ABSTRACT

Atrial fibrillation (AF) is the most common cardiac dysrhythmia, and its prevalence is growing. The care of patients with AF is complex, and involves multiple specialties and venues of care. Guideline recommendations are available for AF therapy; however, their implementation can be challenging. The Society of Cardiovascular Patient Care has developed an accreditation program, formulated by an expert committee on AF. Accreditation is based on specific criteria in 7 domains:

(1) Community outreach
(2) Pre-hospital care
(3) Early stabilization
(4) Acute care
(5) Transitions of care
(6) Clinical Quality Measures
(7) Governance

This document presents the rationale, discussion, and supporting evidence for these criteria, in an effort to maximize effective and efficient AF care.

Keywords: atrial fibrillation, guidelines, accreditation, Society for Cardiovascular Patient Care, emergency department

ABOUT SCPC

The Society of Cardiovascular Patient Care (SCPC) is an international not-for-profit organization leading the fight to eliminate heart disease as the number one cause of death worldwide. SCPC focuses on transforming cardiovascular care by assisting facilities by creating communities of excellence that bring together quality, cost and patient satisfaction. SCPC provides the support needed by hospitals to effectively bridge existing gaps in treatment by providing the tools, education and support necessary to successfully navigate the changing face of healthcare.
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INTRODUCTION

Atrial fibrillation (AF) is the most common cardiac dysrhythmia, and its incidence is increasing.\textsuperscript{1,2} It is estimated that the United States population of patients with AF will increase by 2.5-fold in the next 40 years, from approximately 2 million to over 5 million adults.\textsuperscript{1} Additionally, therapies for AF are rapidly evolving, with greater effectiveness at improving symptoms, controlling heart rate, and preventing thromboembolic events. This has resulted in an increasing number of providers across different specialties managing patients with AF in a multitude of clinical settings.

The Society of Cardiovascular Patient Care (SCPC, formerly the Society of Chest Pain Centers) provides accreditation to nearly 1000 United States and international acute care centers for a number of acute cardiovascular presentations. The SCPC is a non-profit organization geared toward improving patient-centered outcomes in cardiovascular disease. The mission of the society is “To develop and share quality practices that optimize the care and outcomes of patients with acute cardiovascular disease worldwide through innovative cross-disciplinary processes and education that bring science to the bedside.” It has previously provided accreditation tools in an effort to improve consistency and quality of care for a variety of cardiovascular conditions, including chest pain and heart failure.\textsuperscript{3} Accreditation has been associated with improved adherence to guidelines-recommended therapies, as well as better performance on Centers for Medicare and Medicaid Services core measures for acute myocardial infarction.\textsuperscript{4,5}

This report presents the combined perspectives of national experts across a variety of specialties, convened to identify core measures that are fundamental to the safe, efficient, and effective care of patients with AF. In contrast to clinical guidelines, these measures target education and clinical, facility, and personnel characteristics pivotal in the implementation of clinical guidelines. Prior evidence has demonstrated improvement in clinical care when guidelines are implemented.\textsuperscript{6}

The accreditation process focuses on 7 aspects of care for AF patients:

1) Community outreach
2) Pre-hospital care
3) Early stabilization
4) Acute care
5) Transitions of care
6) Clinical quality measures
7) Governance

 Metrics in each of these groups are essential to appropriate care of patients with AF and are required for SCPC accreditation in the care of patients with AF.
GENERAL MANAGEMENT CONSIDERATIONS IN AF

Atrial fibrillation is primarily categorized by chronicity. Patients in whom the rhythm terminates spontaneously within 7 days are labeled as paroxysmal, whereas episodes of AF that last more than 7 days are termed persistent. Patients with established persistent AF over long periods of time (e.g., 1 year) are sometimes labeled as having “long-standing persistent” AF. Often attempts at conversion to sinus rhythm are abandoned in these patients. The management of patients with AF is centered on a limited number of fundamental clinical objectives for every patient. The clinical background for the basic treatment of AF will be discussed here, and the general paradigm is outlined in Figure 1.

