MANAGEMENT OF

ATRIAL FIBRILLATION

A GUIDELINE-BASED APPROACH
Scope of the Problem

- Lifetime risk of developing AF after the age of 40 is 25%
- 9% of people over 65 have AF
- Over 4 million people in the United States have AF
- 15-20% of strokes are due to AF
- Strokes caused by AF tend to be severe
- Stroke, dementia, and mortality increased in AF patients
Atrial Fibrillation

- Definitions
  - NOAC, NVKD-ACs are terms that have been used
  - DOAC - Direct Oral Anticoagulant
  - **Paroxysmal**: A-fib lasting > 30 seconds but < 7 days and reverting to sinus rhythm spontaneously or with intervention
  - **Persistent**: Continuous A-fib lasting > 7 days but < 1 year
  - **Longstanding Persistent**: Continuous A-fib lasting > 1 year
Atrial Fibrillation

**Definitions (cont.)**

**Permanent:**
- More of an attitude than a different electrophysiologic state
- Patient and physician make decision not to attempt to maintain sinus rhythm
- May occasionally move from Permanent back to Persistent
- Rate Control Strategy
Atrial Fibrillation

- Definitions (cont.)

- **Non-valvular atrial fibrillation**
  - Absence of mechanical or bio-prosthetic heart valves
  - No rheumatic mitral stenosis
  - No history of mitral valve repair
Atrial Fibrillation

- Chaotic Electrical Activity
- No atrial contraction
- Left Atrial Appendage
- Rate set by AV node
- Refractory period
EKG Findings
EKG Findings
Typical Isthmus-Dependent Atrial Flutter
Coarse Atrial Fibrillation
Atrial Flutter and Atrial Tachycardia

- Typical Isthmus-Dependent Right Atrial Flutter
- Atypical Isthmus-Dependent Right Atrial Flutter
- Left Atrial Flutter
- Focal Atrial Tachycardia
- Micro-Reentry Atrial Flutter
- Scar-Mediated Atrial Flutter
# Stroke Risk

**CHADS-VASc**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF</td>
<td>1</td>
</tr>
<tr>
<td>HTN</td>
<td>1</td>
</tr>
<tr>
<td>Age 65-74</td>
<td>1</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1</td>
</tr>
<tr>
<td>Stroke/TIA</td>
<td>2</td>
</tr>
<tr>
<td>Vascular Dz</td>
<td>1</td>
</tr>
<tr>
<td>Age ≥ 75</td>
<td>2</td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
</tr>
</tbody>
</table>
## Bleeding Risk

**HAS-BLED**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HTN</strong></td>
<td>1</td>
</tr>
<tr>
<td>Abnormal Liver/Renal Tests</td>
<td>1/1</td>
</tr>
<tr>
<td>Cr &gt; 2.26, Bili &gt; 2x nl, AST/ALT/AP &gt; 3x nl</td>
<td></td>
</tr>
<tr>
<td><strong>Stroke</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Bleeding</strong> (Major/Predisposition)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Labile INRs</strong> (&lt;60% in range)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Elderly</strong> (&gt;64 y/o)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Drugs/Alcohol</strong> (NSAID/Antiplatelet Tx)</td>
<td>1</td>
</tr>
</tbody>
</table>
Anticoagulants

- Warfarin
  - Bleeding risk highly dependent on dietary compliance, drug interactions
- Direct Oral Anticoagulants (DOAC)
  - Pradaxa (dabigatran), Xarelto (rivaroxaban), Eliquis (apixaban), Savaysa (edoxaban)
Anticoagulants
Warfarin

![Diagram showing the coagulation cascade with Warfarin, Xa Inhibitors, and Dabigatran highlighted.]

