CRITERIA FOR CARDIOLOGY MANAGEMENT

TABLE OF CONTENTS

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

33206	Insertion or replacement of permanent pacemaker with transvenous electrodes (atrial)
33207	Insertion or replacement of permanent pacemaker with transvenous electrodes (ventricular)
33208	Insertion or replacement of permanent pacemaker with transvenous electrodes (atrial and ventricular)
33212	Insertion or replacement of pacemaker pulse generator only; single chamber (atrial or ventricular)
33213	Insertion or replacement of pacemaker pulse generator only; single chamber (dual chamber)
33214	Upgrade of implanted pacemaker system, conversion of single chamber system to dual chamber system
33225	Insertion of pacing electrode, cardiac venous system, for left ventricular pacing, at time of insertion of pacing cardioverter-defibrillator or pacemaker pulse generator (including upgrade to dual chamber system)
33240	Insertion of single or dual chamber pacing cardioverterdefibrillator pulse generator
33249	Insertion or repositioning of electrode leads for single or dual chamber pacing cardioverter-defibrillator and insertion in pulse generator

Implantable Cardioverter-Defibrillators

CareCore Cardiology Management has developed evidence-based criteria for appropriate indications that would allow implantation of a cardioverter-defibrillator or ICD. All approved devices will have single chamber pacemaker back-up (VVI). If an ICD with dual chamber pacemaker back-up (DDD) or biventricular pacemaker (CRT) is required, please refer to the appropriate indications in the sections of this document covering pacemakers and biventricular pacemakers.

The indications for implantation of an ICD are divided into indications for primary prevention and indications for secondary prevention:

I. Indications for secondary prevention:

A. History of sustained ventricular tachycardia - defined as sustained ventricular tachycardia in the absence of a reversible etiology not amenable to catheter ablation, or failed attempts at catheter ablation.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

B. History of ventricular fibrillation

C. History of cardiac arrest requiring defibrillation

An ICD is considered medically necessary for these secondary indications providing a reversible cause was not present at the time of the event. Reversible causes include a myocardial infarction with documented cardiac enzyme release within 48 hours of the event, QT prolongation secondary to electrolyte imbalance or drug use, severe coronary artery disease with an ejection fraction over 50 percent that is amendable to revascularization, or if the event occurred as result of a respiratory arrest. Should one of these reversible causes be documented, then one of the primary prevention indications listed below will need to be satisfied prior to meeting criteria for medical necessity.

II. Indications for primary prevention:

An ICD implantation for the primary prevention requires that member life expectancy due to other intercurrent illness is not less than 6 months and that the member is under consideration for a heart transplant if class IV congestive heart failure and an electrocardiographic QRS interval less than 120 milliseconds are present.

Ejection fraction must have been documented by one of the following modalities to be considered for these primary prevention indications.

- Cardiac MRI
- MUGA
- Cardiac CT
- Quantitative calculation form a heart catheterization or echocardiogram
- 3D echocardiogram
- Myocardial perfusion imaging

A. Indications for primary prevention are satisfied for an Ejection Fraction of 30 percent or less if one of the following exists:

1. No myocardial infarction within the last 40 days ("Lockout Period"). The lockout period for Medicare and Medicaid members also includes a 90-day interval after cardiac bypass surgery or percutaneous intervention.
2. Within the lockout period if criteria is satisfied for a pacemaker insertion during this period; or sustained ventricular tachycardia/fibrillation (greater that 30 seconds) was demonstrated on an electrophysiologic study; or there was documented syncope or near-syncope even in the absence of ventricular tachycardia or fibrillation.

B. Indications for primary prevention are satisfied for an Ejection Fraction 31-35 percent if one of the following exists:

1. Congestive heart failure provided there has been no myocardial infarction within the last 40 days ("Lockout Period"). The lockout period for Medicare and Medicaid members also includes a 90-day interval after cardiac bypass surgery or percutaneous intervention. Additionally for Medicare and Medicaid members, congestive heart failure symptoms need to be present for over 90 days and the member must be under medication management for

congestive heart failure for a minimum of 90 days.

2. No congestive heart failure but within the lockout period provided one of the following is present:
   a. sustained ventricular tachycardia/fibrillation (greater that 30 seconds) was demonstrated on an electrophysiologic study
   b. unexplained syncope or near-syncope
   c. coronary artery disease is not the cause for the low ejection fraction and there is a family history of sudden cardiac death or familial heart disease associated with sudden cardiac death
   d. coronary artery disease is not the cause for the low ejection fraction and greater than nine (9) premature ventricular contractions per hour or non-sustained ventricular tachycardia has been demonstrated on 24-hour Holter monitoring

C. Primary prevention indications for an Ejection Fraction over 35 percent:
   1. Idiopathic subaortic stenosis (IHSS) or hypertrophic cardiomyopathy (HCM) and one or more risk factors for sudden cardiac death including syncope, left ventricular thickness over three (3) centimeters, non-sustained ventricular tachycardia, family history of sudden cardiac death, or hypotension documented with exercise.
   2. Long QT syndrome with beta-blocker failure, syncope, or family history of sudden cardiac death.
   3. Cardiomyopathy with family history of sudden cardiac death and an ejection fraction less than 50 percent.
   4. Right ventricular dysplasia and a score of four (4) or greater on the ARVD diagnosis scoring criteria.
   5. Brugada syndrome based on an electrocardiogram showing type I Brugada pattern in two precordial leads or an electrophysiologic study revealing greater than one millimeter ST elevation in two precordial leads after procainamide infusion and the presence of syncope, family history of sudden cardiac death, or inducible ventricular tachycardia on an electrophysiologic study.
   6. Syncope and an electrophysiologic study showing sustained ventricular tachycardia or evidence of structural heart disease unrelated to coronary artery disease including myocardial disease, congenital heart disease, valvular heart disease, or an ejection fraction less than 45 percent.
   7. Non-sustained ventricular tachycardia with a documented ejection fraction of 40 percent or less and an electrophysiologic study documenting sustained ventricular tachycardia.
   8. Electrophysiologic study documenting ventricular fibrillation or tachycardia
   9. Non-compaction syndrome
   10. Catecholamine polymorphous ventricular tachycardia with recurrent ventricular tachycardia or syncope despite beta-blockers.
   11. Myocardial diseases such as cardiac sarcoidosis, giant cell myocarditis, Chagas disease with demonstrated evidence of myocardial involvement or electrophysiologic disturbances.

Biventricular Pacemakers

Biventricular pacemakers are used to coordinate the contraction of the cardiac chambers in an effort to improve cardiac function in some members with congestive heart failure. This cardiac function enhancement is called cardiac resynchronization therapy (CRT) and is approvable for members who meet the evidence-based criteria developed by CareCore Cardiology Management. Biventricular devices are available with or without the implantation of in Implantable Cardioverter-Defibrillator or ICD.

I. Indications for biventricular pacemaker implantation without ICD

A. Members undergoing complete atrio-ventricular (AV) node or junction ablation. In the absence of a planned AV node or junction or ablation, a biventricular pacemaker is medically necessary if all of the following has been documented:

1. Presence of unexplained dyspnea in a member with an existing pacemaker and is predominantly pacemaker dependent.
2. Other pulmonary and cardiac causes for the unexplained dyspnea have been ruled out.
3. The dyspnea is refractory to medical therapy or the member is intolerant to medical therapy.

II. Indications for biventricular pacemaker implantation with ICD (assuming that an indication for an ICD implantation has already been met).

Ejection fraction must have been documented by one of the following modalities to be considered for these secondary indications.

- Cardiac MRI
- MUGA
- Cardiac CT
- Quantitative calculation form a heart catheterization or echocardiogram
- 3D echocardiogram
- Myocardial perfusion imaging

A. Ejection fraction documented to be between 31- 35 percent

1. Electrocardiographic QRS interval measuring 120 milliseconds or more

   All of the following must be demonstrated to validate medical necessity:

   a. Class III or ambulatory class IV congestive heart failure that persists for more than three (3) months despite maximal medical therapy including beta-blockers, angiotension converting enzyme inhibitors or angiotension receptor blockers, and diuretic. Class III congestive heart failure is defined as shortness of breath with minimal exertion (one block or one flight of stairs). Ambulatory class IV congestive heart failure is shortness of breath at rest but the member is not bed-ridden.

   b. No evidence of active ischemia amenable to revascularization exists

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

c. A restrictive cardiomyopathy is not present

2. Electrocardiographic QRS interval measuring less than 120 milliseconds

a. A biventricular pacemaker is medically necessary if the member is likely to pace greater than 30 percent of the time.

B. Ejection fraction documented to be 30 percent or less

1. Electrocardiographic QRS interval measuring 150 milliseconds or more

a. Documentation of Class II, III, or IV congestive heart failure. Class II congestive heart failure is defined as shortness of breath with ordinary activity. Class III congestive heart failure is defined as shortness of breath with minimal exertion (one block or one flight of stairs). Ambulatory class IV congestive heart failure is shortness of breath at rest but the member is not bed-ridden.

2. Electrocardiographic QRS interval measuring 120-149 milliseconds

All of the following must be demonstrated to validate medical necessity:

a. Class III or ambulatory class IV congestive heart failure that persists for more than three (3) months despite maximal medical therapy including beta-blockers, angiotension converting enzyme inhibitors or angiotension receptor blockers, and diuretic. Class III congestive heart failure is defined as shortness of breath with minimal exertion (one block or one flight of stairs). Ambulatory class IV congestive heart failure is shortness of breath at rest but the member is not bed-ridden.

b. No evidence of active ischemia amenable to revascularization exists

c. A restrictive cardiomyopathy is not present

3. Electrocardiographic QRS interval measuring less than 120 milliseconds

a. A biventricular pacemaker is medically necessary if the member is likely to pace greater than 30 percent of the time.

Single (VVI) and Dual (DDD) Chambered Pacemakers

CareCore Cardiology Management has developed evidence-based medical necessity criteria for implantation of cardiac pacemakers. For approvable indications, a DDD pacemaker can be authorized providing no contraindication to DDD pacing exists such as ineffective atrial contraction, atrial fibrillation, or frequent supraventricular tachycardia.

For the indications marked with an asterisk (*) below, the reversible causes that must be excluded prior to meeting medical necessary criteria for these indications include hypothyroidism, Lyme disease, and use of certain medications know to cause or exacerbate cardiac conduction abnormalities (beta-blockers, digoxin, calcium channel blockers, amiodarone, sotalol, propafenone, flecanide, dronedarone, and clonidine). Medical necessity is documented for these approved indications once the listed reversible causes have been evaluated and addressed.

When used in the criteria below, "*vasovagal syndrome"* is defined as a usually transitory condition of fainting associated with hypotension, peripheral vasodilatation, and bradycardia resulting from increased

stimulation of the vagus nerve – also called neurocardiogenic syncope or vasodepressor syncope. The situations that trigger this reaction are diverse and include having blood drawn, straining while urinating or defecating, or coughing. The reaction also can be due to the emotional stress of fear or pain.

I. Bradycardia indications

Bradycardia indications include sick sinus syndrome, bifascicular block, trifascicular block, and atrioventricular block. Symptoms that can be associated with a bradycardic event include dizziness, confusion, syncope, seizure, congestive heart failure, and ventricular ectopy. Alternatively therapeutic medication may be required that may exacerbate bradycardia. Pacemaker indications for bradycardia may differ depending on if there is direct correlation of member symptoms with electrocardiographic findings or if symptoms are present without direct electrocardiographic correlation to a bradycardic event at the time of the symptom occurrence.

A. Electrocardiographic documentation of a bradycardic event with symptoms
    1. Vasovagal syndrome present and one of the following:
        a. Mobitz II heart block, alternating bundle branch block, or in neuromuscular diseases once atrioventricular (AV) block or bundle branch block is electrocardiographically documented. Neuromuscular diseases include myotonic muscular dystrophy, Erb's dystrophy, peroneal dystrophy, and Kearn-Sayre syndrome.
        b. Complete heart block once reversible causes have been ruled out*.
        c. Advanced AV block with pauses of three (3) seconds or more or an escape rate of 40 beats per minute or less once reversible causes have been ruled out*.
    2. Vasovagal syndrome absent and:
        a. Reversible causes have been ruled out*.

