**Cardiac Electrophysiological (EP) Studies**

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### Overview
This Coverage Policy addresses invasive cardiac electrophysiological (EP) studies

### Coverage Policy
A cardiac electrophysiological (EP) study is considered medically necessary when ANY of the following criteria are met:

**Primary Prevention of Sudden Cardiac Death (SCD) in an Individual with Ischemic Heart Disease**
- to determine eligibility for an implantable cardioverter defibrillator (ICD), if meaningful survival of greater than one year is expected, in an individual with nonsustained ventricular tachycardia (NSVT) due to prior myocardial infarction (MI), LVEF ≤ 40%

**Secondary Prevention of SCD**
- for risk stratification for SCD if meaningful survival greater than one year is expected in an individual with nonischemic cardiomyopathy (NICM), who experiences syncope presumed to be due to VA and who do not meet indications for a primary prevention ICD

**Evaluation of Ventricular Arrhythmias (VA)**
• to assess the risk of sustained VT in an individual with ischemic cardiomyopathy, NICM, or adult congenital heart disease who have syncope or other VA symptoms and who do not meet indications for a primary prevention ICD

Adult Congenital Heart Disease
• to evaluate the risk of sustained VT/VF in an adult with repaired Tetralogy of Fallot physiology with high-risk characteristics and frequent VA
• to determine eligibility for an ICD for inducible sustained VA, if meaningful survival of greater than one year is expected, in an individual with repaired moderate or severe complexity adult congenital heart disease with unexplained syncope and at least moderate ventricular dysfunction or marked hypertrophy

Cardiac Sarcoidosis
• to determine eligibility for an ICD, if sustained VA is inducible and meaningful survival of greater than one year is expected, in an individual with cardiac sarcoidosis and LVEF ≥ 35

Syncope
• for the evaluation of an individual with syncope of suspected arrhythmic etiology

Supraventricular Tachycardia (SVT) of Unknown Mechanism
• for the diagnosis and potential treatment of SVT

Symptomatic Individuals with Manifest Accessory Pathways
• to risk-stratify for life-threatening arrhythmic events

Asymptomatic Individual with Asymptomatic Pre-Excitation
• to risk-stratify for arrhythmic events

Initial clinical evaluation in patients with Atrial Fibrillation (AF)
• to clarify the mechanism of wide-QRS-complex tachycardia
• to identify a predisposing arrhythmia such as atrial flutter or paroxysmal supraventricular tachycardia
• to seek sites for curative AF ablation or atrioventricular (AV) conduction block/modification

Arrhythmogenic Right Ventricular Cardiomyopathy
• in an asymptomatic individual with clinical evidence of arrhythmogenic right ventricular cardiomyopathy

Brugada Syndrome
• asymptomatic Brugada syndrome and a spontaneous type 1 Brugada electrocardiographic pattern

For all other indications including the following, an EP study is considered not medically necessary:
• hypertrophic cardiomyopathy (HCM) for risk stratification
• for the sole reason of inducing VA for risk stratification in an individual who meets criteria for ICD implantation
• for risk stratification for VA in the setting of long QT syndrome, catecholaminergic polymorphic ventricular tachycardia, short QT syndrome, or early repolarization syndromes

General Background

The heart produces electrical signals that spread through the heart muscle to make the muscle contract. The signals are small but can be picked up on an electrocardiograph machine. The electrocardiogram (EKG) can be helpful but often the signals are so small that they cannot be seen on an EKG or are hidden providing just a brief snapshot of the heart’s electrical activity. Even tests that stretch over a longer period of time, such as a Holter monitor, may not capture an event. A cardiac electrophysiology (EP) study permits a detailed analysis of the
mechanism(s) underlying the cardiac arrhythmia, precise location of the site of origin, and, if applicable, definitive treatment via catheter-based ablation techniques.

