This care process model (CPM) was developed by an interdisciplinary team formed by SelectHealth and Intermountain that included primary care providers and Intermountain experts in heart rhythm treatment, cardiology, and anticoagulation. It is based on current guidelines\(^1\) - \(^3\) and provides practical guidance for atrial fibrillation treatment. Please note that while this document presents an evidence-based approach that is appropriate for most patients, it should be adapted to meet the needs of individual patients and situations, and should not replace clinical judgment.

### Key points

- Atrial fibrillation (AF) can be managed through rhythm control or rate control. For most patients, it's helpful to begin by attempting rhythm control; this typically involves a cardiologist referral.

- Most AF patients should have long-term anticoagulation, even if restored to sinus rhythm, depending on their stroke risk. While CHADS2 has often been used to decide which patients need chronic anticoagulation, the newer \(\text{CHA}_2\text{DS}_2\text{VASc}\) score represents the optimal risk stratification tool. See page 7.

- The best anticoagulation strategies are based on factors specific to each patient. Assessment of bleeding risk is appropriate to plan risk reduction and monitoring. However, it should not influence decision making on whether to apply anticoagulation therapy. See pages 7 to 10 for guidance on choosing an anticoagulant, monitoring, and other practical issues.

- A working knowledge of AF and its types can help with treatment decisions. See the definitions below, adapted from American College of Cardiology guidelines.\(^2\)

### Why Focus ON AF?

- AF prevalence is high in the elderly. It increases with age and is estimated at 17.8% in adults age 85 and older.\(^4\)
- Mortality and morbidity in AF are significant. AF-associated strokes are more severe, with 30-day mortality of 25% compared to 14% in non-AF strokes.\(^5\)
- AF has a tendency to recur, even if patients are restored to normal sinus rhythm. This tendency increases the importance of appropriate oral anticoagulation.
- Emerging models for stroke risk and bleeding risk can make the choice of anticoagulation safer and more effective.

### Goals OF THIS CPM

- Enhance quality of life for AF patients
- Facilitate evidence-based care for AF
- Guide and standardize appropriate AF workup and rhythm control
- Limit the duration of AF by converting patients to sinus rhythm as quickly as possible
- Optimize the use of appropriate anticoagulation

### What’s Inside

<table>
<thead>
<tr>
<th>ALGORITHM AND NOTES</th>
<th>RHYTHM CONTROL</th>
<th>CHRONIC RATE CONTROL</th>
<th>CHRONIC ANTICOAGULATION</th>
<th>REFERENCES</th>
<th>RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

---

### ATRIAL FIBRILLATION (AF): DEFINITION AND TYPES

- **Basic definition:** Atrial fibrillation (AF) is a supraventricular tachyarrhythmia characterized by uncoordinated atrial activation with consequent deterioration of atrial mechanical function — documented continually on an ECG or for at least 30 seconds on monitoring. (For signs and symptoms, see page 3.)

- **ECG:** On an electrocardiogram (ECG), AF is characterized by the replacement of consistent P waves by rapid oscillations or fibrillatory waves that vary in amplitude, shape, and timing, associated with an irregular, frequently rapid ventricular response when atrioventricular (AV) conduction is intact.

- **Valve involvement:** Patients may have valvular AF (caused by rheumatic disease of the mitral valve or with a history of valve replacement) or nonvalvular AF. This distinction can affect treatment choices.

- **Duration and/or recurrence:** The duration of AF and/or potential recurrence of resolved AF can affect treatment decisions.
  - **Paroxysmal AF:** AF that ends in fewer than 7 days and can be recurrent. (This includes episodes that end spontaneously or are resolved with cardioversion.)
  - **Persistent AF:** Continuous AF (present on every ECG test) that is sustained longer than 7 days.
  - **Longstanding persistent AF:** Continuous AF that lasts longer than 12 months’ duration, with continued efforts to restore to sinus rhythm.
  - **Permanent AF:** Continuous AF of longer than 12 months’ duration, when no further interventions to restore to sinus rhythm are planned.
Patient presents with signs and/or symptoms of possible ATRIAL FIBRILLATION (AF) or atrial flutter (AFL) (a)

Is patient unstable? (b)  YES  NO

Send to emergency department with EMS transport if possible

Any reasons NOT to pursue RHYTHM CONTROL? (d)  YES  NO

BASIC EVALUATION FOR AF PATIENTS

History
- History of AF, including symptoms, AF clinical type (see definitions on page 1), onset time, frequency, duration, precipitating factors, and modes of previous termination.
- Other medical history, including underlying heart disease, comorbidities, and possible reversible conditions such as hyperthyroidism, electrolyte imbalance, or pulmonary disease.

