

**GENE R. QUINN, MD, MS**

Clinical and Research Fellow, Smith Center for Outcomes Research in Cardiology, Beth Israel Deaconess Medical Center, Boston, MA; Fellow in Patient Safety and Quality, Harvard Medical School, Boston, MA

**MARGARET C. FANG, MD, MPH**

Associate Professor of Medicine, Division of Hospital Medicine, University of California, San Francisco



**BRIEF ANSWERS  
TO SPECIFIC  
CLINICAL  
QUESTIONS**

## **Q:** How can I predict bleeding in my elderly patient taking anticoagulants?

**A:** We have tools to predict bleeding risk, but their predictive value is modest, and the estimated risk of bleeding is often outweighed by the benefits of anticoagulant therapy.

Anticoagulant therapy is commonly prescribed for conditions that disproportionately affect the elderly, including atrial fibrillation, venous thromboembolism, and valvular heart disease. Though anticoagulants are highly effective in preventing clots, they also significantly increase the risk of bleeding. Since older age is a risk factor for bleeding as well as thrombosis, it is essential to weigh the risks and benefits of anticoagulants for each patient.

### ■ WHAT KINDS OF BLEEDING DEVELOP IN PATIENTS ON ANTICOAGULANTS?

Patients taking anticoagulants have roughly double the risk of bleeding compared with patients not on anticoagulants.<sup>1</sup> Bleeding rates tend to be slightly higher in patients taking anticoagulants for venous thromboembolism than in those taking them for atrial fibrillation. The average yearly risk of a “major” anticoagulant-associated bleeding event (eg, requiring transfusion or intervention or occurring in a critical anatomic site) is about 2% to 3%, with most of the bleeding being gastrointestinal.<sup>2</sup>

Intracranial hemorrhage is by far the most deadly complication of anticoagulant therapy: it causes 90% of deaths and disability from warfarin-associated hemorrhage and is associated with a death rate over 50%; however, it is much less common than gastrointestinal bleeding.<sup>3</sup> Anticoagulant therapy increases

the risk of intracranial hemorrhage by only 0.2% per year.<sup>1</sup>

### ■ RISK-PREDICTION TOOLS HAVE LIMITATIONS

Not all patients have the same risk of bleeding when taking anticoagulants. Many factors in addition to advanced age have been associated with increased bleeding risk, including coexisting medical conditions (such as malignancy, prior stroke or bleeding event, and renal insufficiency), medications (particularly aspirin, nonsteroidal anti-inflammatory drugs, and other antiplatelet drugs), and the timing and intensity of anticoagulation therapy.<sup>4</sup>

Scoring tools have been developed to identify patients at higher risk of bleeding (Table 1).<sup>4-9</sup> The various schemes incorporate many of the same variables, such as older age, renal impairment, and history of bleeding, but some include additional risk factors while others are more parsimonious. They also differ in how individual risk factors are weighted to generate a final risk score.

In terms of predictive ability, none of the available risk schemes appears to be vastly superior, and their ability to predict hemorrhage is modest at best. There is also no universal or well-established threshold at which the risk of bleeding is so high that one would not consider anticoagulants. In fact, a “high-risk” patient may have an aggregate bleeding rate of only 4% to 6% per year. Using risk schemes such as ATRIA,<sup>5</sup> HEMORR<sub>2</sub>HAGES,<sup>6</sup> and HAS-BLED<sup>7</sup> may be more useful because they provide an estimate of bleeding risk for each point on the scale.

Moreover, the current tools to predict bleeding risk have several other limitations.

**Since age is a risk factor for both bleeding and thrombosis, weigh the risks and benefits of anticoagulants for each patient**