The indications for an invasive cardiac electrophysiology study can be broken down to two categories: diagnostic and risk stratification. An EP study can accomplish the following goals (Homoud, 2018):

- definitive diagnosis of an arrhythmia
- establish the etiology for syncope
- stratification for risk of sudden cardiac death
- evaluate the feasibility or outcome of nonpharmacologic therapy

Absolute contraindications to EP study include (Homoud, 2018):

- unstable angina
- bacteremia or septicemia
- acute decompensated congestive heart failure not caused by the arrhythmia
- major bleeding diathesis
- acute lower extremity venous thrombosis if femoral vein cannulation is desired

An invasive EP study is generally performed in a dedicated EP laboratory. In addition to the cardiac electrophysiologist, several other staff members are required. Intravenous conscious sedation is typically, although in some situations (i.e., prolonged catheter ablation procedures) general anesthesia can be used (Homoud, 2018).

The preprocedure evaluation for an invasive EP study includes a thorough history and physical examination and review of the available EKGs, both at baseline and, if available, during the tachycardia. In select patients additional evaluation prior to the procedure may include (Homoud, 2018):

- Event monitoring for up to four weeks to document the tachycardia.
- Transthoracic echocardiography to assess for structural heart disease. Cardiac magnetic resonance imaging may be considered for special situations (e.g., suspicion of arrhythmogenic right ventricular cardiomyopathy, hypertrophic cardiomyopathy).
- Exercise testing, if there is a history of exercise-induced arrhythmia.
- Cardiac catheterization and coronary angiography, if indicated by the individual's clinical presentation and symptoms suggesting coronary heart disease.

In most individuals, all atrioventricular (AV) nodal blocking agents, including calcium and beta blockers, digoxin, and class I and III antiarrhythmic drugs are discontinued several days prior to the scheduled procedure. In nearly all EP studies, venous vascular access is required, often from multiple sites. The femoral approach is most common, but the subclavian, internal jugular, or brachial approach may be used, most often for placement of a catheter in the coronary sinus. Multipolar electrode catheters are positioned in the heart (Homoud, 2018).

Complications of an invasive cardiac EP study are rare but potentially life threatening. The risks associated with undergoing only an EP study are small. Myocardial perforation with cardiac tamponade, pseudoaneurysms at arterial access sites, and provocation of nonclinical arrhythmias can occur, each with less than a 1/500 incidence; the addition of therapeutic maneuvers (e.g., ablation) to the procedure increases the incidence of complications. Because an EP study carries a relatively small but finite risk of major as well as minor complications and routinely involve the purposeful induction of serious arrhythmias, it is important that their clinical usefulness for diagnosis and therapy of cardiac arrhythmias be carefully considered (Miller, et al., 2019; Homoud, 2018).

**Professional Societies/Organizations**

The American College of Cardiology (ACC)/American Heart Association (AHA) and Heart Rhythm Society (HRS) have numerous guidelines that address recommendations for an EP study. The recommendations listed in the clinical practice guidelines are, whenever possible, evidence-based. The Class of Recommendation (COR)
indicates the strength of the recommendation, encompassing the estimated magnitude and certainty of benefit in proportion to risk. The Level of Evidence (LOE) rates the quality of scientific evidence that supports the intervention on the basis of the type, quantity, and consistency of data from clinical trials and other sources.

Guideline Class of Recommendation (COR) and Level of Evidence (LOE) are described as follows:

Class (Strength) of Recommendation:
- Class I (Strong) Benefit >>>Risk
- Class IIa (Moderate) Benefit>>Risk
- Class IIb (Weak) Benefit ≥ Risk
- Class III No Benefit (Moderate) Benefit=Risk
- Class III Harm (Strong) Risk>Benefit

Level (Quality) of Evidence:
- Level A if the data were derived from high-quality evidence from more than one randomized clinical trial (RCT), meta-analyses of high-quality RCTs, or one or more RCTs corroborated by high-quality registry.
- Level B-R when data were derived from moderate quality evidence from one or more RCTs, or meta-analyses of moderate-quality RCTs.
- Level B-NR was used to denote moderate-quality evidence from one or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies. This designation was also used to denote moderate-quality evidence from meta-analyses of such studies.
- Level C-LD when the primary source of the recommendation was randomized or nonrandomized observational or registry studies with limitations of design or execution, meta-analyses of such studies, or physiological or mechanistic studies of human subjects.
- Level C-EO was defined as expert opinion based on the clinical experience of the writing group.