Patients with AF, either paroxysmal or persistent, have an annual risk of stroke of approximately 5% overall, approaching 20% in the highest-risk groups.

Control of Ventricular Rate
The profound long-term consequences of sustained tachycardia have been previously described. Although contemporary randomized trials have failed to demonstrate a benefit of intense versus lenient rate control in AF, the American College of Cardiology/American Heart Association/Heart Rhythm Society guidelines have endorsed control of chronic ventricular rates and acknowledge the potential for long-term harm without rate control.

Symptom Control
Quality of life for patients with AF has been compared with that of significant heart failure or recent MI. While this effect is highly variable across populations, symptom control is often a major component of AF management. As such, several strategies are available. First, some patients’ symptoms improve with appropriate rate control of AF, regardless of conversion to sinus rhythm. Second, antiarrhythmic drug therapy can provide improved symptom control through maintenance of sinus rhythm, though they are limited by significant contraindications and side effects. Lastly, invasive procedures for AF are indicated in patients with symptomatic AF (paroxysmal or persistent) refractory to antiarrhythmic therapy.

Prophylaxis for Thromboembolism
While AF may contribute significantly to poor hemodynamic status and/or severe symptoms, the major source of morbidity associated with AF remains the risk of thromboembolism, specifically stroke. Patients with AF, either paroxysmal or persistent, have an annual risk of stroke of approximately 5% overall, approaching 20% in the highest-risk groups. Therapy with oral anticoagulation...
tion has been demonstrated to dramatically reduce these rates, with benefits that outweigh the inherent increased risk of bleeding.\textsuperscript{17,18}

Atrial fibrillation is responsible for nearly $3$ billion in estimated costs for hospitalizations, and is associated with a two-fold increase in risk of mortality.\textsuperscript{22,23}

The foundation of stroke prevention in AF has been warfarin for over half of a century. However, newer oral agents that lack the well-known pitfalls of warfarin have been approved. Such agents include the direct-thrombin inhibitor dabigatran\textsuperscript{19} and the factor Xa inhibitors rivaroxaban and apixaban.\textsuperscript{20,21} There are shortcomings to these agents, including the present lack of monitoring tests and reversal agents. Basic characteristics of available oral anticoagulants for AF are shown in Table 1.

### COMMUNITY & PRE-HOSPITAL INVOLVEMENT

#### Outreach

Community involvement in the recognition and management of patients with AF is essential to achieving a high quality of care. Atrial fibrillation is responsible for nearly $3$ billion in estimated costs for hospitalizations, and is associated with a two-fold increase in risk of mortality.\textsuperscript{22,23} Both public and community providers should be aware of the significant burden and long-term risks of AF, as well as the availability of treatment options. Education should include the signs and symptoms of AF, thus potentially improving the diagnosis of otherwise clinically ‘silent’ or paroxysmal AF, and subsequent treatment and outcomes.\textsuperscript{24} Lastly, centers of care for AF should assist in keeping community providers aware of the latest quality measures and evidence-based therapies for AF,\textsuperscript{7,25} which should include the availability of novel, emerging therapies.

One mechanism for education may be through regular, formalized materials for the community. These may include regular newsletters (electronic or otherwise), or consultative services to provide interactive education for AF patients. Engagement of community providers though networking events may help streamline presentation and access to the local center. Ultimately, structured community interventions designed to help patients assess their own cardiac rhythm and heart rate could be implemented. Analogous to similar public health campaigns stressing the recognition of stroke or myocardial infarction symptoms, the potential for self-diagnosis of AF by patients could ultimately contribute to improving management and outcomes across the population.

Atrial fibrillation is often a marker of other underlying processes.