doi:10.3949/ccjm.83a.15002

**TABLE 1**

**Bleeding risk tools and bleeding rates reported in original cohorts**

Risk tool	Population	Risk score calculation	Scores and bleeding rates		
			Points	Risk	Rate at 12 months
<b>Bleeding Risk Index<sup>8</sup></b>	Atrial fibrillation, venous thromboembolism, cardiac surgery	1 point for each of the following: Age ≥ 65, prior stroke, prior gastrointestinal bleeding	0	Low	3%
		1 point if any one of the following: Recent myocardial infarction, diabetes mellitus, hematocrit < 30%, creatinine > 1.5 mg/dL	1–2 3–4	Intermediate High	12% 48%
<b>HEMORR<sub>2</sub>HAGES<sup>6</sup></b>	Atrial fibrillation	1 point for each of the following: Hepatic or renal disease	0	1.9	
		Ethanol abuse	1	2.5	
		Malignancy	2	5.3	
		Older age (> 75)	3	8.4	
		Reduced platelet count or function	4	10.4	
		Hypertension (uncontrolled)	≥ 5	12.3	
		Anemia			
		Genetic factors			
		Excessive fall risk			
		Stroke			
		2 points: prior bleeding event			
<b>RIETE risk scheme<sup>9</sup></b>	Venous thromboembolism	2 points: Major bleeding within 15 days			Rate at 3 months
		1.5 points: Creatinine >1.2 mg/dL	0	Low	0.3%
		1 point: Anemia	1–4	Intermediate	2.6%
		1 point: Malignancy Pulmonary embolism Age > 75	≥ 5	High	7.3%
<b>HAS-BLED<sup>7</sup></b>	Atrial fibrillation	1 point for each of the following: Hypertension	0	1.13	
		Abnormal renal or liver function	1	1.02	
		Stroke	2	1.88	
		Bleeding history or predisposition	3	3.74	
		Labile international normalized ratio	4	8.70	
		Older age	5	12.50	
		Drug or alcohol use	≥ 6	Not available <sup>a</sup>	
<b>ATRIA Risk Score<sup>5</sup></b>	Atrial fibrillation	3 points: Anemia	0	0.40	
		Severe renal disease	1	0.55	
		2 points: Age ≥ 75	2	0.97	
		1 point: Prior bleeding event	3	1.01	
		Hypertension	4	2.62	
			5	5.65	
			6	4.95	
			7	5.17	
			8	9.61	
			9	12.43	
	10	17.25			

<sup>a</sup> There were too few patients in original cohort to provide a reliable estimate.

Based on information in Lopes RD, Crowley MJ, Shah BR, et al. Stroke prevention in atrial fibrillation. Rockville (MD): Agency for Healthcare Research and Quality (US); 2013 Aug. Report No.: 13-EHC113-EF.

They were developed in patients already taking anticoagulants and so probably underestimate the actual risk of hemorrhage, as people who could not take anticoagulants were excluded, most likely because they were at high risk of bleeding. Therefore, bleeding risk tools probably apply best to a patient for whom anticoagulation *can* be considered.

Some clinical variables are necessarily broad. For example, “prior bleeding” is a risk factor included in several risk scores, but does not distinguish between massive variceal bleeding and minor hemorrhoidal bleeding.

Risk scores do not effectively predict intracranial hemorrhage.

Finally, these risk tools were developed in patients taking vitamin K antagonists, and it is not yet established that they can effectively predict hemorrhage related to other, newer anticoagulants.

### ■ WHEN DOES BLEEDING RISK OUTWEIGH ANTICOAGULATION BENEFIT?

For patients with atrial fibrillation, the net clinical benefit of anticoagulation (strokes prevented minus bleeding events induced) increases as the risk of stroke rises. Updated guidelines for managing atrial fibrillation now recommend anticoagulation for most patients.<sup>10</sup>

For most older patients with atrial fibrillation, the decision to anticoagulate may not change even if a bleeding risk tool indicates a high bleeding risk.<sup>11</sup> For example, a patient with a history of ischemic stroke will generally derive more benefit than harm from anticoagulants. The primary exception is in patients with prior lobar intracranial hemorrhage, because of the high risk of rebleeding and the worse outcomes associated with intracranial hemorrhage.<sup>12</sup> As a general rule, most patients with atrial fibrillation and an additional risk factor for stroke should be considered for anticoagulant therapy unless they have a history of lobar intracranial hemorrhage.

Anticoagulation may be deferred if the patient is at the lower end of the stroke risk spectrum and if the bleeding risk is calculated to be high. However, as noted before, current bleeding risk tools probably do not capture the experiences of patients at the extremes of high

bleeding risk, so clinical judgment continues to be important. In addition, forgoing anticoagulation could be reasonable even in patients at high risk for recurrent stroke if their life expectancy is limited, if anticoagulation is unacceptably burdensome, or if it is not within their goals and preferences.

### ■ WHAT ABOUT FALL RISK?

Fall risk commonly deters clinicians from prescribing anticoagulants because of the fear of causing intracranial hemorrhage. In particular, falls increase the risk for subdural hematoma, which has a death rate comparable to that of ischemic stroke.<sup>13</sup>

Studies have had difficulty quantifying the exact risk associated with falls because these patients are less likely to be prescribed anticoagulants. One decision analysis estimated that a person would have to fall about 300 times per year before the risk of intracranial hemorrhage outweighed the benefits from stroke reduction.<sup>14</sup> Studies have found that patients at high risk of falls have a higher risk of intracranial hemorrhage, but that this risk is counterbalanced by an even greater risk of ischemic stroke.<sup>15</sup>

Therefore, if the baseline risk of ischemic stroke is high, anticoagulation is still favored.

