mellitus, vascular disease, age between 65 and 74 years, and female gender are assigned 1 point, and age of 75 years or older and prior stroke are assigned 2 points. A CHA_2DS_2-VASc score of 0 was associated with a 0% stroke rate, a score of 1 with a 0.6% per year risk, a score of 2 with a 1.6% risk, and a score of 3 with a risk of 3.9%. This system may be most useful for patients with an intermediate risk based on a $CHADS_2$ score of 1 or 2.

After a patient's individualized stroke risk is determined, it can be balanced against the risk of anticoagulation to determine what would be appropriate for stroke prevention. A useful tool for estimating bleeding risk due to oral anticoagulation is the HAS-BLED (*h*ypertension, *a*bnormal renal/liver function, *s*troke, *b*leeding history or predisposition, *l*abile international normalized ratio, *e*lderly, *d*rugs/alcohol) score. Patients with a HAS-BLED score of 0 had a risk of 0.59 severe bleeds per 100 patient-years, those with a score of 1 had a risk of 1.51, those with a score of 2 had a risk of 3.20, and those with a score of 3 had a risk of 19.51.

Aspirin and warfarin are the longest-studied antithrombotics used for reducing the rate of AF-related stroke. Aspirin reduces the risk of AF-related stroke by 25%, and warfarin reduces the risk by 50%. Warfarin can be difficult to administer; the level of blood-thinning effect must be constantly monitored with international normalized ratio (INR) blood testing. An INR less than 2.0 is associated with higher rates of ischemic stroke; a level greater than 3.0 is associated with increased intracranial bleeding. On average, a therapeutic INR (between 2.0 and 3.0) is maintained in only two thirds of cases, and there are many drug and dietary interactions with warfarin.

The combination of aspirin plus clopidogrel is somewhat more effective than aspirin alone in preventing stroke (2.4% versus 3.3% per year), but it comes at the cost of almost twice the major bleeding rate. Coumadin is superior to the combination of aspirin and clopidogrel, especially if the INR can be kept within the therapeutic range at least 65% of the time.

Several newer oral anticoagulants have effectiveness and bleeding risk rates similar to warfarin, but they do not require drug level monitoring. They include dabigatran, rivaroxaban, and apixaban, which have been studied in large patient groups and found to be noninferior to warfarin, and some may be superior in certain aspects.

The highest risk of stroke related to AF occurs at time of conversion to sinus rhythm achieved spontaneously or by chemical or electrical cardioversion. If thrombus has formed within the left atrium or left atrial appendage, it may not leave the atria during AF due to ineffective atrial mechanics. However, after sinus rhythm is restored, the improved atrial function may eject the thrombus and cause embolic stroke or other systemic embolic sequelae. Even with restoration of electrical atrial systole, the recovery of normal atrial mechanics may be delayed several days to weeks (i.e., atrial stunning). To reduce the risk of pericardioversion stroke, it is important to reduce the risk of preexisting thrombus and to prevent formation in the time period immediately after cardioversion.

The risk of preexisting thrombus can be reduced by 3 weeks of oral anticoagulation or Doppler transesophageal echocardiography (TEE) before cardioversion. These steps are recommended for any patient who has been in AF for an unknown period or has been documented to be in AF more than 48 hours. Although thrombi have been identified in patients with AF for shorter periods, current clinical practice presumes that most thrombus formation requires at least 48 hours. Thrombus related to AF occurs most commonly in the left atrial appendage, which cannot be well visualized by transthoracic echocardiography; TEE is often recommended before cardioversion for optimal imaging of the left atrial appendage. After cardioversion, at least 4 weeks of oral anticoagulation is recommended (regardless of $CHADS_2$ score).

Acute Management of Atrial Fibrillation: Rate Control

The acute management of AF centers on the control of the ventricular response, timely restoration of sinus rhythm, and identification of potentially reversible factors that might have precipitated the arrhythmia. AF with rapid ventricular response results in acute deterioration in stroke volume and cardiac output and an increase in myocardial oxygen demand with the potential for coronary ischemia. Patients who are symptomatic must be controlled promptly. When pursuing rate control for acute AF of recent onset, the fastest way to achieve rate control is the restoration of sinus rhythm. If rate control proves difficult or is not well tolerated, cardioversion should be undertaken early.

For the acute control of rapidly conducted AF, intravenous administration of a β-blocker (i.e., esmolol, metoprolol, or propranolol) or a nondihydropyridine calcium-channel blocker (i.e., diltiazem or verapamil) is preferred. In the setting of decompensated heart failure, the use of a calcium-channel blocker may exacerbate heart failure and should be avoided. In this setting, digoxin is a useful agent for resting rate control. Digoxin is also a useful second-line drug in addition to a calcium-channel or β-blocker for resting rate control. If this therapy is ineffective or not tolerated, intravenous amiodarone is a useful rate control agent, especially in the setting of congestive heart failure, and it may facilitate restoration of sinus rhythm.

Long-term targets for rate control of permanent AF have been a matter of debate. The recently completed Rate Control Efficacy in Permanent Atrial Fibrillation II (RACE II) study showed no advantage to strict rate control. Targeting a resting rate of less than 80 beats per minute showed no advantage over a target of less than 110 and was much harder to achieve. For long-term management, the results suggest that achieving a resting heart rate of less than 110 beats per minute may be sufficient and safe.

Acute Management of Atrial Fibrillation: Restoration of Sinus Rhythm

When sinus rhythm is restored in the first 48 hours of acute AF, the thromboembolic risk is low, and anticoagulation is not required. New-onset AF should be managed with a plan to restore sinus rhythm during this period if possible. At least one half of new-onset AF episodes terminate spontaneously in the first 24 to 48 hours.

Pharmacologic Conversion of Atrial Fibrillation

Pharmacologic conversion of AF can be undertaken when restoration of sinus rhythm is not urgent. Several antiarrhythmic drugs