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# CLINICAL GUIDELINES

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Cardiology Services

# Overview Statement

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The purpose of these clinical guidelines is to assist healthcare professionals in selecting the medical service that may be appropriate and supported by evidence to improve patient outcomes. These clinical guidelines neither preempt the clinical judgment of trained professionals nor advise anyone on how to practice medicine. The healthcare professionals are responsible for all clinical decisions based on their assessment. These clinical guidelines do not provide authorization, certification, explanation of benefits, or guarantee of payment, nor do they substitute for, or constitute, medical advice.

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# Cardiac Ablation

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Utilization of a cardiac ablation may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

1. Ablation for atrial fibrillation (a-fib) may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Patient has atrial fibrillation that terminates spontaneously within seven (7) days of onset or within 48 hours or less with electrical or pharmacological cardioversion;
  - Patient has continuous atrial fibrillation that is sustained for greater than seven (7) days or does not convert after greater than 48 hours following electrical or pharmacological cardioversion; and **EITHER** of the following:
    - Patient had poor response or was intolerant of at least one antiarrhythmic medication;
    - Patient's lifestyle would be severely limited by atrial fibrillation or the patient does not prefer long-term therapy.
  
2. Ablation for supraventricular tachycardia (SVT) may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Patient is diagnosed with atrioventricular nodal reentrant tachycardia (AVNRT); and **ANY** of the following:
    - Patient had poor response or was intolerant of at least one antiarrhythmic medication;
    - Patient's lifestyle would be severely limited by atrial fibrillation or the patient does not prefer long-term therapy.
    - Prior EPS illustrated rapid ventricular rate of concomitant arrhythmia;
    - Patient is intolerant of drug therapy with recurrent break-through episodes that are life altering.
  - Patient is diagnosed with Wolf-Parkinson-White (WPW) with tachycardia or other atrioventricular reentrant tachycardia, there is rapid ventricular response via accessory pathway noted; and **EITHER** of the following:
    - Patient had poor response or was intolerant of at least one antiarrhythmic medication;

- Patient is intolerant of drug therapy with recurrent break-through episodes that are life altering.
3. Ablation for ventricular tachycardia (VT) may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Patient has a history of sustained monomorphic VT; and **ANY** of the following:
    - Patient is symptomatic with drug-resistant tachycardia;
    - Patient is symptomatic and intolerant of drug therapy;
    - Patient is symptomatic and does not desire long-term drug therapy;
    - Patient has an implantable cardioverter defibrillator (ICD) and is receiving multiple defibrillations not manageable by reprogramming the device or additive drug therapy.
  - Patient has bundle branch reentrant tachycardia;
  - Patient has non-sustained monomorphic VT which is resistant to drug therapy.

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# Cardiac Catheterization

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Utilization of a cardiac catheterization may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

## Left Heart Catheterization

1. Left heart catheterization for acute coronary syndrome, ST-segment elevated myocardial infarction (STEMI) or non-ST segment elevated myocardial infarction (Non-STEMI) may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Documented Non-STEMI within the past three (3) months; and **ANY** of the following:
    - Previous Coronary Computerized Tomography Angiography (CCTA) demonstrates moderate or severe proximal obstructive vessel disease;
    - Patient is exhibiting persistent cardiac symptoms despite anti-anginal therapy;
    - Previous physiologic or pharmacologic noninvasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia.
  - Documented STEMI in the past twenty-four (24) hours.
2. Left heart catheterization to evaluate worsening or recurrent chest pain, ischemic equivalent symptoms or stable patient post revascularization (e.g. PCI or CABG) may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:

- Patient is exhibiting worsening or limiting chest pain/ischemic equivalent despite anti-anginal therapy; and **ANY** of the following:
  - This request is for a diagnostic left heart catheterization only, no PCI is currently anticipated;
  - Previous angiogram is suggestive of 50-79% stenosis and the ordering physician will perform a FFR for blockage less than or equal to 0.8% prior to PCI;
  - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia with or without possible PCI.
  - Previous non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) resulted in equivocal, artefactual or discordant findings making interpretation uncertain or unclear and this request is for a diagnostic left heart catheterization with or without a possible PCI
- Patient's symptoms are stable or controlled with medical management; and **EITHER** of the following:
  - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia with or without possible PCI;
  - Patient has a known incomplete revascularization after previous PCI and staged additional PCI is planned.
- Patient is exhibiting unexplained post procedural symptoms which could possibly represent continuing myocardial ischemia; and the following:
  - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia with or without possible PCI.

- Patient has had a return of the symptoms for which the previous revascularization was performed and the following:
    - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia with or without possible PCI.
  - PCI was performed within the past three (3) months or patient has had a previous coronary artery bypass graft (CABG) and the following:
    - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia.
3. Left heart catheterization related to cardiac transplant may be reasonable and appropriate when the patient's medical record demonstrates that the patient is a candidate for a heart transplant or has had a heart transplant and a surveillance study is deemed necessary per the post-transplant protocol of the treating cardiologist.
4. Left heart catheterization requested with or without planned PCI for follow-up evaluation of an abnormal CCTA suggesting coronary artery disease (CAD) may be reasonable and appropriate when the patient's medical record demonstrates the following:
- Chesty pain or ischemic equivalent; and **EITHER** of the following:
    - CCTA demonstrates a lesion obstructing 50% or more of at least one proximal coronary artery segment.
    - CCTA is non-diagnostic, equivocal or demonstrates lesions of unclear severity.

5. Left heart catheterization requested for evaluation of known or suspected congenital heart disease.
  
6. Left heart catheterization for coronary assessment secondary to aortic dissection, aneurysm or congestive heart failure (CHF) may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Diagnosis of thoracic aortic dissection;
  - Diagnosis of ascending aortic aneurysm;
  - Evaluation of signs and symptoms of congestive heart failure persistent or worsening despite pharmacological therapy with confirmed diastolic dysfunction via TTE or previous cardiac catheterization; and **EITHER** of the following:
    - PCI is planned and previous angiogram is suggestive of 50-79% stenosis; and **EITHER** of the following:
      - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia.
      - CCTA demonstrates a lesion obstructing 50% or more of at least one proximal coronary artery segment.
    - PCI is not planned; and **EITHER** of the following:
      - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia.
      - CCTA demonstrates a lesion obstructing 50% or more of at least one proximal coronary artery segment.
  
7. Left heart catheterization for valvular heart disease may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:

- Assessing hemodynamics or chamber size when non-invasive testing is incomplete or discordant;
  - Pre-operative planning study for cardiac valve surgery in patient's age 50 or older.
8. Left heart catheterization for evaluation of suspected coronary artery disease in a symptomatic patient exhibiting typical angina may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
- Male patient 40 years of age or older; and **EITHER** of the following:
    - PCI is planned and previous angiogram is suggestive of 50-79% stenosis; and **ANY** of the following:
      - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates 5-10% reversible myocardial ischemia.
      - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia.
      - Non-invasive testing (i.e. Cardiac PET, SPECT or Stress Echocardiogram) is non-diagnostic or equivocal making interpretation of the test uncertain or unclear.
    - PCI is not planned; and **ANY** of the following:
      - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates 5-10% reversible myocardial ischemia.
      - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk

- treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia.
- Non-invasive testing (i.e. Cardiac PET, SPECT or Stress Echocardiogram) is non-diagnostic or equivocal making interpretation of the test uncertain or unclear.
- Female patient 60 years of age or older; and **EITHER** of the following:
    - PCI is planned and previous angiogram is suggestive of 50-79% stenosis; and **ANY** of the following:
      - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates 5-10% reversible myocardial ischemia.
      - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia.
      - Non-invasive testing (i.e. Cardiac PET, SPECT or Stress Echocardiogram) is non-diagnostic or equivocal making interpretation of the test uncertain or unclear.
    - PCI is not planned; and **ANY** of the following:
      - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates 5-10% reversible myocardial ischemia.
      - Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia.

- Non-invasive testing (i.e. Cardiac PET, SPECT or Stress Echocardiogram) is non-diagnostic or equivocal making interpretation of the test uncertain or unclear.
9. Left heart catheterization with no plan to perform a PCI for evaluation of left ventricular function may be reasonable and appropriate when the patient's medical record demonstrates left ventricular ejection fraction (LVEF) of 45% or less and **EITHER** of the following:
- PCI is planned and previous angiogram is suggestive of 50-79% stenosis; and **ANY** of the following:
    - New or worsening angina or anginal equivalent (i.e. dyspnea, diaphoresis, arm or jaw pain, profuse vomiting in a diabetic patient) and the previous heart catheterization was performed greater than one (1) year ago and demonstrated ischemic coronary disease;
    - Recent non-invasive (i.e. cardiac PET/SPECT, Stress Echocardiogram, MUGA or Diagnostic Echocardiogram) testing shows a new decline in LVEF of greater than 10%;
    - Patient is under consideration for coronary bypass.
  - PCI is not planned; and **ANY** of the following:
    - New or worsening angina or anginal equivalent (i.e. dyspnea, diaphoresis, arm or jaw pain, profuse vomiting in a diabetic patient) and the previous heart catheterization was performed greater than one (1) year ago and demonstrated ischemic coronary disease;
    - Recent non-invasive (i.e. cardiac PET/SPECT, Stress Echocardiogram, MUGA or Diagnostic Echocardiogram) testing shows a new decline in LVEF of greater than 10%;
    - Patient is under consideration for coronary bypass.

10. Left heart catheterization for clearance prior to a non-cardiac surgical procedure may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- PCI is planned and previous angiogram is suggestive of 50-79% stenosis; and **ANY** of the following:
    - Male 40 years of age or older exhibiting typical angina or anginal equivalent; and **ANY** of the following:
      - BMI of greater than thirty-five (35);
      - Coronary calcium score of 500 or greater;
      - History of atrial fibrillation.
    - Female 60 years of age or older exhibiting typical angina or anginal equivalent; and **ANY** of the following:
      - BMI of greater than 35;
      - Coronary calcium score of 500 or greater;
      - History of atrial fibrillation.
    - Patient with a history of congestive heart failure; and **ANY** of the following:
      - BMI of greater than 35;
      - Coronary calcium score of 500 or greater;
      - History of atrial fibrillation.
  - PCI is not planned; and **ANY** of the following:
    - Male 40 years of age or older exhibiting typical angina or anginal equivalent; and **ANY** of the following:
      - BMI of greater than thirty-five (35);
      - Coronary calcium score of 500 or greater;
      - History of atrial fibrillation.
    - Female 60 years of age or older exhibiting typical angina or anginal equivalent; and **ANY** of the following:
      - BMI of greater than 35;

- Coronary calcium score of 500 or greater;
- History of atrial fibrillation.
- Patient with a history of congestive heart failure; and **ANY** of the following:
  - BMI of greater than 35;
  - Coronary calcium score of 500 or greater;
  - History of atrial fibrillation.
- Previous physiologic or pharmacologic non-invasive imaging (i.e. Cardiac PET, SPECT or Stress Echocardiogram) or high risk treadmill study demonstrates greater than or equal to 10% reversible myocardial ischemia.
- CCTA demonstrates a lesion obstructing 50% or more of at least one proximal coronary artery segment.

## Left and Right Heart Catheterization

1. Left and Right heart catheterization related to cardiac transplantation may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Pre-cardiac transplantation evaluation;
  - Post cardiac transplantation for routine annual evaluation;
  - Post cardiac transplantation for evaluation of possible organ rejection.
  
2. Left and Right heart catheterization for evaluation of chest pain when dyspnea is a major associated symptom may be reasonable and appropriate when the patient's medical record demonstrates clinical signs and symptoms suggesting pulmonary hypertension and evaluation with a non-invasive study was equivocal, inadequate or discrepant.

3. Left and Right heart catheterization for evaluation of chronic heart failure (CHF) may be reasonable and appropriate when the patient's medical record demonstrates the following:
  - Clinical signs and symptoms suggesting pulmonary hypertension and evaluation with a non-invasive study was equivocal, inadequate or discrepant; and **EITHER** of the following:
    - Worsening heart failure with suspected ischemic etiology despite medical management;
    - Diagnosis of CHF with new onset chest pain or chest pain that in not responding o medical management.
  