**Xa Inhibitors**

**Dabigatran**
# Food Vitamin K Content

## Vegetables

<table>
<thead>
<tr>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green beans</td>
<td>Asparagus</td>
<td>Broccoli</td>
</tr>
<tr>
<td>Carrots</td>
<td>Avocado</td>
<td>Brussels sprouts</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>Red Cabbage</td>
<td>Cabbage</td>
</tr>
<tr>
<td>Celery</td>
<td>Green peas</td>
<td>Collard greens</td>
</tr>
<tr>
<td>Corn</td>
<td></td>
<td>Endive (raw)</td>
</tr>
<tr>
<td>Cucumber</td>
<td>Lettuce (iceberg)</td>
<td>Kale (raw leaf)</td>
</tr>
<tr>
<td>Egg plant</td>
<td></td>
<td>Lettuce (bib, red leaf)</td>
</tr>
<tr>
<td>Mushrooms</td>
<td></td>
<td>Mustard greens (raw)</td>
</tr>
<tr>
<td>Onions</td>
<td></td>
<td>Parsley</td>
</tr>
<tr>
<td>Green pepper</td>
<td></td>
<td>Spinach</td>
</tr>
<tr>
<td>Potato</td>
<td></td>
<td>Turnip greens (raw)</td>
</tr>
<tr>
<td>Pumpkin</td>
<td></td>
<td>Watercress (raw)</td>
</tr>
<tr>
<td>Sauerkraut (canned)</td>
<td></td>
<td>Swiss chard</td>
</tr>
<tr>
<td>Tomato</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Food Vitamin K Content

## Fats & Oils

<table>
<thead>
<tr>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn oil</td>
<td>Margarine</td>
<td>Mayonnaise</td>
</tr>
<tr>
<td>Peanut oil</td>
<td>Olive oil</td>
<td>Canola oil</td>
</tr>
<tr>
<td>Safflower oil</td>
<td></td>
<td>Soybean oil</td>
</tr>
<tr>
<td>Sesame oil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunflower oil</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Beverages

<table>
<thead>
<tr>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee</td>
<td></td>
<td>Tea, green</td>
</tr>
<tr>
<td>Cola</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit juices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tea, black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Warfarin

## Limitations

<table>
<thead>
<tr>
<th>Limitation</th>
<th>Clinical Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow onset and offset of action</td>
<td>Need for bridging with a rapidly acting anticoagulant</td>
</tr>
<tr>
<td>Interindividual variability in anticoagulant effect</td>
<td>Variability in dosing requirements</td>
</tr>
<tr>
<td>Narrow therapeutic index</td>
<td>Need for routine coagulation monitoring</td>
</tr>
<tr>
<td>Food and drug interactions</td>
<td>Dietary precautions; need for routine coagulation monitoring</td>
</tr>
<tr>
<td>Reduced synthesis of all vitamin K-dependent proteins</td>
<td>Risk of skin necrosis in patients with protein C or S deficiency; potential for osteoporosis*</td>
</tr>
<tr>
<td>High Major Bleeding Rates</td>
<td>20% during first year for those with CHADS–VASc score ≥ 4</td>
</tr>
<tr>
<td>Difficult to stay in therapeutic range</td>
<td>In trials, in range 50–60% of time. (Real life?)</td>
</tr>
</tbody>
</table>
Warfarin
Limitations

- 55% of warfarin-eligible patients receive it
- Elderly even less likely
- Patients with the highest stroke risk are least likely to receive it
- 28% discontinue warfarin by 1 year
- Room for improvement!
Rats and Mice are Expensive Boarders!

KILL 'EM
WITH
warfarin

Warfarin baits kill off whole colonies of rats and mice in 5 to 14 days. No bait shyness, pre-baiting is never necessary. For proven results, look for warfarin on the label of the next baits you buy.

