Chapter 12
Risk Stratification in Atrial Fibrillation and Observation Unit Entry

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Introduction

The most common complication of atrial fibrillation is arterial thromboembolism, which can lead to ischemic stroke [1–3]. Thus, it is important to determine which patients would benefit from antithrombotic therapy to help lower the risk of thromboembolic events. As detailed in the chapter on anticoagulation therapy, there are various Federal Drug Administration (FDA)-approved options for stroke prevention in atrial fibrillation that are endorsed by current guidelines [4]. These would include both oral and parenteral treatments, including low molecular weight heparin, unfractionated heparin, vitamin K antagonists, direct thrombin inhibitors, and factor Xa inhibitors [4]. The initiation of these medications may occur in the outpatient, emergency department (ED), observation unit (OU), or inpatient setting and will depend on the patient's presentation and risk for thromboembolic events, which will be discussed in this chapter. Furthermore, risk stratification for entry into the OU will be discussed as a means to identify a select number of patients who may be appropriate for a short hospital stay and continued evaluation and management of atrial fibrillation.

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Stroke Risk Stratification Scores

As previously discussed, anticoagulation decreases the risk of stroke and other embolic events. Several decision schemes have been validated to guide practitioners on what patients with non-valvular atrial fibrillation would benefit most from anticoagulant therapy. The decision to initiate anticoagulation therapy should be a shared decision between the patient and provider, and a discussion of the benefits of stroke prevention and the risks of bleeding, along with the patient's values and preferences, needs to be considered.

The two most commonly used stroke risk assessment tools are the $CHADS_2$ and the CHA_2DS_2-VASc [5, 6]. The acronym $CHADS_2$ represents congestive heart failure, hypertension, age ≥ 75 years, diabetes mellitus, and stroke/TIA/thromboembolism. Each risk factor is assigned a point of either 1 or 2 and added together for a maximum of 6 (Table 12.1). The listed risk factors have previously been shown to increase the risk of stroke in patients with atrial fibrillation [7–13]. In general, patients with a $CHADS_2$ score of ≥ 2 should be on oral anticoagulation with warfarin, dabigatran, rivaroxaban, or, apixaban.

The American College of Cardiology, American Heart Association, and Heart Rhythm Society Guidelines recently published that the CHA_2DS_2-VASc risk score is the preferred tool to assess stroke risk in patients with non-valvular atrial fibrillation, and it has widely become accepted by clinicians [4]. The scoring system is also detailed in Table 12.1. Evidence for the utilization of this tool for risk stratification has come from studies showing that several other factors are known to increase stroke risk, and this tool helps identify patients who are high risk for stroke who otherwise would have been considered low or moderate risk with other stratification schemas. Patients with non-valvular atrial fibrillation and a CHA_2DS_2-VASc score

Table 12.1 $CHADS_2$ and CHA_2DS_2-VASc scoring system

$CHADS_2$	Score
Congestive heart failure	1
Hypertension	1
Age ≥ 75	1
Diabetes mellitus	1
Stroke/TIA/thromboembolism	2
Total maximum score	6
CHA_2DS_2**VASc**	Score
Congestive heart failure	1
Hypertension	1
Age ≥ 75	2
Diabetes mellitus	1
Stroke/TIA/thromboembolism	2
Vascular disease	1
Age 65 to 74 years	1
Sex **c**ategory (i.e., female sex)	1
Total maximum score	9

of 0 can be omitted from antithrombotic therapy. Patients with a CHA_2DS_2-VASc score of 1 may have consideration of no treatment or treatment with an oral anticoagulant or aspirin. Patients with a CHA_2DS_2-VASc score of ≥ 2 should be considered for oral anticoagulation with warfarin, dabigatran, rivaroxaban, or apixaban [4]. In this tool, vascular disease, such as prior myocardial infarction, peripheral artery disease, or aortic plaque, is included in the acronym. Vascular diseases have been shown to increase thromboembolic risk in atrial fibrillation [14–16]. Also, a second age category is part of the acronym, as patients with atrial fibrillation who are aged 65 or greater are known to have an increased stroke risk [17]. Additionally, as published in the Birmingham Atrial Fibrillation Treatment of the Aged Study (BAFTA) trial, it was shown that vitamin K antagonists were clearly superior to aspirin in stroke prevention in patients aged ≥ 75 years in the primary care setting, hence why this age group receives an extra point in the scoring tool [18]. Lastly, the scoring tool adds a sex category, as female gender is known to increase the risk of stroke and thromboembolism [19–21]. Table 12.2 outlines the adjusted stroke rates per year based on $CHADS_2$ and CHA_2DS_2-VASc scores.