4. Left and Right heart catheterization for new onset heart failure may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Clinical signs and symptoms suggesting pulmonary hypertension and evaluation with a non-invasive study was equivocal, inadequate or discrepant; and **EITHER** of the following:
    - Multiple risk factors for coronary artery disease (CAD) with no previous evaluation;
    - Chest pain or ischemic equivalent is present.
  - Pulmonary pressure of greater than 25mmHg at rest or 30mmHg during physical activity; and **EITHER** of the following:
    - Multiple risk factors for coronary artery disease (CAD) with no previous evaluation;
    - Chest pain or ischemic equivalent is present.
  
5. Left and Right heart catheterization for evaluation of pulmonary hypertension may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Chest pain or ischemic equivalent is present; and **ANY** of the following:

- Request is for an evaluation of new pulmonary hypertension diagnosis;
  - Patient has an established diagnosis of pulmonary hypertension with unexplained worsening symptoms or to titrate therapy;
  - Clinical signs and symptoms suggesting pulmonary hypertension and evaluation with a non-invasive study was equivocal, inadequate or discrepant.
  - Non-invasive testing suggestive of ischemia; and **EITHER** of the following:
    - Request is for an evaluation of new pulmonary hypertension diagnosis;
    - Clinical signs and symptoms suggesting pulmonary hypertension and evaluation with a non-invasive study was equivocal, inadequate or discrepant.
6. Left and Right heart catheterization for evaluation of valvular heart disease may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Patient is at high risk for death;
  - Pre-operative planning for valvular surgery; and **ANY** of the following:
    - Non-invasive imaging is discordant, discrepant or inadequate for determining the severity of valvular disease;
    - Non-invasive imaging is discordant, discrepant or inadequate for determining pulmonary hypertension;
    - Non-invasive imaging is discordant, discrepant or inadequate for evaluation of ischemia.
  - Features of ischemia are present on non-invasive testing but the non-invasive imaging is discordant, discrepant or inadequate for determining the severity of valvular disease;
  - Chest pain or ischemic equivalent is present but non-invasive imaging is discordant, discrepant or inadequate for determining the severity of valvular disease;

## Right Heart Catheterization

1. Right heart catheterization for post cardiac transplant may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Routine annual evaluation;
  - Evaluation of possible organ rejection;
  - Evaluation of worsening congestive heart failure or unknown etiology.
2. Right heart catheterization for evaluation of cardiomyopathy/ congestive heart failure (CHF) may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Cardiomyopathy with clinical deterioration to titrate inotrope or vasodilator therapy;
  - CHF with clinical deterioration of unclear etiology.
3. Right heart catheterization for evaluation of congenital heart disease may be reasonable and appropriate when the patient's medical record demonstrates **BOTH** of the following:
  - Diagnosis of congenital heart disease;
  - Non-invasive imaging is discordant, discrepant or equivocal.
4. Right heart catheterization for pulmonary hypertension may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Request is for an evaluation of new pulmonary hypertension diagnosis;
  - Patient has an established diagnosis of pulmonary hypertension with unexplained worsening symptoms or to titrate therapy;
  - Clinical signs and symptoms suggesting pulmonary hypertension and evaluation with a non-invasive study was equivocal, inadequate or discrepant.

5. Right heart catheterization for evaluation of valvular heart disease may be reasonable and appropriate when the patient's medical record demonstrates that non-invasive testing was discrepant, equivocal or inadequate to determine the severity of valvular stenosis or regurgitation.

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# Cardiac Electrophysiology Studies

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Utilization of a cardiac electrophysiology studies (EPS) may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

1. Evaluation of Atrioventricular (AV) block may be reasonable and appropriate when the patient's medical record demonstrates that catheter ablation is planned as well as **ANY** of the following:
  - Suspected site of AV block is within the bundle of His (Intra-Hisian); and **ANY** of the following:
    - Syncope is present;
    - Near syncopal episodes are reported;
    - Transient lightheadedness is reported;
    - Severe fatigue is present;
    - Palpitations are reported.
  - Suspected site of AV block is distal or below the bundle of His (Infra-Hisian); and **ANY** of the following:
    - Syncope is present;
    - Near syncopal episodes are reported;
    - Transient lightheadedness is reported;
    - Severe fatigue is present;
    - Palpitations are reported.
  - Complete AV Block is present; and **EITHER** of the following:
    - Recurrent symptoms despite therapy and pacemaker placement, study to aid in identification of other arrhythmias as the cause of symptoms.
    - Study to aid in understanding the block or conduction delay with respect to site, mechanism or response to therapy in order to assess the patient's prognosis.
  - Second degree AV block; and **EITHER** of the following:
    - Recurrent symptoms despite therapy and pacemaker placement, study to aid in identification of other arrhythmias as the cause of symptoms.
    - Study to aid in understanding the block or conduction delay with respect to site, mechanism or response to therapy in order to assess the patient's prognosis.

- Pseudo AV block;
  - Prior EKG illustrating a bundle branch block and this study will aid in understanding the block or conduction delay with respect to site, mechanism or response to therapy in order to assess the patient's prognosis;
  - Other intraventricular conduction delay is present and this study will aid in understanding the block or conduction delay with respect to site, mechanism or response to therapy in order to assess the patient's prognosis.
2. Evaluation of atrial fibrillation or atrial flutter may be reasonable and appropriate when the patient's medical record demonstrates that catheter ablation is planned as well as **EITHER** of the following:
- Patient has atrial fibrillation or atrial flutter that did not terminate spontaneously within seven (7) days of onset or within forty-eight (48) hours or less of electrical or pharmacological cardioversion as well as having had poor response or was intolerant of at least on type of antiarrhythmic medication.
  - Patient has atrial fibrillation or atrial flutter that terminated spontaneously within seven (7) days of onset or within forty-eight (48) hours or less of electrical or pharmacological cardioversion; and **ANY** of the following:
    - Patient is compliant with drug therapy but concern exists for proarrhythmia or adverse effects on the sinus node or atrioventricular conduction;
    - Patient has had a poor response or is intolerant of at least on type of antiarrhythmic medication, drug affects may reveal distinct QT abnormality; and **ANY** of the following:
      - EPS is needed to identify proarrhythmic effect of a drug while patient is experiencing ventricular tachycardia or is at risk for cardiac arrest and prior EKG illustrates a prolonged QT interval;
      - Patient is experiencing near syncopal episodes; and **EITHER** of the following:
        - ◆ EKG illustrates equivocal abnormality of QT interval duration;
        - ◆ EKG illustrates equivocal abnormality of TU wave configuration.
      - Patient is experiencing transient lightheadedness; and **EITHER** of the following:

- ◆ EKG illustrates equivocal abnormality of QT interval duration;
  - ◆ EKG illustrates equivocal abnormality of TU wave configuration.
  - Patient is experiencing severe fatigue; and **EITHER** of the following:
    - ◆ EKG illustrates equivocal abnormality of QT interval duration;
    - ◆ EKG illustrates equivocal abnormality of TU wave configuration.
  - Patient is experiencing syncopal episodes; and **EITHER** of the following:
    - EKG illustrates equivocal abnormality of QT interval duration;
    - EKG illustrates equivocal abnormality of TU wave configuration.
3. Evaluation of unexplained syncope or palpitations thought to be of cardiac origin may be reasonable and appropriate when the patient's medical record demonstrates that catheter ablation is planned as well as **ANY** of the following:
- Palpitations present alone or in the presence of an examination revealing discordance between symptoms and EKG findings which are suggestive of an arrhythmia with or without a structurally abnormal heart;
  - Palpitations preceding a syncopal episode;
  - Recurrent syncopal episodes with a patient who has a structurally normal heart and has had a negative head-up tilt test.
4. Evaluation of supraventricular tachycardia (SVT) may be reasonable and appropriate when the patient's medical record demonstrates that catheter ablation is planned as well as **ANY** of the following:
- EPS is needed to identify proarrhythmic effects of a drug while patient is experiencing SVT or is at risk of cardiac arrest;
  - Patient is diagnosed with Wolff-Parkinson-White syndrome (WPW) or other atrioventricular reentrant/reciprocating tachycardia (AVRT); and **ANY** of the following:
    - EPS is needed to evaluate the patient for ablation of an accessory pathway;

- EPS is needed to understand the properties of an accessory pathway and normal conduction system for determination of appropriate therapy.
  - Prior EKG illustrates a narrow QRS complex and patient is hemodynamically stable;
  - Prior EKG illustrates a wide QRS complex, greater than 120ms with a bundle branch block.
  - Patient is diagnosed with atrioventricular nodal reentrant tachycardia (AVNRT); and **EITHER** of the following:
    - Prior EKG illustrates a narrow QRS complex and patient is hemodynamically stable;
    - Prior EKG illustrates a wide QRS complex, greater than 120ms with a bundle branch block.
  - Clinical evaluation indicates that drug effects may reveal a distinct QT abnormality; and **ANY** of the following:
    - Patient is experiencing syncopal episodes; and **EITHER** of the following:
      - EKG illustrates equivocal abnormality of QT interval duration;
      - EKG illustrates equivocal abnormality of TU wave configuration.
    - Patient is experiencing near syncopal episodes; and **EITHER** of the following:
      - EKG illustrates equivocal abnormality of QT interval duration;
      - EKG illustrates equivocal abnormality of TU wave configuration.
    - Patient is experiencing transient lightheadedness; and **EITHER** of the following:
      - EKG illustrates equivocal abnormality of QT interval duration;
      - EKG illustrates equivocal abnormality of TU wave configuration.
    - Patient is experiencing severe fatigue; and **EITHER** of the following:
      - EKG illustrates equivocal abnormality of QT interval duration;
      - EKG illustrates equivocal abnormality of TU wave configuration.
5. Evaluation of ventricular tachycardia (VT) may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- EPS is needed to assess candidacy for catheter ablation; and **ANY** of the following:
    - Prior ambulatory EKG illustrates VT;

- Premature ventricular complexes (PVC) are present with severe symptoms;
    - Ventricular couplets are present with severe symptoms;
    - Spontaneous sustained VT has occurred.
  - Patient has dilated cardiomyopathy.
  - LVEF is less than 35%; and **ANY** of the following:
    - Patient is status post myocardial infarction (MI) with non-sustained VT on ambulatory EKG;
    - EPS is needed to guide therapy in a patient with inducible VT;
    - EPS is needed to further evaluate risk of VT.
6. Evaluation of sinus node function may be reasonable and appropriate when the patient's medical record demonstrates that catheter ablation is planned as well as **ANY** of the following:
- Clinical examination reveals discordance of symptoms with EKG findings suggestive of arrhythmia; and **ANY** of the following:
    - Patient is experiencing syncopal episodes;
    - Patient is experiencing near syncopal episodes;
    - Patient is experiencing transient lightheadedness;
    - Patient is experiencing severe fatigue;
    - Patient is experiencing palpitations.
  - EPS study may aid in selecting the most appropriate pacing modality;
  - EPS may aid in selecting the best therapeutic option; and **ANY** of the following:
    - Suspected cause of symptoms is intrinsic disease within the sinus node;
    - Suspected cause of symptoms is an abnormality in the autonomic nervous system;
    - Suspected cause of symptoms is effects of drugs.
  - EPS study may aid in identifying other arrhythmias as the cause of symptoms when sinus node bradycardia is present.

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# Cardiac Pacemaker Device

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Utilization of a cardiac pacemaker may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

1. Removal of a cardiac pacemaker may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Device is at the end of its lifespan, implantation of device was greater than ten (10) years ago;
  - Device replacement is required, implantation greater than one (1) year ago but less than ten (10) years ago; and **ANY** of the following:
    - Device migration has occurred, excessive external device manipulation;
    - Complication, implantation related or chronic infection;
    - Complication, erosion of device through the skin;
    - Complication, device related pain;
    - Complication, leakage of other cardiac device or implant.
2. Lead replacement may be reasonable and appropriate when the replacement is for the same device.
3. Initial placement of a dual chamber pacemaker for 2<sup>nd</sup> degree heart block may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Diagnosis of symptomatic bradycardia;
  - Patient develops 2<sup>nd</sup> degree block during exercise in the absence of ischemia;
  - Patient has 2<sup>nd</sup> degree infra-hisian block illustrated on electrophysiology study (EPS);
  - Patient has symptoms of pacemaker syndrome;
  - Patient has Type 2, 2nd degree block with narrow QRST.