| American Heart Association (AHA)/American College of Cardiology (ACC)/Health Rhythm Society (HRS) Guideline for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death (Al-Khatib, et al., 2017) |
|-----------------------------------------------|-------------------------------------------------|-----------------|
| Indication | Recommendation for EP Study | COR/LOE |
| Primary Prevention of SCD in Patients With Ischemic Heart Disease | In patients with NSVT due to prior MI, LVEF of 40% or less and inducible sustained VT or VF at electrophysiological study, an ICD is recommended if meaningful survival of greater than 1 year is expected | I/B-NR |
| Secondary Prevention of SCD in Patients With Nonischemic Cardiomyopathy (NICM) | In patients with NICM who experience syncope presumed to be due to VA and who do not meet indications for a primary prevention ICD, an ICD or an electrophysiological study for risk stratification for SCD can be beneficial if meaningful survival greater than 1 year is expected | IIa/B-R |
| Ventricular Arrhythmias (VA) | In patients with ischemic cardiomyopathy, nonischemic cardiomyopathy (NICM), or adult congenital heart disease who have syncope or other VA symptoms and who do not meet indications for a primary prevention ICD, an electrophysiological study can be useful for assessing the risk of sustained VT | IIa/B-R |
| Adult Congenital Heart Disease | In adults with repaired tetralogy of Fallot physiology with high-risk characteristics and frequent VA, an electrophysiological study can be useful to evaluate the risk of sustained VT/VF | IIa/B-NR |
| | In patients with repaired moderate or severe complexity adult congenital heart disease with unexplained syncope and at least moderate ventricular dysfunction or marked hypertrophy, either ICD implantation or an electrophysiological study with ICD implantation for inducible sustained VA is reasonable if meaningful survival of greater than 1 year is expected | IIa/B-NR |
Cardiac Sarcoidosis
In patients with cardiac sarcoidosis and LVEF greater than 35%, it is reasonable to perform an electrophysiological study and to implant an ICD, if sustained VA is inducible, provided that meaningful survival of greater than 1 year is expected
IIa/C-LD

Arrhythmogenic Right Ventricular Cardiomyopathy
In asymptomatic patients with clinical evidence of arrhythmogenic right ventricular cardiomyopathy, an electrophysiological study may be considered for risk stratification
IIb/B-NR

Brugada Syndrome
In patients with asymptomatic Brugada syndrome and a spontaneous type 1 Brugada electrocardiographic pattern, an electrophysiological study with programmed ventricular stimulation using single and double extra stimuli may be considered for further risk stratification
IIb/B-NR

Hypertrophic Cardiomyopathy
In patients with HCM, an invasive electrophysiological study with programmed ventricular stimulation should not be performed for risk stratification
III/B-NR

Ventricular Arrhythmias (VA)
In patients who meet criteria for ICD implantation, an electrophysiological study for the sole reason of inducing VA is not indicated for risk stratification
III/B-R

An electrophysiologic study is not recommended for risk stratification for VA in the setting of long QT syndrome, catecholaminergic polymorphic ventricular tachycardia, short QT syndrome, or early repolarization syndromes
III/B-R


<table>
<thead>
<tr>
<th>Indication</th>
<th>Recommendation for EP Study</th>
<th>COR/LOE</th>
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<tbody>
<tr>
<td>Syncope</td>
<td>EP study can be useful for evaluation of selected patients with syncope of suspected arrhythmic etiology</td>
<td>IIa/B-NR</td>
</tr>
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ACC/AHA/HRS Guideline for the Management of Adult Patients With Supraventricular Tachycardia (Page, et al., 2016)

<table>
<thead>
<tr>
<th>Indication</th>
<th>Recommendation for EP Study</th>
<th>COR/LOE</th>
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<tbody>
<tr>
<td>SVT of Unknown Mechanism</td>
<td>EP study with the option of ablation is useful for the diagnosis and potential treatment of SVT</td>
<td>I/B-NR</td>
</tr>
<tr>
<td>Symptomatic Patients With Manifest Accessory Pathways</td>
<td>An EP study is useful in symptomatic patients with pre-excitation to risk-stratify for life-threatening arrhythmic events</td>
<td>I/B-NR</td>
</tr>
<tr>
<td>Asymptomatic Patients With Asymptomatic Pre-Excitation</td>
<td>An EP study is reasonable in asymptomatic patients with pre-excitation to risk-stratify for arrhythmic events</td>
<td>IIa/B-NR</td>
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AHA/ACC/HRS Guideline for the Management of Patients with Atrial Fibrillation

**Class I**
- Electrocardiographic documentation is recommended to establish the diagnosis of atrial fibrillation (AF) (Level of Evidence: C).

