

Cardiac Arrhythmias

Moving to the Beat of a Different Drummer



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KEYWORDS

- Atrial fibrillation • Atrioventricular block • Long QT syndrome • Sick sinus syndrome • Cardiac arrhythmia

KEY POINTS

- Atrial fibrillation is likely the most common arrhythmia, requiring understanding of its symptoms, diagnosis, and therapeutic strategies. Atrial flutter has its own treatment algorithm.
- Atrioventricular block, a major cause of symptomatic bradycardia, and sick sinus syndrome, with age-related changes of the myocardium, may lead to pacemaker placement.
- Long QT syndrome has a strong genetic predisposition. Patients with the diagnosis should have genetic counseling for themselves and their family.
- Wolff-Parkinson-White syndrome can carry a high mortality rate if not intervened on with ablation.
- Sinus arrhythmia is likely a benign, if not adventitious, process that does not require intervention.

INTRODUCTION

Cardiac arrhythmias are represented in large sections of the populations and can be seen in clinical patients routinely. These can range from the benign and latent to the lethal and acutely obvious. They may also be caused by an underlying issue, whether known or not, or by a single event. Knowing the basics of many of these arrhythmias is key to successful diagnosis. Having a deeper understanding of their mechanisms, presenting symptoms, diagnostic properties, and current therapy guideline will enhance the level of care that physician assistants can bring to patients.

ATRIAL FIBRILLATION

Likely the most common arrhythmia that one will encounter, in both inpatient and outpatient presentations, is atrial fibrillation (AF).¹ As of 2014, it was estimated by the American

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College of Cardiology (ACC) that there are anywhere from 2.7 to 6.1 million Americans with AF, with 750,000 admissions and 130,000 deaths for AF-related problems.²

As the population continues to age, this number is expected to increase, thus increasing the demand and interactions with health care providers for monitoring and therapy for AF. Over the past 20 years, starting with the Framingham study publishing epidemiologic data in 1982, the information and understanding related to AF and its causes and subsequent therapeutic options have greatly increased, improving outcomes and changing therapy options.³ Based on data from the AnTicoagulation and Risk Factors in Atrial Fibrillation (ATRIA) trial, it is expected that over the next 50 years the population will see a 2.5-fold increase in AF prevalence.⁴

Prevalence from AF has a direct and linear relationship to age, outside of specific risk factors and comorbidities, with an incidence of 9.9 per 1000 person-years. For patients ages 55 to 60 years, rates are as low as 0.7%; however, incidence rates were high given lifetime risk at 20.7 per 1000 person-years. This is compared with those 85 years or older in whom the rates are increased to 17.8%, incidence of 1.1 per 1000 person-years, with rates similar between men and women. Risk of AF are 24.8% and 22.9% lifetime for men and female aged 55 years, respectively.⁵ These numbers are similar to those published in 1982 from the Framingham study. Older patients are at higher risk of developing AF. About 9% of patients older than the age of 65 years will have issues with AF, compared with just 2% of those younger than 65 years.

Risk Factors

Although age is the largest independent risk factor, it is not alone. Patients with hypertension (HTN), specifically those that are not well controlled, also carry a high risk of developing AF.⁶ Overall, HTN can account for 14% to 22% of cases of AF. Direct myocardial damage, most notably due to infarction, and subsequent atrial dilation due to reduced left ventricular (LV) function are significant causes of AF and the risk reduction of these should be targeted for AF prevention.^{7,8} Many other medical diagnoses are linked to an increased risk of AF development, including acute pulmonary embolism, acute and chronic alcoholism, pneumonia with or without sepsis, pericarditis, and severe electrolyte abnormalities.⁸

What is Atrial Fibrillation?

Before AF can be effectively understood and treated, it must be defined. A simple definition is a cardiac arrhythmia “characterized by the presence of rapid, irregular, fibrillary waves that vary in size, shape, and timing.”⁶ Its full definition is a bit more complicated. The typical electrical activity of the heart is rhythmic and repeatable based on the sinoatrial (SA) node. In AF, however, this typical pattern is in chaos. Usually, the pacemaker current and chronicity of normal electrical stimuli of the atria is maintained by potassium (K) movement through inward rectifier K current (I_K) channels in conjunction with the pacemaker current, also known as funny current (I_f) pacemaker with its effects of diastolic depolarization. In AF, this does not happen in a controlled sequence but, instead, with multiple cellular depolarizations with re-entry.³ This causes elevated atrial contractions with rates as high as 400 to 600 beats per minute (BPM), causing atrial contractions to resemble quivering, rather than controlled, contractions.^{9–11}

The initiation of AF usually requires a trigger; typically, either underlying cardiac or noncardiac disease is also present.⁶ In addition to the trigger, the driver, or the mechanism causing and maintaining the atrial rate, is caused by 3 distinct means: (1) an ectopic focus, (2) single circuit reentry, or (3) multiple circuit reentry. Once these drivers converge to create a self-sustaining circuit consisting of multiple reentry circuits, a sustained AF rate or rhythm is created.⁶

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