The New, Proven Way to
KILL RATS
and mice — with
RODENTICIDES
containing newly-discovered
warfarin.
Anticoagulants
Ximelagatran

- First DOAC, introduced in 2006 …not in USA
- Showed reduced risk of stroke
- No increased bleeding risk
- Abandoned due to liver toxicity
Anticoagulants
Dabigatran (Pradaxa)

- Administered as Dabigatran Etexilate
- Zero pharmacologic effect
- Converted to Dabigatran within 1 hr
  - $T_{\frac{1}{2}} \approx 12 - 17$ hours
- Thrombin Inhibitor (Factor II)
- Consistent 10% bioavailability
- 80% renal clearance
Anticoagulants
Dabigatran (Pradaxa)

- **RE-LY Trial**
  (Randomized Evaluation of Long-Term Anticoagulant Therapy Trial)

- 18,113 patients, open label

- AF + 1 risk factor (CHADS2 ≥ 1)

- Non-inferiority trial

- Compared Dabigatran to warfarin
  - INR goal 2.0-3.0 achieved 64% of the time

- 2 Dabigatran doses (110 mg BID & 150 mg BID)
Anticoagulants
Dabigatran (Pradaxa)

- RE-LY Trial Results
- Dabigatran 110 mg BID
  - Non-inferior to warfarin for stroke reduction
  - 20% reduction in major bleeding (p=0.003)
Anticoagulants
Dabigatran (Pradaxa)

- RE-LY Trial Results
  - Dabigatran 150 mg BID
    - 34% reduction in stroke and embolization
    - No overall increase in major bleeding
    - Increased risk of GI bleeding (11.8 vs 5.8%  p<0.001)
Anticoagulants
Dabigatran (Pradaxa)

- **Dosing Recommendations**
  - **Recommended Dose is 150 mg BID**
  - **CrCl 15-30: 75 mg BID**
  - **CrCl < 15: Not recommended**
  - **Dialysis: Not recommended**
Anticoagulants
Rivaroxaban (Xarelto)

- Small molecule active drug
- Direct Factor Xa Inhibitor
- $T_{1/2} \approx 5-12$ hours (longer in elderly)
- Peak plasma concentration 2.5-4 hrs
- Consistent 50% bioavailability
- 66% urine excretion (36% unchanged)
Anticoagulants
Rivaroxaban (Xarelto)

- **ROCKET-AF Trial**
  Rivaroxaban Once Daily Oral Direct Factor Xa Inhibition Compared With Vitamin K Antagonism for Prevention of Stroke and Embolism Trial in Atrial Fibrillation

- 14,264 patients
- Double Blinded, randomized
- Rivaroxaban 20 mg
- **Warfarin** (INR 2.0 - 3.0 - achieved 58% of the time)
- CHADS2 Score ≥ 2.0
- Half of patients had prior stroke
Anticoagulants
Rivaroxaban (Xarelto)

- ROCKET-AF Results
  - 12% relative reduction in stroke or embolization
  - NOT statistically significant
  - Non-inferior to warfarin
  - More “non-major” GI bleeding
    HR 1.42 (95% CI: 1.22 to 1.66)
  - Statistically significant reduction in intracranial hemorrhage and bleeding death
  - Strong CyP-450 3A4 inhibitors increase levels

clarithromycin, erythromycin, verapamil, diltiazem, itraconazole, ketoconazole, ritonavir, grapefruit
**Anticoagulation**

*Apixaban (Eliquis)*

- Small molecule active drug
- Direct Factor Xa Inhibitor (like Rivaroxaban)
- Peak plasma concentrations at 2 hrs
- $T_{1/2} \approx 12$ hours
- Consistent 50% bioavailability
- 25% urine excretion
- Strong CyP-450 3A4 Inhibitors increase levels
### Anticoagulation

**Apixaban (Eliquis)**

- **ARISTOTLE Trial**  
  *Apixaban for Reduction in Stroke and Other Thromboembolic Events in Atrial Fibrillation Trial*

- 18,201 patients

- Apixaban 5 mg

- Warfarin (INR 2.0 - 3.0 - achieved 58% of the time)

- AF + at least one risk factor \((CHADS2 \geq 1)\)