### ■ WHEN SHOULD I USE A BLEEDING RISK TOOL?

Despite their limitations, bleeding risk tools are useful in clinical practice when estimates of bleeding risk affect clinical behavior. They are most helpful for patients at the lower end of the stroke or thromboembolism risk spectrum, where the decision to anticoagulate is strongly influenced by bleeding risk. Risk tools may also be helpful when counseling patients about their bleeding risk off and on anticoagulants.

Finally, recognizing that a patient is at high bleeding risk may lead the clinician to consider closer monitoring of anticoagulants or to implement strategies to reduce the risk. ■

### ■ REFERENCES

1. Hart RG, Pearce LA, Aguilar MI. Meta-analysis: anti-thrombotic therapy to prevent stroke in patients who have nonvalvular atrial fibrillation. *Ann Intern Med* 2007; 146:857–867.

**None of the risk schemes appears vastly superior, and their ability to predict hemorrhage is modest at best**

2. **Lopes LC, Spencer FA, Neumann I, et al.** Bleeding risk in atrial fibrillation patients taking vitamin K antagonists: systematic review and meta-analysis. *Clin Pharmacol Ther* 2013; 94:367–375.
3. **Fang MC, Go AS, Chang Y, et al.** Death and disability from warfarin-associated intracranial and extracranial hemorrhages. *Am J Med* 2007; 120:700–705.
4. **Lopes RD, Crowley MJ, Shah BR, et al.** Stroke prevention in atrial fibrillation. Rockville (MD): Agency for Healthcare Research and Quality (US); 2013 Aug. Report No.: 13-EHC113-EF.
5. **Fang MC, Go AS, Chang Y, 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; 58:395–401.
6. **Gage BF, Yan Y, Milligan PE, et al.** Clinical classification schemes for predicting hemorrhage: results from the National Registry of Atrial Fibrillation (NRAF) Am Heart J 2006; 151:713–719.
7. **Pisters R, Lane DA, Nieuwlaat R, de Vos CB, Crijns HJ, Lip GY.** 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; 138:1093–1100.
8. **Beyth RJ, Quinn LM, Landefeld CS.** Prospective evaluation of an index for predicting the risk of major bleeding in outpatients treated with warfarin. *Am J Med* 1998; 105:91–99.
9. **Nieto JA, Solano R, Iglesias NT, et al, for the RIETE Investigators.** Validation of a score for predicting fatal bleeding in patients receiving anticoagulation for venous thromboembolism. *Thrombosis Res* 2013; 132:175–179.
10. **January CT, Wann LS, Alpert JS, et al; ACC/AHA Task Force Members.** 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines and the Heart Rhythm Society. *Circulation* 2014; 130:2071–2104.
11. **Singer DE, Chang Y, Fang MC, et al.** The net clinical benefit of warfarin anticoagulation in atrial fibrillation. *Ann Intern Med* 2009; 151:297–305.
12. **Eckman MH, Rosand J, Knudsen KA, Singer DE, Greenberg SM.** Can patients be anticoagulated after intracerebral hemorrhage? A decision analysis. *Stroke* 2003; 34:1710–1716.
13. **Fang MC, Go AS, Chang Y, et al.** Thirty-day mortality after ischemic stroke and intracranial hemorrhage in patients with atrial fibrillation on and off anticoagulants. *Stroke* 2012; 43:1795–1799.
14. **Man-Son-Hing M, Laupacis A.** Anticoagulant-related bleeding in older persons with atrial fibrillation: physicians' fears often unfounded. *Arch Intern Med* 2003; 163:1580–1586.
15. **Gage BF, Birman-Deych E, Kerzner R, Radford MJ, Nilasena DS, Rich MW.** Incidence of intracranial hemorrhage in patients with atrial fibrillation who are prone to fall. *Am J Med* 2005; 118:612–617.

.....  
**ADDRESS:** Margaret C. Fang, MD, MPH, Associate Professor of Medicine, Division of Hospital Medicine, University of California, San Francisco, 533 Parnassus Avenue, Box 0131, San Francisco, CA 94143; mfang@medicine.ucsf.edu