B. Symptoms not directly correlated with electrocardiographic documentation of a bradycardic event and neurologic causes have been excluded
    1. Vasovagal syndrome present and one of the following:
        a. Mobitz II heart block, alternating bundle branch block, or in neuromuscular diseases once atrioventricular (AV) block or bundle branch block is electrocardiographically documented. Neuromuscular diseases include myotonic muscular dystrophy, Erb's dystrophy, peroneal dystrophy, and Kearn-Sayre syndrome.
        b. Complete heart block once reversible causes have been ruled out*.
        c. Advanced AV block with pauses of three (3) seconds or more or an escape rate or 40 beats per minute or less once reversible causes have been ruled out*.
    2. Vasovagal syndrome absent and one of the following:
        a. Electrocardiographic documentation of any of the following:
            i. Bifascicular/trifascicular block and syncope.
            ii. Alternating bundle branch block
            iii. High degree AV block and bundle branch block
        b. Electrocardiographic documentation of any of the following once reversible causes have been ruled out*
            i. Average heart rate is 40 beats per minute or less while the member is awake

ii. Pauses of three (3) seconds or more while the member is awake

iii. High degree AV block without bundle branch block

iv. First degree AV block, PR interval over 300 milliseconds, and congestive heart failure

v. Evidence of chronotropic incompetence

II. Electrophysiologic study (EPS) indications

A. Syncope or near syncope and the electrophysiologic findings of an HV interval over 75 milliseconds or infranodal/hisian block with a cycle length over 400 milliseconds.

B. Syncope or near syncope and the electrophysiologic findings showing a corrected sinus node recovery time (CSNRT) over 525 milliseconds and reversible causes have been ruled out*.

C. Electrophysiologic findings of an HV interval over 100 milliseconds or infranodal/hisian block with a cycle length over 400 milliseconds in the absence of syncope or near syncope.

III. Syncope indications (includes loss or near-loss of consciousness)

A. Electrocardiographic documentation of syncope or near syncope during a bradycardic event

1. Vasovagal syndrome present and one of the following:

a. Mobitz II heart block, alternating bundle branch block, or in neuromuscular diseases once atrioventricular (AV) block or bundle branch block is electrocardiographically documented. Neuromuscular diseases include myotonic muscular dystrophy, Erb's dystrophy, peroneal dystrophy, and Kearn-Sayre syndrome.

b. Complete heart block once reversible causes have been ruled out*.

c. Advanced AV block with pauses of three (3) seconds or more or an escape rate or 40 beats per minute or less once reversible causes have been ruled out*.

2. Vasovagal syndrome absent and:

b. Reversible causes have been ruled out*.

B. Syncope or near-syncope not directly correlated with electrocardiographic documentation of a bradycardic event and neurologic causes have been excluded

1. Vasovagal syndrome present and one of the following:

a. Mobitz II heart block, alternating bundle branch block, or in neuromuscular diseases once atrioventricular (AV) block or bundle branch block is electrocardiographically documented. Neuromuscular diseases include myotonic muscular dystrophy, Erb's dystrophy, peroneal dystrophy, and Kearn-Sayre syndrome.

b. Complete heart block once reversible causes have been ruled out*.

c. Advanced AV block with pauses of three (3) seconds or more or an escape rate or 40 beats per minute or less once reversible causes have been ruled out*.

2. Vasovagal syndrome absent and one of the following:

a. Electrocardiographic documentation of any of the following:

i. Bifascicular/trifascicular block and syncope.

ii. Alternating bundle branch block

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

iii. High degree AV block and bundle branch block

b. Electrocardiographic documentation of any of the following once reversible causes have been ruled out*

i. Average heart rate is 40 beats per minute or less while the member is awake

ii. Pauses of three (3) seconds or more while the member is awake

iii. High degree AV block without bundle branch block

IV. Autonomic dysfunction indications

A. Neurocardiogenic syncope

A pause greater than three (3) seconds associated with syncope or on a tilt-table test and recurrent syncope despite a trial of any of the following medication: Norpace, SSRI, beta-blocker, Florinef, or Midodrine.

B. Carotid hypersensitivity

Syncope or near syncope is present but unrelated to change in position and there is a pause of three (3) seconds or more during carotid massage.

V. Hypertrophic cardiomyopathy (HCM) or idiopathic hypertrophic subaortic stenosis (IHSS) indications

A. Documentation of an outflow gradient over 30 millimeters at rest or over 50 millimeters with provocation and one of the following:

1. No current beta-blocker or calcium channel blocker use due to medication intolerance or contraindication.
2. Current beta-blocker or calcium channel blocker use with a history of atrial fibrillation with a mean heart rate over 100 beats per minute or a congenital abnormality of the mitral valve.

VI. Tachy-brady syndrome indications

A. Documentation of symptomatic tachycardia (heart rate over 100 beats per minute) that alternates with bradycardia and one of the following is present:

1. Documentation of electrocardiographic pauses of three (3) seconds or more or the heart rate is 40 beats per minute or less while the member is awake.
2. Syncope or near-syncope and neurologic causes have been excluded

a. Vasovagal syndrome present and one of the following:

i. Mobitz II heart block, alternating bundle branch block, or in neuromuscular diseases once atrioventricular (AV) block or bundle branch block is electrocardiographically documented. Neuromuscular diseases include myotonic muscular dystrophy, Erb's dystrophy, peroneal dystrophy, and Kearn-Sayre syndrome.

ii. Complete heart block once reversible causes have been ruled out*.

iii. Advanced AV block with pauses of three (3) seconds or more or an escape rate or 40 beats per minute or less once reversible causes have been ruled out*.

b. Vasovagal syndrome absent and one of the following:

i. Electrocardiographic documentation of any of the following:

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

- Bifascicular/trifascicular block and syncope.
- Alternating bundle branch block
- High degree AV block and bundle branch block

ii. Electrocardiographic documentation of any of the following once reversible causes have been ruled out*

- High degree AV block without bundle branch block
- Evidence of chronotropic incompetence

3. Need for new or additional negative chronotropic medication with prior electrocardiographic documented pauses of two (2) seconds or more or heart rate less than 50 beats per minute but no syncope or near syncope present.

VII. Congenital heart disease indications

A. Documentation of congenital heart disease and one of the following electrocardiographic findings:

1. Pauses of over three (3) seconds
2. Resting heart rate less than 40 beats per minute
3. Congenital complete heart block or advanced second degree heart block
4. Transient third degree heart block with residual bifascicular block after surgical repair of the congenital cardiac condition.

VIII. Post myocardial infarction indications

A. Documentation of one of the following electrocardiographic findings occurring as the result of an acute myocardial infarction:

1. New second or third degree atrioventricular (AV block) lasting for more than five (5) days.
2. New second or third degree atrioventricular (AV block) with an associated new persistent bundle branch block.

References:

1. Moss AJ, Zareba W, Hall WJ, et al. Prophylactic implantation of a defibrillator in patients with myocardial infarction and reduced ejection fraction. N Engl J Med 2002;346:877-883
2. Moss AJ, Fadl Y, Zareba W, et al. Survival benefit with an implanted defibrillator in relation to mortality risk in chronic coronary heart disease. Am J Cardiol 2001;88:516-520.
3. Moss, AJ, Hall WJ, Cannom DS, et al. Improved survival with an implanted defibrillator in patients with coronary artery disease at high risk for ventricular arrhythmia. N Engl J Med 1997;335:1933-1940.
4. Buxton AE, Lee KL, Fisher JD, et al. A randomized study of the prevention of sudden death in chronic coronary disease. New Eng J Med 1999;341:1882-1890.
5. Sandner SE, Wieselthaler G, Zuckermann A, et al. Survival benefit of the implantable cardioverter-defibrillator in patients on the waiting list for cardiac transplantation. Circulation 2001;104(suppl I);I-171-I-176.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

6. Gabriel Gregoratos, MD, FACC, FAHA, Chair; Jonathan Abrams, MD, FACC, FAHA; Andrew E. Epstein, MD, FACC, FAHA; Roger A. Freedman, MD, FACC;David L.Hayes, MD, FACC, FAHA; Mark A. Hlatky, MD, FACC, FAHA;Richard E. Kerber, MD, FACC, FAHA; Gerald V. Naccarelli, MD, FACC, FAHA; Mark H. Schoenfeld, MD, FACC, FAHA; Michael J. Silka, MD, FACC; Stephen L. Winters, MD, FACC ACC/AHA/NASPE 2002 Guideline Update for Implantation ofGregoratos G, Abrams J, Epstein AE, Freedman RA, Hayes DL, Hlatky MA, Kerber RE, Naccarelli GV, Schoenfeld MH, Silka MJ, Winters SL. ACC/AHA/NASPE 2002 Guideline Update for Implantation of Cardiac Pacemakers and Antiarrhythmia Devices: Summary Article: A Report of the American College of Cardiology/American Heart Association Task Forceon Practice Guidelines (ACC/AHA/NASPE Committee to Update the 1998 Pacemaker Guidelines). Circulation. 2002;106:2145–2161.Cardiac Pacemakers and Antiarrhythmia Devices: Summary Article

7. Buxton AE, et al & Packer D: Prevention of sudden death in patients with coronary artery disease: the Multicenter Unsustained Tachycardia Trial (MUSTT). Prog Cardiovasc Dis 1993, 36:215-226

8. Kadish A, Dyer A, Daubert JP, et al., for the Defibrillators in Non-Ischemic Cardiomyopathy Treatment Evaluation (DEFINITE) Investigators. Prophylactic defibrillator implantation in patients with nonischemic dilated cardiomyopathy. N Engl J Med. 2004;350:2151-2158.

9. Bardy, GH. The Sudden Cardiac Death–Heart Failure Trial (SCD-HeFT). In: Arrhythmia Treatment and Therapy: Evaluation of Clinical Trial Evidence. Eds: Woosley, RL and Singh, SN. 2000, 323-342

10. Barry J. Maron, William J. McKenna, Gordon K. Danielson, Lukas J. Kappenberger, Horst J. Kuhn, Christine E. Seidman, Pravin M. Shah, William H. Spencer, III, Paolo Spirito, Folkert J. Ten Cate, E. Douglas Wigle, Robert A. Vogel, Jonathan Abrams, Eric R. Bates, Bruce R. Brodie, Peter G. Danias, Gabriel Gregoratos, Mark A. Hlatky, Judith S. Hochman, Sanjiv Kaul, Robert C. Lichtenberg, Jonathan R. Lindner, Robert A. O'rourke, Gerald M. Pohost, Richard S. Schofield, Cynthia M. Tracy, William L. Winters, Jr, Werner W. Klein, Silvia G. Priori, Angeles Alonso-Garcia, Carina Blomström-Lundqvist, Guy De Backer, Jaap Deckers, Markus Flather, Jaromir Hradec, Ali Oto, Alexander Parkhomenko, Sigmund Silber, and Adam Torbicki

11. American College of Cardiology/European Society of Cardiology Clinical Expert Consensus Document on Hypertrophic Cardiomyopathy: a report of the American College of Cardiology Foundation Task Force on Clinical Expert Consensus Documents and the European Society of Cardiology Committee for Practice Guidelines J. Am. Coll. Cardiol., Nov 2003; 42: 1687 - 1713.

12. JTakashi Noda, MD, PhD, Wataru Shimizu, MD, PhD, Atsushi Taguchi, MD*, Takeshi Aiba, MD, PhD , Kazuhiro Satomi, MD, Kazuhiro Suyama, MD, PhD*, Takashi Kurita, MD, PhD, Naohiko Aihara, MD and Shiro Kamakura, MD, PhD Malignant Entity of Idiopathic Ventricular Fibrillation and Polymorphic Ventricular Tachycardia Initiated by Premature Extrasystoles Originating From the Right Ventricular Outflow Tract. J Am Coll Cardiol, 2005; 46:1288-1294, doi:10.1016/j.jacc.2005.05.077 (Published online 9 September 2005).

13. Nogami A. Idiopathic Left Ventricular Tachycardia: Assessment and Treatment, Cardiac Electrophysiology Review, Volume 6, Number 4, December 2002, pp. 448-457(10)

14. Brugada P, Brugada R, Brugada J, Geelen P. Use of the prophylactic implantable cardioverter defibrillator for patients with normalhearts. Am J Cardiol 1999;83:98D-100D.

15. Roguin A, Bomma CS, Nasir K, et al. Implantable cardioverter-defibrillators in patients with arrhythmogenic right ventricular dysplasia/cardiomyopathy J Am Coll Cardiol 2004;43:1843-1852.

16. The DAVID Trial Investigators. Dual-chamber pacing or ventricular backup pacing in patients with an implantable defibrillator. The Dual Chamber and VVI Implantable Defibrillator (DAVID) Trial. JAMA 2002;288:3115-3123.

17. Bristow MR, Saxon LA, Boehmer J, et al; the Comparison of Medical Therapy, Pacing, and Defibrillation in Heart Failure (COMPANION) Investigators. Cardiac-resynchronization therapy with or without an implantable defibrillator in advanced chronic heart failure. N Engl J Med. 2004;350:2140-2150.