4. Initial placement of a dual chamber pacemaker for 3<sup>rd</sup> degree heart block may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Diagnosis of symptomatic bradycardia;
  - Patient requires drugs which induce symptomatic bradycardia;
  - There are documented pauses in the patient's cardiac rhythm of greater than or equal to three (3) seconds;
  - Patient has a documented heart rate of less than forty (40) while awake;
  - Patient is undergoing an AV node ablation that will result in a complete AV block;
  - Patient has a post-operative AV block that is not expected to resolve;
  - Patient is asymptomatic with left ventricular dysfunction;
  - Patient develops complete AV block during exercise in the absence of ischemia;
  - Patient has a neuromuscular disease associated with AV block.
  
5. Initial placement of a dual chamber pacemaker for AV block due to other causes may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Patient underwent a cardiac transplant and has persistent, inappropriate symptomatic bradycardia;
  - Patient has symptomatic bradycardia or pauses in cardiac rhythm of greater than or equal to three (3) seconds with sleep apnea syndrome;
  - Patient has cardiac sarcoidosis with conduction system abnormality;
  - Patient has hypertrophic cardiomyopathy with sinus node disease or AV block and is medically refractory with left ventricular outflow tract obstruction;
  - Patient has a neuromuscular disease and conduction system abnormality;
  - Patient has congenital heart disease and a conduction system abnormality.
  
6. Initial placement of a dual chamber device for AV block with hypersensitive carotid and/or neurocardiogenic syncope may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Patient has recurrent syncopal episodes caused by spontaneously occurring carotid sinus stimulation with a greater than or equal to three (3) second pause;
  - Patient has syncope without clear provocation of carotid stimulation but known carotid sinus sensitivity.

7. Initial placement of a dual chamber pacemaker for AV block with pace termination of tachycardia may be reasonable and appropriate when the patient's medical record demonstrates that the patient has symptomatic, recurrent SVT that is reproducibly terminated by pacing where drugs or ablation have failed.
8. Initial placement of a dual chamber pacemaker for AV block with pacing to prevent tachycardia may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Patient has sustained pause dependent VT;
  - Patient is high risk with long QT syndrome.
9. Initial placement of a dual chamber pacemaker for Bi and Tri fascicular AV block may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Patient has advanced 2<sup>nd</sup> degree or intermittent 3<sup>rd</sup> degree block;
  - Patient has Type 2, 2<sup>nd</sup> degree block;
  - Patient has alternating bundle branch block;
  - Patient is experiencing syncopal episodes and all other causes have been ruled out;
  - EPS illustrates incidental long His ventricle interval of greater than 100msec;
  - EPS illustrates incidental infra-hisian block.
10. Initial placement of dual chamber pacemaker post myocardial infarction (MI) for AV block may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Patient has a persistent 2<sup>nd</sup> degree AV block with alternating bundle branch block or 3<sup>rd</sup> degree block;
  - Patient has transient advanced 2<sup>nd</sup> or 3<sup>rd</sup> degree block;
  - Patient has persistent and symptomatic 2<sup>nd</sup> or 3<sup>rd</sup> degree block.
11. Initial placement of a dual chamber pacemaker for sinus node disease may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Patient has documented symptomatic bradycardia or cardiac rhythm pauses greater than or equal to three (3) seconds;
  - Patient has chronotropic incompetence;

- Patient has symptomatic bradycardia caused by drug therapy which is required, Tachy Brady Syndrome;
  - Patient has documented sinus node disease with syncope of unknown origin;
  - Patient has a heart rate of less than forty (40) while aware with symptoms that are not clearly linked.
12. Initial placement of a single chamber pacemaker for 2<sup>nd</sup> or 3<sup>rd</sup> degree AV block may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Patient has documented symptomatic bradycardia or cardiac rhythm pauses greater than or equal to three (3) seconds;
  - Patient has chronotropic incompetence;
  - Patient has symptomatic bradycardia caused by drug therapy which is required, Tachy Brady Syndrome;
  - Patient has documented sinus node disease with syncope of unknown origin;
  - Patient has a heart rate of less than forty (40) while aware with symptoms that are not clearly linked.
13. Initial placement of a single chamber pacemaker for AV block due to other causes may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Patient has persistent inappropriate or symptomatic bradycardia post cardiac transplant;
  - Patient has sleep apnea syndrome with symptomatic bradycardia or pauses in cardiac rhythm or greater than or equal to three (3) seconds;
  - Patient has cardiac sarcoidosis with conduction system abnormalities;
  - Patient has hypertrophic cardiomyopathy with sinus node disease or AV block and is symptomatic with left ventricular outflow tract obstruction that is refractory to medical management;
  - Patient has a neuromuscular disease with conduction system abnormalities;
  - Patient has congenital heart disease with conduction system abnormalities.
14. Initial placement of a single chamber pacemaker for AV block with hypersensitive carotid and/or neurocardiogenic syncope may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:

- Patient is experiencing recurrent syncope caused by spontaneously occurring carotid sinus stimulation with a pause in cardiac rhythm of greater than three (3) seconds;
  - Patient is experiencing syncopal episodes without clear provocation of carotid stimulation but with known carotid sinus sensitivity.
15. Initial placement of a single chamber pacemaker for AV block with pace termination of tachycardia may be reasonable and appropriate when the patient's medical record demonstrates symptomatic recurrent SVT that has failed drug or ablation therapy but is reproducibly terminated by pacing.
16. Initial placement of a single chamber pacemaker for Bi and Tri fascicular AV block may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Patient has advanced 2<sup>nd</sup> degree or intermittent 3<sup>rd</sup> degree block;
  - Patient has Type 2, 2<sup>nd</sup> degree block;
  - Patient has alternating bundle branch block;
  - Patient is experiencing syncopal episodes and all other causes have been ruled out;
  - EPS illustrates incidental long His ventricle interval of greater than 100msec;
  - EPS illustrates incidental infra-hisian block.
17. Initial placement of single chamber pacemaker post myocardial infarction (MI) for AV block may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Patient has a persistent 2<sup>nd</sup> degree AV block with alternating bundle branch block or 3<sup>rd</sup> degree block;
  - Patient has transient advanced 2<sup>nd</sup> or 3<sup>rd</sup> degree block;
  - Patient has persistent and symptomatic 2<sup>nd</sup> or 3<sup>rd</sup> degree block.
18. Initial placement of a single chamber pacemaker for sinus node disease may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Patient has documented symptomatic bradycardia or cardiac rhythm pauses greater than or equal to three (3) seconds;
  - Patient has chronotropic incompetence;

- Patient has symptomatic bradycardia caused by drug therapy which is required, Tachy Brady Syndrome;
  - Patient has documented sinus node disease with syncope of unknown origin;
  - Patient has a heart rate of less than forty (40) while aware with symptoms that are not clearly linked.
19. Replacement of a pacemaker due to device battery error messaging may be reasonable and appropriate when the patient's medical record demonstrates the current device will be replaced with the same type of device and the device is at the end of its lifespan with implantation greater than ten (10) years ago.
20. Replacement of a pacemaker due to complication may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
- Implantation of device was more than a year ago; and **ANY** of the following:
    - Complication, lead fracture;
    - Complication, implantation related chronic infection;
    - Complication, erosion of device through the skin;
    - Complication, device related pain.
  - Device migration has occurred, excessive external device manipulation.

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# Cardiac Positron Emission Test

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PET scan of the heart may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

1. PET scan of the heart may be reasonable and appropriate for a patient who has Coronary Artery Disease (CAD), symptoms are present but stable, and the requested study is for follow-up when the patient's medical record demonstrates **BOTH** of the following:
  - Over 2 years have passed since last myocardial perfusion scan;
  - Body Mass Index (BMI) is greater than 35.
  
2. PET scan of the heart may be reasonable and appropriate for a patient who requires myocardial viability assessment and the patient's medical record demonstrates **EITHER** of the following:
  - Abnormal myocardial perfusion scan (indeterminate for scar vs. hibernating myocardium) with compromised left ventricular function;
  - Documented coronary artery stenosis illustrated on previous cardiac catheterization; and **BOTH** of the following:
    - Documented compromised left ventricular function (finding indeterminate for scar vs. hibernating myocardium);
    - Anatomically by-passable vessels in area(s) of myocardial dysfunction.
  
3. PET scan of the heart may be reasonable and appropriate for an asymptomatic patient who requires a Stress-Rest myocardial perfusion scan for detection of CAD when the patient's medical record demonstrates the following:
  - BMI is greater than 35 with no myocardial perfusion scan in the last 2 years which illustrated a normal result; and **EITHER** of the following:
    - Prior history of CAD;
    - At least **TWO** of the following:

- Male over 50 years of age;
  - Diabetes Mellitus;
  - Hypertension;
  - Hypercholesterolemia;
  - Family history of CAD;
  - History of tobacco use;
  - Recent ECG which was uninterpretable or illustrates significant changes.
4. PET scan of the heart may be reasonable and appropriate for an asymptomatic patient who requires a Stress-Rest myocardial perfusion scan for detection of CAD in the presence of a new diagnosis of ventricular tachycardia when the patient's medical record demonstrates the following:
- BMI is greater than 35; and **EITHER** of the following:
    - Prior history of CAD;
    - At least **TWO** of the following:
      - Male over 50 years of age;
      - Diabetes Mellitus;
      - Hypertension;
      - Hypercholesterolemia;
      - Family history of CAD;
      - History of tobacco use;
      - Recent ECG which was uninterpretable or illustrates significant changes.
5. PET scan of the heart may be reasonable and appropriate for an asymptomatic patient who requires a Stress-Rest myocardial perfusion scan for detection of CAD in the presence of a new diagnosis of atrial fibrillation when the patient's medical record demonstrates the following:

- BMI is greater than 35; and **EITHER** of the following:
  - Prior history of CAD;
  - At least **TWO** of the following:
    - Male over 50 years of age;
    - Diabetes Mellitus;
    - Hypertension;
    - Hypercholesterolemia;
    - Family history of CAD;
    - History of tobacco use;
    - Recent ECG which was uninterpretable or illustrates significant changes.
  
- 6. PET scan of the heart may be reasonable and appropriate for a Stress-Rest myocardial perfusion scan for detection of CAD in the presence of a new onset heart failure or systolic dysfunction when the patient's medical record demonstrates the **ALL** of the following:
  - BMI is greater than 35;
  - No cardiac catheterization is planned;
  - No prior CAD evaluation;
  - **ANY** of the following:
    - Male over 50 years of age;
    - Diabetes Mellitus;
    - Hypertension;
    - Hypercholesterolemia;
    - Family history of CAD;
    - History of tobacco use;
    - Recent ECG which was uninterpretable or illustrates significant changes.

7. PET scan of the heart may be reasonable and appropriate for a Stress-Rest myocardial perfusion scan for the evaluation of chest pain when the patient's medical record demonstrates **BOTH** of the following:
  - BMI is greater than 35 with no myocardial perfusion scan performed in the last 2 years which illustrated a normal result;
  - **ANY** of the following:
    - Male over 50 years of age;
    - Diabetes Mellitus;
    - Hypertension;
    - Hypercholesterolemia;
    - Family history of CAD;
    - History of tobacco use;
    - Recent ECG which was uninterpretable or illustrates significant changes.
  
8. PET scan of the heart may be reasonable and appropriate for a Stress-Rest myocardial perfusion scan for the evaluation of a patient with known CAD and worsening symptoms when the patient's medical record demonstrates the following:
  - BMI is greater than 35; and **EITHER** of the following:
    - Revascularization procedure was performed since last myocardial scan;
    - Over 1 year has passed since last myocardial perfusion scan.
  
9. PET scan of the heart may be reasonable and appropriate for a Stress-Rest myocardial perfusion scan for the evaluation of a patient with an intermediate Duke Treadmill score when the patient's medical record demonstrates the following:
  - BMI is greater than 35; and **EITHER** of the following:
    - Unable to exercise;
    - **ANY** of the following:
      - Male over 50 years of age;

- Diabetes Mellitus;
  - Hypertension;
  - Hypercholesterolemia;
  - Family history of CAD;
  - History of tobacco use;
  - Recent ECG which was uninterpretable or illustrates significant changes.
10. PET scan of the heart may be reasonable and appropriate for a Stress-Rest myocardial perfusion scan for evaluation prior to surgery when the patient's medical record demonstrates **ALL** of the following:
- BMI is greater than 35;
  - Over one year has passed since last cardiac test or intervention;
  - Intermediate or high risk for surgery;
  - Unable to perform adequate exercise.
11. PET scan of the heart may be reasonable and appropriate for a Stress-Rest myocardial perfusion scan as part of the patient's risk assessment after acute coronary syndrome when the patient's medical record demonstrates **BOTH** of the following:
- BMI is greater than 35;
  - No cardiac catheterization is planned.
12. PET scan of the heart may be reasonable and appropriate for a Stress-Rest myocardial perfusion scan as part of the patient's risk assessment after coronary artery bypass graft (CABG) or percutaneous coronary intervention (PCI) when the patient's medical record demonstrates the following:
- BMI is greater than 35; and **ANY** of the following:
    - Patient is being evaluated for new onset chest pain;

- Study is being performed for assessment of an asymptomatic patient 5 years post CABG;
- Study is being performed for assessment of an asymptomatic patient 1 year post PCI.