#### Pre-Hospital Care

Therapy for patients with other cardiovascular conditions has benefited greatly from coordination with pre-hospital providers, specifically emergency medical services (EMS).\textsuperscript{26,27} Centers accredited in AF care should engage with EMS coordinators to maintain open lines of communication. The discussion of AF cases is key to the improvement of pre-hospital management, and should extend beyond topics on arrhythmia to broader areas such as the management of patients taking oral anticoagulants. For example, the pres-

### Table 1. Oral anticoagulants approved in the US for prevention of stroke or systemic embolism in atrial fibrillation

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>AF Dosing</th>
<th>Renal-Based Dosing Adjustments*</th>
<th>Time-to-Onset</th>
<th>Half-life</th>
<th>Monitoring</th>
<th>Reversal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warfarin</td>
<td>Variable</td>
<td>Nonrenally cleared</td>
<td>24-72 h</td>
<td>20-60 h</td>
<td>INR</td>
<td>Vitamin K, fresh frozen plasma</td>
</tr>
<tr>
<td>Dabigatran (40)</td>
<td>150 mg bid</td>
<td>75 mg bid for CrCl 15-30, &lt;15 not recommended</td>
<td>1-2 h</td>
<td>12-17 h</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Rivaroxaban (41)</td>
<td>20 mg daily</td>
<td>15 mg daily for CrCl 15-50, &lt;15 not recommended</td>
<td>2-4 h</td>
<td>5-9 h</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Apixaban (42)</td>
<td>5 mg bid</td>
<td>2.5 mg bid for patients with &gt;2 of the following: creatinine ≥1.5 mg/dL, age ≥80 years, weight ≤60 kg; CrCl &lt;15 no data available</td>
<td>3-4 h</td>
<td>8-15 h</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

*Does not include adjustments recommended for interactions with other agents or for other indications. See package inserts for full details.

AF: atrial fibrillation; CrCl: estimated Creatinine clearance by Cockroft-Gault formula; NA: not available.
ence of an oral anticoagulant could influence triage decisions in the case of head injuries. Such presentations should provide both the opportunity for education of EMS providers and a foundation for the formulation of protocols to guide pre-hospital management.

Additional EMS capabilities could also improve the care of AF patients. For example, emergency personnel should ideally have the ability to transmit electrocardiogram data from the field to the AF center, for cases that warrant immediate physician input. Several communities have implemented such technology for the management of acute coronary syndromes, improving outcomes. Extension to the AF population warrants investigation. Only through ongoing communication with AF centers can EMS providers partner in improving the care of such patients.

**STABILIZATION AND EMERGENCY CARE**

The initial management of patients presenting with AF, particularly in the Emergency Department (ED), is assessment and stabilization (Figure 2). The use of standardized protocols and/or pathways has been widely reported across a variety of disease states. Such tools often improve the consistency and quality of care. Similarly, centers accredited for the care of patients with AF should employ standardized approaches to improve care, particularly in emergent situations.

Management of patients presenting acutely with unstable AF should be guided by a facility-specific protocol and/or an Advance Cardiac Life Support (or similar) algorithm. Unstable AF includes all patients with hemodynamic instability, and may also include individuals with ischemic chest pain or signs of impaired cardiac output. Therapies for these patients may include intravenous medications for immediate rate control, however, they can precipitate worsening hemodynamics and the best approach may be emergent cardioversion. In this setting, clinicians must weigh the risks of hemodynamic instability versus anesthesia and cardioversion. In the severely unstable patient, cardioversion without sedation, although not encouraged, may be necessary. Other risks to consider include the potential for thromboembolism from the left atrial appendage and as such, even patients cardioverted emergently should be provided immediate systemic anticoagulation (using quick-onset oral or paren-

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**FIGURE 2.** Management pathway and discharge for patients presenting to the emergency department with atrial fibrillation. AF: atrial fibrillation; AAD: antiarrhythmic drug, LMWH: low-molecular weight heparin, UFH: unfractionated heparin.
teral anticoagulants). In more stable settings, patients should be assessed for risk of left atrial appendage thrombus, as well as the risks of anesthesia (e.g., aspiration, hemodynamic effects).

