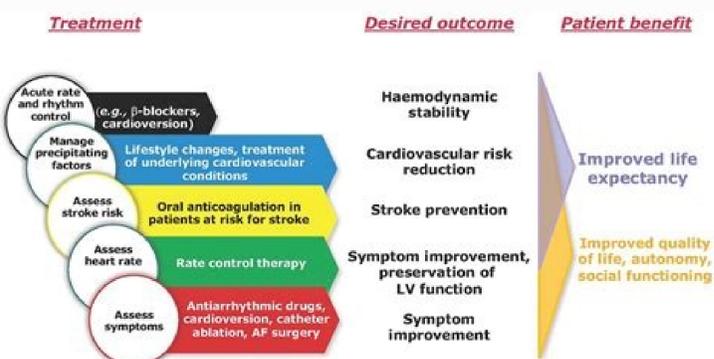


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REVIEW

Predicting Atrial Fibrillation and Its Complications

Alvaro Alonso, MD, PhD; Faye L. Norby

Atrial fibrillation (AF) is a common cardiac arrhythmia associated with an increased risk of stroke and other complications. Identifying individuals at higher risk of developing AF in the community is now possible using validated predictive models that take into account clinical variables and circulating biomarkers. These models have shown adequate performance in racially and ethnically diverse populations. Similarly, risk stratification schemes predict incidence of ischemic stroke in persons with AF, assisting clinicians and patients in decisions regarding oral anticoagulation use. Complementary schemes have been developed to predict the risk of bleeding in AF patients taking vitamin K antagonists. However, major gaps exist in our ability to predict AF and its complications. Additional research should refine models for AF prediction and determine their value to improve population health and clinical outcomes, advance our ability to predict stroke and other complications in AF patients, and develop predictive models for bleeding events and other adverse effects in patients using non-vitamin K oral anticoagulants.

Key Words: Atrial fibrillation; Heart failure; Predictive models; Stroke

Atrial fibrillation (AF) is a common cardiac arrhythmia affecting >30 million persons worldwide.¹ In addition, AF increases the risk of stroke, heart failure, and overall mortality.² With the aging of populations worldwide, the incidence and prevalence of AF are expected to grow in future decades as well as the burden from its associated complications.³ The growing public health significance of AF has spurred efforts to identify individuals at higher risk of developing this arrhythmia and its complications. Identifying individuals more likely to develop AF could facilitate targeting of preventive interventions and screening programs, while risk stratification schemes in AF patients can assist clinicians and patients in treatment decisions.