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# Cardiac Resynchronization Therapy

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Utilization of a cardiac resynchronization therapy may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

## **CARDIAC RESYNCHRONIZATION THERAPY: DEFIBRILLATOR (CRT-D)**

1. Removal of a CRT-D may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Device is at the end of its lifespan, implantation of device was greater than or equal to five (5) years ago; and **EITHER** of the following:
    - Request is for an upgrade of a single or dual chamber defibrillator to a device with biventricular pacing capability;
    - Request is for replacement with the same biventricular device.
  - Device replacement is required, implantation greater than one (1) year ago and earlier than the normal replacement interval of five (5) years ago; and **ANY** of the following:
    - Device migration has occurred, excessive external device manipulation;
    - Complication, implantation related or chronic infection;
    - Complication, erosion of device through the skin;
    - Complication, device related pain;
    - Complication, leakage of other cardiac device or implant.
  
2. Lead replacement may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Replacement with the same device due to end of lifespan, implantation of device was greater than or equal to five (5) years ago with or without an upgrade of a single or dual chamber defibrillator to a device with biventricular pacing capability.
  - Replacement is needed earlier than replacement interval, implantation was less than five (5) years ago with implantation more than a year ago and this request

is for an upgrade of a single or dual chamber defibrillator to a device with biventricular pacing capability.

3. Replacement of CRT-D due to device battery error messaging may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Replacement of the current battery with the same battery; and **EITHER** of the following:
    - Device is at the end of its lifespan, implantation of device was greater than or equal to five (5) years ago with or without an upgrade of a single or dual chamber defibrillator to a device with biventricular pacing capability;
    - Device replacement is required, implantation greater than one (1) year ago and earlier than the normal replacement interval of five (5) years ago with or without an upgrade of a single or dual chamber defibrillator to a device with biventricular pacing capability.
4. Replacement of CRT-D due to complication may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Implantation of device was more than a year ago; and **ANY** of the following:
    - Complication, lead fracture;
    - Complication, implantation related chronic infection;
    - Complication, erosion of device through the skin;
    - Complication, device related pain.
    - Complication, leakage of other cardiac device or implant.
  - Device migration has occurred, excessive external device manipulation.
5. Upgrade from a single chamber device to dual chamber device with biventricular pacing capability may be reasonable and appropriate when the patient's medical record demonstrates **ALL** of the following:
  - Current device was implanted more than a year ago;
  - Patient has QRS complex width of greater than 120msec;
  - Patient's condition requires pacing, such as chronotropic incompetence;
  - Patient is exhibiting progression of congestive heart failure to New York Heart Association functional class of II, III or IV.

## CARDIAC RESYNCHRONIZATION THERAPY: PACEMAKER (CRT-P)

1. Removal of a CRT-P may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Device is at the end of its lifespan, implantation of device was greater than or equal to five (5) years ago; and EITHER of the following:
    - Request is for an upgrade of a single or dual chamber defibrillator to a device with biventricular pacing capability;
    - Request is for replacement with the same biventricular device.
  - Device replacement is required, implantation greater than one (1) year ago and earlier than the normal replacement interval of five (5) years ago; and **ANY** of the following:
    - Device migration has occurred, excessive external device manipulation;
    - Complication, implantation related or chronic infection;
    - Complication, erosion of device through the skin;
    - Complication, device related pain;
    - Complication, leakage of other cardiac device or implant.
  
2. Lead replacement may be reasonable may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Replacement with the same device due to end of lifespan, implantation of device was greater than or equal to five (5) years ago with or without an upgrade of a single or dual chamber defibrillator to a device with biventricular pacing capability.
  - Replacement is needed earlier than replacement interval, implantation was less than five (5) years ago with implantation more than a year ago and this request is for an upgrade of a single or dual chamber defibrillator to a device with biventricular pacing capability.
  
3. Replacement of CRT-P due to device battery error messaging may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Replacement of the current battery with the same battery; and EITHER of the following:
    - Device is at the end of its lifespan, implantation of device was greater than or equal to five (5) years ago with or without an upgrade of a single

- or dual chamber defibrillator to a device with biventricular pacing capability;
- Device replacement is required, implantation greater than one (1) year ago and earlier than the normal replacement interval of five (5) years ago with or without an upgrade of a single or dual chamber defibrillator to a device with biventricular pacing capability.
4. Replacement of CRT-P due to complication may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
- Implantation of device was more than a year ago; and **ANY** of the following:
    - Complication, lead fracture;
    - Complication, implantation related chronic infection;
    - Complication, erosion of device through the skin;
    - Complication, device related pain.
    - Complication, leakage of other cardiac device or implant.
  - Device migration has occurred, excessive external device manipulation.
5. Upgrade from a single chamber device to dual chamber device with biventricular pacing capability may be reasonable and appropriate when the patient's medical record demonstrates **ALL** of the following:
- Current device was implanted more than a year ago;
  - Patient has QRS complex width of greater than 120msec;
  - Patient's condition requires pacing, such as chronotropic incompetence;
  - Patient is exhibiting progression of congestive heart failure to New York Heart Association functional class of II, III or IV.

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# Cardiac Single Photon Emission Computerized Tomography

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SPECT scan of the heart may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

1. Evaluation of a patient who has had acute coronary syndrome (ACS) in the past twelve (12) months but is currently asymptomatic may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - It has been greater than three (3) months since the ACS event and there was no percutaneous coronary intervention (PCI) or coronary artery bypass graft (CABG) performed at the time of the event and **ANY** of the following:
    - Patient has not had any previous coronary angiography for the evaluation of coronary artery disease (CAD);
    - Patient has had previous CAD evaluation within the last twenty four (24) months which demonstrated clinically significant cardiac stenosis of greater than 50% or a moderate to large stress induced perfusion defect;
    - Patient has had previous CAD evaluation greater than twenty four (24) months ago which demonstrated clinically significant cardiac stenosis of greater than 50% or a moderate or large stress induced perfusion defect or the previous study findings were equivocal.
  - Patient had an incomplete vascularization after revascularization with PCI or CABG at the time of the ACS event;
  - Patient had a complete vascularization after revascularization with PCI or CABG at the time of the ACS event and the patient has had a PCI more than two (2) years ago or a CABG more than five (5) years ago.
  
2. Evaluation of new onset atrial fibrillation with an unclear etiology demonstrated by standard workup in an asymptomatic patient may be reasonable and appropriate when the patient's medical record demonstrates **ALL** of the following:
  - No metabolic or other causes of atrial fibrillation identified;

- Framingham Risk Criteria greater than 10%.
3. Evaluation of an asymptomatic patient with an elevated troponin level may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Patient has a coronary artery calcium (CAC) score of greater than five hundred (500);
  - Patient is experiencing documented atrial fibrillation.
4. Evaluation of an asymptomatic patient who has had a previous revascularization via PCI or CABG may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Patient has had an incomplete revascularization and additional revascularization is feasible;
  - It has been greater than five (5) years since the patient's last CABG;
  - It has been greater than two (2) years since the patient's last PCI.
5. Evaluation of an asymptomatic patient who has had a current diagnosis of CAD but no previous PCI or CABG may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Patient has had a previous CAD evaluation with stress echocardiogram which illustrated a severe wall motion abnormality;
  - Patient has had a previous CAD evaluation with heart catheterization or CCTA demonstrating cardiac stenosis of greater than 50% in major vessel less than or equal to twenty four (24) months ago;
  - Patient has had a previous CAD evaluation with cardiac SPECT demonstrating a moderate or large stress induced perfusion defect greater than or equal to twenty four (24) months ago.
6. Evaluation of an asymptomatic patient who does not have a diagnosis of CAD may be reasonable and appropriate when the patient's medical record demonstrates the following:
- It has been greater than twenty four (24) months since the patient's last CAD evaluation; and **EITHER** of the following:
    - Patient is experiencing documented atrial fibrillation;

- Framingham Risk Criteria greater than 20%.
7. Evaluation of a patient with a high risk occupation, i.e., police, fireman, pilot or bus driver may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
    - Framingham Risk Criteria of greater than 20%;
    - Framingham Risk Criteria of greater than 10% and patient is currently experiencing documented atrial fibrillation.
  8. Evaluation of cardiac viability via a rest redistribution thallium scan may be reasonable and appropriate when the patient's medical record demonstrates **BOTH** of the following:
    - Patient is eligible for revascularization;
    - Patient has ischemic cardiomyopathy or myocardial infarct with possibility of viable myocardium.
  9. Evaluation of worsening chest pain or ischemic equivalent in a patient who has not had PCI or CAB and is currently undergoing medical management of CAD may be reasonable and appropriate when the patient's medical record demonstrates the following:
    - Worsening cardiac symptoms suggesting ischemic equivalent despite treatment with maximal medical management and the patient's last CAD evaluation was within the past twelve (12) months; and **EITHER** of the following:
      - Last CAD testing was via heart catheterization or cardiac computed tomography angiography (CCTA) within the last twelve (12) months demonstrating cardiac stenosis of greater than 20% in any major vessel;
      - Last CAD testing was via cardiac SPECT or stress echocardiogram within the last twelve (12) months demonstrating an abnormal result of a mild or more severe stress induced perfusion defect or definite stress induced wall motion abnormality and if these findings are unchanged the ordering physician has no intent to proceed to a heart catheterization.
  10. Evaluation of worsening cardiac symptoms in a patient who has a diagnosis of CAD and has had a PCI or CABG may be reasonable and appropriate when the patient's medical record demonstrates the following:

- Worsening cardiac symptoms suggesting cardiac ischemia in a patient who is on maximal medical management; and **ANY** of the following:
  - Heart Catheterization or CCTA was performed within the last twelve (12) months ago with clinically significant findings on last Heart Catheterization or CCTA that could explain patient's ischemic equivalent symptoms;
  - Heart Catheterization or CCTA was performed greater than twelve (12) months ago or patient has not had previous Heart Catheterization or CCTA have been performed;
  - Cardiac SPECT or Stress Echocardiogram was performed within the last twelve (12) months and illustrated mild to severe stress induced perfusion defect or definite wall motion abnormality and if the perfusion defect or wall motion abnormality defect previous detected has not changed the patient will not undergo a heart cath.
  
- 11. Evaluation of stable chest pain or ischemic equivalent in a patient who has not had PCI or CABG and is currently undergoing medical management of CAD may be reasonable and appropriate when the patient's medical record demonstrates the following:
  - Last CAD testing was within the past twenty four (24) months demonstrating cardiac stenosis of less than 50% in any major vessel or moderate to severe stress induced perfusion defect or wall motion abnormality.
  
- 12. Evaluation of stable chest pain or ischemic equivalent in a patient who has a diagnosis of CAD and has had PCI or CABG may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Last CAD evaluation was performed less than or equal to twenty four (24) months ago and demonstrated a lesion in a major coronary vessel or bypass graft with the potential to produce ischemia or a moderate to severe perfusion defect or wall motion abnormality;
  - Last CAD evaluation was performed greater than twenty four (24) months ago and if this Cardiac SPECT illustrates a new perfusion defect or increase in a previous defined perfusion defect the patient will undergo a heart catheterization.