**ACUTE CARE**

Secondary assessment of the patient with AF should consider an evaluation of arrhythmic precipitants, comorbidities, or complications. Severe, concomitant disease should impact acute treatment decisions. Optimal evaluation includes consideration of metabolic disease (e.g., thyrotoxicosis), infections, other cardiac pathology (e.g., ischemia), and pulmonary disease (e.g., pulmonary embolism). Atrial fibrillation is often a marker of other underlying processes. Further, the presence of underlying cardiac pathology, such as impaired systolic function or hypertrophic cardiomyopathy, affects the approach to the AF patient. Thus, structured processes by which these conditions can be diagnosed are essential to a successful AF program. Ultimately, AF management should revolve around the objectives of rate control (often the source of symptoms) and thromboembolic prophylaxis.

**Rate Control**

For patients with elevated ventricular rates but stable hemodynamics, several agents are available to reduce heart rate. The most commonly-used include beta-blockers and non-dihydropyridine calcium-channel blockers. These can be administered orally, by intravenous bolus, or intravenous infusion. However, they may not be ideal in some patients, such as those with underlying heart failure or accessory pathway conduction (e.g., Wolff-Parkinson-White syndrome). Additional agents, including membrane-active antiarrhythmic drugs, such as amiodarone, may be considered for rate control in patients with heart failure. Of note, clinicians should recognize that use of these agents can result in chemical cardioversion, with its inherent risks (i.e., thromboembolism in the patient with left atrial appendage thrombus).

**Rhythm Control**

In patients whose tachycardia does not respond to medical therapy, or in whom symptoms persist, urgent cardioversion may be warranted. In such cases, a streamlined ED process can be much more efficient and safe. Appropriately-qualified AF centers should have an established process by which patients can safely undergo cardioversion. Such protocols can systematically address several important considerations prior to cardioversion. These include:

1) Duration of AF episode
2) Use, duration, and consistency of systemic anticoagulation
3) Candidacy for anticoagulation following cardioversion
4) Necessity and availability of transesophageal echocardiography (TEE)
5) Availability and safety of anesthesia

Patients in AF without anticoagulation for greater than 48 hours, or in whom the duration of AF is unclear, should have some evaluation for left atrial appendage thrombus prior to cardioversion (usually by TEE). Additionally, many centers use systemic anticoagulation for a period following cardioversion, regardless of underlying risk or history. However, there can be local variation in these details and thus a consistent, center-wide approach is helpful.

There may also be a role for chemical cardioversion with antiarrhythmic drug therapy in selected patients. Ibutidilide, procainamide, flecainide, propafenone, or amiodarone are most commonly used. Electrocardiographic (ECG) monitoring and appropriate choice of both patient and agent is important. Once again, a standardized approach in centers choosing to use these agents should be implemented. Prior published reports have demonstrated the safety and effectiveness of a progressive approach for treating symptomatic AF, integrating chemical and electrical cardioversion. Furthermore, these may be appropriately implemented in an ED observation unit (OU) setting.

**Prevention of Thromboembolism**

Prior to the disposition of any patient with AF, each should be evaluated for the necessity of anticoagulation. Some will require immediate systemic anticoagulation – these include patients with additional indications for anticoagulation (e.g., mechanical heart valves), those who are post-cardioversion, or individuals with valvular AF (i.e., AF related to mitral valve disease). Such patients have a significant risk of thromboembolic events and require anticoagulation with an agent that is quick in onset (in comparison to warfarin). Yet, it should be noted that none of the quick-acting, newer oral anticoagulants are indicated for patients with mechanical valves or valvular AF. Therefore, many patients will require subcutaneous low-molecular weight heparin (LMWH), and patients with significant renal dysfunction will require a titrated UFH infusion (necessitating inpatient admission). The need for anticoagulation in other patients will largely be determined by their underlying risk of stroke or systemic embolism. Several tools have been developed for such an assessment, but the most widely used being the CHADS2 and CHA2DS2-VASc scores (Table 2). Generally, patients with scores of 2 or higher warrant long-term systemic oral anticoagulation, in the absence of significant contraindication.