The guideline states that the diagnosis of AF in a patient is based on the patient’s clinical history and physical examination and is confirmed by ECG, ambulatory rhythm monitoring (e.g., telemetry, Holter monitor, event recorders), implanted loop recorders, pacemakers or defibrillators, or, in rare cases, by electrophysiological study. An electrophysiological study can be helpful when initiation of AF is due to a supraventricular tachycardia, such as atrioventricular node (AV) node reentrant tachycardia, AV reentry involving an accessory pathway, or ectopic atrial tachycardia. Electrophysiological study is often warranted in patients with a delta wave on the surface ECG indicating pre-excitation. Some patients with AF also have atrial flutter that may benefit from
treatment with radiofrequency catheter ablation. AF associated with rapid ventricular rates and a wide-complex QRS (aberrant conduction) may sometimes be mislabeled as ventricular tachycardia, and an electrophysiological study can help establish the correct diagnosis (January, et al., 2014). Electrophysiological studies were not addressed in the 2019 focused update to the 2014 guideline (January, et al., 2019).

Pediatric and Congenital Electrophysiology Society (PACES)/HRS Expert Consensus Statement on the Management of the Asymptomatic Young Patient with a Wolff-Parkinson-White (WPW, Ventricular Preexcitation) Electrocardiographic Pattern: The guideline discusses rationale, definition, and techniques for an invasive EP study stating that in the absence of a clear understanding of the accessory pathway anterograde characteristics by noninvasive testing, invasive testing should be considered. The purpose of such an invasive EP study in asymptomatic patients with a WPW ECG pattern is to identify a potential subgroup of patients who may be at increased risk for lethal cardiac arrhythmias and in whom the risk-to-benefit ratio favors ablation (Cohen, et al., 2012).

ACC/AHA Guidelines for Clinical Intracardiac Electrophysiological and Catheter Ablation Procedures:
Recent textbook literature reports that the basic themes of the 1995 ACC/AHA Guidelines for Clinical Intracardiac Electrophysiological and Catheter Ablation Procedures remain valid (Miller, et al., 2019).

Guideline recommendations for an electrophysiological study are classified as Class I, Class II, and Class III. The classification system is described as follows:

Class I: Conditions for which there is general agreement that the electrophysiological study provides information that is useful and important for patient treatment. Experts agree that patients with these conditions are likely to benefit from electrophysiological studies.

Class II: Conditions for which electrophysiological studies are frequently performed, but there is less certainty about the usefulness of the information that is obtained. Experts are divided in their opinion as to whether patients with these conditions are likely to benefit from electrophysiological study.

Class III: Conditions for which there is general agreement that electrophysiological studies do not provide useful information. Experts agree that electrophysiological studies are not warranted in patients with these conditions. This classification is assigned to patients with a variety of arrhythmias and clinical syndromes resulting from cardiac electrical abnormalities. Because use of electrophysiological studies in children on occasion differs from that in adults, it is discussed in another section.