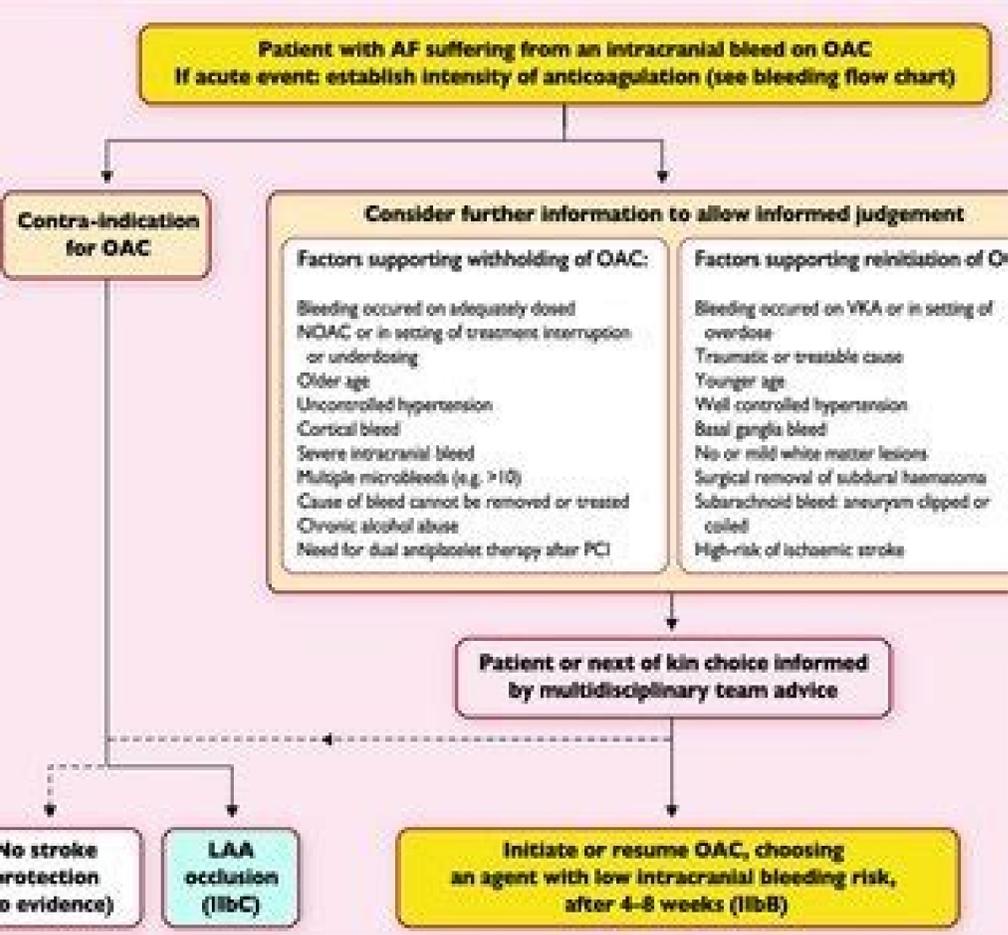
We present an overview of the expanding field of AF prediction, as follows. First, we describe available models for the prediction of incident AF in the community and their potential applications. Second, we summarize the main existing risk schemes for prediction of ischemic stroke in patients with AF, highlighting some limitations. Third, we discuss prediction of bleeding and other complications in patients with AF. We end by highlighting areas that demand additional research. To inform the review, we searched PubMed through December 31, 2015 using the search terms "atrial fibrillation" AND "prediction". We considered publications mostly from the past 5 years, though we did not exclude frequently referenced older publications, and selected those considered relevant. Though related to the topic, we do not discuss the extensive work on prediction of AF recurrence after electrical cardioversion or catheter ablation, or on AF prediction in the context of specific clinical contexts, such as postoperative AF after cardiac surgery.

Prediction of AF in the Community

Risk Scores and Equations for AF Prediction
Over the past few years, several risk scores and equations for the prediction of AF in the general population have been developed, published, and validated. Table 1 enumerates in chronological order the published scores, the variables included, the characteristics of the derivation and validation samples, if any, and the performance of the model (discrimination and calibration). Discrimination refers to the ability of the model to separate subjects who develop the outcome from those who do not, while calibration refers to the agreement between observed outcomes and predictions.⁴

The first published risk score was derived in 4,764 mostly white participants in the Framingham Heart Study (FHS), and used basic demographic and clinical variables to predict the 10-year risk of AF.⁵ The discrimination of the model, assessed with the C-statistic, was good (0.78, 95% confidence interval [CI] 0.76, 0.80). This score was subsequently validated in 4 different cohorts: the Age, Gene/Environment Susceptibility-Reykjavik (AGES) study, Atherosclerosis Risk in Communities (ARIC) study, Cardiovascular Health Study (CHS), and the Multi-Ethnic Study of Atherosclerosis (MESA).⁶⁻⁸ In these external cohorts, the discrimination of the model was acceptable, ranging from 0.67 in African-American participants in CHS to 0.75 in the racially diverse MESA cohort. In most populations, however, the model required recalibration to adjust the predicted probabilities to the actual risk of AF in the different cohorts. Independently, the ARIC study also developed a 10-year risk score for AF prediction among 14,546 study participants aged 45–64 years.⁹ In contrast to the FHS AF risk