**Complications**

Lastly, the initial evaluation and care of patients presenting with AF should include the possibility of complications of AF therapy (Table 3). First, patients taking any oral anticoagulants are at an increased risk of bleeding. Warfarin represents the most frequent drug-related reason for presentation to the emergency department (ED). An analysis of the RE-LY trial found that 2-year bleeding rates for patients treated with the approved 150 mg dose of dabigatran were similar to those of patients taking...
Bleeding in any patient on systemic anticoagulation represents a significant management concern. The most feared event is intracranial bleeding in the patient on an anticoagulant, with a mortality approaching 50%. However, the most frequent site of hemorrhage is the gastrointestinal (GI) tract. While endoscopic evaluation may yield a source for intervention, the findings may not be definitive. In that case the treatment approach must balance GI and cardiovascular risks, and reevaluation of the use of drugs that may cause bleeding (e.g., antiplatelet agents, non-steroidal anti-inflammatory drugs) and co-therapies to reduce upper GI injury may be warranted.

Table 2. Risk scores for patients with atrial fibrillation

<table>
<thead>
<tr>
<th>Stroke or Systemic Embolism</th>
<th>Congestive heart failure, Hypertension, Age ≥75, Diabetes, Stroke or TIA (2 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHADS, (15)</td>
<td>Congestive heart failure, Hypertension, Age ≥75 (2 points), Diabetes, Stroke or TIA (2 points), Vascular disease (1 point), Age 65-74 (1 point), Sex category (1 point for female)</td>
</tr>
<tr>
<td>HAS-BLED (66)</td>
<td>Hypertension, Abnormal liver or Renal function (1 point each), Stroke, Bleeding, Labile INR, Elderly (age&gt;65), Drugs or Alcohol</td>
</tr>
<tr>
<td>HEMORR, HAGES (67)</td>
<td>Hepatic or renal disease, Ethanol abuse, Older age, Reduced platelet count or function, Rebleeding risk, Hypertension, Anemia, Genetic factors, Excessive fall risk, Stroke</td>
</tr>
</tbody>
</table>

Table 3. Potential complications in patients with atrial fibrillation

<table>
<thead>
<tr>
<th>BLEEDING</th>
<th>Spontaneous • Supratherapeutic anticoagulation • Trauma/post-operative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible Precipitants</td>
<td>Change in renal function • Medication interaction or poor compliance</td>
</tr>
<tr>
<td>Management Considerations</td>
<td>Stabilization • Reversal (agent-specific) • Intervention, if necessary • Correction of precipitant</td>
</tr>
<tr>
<td>ARRHYTHMIAS</td>
<td>Bradyarrhythmias: sinus bradycardia, sinus arrest, heart block (with or without underlying atrial arrhythmia) • Tachyarrhythmias: VT, Torsades de pointes (polymorphic VT), atrial arrhythmias with rapid ventricular conduction</td>
</tr>
<tr>
<td>Possible Precipitants</td>
<td>Change in renal function • Use of AADs (class Ic, III, or digoxin) • Medication interaction • New or worsening structural heart disease • Accessory conduction (e.g., WPW syndrome)</td>
</tr>
<tr>
<td>Management Considerations</td>
<td>Vasopressor support • Temporary pacing • Cardioversion or defibrillation • Use of antidote (agent-specific) • Correction of precipitant • Specialist consultation</td>
</tr>
<tr>
<td>PROCEDURAL COMPLICATIONS</td>
<td>Cardioversion: arrhythmias, thromboembolism • Catheter Ablation (percutaneous or surgical): arrhythmias, thromboembolism, groin access complications, cardiac tamponade, atrio-esophageal fistula, pulmonary vein stenosis • Pacemaker Placement: pneumo- or hemo-thorax, cardiac perforation and/or tamponade, arrhythmias due to pacemaker malfunction • Left atrial appendage exclusion (percutaneous or surgical): thromboembolism, cardiac tamponade, surgical site complications</td>
</tr>
<tr>
<td>Possible Precipitants</td>
<td>Medication interaction • Concomitant disease (e.g., lung disease) • Anatomic anomalies</td>
</tr>
<tr>
<td>Management Considerations</td>
<td>Stabilization • Imaging • Appropriate intervention (e.g., pericardiocentesis, chest tube) • Specialist consultation</td>
</tr>
<tr>
<td>AAD: antiarrhythmic drug; VT: ventricular tachycardia; WPW: Wolff-Parkinson-White</td>
<td></td>
</tr>
</tbody>
</table>

