events related to AF result in significant morbidity, mortality, and cost
Epidemiology

• Incidence increases with age: 2 to 3 cases per 1000/yr at age 55-64 y, and upto 35 cases per 1000/yr between age of 85-94 y

• The overall prevalence among men and women is similar

• 1 in 4 adult over age 40 develop AF in their lifetime

Epidemiology (cont)

• AF is less common among black and Indo-Asian people than white people

• First-ever ischemic stroke: prevalence of AF 15-25%, and incidence 5%

• New-onset AF 10% (AMI) and 20%(HF)
Most Common Comorbid Chronic Conditions Among Patients with AF

- Hypertension
- Ischemic heart disease
- Hyperlipidemia
- HF
- Hyperthyroidism
- Anemia
- Diabetes Mellitus
- CKD
- Arthritis
- Depression
- COPD

Pathophysiology
**Classification**

- **Atrial Fibrillation**
  - **Paroxysmal AF**: AF that terminates spontaneously or with intervention within 7 d of onset. Episodes may recur with variable frequency
  - **Persistant AF**: Continuous AF that is sustained >7 d
  - **Long-Standing Persistant AF**: Continuous AF >12 mo in duration
  - **Permanent AF**: Further attempts to restore and/or maintain sinus rhythm are stopped
  - **Nonvalvular AF**: AF in the absence of rheumatic mitral stenosis, a mechanical or bioprosthetic heart valve, or mitral valve repair.

**Management objectives in AF**

- **Rate control**
- **Prevention of TE**
- **Rhythm control**
Established stroke risk factors

High-Risk Factors
► Mitral stenosis
► Prosthetic heart valve
► History of stroke or TIA

Moderate-Risk Factors
► Age > 75 years
► Hypertension
► Diabetes mellitus
► Heart failure or ↓ LV function

Less Validated Risk Factors
► Age 65–75 years
► Coronary artery disease
► Female gender
► Thyrotoxicosis

Stroke risk stratification in non valvular AF

<table>
<thead>
<tr>
<th>Definition and Scores for CHADS₂ and CHA₂DS₂-VASc</th>
<th>Score</th>
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<tbody>
<tr>
<td><strong>CHADS₂</strong></td>
<td></td>
</tr>
<tr>
<td>Congestive HF</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Age ≥75 y</td>
<td>1</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1</td>
</tr>
<tr>
<td>Stroke/TIA/TE</td>
<td>2</td>
</tr>
<tr>
<td><strong>Maximum score</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>CHA₂DS₂-VASc</strong></td>
<td></td>
</tr>
<tr>
<td>Congestive HF</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Age ≥75 y</td>
<td>2</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1</td>
</tr>
<tr>
<td>Stroke/TIA/TE</td>
<td>2</td>
</tr>
<tr>
<td>Vascular disease (prior MI, PAD, or aortic plaque)</td>
<td>1</td>
</tr>
<tr>
<td>Age 65–74 y</td>
<td>1</td>
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<tr>
<td>Sex category (i.e., female sex)</td>
<td>1</td>
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<tr>
<td><strong>Maximum score</strong></td>
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</table>

Annual Stroke Risk

<table>
<thead>
<tr>
<th>CHA₂DS₂-VASc Score</th>
<th>Stroke Risk %</th>
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<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1.3</td>
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<tr>
<td>2</td>
<td>2.2</td>
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<td>3</td>
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<td>7</td>
<td>9.6</td>
</tr>
<tr>
<td>8</td>
<td>12.5</td>
</tr>
<tr>
<td>9</td>
<td>15.2</td>
</tr>
</tbody>
</table>
**CHADS$_2$-VASc**
- Score : 0 (Low risk, no anticoagulation needed)
- Score : 1 (Low-moderate, consider antiplatelets or anticoagulation)
- Score : ≥ 2 (Moderate-High risk, should consider anticoagulation)
  
  Warfarin *(COR 1 LOE: A)* or Dabigatran, or Rivaroxaban, or Apixaban *(COR 1 LOE: B)*

- CHADS$_2$-VASc is the predominant assessment tool to predict stroke risk *(COR 1, LOE B)*

- Selection of antithrombotic therapy - risk of TE irrespective of type of AF *(COR 1, LOE B)*

- Patients on warfarin, weekly INR during initiation and than monthly once stable INR achieved *(COR:1, LOE A)*

- Bridging therapy with UFH or LMWH in patients with mechanical or native valves undergoing procedures that require interruption of warfarin *(COR:1, LOE C)*

- Decisions on bridging therapy should balance the risks of stroke and bleeding
Management in Patients with newly discovered AF