<table>
<thead>
<tr>
<th>Evaluation of Specific Electrocardiographic Abnormalities</th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
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<tbody>
<tr>
<td>Evaluation of sinus node function</td>
<td>Symptomatic patients in whom sinus node dysfunction is suspected as the cause of symptoms, but a causal relationship between an arrhythmia and the symptoms has not been established after appropriate evaluation</td>
<td>Patients with documented sinus node dysfunction in whom evaluation of AV or ventriculoatrial conduction or susceptibility to arrhythmias may aid in selection of the most appropriate pacing modality</td>
<td>Symptomatic patients in whom an association between symptoms and a documented bradyarrhythmia has been established and the choice of therapy would not be affected by EP study results</td>
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<td></td>
<td>Patients with electrocardiographically documented sinus bradyarrhythmias to determine whether abnormalities are caused by intrinsic disease, autonomic nervous system dysfunction, or effects of drugs to help select therapeutic options</td>
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<td>Asymptomatic patients with sinus bradyarrhythmias or sinus pauses observed only during sleep, including sleep apnea</td>
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<tr>
<td>Condition</td>
<td>Indications</td>
<td>Remarks</td>
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| Acquired AV block                             | Symptomatic patients in whom His-Purkinje block, suspected as a cause of symptoms, has not been established.  
 Patients with second- or third-degree AV block treated with a pacemaker who remain symptomatic and in whom another arrhythmia is suspected as a cause of the symptoms. | Symptomatic patients in whom the symptoms and presence of AV block are correlated by ECG findings.  
 Asymptomatic patients with transient AV block associated with sinus slowing (e.g., nocturnal type I second-degree AV block). |
| Chronic intraventricular conduction delay     | Symptomatic patients in whom the cause of symptoms is not known.                                | Asymptomatic patients with bundle branch block in whom pharmacologic therapy that could increase conduction delay or produce heart block is contemplated.  
 Asymptomatic patients with intraventricular conduction delay.  
 Symptomatic patients whose symptoms can be correlated with or excluded by ECG events. |
| Narrow-QRS tachycardia (QRS complex <0.12 sec) | Patients with frequent or poorly tolerated episodes of tachycardia who do not adequately respond to drug therapy and for whom information about the site of origin, mechanism, and electrophysiologic properties of pathways of the tachycardia is essential for choosing appropriate therapy (e.g., drugs, catheter ablation, pacing, or surgery).  
 Patients who prefer ablative therapy to pharmacologic treatment. | Patients with frequent episodes of tachycardia requiring drug treatment for whom there is concern about proarrhythmia or effects of the antiarrhythmic drug on the sinus node or AV conduction.  
 Patients with tachycardias easily controlled by vagal maneuvers and/or well-tolerated drug therapy who are not candidates for nonpharmacologic therapy. |
| Wide-complex tachycardias                     | Patients with wide–QRS complex tachycardia in whom the correct diagnosis is unclear after analysis of available ECG tracings and for whom knowledge of the correct diagnosis is necessary for care. | None.                                                                                     | Patients with VT or supraventricular tachycardia with aberrant conduction or preexcitation syndromes diagnosed with certainty by ECG criteria and for whom invasive electrophysiologic data would not influence therapy; however, data obtained at baseline EP study in these patients might be appropriate as a guide for subsequent therapy. |
| Prolonged–QT interval syndrome                 | None.                                                                                           | Identification of proarrhythmic effect of a drug in patients experiencing sustained VT or cardiac arrest while receiving the drug. | Patients with clinically manifest congenital QT prolongation, with or without symptomatic arrhythmias.  
 Patients with acquired QT prolongation. |
Patients who have equivocal abnormalities in QT interval duration or T-U wave configuration, along with syncope or symptomatic arrhythmias, in whom the effects of catecholamine may unmask a distinct QT abnormality

Wolff-Parkinson-White syndrome

Patients with ventricular preexcitation who have survived cardiac arrest or who have unexplained syncope

Symptomatic patients in whom determination of the mechanism of arrhythmia or knowledge of the electrophysiologic properties of the accessory pathway and normal conduction system would help in determining appropriate therapy

Asymptomatic patients with a family history of sudden cardiac death or with ventricular preexcitation but no spontaneous arrhythmia who engage in high-risk occupations or activities and in whom knowledge of the electrophysiologic properties of the accessory pathway or inducible tachycardia may help determine recommendations for further activities or therapy

Asymptomatic patients with ventricular preexcitation who are undergoing cardiac surgery for other reasons

Premature ventricular complexes (PVCs), couplets, and nonsustained VT

None

Asymptomatic or mildly symptomatic patients with PVCs, couplets, and nonsustained VT who are considered potential candidates for catheter ablation

Patients with other risk factors for future arrhythmic events, such as a low ejection fraction, positive signal-averaged electrocardiogram, and nonsustained VT on ambulatory ECG recordings in whom EP study will be used for further risk assessment and for guiding therapy in patients with inducible VT

Patients with highly symptomatic, uniform morphology PVCs, couplets, and nonsustained VT who are undergoing cardiac surgery for other reasons