While the $CHADS_2$ scoring system is simpler to use than the CHA_2DS_2-VASc, there are notable limitations due to it not including the previously stated common risk factors. It is noted that patients classified as low risk by $CHADS_2$ in its original validation study still had a stroke rate of 1.9 % per year, as listed in Table 12.2 [5]. A recent meta-analysis by Olesen et al. showed that many patients with a $CHADS_2$ score of 0 were not all at low risk for stroke [22]. By instead utilizing the CHA_2DS_2-VASc score, one would better classify the risk of stroke in atrial fibrillation patients and guide decision-making for anticoagulation therapy more appropriately.

Table 12.2 Adjusted stroke rate per year

$CHADS_2$ score	Adjusted stroke rate (% per year) [5]
0	1.9
1	2.8
2	4.0
3	5.9
4	8.5
5	12.5
6	18.2
CHA_2DS_2-VASc score	Adjusted stroke rate (% per year) [6, 23, 24]
0	0
1	1.3
2	2.2
3	3.2
4	4.0
5	6.7
6	9.8
7	9.6
8	6.7
9	15.20

Bleeding Risk Scores

Patients with atrial fibrillation also need evaluation for bleeding risk prior to the initiation of oral anticoagulation for stroke prevention. While identifying bleeding risk should not exclude physicians from initiating oral anticoagulation, it is important to correct any modifiable bleeding risk factors if possible. It is known that physicians overestimate bleeding risk, especially in the elderly, and this is a barrier to prescribing oral anticoagulants in patients with atrial fibrillation [25, 26]. This is important to note because as demonstrated in an analysis by van Walraven et al., oral anticoagulation was significantly protective against ischemic stroke regardless of the patient's age. Their study showed that while the protective benefit of antiplatelet therapy decreased significantly as the patient aged, the benefit for oral anticoagulation increased as they aged. Additionally, while there was an increased risk of serious hemorrhage as patient's aged, there were no significant differences between patients on aspirin versus those on warfarin [27].

While there are several bleeding scores available [28–30], the HAS-BLED score is a simple tool that allows for evaluation of bleeding risk in patients with atrial fibrillation [31]. HAS-BLED has several risk factors that are also known to be risk factors for stroke. The acronym stands for hypertension >160 systolic, abnormal liver or renal function (defined as dialysis, renal transplant, creatinine >2.6, cirrhosis, bilirubin >2 X's normal, alanine transaminase, aspartate aminotransferase, or alkaline phosphatase >3 X's normal), history of stroke, predisposition to or prior major bleeding, labile international normalized ratio (INR), elderly age >65, and, drugs, including medications that predispose to bleeding, along with excessive alcohol usage. The HAS-BLED score ranges from 0 to 9 with scores ≥3 indicate a high risk of bleeding. It is important to reiterate that HAS-BLED should not be used as a tool to exclude patients from receiving oral anticoagulation but rather to help physicians identify modifiable risk factors as they proceed cautiously and regularly review treatment plans. Table 12.3 illustrates the scoring system.

Table 12.3 HAS-BLED risk score

Risk factor	Description	Score
Hypertension	>160 systolic	1
Abnormal liver or renal function	Renal disease: dialysis, transplant, Cr >2.6	1
	Liver disease: cirrhosis, bilirubin >2 X's normal, alanine transaminase, aspartate aminotransferase, or alkaline phosphatase >3 X's normal	1
Stroke	History	1
Bleeding	Predisposition to or prior major bleeding	1
Labile INRs	Labile INRs	1
Elderly	>65	1
Drugs/alcohol use	Medications predisposing to bleeding	1
	Excessive alcohol use	1
Total maximum score		9

Observation Unit Inclusion and Exclusion Criteria

There are often scenarios where patients with atrial fibrillation may not require inpatient admission, but a short stay in the OU could be appropriate for stable patients that are not ready for discharge from the ED and warrant further management. As detailed in other chapters, the OU can serve to utilize pharmacologic treatments in attempts to achieve rate control or chemical cardioversion, electrical cardioversion if indicated, and initiation of parenteral and/or oral anticoagulation, provide patient education and consultation with cardiologists, and have appropriate discharge planning.