Pharmacologic management in Patients with newly discovered AF
Pharmacologic management in Patients with recurrent paroxysmal AF

- Recurrent paroxysmal AF
  - Minimal or no symptoms: Anticoagulation and rate control as needed
  - Disabling symptoms in AF: Anticoagulation and rate control as needed
    - No drug for prevention of AF
    - Antiarrhythmic drug therapy
      - AF ablation if AAD treatment fails

Pharmacological Management for recurrent persistent or permanent AF

- Recurrent persistent AF
  - Minimal or no symptoms: Anticoagulation and rate control as needed
  - Disabling symptoms in AF: Anticoagulation and rate control
    - Antiarrhythmic drug therapy
      - Electrical cardioversion as needed
      - Continue anticoagulation as needed and therapy to maintain sinus rhythm
        - Consider ablation for severely symptomatic recurrent AF after failure of greater than or equal to 1 AAD plus rate control

- Permanent AF: Anticoagulation and rate control as needed
Approach to selecting drug therapy for ventricular rate control

- Atrial fibrillation
  - No other CV disease
    - Beta blocker: Diltiazem, Verapamil
  - Hypertension or HFpEF
    - Beta blocker: Diltiazem, Verapamil
  - LV dysfunction of HF
    - Beta blocker: Digoxin
  - COPD
    - Diltiazem, Verapamil
  - Amiodarone

Strategies for rhythm control in patients with paroxysmal and persistent AF

- No structural heart disease
  - Dofetilide, Dronedarone, Flecaïnide, Propafenone, Sotalol
  - Amiodarone
  - Catheter ablation ±

- Structural heart disease
  - CAD
    - Dofetilide, Dronedarone, Sotalol
    - Catheter ablation
    - Amiodarone

  - HF
    - Dofetilide, Dronedarone, Sotalol
    - Catheter ablation
    - Amiodarone

  - Amiodarone
Clinical Case

- A 68yrs old man presents to ER c/o mild fatigue since 1 day. A new and first finding is an irregular pulse. Atrial fibrillation is confirmed on 12-lead ECG. He has no additional symptoms. Past history includes HT, hyperlipidemia and NIDDM

- O/E: BP of 125/80 mm and a HR of 140 bpm
- Chest: Clear
- CVS: He has a short 1/6 systolic murmur at the apex without radiation

- Medications include atenolol 50mg, lisinopril 5 mg daily, metformin, atorvastatin 20 mg daily

Management

- Rate control: BB or non dihydropyridine CCB : target HR <80 at rest and <110 during exercise

- Anticoagulation: CHA2DS2VASc: 3
  - 3 weeks prior to and 4 week after cardioversion

- Rhythm control: Hemodynamically stable
electrical vs chemical cardioversion – discuss with the patient
Management (cont)

• Restoring sinus rhythm
  
  a. Dofetilide  
  b. Flecainide  
  c. Propafenone  
  d. I/V Ibutilide  
  
  (COR 1, LOE A)

  • Oral amiodarone can be used for pharmacological cardioversion (COR IIa, LOE A)

Management (cont)

• Maintaining sinus rhythm
  
  a. Dofetilide  
  b. Flecainide  
  c. Propafenone  
  d. Amiodarone  
  e. Sotalol  
  f. Dronaderone  
  
  (COR 1, LOE A)
Management (cont)

- DC cardioversion for rhythm control (COR 1, LOE B)

- OR

- When a RVR to AF does not respond promptly to drugs and contributes to ongoing myocardial ischemia, hypotension, or HF (COR 1, LOE C)

Management (cont)

- Catheter ablation for symptomatic paroxysmal AF refractory or intolerant to at least 1 class I or III antiarrhythmic medication when a rhythm-control strategy is desired (COR 1, LOE A)
Case 2

- 62 yr old female, presented to ER with palpitation, dyspnea and chest pain since 3 days. Past history is significant for hypertension, CAD, and stable ischemic cardiomyopathy

- On examination: BP: 90/60, Pulse: Irregularly irregular, HR: 160/min
- Chest: B/L crepitation upto midzone
- CVS: S1-S2 with gallop rhythm

- ECG: Atrial fibrillation and old LBBB, (1 month old ecg showing sinus rhythm)

- Medications: Furosemide 40mg BD, Spironolatone 25mg OD, Aspirin75mg OD, Ramipril 5mg OD, Atorvastatin 20mg OD, Carvedilol 6.26mg BD

Management

- Immediate DC cardioversion with anticoagulation started asap and continued afterwards (COR 1 LOE C)

- CHA₂DS₂VASc = 5, I/V heparin, LMWH, Factor Xa inhibitors or direct thrombin inhibitors

- For rate control, CCB, BB, and dronedarone should not be administered to patients with decompensated HF. (COR III (Harm) LOE C)
Clinical Case 3

• 55 yr old male presented with palpitations with fatigueability for last 2 weeks. Past hx is significant for hypertension, CAD, AF and stable CCF.