Physical
- Vital signs, including oximetry
- ECG to verify AF and identify other cardiac concerns
- Labs: CBC, CMP, thyroid function
- Transthoracic echocardiogram
- Consider CXR if pulmonary signs or symptoms are present

Consider STOP-BANG screen and/or nocturnal oximetry for sleep apnea

Imaging stress test if antiarrhythmic medications are considered or if moderate to high CHD risk (c)

CHRONIC RATE CONTROL (h)

CHRONIC ANTICOAGULATION (i)

ONGOING FOLLOW-UP
- Evaluate and manage side effects (see medication tables, pages 5 and 7)
- If warfarin prescribed, ongoing INR monitoring (see medication table, page 7); Intermountain-employed physicians can use a decision support tool within HELP2 to assist in managing patients for optimal time in therapeutic range (TTR)
- Reconsider rhythm control

RHYTHM CONTROL (g)  NO

Any reasons NOT to pursue RHYTHM CONTROL? (d)  YES  NO

ELECTRICAL (DC) CARDIOVERSION

Successful
- Consider starting ANTIARRHYTHMIC if patient has structural heart disease (f)

Unsuccessful
- Load with ANTIARRHYTHMIC and achieve therapeutic ANTICOAGULATION then reattempt DC CARDIOVERSION

2nd try successful?  NO  YES

ONE-MONTH ANTICOAGULATION post DC CARDIOVERSION (e) (regardless of CHA, DS, VASc score)

FOLLOW-UP
- REEVALUATE in 1 month for ongoing treatment, including CHRONIC ANTICOAGULATION (i)
- Evaluate need for continued antiarrhythmia medication
- AF recurs?

AF RECURS or CARDIOVERSION FAILS

Follow up with cardiologist to consider cardioversion, antiarrhythmic, chronic rate control, or other options

CHRONIC RATE CONTROL (h)

Therapeutic ANTICOAGULATION
- 4 WEEKS pre CARDIOVERSION (e)
- Initiate RATE CONTROL if symptomatic or HR >100 (see medication table, page 6)

TRANSESOPHAGEAL ECHOCARDIOGRAPHY (TEE) readily available?

NO

AF definitely known to be <48 hours AND NO history of mitral stenosis or prosthetic valves, AND NO history of TIA, stroke, or thromboembolism? (e)

NO

Transesophageal echocardiogram (TEE) readily available?

NO

TEE before cardioversion

THROMBUS present

- THERAPEUTIC ANTICOAGULATION
- Initiate RATE CONTROL if symptomatic or HR >100 (see medication table, page 6)
**Algorithm Notes**

(a) **Symptoms associated with AF or AFL**
- Fatigue/tiredness
- Dyspnea
- Chest pain
- Palpitations
- Dizziness
- Weakness

(b) **Signs of instability**
- Unstable vital signs
- Ongoing chest pain with AF
- Decompensated heart failure
- Myocardial ischemia
- Hypotension

(c) **Coronary heart disease (CHD) risk**
- Mild: 1 to 2 risk factors;
- Moderate: 3 risk factors;
- High: ≥4 risk factors
  - Age (men > 45, women > 55 years)
  - Cigarette smoking
  - BP > 140/90 or on antihypertensive medication
  - Low HDL cholesterol (men < 40, women < 50)
  - Impaired fasting glucose (101–125)
  - Family history of premature CHD (male 1st-degree relative < 60 years or female 1st-degree relative < 70 years)
  - Non-HDL cholesterol > 160

(d) **Reasons NOT to pursue Rhythm Control**
The following are reasons to pursue chronic rate control rather than attempting rhythm control:
- Elderly asymptomatic patient with relatively normal heart function
- Risks of cardioversion may outweigh benefits (e.g., multiple comorbidities or overall poor prognosis)
- History of ≥2 previous DC cardioversions while on antiarrhythmic
- Low chance of success (AF duration > 1 year; moderate to severe mitral stenosis)

(e) **Pre- and Post-Cardioversion Anticoagulation**
**Pre-cardioversion — 3 options:**
- If 4 weeks therapeutic anticoagulation with apixaban, rivaroxaban, dabigatran, or warfarin (INR range 2–3 or if patient has mechanical valve, INR 2.5–3.5), then elective DC cardioversion is acceptable.
- If AF < 48 hours AND NO history of mitral stenosis/prosthetic valves, TIA, stroke, or thromboembolism, then DC cardioversion without TEE is acceptable. If patient is not fully anticoagulated, give enoxaparin (30 mg IV and 1 mg/kg subcut) before cardioversion.
- If AF ≥ 48 hours (or duration unknown) OR there are any of the thrombosis risk factors above, then TEE-guided cardioversion is warranted. If patient is not fully anticoagulated, give enoxaparin (30 mg IV and 1 mg/kg SCQ) before cardioversion.

**Post-cardioversion:**
- One (1) month therapeutic anticoagulation for all patients, regardless of CHA$_2$DS$_2$-VASc score (see note i). Anticoagulation is important due to risk of AF recurrence during this time window. Warfarin, apixaban, rivaroxaban, or dabigatran may be used; if warfarin is used, bridge with enoxaparin until therapeutic INR has been achieved for 2 days.
- Evaluate need for CHRONIC ANTICOAGULATION, based on CHA$_2$DS$_2$-VASc score (see note i). (Note: After DC or spontaneous cardioversion, AF should be considered paroxysmal and chronic anticoagulation is appropriate; see page 7)

(f) **Risk of AF recurrence after cardioversion**
The AF recurrence rate after cardioversion is high. Studies have shown AF recurrence of up to 70% in patients not taking antiarrhythmics.\textsuperscript{5,8} Structural heart disease (moderate mitral regurgitation, moderate left ventricular hypertrophy, LAA enlargement, stenotic valve disease) increases the risk of recurrence after cardioversion. Antiarrhythmic medications reduce the risk of AF recurrence and persistent AF.