18. Bradley DJ, Bradley EA, Baughman KL, et al. Cardiac resynchronization and death from progressive heart failure: a meta-analysis of randomized controlled trials. JAMA. 2003 Feb 12;289(6):730-40

19. St. John Sutton MG, Plappert T, Abraham WT, et.al. Multicenter InSync Randomized Clinical Evaluation (MIRACLE) Study Group. Effect of cardiac resynchronization therapy on left ventricular size and function in chronic heart falure. Circulation. 2003 Apr 22; 107(15):1985-90.

20. Christophe Leclercq, MD, PhD; Joshua M. Hare, MD, Ventricular Resynchronization -Circulation. 2004;109:296-299

21. Angelo Auricchio, MD, PhD; William T. Abraham, MD , Cardiac Resynchronization Therapy: Current State of the Art -Circulation. 2004;109:300-307

22. Moss AJ, Hall WJ, Cannom DS, et al. Cardiac-resynchronization therapy for the prevention of heart-failure events. N Engl J Med 2009;361. DOI: 10.1056/NEJMoa0906431.

23. Ryan TJ, Antman EM, Brooks NH, et al. 1999 update:ACC/AHA guidelines for the management of patients with acute myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines(Committee on Management of Acute Myocardial Infarction). J Am Coll Cardiol 1999;34:890-911.

24. Zipes DP, DiMarco JP, Gillette PC, et al. Guidelines for clinical intracardiac electrophysiological and catheter ablation procedures: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Clinical Intracardiac Electrophysiological and Catheter Ablation Procedures), developed in collaboration with the North American Society of Pacing and Electrophysiology. J Am Coll Cardiol 1995;26:555-73.

25. Mymin D, Mathewson FA, Tate RB, Manfreda J. The natural history of primary first-degree atrioventricular heart block. N Engl JMed 1986;315:1183-7.

26.Barold SS. Indications for permanent cardiac pacing in firstdegree AV block: class I, II, or III? PACE Pacing Clin Electrophysiol 1996;19:747-51.

27.Strasberg B, Amat-Y-Leon F, Dhingra RC, et al. Natural history of chronic second-degree atrioventricular nodal block. Circulation 1981;63:1043-9.

28.Dhingra RC, Denes P, Wu D, Chuquimia R, Rosen KM. The significance of second degree atrioventricular block and bundle branch block: observations regarding site and type of block. Circulation 1974;49:638-46.

29.Dhingra RC, Denes P, Wu D, et al. Syncope in patients with chronic bifascicular block: significance, causative mechanisms, and clinical implications. Ann Intern Med 1974;81:302-6.

30.Sugrue DD, Gersh BJ, Holmes DR, Wood DL, Osborn MJ, Hammill SC. Symptomatic "isolated" carotid sinus hypersensitivity: natural history and results of treatment with anticholinergic drugs or pacemaker. J Am Coll Cardiol 1986;7:158-62.

31.Brignole M, Menozzi C, Gianfranchi L, Oddone D, Lolli G, Bertulla A. Neurally mediated syncope detected by carotid sinus massage and head-up tilt test in sick sinus syndrome. Am Cardiol 1991;68:1032-6.

32.Nishimura RA, Trusty JM, Hayes DL, et al. Dual-chamber pacing for hypertrophic cardiomyopathy: a randomized, double-blind crossover trial. J Am Coll Cardiol 1997;29:435-41.

33.Krongrad E. Prognosis for patients with congenital heart disease and post-operative intraventricular conduction defects. Circulation 1978;57:867-70.

34.Kay R, Estioko M, Wiener I. Primary sick sinus syndrome as an indication for chronic pacemaker therapy in young adults: incidence, clinical features, and long-term evaluation. Am Heart J 1982;103:338-42.

35.Shaw DB, Holman RR, Gowers JI. Survival in sinoatrial disorder (sick-sinus syndrome). Br Med J 1980;280:139-41.

36.Naccarelli GV, Dougherty AH, Jalal S, Shih HT, Wolbrette D. Paroxysmal supraventricular tachycardia: comparative role of therapeutic methods —drugs, devices and ablation. In: Saksena S, Luderitz B, editors. Interventional Electrophysiology: A Textbook. Armonk (NY): Futura Publishing Co Inc, 1996:381-90.

37.Bloomfield DM, et al. Putting it together: a new treatment algorithm for vasovagal syncope and related disorders. Am J Cardiol October 21, 1999;84:33Q-9Q.

38.Ellenbogen KA, Estes NAM III, Freedman RA, Gettes LS, Gillinov AM, Gregoratos G, Hammill SC, Hayes DL, Hlatky MA, Newby LK, Page RL, Schoenfeld MH, Silka MJ, Stevenson LW, Sweeney MO. ACC/AHA/HRS 2008 guidelines for device-based therapy of cardiac rhythm abnormalities: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the ACC/AHA/NASPE 2002 Guideline Update for Implantation of Cardiac Pacemakers and Antiarrhythmia Devices). J Am Coll Cardiol 2008;51:e1–62.

39.Epstein AE, DiMarco JP, Ellenbogen KA, Estes NAM III, Freedman RA, Gettes LS, Gillinov AM, Gregoratos G, Hammill SC, Hayes DL, Hlatky MA, Newby LK, Page RL, Schoenfeld MH, Silka MJ, Stevenson LW, Sweeney MO. ACC/ AHA/HRS 2008 guidelines for device-based therapy of cardiac rhythm abnormalities: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the ACC/AHA/vNASPE 2002 Guideline Update for Implantation of Cardiac Pacemakers and Antiarrhythmia Devices). *Heart Rhythm* 2008;5:e1–e62.

Reviewed: 04/07/2010, 05/26/2010

Posted: 07/02/2010

75557	Cardiac MRI for Morphology and Function without Contrast
75559	Cardiac MRI for Morphology and Function without Contrast; with Stress Imaging
75561	Cardiac MRI for Morphology and Function without Contrast; Followed by Contrast Material and Further Sequences
75563	Cardiac MRI for Morphology and Function without Contrast; Followed by Contrast Material and Further Sequences; with Stress Imaging
75565	Cardiac magnetic resonance imaging for velocity flow mapping

I. Coronary artery disease/chest pain

A. Assessment of myocardial viability
   1. Documentation of regional left ventricular dysfunction with no revascularization since the documented left ventricular dysfunction
   2. Documentation of regional left ventricular dysfunction and a nuclear stress test showing a fixed defect in the same region as the demonstrated left ventricular dysfunction and in the same region under consideration for a revascularization procedure.

A. Recent myocardial infarction
   1. Documentation of a myocardial infarction within the last 2 months by abnormal cardiac isoenzymes or new “Q” waves on electrocardiogram AND
   2. Documentation of heart catheterization since the myocardial infarction showing less 50% stenosis of all coronary arteries

II. Cardiac or pericardial mass

A. Documentation of suspected cardiac mass on echocardiogram, catheterization, or cardiac CT

III. Congenital heart disease

Cardiac MRI can be approved for congenital heart disease if prior cardiac CT, cardiac MRI, or cardiac catheterization documents congenital heart disease and there are new cardiovascular signs or symptoms. In the absence of prior imaging documentation of congenital heart disease, a cardiac MRI is appropriate for:

A. Marfan’s syndrome
B. Coarctation of the aorta
   1. Suspected coarctation
   2. Known coarctation and prior cardiac CT/MRI one or more years ago
   3. Known coarctation with surgical intervention less than one year ago
C. Preoperative assessment for congenital heart disease surgery
D. Anomalous pulmonary venous drainage
E. Pulmonary outflow tract obstruction
F. Prior surgical or catheter intervention for congenital heart disease

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

IV. Cardiomyopathy

A. Cardiac sarcoid
B. Cardiac amyloidosis
C. Hemochromatosis
D. Hemosiderosis
E. Restrictive cardiomyopathy
F. Cardiotoxic chometherapy use

V. Arrhythmogenic right ventricular dysplasia

VI. Myocarditis

VII. Pericardial disease

VIII. Aortic disease

Aortic dissection, aortic aneurysm, and prior aortic surgery do not require cardiac MRI and should be referred to appropriate CT/MRI chest ICD codes.

IX. Pulmonary vein evaluation prior to ablation

Requires documentation from an electrophysiologist of the planned ablation

X. Left ventricular dysfunction

Documentation of left ventricular dysfunction and a prior uninterpretable echocardiogram due to poor visualization windows

XI. Valvular heart disease

Documentation of left ventricular dysfunction and a prior uninterpretable echocardiogram due to poor visualization windows

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

References:

1. Eagle KA, Berger PB, Calkins H, Chaitman BR, Ewy GA, Fleischmann KE, Fleisher LA, Froehlich JB, Gusberg RJ, Leppo JA, Ryan T, Schlant RC,Winters WL Jr. ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery: a report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines (Committee to Update the 1996 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery). 2002. American College of Cardiology Web site

2. Brindis RG, Douglas PS, Hendel RC, Peterson ED, Wolk MJ, Allen JM, Patel MR, Raskin IE. ACCF/ASNC appropriateness criteria for single-photon emission computed tomography myocardial perfusion imaging (SPECT MPI): a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group and the American Society of Nuclear Cardiology. J Am Coll Cardiol 2005;46:1587– 605.

3. Klocke FJ, Baird MG, Bateman TM, Berman DS, Carabello BA, Cerqueira MD, DeMaria AN, Kennedy JW, Lorell BH, Messer JV, O'Gara PT, Russell RO Jr., St. John Sutton MG, Udelson JE, Verani MS, Williams KA. ACC/AHA/ASNC guidelines for the clinical use of cardiac radionuclide imaging: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/ASNC Committee to Revise the 1995 Guidelines for the Clinical Use of Radionuclide Imaging). (2003).

4. Hendel, Robert C., Patel, Manesh R., Kramer, Christopher M., Poon, Michael, Hendel, Robert C., Carr, James C., Gerstad, Nancy A., Gillam, Linda D., Hodgson, John McB., Kim, Raymond J., Kramer, Christopher M., Lesser, John R., Martin, Edward T., Messer, Joseph V., Redberg, Rita F., Rubin, Geoffrey D., Rumsfeld, John S., Taylor, Allen J., Weigold, Wm. Guy, Woodard, Pamela K., Brindis, Ralph G., Hendel, Robert C., Douglas, Pamela S., Peterson, Eric D., Wolk, Michael J., Allen, Joseph M., Patel, Manesh R. ACCF/ACR/SCCT/SCMR/ASNC/NASCI/SCAI/SIR 2006 Appropriateness Criteria for Cardiac Computed Tomography and Cardiac Magnetic Resonance Imaging: A Report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group, American College of Radiology, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, American Society of Nuclear Cardiology, North American Society for Cardiac Imaging, Society for Cardiovascular Angiography and Interventions, and Society of Interventional Radiology. J Am Coll Cardiol 2006 48: 1475-1497

Reviewed: 11/18/2009

Posted: 01/01/2010

75571	Computed tomography, heart, without contrast material, with quantitative evaluation of coronary calcium
75572	Computed tomography, heart, with contrast material, for evaluation of cardiac structure and morphology (including 3D image postprocessing, assessment of cardiac function, and evaluation of venous structures, if performed)
75573	Computed tomography, heart, with contrast material, for evaluation of cardiac structure and morphology in the setting of congenital heart disease (included 3D image postprocessing, assessment of LV cardiac function, RV structure and function and evaluation of venous structures, if performed)
75574	Computed tomographic angiography, heart, coronary arteries and bypass grafts (when present), with contrast material, including 3D image postprocessing (including evaluation of cardiac structure and morphology, assessment of cardiac function, and evaluation of venous structures, if performed)

The uses for Cardiac CT/CCTA include assessment for coronary artery disease, congenital heart disease, cardiac structure and morphology, and quantitative coronary calcium scoring.