• ECG : AF with a fast ventricular rate (160bpm)
• Echo: LV diastolic dysfunction, EF: 45

• Medications: aspirin 75mg, rosvastatin 10mg, Spiromide 40mg, lisinopril 10mg, bisoprolol 2.5mg, warfarin 5mg

• INR: 2.2

Management

• Rate control: BB or CCB is recommended for this patient with persistent or permanent AF and compensated HF with preserved ejection fraction (HFpEF) (COR 1 LOE B)

• Digoxin is effective to control resting heart rate in patients with HF with reduced EF (COR 1 LOE C)

• Anticoagulation: Continue warfarin (target INR 2-3)
Clinical Case 4

• 45 yr old male NIDDM, hypertensive, smoker, with positive family hx of CAD presented with typical chest pain for last 6 hours, with associated palpitations and profuse sweating

• O/E: BP: 105/65, Pulse: 130 bpm irregular
• Chest: B/L minimal basal crepts
• CVS: S1-S2

• ECG: ST-T changes in anterior leads, no p-waves, and irregularly placed QRS complexes, HR: 130 (sinus rhythm in old ecg)

Management

• Rate control: I/V BB are recommended to slow RVR to AF in this patient with ACS who do not display HF, hemodynamic instability, or bronchospasm (COR 1 LOE C)

• Urgent DC cardioversion: If the patient becomes unstable, ongoing ischemia, or inadequate rate control (COR 1 LOE C)

• Amiodarone or digoxin can be used to slow a RVR in patients with ACS and AF associated with severe LV dysfunction and HF or hemodynamic instability (COR IIb, LOE C)
Management

• CHA₂DS₂-VASc = 3
• Anticoagulation: Warfarin unless contraindicated (COR 1 LOE C)
• ACS with AF: DAP and warfarin (Triple therapy) – 1 month

Clinical Case 5

• 30 years old pregnant female known case of moderate MS and AF presented with 3 days history of increasing palpitations and dyspnea

• O/E: Bp: 115/70 , Pulse: 140/min , Irregular
• Chest: B/L minimal basal crepts
• CVS: S1-S2-MDM at apex

• ECG: AF with FVR (HR: 140)
• Echo: Mod. Ms : MVA 1.6, Mild PAH, LA enlarged
Management

• **Rate:** Digoxin, BB, or CCB *(COR 1 LOE C)*

• **DC cardioversion:** Hemodynamic instability *(COR 1, LOE C)*

• **Anticoagulation:** throughout pregnancy except those at low TE risk *(COR 1 LOE C)*

• **LMWH:** 1st trimester and in last month of pregnancy *(COR 1, LOE C)*

• **Warfarin:** 2nd trimester until 1 month before expected delivery *(COR 1, LOE B)*

Clinical Case 6

• 30 yrs old young male paramedic c/o palpitation since 1 day

• No past history significant for DM, HT, CAD, or TIA/Stroke, non Smoker

• O/E: BP 120/70, pulse: 130 irregular

• Chest Clear

• CVS: S1,S2

• ECG: AF with FVR
Management

• Rate control: BB or CBB with a target HR<80 is desirable

• Since there is low risk of TE, no anticoagulation is needed

• Wait and see approach before deciding about rhythm control

Clinical Case 7

• 63 years old female known hyperthyroid, on antithyroid medications presented with 1 week hx of palpitations and easy fatigueability

• O/E: BP: 120/70, Pulse: 150 irregular
• Chest: Clear
• CVS: NAD

• ECG: AF with FVR
• TFT’s: T3: raised, TSH: Low
Management

• **Rate control:** BB in this thyrotoxic patient (COR 1, LOE C), CCB if BB is CI (COR 1, LOE C)

• **Rhythm control:** Normalize TFT’s prior to cardioversion (COR 1, LOE C)

• **Anticoagulation:** Warfarin (INR:2-3) (COR 1, LOE C)

Clinical Case 8

• 58 yrs old male smoker, presented with acute on chronic exacerbation of COPD, he is c/o tight chest, palpitations and productive cough since 1 week. A new finding on examination is irregular pulse