(g) **Rhythm Control** (see page 4 for details)
- Why it’s important: The longer a patient is in AF, the more likely it is to become permanent. Rhythm control is recommended for most patients, and should be achieved ASAP if possible.
- DC cardioversion: DC cardioversion should be pursued in most patients unless the risks outweigh the benefits or there is a low chance of success (see factors listed in d at left).

Antithrombotic medications
- Post cardioversion: Consider antiarrhythmic medication unless it is the 1st episode and there is no structural heart disease.
- Chronic: Consider cardiologist referral to evaluate the need for chronic antiarrhythmic medication.

(h) **Chronic Rate Control** (see page 6 for details)
- When to consider: Patients with the factors listed in note (d) and patients for whom rhythm control has failed
- Treatment goal: Use diltiazem or verapamil and/or beta blocker, unless EF < 35%; options include digoxin and amiodarone

(i) **Chronic Anticoagulation** (see pages 7–10 for details)
- CHA$_2$DS$_2$-VASc scoring:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestive heart failure</td>
<td>1 pt</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1 pt</td>
</tr>
<tr>
<td>Age ≥ 75 years</td>
<td>2 pts</td>
</tr>
<tr>
<td>Age 65 to 74 years</td>
<td>1 pt</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1 pt</td>
</tr>
<tr>
<td>Stroke/TIA/VTE</td>
<td>2 pts</td>
</tr>
<tr>
<td>Sex = female</td>
<td>1 pt</td>
</tr>
<tr>
<td>Vascular disease (MI, PAD, or aortic plaque)</td>
<td>1 pt</td>
</tr>
</tbody>
</table>

**Using the score:**
- Score = 0: No therapy
- Score = 1: Decision determined by bleeding risk (see page 7):  
  - Aspirin alone (75 mg to 325 mg daily) OR 
  - Aspirin plus clopidogrel
- Score ≥ 2: Chronic anticoagulation:
  - DOACs (Direct oral anticoagulants: apixaban, dabigatran, rivaroxaban):
    - Recommended for most AF patients, unless contraindicated or warfarin is strongly preferred
    - Contraindicated in valvular heart disease (mitral stenosis or valve surgery) or renal impairment (eGFR < 30)
  - Warfarin:
    - Mandatory choice in patients with valvular heart disease
    - Recommended if TTR (time in therapeutic INR range) is ≥ 65%
  - Aspirin and clopidogrel as last alternative
    - If anticoagulation is contraindicated or patient will not take an anticoagulant (for reasons other than concerns about bleeding)

**Relative contraindications** to anticoagulation include history of transfusion-dependent bleed (≥ 2 units) or intracranial bleed; see page 7 for information on the HAS-BLED score.
RHYTHM CONTROL: KEY PRINCIPLES
- Cardiovascular factors help determine the best medication choice. Choose therapy based on the patient’s most serious condition.
- Pharmacological cardioversion conversion is discouraged (see note below).

PHARMACOLOGICAL CARDIOVERSION
Pharmacological cardioversion is discouraged due to low efficacy, the dosage required, and the need for inpatient initiation with most patients.

WHEN TO CONSIDER AF ABLATION
Consult a cardiologist to consider catheter ablation for symptomatic patients who have failed one or more trials of antiarrhythmic medication. See Heart Rhythm Society guidelines for more information.1

RHYTHM CONTROL
Consult a cardiologist to evaluate the need for antiarrhythmic medication after DC cardioversion, especially if the patient has structural heart disease.

1. Choose the desired medication.

The algorithm below is based on ACCF/AHA guidelines for maintaining sinus rhythm in patients with recurrent/persistent AF after cardioversion; choose therapy based on the patient’s most serious condition.

![Diagram showing maintenance of sinus rhythm](Diagram)

- **No** (or minimal) heart disease
  - **No** hypertension
    - Dronedarone
    - Amiodarone
    - Sotalol
  - **Yes** hypertension
    - Dronedarone
    - Amiodarone
    - Sotalol

- **Substantial left ventricular hypertrophy?**
  - **No**
    - Dronedarone
    - Amiodarone
    - Sotalol
  - **Yes**
    - Dronedarone
    - Amiodarone
    - Sotalol

- **Coronary artery disease?**
  - **Yes**
    - Dronedarone
    - Amiodarone
    - Sotalol
  - **No**
    - Dronedarone
    - Amiodarone
    - Sotalol

- **Heart Failure**
  - **Yes**
    - Dronedarone
    - Amiodarone
    - Sotalol
  - **No**
    - Dronedarone
    - Amiodarone
    - Sotalol

*Note: Dofetilide has least effect on heart rate.*

**TABLE 1. Rhythm control medications**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage</th>
<th>Contraindications and potential adverse drug reactions (ADRs)</th>
<th>Drug-drug interactions</th>
<th>SH tier, cost*</th>
</tr>
</thead>
<tbody>
<tr>
<td>amiodarone (Cordarone, Pacerone)</td>
<td>100 mg to 400 mg, once daily</td>
<td>ADRs: photosensitivity, pulmonary fibrosis/toxicity, GI upset, bradycardia, hepatic toxicity, thyroid dysfunction, eye complications, skin discoloration</td>
<td>Use caution with drugs that prolong QT interval; CYP3A4 inhibitors may increase concentrations of amiodarone.</td>
<td>Tier 1, $</td>
</tr>
<tr>
<td>dofetilide (Tikosyn)</td>
<td>125 mcg to 500 mcg, twice daily</td>
<td>ADRs: torsades de pointes, heart block, and arrhythmias (ventricular arrhythmias, fibrillation, or tachycardia)</td>
<td>Use caution with drugs that prolong QT interval. Avoid meds that inhibit renal tubular secretion (cimetidine, trimethoprim).</td>
<td>Tier 2, $$$$$</td>
</tr>
</tbody>
</table>
Initiate and monitor therapy appropriately.