The following is a list of exclusion criteria for CCTA:

- Atrial fibrillation
- Multifocal Atrial Tachycardia (MAT)
- Frequent Atrial Premature Contractions
- More than 50 premature ventricular contractions per hour
- Inability to lie flat
- Body mass index >40
- Inability to obtain a heart rate less than 65 beats per minute after beta blockers
- Calcium (Agatston) score of 1000 or more
- Normal coronary angiogram less than one year ago
- Inability to hold breath for >8 seconds
- Prior percutaneous coronary intervention or coronary artery bypass surgery

The approvable indications for cardiac CT/CCTA include:

I. Congestive heart failure
II. Positive routine exercise stress test

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

III. Abnormal imaging stress test
IV. New or changed chest pain or dyspnea on exertion
V. Normal imaging stress test and chest pain
VI. Pre-operative assessment for non-cardiac surgery
VII. Valvular heart disease, congenital heart disease, pericardial disease
VIII. Pulmonary vein mapping
IX. Congenital heart disease

I. Congestive heart failure [A and B or C]

A. To meet criteria for congestive heart failure, one of the following must be documented:
   1. Pulmonary vascular congestion on chest X-ray
   2. Hospitalization for congestive heart failure with documented weight loss and symptom improvement with diuretics
   3. Outpatient congestive heart failure management with documented weight loss and symptom improvement with diuretics
   4. A member with cardiomyopathy and ejection fraction of <50%
B. NEW diagnosis of congestive heart failure AND NO coronary angiogram, CCTA, or imaging stress was performed in the last eight (8) weeks
C. Known diagnosis of congestive heart failure if no coronary angiogram or CCTA has been performed since the diagnosis of congestive heart failure was made

II. Positive routine exercise stress test

A. A positive routine exercise stress test is defined as:
   1. ≥1 mm ST-J depression with horizontal or downsloping ST segments for 80msec after J point in three (3) consecutive beats
   2. Ventricular tachycardia, multifocal premature ventricular contractions, triplets, supraventricular tachycardia, or heart block induced during a routine exercise stress test
   3. A drop in systolic blood pressure >10 mm Hg induced during a routine exercise stress test
B. No prior routine exercise stress test performed within the last two (2) years, a CCTA is medically necessary if no coronary angiogram is planned, there are no symptoms of chest pain or dyspnea on exertion, the Framingham risk percentage is less than 10% (see Rule 2 below), and there are no exclusion criteria listed above.
C. No new electrocardiogram changes compared to a routine stress test done less than two (2) years ago, and
   1. There are symptoms of chest pain or dyspnea on exertion, And
   2. The pretest probability assessment (see Rule 1 below) is determined to be very low or low risk and there is no exclusion criteria listed above
D. New electrocardiogram changes compared to a routine stress test done less than two (2) years ago
   1. A CCTA is medically necessary if ALL
      a. No coronary angiogram is planned
      b. There are no symptoms of chest pain or dyspnea on exertion.
      c. The Framingham risk percentage is less than 10% (see Rule 2 below)
      d. There is no exclusion criteria listed above
E. Prior coronary angiogram was normal or revealed <30% stenosis in all vessels
F. Prior CCTA was normal or revealed <40% stenosis in all vessels, or the calcium score was < 100

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

III. Abnormal imaging stress test

A. No symptoms of chest pain or dyspnea on exertion, a CCTA is medically necessary if the Framingham risk percentage is less than 10% (see Rule 2 below), no coronary angiogram is planned, and there is no exclusion criteria listed above
B. New findings on the current imaging stress compared to one done in past two years a CCTA is medically necessary depending on the evaluation done to assess the prior abnormal imaging stress test as follows:
    1. No evaluation (medical therapy)- a CCTA is medically necessary if ALL
        a. No coronary angiogram is planned
        b. There are no symptoms of chest pain or dyspnea on exertion.
        c. The Framingham risk percentage is less than 10% (see Rule 2 below).
        d. There is no exclusion criteria listed above
    2. If the prior coronary angiogram was normal
    3. If the prior CCTA was normal

IV. New or changed chest pain or dyspnea on exertion

If there is no prior documentation of coronary artery disease, a CCTA can be approved for the complaint of chest pain if there are contraindications to a routine stress test and the Pre-Test Probability Assessment (see Rule 1 below) defines a member at very low to low-risk. Contraindications to a routine exercise stress test include:

A. Inability to exercise
B. Diabetes
C. Current digoxin use
D. Poor heart rate response due to medication, or impulse formation or conduction system disease
E. Wolfe-Parkinson-White syndrome on electrocardiogram
F. Complete left bundle branch block on electrocardiogram
G. Ventricular paced rhythm on electrocardiogram
H. Resting electrocardiogram showing ≥1 mm ST-J depression with horizontal or downsloping ST segments for 80 msec after J point

V. Normal imaging stress test and chest pain

If an imaging stress test was normal but chest pain is present, then a CCTA is medically necessary if the Pre-Test Probability Assessment (see Rule 1) places the member in the intermediate to high-risk range. For a member with very low-to-low pre-test probability based on the character of chest pain, age and sex, and a normal imaging stress test, a CCTA is not indicated as there is insufficient peer-reviewed literature to support this indication.

VI. Pre-operative assessment for non-cardiac surgery

Members scheduled for non-cardiac surgery may require a CCTA within four weeks of surgery to assess cardiac risk in an effort to reduce peri-operative complications. The medical necessity of CCTA in assessing surgical risk is based upon whether the surgery is deemed "High", "Intermediate", or "Low" risk surgery and whether or not the member has pre-existing coronary artery disease. The ACC defines the following:

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

- High risk surgery -
    1. Emergent operations, especially in the elderly
    2. Aortic and other major vascular surgeries
    3. Peripheral vascular surgeries
    4. Anticipated prolonged surgical procedures associated with large fluid shifts and/or blood loss.

- Intermediate risk surgery -
    1. Carotid endarterectomy
    2. Head and neck surgery
    3. Intraperitoneal and intrathoracic surgery
    4. Orthopedic surgery
    5. Prostate surgery

- Low risk surgery -
    1. Endoscopic surgeries
    2. Superficial procedures
    3. Cataract surgery
    4. Breast surgery

If a member is scheduled for high-risk non-cardiac surgery in the next four weeks, a CCTA is medically necessary if the Framingham risk calculation (see Rule 2 below) is less than 10% and no imaging stress test has been performed in the last year.

VII. Valvular heart disease, congenital heart disease, pericardial disease

CCTA is medically necessary if a surgical intervention is planned for these indications and no heart catheterization is needed prior to surgery.

VIII. Pulmonary vein mapping (75572)

CPT 75572 is medically necessary for pulmonary vein mapping in preparation for cardiac pacing or pulmonary vein catheter ablation for elimination of recurrent atrial fibrillation. If a member met this criterion and meets the above criteria for a CCTA, use CPT 75574.

IX. Congenital heart disease (75573)

A. Known congenital heart disease and new or changed cardiovascular symptoms
B. Known Marfan's syndrome and new or changed cardiovascular symptoms
C. Suspected Marfan's syndrome
D. Suspected coaractation of the aorta
E. Suspected anomalous pulmonary venous drainage
F. Suspected pulmonary outflow tract obstruction
G. Prior surgical intervention for congenital heart disease
H. Planned surgical intervention for congenital heart disease
I. Known coarctation of the aorta and one of the following:
    1. New or changed cardiovascular symptoms
    2. After one (1) year of a prior cardiac CT or cardiac MRI
    3. Within one (1) year of surgical correction

X. Calcium Scoring (75571)

Calcium scoring is not medically necessary for members with documented vascular disease or coronary artery equivalents including coronary artery disease, peripheral vascular disease, cerebrovascular disease, known atherosclerosis, and diabetes. Additionally, there is no indication for calcium scoring in a symptomatic or asymptomatic member with a low (less than 10%) or high (20% or greater) Framingham risk percentage. Indications include:

A. Asymptomatic member with intermediate Framingham Risk Percentage and all of the following:
   1. No documentation of an equivocal or abnormal routine or imaging stress test within the last two (2) years
   2. No documentation of abnormal cardiac catheterization or coronary CT angiography within the last two (2) years
   3. No documented calcium scoring within the last five (5) years
B. Symptomatic member with intermediate Framingham Risk Percentage and all of the following:
   1. Documentation of chest pain syndrome *
   2. Documentation of a normal routine or imaging stress test since the onset of chest pain syndrome
   3. No documented calcium scoring within the last five (5) years

** Chest pain syndrome includes chest pain, chest tightness, chest burning, dyspnea, shoulder pain, and jaw pain.*

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

Rule 1: Determination of pretest probability for coronary disease based on chest pain

The following assessment is used to determine the pre-test probability of coronary artery disease based on a description of the character of the chest pain, member age and sex. This assessment will define the chest pain as typical angina, atypical angina, and non-anginal chest pain. This description then is applied to the age/sex criteria as follows:

Pre-Test Probability of CAD by Age, Gender, and Symptoms					
Age Years	**Gender**	**Typical/Definite Angina Pectoris**	**Atypical/Probable Angina Pectoris**	**Nonanginal Chest Pain**	**Asymptomatic**
30- 39	Men	Intermediate	Intermediate	Low	Very low
	Women	Intermediate	Very low	Very low	Very low
40- 49	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Low	Very low	Very low
50- 59	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Intermediate	Low	Very low
≥ 60	Men	High	Intermediate	Intermediate	Low
	Women	High	Intermediate	Intermediate	Low
		High : Greater than 90% pre-test probability	**Intermediate:** Between 10% and 90% pre-test probability	**Low:** Between 5% and 10% pre-test probability	**Very Low:** Less than 5% pre-test probability
Typical angina (definite) : 1) Substernal chest pain or discomfort that is 2) provoked by exertion or emotional stress and 3) relieved by rest and/or nitroglycerin.					
Atypical angina (probable): Chest pain or discomfort that lacks one of the characteristics of definite or typical angina.					
Non-anginal chest pain: Chest pain or discomfort that meets one or none of the typical angina characteristics.					

The pre-test probability is thus defined as high, intermediate, low, or very low. This is applied to the criteria sets for determination of the need for CCTA.

Rule 2: Framingham risk assessment for coronary artery disease

Framingham risk assessment is a calculation to predict the 10-year risk of heart disease in an individual member. The calculation is made from member age, sex, lipid values and blood pressure, as well as smoking history and the presence of diabetes. A sample calculator can be found on-line at: http://www.healthylifeinfo.com/healthlib/calcs/calc_heart_risk.asp

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

References:

1. Brindis RG, Douglas PS, Hendel RC, Peterson ED, Wolk MJ, Allen JM, Patel MR, Raskin IE, ACCF/ASNC appropriateness criteria for single-photon emission computed tomography myocardial perfusion imaging (SPECT MPI): a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group and the American Society of Nuclear Cardiology, *J Am Coll Cardiol*, 2005; 46: 1587- 605.
2. Klocke FJ, Baird MG, Bateman TM, Berman DS, Carabello BA, Cerqueira MD, DeMaria AN, Kennedy JW, Lorell BH, Messer JV, O'Gara PT, Russell RO Jr., St. John Sutton MG, Udelson JE, Verani MS, Williams KA, ACC/AHA/ASNC guidelines for the clinical use of cardiac radionuclide imaging: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/ASNC Committee to Revise the 1995 Guidelines for the Clinical Use of Radionuclide Imaging), 2003, *American College of Cardiology Web Site,* Accessed at: http://www.acc.org/clinical/guidelines/radio/rni_fulltext.pdf.
3. Mollet NR, Cademartiri, F, van Mieghem CAG, Runza G, McFadden EP, Baks T, Serruys PW, Krestin GP, de Feyter PJ, High-Resolution spiral computed tomography coronary angiography in members referred for diagnostic conventional coronary angiography, *Circulation,* 2005; 112: 2318-2323.
4. ACCF/ACR/SCCT/SCMR/ASNC/NASCI/SCAI/SIR Appropriateness Criteria for Cardiac Computed Tomography and Cardiac Magnetic Resonance Imaging. Journal of the American College of Cardiology Vol. 48, No. 7, 2006

Reviewed: 11/18/2009

Posted: 01/01/2010

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

78451	Myocardial perfusion imaging, tomographic (SPECT) (including attenuation correction, qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); single study, at rest or stress (exercise or pharmacologic)
78452	Myocardial perfusion imaging, tomographic (SPECT) (including attenuation correction, qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); multiple studies, at rest and/or stress (exercise or pharmacologic) and/or redistribution and/or rest reinjection
78453	Myocardial perfusion imaging, planar (including qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); single study, at rest or stress (exercise or pharmacologic)
78454	Myocardial perfusion imaging, planar (including qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); multiple studies, at rest and/or stress (exercise or pharmacologic) and/or redistribution and/or rest reinjection

I. Assessment of an asymptomatic member prior to non-cardiac surgery

Members scheduled for non-cardiac surgery may require a nuclear stress test within four weeks of surgery to assess cardiac risk in an effort to reduce peri-operative complications. The acceptable risk depends on whether the surgery is deemed "High", "Intermediate", or "Low" risk surgery and whether or not the member has pre-existing coronary artery disease.