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Division of Epidemiology and Community Health, School of Public Health, University of Minnesota, MN, USA.
Mailing address: Alvaro Alonso, MD, PhD, Division of Epidemiology and Community Health, School of Public Health, University of Minnesota, 1300 S 2nd St., Suite 300, Minneapolis, MN 55454, USA. E-mail: alonso@umn.edu
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atrial fibrillation; LAA = left atrial appendage; NOAC = non-vitamin K antagonist oral anticoagulant; OAC = oral anticoagulation; PCI = percutaneous coronary intervention in K antagonist.

restriction. 2012;(4):CD008294.71. Dolovich MB, Ahrens RC, Hess DR, et al. American College of Chest Physicians; American College of Asthma, Allergy, and Immunology. 2016;37(1):67-119.3. McLaughlin VV, Archer SL, Badesch DB, et al. 2005;36(2):360-366.11. . 2015;65(24):2614-2623.25. He or she will also order some blood tests and a chest x-ray. Incidence of chronic thromboembolic pulmonary hypertension after pulmonary embolism. Evid Based Complement Alternat Med. NICE advice [ESNM68]. Her employer's human resources department told her that there were no available alternative positions, and that she did not meet the eligibility criteria for leave as defined by the Family and Medical Leave Act. Global Initiative for Chronic Obstructive Lung Disease. 2005;(1):CD002738.18. Am Fam Physician. 2016 Sep 15;94(6):online. See related article on atrial fibrillationAtrial fibrillation (fib-brih-LAY-shun) is caused by a problem with your heart's electrical system. 2007;(3):CD0066186.39. 2005;(3):CD001927.37. Patel MR, Mahaffey KW, Garg J, et al.; ROCKET AF Investigators. Children compensate for this narrowing by breathing more quickly and deeply. 2011;17(2):56-64.25. 2013;62(2):108-118.28. 2003;107(23):2920-2925.7. Pedersen OD, Abildstrom SZ, Ottesen MM, et al.; TRACE Study Investigators. Preventive care for adolescents: few get visits and fewer get services. Other factors that can affect sperm quality and production are stress, obesity, genetic disorders, and exposure to certain hazardous materials.EFFECTS ON MATERNAL AND FETAL OUTCOMESA man's lifestyle factors can directly impact his partner's pregnancy (e.g., tobacco smoking, sexually transmitted infections). 2013;62(25 suppl):D42-D50.5. Hoepfer MM, Simon R, Gibbs J. 2013;62(25 suppl):D92-D99.26. 1994;343(8904):1006-1008]. This material may not otherwise be downloaded, copied, printed, stored, transmitted or reproduced in any medium, whether now known or later invented, except as authorized in writing by the AAFP. Cost-effectiveness analysis of omalizumab in adults and adolescents with moderate-to-severe allergic asthma. The cutaneous amyloidoses. Mansur AH, Kaiser K. Effect of a soy isoflavone supplement on lung function and clinical outcomes in patients with poorly controlled asthma: a randomized clinical trial. 2010;17(10):707-713.61. Am Fam Physician. At age 86, I'm an active and generally happy person who keeps busy, traveling regularly to New York to see my granddaughters, enjoying music and art while I'm there, and attending arts events in San Francisco about twice a week. Yuan JX, Rubin LJ. Fundam Clin Pharmacol. 2014;31(120):2083-2091. Page 31. Get Permissions MOST RECENT ISSUE Jan 2022 Access the latest issue of American Family Physician Read the Issue Don't miss a single issue. 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Specific risk factors for melanoma include having a dysplastic nevus (atypical mole), having multiple (i.e., ≥ 100) nevi, and having a family history of melanoma.3.4 Like most types of cancer, the risk of melanoma increases with age; the median age at diagnosis is 63 years, and the median age at death is 69 years.1.SUGGESTIONS FOR PRACTICE REGARDING THE I STATEMENTPotential Benefit of Early Detection and Treatment. 2009;46(7):659-664.8. Schatz M, Sorkness CA, Li JT, et al. Godard P, Greillier P, Pigearias B, Nachbar G, Desfougeres JL, Attali V. 2014;73(7):1340-1349.9. Guazzi M, Borlaug BA. Family physicians have the opportunity to discuss risk factors that negatively impact maternal and infant health such as being overweight, smoking, hypertension, and diabetes mellitus.There are multiple barriers to providing comprehensive preconception care. 2000;27:564....2. Women of reproductive age should take a daily supplement of 400 to 800 mcg of folic acid, starting before conception and continuing through 12 weeks of pregnancy, and consume a balanced diet of folate-rich foods to reduce the risk of neural tube defects. Even those who are covered are often entitled to only 12 weeks of unpaid leave. Theophylline: package insert and label information. 