Patients with highly symptomatic, uniform morphology PVCs, couplets, and nonsustained VT without other risk factors for sustained arrhythmias

Evaluation of Clinical Syndromes

Unexplained syncope

Patients with suspected structural heart disease and syncope that remain unexplained after appropriate evaluation

Patients with recurrent unexplained syncope but without structural heart disease and a negative head-up tilt test result

Patients with a known cause of syncope for whom treatment will not be guided by electrophysiologic testing

Survivors of cardiac arrest

Patients surviving cardiac arrest without evidence of acute Q wave MI

Patients surviving cardiac arrest caused by bradyarrhythmia

Patients surviving cardiac arrest that occurred during acute phase (<48 hr) of MI

Patients surviving a cardiac arrest that occurred during acute phase (<48 hr) of MI

Patients with cardiac arrest resulting from clearly definable specific causes, such as reversible ischemia, severe valvular aortic stenosis, or noninvasively defined
### Congenital or Acquired Long-QT Syndrome

Patients with palpitations suspected to be of cardiac origin in whom the symptoms are sporadic and cannot be documented; studies performed to determine mechanisms of arrhythmias, direct or provide therapy, or assess prognosis.

### Unexplained Palpitations

Patients with palpitations who have their pulse rate documented by medical personnel as inappropriately rapid and in whom ECG recordings fail to document the cause of the palpitations.

Patients with palpitations preceding a syncopal episode.

### Patients with Palpitations Documented to Result from Extracardiac Causes (E.g., Hyperthyroidism)

Patients with palpitations documented to result from extracardiac causes.

### Therapeutic Intervention

#### Guidance of Drug Therapy

Patients with sustained VT or cardiac arrest, especially those with prior MI.

Patients with atrial tachycardia, atrial flutter, AF, or atrial flutter without ventricular preexcitation syndrome for whom chronic drug therapy is planned.

Patients with isolated atrial or ventricular premature complexes.

Patients with AVNRT, AV reentrant tachycardia using an accessory pathway, or AF associated with an accessory pathway for whom chronic drug therapy is planned.

Patients with ventricular fibrillation with a clearly identified reversible cause.

#### Patients Who Are Candidates for or Who Have Implantable Electrical Devices

Patients with tachyarrhythmias before and during implantation and final (predischarge) programming of an electrical device to confirm its ability to perform as anticipated.

Patients with an implanted electrical antitachycardia device in whom changes in status or therapy may have influenced the continued safety and efficacy of the device.

Patients with atrial tachycardia, atrial flutter, or atrial fibrillation with a clearly identified reversible cause.

Patients who have a pacemaker to treat a bradyarrhythmia and receive an ICD to test for device interactions.

Patients with previously documented indications for pacemaker implantation to test for the most appropriate long-term pacing mode and sites to optimize symptomatic improvement and hemodynamics.

Patients who are not candidates for device therapy.

#### Centers for Medicare & Medicaid Services (CMS)

- National Coverage Determinations (NCDs): There is a NCD titled Diagnostic Endocardial Electrical Stimulation (Pacing) 20.12 effective 12/3/1984. Refer to the CMS NCD table of contents link in the reference section. This Medical Coverage Policy is broader in scope.

- Local Coverage Determinations (LCDs): No LCDs found.

#### Use Outside of the US

The European Heart Rhythm Association (EHRA) and the European Society of Cardiology (ESC) have guidelines that address recommendations for an EP study.

Guideline recommendations are classified as Class I, Class IIa, Class IIb, and Class III. The classification system is described as follows:
- **Class I**: Benefit >>> Risk; Procedure/Treatment should be performed/administered
- **Class IIA**: Benefit >> Risk; Additional studies with focused objectives needed. It is reasonable to perform procedure/administer treatment
- **Class IIB**: Benefit ≥ Risk; Additional studies with broad objectives needed; additional registry data would be helpful. Procedure/treatment may be considered.
- **Class III**: No Benefit. Procedure/Test not helpful/Treatment: no proven benefit
- **Class III** Harm. Procedure/Test: Excess cost without benefit, or harmful. Treatment: harmful to patients

The weight of evidence supporting each recommendation is classified as follows:
- **Level A**: Multiple populations evaluated. Data derived from multiple randomized clinical trials or meta-analyses.
- **Level B**: Limited populations evaluated. Data derived from a single randomized trial or nonrandomized studies.
- **Level C**: Very limited populations evaluated. Only consensus opinion of experts, case studies, or standard of care.