The ACC defines the following:

- High risk surgery
  1. Emergent operations, especially in the elderly
  2. Aortic and other major vascular surgeries
  3. Peripheral vascular surgeries
  4. Anticipated prolonged surgical procedures associated with large fluid shifts and/or blood loss.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

- Intermediate risk surgery-
  1. Carotid endarterectomy
  2. Head and neck surgery
  3. Intraperitoneal and intrathoracic surgery
  4. Orthopedic surgery
  5. Prostate surgery

- Low risk surgery-
  1. Endoscopic surgeries
  2. Superficial procedures
  3. Cataract surgery
  4. Breast surgery

A. High risk non-cardiac surgery
B. Intermediate risk non-cardiac surgery
   A nuclear stress test is medically necessary prior to intermediate risk non-cardiac surgery if no normal imaging stress or coronary angiography with in the last year and one of the following:
   1. Known coronary artery disease
   2. Known congestive heart failure
   3. Diabetes
   4. Prior stroke or transient ischemic attack
   5. Creatinine level of 2.0 mg/dl or greater
   6. Framingham risk of 10% or greater
   7. Uninterpretable electrocardiogram

   Note: Asymptomatic members planning low risk surgery do not require MPI.

II. Assessment of member discharged within the last eight weeks after hospitalization for a cardiac condition

A. Discharged, without a positive or symptom-limited stress test, for
   1. Atrial fibrillation- if the member has not had an imaging stress test within two years prior to the hospital discharge, and has
      a. Framingham risk* percentage ≥10%
      b. Diabetes

If the Framingham risk* is <10% and there are no contraindications to a routine exercise stress test, then a nuclear study is not supported by adequate peer-reviewed literature as a routine stress test can be performed as the initial test modality. Contraindication to a routine exercise stress test include diabetes, inability to exercise, digoxin use, inability to raise heart rate due to electrical system disease or medication that cannot be stopped or an uninterpretable electrocardiogram. The ACC defines an uninterpretable electrocardiogram as a ventricular paced rhythm, left bundle branch block, Wolfe-Parkinson-White syndrome or ≥1mm ST depression at baseline.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

B. Myocardial ischemia (including myocardial infarction, unstable angina, or chest pain syndrome**)
   1. And NONE of the following:
      a. Heart catheterization
      b. Coronary CT angiography
      c. Symptom limited stress test prior to discharge.
   2. Percutaneous intervention was performed during hospitalization and lesions of the coronary anatomy of >50% were present but not fixed, a nuclear stress test is medically necessary.

C. Congestive heart failure
   1. New diagnosis, and NONE of the following:
      a. Heart Catheterization
      b. Coronary CT Angiogram
      c. Imaging stress study performed during or since hospitalization.
   2. Recurrent congestive heart failure and NONE of the following:
      a. Heart catheterization within three years prior
      b. Coronary CT Angiogram within three years prior
      c. Imaging stress test within two years
   3. Recurrent congestive heart failure and greater than 40% stenosis seen in any vessel on heart catheterization or coronary CT angiogram within three years prior provided no imaging stress test within the last year.
   4. Recurrent congestive heart failure and less than 40% stenosis seen in any vessel on heart catheterization or coronary CT angiogram within three years prior provided no imaging stress test within the last two years.

D. Syncope or near syncope
   1. Within the last year, regardless of the findings of coronary artery disease, No:
      a. Imaging Stress Test
      b. Heart Catheterization
      c. Coronary CT Angiogram was performed
   2. After one year from an imaging stress test, heart catheterization, or coronary CT angiogram, a nuclear stress test is medically necessary if coronary artery disease was documented

In the absence of known coronary artery disease, a routine exercise stress test is the first-line test provided there are no contraindications to a routine exercise stress test as described in section IIA above.

III. Assessment of member with known cardiac disease

A. Member stable or with no symptoms
   1. No CHF a nuclear stress test every two years
   2. With CHF every year
   3. Two years after a percutaneous intervention

B. New or changed chest pain or chest pain syndrome**

C. Congestive heart failure
   1. A nuclear stress test is medically necessary every two years in the absence of coronary artery disease.
   2. Yearly if coronary artery disease is present

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

D. SEND FOR REVIEW
   1. Heart catheterization or coronary CT angiogram done within the last year showed no stenotic lesion >50% and there are no symptoms of chest pain or chest pain syndrome**.
   2. A nuclear stress test is not supported by adequate peer-reviewed literature within five years after coronary artery bypass grafting in the absence of chest pain or chest pain syndrome**. Thereafter a nuclear stress is medically necessary every two years. See III-C for symptomatic members.
   3. A nuclear stress test is not supported by adequate peer-reviewed literature within two years of percutaneous intervention in the absence of chest pain or chest pain syndrome**.

IV. Assessment of member without documented coronary artery disease

Routine exercise stress test is the first-line test with the indications listed below, unless the member meets one of the following criteria for nuclear stress imaging:

A. Framingham risk* percentage ≥10% and asymptomatic, a nuclear stress test can be approved every two years.
B. Diabetes- a nuclear stress test is medically necessary every two years for all diabetic members in the absence of symptoms.
C. Uninterpretable electrocardiogram and:
   1. Atrial fibrillation
   2. Chest pain
   3. Dyspnea on exertion
   4. Syncope

   Note: The ACC defines an uninterpretable electrocardiogram as:
   - Ventricular paced rhythm
   - Left bundle branch block
   - Wolfe-Parkinson-White Syndrome
   - One (1) mm or greater ST depression at baseline

D. Digoxin use and any other indication
E. Abnormal routine exercise stress test
   1. The definition of an abnormal routine stress test is one (1) mm or greater J point depression (ST 80) with horizontal or down-sloping ST segments. A member with this abnormality may qualify for a nuclear stress test if no heart catheterization or coronary CT angiogram is planned.
   2. If during the routine stress test the member developed chest pain but had no electrocardiogram changes, a nuclear stress test can be approved.
   3. If there was ventricular tachycardia, multifocal premature ventricular contractions, triplets, supraventricular tachycardia, or heart block induced during the routine stress test, a nuclear stress test can be approved
   4. If there is a drop in systolic blood pressure of >10 mm Hg during a routine exercise stress test, a nuclear stress test can be approved.
F. Inability to attain an adequate heart rate due to electrical system disease or medications that cannot be withdrawn
G. Member unable to exercise due to medical illness
H. Syncope- A member with syncope and no known coronary artery disease, who does not meet other criteria for a nuclear stress test, requires a first-line routine exercise stress test.

I. New or changed chest pain or dyspnea- A member with new or changed chest pain or chest pain syndrome** (and no known coronary artery disease) requires a first-line routine exercise stress test if no other criteria for a nuclear stress test are met.
J. Documented ventricular tachycardia

* An online Framingham risk calculator can be accessed at the following link: *http://www.healthylifeinfo.com/healthlib/calcs/calc_heart_risk.asp*

** Chest pain syndrome includes chest pain, chest tightness, chest burning, dyspnea, shoulder pain, and jaw pain.

References:

1. Eagle KA, Berger PB, Calkins H, Chaitman BR, Ewy GA, Fleischmann KE, Fleisher LA, Froehlich JB, Gusberg RJ, Leppo JA, Ryan T, Schlant RC, Winters WL Jr., ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery: a report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines (Committee to Update the 1996 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery), 2002; Retrieved from http://www.acc.org.
2. Brindis RG, Douglas PS, Hendel RC, Peterson ED, Wolk MJ, Allen JM, Patel MR, Raskin IE, ACCF/ASNC appropriateness criteria for single-photon emission computed tomography myocardial perfusion imaging (SPECT MPI): a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group and the American Society of Nuclear Cardiology, *J Am Coll Cardiol,* 2005; 46: 1587- 605.
3. Klocke FJ, Baird MG, Bateman TM, Berman DS, Carabello BA, Cerqueira MD, DeMaria AN, Kennedy JW, Lorell BH, Messer JV, O'Gara PT, Russell RO Jr., St. John Sutton MG, Udelson JE, Verani MS, Williams KA, ACC/AHA/ASNC guidelines for the clinical use of cardiac radionuclide imaging: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/ASNC Committee to Revise the 1995 Guidelines for the Clinical Use of Radionuclide Imaging), 2003.
4. Fleischmann KE et al., Exercise echocardiography or exercise SPECT imaging: a meta-analysis of diagnostic test performance, *JAMA*, 1998; 280: 913-920.
5. Strickberger SA, MD, Benson DW, MD, PhD, Biaggioni I, MD, Callans DJ, MD, Cohen MI, MD, et al., AHA/ACCF Scientific Statement on the Evaluation of Syncope From the American Heart Association Councils on Clinical Cardiology, Cardiovascular Nursing, Cardiovascular Disease in the Young, and Stroke, and the Quality of Care and Outcomes Research Interdisciplinary Working Group; and the American College of Cardiology Foundation In Collaboration With the Heart Rhythm Society, *J Am Coll Cardiol*, 2006; 47: 473-484, doi:10.1016/j.jacc.2005.12.019.
6. Lee A. Fleisher, Joshua A. Beckman, Kenneth A. Brown, Hugh Calkins, Elliott Chaikof, Kirsten E. Fleischmann, William K. Freeman, James B. Froehlich, Edward K. Kasper, Judy R. Kersten, Barbara Riegel and John F. ACC/AHA 2007 Guidelines on Perioperative Cardiovascular Evaluation Care for Noncardiac Surgery:Execuative Summary. A Report of the American/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery)

Reviewed: 11/18/2009
Posted: 01/01/2010

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

78472 Gated Cardiac Radionuclide Angiography
78473 Gated Multiple Cardiac Radionuclide Angiography
78481 Planar First Pass Cardiac Radionuclide Angiography
78483 Planar First Pass Multiple Cardiac Radionuclide Angiography
78494 SPECT Equilibrium Cardiac Radionuclide Angiography
78496 SPECT Equilibrium Multiple Cardiac Radionuclide Angiography

A first pass or multi-gated acquisition (MUGA) scan uses a radioisotope circulating in the blood to assess ventricular function. Similar data is collected during myocardial perfusion examinations (represented by CPT codes 78478 and 78480) and can be derived from echocardiography and certain CT and MR examinations.

I. Assessment of cardiac function for cardiotoxic chemotherapy

A. Prior to the initiation of cardiotoxic chemotherapy and one of the following:
   1. No echocardiogram is planned or performed
   2. Prior echocardiogram is uninterpretable due to poor visualization window

B. Cardiac function monitoring during cardiotoxic chemotherapy

Cardiotoxic chemotherapy includes any of the following medications:

- 5-FU (5 flouruiacil)
- Adriamycin (doxorubicin)
- Avastin (bevacizumab)
- Cerubidine (danorubicin)
- Clolar (clofarabine)
- Cytoxan (cyclophosphamide)
- Epirubicin (pharmorubicin)
- Gleevec (imatinib)
- Herceptin (trastuzumab)
- Iflex (ifosamide)
- Mutamycin (mitomycin)
- Nexavar (sorafenib)
- Novantrone (mitoxantrone)
- Sutent (sunitinib)
- Taxol (paclitaxel)
- Taxotere (docetaxel)

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

- Tykerb (lapatinib)
- Valstar (valrubicin)
- Xeloda (capcecitabine)
- Zavedos (idarubicin)

II. Assessment of cardiomyopathy

A. Known ejection fraction less than 50 percent on prior imaging
   1. Asymptomatic follow-up and both of the following:
      a. No cardiac function imaging in the last year
      b. No planned echocardiogram
   2. Symptomatic
      a. Shortness of breath

III. Assessment of congestive heart failure

A. Known ejection fraction less than 50 percent on prior imaging
   1. Asymptomatic follow-up and both of the following:
      a. No cardiac function imaging in the last year
      b. No planned echocardiogram
   2. Symptomatic
      a. Shortness of breath
      b. Paroxysmal nocturnal dyspnea
      c. Orthopnea

References:

1. Howlett JG, McKelvie RS, Arnold JMO, et al, Canadian cardiovascular society consensus conference guidelines on heart failure, update 2009: diagnosis and management of right-sided heart falure, myocariditis, device therapy and recent important clinical trials, Can J Cardiol , 2009; 25:85-105, accessed at https://services3.horizon-bcbsnj.com/hcm/MedPol2.nsf , October 22, 2009.
2. Dumitru I, and Baker M, Heart Failure: Differential diagnosis and workup, emedicine, 2009 accessed at http://emedicine.medscape.com/article/163062-diagnosis , October 22, 2009.
3. Yeh ETH, and Bickford CL, Cardiovascular complications of cancer therapy Incidence, pathogenesis, diagnosis and management, J Am Coll Cardiol, 2009; 53:2231-2247.