13. Evaluation of patient diagnosed with CAD and having high risk findings may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
- Last CAD testing was within the last twenty four (24) months; and **ANY** of the following:
    - Previous evaluation was via Stress Echocardiogram which demonstrated severe wall motion abnormality;
    - Patient has a history of silent ischemia on previous testing;
    - Previous evaluation was via Heart Catheterization or CCTA and demonstrated cardiac stenosis of greater than 50% in a major vessel.
  - Last CAD testing via Stress Echocardiogram was greater than or equal to twenty four (24) months ago and demonstrated severe wall motion abnormality.
14. Evaluation of a patient with cardiac symptoms who has no known history of CAD and no previous CAD testing in the past twenty four (24) months may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Male patient 40 years of age or older with typical angina, (substernal chest pain or discomfort that is provoked by exertion or stress and is relieved by rest and/or administration of nitroglycerin);
  - Male patient 60 years of age or older with atypical angina, (defined as chest pain that lacks one of the characteristics of typical chest pain, i.e., substernal chest pain or discomfort that is provoked by exertion or stress and is relieved by rest and/or administration of nitroglycerin);
  - Female patient 60 years of age or older with typical angina, (substernal chest pain or discomfort that is provoked by exertion or stress and is relieved by rest and/or administration of nitroglycerin);
  - Patient with typical angina, (substernal chest pain or discomfort that is provoked by exertion or stress and is relieved by rest and/or administration of nitroglycerin) where a baseline EKG is not interpretable and the patient is unable to exercise on a treadmill.
15. Evaluation of CAD in an asymptomatic patient who has a new diagnosis of heart failure or left ventricular systolic dysfunction may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Framingham Risk Criteria of between 10 and 20% and patient is currently experiencing documented atrial fibrillation;

Framingham Risk Criteria of greater than 20%; and **EITHER** of the following:

- Patient's last CAD evaluation was performed greater than twelve (12) months ago;
- Patient has not had a previous CAD evaluation.
- Patient has had a previous Heart Catheterization or CCTA was performed within the last twelve (12) months demonstrating cardiac stenosis of greater than 50% in a major vessel.

16. Cardiac evaluation in the presence of an abnormal of uninterpretable electrocardiogram (ECG) in a patient with no previous PCI or CABG may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:

- Framingham Risk Criteria of greater than 20% in a patient who is asymptomatic with no ischemic equivalent;
- Patient is experiencing an ischemic equivalent with a possible acute coronary syndrome;
- Patient is experiencing ischemic equivalent symptoms chronically and is unable to walk perform a walking treadmill stress test due to physical limitation such as orthopedic or vascular issues, this does not include dyspnea on exertion if it is considered to be the angina equivalent.

17. Cardiac evaluation in the presence of an equivocal or uninterpretable Stress Echocardiogram in a patient with no previous PCI or CABG may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:

- Patient is experiencing new or worsening cardiac symptoms or ischemic equivalent;
- Patient is experiencing documented atrial fibrillation;
- Patient has a diagnosis of CAD and their last evaluation was greater than two (2) years ago.

18. Stress-Rest Myocardial Cardiac Risk Assessment in an asymptomatic patient who is post-surgical intervention with CABG or PCI may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:

- Incomplete revascularization and additional revascularization is feasible;
- It has been greater than five (5) years since the patient has had a CABG;
- It has been greater than two (2) years since the patient has had a PCI;

- There are new changes on the patient's ECG consistent with ischemia;
  - There is new documentation illustrating worsening of left ventricular function;
  - Patient has had a PCI of the left main coronary artery in the past.
19. Pre-operative Cardia Risk Evaluation of a stable patient may be reasonable and appropriate when the patient's medical record demonstrates the following:
- The patient is to undergo vascular, open thoracic or open abdominal surgery or organ transplant and it has been greater than one (1) year since the patient has had a previous myocardial perfusion study, diagnostic heart catheterization or myocardial revascularization procedure; and **ANY** of the following:
    - Patient is unable to walk perform a walking treadmill stress test due to physical limitation such as orthopedic or vascular issues, this does not include dyspnea on exertion if it is considered to be the angina equivalent and they have **ANY** of the following documented risk factors:
      - History of CAD;
      - History of prior or compensated congestive heart failure (CHF);
      - History of cerebrovascular disease;
      - History of diabetes mellitus (DM) requiring insulin;
      - History of renal insufficiency with a creatinine level of greater than 2.0.
    - Patient has a recent ECG obtained at rest demonstrating a left bundle branch block (LBBB) or ST-T wave depression greater than 1mm and an exercise tolerance score of less than 4 MET;
    - Patient has an exercise tolerance score of less than 4 MET.
20. Pre-operative Cardia Risk Evaluation of a symptomatic or unstable patient may be reasonable and appropriate when the patient's medical record demonstrates the following:
- Patient with active, new or unstable cardiovascular symptoms felt to represent ischemic CAD or CHF who is to undergo vascular, open thoracic or open abdominal surgery or organ transplant; and **EITHER** of the following:
    - Patient is unable to walk perform a walking treadmill stress test due to physical limitation such as orthopedic or vascular issues, this does not include dyspnea on exertion if it is considered to be the angina equivalent;
    - Patient has an exercise tolerance score of less than 4 MET.

21. Evaluation of syncope in a patient with no chest pain and no ischemic equivalent who has had a full evaluation for possible non-cardiac causes which was indeterminate may be reasonable and appropriate when the patient's medical record demonstrates the following:
- Last CAD testing was greater than twelve (12) months ago; and **EITHER** of the following:
    - Patient does not have a diagnosis of CAD; and **ANY** of the following:
      - Framingham Risk Score of greater than 20%;
      - Framingham Risk Score of 10-20% and is currently experiencing documented atrial fibrillation
    - Patient has a diagnosis of CAD.
22. Evaluation of a patient with ventricular tachycardia who is not having any cardiac symptoms but does have a diagnosis of CAD may be reasonable and appropriate when the patient's medical record demonstrates the **EITHER** of following:
- Last CAD testing was greater than twelve (12) months ago;
  - Last CAD testing via Heart Catheterization or CCTA was less than twelve (12) months ago and demonstrated cardiac stenosis of greater than 50% in a major vessel.
23. Evaluation of a patient with ventricular tachycardia who is not having any cardiac symptoms but does not have a diagnosis of CAD may be reasonable and appropriate when the patient's medical record demonstrates the **EITHER** of following:
- Last CAD testing was greater than twenty four of (24) months ago and the patient has a Framingham Score of greater than 20%;
  - Last CAD testing was less than or equal to twenty four (24) months ago; and **EITHER** of the following:
    - Last CAD testing was via Heart Catheterization or CCTA and demonstrated cardiac stenosis of greater than 50% in a major vessel;
    - Last CAD testing was via Stress Echocardiogram and demonstrated severe wall motion abnormality.

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# Coronary Computed Tomography Angiography

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Utilization of a cardiac coronary tomography (CT) angiography may be medically appropriate and supported by evidence to improve patient outcomes for the **ANY** of the following indications.

1. Evaluation of chest pain may be reasonable and appropriate when the patient's medical record demonstrates ALL of the following:
  - No significant arrhythmia or tachycardia (heart rate > 100);
  - Recent stress test (treadmill ECG, myocardial perfusion study, or echocardiogram) negative or equivocal;
  - At least two (2) of the following risk factors are present:
    - Male over 50;
    - Diabetes mellitus;
    - Hypertension;
    - Hypercholesterolemia;
    - Family history of coronary artery disease;
    - History of tobacco use;
    - Recent ECG which was uninterpretable or demonstrates significant changes.
  
2. Evaluation of shortness of breath with suspected underlying coronary cause may be reasonable and appropriate when the patient's medical record demonstrates **ALL** of the following:
  - No significant arrhythmia or tachycardia (heart rate > 100);
  - Recent stress test (treadmill ECG, myocardial perfusion study, or echocardiogram) negative or equivocal;
  - At least two (2) of the following risk factors are present:
    - Male over 50;
    - Diabetes mellitus;
    - Hypertension;

- Hypercholesterolemia;
  - Family history of coronary artery disease;
  - History of tobacco use;
  - Recent ECG which was uninterpretable or demonstrates significant changes.
3. Follow-up study for patient who has had a previous cardiac catheterization which demonstrated coronary artery stenosis.
  4. Follow-up study for a patient who has had a previous Percutaneous Coronary Intervention (PCI/STENT) procedure within the last three (3) months.

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# Echocardiogram

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Utilization of an echocardiogram may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

## TRANSTHORACIC ECHOCARDIOGRAM (TTE)

1. Evaluation of an abnormal electrocardiogram (ECG) finding may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - No prior TTE; and **EITHER** of the following:
    - Lightheadedness or near loss of consciousness with documented underlying heart disease;
    - Arrhythmia documented by telemetry, Holter monitoring or ECG;
  - Prior TTE performed less than twelve(12) months ago; and **EITHER** of the following:
    - Syncope or near syncope with clinical change;
    - Arrhythmia documented by telemetry, Holter monitoring or ECG with or without clinical change;
  - Prior TTE was performed greater than twelve (12) months ago; and **EITHER** of the following:
    - Syncope or near syncope with clinical change;
    - Arrhythmia documented by telemetry, Holter monitoring or ECG with or without clinical change;
  - Syncope or near syncope with occasional atrial or ventricular premature complexes (APC) (VPC) without evidence of heart disease;
  - Frequent or exercise induced VPCs.
2. Evaluation of the aorta or aortic root may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Change in symptoms or clinical findings in a patient who has documented ascending aortic disease demonstrated on a previous TTE;
  - Known or suspected Marfan's Syndrome;
  - Patient is under consideration for surgical intervention to repair a known ascending aorta or aortic valve condition;

- Post-surgical evaluation after repair of an ascending aorta or aortic valve condition;
  - Prior TTE was greater than one (1) year ago and patient has documented ascending aortic disease demonstrated on a previous TTE.
3. Evaluation of atrial fibrillation may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- No prior TTE; and **EITHER** of the following:
    - Patient is diagnosed with atrial fibrillation;
    - Patient has sustained or non-sustained atrial fibrillation documented by telemetry, Holter monitor or ECG.
  - Prior TTE performed less than twelve(12) months ago; and **EITHER** of the following:
    - Patient is diagnosed with atrial fibrillation and exhibiting new cardiac symptoms;
    - Patient has sustained or non-sustained atrial fibrillation documented by telemetry, Holter monitor or ECG with a clinical change.
  - Prior TTE was performed greater than twelve (12) months ago; and **EITHER** of the following:
    - Patient has sustained or non-sustained atrial fibrillation documented by telemetry, Holter monitor or ECG;
    - Patient is diagnosed with atrial fibrillation and exhibiting new cardiac symptoms.
  - Patient is suspected of having an embolus originating from the heart or has had a transient ischemic attack(s) (TIA) or cerebrovascular accident (CVA).
4. Evaluation of dyspnea in a patient with known cardiac disease may be reasonable and appropriate when the patient's medical record demonstrates that non-cardiac causes have been ruled out and **ANY** of the following:
- No prior TTE; and **ANY** of the following:
    - Suspicion of congestive heart failure (CHF);
    - Known or suspected diastolic dysfunction;
    - Known valvular heart disease.
  - Prior TTE was performed greater than twelve (12) months ago; and **ANY** of the following:
    - Suspicion of congestive heart failure (CHF);

- Known or suspected diastolic dysfunction;
  - Known valvular heart disease.
  - Suspected CHF with clinical change/deterioration.
- 5. Evaluation of dyspnea in a patient without known cardiac disease may be reasonable and appropriate when the patient's medical record demonstrates that non-cardiac causes have been ruled out and **EITHER** of the following:
  - No prior TTE and cardiac etiology of dyspnea is suspected based on clinical findings;
  - Prior TTE was performed greater than twelve (12) months ago and cardiac etiology of dyspnea is suspected based on clinical findings.

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# Implantable Loop Recorder

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Placement of an Implantable Loop Recorder may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

1. Utilization in a patient who is over the age of 18 and has had a recent myocardial infarction (MI) may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Patient has a New York Heart Association (NYHA) Functional Classification of I, II, or III and has no valvular heart disease present; and **ALL** of the following:
    - Patient's life expectancy is greater than one (1) year;
    - Patient has had an echocardiogram performed in the past twenty-one (21) days demonstrating a left ventricular ejection fraction (LVEF) of 40 percent or less and cardiac wall motion of 1.3 or less;
    - Patient has not had a coronary bypass graft (CABG) or previous insertion or explanations of an implantable cardioverter defibrillator (ICD) or cardiac pacemaker;
    - Patient is not currently pregnant or expecting to become pregnant;
    - Patient is currently in normal sinus rhythm;
    - Patient has a baseline electrocardiogram (ECG) or Holter monitor which demonstrates evidence of non-sustained ventricular tachycardia;
    - Patient has a turbulence slope value of less than 0 or greater than 2.5ms/per normal to normal R-R interval on Holter monitoring;
    - Patient is at risk for sudden cardiac death (SCD) as evidenced by **ANY** of the following arrhythmias or conduction abnormalities:
      - New onset atrial fibrillation (A-fib);
      - Second- or third-degree atrioventricular (AV) block;
      - Bradycardia with or without beta-blocking therapy;
    - Patient has received a thirty (30) day ECG event monitoring previously.