Additional cardiac arrhythmias represent a second group of complications from AF therapy. Rate-controlling AV-nodal blockers can precipitate bradyarrhythmias (symptomatic or asymptomatic) or varying degrees of heart block. Some membrane-active antiarrhythmic drugs can precipitate ventricular tachyarrhythmias under certain circumstances. This is a particular concern among AF patients with impaired renal function; the concentration of many of these agents is heavily dependent on glomerular filtration rate, as are their adverse side effects. Thus, even among AF patients presenting with unrelated complaints (e.g., sepsis), careful scrutiny of the medical regimen for AF is warranted.
Patients at low risk who may be discharged from the ED or OU will still require further work-up and monitoring over the long-term.

Lastly, more complex procedures are available for patients with AF. These include catheter-based radiofrequency ablation, surgical ablation, pacemaker placement, or newer techniques designed to isolate the left atrial appendage and minimize stroke risk. As such, patients may present with acute complications of these interventions. The most serious of these may include cardiac tamponade, stroke, myocardial infarction, pulmonary embolism, pneumothorax or hemothorax, pulmonary vein stenosis, atrial-esophageal fistula (and subsequent GI bleed or arterial air emboli), or various vascular access complications. Early recognition by acute-care providers can often prove vital to the timely diagnosis and effective management of such conditions.

### Disposition

Few multicenter, controlled studies are available to guide the disposition of patients with AF in the ED. Patients with significant co-morbid disease or precipitants are appropriate for admission, both to manage the primary pathology, as well as the AF. Patients of intermediate risk may warrant extended stay in an observation unit to assess rate control, symptoms, and/or tolerance of anticoagulation.

### Oral Anticoagulation

Oral anticoagulation for prevention of thromboembolism may be initiated in the ED or OU (with either LMWH plus warfarin or with a novel oral anticoagulant); however, subsequent outpatient follow-up and management of such patients is paramount. Patients at low risk who may be discharged from the ED or OU will still require further work-up and monitoring over the long-term. As such, access and referral to specialists, and potentially specialized AF centers, can assist in the appropriate evaluation and follow-up of such patients.

### Transitions in Care

Patients with AF are particularly susceptible to the dangers of transitions in care. Often they take several medications with various interactions, side effects, and potential adverse effects. Furthermore, their condition is often dynamic and warrants attentive management and follow-up. Upon admission to the hospital reconciliation of medicines (and non-prescription supplements) is necessary to reduce adverse interactions. This should be reviewed and updated at all transitions, and ongoing communication amongst providers should be built into the system of AF care. Patients should be also assessed for the presence of lifestyle risk factors for AF (e.g., alcohol, stress, caffeine, sleeping habits, illicit drugs, stimulants). Lastly, patient education is vital to their management. Prior to discharge, education of patients with AF should include several topics:

1) The disease process of AF, its basic mechanisms, symptoms, and signs, and treatments.

2) Risk factors for AF and how to modify them.

3) The specific AF therapies the patient will be prescribed, their objectives, interactions, and potential risks.

4) The signs and symptoms of stroke, and their appropriate management.

At discharge, either from the ED or an acute care facility, patients with AF should be provided with near-term (e.g., within 1 week) outpatient follow-up with either a generalist or specialist. Even in the patient initially requiring minimal medical therapy, post-discharge assessment could obviate future ED visits due to symptoms brought on by resuming normal activity.