Reviewed: 05/26/2010
Posted: 07/02/2010

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

78459 PET Myocardial Imaging; Positron Emission Tomography (PET) Metabolic Evaluation
78491 Myocardial Perfusion Imaging, Positron Emission Tomography (PET) Single Study, Rest or Stress
78492 Myocardial Perfusion Imaging, Positron Emission Tomography (PET), Multiple Studies at Rest and/or Stress[1]

78491 and 78492 is also referred to as a Rubidium study stress test.

I. Sarcoid (78459)

A. Suspected cardiac sarcoidosis - Documentation of an established diagnosis of sarcoidosis and ONE of the following:
   1. Premature ventricular contractions
   2. Ventricular tachycardia
   3. Heart block
   4. Left ventricular dysfunction
   5. Supraventricular tachycardia
   6. Restrictive cardiomyopathy

B. Known cardiac sarcoidosis - Documentation of an established diagnosis of cardiac sarcoidosis and ONE of the following:
   1. Documentation of a completed treatment course for sarcoidosis since last cardiac PET scan
   2. No cardiac PET scan within six (6) months of completion of treatment for sarcoidosis

II. Suspected coronary artery disease (78491, 78492)

A routine exercise stress test is the first-line test with the indications listed below, unless the member meets one of the following criteria cardiac PET scan:

A. Body mass index*** greater or equal to 40 AND one of the following:
   1. Framingham risk* percentage ≥10% and asymptomatic, a cardiac PET scan can be approved every two (2) years.
   2. Diabetes and asymptomatic, a cardiac PET scan can be approved every two (2) years.
   3. Abnormal calcium (Agatston) score ≥400 and asymptomatic, a cardiac PET scan can be approved every two (2) years.
   4. Abnormal routine exercise stress test
      a. The definition of an abnormal routine stress test is one (1) mm or greater J point depression (ST 80) with horizontal or down-sloping ST segments. A member with this abnormality may qualify for a cardiac PET scan if no heart catheterization or coronary CT angiogram is planned
      b. If during the routine stress test the member developed chest pain but had no electrocardiogram changes, a cardiac PET scan can be approved.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

c. If there was ventricular tachycardia, multifocal premature ventricular contractions, triplets, supraventricular tachycardia, or heart block induced during the routine stress test, a cardiac PET scan can be approved
d. If there is a drop in systolic blood pressure of >10 mm Hg during a routine exercise stress test, a cardiac PET can be approved

5. New or changed chest pain or dyspnea or syncope - A member with new or changed chest pain or chest pain syndrome** or syncope (and no known coronary artery disease) requires a first-line routine exercise stress test unless one of the following criteria is met:
   a. Inability to attain an adequate heart rate due to electrical system disease or medications that cannot be withdrawn
   b. Member unable to exercise due to medical illness
   c. Framingham risk* percentage >10%
   d. Diabetes
   e. Uninterpretable electrocardiogram
      Note: The ACC defines an uninterpretable electrocardiogram as:
      - Ventricular paced rhythm
      - Left bundle branch block
      - Wolfe-Parkinson-White Syndrome
      - One (1) mm or greater ST depression at baseline
   f. Digoxin use

* An online Framingham risk calculator can be accessed at the following link: http://www.healthylifeinfo.com/healthlib/calcs/calc_heart_risk.asp

** Chest pain syndrome includes chest pain, chest tightness, chest burning, dyspnea, shoulder pain, and jaw pain.

*** An online body mass index calculator can be accessed at the following link: http://www.nhlbisupport.com/bmi/.

B. Prior uninterpretable nuclear stress test AND one of the following:
   a. No prior cardiac PET scan
   b. A prior cardiac PET scan and new chest pain or shortness of breath

III. Known coronary artery disease to assess myocardial viability (78459)

A. Documentation of regional left ventricular dysfunction AND one of the following:
   1. No revascularization since the documentation of regional left ventricular dysfunction
   2. A fixed defect on nuclear stress testing in the same region as the documented regional left ventricular dysfunction AND this region is being considered for revascularization

IV. Known coronary artery disease (78491, 78492)

A. Body mass index*** greater or equal to 40 AND prior documentation of coronary artery disease**** AND one of the following:
   1. Chest pain syndrome**.
   2. Dyspnea on exertion.
   3. Two years after a percutaneous intervention
   4. Five years after a coronary artery bypass grafting.
   5. Asymptomatic and no intervention as defined in 3 and 4 above, a cardiac PET scan can be approved every two (2) years.

* An online Framingham risk calculator can be accessed at the following link: http://www.healthylifeinfo.com/healthlib/calcs/calc_heart_risk.asp

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

** Chest pain syndrome includes chest pain, chest tightness, chest burning, dyspnea, shoulder pain, and jaw pain.

*** An online body mass index calculator can be accessed at the following link: http://www.nhlbisupport.com/bmi/.

**** Accepted documentation of coronary artery disease:

- Abnormal Catheterization
- Abnormal CCTA
- Abnormal Nuclear Stress Test/PET
- Abnormal Stress Echo
- Prior PCI
- Prior CABG
- Calcium score >10

V. Standards

A. Readers

1. Physicians who perform* or interpret myocardial perfusion PET examinations must be certified by the American College of Radiology, the Certification Board for Nuclear Cardiology or equivalent certifying board deemed acceptable by the CareCore National Medical Advisory Committee. Any person whose current certification was issued before January of 2000 must also document at least 40 hours of accredited training in the interpretation of myocardial perfusion PET examinations.

B. Laboratories

1. All myocardial perfusion PET imaging must be performed on a full ring PET scanner accredited by the American College of Radiology or the Intersocietal Commission for the Accreditation of Nuclear Laboratories. PET/CT scanners will be given preference in determinations of geographic need.
   - For the purposes of this document the person billing for the technical component of the examination will be deemed to be performing the examination.

References:

1. Eagle KA, Berger PB, Calkins H, Chaitman BR, Ewy GA, Fleischmann KE, Fleisher LA, Froehlich JB, Gusberg RJ, Leppo JA, Ryan T, Schlant RC, Winters WL Jr., ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery: a report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines (Committee to Update the 1996 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery), 2002, Accessed at http://acc.org/.

2. Brindis RG, Douglas PS, Hendel RC, Peterson ED, Wolk MJ, Allen JM, Patel MR, Raskin IE, ACCF/ASNC appropriateness criteria for single-photon emission computed tomography myocardial perfusion imaging (SPECT MPI): a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group and the American Society of Nuclear Cardiology, J Am Coll Cardiol 2005; 46: 1587– 605.

3. Klocke FJ, Baird MG, Bateman TM, Berman DS, Carabello BA, Cerqueira MD, DeMaria AN, Kennedy JW, Lorell BH, Messer JV, O'Gara PT, Russell RO Jr., St. John Sutton MG, Udelson JE, Verani MS, Williams KA, ACC/AHA/ASNC guidelines for the clinical use of cardiac radionuclide imaging: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/ASNC Committee to Revise the 1995 Guidelines for the Clinical Use of Radionuclide Imaging), 2003.

4. Fleischmann KE, et al., Exercise echocardiography or exercise SPECT imaging: a meta-analysis of diagnostic test performance, JAMA 1998; 280: 913-920.

5. Strickberger SA, Benson DW, Biaggioni I, Callans DJ, Cohen MI, Ellenbogen KA, Epstein AE, Friedman P, Goldberger J, Heidenreich PA, Klein GJ, Knight BP, Morillo CA, Myerburg RJ, Sila CA, FAHA AHA/ACCF Scientific statement on the evaluation of syncope from the American Heart Association councils on clinical cardiology, cardiovascular nursing, cardiovascular disease in the young, and stroke, and the quality of care and outcomes research interdisciplinary working group and the American College of Cardiology Foundation in collaboration with the Heart Rhythm Society, J Am Coll Cardiol 2006; 47: 473-484, doi:10.1016/j.jacc.2005.12.019.

6. Saunders, Cardiac Imaging, A Companion to Brauns World's Heart Disease, 2nd Edition, 1998.

93303	Transthoracic Echocardiography for Congenital Cardiac Anomalies; Complete
93304	Transthoracic Echocardiography for Congenital Cardiac Anomalies; Follow-up or Limited Study
93306	Echocardiography, Transthoracic, Real-time with Image Documentation (2D), Includes M-mode Recording, when Performed, Complete, with Spectral Doppler Echocardiography, and with Color Flow Doppler Echocardiography
93307	Echocardiography, Transthoracic, Real-time with Image Documentation (2D) with or without M-mode Recording; Complete
93308	Echocardiography, Transthoracic, Real-time with Image Documentation (2D) with or without M-mode Recording; Follow-up or Limited Study
93320	Doppler Echocardiography, Pulsed Wave and/or Continuous Wave with Spectral Display; Complete
93321	Doppler Echocardiography, Pulsed Wave and/or Continuous Wave with Spectral Display; Follow-up or Limited Study
93325	Doppler Echocardiography Color Flow Velocity Mapping

If the requested echocardiogram is for follow-up on a previously abnormal echo then CPT codes 93304, 93308, or 93321 are to be used.

There are numerous broad categories of indications for an echocardiogram including:

- Valvular heart disease
- Symptoms/findings such as chest pain, palpitations/arrhythmia, shortness of breath, syncope or near-syncope, and atrial fibrillation
- Coronary artery disease
- Hypertensive heart disease
- Cardiomyopathy
- Pericardial disease
- Documented Neurologic or vascular occlusive event
- Diseases of the Great Vessels
- Pulmonary vascular disease

I. Conditions permitting routine annual follow-up examinations

A. Cardiac tumors
B. Cardiac mass

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

C. Atrial myxoma
D. Congenital heart disease
E. Adult congenital heart disease
F. Patent ductus arteriosis
G. Right ventricular dysplasia
H. Cardiac resynchronization therapy

II. For the following indications, an echocardiogram is allowed once. Follow-up echocardiograms for these indications must be based on the findings on the initial echocardiogram.

A. Family history of genetically transmitted cardiac disease
B. First-degree relative of a member with unexplained cardiomyopathy
C. Sarcoidosis
D. Amyloidosis

III. General indications

A. Valvular heart disease
   1. Heart murmur - An initial echocardiogram is medically indicated to assess a heart murmur but subsequent requests must be based on the findings of the initial study.
   2. Use of anorectic Fen-Phen - An initial echocardiogram is indicated to assess a member that has been treated with Fen-Phen but subsequent requests must be based on the findings of the initial study.
   3. Endocarditis - An echocardiogram is medically indicated if endocarditis is suspected based on:
      a. Fever of 101.4 degrees F that has been present for at least 7 days
      b. Member has documented bacteremia.
      c. Member with known endocarditis. An echocardiogram is indicated within the first eight weeks of antibiotic therapy or after eight weeks if no prior echocardiogram was done
      d. After eight weeks, an echocardiogram request should be based on the findings of the initial study and follow-up would go to the appropriate pathway.
   4. Mitral valve prolapse - An echocardiogram is indicated once only for the physical findings of:
      a. Documented murmur or click
      b. If there is a first degree relative with mitral valve prolapse
      c. Future echocardiograms for these indications must be based on the findings seen on the initial echocardiogram.
   5. Pulmonic stenosis - An echocardiogram is indicated:
      a. Within a year of valvuloplasty
      b. If pulmonic stenosis is suggested by physical signs, symptoms, or other imaging procedures.
      c. Follow-up studies for documented pulmonic stenosis depend on age and pulmonary valve gradient.
         i. For a member with a pulmonary valve mean gradient of 30 mm Hg or more, an echocardiogram is medically necessary if chest pain or syncope is present.
         ii. For a member with a pulmonary valve mean gradient of 30 mm Hg or more and asymptomatic, an echocardiogram is medically necessary every two years.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

iii. If the initial echocardiogram had a pulmonary valve gradient of less than 30 mm Hg and the member is less than 20 years old, an echocardiogram can be approved every 12 months.

iv. If the initial echocardiogram had a pulmonary valve gradient of less than 30 mmHg and the member is more than 20 years old, an echocardiogram is only indicated for new chest pain or dyspnea on exertion.