- Patient has a NYHA Functional Classification of I, II, or III and mild to moderate valvular heart disease present; and **ALL** of the following:
  - Patient's life expectancy is greater than one (1) year;
  - Patient has had an echocardiogram performed in the past twenty-one (21) days demonstrating an LVEF of 40 percent or less and cardiac wall motion of 1.3 or less;
  - Patient has not had a CABG or previous insertion or explanations of an ICD or cardiac pacemaker;
  - Patient is not currently pregnant or expecting to become pregnant;
  - Patient is currently in normal sinus rhythm;
  - Patient has a baseline ECG or Holter monitor which demonstrates evidence of non-sustained ventricular tachycardia;
  - Patient has a turbulence slope value of less than 0 or greater than 2.5ms/per normal to normal R-R interval on Holter monitoring;
  - Patient is at risk for SCD as evidenced by **ANY** of the following arrhythmias or conduction abnormalities:
    - New onset Afib;
    - Second- or third-degree AV block;
    - Bradycardia with or without beta-blocking therapy;
- Patient has received a thirty (30) day ECG event monitoring previously.
- 2. Utilization in a patient who is 40 years of age or older and who has had a recent stroke or transient ischemic attack (TIA) but who has not had a recent MI may be reasonable and appropriate when the patient's medical record demonstrates **ALL** of the following:
  - Stroke or TIA occurred within the past ninety (90) days;
  - Cryptogenic stroke which has had all non-cardiac causes ruled out;
  - Patient does not have a history of A-fib;
  - Patient does not have an indication for and does not currently have an ICD or cardiac pacemaker;
  - Patient is a candidate for anti-coagulant therapy;

- Patient has received a thirty (30) day ECG event monitoring previously which did not detect A-fib or any other cardiac arrhythmia.
3. Utilization in a patient who is under the age of 40 and who has had a recent stroke or TIA but who has not had a recent MI may be reasonable and appropriate when the patient's medical record demonstrates **ALL** of the following:
- Stroke or TIA occurred within the past ninety (90) days;
  - Cryptogenic stroke which has had all non-cardiac causes ruled out;
  - Patient does not have a history of A-fib;
  - Patient does not have an indication for and does not currently have an ICD or cardiac pacemaker;
  - Patient is a candidate for anti-coagulant therapy;
  - Patient has received a thirty (30) day ECG event monitoring previously which did not detect A-fib or any other cardiac arrhythmia.
4. Utilization in a patient who has not had a recent MI, stroke, or TIA but has been diagnosed with A-fib may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
- Patient is receiving anti-coagulant therapy; and **ALL** of the following:
    - Patient has undergone catheter ablation or Maze surgery which produced successful pulmonary vein isolation;
    - Patient has A-fib that terminates spontaneously or with intervention within seven (7) days of onset;
    - Transesophageal echocardiogram (TEE) was performed but it was non-diagnostic for structural causes of the patient's symptoms;
    - Discontinuation of anti-coagulants is being considered;
    - Patient has received a thirty (30) day ECG event monitoring previously which was non-diagnostic for A-fib or any other cardiac arrhythmia;
  - Patient is not receiving anti-coagulant therapy; and **ALL** of the following:

- Patient has undergone catheter ablation or Maze surgery which produced successful pulmonary vein isolation;
  - Patient has A-fib that terminates spontaneously or with intervention within seven (7) days of onset;
  - Patient is a candidate for anti-coagulation therapy;
  - Patient has received a thirty (30) day ECG event monitoring previously which was non-diagnostic for A-fib or any other cardiac arrhythmia.
5. Utilization in a patient who has transient loss of consciousness but has not had a recent MI, stroke, TIA, or A-fib diagnosis may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
- Syncope or Pre-syncope are present with at least two (2) episodes of arrhythmogenic symptoms in the past six (6) months; and **ALL** of the following:
    - Unknown likelihood that episodes are being caused by a cardiac arrhythmia;
    - **TWO or MORE** of the following are present:
      - Palpitations present before syncopal episode;
      - Abnormal ECG and/or a diagnosis of heart disease is present;
      - Arrhythmogenic symptoms occur during effort;
      - Arrhythmogenic symptoms occur while the patient is supine;
    - Patient has had recent non-invasive cardiac imaging which has ruled out structural cardiac abnormalities and malignant ventricular arrhythmia as possible causes for arrhythmogenic symptoms;
    - Patient is not at high risk for SCD.
  - Syncope or Pre-syncope are present with at least two (2) episodes of arrhythmogenic symptoms in the past six (6) months; and **ALL** of the following:
    - Unknown likelihood that episodes are being caused by a cardiac arrhythmia;
    - **TWO or MORE** of the following are present:

- Palpitations present before syncopal episode;
  - Abnormal ECG and/or a diagnosis of heart disease is present;
  - Arrhythmogenic symptoms occur during effort;
  - Arrhythmogenic symptoms occur while the patient is supine;
  - Patient has had recent non-invasive cardiac imaging which has ruled out structural cardiac abnormalities and malignant ventricular arrhythmia as possible causes for arrhythmogenic symptoms;
  - Patient is at high risk for SCD;
  - Electrophysiology study (EPS) has been performed and the patient is negative for ventricular tachycardia.
- Syncope or Pre-syncope are present and patient has had one (1) episode every two (2) days for the past thirty (30) days and a thirty (30) day ECG event monitor has been unsuccessful in correlating the arrhythmogenic symptoms with a cardiac arrhythmia; and **ALL** of the following:
    - Unknown likelihood that episodes are being caused by a cardiac arrhythmia;
    - **TWO or MORE** of the following are present:
      - Palpitations present before syncopal episode;
      - Abnormal ECG and/or a diagnosis of heart disease is present;
      - Arrhythmogenic symptoms occur during effort;
      - Arrhythmogenic symptoms occur while the patient is supine;
    - Patient has had recent non-invasive cardiac imaging which has ruled out structural cardiac abnormalities and malignant ventricular arrhythmia as possible causes for arrhythmogenic symptoms;
    - Patient is not at high risk for SCD.
  - Syncope or Pre-syncope are present and patient has had one (1) episode every two (2) days for the past thirty (30) days and a thirty (30) day ECG event monitor has been unsuccessful in correlating the arrhythmogenic symptoms with a cardiac arrhythmia; and **ALL** of the following:

- Unknown likelihood that episodes are being caused by a cardiac arrhythmia;
  - **TWO or MORE** of the following are present:
    - Palpitations present before syncopal episode;
    - Abnormal ECG and/or a diagnosis of heart disease is present;
    - Arrhythmogenic symptoms occur during effort;
    - Arrhythmogenic symptoms occur while the patient is supine;
  - Patient has had recent non-invasive cardiac imaging which has ruled out structural cardiac abnormalities and malignant ventricular arrhythmia as possible causes for arrhythmogenic symptoms;
  - Patient is at high risk for SCD;
  - EPS has been performed and the patient is negative for ventricular tachycardia.
- Syncope or Pre-syncope are present with at least two (2) episodes of arrhythmogenic symptoms in the past six (6) months; and **ALL** of the following:
    - High likelihood that episodes are being caused by a cardiac arrhythmia;
    - Neurological factors have been ruled out as cause for arrhythmogenic symptoms;
    - Orthostatic hypertension has been ruled out as cause for syncopal episodes;
    - Patient has had recent non-invasive cardiac imaging which has ruled out structural cardiac abnormalities and malignant ventricular arrhythmia as possible causes for arrhythmogenic symptoms;
    - Patient is not at high risk for SCD.
  - Syncope or Pre-syncope are present with at least two (2) episodes of arrhythmogenic symptoms in the past six (6) months; and **ALL** of the following:
    - High likelihood that episodes are being caused by a cardiac arrhythmia;
    - Neurological factors have been ruled out as cause for arrhythmogenic symptoms;

- Orthostatic hypertension has been ruled out as cause for arrhythmogenic symptoms;
  - Patient has had recent non-invasive cardiac imaging which has ruled out structural cardiac abnormalities and malignant ventricular arrhythmia as possible causes for arrhythmogenic symptoms;
  - Patient is at high risk for SCD;
  - EPS has been performed and the patient is negative for ventricular tachycardia.
- Syncope or Pre-syncope are present and patient has had one (1) episode every two (2) days for the past thirty (30) days and a thirty (30) day ECG event monitor has been unsuccessful in correlating the arrhythmogenic symptoms with a cardiac arrhythmia; and **ALL** of the following:
    - High likelihood that episodes are being caused by a cardiac arrhythmia;
    - Neurological factors have been ruled out as cause for arrhythmogenic symptoms;
    - Orthostatic hypertension has been ruled out as cause for arrhythmogenic symptoms;
    - Patient has had recent non-invasive cardiac imaging which has ruled out structural cardiac abnormalities and malignant ventricular arrhythmia as possible causes for arrhythmogenic symptoms;
    - Patient is not at high risk for SCD.
  - Syncope or Pre-syncope are present and patient has had one (1) episode every two (2) days for the past thirty (30) days and a thirty (30) day ECG event monitor has been unsuccessful in correlating the arrhythmogenic symptoms with a cardiac arrhythmia; and **ALL** of the following:
    - High likelihood that episodes are being caused by a cardiac arrhythmia;
    - Neurological factors have been ruled out as cause for arrhythmogenic symptoms;
    - Orthostatic hypertension has been ruled out as cause for arrhythmogenic symptoms;

- Patient has had recent non-invasive cardiac imaging which has ruled out structural cardiac abnormalities and malignant ventricular arrhythmia as possible causes for arrhythmogenic symptoms;
  - Patient is at high risk for SCD;
  - EPS has been performed and the patient is negative for ventricular tachycardia.
- Seizure activity is present and patient has had one (1) episode every two (2) days for the past thirty (30) days and a thirty (30) day ECG event monitor has been unsuccessful in correlating the arrhythmogenic symptoms with a cardiac arrhythmia; and **ALL** of the following:
- Abnormal ECG;
  - Patient has had non-invasive cardiac imaging demonstrating a LVEF of greater than 35 percent and no structural abnormalities, heart failure, or pulmonary hypertension identified;
  - Patient has had tilt table testing resulting in either maintenance of a normal heart rate and blood pressure or reduced heart rate of 10 to 15 beats per minute with normal blood pressure maintained;
  - Patient is not at high risk for SCD.
- Seizure activity is present and patient has had one (1) episode every two (2) days for the past thirty (30) days and a thirty (30) day ECG event monitor has been unsuccessful in correlating the arrhythmogenic symptoms with a cardiac arrhythmia; and **ALL** of the following:
- Abnormal ECG;
  - Patient has had non-invasive cardiac imaging demonstrating a LVEF of greater than 35 percent and no structural abnormalities, heart failure, or pulmonary hypertension identified;
  - Patient has had tilt table testing resulting in either maintenance of a normal heart rate and blood pressure or reduced heart rate of 10 to 15 beats per minute with normal blood pressure maintained;
  - Patient is at high risk for SCD;

- EPS has been performed and the patient is negative for ventricular tachycardia.
- Seizure activity is present with at least two (2) episodes of arrhythmogenic symptoms in the past six (6) months; and **ALL** of the following:
  - Abnormal ECG;
  - Patient has had non-invasive cardiac imaging demonstrating a LVEF of greater than 35 percent and no structural abnormalities, heart failure, or pulmonary hypertension identified;
  - Patient has had tilt table testing resulting in either maintenance of a normal heart rate and blood pressure or reduced heart rate of 10 to 15 beats per minute with normal blood pressure maintained;
  - Patient is not at high risk for SCD.
- Seizure activity is present with at least two (2) episodes of arrhythmogenic symptoms in the past six (6) months; and **ALL** of the following:
  - Abnormal ECG;
  - Patient has had non-invasive cardiac imaging demonstrating a LVEF of greater than 35 percent and no structural abnormalities, heart failure, or pulmonary hypertension identified;
  - Patient has had tilt table testing resulting in either maintenance of a normal heart rate and blood pressure or reduced heart rate of 10 to 15 beats per minute with normal blood pressure maintained;
  - Patient is at high risk for SCD;
  - EPS has been performed and the patient is negative for ventricular tachycardia.
- 6. Utilization in a patient who is experiencing palpitations but has not had a recent MI, stroke, TIA, A-fib diagnosis, or transient loss of consciousness may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Patient has had a baseline ECG or Holter monitor with **ANY** of the following:
    - Normal ECG; and **ALL** of the following:

- Normal result on prior non-invasive cardiac imaging;
  - LVEF of greater than 35 percent;
  - Patient has reported only one (1) episode of palpitations in the past seven (7) days.
  - Patient has had previous 30 day event monitoring which did not correlate palpitations to a cardiac arrhythmia.
- Normal ECG; and **ALL** of the following:
    - Normal result on prior non-invasive cardiac imaging;
    - LVEF of greater than 35 percent;
    - Patient has reported only one (1) episode of palpitations in the past seven (7) days;
    - Patient has not had previous 30 day event monitoring.
- Normal ECG; and **ALL** of the following:
    - Normal result on prior non-invasive cardiac imaging;
    - LVEF of greater than 35 percent;
    - Patient has reported only one (1) episode of palpitations more than seven (7) days ago.
- Palpitations which have a high likelihood of arrhythmic origin and no family history of SCD; and **ALL** of the following:
    - Normal result on prior non-invasive cardiac imaging;
    - LVEF of greater than 35 percent;
    - Patient has reported only one (1) episode of palpitations in the past seven (7) days.
    - Patient has had previous 30 day event monitoring which did not correlate palpitations to a cardiac arrhythmia.
- Palpitations which have a high likelihood of arrhythmic origin and no family history of SCD; and **ALL** of the following:
    - Normal result on prior non-invasive cardiac imaging;

- LVEF of greater than 35 percent;
  - Patient has reported only one (1) episode of palpitations in the past seven (7) days;
  - Patient has not had previous 30 day event monitoring.
- Palpitations which have a high likelihood of arrhythmic origin and no family history of SCD; and **ALL** of the following:
- Normal result on prior non-invasive cardiac imaging;
  - LVEF of greater than 35 percent;
  - Patient has reported only one (1) episode of palpitations more than seven (7) days ago.

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# Leadless Intracardiac Pacemaker

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Utilization of a leadless intracardiac pacemaker may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

1. Insertion of a leadless intracardiac pacemaker may be reasonable and appropriate when the patient's medical record demonstrates **BOTH** of the following:
  - Patient does NOT demonstrate any of the following:
    - Implanted mechanical tricuspid valve;
    - Implanted inferior vena cave filter;
    - Hypersensitivity to Dexamethasone Acetate
    - Unfavorable femoral venous anatomy;
    - Morbid obesity that prevents the implanted device from obtaining telemetry communication within 12.5 cm.
    - Intolerance to heparin;
    - Sensitivity to contrast media that cannot be adequately pre-medicated.
  - Patient has clinical factors that render atrial lead placement difficult, high risk or not deemed necessary for effective therapy.

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# Left Atrial Appendage Closure

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Performing closure of the left atrial appendage (LAA) may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

1. LAA closure in patients with non-valvular atrial fibrillation may be reasonable and appropriate when the patient's medical record demonstrates **ALL** of the following:
  - CHADS<sub>2</sub> of two (2) or greater or CHA<sub>2</sub>DS<sub>2</sub>-VASc score of three (3) or greater has been determined;
  - Patient has had a diagnostic workup for atrial fibrillation (A-fib) using transesophageal echocardiography (TEE) which was negative for any structural heart disease.
  - Patient is currently on oral anti-coagulant therapy but is unsuitable for long-term use of this therapy due to a HAS-BLED score of three (3) or greater.
  - Patient is enrolled in, and the patient's medical care team and facility are participating in a prospective, nation and audited registry for LAA closure.

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# Percutaneous Coronary Interventions

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Utilization of a percutaneous coronary intervention (PCI) may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

1. PCI use in the presence of a previous coronary artery bypass graft (CABG) may be reasonable and appropriate when the patient's medical record demonstrates **EITHER** of the following:
  - Non-Invasive cardiac testing has been performed; and **EITHER** of the following:
    - Symptoms of cardiac ischemia are present; and **ANY** of the following:
      - Non-Invasive cardiac testing revealed an intermediate to high risk of coronary artery disease (CAD); and **EITHER** of the following:
        - ◆ Coronary angiogram illustrating coronary vessel stenosis of greater than 70% in a grafted vessel;
        - ◆ Coronary angiogram illustrating coronary vessel stenosis of greater than 70% in a non-grafted vessel.
      - Non-Invasive cardiac testing revealed a low risk of CAD; and **EITHER** of the following:
        - ◆ Moderate to severe ischemic symptoms, Canadian Class Score of 3-4; and **EITHER** of the following:
          - Coronary angiogram illustrating coronary vessel stenosis of greater than 70%;
          - Coronary angiogram illustrating coronary vessel stenosis of greater than 70% in a non-grafted vessel.
        - ◆ Coronary angiogram illustrating coronary vessel stenosis of greater than 70% in a non-grafted vessel.
  - Non-Invasive cardiac testing has not been performed and patient is having moderate to severe symptoms of cardiac ischemia, Canadian Class Score of 3-4 while on maximal medical therapy for CAD; and **EITHER** of the following:

- Coronary angiogram illustrating coronary vessel stenosis of greater than 70% in a grafted vessel;
  - Coronary angiogram illustrating coronary vessel stenosis of greater than 70% in a non-grafted vessel.
2. Initial use of PCI in the presence of symptomatic Ischemic CAD of a native vessel may be reasonable and appropriate when the patient's medical record demonstrates that a coronary angiogram has already been performed and **EITHER** of the following:
- Non-Invasive cardiac testing has been performed but a Fractional Flow Reserve (FFR) was not performed as part of a prior left heart catheterization; and **EITHER** of the following:
    - Non-Invasive cardiac testing revealed an intermediate to high risk of coronary artery disease (CAD); and **ANY** of the following:
      - Coronary angiogram illustrating any single proximal vessel with greater than 70% stenosis and left main stenosis of less than 50%, FFR was not performed due to facility or physician training limitations;
      - Coronary angiogram illustrating left anterior descending (LAD) vessel with greater than 70% stenosis or greater than 70% stenosis in 2 or 3 vessels, FFR was not performed due to facility or physician training limitations;
      - Isolated left main stenosis of less than 50%;
      - Isolated left main stenosis of greater than or equal to 50%.
  - Non-Invasive cardiac testing revealed a low risk of CAD; and **ANY** of the following:
    - Coronary angiogram illustrating any single proximal vessel with greater than 70% stenosis and left main stenosis of less than 50%, FFR was not performed due to facility or physician training limitations;
    - Coronary angiogram illustrating left anterior descending (LAD) vessel with greater than 70% stenosis or greater than 70% stenosis in 2 or 3 vessels, FFR was not performed due to facility or physician training limitations;
    - Isolated left main stenosis of less than 50%;
    - Isolated left main stenosis of greater than or equal to 50%.

- Non-Invasive cardiac testing has not been performed and patient is having moderate to severe symptoms of cardiac ischemia, Canadian Class Score of 3-4 while on maximal medical therapy for CAD; and **EITHER** of the following:
  - Coronary angiogram illustrating any single proximal vessel with greater than 70% stenosis and left main stenosis of less than 50%, FFR was not performed due to facility or physician training limitations;
  - Coronary angiogram illustrating left anterior descending (LAD) vessel with greater than 70% stenosis or greater than 70% stenosis in 2 or 3 vessels, FFR was not performed due to facility or physician training limitations.
  
- 3. Repeated use of PCI in the presence of symptomatic Ischemic CAD of a native vessel may be reasonable and appropriate when the patient's medical record demonstrates that a coronary angiogram has already been performed and **ANY** of the following:
  - This planned PCI will be conducted on the a vessel which was previously treated with PCI; and **EITHER** of the following:
    - Non-Invasive cardiac testing revealed an intermediate to high risk of coronary artery disease (CAD); and **ANY** of the following:
      - Isolated left main stenosis of greater than or equal to 50%;
      - Coronary angiogram illustrating any single proximal vessel with greater than 70% stenosis and left main stenosis of less than 50%;
      - Coronary angiogram illustrating left anterior descending (LAD) vessel with greater than 70% stenosis or greater than 70% stenosis in 2 or 3 vessels as well as left main stenosis of less than 50% and moderate to severe symptoms of cardiac ischemia, Canadian Class Score of 3-4.
    - Non-Invasive cardiac testing revealed a low risk of CAD; and **ANY** of the following:
      - Isolated left main stenosis of greater than or equal to 50%;
      - Coronary angiogram illustrating any single proximal vessel with greater than 70% stenosis and left main stenosis of less than

- 50% and moderate to severe symptoms of cardiac ischemia, Canadian Class Score of 3-4 are present;
- Coronary angiogram illustrating left anterior descending (LAD) vessel with greater than 70% stenosis or greater than 70% stenosis in 2 or 3 vessels as well as left main stenosis of less than 50% and moderate to severe symptoms of cardiac ischemia, Canadian Class Score of 3-4.
  - Non-Invasive cardiac testing was not performed; and **ANY** of the following:
    - ◆ Coronary angiogram illustrating any single proximal vessel with greater than 70% stenosis and left main stenosis of less than 50% and moderate to severe symptoms of cardiac ischemia, Canadian Class Score of 3-4 are present;
    - ◆ Coronary angiogram illustrating left anterior descending (LAD) vessel with greater than 70% stenosis or greater than 70% stenosis in 2 or 3 vessels as well as left main stenosis of less than 50% and mild symptoms of cardiac ischemia, Canadian Class Score of 1-2.
    - ◆ Coronary angiogram illustrating borderline stenosis of 50-70% in any proximal vessel with no other stenosis of greater than 70% identified and mild symptoms of cardiac ischemia, Canadian Class Score of 1-2.
  - This planned PCI will be conducted on a vessel other than that which was previously treated with PCI and Fractional Flow Reserve (FFR) was not performed as part of a prior left heart catheterization; and **ANY** of the following:
    - Non-Invasive cardiac testing revealed an intermediate to high risk of coronary artery disease (CAD); and **ANY** of the following:
      - Isolated left main stenosis of greater than or equal to 50%;
      - Coronary angiogram illustrating any single proximal vessel with greater than 70% stenosis and left main stenosis of less than 50%;
      - Coronary angiogram illustrating left anterior descending (LAD) vessel with greater than 70% stenosis or greater than 70% stenosis in 2 or 3 vessels as well as left main stenosis of less than 50% and moderate to severe symptoms of cardiac ischemia,

Canadian Class Score of 3-4, FFR was not performed due to facility or physician training limitations.

- Non-Invasive cardiac testing revealed a low risk of CAD; and **ANY** of the following:
  - ◆ Isolated left main stenosis of greater than or equal to 50%;
  - ◆ Coronary angiogram illustrating any single proximal vessel with greater than 70% stenosis and left main stenosis of less than 50% and moderate to severe symptoms of cardiac ischemia, Canadian Class Score of 3-4 are present;
  - ◆ Coronary angiogram illustrating left anterior descending (LAD) vessel with greater than 70% stenosis or greater than 70% stenosis in 2 or 3 vessels as well as left main stenosis of less than 50% and moderate to severe symptoms of cardiac ischemia, Canadian Class Score of 3-4, FFR was not performed due to facility or physician training limitations.
- Non-Invasive cardiac testing was not performed; and **ANY** of the following:
  - ◆ Coronary angiogram illustrating any single proximal vessel with greater than 70% stenosis and left main stenosis of less than 50% and moderate to severe symptoms of cardiac ischemia, Canadian Class Score of 3-4 are present;
  - ◆ Coronary angiogram illustrating left anterior descending (LAD) vessel with greater than 70% stenosis or greater than 70% stenosis in 2 or 3 vessels as well as left main stenosis of less than 50% and mild symptoms of cardiac ischemia, Canadian Class Score of 1-2.
  - ◆ Coronary angiogram illustrating borderline stenosis of 50-70% in any proximal vessel with no other stenosis of greater than 70% identified and mild symptoms of cardiac ischemia, Canadian Class Score of 1-2.
- AdHoc PCI where cardiac catheterization findings suggest 50-79% stenosis and the physician will perform an FFR prior to PCI and where PCI will only be performed if FFR is less than 0.80.