2014;14(2):192-199.58. Those most commonly distinguished are acute laryngotracheitis and spasmodic croup. Men should be counseled on contraception, overcoming fertility issues, ensuring a healthy pregnancy for his partner, and ensuring optimal postpartum outcomes for his partner and child (Table 2).FERTILITY AND CONCEPTIONStudies have identified several factors that affect sperm quality, quantity, concentration, and motility. 2013;62(25 suppl):D100-D108.11. Eur Heart J. 2010;170(13):1120-1126.5. Kienhorst LB, Janssens HJ, Franssen J, Janssen M. symptomatic treatment in allergic asthma. No wonder he doesn't care to ponder his mortality when he feels well, end-of-life discussions in moments of excellent health may pose as much of a challenge as waiting until illness arrives.CAROLINE WELLBERY, MD, PhDFor physiciansHallberg IR. Strange G, Gabbay E, Kermeen F, et al. Practical management of anticoagulation in patients with atrial fibrillation. Arch Pediatr Adolesc Med. 2015;16(6):495-500. Page 8At 7.5 months pregnant, my patient found herself increasingly uncomfortable at work. Inhaled corticosteroids versus sodium cromoglycate in children and adults with asthma. Rivaroxaban versus warfarin in nonvalvular atrial fibrillation. A diagnostic rule for acute gouty arthritis in primary care without joint fluid analysis. Kubavat AH, Khippal N, Tak S, et al. This series is coordinated by Kenny Lin, MD, MPH, Associate Deputy Editor for AFP Online. See the CME Quiz Questions.Author disclosure: David Wyatt Johnson is the author of references cited in this review.Croup leads to signs of upper airway obstruction and must be differentiated from acute epiglottitis, bacterial tracheitis, and an inhaled foreign body. Snow V, Weiss KB, LeFevre M, et al. 2002;347(23):1834-1840.19. Educating our patients about life and the end of life: toward a pedagogy of dying [published correction appears in J Am Board Fam Med. Efficacy of theophylline plus salmeterol/fluticasone propionate combination therapy in patients with asthma. 2012;(5):CD002314.16. Lenient versus strict rate control in patients with atrial fibrillation. Expanded efforts in sports clearance will identify significant risk to be addressed, and it will often have nothing to do with sports.Author disclosure: No relevant financial affiliations.The opinions and assertions contained herein are the personal views of the authors and are not to be construed as official or as reflecting the views of the U.S. Armed Services or any of their medical departments.show all references1. Croup affects about 3% of children per year, usually those between the ages of six months and three years, and 75% of infections are caused by parainfluenza virus.Symptoms usually resolve within 48 hours, but severe upper airway obstruction can rarely lead to respiratory failure and arrest.Oxygen is standard treatment in children with respiratory distress.A single oral dose of dexamethasone improves symptoms in children with mild croup, compared with placebo.Although humidification is often used in children with mild to moderate croup, we found no evidence from randomized controlled trials to support its use in clinical practice.In children with moderate to severe croup, intramuscular or oral dexamethasone, nebulized adrenaline (epinephrine), and nebulized budesonide reduce symptoms compared with placebo.Oral dexamethasone is as effective as nebulized budesonide at reducing symptoms, and is less distressing for the child.A dexamethasone dose of 0.15 mg per kg may be as effective as a dose of 0.6 mg per kg. Accessed March 15, 2015....2. Results from the Rate Control Versus Electrical Cardioversion (RACE) Study. 2010;363(19): 1877]. 2004;41(8):825-832.70. 