### European Heart Rhythm Association (EHRA)/HRS/Asia Pacific Heart Rhythm Society (APHRS) Expert Consensus on Ventricular Arrhythmias (Pedersen, et al., 2014)

<table>
<thead>
<tr>
<th>Indication</th>
<th>Recommendation for EP Study</th>
<th>COR/LOE</th>
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<tbody>
<tr>
<td>Non-sustained ventricular arrhythmia (VA)</td>
<td>An invasive EP study should be considered in patients with significant structural heart disease (SHD) and non-sustained VAs especially if accompanied by unexplained symptoms such as syncope, near-syncope, or sustained palpitations</td>
<td>IIa/C</td>
</tr>
<tr>
<td>Sustained monomorphic ventricular tachycardia (SMVT)</td>
<td>For patients with a wide QRS complex tachycardia in whom the diagnosis is uncertain, an invasive EP study should be considered to identify the tachycardia mechanism</td>
<td>IIa/C</td>
</tr>
</tbody>
</table>

### European Society of Cardiology (ESC) Guidelines for the Management of Patients with Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death (Priori, et al., 2015)

<table>
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<tr>
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<tbody>
<tr>
<td>Suspected or known ventricular arrhythmias</td>
<td>In patients with coronary artery disease (CAD) for diagnostic evaluation of patients with remote myocardial infarction with symptoms suggestive of ventricular tachyarrhythmias, including palpitations, presyncope and syncope</td>
<td>I/B</td>
</tr>
<tr>
<td>In patients with syncope when bradyarrhythmias or tachyarrhythmias are suspected, based on symptoms (e.g. palpitations) or the results of non-invasive assessment, especially in patients with structural heart disease</td>
<td>I/B</td>
<td></td>
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<tr>
<td>For the differential diagnosis of arrhythmogenic right ventricular cardiomyopathy (ARVC) and benign right ventricular outflow tract (RVOT) tachycardia or sarcoidosis</td>
<td>IIb/B</td>
<td></td>
</tr>
<tr>
<td>Risk stratification and management of patients with dilated cardiomyopathy</td>
<td>Invasive EP study with programmed ventricular stimulation (PVS) may be considered for risk stratification of sudden cardiac death (SCD)</td>
<td>IIb/B</td>
</tr>
<tr>
<td>Prevention of SCD in patients with hypertrophic cardiomyopathy</td>
<td>Invasive EP study with PVS is not recommended for stratification of SCD risk</td>
<td>III/C</td>
</tr>
<tr>
<td>Risk stratification and management of patients with arrhythmogenic right ventricular cardiomyopathy</td>
<td>Invasive EP study with PVS may be considered for stratification of SCD risk</td>
<td>IIb/C</td>
</tr>
</tbody>
</table>
Risk stratification and management in Long QT Syndrome

Invasive EP study with PVS is not recommended for SCD risk stratification

III/C

Risk stratification and management in Short QT Syndrome

Invasive EP study with PVS is not recommended for SCD risk stratification

III/C

Risk stratification and management in Catecholaminergic Polymorphic Ventricular Tachycardia

Invasive EP study with PVS is not recommended for stratification of SCD risk

III/C

Management of ventricular arrhythmias in valvular heart disease

An EP study with standby catheter ablation should be considered in patients who develop VT following valvular surgery in order to identify and cure bundle branch re-entry VT

IIa/C

ESC Guidelines for the Diagnosis and Management of Syncope (Brignole, et al., 2018)

<table>
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<tbody>
<tr>
<td>Syncope</td>
<td>In patients with syncope and previous myocardial infarction, or other scar-related conditions, EP study is indicated when syncope remains unexplained after non-invasive evaluation</td>
</tr>
<tr>
<td></td>
<td>In patients with syncope and bifascicular bundle branch block (BBB), EP study should be considered when syncope remains unexplained after non-invasive evaluation</td>
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<td>In patients with syncope and asymptomatic sinus bradycardia, EP study may be considered in a few instances when non-invasive tests (e.g. ECG monitoring) have failed to show a correlation between syncope and bradycardia</td>
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<tr>
<td></td>
<td>In patients with syncope preceded by sudden and brief palpitations, EP study may be considered when syncope remains unexplained after non-invasive evaluation</td>
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A section of the guideline addresses additional advice and clinical perspectives stating:

- In general, whereas a positive EP study predicts the cause of syncope, a negative study is unable to exclude an arrhythmic syncope and further evaluation is warranted.
- The induction of polymorphic VT or VF in patients with ischemic cardiomyopathy or DCM cannot be considered a diagnostic finding of the cause of syncope.
- EP study is generally not useful in patients with syncope, normal ECG, no heart disease, and no palpitations.

Coding/Billing Information

Note: 1) This list of codes may not be all-inclusive.
   2) Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement.

Considered Medically Necessary when criteria in the applicable policy statements listed above are met:

<table>
<thead>
<tr>
<th>CPT® Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>93619</td>
<td>Comprehensive electrophysiologic evaluation with right atrial pacing and recording, right ventricular pacing and recording, His bundle recording, including insertion and repositioning of multiple electrode catheters, without induction or attempted induction of arrhythmia</td>
</tr>
<tr>
<td>93620</td>
<td>Comprehensive electrophysiologic evaluation including insertion and repositioning of multiple electrode catheters with induction or attempted induction of arrhythmia; with right atrial pacing and recording, right ventricular pacing and recording, His bundle recording</td>
</tr>
<tr>
<td>93621</td>
<td>Comprehensive electrophysiologic evaluation including insertion and repositioning of multiple electrode catheters with induction or attempted induction of arrhythmia; with left atrial pacing</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
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</tr>
<tr>
<td>93622</td>
<td>Comprehensive electrophysiologic evaluation including insertion and repositioning of multiple electrode catheters with induction or attempted induction of arrhythmia; with left ventricular pacing and recording (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>93623</td>
<td>Programmed stimulation and pacing after intravenous drug infusion (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>93624</td>
<td>Electrophysiologic follow-up study with pacing and recording to test effectiveness of therapy, including induction or attempted induction of arrhythmia</td>
</tr>
<tr>
<td>93654</td>
<td>Comprehensive electrophysiologic evaluation including insertion and repositioning of multiple electrode catheters with induction or attempted induction of an arrhythmia with right atrial pacing and recording, right ventricular pacing and recording (when necessary), and His bundle recording (when necessary) with intracardiac catheter ablation of arrhythmogenic focus; with treatment of ventricular tachycardia or focus of ventricular ectopy including intracardiac electrophysiologic 3D mapping, when performed, and left ventricular pacing and recording, when performed</td>
</tr>
<tr>
<td>93655</td>
<td>Intracardiac catheter ablation of a discrete mechanism of arrhythmia which is distinct from the primary ablated mechanism, including repeat diagnostic maneuvers, to treat a spontaneous or induced arrhythmia (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>93662</td>
<td>Intracardiac echocardiography during therapeutic/diagnostic intervention, including imaging supervision and interpretation (List separately in addition to code for primary procedure)</td>
</tr>
</tbody>
</table>


**References**


18. Pediatric and Congenital Electrophysiology Society (PACES); Heart Rhythm Society (HRS); American College of Cardiology Foundation (ACCF); American Heart Association (AHA); American Academy of Pediatrics (AAP); Canadian Heart Rhythm Society (CHRS), Cohen MI, Friedman JK, Cannon BC, Davis AM, Drago F, Janousek J, Klein GJ, Law IH, Morady FJ, Paul T, Perry JC, Sanatani S, Tanel RE. PACES/HRS expert consensus statement on the management of the asymptomatic young patient with a
Wolff-Parkinson-White (WPW, ventricular preexcitation) electrocardiographic pattern: developed in partnership between the Pediatric and Congenital Electrophysiology Society (PACES) and the Heart Rhythm Society (HRS). Endorsed by the governing bodies of PACES, HRS, the American College of Cardiology Foundation (ACCF), the American Heart Association (AHA), the American Academy of Pediatrics (AAP), and the Canadian Heart Rhythm Society (CHRS). Heart Rhythm. 2012 Jun;9(6):1006-24.


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