- Lower risk patients than ROCKET-AF
Anticoagulation
Apixaban (Eliquis)

- ARISTOTLE Trial Results
  - 21% relative reduction in stroke or embolization
  - 31% relative reduction in overall bleeding
  - 11% relative reduction in mortality
  - Better tolerated than warfarin
Anticoagulation
Apixaban (Eliquis)

- AVERROES Trial
  Apixaban Versus Acetylsalicylic Acid to Prevent Strokes Trial

  - 5599 patients
  - Apixaban 5 mg vs. ASA 81-325 mg
  - Unsuitable for warfarin
  - Stopped early due to clear Apixaban superiority
  - Bleeding rates similar to ASA
  - Apixaban better tolerated than ASA (less discontinuations)
Anticoagulation
Edoxaban (Savaysa)

- Small molecule active drug
- Direct Factor Xa Inhibitor (like Rivaroxaban/Apixaban)
- Peak plasma concentration at 1 - 1.5 hrs
- $T_{1/2} \approx 8-10$ hours
- 40% urine excretion
- Consistent 50% bioavailability
- Strong CyP-450 3A4 Inhibitors increase levels
Anticoagulation
Edoxaban (Savaysa)

* ENGAGE-AF - TIMI 48
  Effective Anticoagulation With Factor Xa Next Generation in Atrial Fibrillation
  >20,000 patients
  Double Blind
  CHADS2 ≥ 2 (high risk)
  Warfarin (INR 2.0 - 3.0 - achieved 68.4% of the time)
  Bioprosthetic valves and repaired valves included
Anticoagulation
Edoxaban (Savaysa)

- ENGAGE-AF Trial Results
  - Edoxaban 30 mg daily
    - 53% relative reduction in major bleeding
    - 15% relative reduction in mortality
    - 7% relative increase in stroke or embolization
Anticoagulants
Comparison of GI Bleeding

Figure 2. Cumulative Incidence of Major Bleeding (Inpatient Bleeding) for Anticoagulant Initiation

- Warfarin vs. Apixaban: Adjusted HR: 1.93 (95% CI: 1.12 - 3.33), P=0.018
- Rivaroxaban vs. Apixaban: Adjusted HR: 2.19 (95% CI: 1.26 - 3.79), P=0.0052
- Dabigatran vs. Apixaban: Adjusted HR: 1.71 (95% CI: 0.94 - 3.10), P=0.079

Apixaban also showed significantly reduced major bleeding in all age groups, including those > 75 y/o
# Anticoagulants

## Direct Comparisons

<table>
<thead>
<tr>
<th>Anticoagulant</th>
<th>Winner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major GI bleeding:</td>
<td>Apixaban*</td>
</tr>
<tr>
<td>Major intracranial bleeding</td>
<td>Unknown</td>
</tr>
<tr>
<td>Other major bleeding</td>
<td>Unknown</td>
</tr>
<tr>
<td>Minor bleeding</td>
<td>Unknown</td>
</tr>
<tr>
<td>Real world stroke reduction</td>
<td>All*</td>
</tr>
<tr>
<td>Cost</td>
<td>Apixaban**</td>
</tr>
</tbody>
</table>

*Based on retrospective insurance claims

**Many non-validated assumptions about cost of bleeding have to be made

Data on Savaysa is lacking due to its more recent release
Anticoagulation
Valvular AF

- RE-ALIGN
  - Dabigatran 150, 220, 300 mg vs. Warfarin
  - Mechanical Valves (AVR or MVR)
  - 252 patients (target of approximately 450 patients)
**Anticoagulation**
Valvular AF

- **RE-ALIGN**
  - Halted early
  - 9 CVAs in Dabigatran arm vs. 0 in Warfarin arm
  - 5 subclinical thromboses of valve vs. 0
  - Composite of stroke, transient ischemic attack, systemic embolism, myocardial infarction, or death
    - 9% in Dabigatran arm vs. 5% in Warfarin arm
  - Increased bleeding in Dabigatran arm
Anticoagulation
Valvular AF