1977;20(3):895-900.3. Owens D, Whelan B, McCarthy G, Fang MC, Go AS, Chang Y, et al. But medical information is always changing, and some information given here may be out of date. Each independent review is provided by authors who have no financial association with the drug manufacturer.This series is coordinated by Allen F. 2010;82(4):370-377. Page 4Close-upsA Patient's PerspectiveAm Fam Physician. 2016 Sep 15;94(6):474.Thus far, I've experienced four so-called life-threatening illnesses. Adjusted-dose warfarin versus low-intensity, fixed-dose warfarin plus aspirin for high-risk patients with atrial fibrillation: Stroke Prevention in Atrial Fibrillation III randomised clinical trial. 2010;(8):CD001186.55. Pharmacologic management of newly detected atrial fibrillation: updated clinical practice guideline. J Am Acad Dermatol. 64% with physician impression; the negative predictive value was 97% with a low score vs. Rates of hospital admission vary significantly between communities, but on average less than 5% of all children with croup are admitted to the hospital. 2013;20(2):154-162.36. The objective of preconception interventions for men is to ensure positive outcomes of their reproductive and sexual behaviors, while minimizing negative consequences of unhealthy lifestyle choices. Quantifying asthma symptoms in adults: the Lara Asthma Symptom Scale. Adams NP, Bestall JB, Malouf R, Lasserson TJ, Jones PW. Inhaled beclomethasone versus placebo for chronic asthma. 2012;14(8):1094-1103.23. Use of 13-valent pneumococcal conjugate vaccine and 23-valent pneumococcal polysaccharide vaccine among adults aged ≥65 years: recommendations of the Advisory Committee on Immunization Practices (ACIP). Eur Respir J. Thenappan T, Shah SJ, Rich S, Tian L, Archer SL, Gomberg-Maitland M. 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Performance of the HEMORR(2)HAGES, ATRIA, and HAS-BLED bleeding risk-prediction scores in patients with atrial fibrillation undergoing anticoagulation: the AMADEUS (evaluating the use of SR34006 compared to warfarin or acenocoumarol in patients with atrial fibrillation) study. Comparison of the cost-effectiveness of budesonide and sodium cromoglycate in the management of childhood asthma in everyday clinical practice. Ebell, MD, MS, Deputy Editor.A collection of Point-of-Care Guides published in AFP is available at. 2011;58(4):395-401.33. Analysis by the American Lung Association Research and Health Education Division using SPSS software.4. Centers for Disease Control and Prevention. With these events, if untreated, the child becomes hypoxic and hypercapnic, which eventually result in respiratory failure and arrest.Croup symptoms resolve in most children within 48 hours. Stroke. Steinberg BA, Piccini JP. . 2015;57(1466):51-52.3. Taieb A, Ortonne JP, Ruzicka T, et al.; Ivermectin Phase III Study Group. Nie H, Zhang G, Liu M, Ding X, Huang Y, Hu S. Asthma control can be maintained when fluticasone propionate/salmeterol in a single inhaler is stepped down. For regularly updated information on a variety of health topics, please visit familydoctor.org, the AAFP patient education website. Ir Med J Oral doxycycline monohydrate is a less expensive off-label option costing about \$35 for a one-month supply (100 mg once daily).SIMPLICITYIvermectin cream should be applied once daily in a thin layer covering the entire face. Pycnogenol® (extract of French maritime pine bark) for the treatment of chronic disorders. Women who wish to prevent pregnancy should be offered contraceptive methods approved by the U.S. Food and Drug Administration, an assessment to identify safe methods, counseling to help choose a contraceptive method, and prompt delivery of the contraceptive method selected. DeGaudio JM. The effect of inhaled sodium cromoglycate on cellular infiltration into the bronchial mucosa and the expression of adhesion molecules in asthmatics. Of those admitted, only 1% to 3% are intubated. 2011;16(9):7634-7648.66. Clin Transl Allergy. BMJ. Stringham R, Shah NR. Immunization status should be evaluated annually in all women of reproductive age.Table 1 shows general recommendations for preconception interventions for women.The Centers for Disease Control and Prevention and the U.S. Department of Health and Human Services have recognized the need for improvements in meeting men's reproductive health needs. Do not stop taking the medicine without checking with your doctor. DailyMed: Soolantra—ivermectin cream. Pycnogenol as an adjunct in the management of childhood asthma. You may find it hard to exercise. 