6. Prosthetic heart valve - An echocardiogram to assess a prosthetic heart valve is appropriate:
   a. If there are new or changed signs, symptoms, or murmurs on exam.
   b. After a valve replacement
      i. An initial echocardiogram can be approved after valve replacement
         01. Follow-up studies can be approved yearly for members with an ejection fraction of less than 50%
         02. Every two years for members with an ejection fraction of 50% or more
      ii. If a prosthetic valve has been documented to be leaking or narrowed by prior echocardiogram, then a follow-up echocardiogram can be approved every three months.
7. Mitral regurgitation -
   a. A pregnant woman with known mitral regurgitation is allowed to have a follow-up echocardiogram during the course of pregnancy.
   b. Members with mild mitral regurgitation on a prior echocardiogram only qualify for a follow-up study if one of the following is present:
      i. New dyspnea on exertion
      ii. Decreased exercise tolerance
      iii. Congestive heart failure
      iv. Documented changing murmur
   c. If the prior echocardiogram documented moderate mitral regurgitation, a follow-up study can be approved yearly or whenever the following exist:
      i. New dyspnea on exertion
      ii. Decreased exercise tolerance
      iii. Congestive heart failure
      iv. Documented changing murmur
   d. If the prior echocardiogram documented severe mitral regurgitation, a follow-up study can be approved every six months or whenever the following exist:
      i. New dyspnea on exertion
      ii. Decreased exercise tolerance
      iii. Congestive heart failure
      iv. Documented changing murmur
8. Mitral stenosis –
   a. An echocardiogram is indicated once within a year of a valvuloplasty.
   b. If mild mitral stenosis was seen on a prior echocardiogram defined as:
      i. Mean valve gradient of 5 mm Hg or less
      ii. Valve area greater than 1.5 cm2
      iii. Right ventricular systolic pressure between 26-39 mm Hg
      A repeat study is indicated only if the following exist:
         01. New dyspnea on exertion
         02. Decreased exercise tolerance

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

03. Congestive heart failure
04. Fatigue

c. If moderate mitral stenosis was seen on a prior echocardiogram defined as:
   i. Mean valve gradient of 6-10 mm Hg, or valve area of 1.1-1.5 cm2.
   ii. Right ventricular systolic pressure between 40-69 mm Hg
   A repeat study is indicated only if the following exist:
   01. New dyspnea on exertion
   02. Decreased exercise tolerance
   03. Congestive heart failure
   04. Fatigue
d. If severe mitral stenosis was seen on prior echocardiogram defined as:
   i. Mean valve gradient of greater than 10 mm Hg.
   ii. Valve area less than 1 cm2
   iii. Right ventricular systolic pressure of 70 mm Hg or greater
   A repeat study is indicated every year OR if the following exist:
   01. New dyspnea on exertion
   02. Decreased exercise tolerance
   03. Congestive heart failure
   04. Fatigue

9. Aortic stenosis-
   a. An echocardiogram is indicated for suspected aortic stenosis.
   b. If mild aortic stenosis is documented defined as:
      i. Mean aortic valve gradient of 20 mm Hg or less
      ii. Valve gradient greater than 1.5 cm2
      A follow-up study can be approved every five (5) years or sooner if any of the following exist:
      01. Chest pain
      02. Dyspnea on exertion
      03. Syncope
      04. Left ventricular hypertrophy by electrocardiogram
      05. Change in left ventricular function found on other imaging modalities
   c. If moderate aortic stenosis is documented defined as:
      i. Mean aortic valve gradient of 20-40 mm Hg.
      ii. Valve area between 1-1.5 cm2
      A follow-up study can be approved every 2 years or sooner if any of the following exist:
      01. Chest pain
      02. Dyspnea on exertion
      03. Syncope
      04. Left ventricular hypertrophy byeElectrocardiogram
      05. Change in left ventricular function found on other imaging modalities
   d. If severe aortic stenosis is documented defined as:
      i. Mean aortic valve gradient of more than 40 - Hg.
      ii. Valve area less than 1 cm2
      A follow-up study can be approved every year or sooner if any of the following exist:
      01. Chest pain

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

02. Dyspnea on exertion
03. Syncope
04. Left ventricular hypertrophy by electrocardiogram
05. Change in left ventricular function found on other imaging modalities

10. Aortic regurgitation –
    a. An echocardiogram is indicated for suspected aortic regurgitation.
    b. If mild aortic regurgitation is documented, a follow-up study can be approved every three (3) years or sooner if any of the following exist:
        i. Chest pain
        ii. Change in exercise tolerance
    c. If moderate aortic regurgitation is documented, a follow-up study can be approved every 2 years or sooner if any of the following exist:
        i. Chest pain
        ii. Change in exercise tolerance
    d. If severe aortic regurgitation is documented
        i. Follow-up study can be approved every year
        ii. Follow-up study can be approved every six months
            01. If the systolic left ventricular dimension is less than 50mm
            02. Diastolic left ventricular dimension is less than 75mm.
            03. If severe aortic regurgitation is documented and the member is symptomatic or has a systolic left ventricular dimension of greater than 55mm or diastolic left ventricular dimension of greater than 75mm, a follow-up echocardiogram is not needed, as the member is a surgical candidate for valve replacement.

B. Symptoms/findings
    1. Chest pain - Chest pain is not an indication for an echocardiogram. If chest pain is part of a symptom complex, follow the appropriate guideline for the primary diagnosis.
    2. Palpitations/arrhythmia –
        a. If a prior echocardiogram has been performed for this diagnosis, a repeat echocardiogram for this indication must be based on the findings seen on the initial echocardiogram.
        b. If no prior echocardiogram has been performed, and the palpitations have been directly linked to an arrhythmia documented by electrocardiographic tracing, an echocardiogram can be approved for:
            i. Non-sustained ventricular tachycardia
            ii. Sustained or non-sustained supraventricular tachycardia
            iii. Ventricular tachycardia and premature ventricular contractions
        c. Atrial premature contractions do not require an echocardiogram as there is inadequate peer-reviewed literature to support this indication.
    3. Dyspnea on exertion- In a member with new or changed dyspnea on exertion, an echocardiogram can be approved. If the member has known congestive heart failure, a 2-D echocardiogram (CPT 93307 and 93308) can be approved yearly.
    4. Syncope -
        a. If symptoms include complete loss of consciousness or control, related to vasovagal symptoms*, an echocardiogram is not indicated unless the symptoms are new or vary from prior episodes.
        b. If symptoms include complete loss of consciousness or control, unrelated to vasovagal symptoms*, an initial echocardiogram is allowed. Repeat studies for this diagnosis are

not allowed within four weeks of the prior echocardiogram and if there is recurrent syncope with a known cause.

5. Atrial fibrillation - An echocardiogram can be approved for the diagnosis of new onset atrial fibrillation. If there has been a prior echocardiogram, a follow-up study can be approved after six (6) months for new onset atrial fibrillation. An echocardiogram is indicated once for the evaluation of chronic atrial fibrillation.

C. Coronary artery disease
   1. Acute myocardial infarction - An echocardiogram can be approved within three (3) months of an acute myocardial infarction providing there is documentation of:
      a. Elevated cardiac enzymes at the time of the infarct
      b. New Q waves on electrocardiogram
   2. Left Ventricular Function Assessment - See *Section E (Cardiomyopathy)* below.
   3. Myocardial ischemia, angina, unstable angina, acute coronary syndrome; These indications are not supported by peer-reviewed literature as an indication for an echocardiogram.

D. Hypertensive heart disease
   1. Left ventricular hypertrophy - An echocardiogram can be approved once for this indication.
   2. Dyspnea on exertion - See B3 (Dyspnea on Exertion) above
   3. Congestive heart failure - See E4 (Congestive Heart Failure)below
   4. Diastolic dysfunction - An echocardiogram can be approved once for this indication. If there is new shortness of breath and a known diagnosis of diastolic dysfunction - See B3 (Dyspnea on Exertion) above

E. Cardiomyopathy
   1. Hypertrophic cardiomyopathy - An echocardiogram can be approved:
      a. Once
         i. If there is suspicion of hypertrophic cardiomyopathy on physical exam, electrocardiogram
         ii. There is a family history of hypertrophic cardiomyopathy.
      b. A follow-up study can be performed if:
         i. Hypertrophic cardiomyopathy has been documented on prior echocardiogram
         ii. Member has new signs or symptoms.
      c. Members with a family history of hypertrophic cardiomyopathy can have a yearly echocardiogram.
   2. Monitoring chemotherapy toxicity - A 2-D echocardiogram (CPT 93307 and 93308) can be approved for members on cardiotoxic chemotherapy.
   3. Diastolic dysfunction - See D4 (Diastolic Dysfunction) above
   4. Implantable cardioverter-defibrillator (ICD) planning – An echocardiogram can be approved for the assessment of ejection fraction prior to ICD placement if no other determination of ejection fraction has been completed within the last year.
   5. Congestive heart failure - If a member meets the definition of congestive heart failure below, an initial echocardiogram can be approved and a follow-up 2-D echocardiogram (CPT 93307 and 93308) can be approved yearly for this diagnosis or at any time if worsening shortness of breath occurs.
      a. Pulmonary vascular congestion on chest X-ray
      b. A documented hospitalization or outpatient treatment regimen showing weight loss and symptom improvement with diuretics
      c. A known ejection fraction less than 50%

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

F. Pericardial disease
   1. Pericarditis - If signs or symptoms including chest pain with a rub, or chest pain with diffuse ST elevation on an electrocardiogram are present, an echocardiogram can be approved.
   2. Pericardial constriction - An echocardiogram can be approved for this indication if any of the following signs or symptoms are present:
      a. Fatigue, hypotension
      b. Reflex tachycardia
      c. Jugular venous distention
      d. Hepatomegaly with ascities and peripheral edema
      e. Dyspnea on exertion
      f. Orthopnea
      g. Cough
   3. Post-surgical pericardial disease - If the member is less than 12 weeks from pericardial surgery, an echocardiogram can be approved if any of the following are present:
      a. Chest pain
      b. Dyspnea on exertion
      c. Syncope
      d. Hypotension
      e. Pulsus paradoxus
      f. Jugular venous distention
      g. Tachycardia
   4. Pericardial effusion –
      a. If a pericardial effusion is suspected, an echocardiogram can be approved
      b. If the effusion is small or mild, no follow-up echocardiogram is supported by peer-reviewed literature in the absence of new signs or symptoms.
      c. If the effusion is moderate or large and there are no new symptoms, a follow-up 2-D echocardiogram (CPT 93307 and 93308), can be approved.
      d. If the effusion is moderate or large, a follow-up can be approved if there are findings of:
         i. Chest pain
         ii. Dyspnea on exertion
         iii. Syncope
         iv. Hypotension
         v. Pulsus paradoxus
         vi. Jugular venous distension
         vii. Tachycardia

G. Neurologic or vascular occlusive event
   1. Neurologic event - If a member has a new diagnosis of transient ischemic attack or cerebrovascular accident, an echocardiogram can be approved provided this study was not performed during a hospitalization for this event.
   2. Peripheral vascular occlusion - If a member has been documented to have an embolic event to the peripheral vascular system, an echocardiogram can be approved provided this study was not performed during a hospitalization for this event.

H. Diseases of the Great Vessels
   1. Aortic aneurysm - An echocardiogram can be approved for the diagnosis of suspected aortic aneurysm and yearly thereafter for this diagnosis.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

2. Marfan's syndrome - An echocardiogram can be approved for the diagnosis of Marfan's syndrome and yearly thereafter for this diagnosis.
3. Aortic dissection - An aortic dissection is not an indication for an echocardiogram.
4. Prior surgical repair of an aortic aneurysm or dissection - One echocardiogram is allowed within a year of repair for an aortic aneurysm or dissection.

I. Pulmonary vascular disease
   1. One echocardiogram is allowed for suspected pulmonary hypertension.
   2. If there is a known diagnosis of pulmonary hypertension documented on prior echocardiogram, echo angiography, or right heart catheterization, a follow-up echocardiogram can be approved if there is:
      a. Dyspnea on exertion
      b. Syncope or decreased exercise tolerance provided no echocardiogram was performed within the last six (6) months.
   3. If a member is on treatment for pulmonary hypertension (i.e. Flolan or nitrous oxide); an echocardiogram can be approved every three months regardless of symptoms.

* Vasovagal syndrome is a usually transitory condition that is marked by fainting associated with hypotension, peripheral vasodilation, and bradycardia resulting from increased stimulation of the vagus nerve - also called neurocardiogenic syncope or vasodepressor syncope. The situations that trigger this reaction are diverse and include having blood drawn, straining while urinating, defecating, or coughing. The reaction also can be due to emotional stress, fear, or pain.

References:

1. Cheitlin MD, Armstrong WF, Aurigemma GP, Beller GA, Bierman FZ, Davis JL, Douglas PS, Faxon DP, Gillam LD, Kimball TR, Kussmaul WG, Pearlman AS, Philbrick JT, Rakowski H, Thys DM. ACC/AHA/ASE 2003 guideline update for the clinical application of echocardiography: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/ASE Committee to Update the 1997 Guidelines for the Clinical Application of Echocardiography). 2003. *American College of Cardiology Web Site*. Accessed at: www.acc.org/clinical/guidelines/echo/index.pdf.