- What did we learn?
  - Most events occurred in de-novo valve replacements
  - Because of increased bleeding, increasing the dose of Dabigatran not an option
  - Don’t use Dabigatran with mechanical valves
  - Guidelines recommend no DOAC with mechanical or bioprosthetic heart valves
  - More to come…
Anticoagulation
Valvular AF - Guidelines

- For Atrial fibrillation with a CHA$_2$DS$_2$-VASc score ≥ 2
- A DOAC is reasonable among patients with
  - Native aortic valve disease
  - Native tricuspid valve disease
  - Non-rheumatic mitral regurgitation

2017 AHA/ACC Focused Update of Valvular Heart Disease Guideline
Anticoagulation
General Guidelines

- Anticoagulate based on stroke (CHADS-VASC Score) and bleeding risks
  - HAS-BLED

- Acceptable anticoagulants: Warfarin or DOAC

- Atrial Flutter = Atrial Fibrillation

- Check and periodically monitor renal function with DOAC - reduce doses when necessary

- DOACs recommended when INRs labile on warfarin
  (< 60% in target range)
# Anticoagulation Guidelines

<table>
<thead>
<tr>
<th>CHADS-VASC Score</th>
<th>Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Reasonable to omit anticoagulation</td>
</tr>
<tr>
<td>1</td>
<td>Reasonable to Anticoagulate with DOAC or warfarin</td>
</tr>
<tr>
<td></td>
<td>Reasonable to omit anticoagulation</td>
</tr>
<tr>
<td>2</td>
<td>Anticoagulate with DOAC or warfarin</td>
</tr>
</tbody>
</table>
Anticoagulation
Guidelines

- End Stage Renal Disease / Dialysis
  - Reasonable to use warfarin
  - Do not use DOAC (especially rivaroxaban and dabigatran)
  - Some recommend no anticoagulation - not in the guidelines
Aspirin

Guidelines

- Aspirin
- 23% stroke reduction for secondary prevention
- Prior recommendation driven by 1 trial
- SPAF: ↓ stroke in high-risk (CHADS-VASc ≥ 3)
- Meta-analysis
  - Reduction in stroke risk what would be expected from carotid/aortic disease
- ICH risk similar to Apixaban
- No longer in guidelines for primary prevention a-fib
- Do not use
Non-pharmacologic Stroke Prophylaxis Guidelines

- **WATCHMAN**
  - Non-inferior to warfarin
  - For patients at excessive bleeding risk
  - Used when intolerant to anticoagulants

- **LARIAT, AtriClip, surgical removal/oversewing**
  - Probably reduce CVA risk, not enough data
  - Pose significant risks
Non-pharmacologic Stroke Prophylaxis Guidelines

- **WATCHMAN**
  - Non-inferior to warfarin
  - For patients at excessive bleeding risk
  - Used when intolerant to anticoagulants
  - Need anticoagulation temporarily
    - Clopidogrel + ASA then ASA only
Reversal Agents

Warfarin

- Vitamin K and FFP
- Duration of effect of FFP: 6-8 hours
- Onset of action of IV Vitamin K: Onset 2 hrs, Peak 6-24 hrs
Reversal Agents

Dabigatran

- Dabigatran / Idarucizumab (Praxabind)
- 90% of patients showed complete reversal in 4 hours
- Reversal effect lasts 24 hours
- Approved under accelerated protocol based on reversal in healthy volunteers
- Ongoing trial of reversal for emergency surgery
Reversal Agents
Xa Inhibitors

- No reversal agents currently available
- AndexXa
  - Fast-tracked for FDA approval
  - Achieved desired endpoints in Phase III clinical trials
  - Approval delayed in August 2016 by FDA
  - Requested more information
Reversal Agents
Xa Inhibitors