OU treatment protocols for atrial fibrillation have previously been described in the literature as a means to provide an alternative method to prolonged inpatient management of uncomplicated atrial fibrillation [32–35]. More recently, the Society for Cardiovascular Patient Care (SCPC) published a white paper on observation services, which included recommendations for the management of atrial fibrillation in the OU [36]. Included in those recommendations were the following inclusion and exclusion criteria:

Inclusion Criteria

- Hemodynamically stable patient
- Heart rate less than 110–120 after initial rate control
- Patient able to assist in follow-up and treatment plan

Exclusion Criteria

- Evidence of comorbidities requiring inpatient hospitalization
- Concerns for ischemia: positive initial troponins or presence of ischemic ECG changes
- Signs of CHF
- Ongoing significant tachycardia or hypoxia

The criteria above provide only framework for OU entry. There are several ways to treat atrial fibrillation, and an OU protocol may be best identified on an individual facility basis, as long as guideline and evidence-based medicine are practiced. This may depend on several factors including the availability of certain pharmacologic agents, diagnostic testing, and cardiology consultation. Either way, the OU is a viable destination for the uncomplicated patient with atrial fibrillation to receive further management to determine the need for inpatient admission or outpatient follow-up.

References

1. Sherman DG, et al. Thromboembolism in patients with atrial fibrillation. Arch Neurol. 1984;41:708–10.
2. Britton M, Gustafsson C. Non-rheumatic atrial fibrillation as a risk factor for stroke. Stroke. 1985;16(2):182–8.
3. Petersen P, Godtfredsen J. Embolic complications in paroxysmal atrial fibrillation. Stroke. 1986;17(4):622–6.
4. January CT, et al. 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: executive summary. J Am Coll Cardiol. 2014;64(21):2246–80.
5. Gage BF, et al. Validation of clinical classification schemes for predicting stroke. JAMA. 2001;285(22):2864–70.
6. Lip GY, et al. Refining clinical risk stratification for predicting stroke and thromboembolism in atrial fibrillation using a novel risk factor-based approach: the euro heart survey on atrial fibrillation. Chest. 2010;137(2):263–72.
7. Atrial Fibrillation Investigators. Risk factors for stroke and efficacy of antithrombotic therapy in atrial fibrillation: analysis of pooled data from five randomized controlled trials. Arch Intern Med. 1994;154:1449–57.
8. Atrial Fibrillation Investigators. Echocardiographic predictors of stroke in patients with atrial fibrillation: a prospective study of 1066 patients from 3 clinical trials. Arch Intern Med. 1998;158:1316–20.
9. D'Agostino RB, et al. Stroke risk profile: adjustment for antihypertensive medication. The Framingham Study. Stroke. 1994;25(1):40–3.
10. van Latum JC, et al. Predictors of major vascular events in patients with a transient ischemic attack or minor ischemic stroke and with nonrheumatic atrial fibrillation. European Atrial Fibrillation Trial (EAFT) Study Group. Stroke. 1995;26(5):801–6.
11. Flegel KM, Hanley J. Risk factors for stroke and other embolic events in patients with non-rheumatic atrial fibrillation. Stroke. 1989;20(8):1000–4.
12. Yuan Z, et al. Atrial fibrillation as a risk factor for stroke: a retrospective cohort study of hospitalized Medicare beneficiaries. Am J Public Health. 1998;88(3):395–400.
13. Moulton AW, Singer DE, Haas JS. Risk factors for stroke in patients with nonrheumatic atrial fibrillation: a case-control study. Am J Med. 1991;91(2):156–61.
14. Siu CW, et al. Transient atrial fibrillation complicating acute inferior myocardial infarction: implications for future risk of ischemic stroke. Chest. 2007;132(1):44–9.
15. Davila-Roman VG, et al. Atherosclerosis of the ascending aorta. Prevalence and role as an independent predictor of cerebrovascular events in cardiac patients. Stroke. 1994;25(10):2010–6.
16. Aguilar E, et al. Clinical outcome of stable outpatients with coronary, cerebrovascular or peripheral artery disease, and atrial fibrillation. Thromb Res. 2012;130(3):390–5.
17. Lip GYH, Lim HS. Atrial fibrillation and stroke prevention. Lancet Neurol. 2007;6(11):981–93.
18. Mant J, et al. Warfarin versus aspirin for stroke prevention in an elderly community population with atrial fibrillation (the Birmingham Atrial Fibrillation Treatment of the Aged Study, BAFTA): a randomised controlled trial. Lancet. 2007;370(9586):493–503.
19. Dagres N, et al. Gender-related differences in presentation, treatment, and outcome of patients with atrial fibrillation in Europe: a report from the Euro Heart Survey on Atrial Fibrillation. J Am Coll Cardiol. 2007;49(5):572–7.
20. Fang MC, et al. Gender differences in the risk of ischemic stroke and peripheral embolism in atrial fibrillation: the AnTicoagulation and Risk factors In Atrial fibrillation (ATRIA) study. Circulation. 2005;112(12):1687–91.
21. Lane DA, Lip GYH. Female gender is a risk factor for stroke and thromboembolism in atrial fibrillation patients. Thromb Haemost, 2009;101:802–5.