### Table 4. Criteria for discharge of atrial fibrillation patients from emergency department

<table>
<thead>
<tr>
<th>Category</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitant</td>
<td>No significant clinical precipitant of AF identified that would require inpatient management (e.g., pulmonary embolism, thyrotoxicosis)</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Minimal symptoms at rest and with ambulation</td>
</tr>
<tr>
<td>Hemodynamics</td>
<td>Stable blood pressure and well-controlled resting heart rate (ideally &lt;100 bpm)</td>
</tr>
<tr>
<td>Prevention of Thromboembolism</td>
<td>Risk assessment performed; if anticoagulation indicated:</td>
</tr>
<tr>
<td></td>
<td>• Anticoagulation education performed</td>
</tr>
<tr>
<td></td>
<td>• Anticoagulant, at appropriate dose, prescribed</td>
</tr>
<tr>
<td></td>
<td>• Follow-up for anticoagulation scheduled</td>
</tr>
<tr>
<td>Concomitant Disease</td>
<td>No significant concomitant disease requiring inpatient evaluation and/or treatment</td>
</tr>
<tr>
<td>Follow-up</td>
<td>Outpatient appointment scheduled with provider following AF</td>
</tr>
</tbody>
</table>
Consultations and Referrals for Sub-specialty Care
The involvement of cardiologists and electrophysiologists in the care of AF patients is ultimately at the discretion of the initial provider. However, access to consultative services by these specialists should be available, either locally or remotely, in centers managing patients with AF. Table 5 lists several potential indications for specialist referral. These include patients who have failed first- or second-line therapies for any of the primary objectives (rate control, symptom control with or without rhythm control, or thromboembolism prophylaxis). Therapies for each of these objectives have evolved, and many specialists and centers of excellence can offer effective treatments not available elsewhere.

For patients failing to achieve adequate rate control, novel pharmacologic therapies are increasingly available. His-bundle ablation with pacemaker placement is an option, and even catheter ablation is appropriate in some circumstances. For patients with refractory symptoms, even after initial catheter ablation, more advanced ablative techniques may be available. Lastly, for the patient with multiple thromboembolic events despite anticoagulation, or due to intolerance of anticoagulation, several techniques (both percutaneous and surgical) have become available to isolate the left atrial appendage and potentially minimize stroke risk with the need for only temporary systemic anticoagulation.57,58

Table 5. Potential criteria for specialist consultation for patients with atrial fibrillation

<table>
<thead>
<tr>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractory or intolerant to first-line therapies for rate control or thromboembolic prophylaxis</td>
</tr>
<tr>
<td>Urgent or elective Cardioversion, and subsequent follow-up</td>
</tr>
<tr>
<td>Procedures for Atrial Fibrillation</td>
</tr>
<tr>
<td>• Initial referral for potential intervention (e.g., catheter or surgical ablation, left atrial appendage occlusion, pacemaker placement, etc.)</td>
</tr>
<tr>
<td>• Management of medical therapy in the peri-procedural setting</td>
</tr>
<tr>
<td>• Management of potential procedural complications</td>
</tr>
<tr>
<td>Management of thromboembolic events (e.g. stroke, acute limb ischemia)</td>
</tr>
<tr>
<td>Initiation, monitoring, or management of membrane-active antiarrhythmic agents (e.g., sotalol, dofetilide, amiodarone)</td>
</tr>
</tbody>
</table>

Development of an accredited center that is capable of providing high-quality care for patients with AF requires commitment from all levels of the organization.

Chronic Management
Atrial fibrillation often represents a dynamic disease process. Patients may progress from paroxysmal to persistent AF; they may become increasingly symptomatic, less tolerant to anticoagulation, or have more impaired hemodynamics. Therefore, proper follow-up and long-term assessment is necessary. This should include not just monitoring of anticoagulation (when applicable), but an ongoing assessment of the safety and/or need for anticoagulants. For example, younger patients without comorbidities may develop comorbidities that increase their thromboembolic risk and need for anticoagulation. Conversely, older patients already treated with anticoagulants may require additional medications that increase bleeding risk (e.g., anti-platelet therapies), or develop significant contraindications to the anticoagulant they are taking (e.g., a new intracranial pathology).

Among patients with new or intensifying symptoms, rhythm control management with antiarrhythmic therapy may be warranted. Guideline-recommended therapies for rhythm control are based on underlying structural heart disease, if any.7 Selection of such agents is often made on a case-by-case basis, and patients treated with antiarrhythmic drugs typically require some regular assessment of effectiveness and safety. For example, patients receiving amiodarone require monitoring for pulmonary, thyroid, hepatic, and ocular toxicities. Those on sotalol or dofetilide will need regular assessments of their renal function and QT interval. In centers lacking experience with such therapies, access and referral to specialists is warranted.