See the table below for guidance on initiating and monitoring antiarrhythmic therapy. **Stop medication if any contraindication develops; see the list of contraindications for each medication in Table 1, page 4.** (Note that severe sinus bradycardia of HR < 50 is a relative contraindication to initiating any antiarrhythmic medication.)

<table>
<thead>
<tr>
<th>MEDICATION</th>
<th>INITIATION DOSE</th>
<th>SHORT-TERM MONITORING</th>
<th>LONG-TERM MONITORING</th>
</tr>
</thead>
<tbody>
<tr>
<td>amiodarone</td>
<td>200 mg twice daily, then reduce to 200 mg daily after 8 grams have been administered.</td>
<td>Basic laboratory testing to include liver function tests, pulmonary function tests, and thyroid function tests.</td>
<td>Biannual liver function testing. Annual or symptom-driven thyroid function testing. Annual pulmonary physical exam; additional testing (PFT and consider DLCO) if signs/symptoms of amiodarone-associated pulmonary toxicity. Periodic eye exams; monitor for visual acuity changes.</td>
</tr>
<tr>
<td>(Cordarone, Pacerone)</td>
<td></td>
<td>Patients should use adequate UVA/UVB sun block. If skin discoloration (bluish tint) occurs, reduce dose or discontinue.</td>
<td>Biannual liver function testing. Annual or symptom-driven thyroid function testing. Annual pulmonary physical exam; additional testing (PFT and consider DLCO) if signs/symptoms of amiodarone-associated pulmonary toxicity. Periodic eye exams; monitor for visual acuity changes.</td>
</tr>
<tr>
<td>dofetilide</td>
<td>Dofetilide can only be prescribed by qualified individuals. If you are interested in prescribing this medication you must become certified (see tikosynrems.com). Initiation of dofetilide requires 3 days in the hospital to assess the impact of the drug on the QT interval.</td>
<td>Every 3 months: ECG to assess QT interval. Every 3 months: basic metabolic profile to determine kidney function.</td>
<td>Biannual liver function testing.</td>
</tr>
<tr>
<td>(Tikosyn)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dronedarone</td>
<td>400 mg twice daily.</td>
<td>Liver function tests. ECG to determine if sinus rhythm is present; if not, the patient needs to be cardioverted before drug initiation or &lt; 1 week after initiation.</td>
<td>Biannual liver function testing.</td>
</tr>
<tr>
<td>(Multaq)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flecainide</td>
<td>100 mg twice daily (typical starting dose). (Also start beta blocker or calcium channel blocker.)</td>
<td>Inpatient initiation if started in the presence of atrial fibrillation. Outpatient initiation if started in sinus rhythm with a normal QRS. Follow-up ECG after 4–6 doses to measure the QRS change.</td>
<td>Biannual ECG to assess QRS duration. Annual assessment of metabolic profile to assess renal and liver function.</td>
</tr>
<tr>
<td>(Tambocor)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>propafenone</td>
<td>IR: 150 mg, 3 times daily (typical starting dose). (Also start beta blocker or calcium channel blocker.)</td>
<td>Inpatient initiation if started in the presence of atrial fibrillation. Outpatient initiation if started in sinus rhythm with a normal QRS. Follow-up ECG after 4–6 doses to measure the QRS change.</td>
<td>Biannual ECG to assess QRS duration. Annual assessment of metabolic profile to assess renal and liver function.</td>
</tr>
<tr>
<td>(Rythmol)</td>
<td>SR: 225 mg, twice daily (typical starting dose).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sotalol</td>
<td>80 mg, twice daily (typical starting dose).</td>
<td>Inpatient initiation is recommended with serial assessment of the QT interval for 3–4 doses.</td>
<td>Biannual ECG to measure QT interval. Biannual basic metabolic profile to assess renal function.</td>
</tr>
<tr>
<td>(Betapace AF)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**RATE CONTROL: KEY PRINCIPLES**

- Aim for a heart rate of 60 to 100 BPM.
- In some circumstances (reduced ejection fraction, etc.), add digoxin, a beta blocker, or a calcium channel blocker (details appear at right).

**CHRONIC RATE CONTROL**

Medications to meet the goal of 60 to 100 BPM include diltiazem, metoprolol, propranolol, and verapamil. See the table below for details on preferred rate control medications.

Consider additional medications based on patient’s circumstances:

- If the patient’s ejection fraction is less than 35% (chronic), add digoxin or a beta blocker.
- If the patient’s heart rate is high at rest and the patient is already taking a calcium channel blocker or beta blocker, add digoxin.
- If the patient’s elevated heart rate is exertion-induced, add a beta blocker or calcium channel blocker.