22. Olesen JB, et al. The value of the CHA2DS2-VASc score for refining stroke risk stratification in patients with atrial fibrillation with a CHADS2 score 0-1: a nationwide cohort study. Thromb Haemost. 2012;107(6):1172–9.
23. Lip GYH, Tse HF, Lane DA. Atrial fibrillation. Lancet. 2012;379(9816):648–61.
24. Lane DA, Lip GY. Use of the CHA(2)DS(2)-VASc and HAS-BLED scores to aid decision making for thromboprophylaxis in nonvalvular atrial fibrillation. Circulation. 2012;126(7):860–5.
25. Pugh D, Pugh J, Mead GE. Attitudes of physicians regarding anticoagulation for atrial fibrillation: a systematic review. Age Ageing. 2011;40(6):675–83.
26. Sen S, Dahlberg KW. Physician's fear of anticoagulant therapy in nonvalvular atrial fibrillation. Am J Med Sci. 2014;348(6):513–21.
27. van Walraven C, et al. Effect of age on stroke prevention therapy in patients with atrial fibrillation: the atrial fibrillation investigators. Stroke. 2009;40(4):1410–6.
28. Fang MC, et al. A new risk scheme to predict warfarin-associated hemorrhage: The ATRIA (Anticoagulation and Risk Factors in Atrial Fibrillation) Study. J Am Coll Cardiol. 2011;58(4):395–401.
29. Gage BF, et al. Clinical classification schemes for predicting hemorrhage: results from the National Registry of Atrial Fibrillation (NRAF). Am Heart J. 2006;151(3):713–9.
30. Shireman TI, et al. Development of a contemporary bleeding risk model for elderly warfarin recipients. Chest. 2006;130(5):1390–6.
31. Pisters R, et al. A novel user-friendly score (HAS-BLED) to assess 1-year risk of major bleeding in patients with atrial fibrillation: the Euro Heart Survey. Chest. 2010;138(5):1093–100.
32. Cristoni L, et al. Cardioversion of acute atrial fibrillation in the short observation unit: comparison of a protocol focused on electrical cardioversion with simple antiarrhythmic treatment. Emerg Med J. 2011;28(11):932–7.
33. Koenig BO, Ross MA, Jackson RE. An emergency department observation unit protocol for acute-onset atrial fibrillation is feasible. Ann Emerg Med. 2002;39(4):374–81.
34. Ross MA, Davis B, Dresselhouse A. The role of an emergency department observation unit in a clinical pathway for atrial fibrillation. Crit Pathw Cardiol. 2004;3(1):8–12.
35. Decker WW, et al. A prospective, randomized trial of an emergency department observation unit for acute onset atrial fibrillation. Ann Emerg Med. 2008;52(4):322–8.
36. Peacock F, et al. Recommendations for the evaluation and management of observation services: a consensus white paper: the Society of Cardiovascular Patient Care. Crit Pathw Cardiol. 2014;13(4):163–98.