- **aPCC** (Activated Prothrombin Complex Concentrate)
- 4-factor aPCC
- Not a true reversal agent
- Activates the clotting cascade
- Increased **Thrombosis**
Bridging Therapy

- Indications
  - Mechanical heart valves
  - Otherwise decide based on risks and duration

- Agents
  - Unfractionated Heparin or LMWH

- Protocols (D = procedure date)
  - Warfarin: Stop D-4, begin BID enoxaparin/heparin D-2, terminate after morning dose at D-1, resume on D or ASAP
  - DOACs: Stop D-3, Resume ASAP (immediate effect)
Cost Analysis

- Analysis is difficult
  - Depends on value placed on bleeding
  - Value placed on stroke better established
- Overall, DOACs appear to be cost effective
- Has resulted in improving coverage
## Cost Analysis

<table>
<thead>
<tr>
<th>Agent</th>
<th>Annual Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dabigatran</td>
<td>$204</td>
</tr>
<tr>
<td>Rivaroxaban</td>
<td>$140</td>
</tr>
<tr>
<td>Apixaban</td>
<td>$495</td>
</tr>
<tr>
<td>Edoxaban</td>
<td>$340</td>
</tr>
</tbody>
</table>

A. Amin, A. Bruno, J. Trocio, J. Lin, and M. Lingohr-Smith, “Comparison of differences in medical costs when new oral anticoagulants are used for the treatment of patients with non-valvular atrial fibrillation and venous thromboembolism vs warfarin or placebo in the US,” *Journal of Medical Economics*, vol. 18, no. 6, pp. 399–409, 2015
Rate Control
Guidelines

- Use B-blockers and nondihydropyridine calcium channel blockers (diltiazem, verapamil) when needed
- Assess HR with exertion if symptomatic with exercise
- Routine ambulatory monitoring of HR not in guidelines
- IV amiodarone useful for rate control in ill patients
- Oral amiodarone is last-line therapy for rate control
Rate Control
Guidelines

- Target Resting HR
  - < 80 BPM
  - < 110 BPM if asymptomatic and LVEF monitored
Rate Control
Approaches in Specific Patient Populations

- Atrial Fibrillation
  - No Other CV Disease
    - Beta blocker
    - Diltiazem
    - Verapamil
  - Hypertension or HFP EF
    - Beta blocker
    - Diltiazem
    - Verapamil
  - LV Dysfunction or HF
    - Beta blocker
    - Digoxin
  - COPD
    - Beta blocker
    - Diltiazem
    - Verapamil
  - Amiodarone

†: Additional medication
§: Second-line therapy
Rate Control

Special Contraindications

- Ca channel blockers, digoxin, adenosine contraindicated with ventricular pre-excitation (WPW)
- Catheter ablation of WPW may reduce risk of atrial fibrillation (in select patients)
- Dronedarone contraindicated for rate control
Rate Control
Which agent is best?

In AFFIRM trial:
* B-blockers were the most effective agent for rate control (70% vs 60% for diltiazem/verapamil)
* Side-effects may be higher for some patients
* Individualize based on likely side effects
Rate Control
Digoxin

- May be useful, especially in the elderly
- Elderly have the highest risk of serious side effects
- Ineffective in controlling HR with exercise - often needs a secondary agent
- Serious pro-arrhythmia risks
- Avoid if possible
Rate Control
Ablate-and-Pace

- Used when other approaches are contraindicated or unsuccessful in controlling symptoms/heart rate
  - Highly successful
  - Produces pacemaker dependence
  - Generally reserved for more elderly patients
  - May result in pacemaker-induced cardiomyopathy
  - Bi-ventricular pacing
Rate Control

Limitations

- AFFIRM Trial
  - Rate vs. Rhythm Control
  - Both strategies equally safe and effective
  - Mainly older patients (mean 70 years)
  - In studies, rate control is better than in “real life”
- Many patients remain symptomatic despite rate control
- Non-compliance - Tachycardia-induced cardiomyopathy
Rhythm Control
Cardioversion