**TABLE 3. Preferred rate control medications**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosing</th>
<th>Special considerations:</th>
<th>SH tier, cost*</th>
</tr>
</thead>
<tbody>
<tr>
<td>carvedilol (Coreg, Coreg CR)</td>
<td>Immediate-release (IR) or extended-release (ER)</td>
<td>IR: 3.125 mg to 25 mg, twice daily  \nER: 10 mg to 80 mg, once daily</td>
<td>IR: Tier 1, $ \nER: Tier 3, $$$ (generic not available)</td>
</tr>
<tr>
<td>diltiazem (Cardizem CD, Dilacor CD, Tiazac)</td>
<td>120 mg to 480 mg, once daily</td>
<td>Major potential ADRs: bradycardia, dizziness, headache, cough, fatigue, heart block, heart failure  \nPreferred for patients with heart failure or diabetes, due to increases in insulin sensitivity</td>
<td>Tier 1, $</td>
</tr>
<tr>
<td>metoprolol succinate (Toprol XL)</td>
<td>Toprol XL: 25 mg to 300 mg, once daily  \nLopressor: 25 mg to 100 mg, twice daily</td>
<td>Major potential ADRs: bradycardia, dizziness, dyspnea, fatigue, heart block, heart failure  \nSuccinate (Toprol XL) preferred for patients with heart failure</td>
<td>Tier 1, $</td>
</tr>
<tr>
<td>metoprolol tartrate (Lopressor)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>verapamil (Calan, Isoptin, Verelan, Covera-HS)</td>
<td>Immediate-release (IR) or extended-release (ER)</td>
<td>IR: 60 mg to 80 mg, 3 to 4 times daily  \nSR: 120 mg to 360 mg, once daily</td>
<td>Tier 1, $</td>
</tr>
</tbody>
</table>

*Tier and cost: Tier 1 = $5 to $10 copay; Tier 2 = $30 to 50% coinsurance; Tier 3 = $50 to 50% coinsurance (based on SelectMed 2013 benefit design; benefit designs may differ). Cost is 30-day actual cost (not copay) and based on generic unless otherwise noted: $ = $1 to $25; $5 = $26 to $75; $$$ = $76 to $150; $$$$ = $151 to $300
CHRONIC ANTICOAGULATION

Chronic oral anticoagulation (OAC) — lifelong therapy with close follow-up — is recommended for most AF patients, due to the high rate of AF recurrence (often subclinical) and the devastating outcomes from strokes. Patients with paroxysmal AF (which includes AF that spontaneously cardioverts) should have chronic OAC according to their stroke risk score. (Note: If AF is definitely known to be secondary to surgery or other illness, OAC can be stopped after 6 months if there are no clinical symptoms or recurrence of AF, the secondary cause has been addressed, and an ambulatory telemetry test at 6 months is negative.)

1. Assess stroke risk

The CHA\textsubscript{2}DS\textsubscript{2}VASc score, based on the widely used CHADS\textsubscript{2} score, adds 3 factors (age 65 to 74, female sex, and vascular disease) that are validated for predicting stroke risk.\textsuperscript{9}

<table>
<thead>
<tr>
<th>CHA\textsubscript{2}DS\textsubscript{2}VASc SCORING</th>
<th>USING THE SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factors:</td>
<td>Strategy based on total score:</td>
</tr>
<tr>
<td>Congestive heart failure 1 pt</td>
<td>Score = 0: No antithrombotic therapy needed</td>
</tr>
<tr>
<td>Hypertension 1 pt</td>
<td>Score = 1: Aspirin (75 to 325 mg daily)</td>
</tr>
<tr>
<td>Age &gt; 75 2 pts</td>
<td>and/or clopidogrel</td>
</tr>
<tr>
<td>Age 65 to 74 1 pt</td>
<td>Score ≥ 2: Anticoagulation unless contraindicated</td>
</tr>
<tr>
<td>Diabetes mellitus 1 pt</td>
<td>See below and pages 7 to 9 for information on</td>
</tr>
<tr>
<td>Sex-female 1 pt</td>
<td>bleeding risk stratification and management,</td>
</tr>
<tr>
<td>Stroke/TIA/TE 2 pts</td>
<td>medication choices, and medication management.</td>
</tr>
<tr>
<td>Vascular disease 1 pt</td>
<td></td>
</tr>
<tr>
<td>(MI, PAD, aortic plaque)</td>
<td></td>
</tr>
</tbody>
</table>

2. Assess and manage bleeding risk

Because many stroke risk factors can also increase bleeding risk on oral anticoagulants, it’s important to assess and manage the patient’s risk. Bleeding risk is not a reason to withhold anticoagulation. However, management of modifiable bleeding risk factors enhances care. The HAS-BLED score has been validated for accuracy in multiple studies.\textsuperscript{10} See below.

