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## CARDIOLOGY BOARD REVIEW MANUAL

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## Current Topics in Electrophysiology: Case Studies

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## Current Topics in Electrophysiology: Case Studies

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### I. INTRODUCTION

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Because cardiology is dominated by pictures, clinical electrophysiology can seem esoteric and daunting. For example, to analyze data from electrophysiology studies in a clinically useful manner, the cardiologist must be able to envision temporal and spatial relationships. Unfortunately, most training programs spend comparatively little time on electrophysiology. Currently, less information is available to guide practice (ie, data from large randomized trials) compared with other areas of cardiology, leading to a wide array of practice styles. Thus, there is a definite need for review articles in clinical electrophysiology that are written by clinicians with experience in this area.

The general cardiologist faces many management decisions involving electrophysiology, and fortunately the knowledge base is growing rapidly. Three case patients are presented in this review to introduce concepts important to the evaluation and management of **syncope, supraventricular tachycardia, and ventricular tachycardia**. It is impossible to comprehensively discuss these topics in a single article or in this format, but references to seminal papers and review articles are provided.

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### II. SYNCOPE

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#### GENERAL PRINCIPLES

Syncope, transient loss of both consciousness and postural tone with subsequent spontaneous and complete recovery, is among the most commonly encountered problems in cardiology. Its incidence increases with age, and it affects more than 5% of elderly persons.<sup>1</sup>

Most causes of syncope are not life threatening, but cardiac causes have been associated with a poor prognosis.<sup>2</sup> Nevertheless, the effect of benign causes of syncope is substantial. Patients diagnosed with a benign cause can be injured or be forced to make substantial lifestyle alterations. Up to 65% of people who experience syncope limit their daily activities voluntarily in response to their fear of having a repeat episode.<sup>3</sup>

Assessing the cause and assigning a level of future risk can be difficult and often inconclusive.<sup>4</sup> Ultimately, the presumptive cause of syncope is based most frequently on the history and physical examination. Selective confirmatory tests aid in risk stratification and increase diagnostic certainty. These tests include ambulatory electrocardiography (ECG Holter monitoring), head-upright tilt-table testing (HUT), signal-averaged electrocardiography (SAECG), event ECG monitoring, and electrophysiology studies. Because patients with syncope and structural heart disease have a poorer outcome than those without structural abnormalities, one of the most important initial diagnostic steps is to identify patients with abnormal hearts. Patients with structurally abnormal hearts have a higher susceptibility to dysrhythmias, which often necessitates electrophysiology testing at an early stage.<sup>5,6</sup> For syncope to occur, the brain must transiently cease to function normally. **The most common cause of syncope is sufficiently diminished blood flow to the brain** globally or selectively in the reticular activating system. Any conduit or component system that maintains blood pressure can fail, leading to a loss of consciousness (**Table 1**).

**Preload** and **afterload** are important determinants of cardiac output and cerebral blood flow. In most neurally mediated syncope, the common thread is an exaggerated reflex resulting in bradycardia, vasodilation, or both. These syndromes can be subdivided by their triggers into groups such as vasovagal, carotid sinus hypersensitivity, and neurocardiogenic syncope. In neurocardiogenic syncope, orthostatic stress and catecholamines combine to cause the abnormal reflex. A related cause of syncope is orthostasis (triggered by standing erect), which is the result of a sustained problem in the regulation of blood pressure in response to gravitational stress. Finally, transient obstructions to flow, such as a pulmonary embolus, can cause syncope.

The **heart** itself can be the problem. Cardiac output falls during either bradycardia (slow heartbeat) or tachycardia (rapid heart rate). In contrast to the previously mentioned causes, these dysrhythmias can be life threatening and are associated frequently with structural heart disease. A main job of the cardiology consultant is to identify and aggressively treat these patients.