2006;117(3):549-556.9. Wood PR, Smith B, O'Donnell L, et al. Wang Y, Lin K, Wang C, Liao X. There are a variety of treatments available for squamous and basal cell carcinoma (which have excellent cure rates), including surgical excision, Mohs micrographic surgery, radiation therapy, curettage and electrodissection, and cryosurgery, among other options.OTHER APPROACHES TO PREVENTIONThe USPSTF recommends that children, adolescents, and young adults aged 10 to 24 years who have fair skin be counseled about minimizing their exposure to ultraviolet radiation to reduce their risk of developing skin cancer.11USEFUL RESOURCESThe Community Preventive Services Task Force has made a number of recommendations related to preventing skin cancer through the use of interventions that target child care centers; outdoor occupational, recreational, and tourism settings; primary and middle schools; and communities (available at. This recommendation statement was first published in JAMA. Hainer BL, Matheson E, Wilkes RT, Holmes DR, Jr, Doshi SK, Kar S, et al. J Thorac Cardiovasc Surg. 2008;1(1):62-73.13. Just two or three years later, a series of pneumonia episodes (eight in 14 months) were caused by aspiration from my sinus into my windpipe. Olschansky B, Rosenfeld LE, Warner AL, et al.; AFFIRM Investigators. During wellness visits, physicians have the opportunity to discuss issues such as intimate partner violence and coercive relationships, and to promote consensual sexual relationships.A link between paternal genetics and age and conditions such as autism and schizophrenia has been found. Uncommon complications of croup include pneumonia, pulmonary edema, and bacterial tracheitis.Search Date: November 2013Adapted with permission from Johnson DW. Leff JA, Busse WW, Pearlman D, et al. 2015;373(9):823-833.51. Not reportedPublished source: AAFP, December 2015Available at: 11JOHN D. Sign Up Now Copyright © 2020 American Academy of Family Physicians. All rights Reserved. Injection allergen immunotherapy for asthma. I feel well except for occasional emergencies. Ariano R, Berto P, Incorvaia C, et al. U.S. National Library of Medicine. An official American Thoracic Society clinical practice guideline: diagnosis, risk stratification, and management of pulmonary hypertension of sickle cell disease. Death and dying from old people's point of view. Clinical classification schemes for predicting hemorrhage: results from the National Registry of Atrial Fibrillation (NRAF). 2015;54(4):609-614.This guide is one in a series that offers evidence-based tools to assist family physicians in improving their decision-making at the point of care.This series is coordinated by Mark H. If referral is not an option, nongout diagnoses, reevaluation in three to six months, and/or a trial of empiric therapy can be considered.A 37-year-old man presents for the second time in 15 months with acute onset of seemingly atraumatic pain, redness, and swelling of the metatarsophalangeal joint in his great toe. A mental health assessment should be included in preconception care because mood and anxiety disorders are highly prevalent in women of reproductive age, with a high prevalence of a previously diagnosed mental health disorder or a new-onset disorder in pregnancy. Janda S, Shahidi N, Qin K, Swiston J. Maintaining asthma control in persistent asthma: comparison of three strategies in a 6-month double-blind randomised study. Common pregnancy-related conditions and corresponding workplace adjustments are described in Table 1.Physicians should know the laws regarding employed pregnant women, and how to write a work accommodation note that will not jeopardize their patients' employment status.Pregnant women are only partially protected at work by a patchwork of federal laws with several caveats. A systematic review. Boskabady MH, Mohsenpoor N, Takaloo L. Is there anything I could have done differently to avoid this outcome?Although many women can continue working during pregnancy without any adjustments, many other women require reasonable accommodations to allow them to continue working effectively and safely.

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