<table>
<thead>
<tr>
<th>HAS-BLED SCORING</th>
<th>USING THE SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each checkmark = 1 point:</td>
<td>Score = 0–1: Low risk</td>
</tr>
<tr>
<td>Hypertension (SBP &gt;160 mm Hg)</td>
<td>Score = 2: Moderate risk</td>
</tr>
<tr>
<td>Abnormal: Kidney function: serum creatinine &gt;2.26</td>
<td>Score = 3: High risk</td>
</tr>
<tr>
<td>Liver function: Bili &gt;2X ULN and LFTs &gt;3X LN</td>
<td></td>
</tr>
<tr>
<td>Stroke history</td>
<td>Optimizing blood pressure control</td>
</tr>
<tr>
<td>Bleeding history or predisposition</td>
<td>More frequent INRs in first 3 months of warfarin</td>
</tr>
<tr>
<td>Labile INRs: TTR 60%</td>
<td>Anticoagulation clinic management</td>
</tr>
<tr>
<td>Elderly: &gt;65 years</td>
<td>Fall prevention interventions, if needed</td>
</tr>
<tr>
<td>Drugs: ETOH abuse</td>
<td>Use of NOAC (see next page)</td>
</tr>
<tr>
<td>ASA or NSAID use</td>
<td></td>
</tr>
</tbody>
</table>

Notes:

- Regardless of bleeding risk magnitude, concurrent aspirin/clopidogrel with oral anticoagulation should be used ONLY for patients with a recent history (12 months) of stent placement, high-risk mechanical heart valve placement, or acute coronary syndrome.
- Patients with stable CAD may be managed with oral anticoagulants alone; adding aspirin increases bleeding risk and does not reduce MI/stroke risk.
- Even after significant GI bleed or intracranial hemorrhage, consider restarting chronic anticoagulation in patients at risk for thrombotic events.
3 Choose the desired anticoagulant

The choice of warfarin versus DOAC (direct oral anticoagulant: apixaban, rivaroxaban, or dabigatran) is based on certain medical conditions, medication interactions, and the TTR (time in therapeutic INR range) that can be achieved with warfarin. See below for information on choosing between warfarin or DOAC. Table 3 below provides dosage and management guidance for individual medications.

<table>
<thead>
<tr>
<th>WARFARIN MANDATORY</th>
<th>WARFARIN PREFERRED</th>
<th>DOAC PREFERRED</th>
<th>UNCERTAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Valvular heart disease</td>
<td>• If patient is taking meds that interact with NOAC</td>
<td>• For most patients with nonvalvular AF, unless warfarin preferred</td>
<td>• Stable coronary artery disease (guidelines vary)</td>
</tr>
<tr>
<td>• Renal failure (see CrCl and eGFR notes below)</td>
<td>• If patient prefers warfarin and TTR is at least 65% to 70%</td>
<td>• If TTR on warfarin is less than 65% to 70%, not due to noncompliance</td>
<td>• High GI bleed risk (some NOACs may increase GI bleeding)</td>
</tr>
<tr>
<td></td>
<td>• NOAC is cost prohibitive</td>
<td>• If patient has limited access to INR monitoring</td>
<td>• Frail elderly patients: age ≥ 75, weight &lt;60 kg, eGFR 30–49, and/or polypharmacy (many bleeds on NOACs occur when one or more of these are present)</td>
</tr>
<tr>
<td></td>
<td>• Chronic kidney disease (see CrCl and eGFR notes below)</td>
<td>• If frequent procedures interrupt anticoagulation</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 3. Anticoagulants

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage</th>
<th>Contraindications, ADRs, and drug-drug interactions</th>
<th>Other special considerations and monitoring</th>
<th>Antidote</th>
<th>SH tier, cost*</th>
</tr>
</thead>
<tbody>
<tr>
<td>apixaban (Eliquis) Factor Xa inhibitor</td>
<td>5 mg, twice daily (2.5 mg twice daily if 2 of these factors: age &gt;80, weight &lt;60 kg, or sCr &gt;1.5 mg/dL)</td>
<td>Contraindications: DO NOT use in severe liver disease; DO NOT use in patients on dialysis or if CrCl &lt;15 Drug-drug interactions: azoles, HIV protease inhibitors, macrolide antibiotics, carbamazepine, phenytoin, rifampin</td>
<td>Only DOAC with proven survival benefit against warfarin; lower bleeding risk than aspirin. Activated charcoal may be useful in managing overdose or accidental ingestion (by leading to a more rapid fall in apixaban blood levels).</td>
<td>None</td>
<td>Tier 2, $$$</td>
</tr>
<tr>
<td>dabigatran (Pradaxa) Direct thrombin inhibitor</td>
<td>150 mg, twice daily (Do not use 75 mg dose)</td>
<td>Contraindication: DO NOT use if CrCl &lt;30 mL/min ADRs: dyspepsia, other GI side effects, increased GI bleeds Drug-drug interactions: antacids, verapamil, amiodarone, clarithromycin, rifampin, SJW, carbamazepine</td>
<td>DO NOT use 75 mg dose in renal impairment, as this dose has never been studied. Must remain in original packaging.</td>
<td>None</td>
<td>Tier 3, $$$</td>
</tr>
<tr>
<td>rivaroxaban (Xarelto) Factor Xa inhibitor</td>
<td>20 mg, once daily (15 mg daily if CrCl is 15–50)</td>
<td>Contraindication: DO NOT use in liver disease or if CrCl &lt;15 Drug-drug interactions: azoles, carbamazepine, HIV protease inhibitors, macrolide antibiotics, phenytoin, primidone, rifampin, phenobarbital</td>
<td>Once daily dosing and fewer GI effects may make this the preferred NOAC for some patients.</td>
<td>None</td>
<td>Tier 2, $$$</td>
</tr>
<tr>
<td>warfarin (Coumadin) Vitamin K antagonist</td>
<td>Dose based on current and previous INR (No dose change for renal dysfunction)</td>
<td>Interactions: Many drug-drug and food-drug interactions</td>
<td>Monitoring: INR tests at least every 4 weeks with frequency based on INR level. Intermountain’s decision support tool: the chronic anticoagulation module in HELP2 helps optimize TTR and provides a longitudinal anticoagulation record (see page 12).</td>
<td>Vitamin K, fresh frozen plasma</td>
<td>Tier 1, $</td>
</tr>
</tbody>
</table>