CLINICAL QUALITY AND OUTCOMES

Performance Measures
Ongoing reassessment of performance and clinical outcomes is essential to establish effective and efficient treatment of patients with AF. To this end, several performance measures have been established by the American College of Cardiology and the American Heart Association.59 They include:

1) Assessing thromboembolic risk factors in patients with AF
2) Prescribing oral anticoagulation for patients with 1 high risk factor, or more than 1 moderate risk factor.
3) Measurement of INR no less frequently than monthly in patients on warfarin.

However, these represent only a starting point for the minimum of quality care for AF patients. Essential to the management of anticoagulation is the consideration of bleeding risk in each
patient considered for anticoagulation. While no formal approach to incorporating bleeding scores into management of AF is currently recommended or validated, several tools exist for clinicians to consider. These include the HAS-BLED, ATRIA, and HEMORRHAGE scores (Table 2). While an in-depth comparison of these scores is beyond the scope of this document, clinicians caring for patients with AF must consider bleeding risk in management decisions. However, it is noted that there has never been a prospective validation of an anticoagulation strategy incorporating a bleeding risk score. Lastly, patients who are managed with anticoagulation should be educated as to its risks and benefits, such that they appropriately report potential adverse effects.

Several additional measures can provide insight into the quality of care offered to patients with AF. First, given the impact on quality of life, the burden of AF symptoms should be assessed. This will greatly influence intensity of subsequent therapies. Second, among patients undergoing non-emergent cardioversion, an assessment for risk of left atrial appendage thrombus should be performed. This includes either confirmed, consistent anticoagulation for >3 weeks or performance of TEE prior to cardioversion. Lastly, many patients with AF will benefit from specialist input from either a cardiologist or an electrophysiologist. While long-term follow-up with a cardiologist may not be necessary, initial consultation following diagnosis of AF is very reasonable. Furthermore, specific subgroups are likely to particularly benefit from specialist involvement. These include patients with other concomitant cardiovascular diseases (e.g., coronary artery disease), individuals with refractory symptoms or tachycardia, and those managed with membrane-active antiarrhythmic drugs.

Clinical Outcomes
In addition to measuring the consistency of care at a center, some assessment of clinical outcomes is also necessary. Though clinical event rates will be heavily influenced by the risk of the underlying population, other comorbidities can directly influence the effectiveness of therapy. Further, improvement in cardiovascular outcomes is the over-arching goal of improving quality of care.

Due to the adverse effects of chronic tachycardia, surveillance of chronic rate control should be considered, particularly in apparently-asymptomatic patients. Resting heart rate <100 bpm is a conservative goal, and can be supplemented with an assessment of exertional heart rate control (either via treadmill test or ambulatory monitoring). Though appealing, the use of average 24-hour heart rate or nocturnal heart rate monitoring has not been shown to be superior to simple, resting measurement (as was used in clinical trials).

Most importantly, rates of stroke or systemic embolism and bleeding within 30 days of discharge should be measured. These are the pivotal clinical outcomes in these patients, and could provide opportunities for improvement or other interventions.

PERSONNEL AND GOVERNANCE

Development of an accredited center that is capable of providing high-quality care for patients with AF requires commitment from all levels of the organization. In addition to provider leadership, administrators and nursing staff need to be invested as well. This includes commitments to the training and education of support staff and providers, as well as the identification of AF champions responsible for achieving and maintaining accreditation. Ongoing review of processes and protocols is necessary. Establishment of this structure is pivotal in the SCPC accreditation process.

CONCLUSIONS

The management of patients with AF is complex and challenging. However, its importance will only increase, as more patients develop AF. The implementation of a framework geared toward adhering to recommended therapies and best practices for these patients will streamline care and could improve outcomes. Accreditation through the SCPC provides a framework for continuing to improve the quality of care for atrial fibrillation patients.

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