• O/E: BP 115/85, Pulse: 140/min irregular
• Chest: B/L wheeze and ronchi and minimal basal crepts
• CVS: S1-S2

• ECG: AF with FVR
• Echo: LVDD, moderate PAH, RV overload
Management

- Correction of hypoxemia and acidosis are the primary therapeutic measures (COR 1, LOE C)

- Rate control: Non dihydropyridine CCB (COR 1 LOE C)

- Rhythm control: DC cardioversion hemodynamically unstable (COR 1 LOE C)

- Anticoagulation: As per CHA₂DS₂VASc score

Rate Control vs Rhythm Control

<table>
<thead>
<tr>
<th>FAVOURING RATE CONTROL</th>
<th>FAVOURING RHYTHM CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistant AF</td>
<td>Paroxysmal AF or newly detected AF</td>
</tr>
<tr>
<td>Less symptomatic</td>
<td>More symptomatic</td>
</tr>
<tr>
<td>Age ≥ 65 y</td>
<td>Age &lt; 65 y</td>
</tr>
<tr>
<td>Hypertension</td>
<td>No hypertension</td>
</tr>
<tr>
<td>Previous failure of antiarythmic drug</td>
<td>No previous failure of antiarythmic drug</td>
</tr>
<tr>
<td>Patient preference</td>
<td>Patient preference</td>
</tr>
</tbody>
</table>
HAS–BLED Score

Estimates risk of major bleeding for patients on anticoagulation for atrial fibrillation

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension (&gt; 160 mm Hg systolic)</td>
<td>1</td>
</tr>
<tr>
<td>Abnormal renal or hepatic function</td>
<td>1-2</td>
</tr>
<tr>
<td>Stroke</td>
<td>1</td>
</tr>
<tr>
<td>Bleeding history or anemia</td>
<td>1</td>
</tr>
<tr>
<td>Labile INR (TTR &lt; 60%)</td>
<td>1</td>
</tr>
<tr>
<td>Elderly (age &gt; 75 years)</td>
<td>1</td>
</tr>
<tr>
<td>Drugs (antiplatelet, NSAID)</td>
<td>1-2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Levels</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>High risk (&gt; 4%/year)</td>
<td>≥ 4</td>
</tr>
<tr>
<td>Moderate risk (2-4%/year)</td>
<td>2-3</td>
</tr>
<tr>
<td>Low risk (&lt; 2%/year)</td>
<td>0-1</td>
</tr>
</tbody>
</table>

- HAS-BLED: Emerged as the most predictive bleeding index
- It is best used as a cautionary “yellow flag” rather than as a reason to withhold anticoagulation
- Score of ≥3 indicates need for regular clinical review
- Patients with a higher HAS-BLED score also have a higher CHA2DS2-VASc score
NOACs vs Warfarin

Coagulation Cascade
Known Problems With Warfarin

- Delayed onset/offset
- Unpredictable dose response
- Narrow therapeutic index
- Drug-drug, drug-food interactions
- Problematic monitoring
- High bleeding rate
- Slow reversibility

Comparison between NOAC and Warfarin

<table>
<thead>
<tr>
<th>Features</th>
<th>Warfarin</th>
<th>NOAC</th>
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<tbody>
<tr>
<td>Onset</td>
<td>Slow</td>
<td>Rapid</td>
</tr>
<tr>
<td>Dosing</td>
<td>Variable</td>
<td>Fixed</td>
</tr>
<tr>
<td>Food effect</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Drug interactions</td>
<td>Many</td>
<td>Few</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Half-life</td>
<td>Long</td>
<td>Short</td>
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<tr>
<td>Antidote</td>
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## Novel Oral Anticoagulants
### Important Comparative Features

<table>
<thead>
<tr>
<th>Drug</th>
<th>Type</th>
<th>Dosing</th>
<th>Clearance</th>
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<tbody>
<tr>
<td>Dabigatran</td>
<td>Oral direct thrombin inhibitor</td>
<td>Twice daily</td>
<td>Renal clearance</td>
</tr>
<tr>
<td>Rivaroxaban</td>
<td>Direct factor Xa inhibitor</td>
<td>Once daily (maintenance), twice daily (loading)</td>
<td>Renal clearance</td>
</tr>
<tr>
<td>Apixaban</td>
<td>Direct factor Xa inhibitor</td>
<td>Twice daily</td>
<td>Hepatic clearance</td>
</tr>
<tr>
<td>Edoxaban</td>
<td>Direct factor Xa inhibitor</td>
<td>Once daily</td>
<td>Hepatic clearance</td>
</tr>
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THANK YOU