*Tier and cost: Tier 1 = $5 to $10 copay; Tier 2 = $30 to 50% coinsurance; Tier 3 = $50 to 50% coinsurance (based on SelectMed 2013 benefit design; benefit designs may differ). Cost is 30-day actual cost (not copay) and based on generic unless otherwise noted: $ = $1 to $25; $$ = $26 to $75; $$$ = $76 to $150

Key Principles

- The best medication choice is based on a range of factors (see the tables at right). These include time in therapeutic INR range (TTR) on warfarin, access to INR monitoring, cost, medication interactions, and kidney function.
- Shared decision-making in choosing an oral anticoagulant can improve patient safety and compliance. A shared decision-making conversation includes a brief discussion of the pros and cons of the medications being considered, including convenience and cost. It’s helpful to explain the reasons behind your recommendations. Also, consider asking patients to explain key information about their new prescription back to you in their own words.
## Switch between anticoagulants wisely

See below for the recommended procedure for switching between anticoagulants.

<table>
<thead>
<tr>
<th>SWITCH</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warfarin → NOAC</td>
<td>Stop warfarin. Start apixaban, dabigatran, or rivaroxaban as soon as INR is less than 2.5. (Note: Do not use DOAC in patients with valvular disease.)</td>
</tr>
</tbody>
</table>
| Apixaban* → warfarin† | Start warfarin while patient is still taking apixaban. Check INR on day 4 of overlap.  
   - If the INR is ≥ 2.0, stop apixaban and repeat INR after 1 to 2 days of warfarin alone.  
   - If the INR is < 2.0, consider continuing apixaban along with warfarin; repeat INR 1 to 2 days later. |
| Dabigatran† → warfarin§ | Start warfarin while patient is still taking dabigatran. Stop dabigatran 1 to 4 days later, with timing based on patient’s creatinine clearance (CrCl) and INR level:‡  
   - If CrCl > 50: Check INR on day 4 of overlap.  
     - If INR is ≥ 2.0, stop dabigatran; repeat INR after 1 to 2 days of warfarin alone.  
     - If INR is < 2.0, consider continuing dabigatran along with warfarin; repeat INR 1 to 2 days later.  
   - If CrCl = 31–50: Stop dabigatran 2 days later and check INR after 2 days of warfarin alone.  
   - If CrCl < 30: Stop dabigatran 1 day later and check INR after 3 days of warfarin alone. |
| Rivaroxaban† → warfarin | Start warfarin while patient is still taking rivaroxaban. Stop rivaroxaban 2 to 4 days later, with timing based on patient’s creatinine clearance (CrCl) and INR level:‡  
   - If CrCl > 50: Check INR on day 4 of overlap.  
     - If INR is ≥ 2.0, stop rivaroxaban; repeat INR after 1 to 2 days on warfarin alone.  
     - If INR is < 2.0, consider continuing rivaroxaban along with warfarin; repeat INR 1 to 2 days later.  
   - CrCl = 31–50: Stop rivaroxaban 3 days later; check INR after patient has received 1 to 2 days of warfarin only.  
   - If CrCl < 30: Stop rivaroxaban 2 days later; check INR after patient has received 2 days of warfarin only. |
| Enoxaparin → NOAC | Start dabigatran, rivaroxaban, or apixaban 10 to 12 hours after last enoxaparin dose. |
| NOAC → IV UH or LMWH | † Apixaban: Start unfractionated heparin or low molecular-weight heparin 12 hours after last apixaban dose.  
   † Dabigatran:  
     - If CrCl > 30, start unfractionated heparin or low molecular-weight heparin 12 hours after last dabigatran dose.  
     - If CrCl ≤ 30, consider starting LMWH 24 hours after last dabigatran dose, based on clinical interpretation of the patient’s risk of bleeding and thrombosis.  
   † Rivaroxaban: Start unfractionated heparin or low molecular-weight heparin 12 hours after last rivaroxaban dose if patient is within first 21 days of treatment for VTE, or 24 hours after last rivaroxaban dose for other indications. |

**Notes:**

* This recommendation differs from the apixaban package insert, which suggests use of an injectable anticoagulant during the transition from apixaban to warfarin. This CPM suggests the above course for pragmatic patient management to avoid introducing an injectable agent while assuring adequate overlap of anticoagulation. The apixaban recommendation differs from those for rivaroxaban and dabigatran because apixaban has a different renal clearance than the other two DOACs.