- A-fib duration > 48 hrs or unknown
  - Anticoagulate x 3 weeks before, 4 weeks after cardioversion
  - TEE guided cardioversion - start anticoagulation first, continue for 4 weeks
- Hemodynamic instability → cardiovert
**Rhythm Control**

**Cardioversion**

- A-fib duration < 48 hrs
  - DC or pharmacologic cardioversion is reasonable
  - If thromboembolic risk is high (CHADS-VASc ≥ 2)
    - Cardiovert
    - Use heparin, LMWH, or DOAC as soon as possible and indefinitely
    - Xarelto onset in elderly may be > 12 hrs
  - If thromboembolic risk is low (CHADS-VASc = 0 or 1)
    - Cardioversion reasonable without anticoagulation
Rhythm Control
Cardioversion

- Pharmacologic Cardioversion
  - Flecainide and propafenone most common
  - CHF!
- Pill-in-the-pocket
  - B-blocker or Ca^{++} Blocker 30 min before
  - Reduce dose in patients on chronic B-blockers?
- Oral amiodarone is reasonable - may take weeks!
Rhythm Control
Anti-arrhythmic Drugs

- Routine monitoring required with all antiarrhythmic drugs
  - Amiodarone is safe to start as an outpatient if familiar with its risks and adverse reactions
  - All others probably best initiated by cardiologist or EP
  - Discontinue most when AF becomes permanent
  - Dronedarone contraindicated:
    - Class III/IV heart failure
    - Decompensated HF within 4 weeks
Rhythm Control
Catheter Ablation

- Two ablation modalities
  - RF (point-by-point)
  - Cryo-ablation
- Both useful in different populations
- Combined techniques often used
Rhythm Control
Catheter Ablation

* Ablation superior to antiarrhythmic drugs in select patients
* Improved quality of life
* Reduced AF symptoms
* 60% reduction in cardiac mortality after ablation*
* Very elderly not studied
Rhythm Control
Catheter Ablation

- Success varies from < 30% to over 90% based on
  - Patient selection
  - Type of a-fib
  - Patient age
  - Ablative methods
  - Experience

- Complication rates generally less than 5%
  - Dependent on experience
  - Should be performed at experienced centers only
Rhythm Control
Catheter Ablation Guidelines

- Paroxysmal A-fib
  - Ablation useful
  - Typical success rates > 75-85%

- Persistent A-fib
  - Ablation reasonable after failure of at least 1 AAD
  - Success rates typically 30-60%
  - > 1 procedure necessary

- Long-term Persistent
  - Ablation reasonable in select patients only
  - Success rates lower (20-40%)
Rhythm Control
Catheter Ablation

- Contraindicated in patients that cannot be treated with anticoagulation
- Contraindicated for sole intent of stopping anticoagulation
Rhythm Control
Surgical Approaches

- Maze Procedure
  - Cut-and-sew maze highly effective but infrequently used due to complications
  - Ablative maze procedures done most frequently with other open heart procedures
  - May be considered as stand-alone when other therapies are unsuccessful
- Minimally invasive maze procedures
- Hybrid
A-fib and Heart Failure

Management

- Heart failure both causes and may be caused by a-fib
- Maintenance of sinus rhythm may be particularly important in some HF patients
- Poor rate control may seriously worsen HF
- Should generally be managed by specialists with experience with such patients
The future is bright

- Enormous amounts of research are being directed at atrial fibrillation
- Our knowledge of the underlying pathophysiology is many fold greater than just 10 years ago
- Antiarrhythmic drug progress is frustratingly slow
- Fortunately ablation has emerged as an excellent alternative for many patients
- New treatment modalities are being pursued and many advances will occur over the next decade
- The vast majority of patients can live normal day-to-day lives
MANAGEMENT OF

ATRIAL FIBRILLATION

TO BE CONTINUED...