4. PCI use for patient who is asymptomatic but based on Non-Invasive cardiac testing is suspected to have Ischemic CAD may be reasonable and appropriate when the patient's medical record demonstrates that a coronary angiogram has already been performed and **EITHER** of the following:
- Non-Invasive testing reveals low risk for CAD; and **EITHER** of the following:
    - Left main stenosis less than 50% and proximal LAD stenosis greater than 70%, patient is on maximal medical management for CAD and a FFR was not performed as part of the prior left heart catheterization due to facility or physician training limitations.
    - Isolated left main stenosis of greater than or equal to 50% and a FFR was not performed as part of the prior left heart catheterization.
  - Non-Invasive testing reveals intermediate to high risk for CAD; and **ANY** of the following:
    - Left main stenosis less than 50% and proximal LAD stenosis greater than 70%, patient is on maximal medical management for CAD and a FFR was not performed as part of the prior left heart catheterization due to facility or physician training limitations.
    - Left main stenosis less than 50% and proximal LAD stenosis greater than 70%, patient is not on maximal medical management for CAD and a FFR was not performed as part of the prior left heart catheterization due to facility or physician training limitations.
    - Left main stenosis less than 50% and any single proximal vessel with greater than 70% stenosis, patient is on maximal medical management for CAD and a FFR was not performed as part of the prior left heart catheterization due to facility or physician training limitations.
    - Left main stenosis of less than 50% and an FFR was performed as part of the prior left heart catheterization to assess for lesion severity and the FFR was less than or equal to 0.80.
    - Isolated left main stenosis of greater than or equal to 50% and a FFR was not performed as part of the prior left heart catheterization.

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# Percutaneous Ventricular Assistive Device

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Utilization of a percutaneous ventricular assistive device (PVAD) may be medically appropriate and supported by evidence to improve patient outcomes for the following indications.

1. PVAD to be utilized as a bridge to cardiac transplant or permanent left ventricular assistive device (LVAD) may be reasonable and appropriate when the patient's medical record demonstrates the following:
  - Patient is scheduled to have a cardiac transplant or permanent LVAD placement within the next fourteen (14) days; and **ANY** of the following:
    - Patient is status post-cardiotomy; and **ANY** of the following:
      - Patient has experienced cardiogenic shock refractory to intra-aortic balloon pump (IABP);
      - Patient is diagnosed with an aortic dissection;
      - Patient has aortic stenting;
      - Patient has severe aortic insufficiency.
    - Patient is status post-acute myocardial infarction (MI); and **ANY** of the following:
      - Patient has experienced cardiogenic shock refractory to IABP;
      - Patient is diagnosed with an aortic dissection;
      - Patient has aortic stenting;
      - Patient has severe aortic insufficiency.
    - Patient is high risk and needs ancillary support for an invasive cardiovascular procedure; and **ANY** of the following:
      - Patient has experienced cardiogenic shock refractory to IABP;
      - Patient is diagnosed with an aortic dissection;
      - Patient has aortic stenting;
      - Patient has severe aortic insufficiency
  - Patient is status post-cardiotomy; and **ANY** of the following:
2. PVAD for use in a patient with cardio myogenic shock for IABP may be reasonable and appropriate when the patient's medical record demonstrates **ANY** of the following:
  - Patient is status post-cardiotomy; and **ANY** of the following:

- Patient has experienced cardiogenic shock refractory to intra-aortic balloon pump (IABP);
- Patient is diagnosed with an aortic dissection;
- Patient has aortic stenting;
- Patient has severe aortic insufficiency.
- Patient is status post-acute myocardial infarction (MI); and **ANY** of the following:
  - Patient has experienced cardiogenic shock refractory to IABP;
  - Patient is diagnosed with an aortic dissection;
  - Patient has aortic stenting;
  - Patient has severe aortic insufficiency.
- Patient is high risk and needs ancillary support for an invasive cardiovascular procedure; and **ANY** of the following:
  - Patient has experienced cardiogenic shock refractory to IABP;
  - Patient is diagnosed with an aortic dissection;
  - Patient has aortic stenting;
  - Patient has severe aortic insufficiency.

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# Trans catheter Aortic Valve Replacement

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Performing a Trans catheter Aortic Valve Replacement (TAVR) may be medically appropriate and supported by evidence to improve patient outcomes for the treatment of aortic valve stenosis when the patient's medical record demonstrates **EITHER** of the following

1. Patient has an activities of daily living (ADL) score of three (3) or more with asymptomatic Stage C ventricular heart disease and aortic velocity of greater than 5.0m/s or mean pressure gradient greater than 40mmHg; and **ANY** of the following:
  - Patient has a predicted post-TAVR survival rate of greater than twelve (12) months; and **ANY** of the following:
    - Left ventricular ejection fraction (LVEF) of less than 50% and greater than 50% predicted post-operative surgical risk morbidity from all causes at one (1) year;
    - Left ventricular ejection fraction (LVEF) of less than 50% and three (3) or more organ systems which are compromised and not expected to improve post-operatively;
    - Left ventricular ejection fraction (LVEF) of less than 50% and patient has a severe procedure specific impediment;
    - Patient has a decreased exercise tolerance or a drop in blood pressure is exhibited with exercise and greater than 50% predicted post-operative surgical risk morbidity from all causes at one (1) year;
    - Patient has a decreased exercise tolerance or a drop in blood pressure is exhibited with exercise and three (3) or more organ systems which are compromised and not expected to improve post-operatively;
    - Patient has a decreased exercise tolerance or a drop in blood pressure is exhibited with exercise and patient has a severe procedure specific impediment;

- Left ventricular ejection fraction (LVEF) of less than 50% and patient has a Society of Thoracic Surgeons Predicted Risk of Mortality (STS-PROM) greater than 8%;
  - Left ventricular ejection fraction (LVEF) of less than 50% and two (2) or more organ systems which are compromised and not expected to improve post-operatively;
  - Left ventricular ejection fraction (LVEF) of less than 50% and patient has a possible procedure specific impediment;
  - Left ventricular ejection fraction (LVEF) of less than 50% and patient has moderate to severe frailty;
  - Patient has a decreased exercise tolerance or a drop in blood pressure is exhibited with exercise and the patient has a Society of Thoracic Surgeons Predicted Risk of Mortality (STS-PROM) greater than 8%;
  - Patient has a decreased exercise tolerance or a drop in blood pressure is exhibited with exercise and two (2) or more organ systems which are compromised and not expected to improve post-operatively;
  - Patient has a decreased exercise tolerance or a drop in blood pressure is exhibited with exercise and patient has a possible procedure specific impediment.
  - Patient has a decreased exercise tolerance or a drop in blood pressure is exhibited with exercise and patient has moderate to severe frailty.
2. Patient has an activities of daily living (ADL) score of three (3) or more with symptomatic Stage D ventricular heart disease; and **ALL** of the following:
- Patient has a predicted post-TAVR survival rate of greater than twelve (12) months;
  - Left ventricular ejection fraction (LVEF) of less than 50%;
  - Greater than 50% predicted post-operative surgical risk morbidity from all causes at one (1) year;
  - Aortic velocity of greater than 5.0m/s or mean pressure gradient greater than 40mmHg;
  - Patient has low-flow, low-grade aortic stenosis.
- As well as **ANY** of the following:

- Greater than 50% predicted post-operative surgical risk morbidity from all causes at one (1) year;
- Patient has two (2) or more organ systems which are compromised and not expected to improve post-operatively;
- Patient has a possible or severe procedure specific impediment;
- Patient has a Society of Thoracic Surgeons Predicted Risk of Mortality (STS-PROM) greater than 8%;
- Patient has moderate to severe frailty.

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### Clinical Frailty Scale:

Very Fit – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

Well – People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally, e.g. seasonally.

Managing Well – People whose medical problems are well controlled, but are not regularly active beyond routine walking.

Vulnerable – While not dependent on others for daily help, often symptoms limit activities. A common complaint is being “slowed up”, and/or being tired during the day.

Mildly Frail – These people often have more evident slowing, and need help in high order IADLs (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

Moderately Frail – People need help with all outside activities and with keeping house. Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (cuing, standby) with dressing.

Severely Frail – Completely dependent for personal care, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

Very Severely Frail – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

Terminally Ill - Approaching the end of life. This category applies to people with a life expectancy <6 months, who are not otherwise evidently frail.

### Scoring frailty in people with dementia:

The degree of frailty corresponds to the degree of dementia.

Common symptoms in mild dementia include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In moderate dementia, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In severe dementia, they cannot do personal care without help.

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# Trans catheter Mitral Valve Replacement

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Performing a Trans catheter Mitral Valve Repair (TMVR) may be medically appropriate and supported by evidence to improve patient outcomes for the treatment of mitral valve regurgitation when the patient's medical record demonstrates **ALL** of the following:

- Patient has a high surgical risk;
- Patient has no other indication for cardiac surgery, i.e. Coronary bypass graft, aortic valve repair etc.;
- Patient is a candidate for surgical mitral valve repair;
- Patient has primary mitral valve regurgitation resulting in anatomical alteration of the valve leaflets or sub-valvular structures;
- Patient is exhibiting severe symptoms despite guideline directed medical therapy (GDMT) for heart failure;
- Left ventricular ejection fraction (LVEF) is between 20 and 60%;
- Care will be overseen utilizing a heart team approach with surgical representation to determine the most appropriate plan of care;
- The facility where the procedure is to be conducted has a surgical team with at least twenty-five (25) total mitral valve procedures for severe mitral regurgitation per year and at least ten (10) of these must be mitral valve repairs;
- The facility where the procedure is to be conducted has a interventional cardiology program which performs at least one thousand (1000) cardiac catheterizations per year which includes at least four hundred (400) percutaneous coronary interventions (PCI) per year with acceptable outcomes compared to the National Cardiovascular Data Registry (NCDR) benchmarks with each interventional cardiologist performing at least fifty (50) structural procedures per year including atrial septal defects (ASD), patent foramen ovale (PFO) and trans-septal punctures;

- This request is going to be reported to the single national database;
- The heart team and facility must be participating in a prospective, national, audited registry that collects data to address how outcomes, adverse events, device durability and patient demographics compare to pivotal clinical studies in statistical populations and subpopulations.

As well as **ANY** of the following:

- Patient is diagnosed with mitral regurgitation severity of a three (3) and New York Heart Association (NYHA) class three (3) heart failure;
- Patient is diagnosed with mitral regurgitation severity of a four (4) and New York Heart Association (NYHA) class three (3) heart failure;
- Patient is diagnosed with mitral regurgitation severity of a three (3) and New York Heart Association (NYHA) class four (4) heart failure;
- Patient is diagnosed with mitral regurgitation severity of a four (4) and New York Heart Association (NYHA) class four (4) heart failure.

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# Wearable Cardiac Defibrillator

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Utilization of a wearable cardiac defibrillator (WCD) may be medically appropriate and supported by evidence to improve patient outcomes for the following indications where the patient has no contraindications

1. WCD status post coronary artery bypass graft (CABG) or percutaneous cardiac intervention (PCI) may be reasonable and appropriate when the patient's medical record demonstrates **ALL** of the following:
  - New York Heart Association (NYHA) functional class score of 2 or 3
  - Left ventricular ejection fraction (LVEF) of less than or equal to 35% documented on previous cardiac study
  - The patient is expected to receive a permanent implanted cardiac defibrillator (ICD) within the next ninety (90) days or after any temporary contraindication or complication to receiving a permanent ICD is resolved with or without concurrent disease which prevents immediate implantation.
  
2. WCD status post cardiac rhythm abnormality or cardiac arrest may be reasonable and appropriate when the patient's medical record demonstrates **ALL** of the following:
  - The patient is has no contraindication to an automatic implantable cardioverter defibrillator;
  - The patient has had an episode of cardiac arrest due to irreversible ventricular fibrillation ;
  - The patient is expected to receive a permanent implanted cardiac defibrillator (ICD) within the next ninety (90) days or after any temporary contraindication or complication to receiving a permanent ICD is resolved with or without concurrent disease which prevents immediate implantation.
  - The patient has had sustained ventricular tachyarrhythmia either induced during electrophysiology study or spontaneously for greater than thirty (30) seconds;

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