† All DOACs may prolong the INR in an unpredictable fashion when coadministered with warfarin. These recommendations place value on avoiding interruption of therapeutic anticoagulation when transitioning from an DOAC to warfarin, as interruption has been associated with an increase in thromboembolic events.¹¹

‡ Point-of-care INR monitors should not be used to assess INR during transitions between the DOACs and warfarin, due to unreliability.¹⁴,¹⁵

---

**ANTICOAGULATION SWITCHING: KEY PRINCIPLES**

- When switching medications, an important goal is to avoid interrupting therapeutic anticoagulation during the transition.
- The protocols for switching at left are based on a range of factors and are designed to meet this goal.
5 Initiate warfarin wisely

For patients starting on warfarin, follow Intermountain’s [Warfarin Initiation Guidelines](#) available from the Anticoagulation Task Force.

- **Consider warfarin sensitivity.** The [Initiation Guidelines](#) specify a lower initiation dose for patients in the following situations: age greater than 75 years, congestive heart failure, diarrhea, drug interactions, elevated baseline INR, fever, hyperthyroidism, malignancy, and malnutrition or NPO greater than 3 days.
- **Check INR frequently during titration.** Obtain an INR 3 days after the first starting dose, then every 2 to 3 days until in-range INR is achieved on two measurements. Then check INR one week after the second in-range INR. See the [Initiation Guidelines](#) for details.

6 Manage bleeding or supratherapeutic INR

- **Severe or life-threatening bleeding, on any anticoagulant:** Send the patient to the ED with EMS transport.
- **Minor bleeding on apixaban, rivaroxaban, or dabigatran:** Assess the patient individually. If necessary, hold 1 to 2 doses to achieve homeostasis, then restart the medication.
- **Supratherapeutic INR on warfarin:**
  - If INR is **4.5 to 10:** Hold 1 to 2 doses; check INR more frequently (1 to 3 days). Resume warfarin at adjusted dose when INR returns to therapeutic range.
  - If INR is **over 10:** Hold warfarin and give vitamin K 2.5 to 5 mg orally. Check INR more frequently (e.g. every 1 to 3 days); give additional vitamin K if needed. Resume warfarin at adjusted dose when INR returns to therapeutic range.

7 Manage periprocedural bridging

For bridging patients on warfarin, see these Intermountain materials:

- **For Providers:** [Anticoagulation Bridging Guidance and Decision Tree](#)
- **For Patients:** Bridging handouts based on thromboembolism (TE) risk and the bleeding risk of the procedure:
  - A pre-procedure handout (customizable by TE and bleeding risk)
  - A post-procedure handout for moderate TE risk, moderate bleeding risk
  - A post-procedure handout for moderate TE risk, high bleeding risk
  - A post-procedure handout for high TE risk, moderate bleeding risk
  - A post-procedure handout for high TE risk, high bleeding risk

For bridging patients on NOACs, see information provided in these Intermountain resources:

- Provider information sheet for dabigatran
- Provider information sheet for rivaroxaban
- Provider information sheet for apixaban
REFERENCES


HOW TO ACCESS RESOURCES:

- View provider and patient resources online via topic pages on intermountain.net or intermountainphysician.org. Find the Clinical Programs home page and follow the directions below.
  - **Arrhythmia topic page:** In the Clinical Topics A to Z list, choose arrhythmia.
  - **Anticoagulation topic page:** Choose Primary Care Clinical Program from the menu at left, then choose Topics, then choose Anticoagulation – Outpatient.
  - **Anticoagulation Task Force index:** Click the underlined link, go to kr.ihc.com/kro/Dcmnt?ncid=520456136, or type ATF in any browser within the Intermountain firewall.

- Order provider or patient resources at Intermountain's Library and Print Store, www.i-printstore.com. Search for fibrillation, cardioversion, or anticoagulation, or use the browse menus. Click an item to see a description, open the PDF or click Add to Cart to order copies.

- Refer to the **Health Topic Library** on www.intermountainhealthcare.org. On the topic library, direct patients to choose Intermountain Patient Education, then choose arrhythmia or anticoagulation from the A to Z list.

### RESOURCES

**Resources for providers:**

- **Chronic anticoagulation clinic decision support tools:** For patients on warfarin, Intermountain has created a decision support tool that can be used within HELP2 to help manage patients for optimal time in therapeutic range (TTR) and to support bridging if necessary. The chronic anticoagulation tool has worked well for helping providers optimize patients’ TTR and provides a longitudinal anticoagulation record. To implement this tool, please contact the Primary Care Clinical Program.

- **Guidelines and resources for managing warfarin,** including dosing, INR monitoring, and bridging, are available via clinical programs topic pages and/or the Anticoagulation Task Force index (see the information at left).

- **Provider fact sheets for rivaroxaban, dabigatran** and **apixaban** are also available.

**Resources for patients:**

Patient education resources for AF management include:

- **Fact Sheets on rhythm-related topics**, including atrial fibrillation, event monitoring, ambulatory telemetry, and cardioversion

- **Fact Sheets on anticoagulation**, including warfarin, a warfarin eating plan, apixaban, rivaroxaban, and dabigatran

- **Bridging instructions** for warfarin before and after a procedure (linked on page 10)

---

**Atrial Fibrillation CPM Development Team**

Team members listed alphabetically: Curtis Andersen, MD; Jared Bunch, MD; Roy Gandolfi, MD; Donald Lappé, MD; Jeffrey Twitchell, MD; Sherri Vance, BA; Tracy Vayo, MS; Curtis Wander, PharmD; Scott Woller, MD.