2. Douglas PS, Khandheria B, Stainback RF, Weissman NJ. ACCF/ASE/ACEP/ASNC/SCAI/SCCT/SCMR 2007 appropriateness criteria for transthoracic and transesophageal echocardiography. J Am Coll Cardiol 2007

3. Bonow RO, Carabello BA, Chatterjee K, de Leon AC Jr., Faxon DP, Freed MD, Gaasch WH, Lytle BW, Nishimura RA, O'Gara PT, O'Rourke RA, Otto CM, Shah PM, Shanewise JS. ACC/AHA 2006 guidelines for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Develop Guidelines for the Management of Patients With Valvular Heart Disease).

4. Douglas PS, Khandheria B, Stainback RF, Weissman NJ. ACCF/ASE/ACEP/AHA/ASNC/SCAI/SCCT/SCMR 2008 appropriateness criteria for stress echocardiography. J Am Coll Cardiol 2008;51:1127– 47.

Reviewed: 05/26/2010
Posted: 07/02/2010

93350 Echocardiography, Transthoracic, Real-time with Image Documentation (2D), Includes M-mode Recording, when Performed, During Rest and Cardiovascular Stress Test Using Treadmill, Bicycle Exercise and/or Pharmacologically Induced Stress, with Interpretation and Report with or without M-mode Recording, During Rest and Cardiovascular Stress Test, with Interpretation and Report

93351 Echocardiography, Transthoracic, Real-time with Image Documentation (2D), Includes M-mode Recording, when Performed, During Rest and Cardiovascular Stress Test Using Treadmill, Bicycle Exercise and/or Pharmacologically Induced Stress, with Interpretation and Report with or without M-mode Recording, During Rest and Cardiovascular Stress Test, with Interpretation and Report; Including Performance of Continuous Electrocardiographic Monitoring, with Physician Supervision

I. Assessment of an asymptomatic member prior to non-cardiac surgery

Members scheduled for non-cardiac surgery may require an echo stress test within four weeks of surgery to assess cardiac risk in an effort to reduce peri-operative complications. The acceptable risk depends on whether the surgery is deemed "High", "Intermediate", or "Low" risk surgery and whether or not the member has pre-existing coronary artery disease.

The ACC defines the following:

- High risk surgery -
  1. Emergent operations, especially in the elderly
  2. Aortic and other major vascular surgeries
  3. Peripheral vascular surgeries
  4. Anticipated prolonged surgical procedures associated with large fluid shifts and/or blood loss

- Intermediate risk surgery -
  1. Carotid endarterectomy
  2. Head and neck surgery
  3. Intraperitoneal and intrathoracic surgery
  4. Orthopedic surgery
  5. Prostate surgery

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

- Low risk surgery -
  1. Endoscopic surgeries
  2. Superficial procedures
  3. Cataract surgery
  4. Breast surgery

The indications for an echo stress test for members prior to non-cardiac surgery are as follows:

A. High risk non-cardiac surgery

B. Intermediate risk non-cardiac surgery

An echo stress test is medically necessary prior to intermediate risk non-cardiac surgery if no normal imaging stress or coronary angiography with in the last year and one of the following:

1. Known coronary artery disease
2. Known congestive heart failure
3. Diabetes
4. Prior stroke or transient ischemic attack
5. Creatinine level of 2.0 mg/dl or greater
6. Framingham risk of 10% or greater
7. Uninterpretable electrocardiogram

Note: Asymptomatic members planning low risk surgery do not require MPI. Send for medical review.

II. Assessment of a member discharged within the last eight weeks after hospitalization for a cardiac condition, providing the member did not have a symptom-limited stress test or a positive imaging study prior to discharge

A. Atrial fibrillation: If the member has not had an imaging stress test within two years prior to the hospitalization, and has:
   1. Framingham risk* percentage of ≥10%
   2. Diabetes

If the Framingham risk* is <10% and there are no contraindications to a routine exercise stress test, then an echo stress test is not supported by adequate peer-reviewed literature as a routine stress test can be performed as the initial test modality. Contraindication to a routine exercise stress test include diabetes, inability to exercise, digoxin use, inability to raise heart rate due to electrical system disease or medication that cannot be stopped or an uninterpretable electrocardiogram. The ACC defines an uninterpretable electrocardiogram as a ventricular paced rhythm, left bundle branch block, Wolfe-Parkinson-White syndrome or ≥1mm ST depression at baseline.

B. Myocardial ischemia (including myocardial infarction, unstable angina, or chest pain syndrome**)
   1. And NONE:
      a. Heart catheterization

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

b. Coronary CT angiography
c. Symptom-limited stress test prior to discharge

2. Percutaneous intervention was performed during the hospitalization and lesions of the coronary anatomy of >50% were present but not fixed, an echo stress test is medically necessary.

C. Congestive heart failure
1. New diagnosis, and NONE:
a. Heart Catheterization
b. Coronary CT Angiogram
c. Imaging stress study performed during or since hospitalization.
2. Recurrent congestive heart failure
a. Member has not had a heart catheterization or coronary CT angiogram within three years prior but had an imaging stress test more than two years prior, then an echo stress is medically necessary, provided no left heart catheterization is planned.
b. Member had a heart catheterization or coronary CT angiogram within three years prior, the need for echo stress testing depends on the findings.
i. If the catheterization or coronary CT angiogram was normal, an echo stress test is not supported by adequate peer-reviewed literature.
ii. If there were no lesions of >40% seen, then an echo stress test is medically necessary every two years.
iii. If there were any lesions >40% seen, then an echo stress test is medically necessary yearly.

D. Syncope or near syncope
1. Within the last year, regardless of the findings of coronary artery disease, may be approved if NONE of the following were performed:
a. Imaging stress test
b. Heart catheterization
c. Coronary CT angiogram
2. After one year from an imaging stress test, heart catheterization, or coronary CT angiogram, an echo stress test is medically necessary if coronary artery disease was documented.

In the absence of known coronary artery disease, a routine exercise stress test is the first-line test, provided there are no contraindications to a routine exercise stress test as described in section IIA above.

III. Assessment of a member with known cardiac disease

A. Member stable or with no symptoms
1. With CHF, every year
2. No CHF, an echo stress test every two years
3. Two years after a percutaneous intervention

B. New or changed chest pain or chest pain syndrome**

C. Congestive heart failure
1. An echo stress test is medically necessary every two years in the absence of coronary artery disease.
2. Yearly if coronary artery disease is present

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

D. SEND FOR REVIEW
   1. Heart catheterization or coronary CT angiogram done within the last year showed no stenotic lesion >50% and there are no symptoms of chest pain or chest pain syndrome**.
   2. An echo stress test is not supported by adequate peer-reviewed literature within five years after coronary artery bypass grafting in the absence of chest pain or chest pain syndrome**. Thereafter an echo stress is medically necessary every two years. See III-C for symptomatic members.
   3. An echo stress test is not supported by adequate peer-reviewed literature within two years of percutaneous intervention in the absence of chest pain or chest pain syndrome**.

IV. Valvular heart disease

A. Aortic stenosis
   1. An ejection fraction >40%, echo stress test is not supported by adequate peer-reviewed literature for a member with aortic stenosis.
   2. Ejection fraction is <40% and:
      a. No echocardiogram performed
      b. No prior echo stress test
      c. Last echo stress test was more than one year ago.
      d. Mean aortic valve gradient on echocardiogram was >10 mm HG

B. Hypertrophic cardiomyopathy
   1. An echo stress test is medically necessary for a member with documented hypertrophic cardiomyopathy by echocardiogram on a yearly basis.
   2. If there are no findings of hypertrophic cardiomyopathy on echocardiogram, then an echo stress test is not supported by adequate peer-reviewed literature for that diagnosis.

C. Mitral Regurgitation
   An echo stress test is medically necessary for an asymptomatic member with severe mitral regurgitation if all of the following criteria are met:
   1. Ejection fraction >60 % on prior cardiac imaging.
   2. Left ventricular end-systolic diameter on prior echocardiogram <40 mm.
   3. No echo stress test within the last six (6) months.

D. Aortic Insuffiency
   An echo stress test is medically necessary for an asymptomatic member with severe aortic insuffiency if all of the following criteria are met:
   1. Ejection fraction >50 % on prior cardiac imaging.
   2. Left ventricular systolic dimension on prior echocardiogram <55 mm or left ventricular diastolic dimension on prior echocardiogram <75 mm
   3. No echo stress test within the last six (6) months

V. Assessment of member without documented coronary artery disease

A routine exercise stress test is the first-line test with the indications listed below, unless the member meets one of the following criteria for echo stress imaging:

A. Framingham risk* percentage ≥10% and asymptomatic, an echo stress test can be approved every two years
B. Diabetes: An echo stress test is medically necessary every two years for all diabetic members in the absence of symptoms.
C. Digoxin use

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

D. Uninterpretable electrocardiogram (The ACC defines an uninterpretable electrocardiogram as a ventricular paced rhythm, left bundle branch block, Wolfe-Parkinson-White syndrome or ≥1 mm ST depression at baseline*)* and:
   1. Atrial fibrillation
   2. Chest pain
   3. Dyspnea on exertion
   4. Syncope

E. Abnormal routine exercise stress test
   1. The definition of abnormal is 1 mm or greater J point depression (ST 80) with horizontal or down-sloping ST segments. A member with this abnormality may qualify for an echo stress test if no heart catheterization or coronary CT angiogram is planned.
   2. If during the routine stress test the member developed chest pain but had no electrocardiogram changes, an echo stress test can be approved.
   3. If there was ventricular tachycardia, multifocal premature ventricular contractions, triplets, supraventricular tachycardia, or heart block induced during the routine stress test, an echo stress test can be approved.
   4. If there is a drop in systolic blood pressure of >10 mm Hg during a routine exercise stress test, an echo stress test can be approved.

F. Inability to attain an adequate heart rate due to electrical system disease or medications that cannot be withdrawn

G. Member unable to exercise due to medical illness

H. Syncope: A member with syncope and no known coronary artery disease, who does not meet other criteria for an echo stress test, requires a first-line routine exercise stress test.

I. New or changed chest pain or dyspnea- A member with new or changed chest pain or chest pain syndrome** (and no known coronary artery disease) requires a first-line routine exercise stress test if no other criteria for an echo stress test are met.

J. Documented ventricular tachycardia

* An online Framingham risk calculator can be accessed at the follow link: *http://www.healthylifeinfo.com/healthlib/calcs/calc_heart_risk.asp*

** Chest pain syndrome includes chest pain, chest tightness, chest burning, dyspnea, shoulder pain, and jaw pain.

VI. Prior cardiac transplantation

A. Symptomatic- An echo stress test is medically necessary for a member with a prior cardiac transplantation in the presence of new or changed chest pain or shortness of breath.

B. Asymptomatic- An echo stress test is medically necessary at yearly intervals for a member with a prior cardiac transplantation provided there has been no cardiac catheterization or imaging stress test performed within this interval

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

References:

1. Eagle KA, Berger PB, Calkins H, Chaitman BR, Ewy GA, Fleischmann KE, Fleisher LA, Froehlich JB, Gusberg RJ, Leppo JA, Ryan T, Schlant RC, Winters WL Jr. ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery: a report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines (Committee to Update the 1996 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery). 2002, *American College of Cardiology Web Site,* Accessed at http://www.acc.org.

2. Brindis RG, Douglas PS, Hendel RC, Peterson ED, Wolk MJ, Allen JM, Patel MR, Raskin IE. ACCF/ASNC appropriateness criteria for single-photon emission computed tomography myocardial perfusion imaging (SPECT MPI): a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group and the American Society of Echo Cardiology, *J Am Coll Cardiol*, 2005; 46: 1587- 605.

3. Klocke FJ, Baird MG, Bateman TM, Berman DS, Carabello BA, Cerqueira MD, DeMaria AN, Kennedy JW, Lorell BH, Messer JV, O'Gara PT, Russell RO Jr., St. John Sutton MG, Udelson JE, Verani MS, Williams KA. ACC/AHA/ASNC guidelines for the clinical use of cardiac radionuclide imaging: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/ASNC Committee to Revise the 1995 Guidelines for the Clinical Use of Radionuclide Imaging), 2003.

4. Fleischmann KE et al. Exercise echocardiography or exercise SPECT imaging: a meta-analysis of diagnostic test performance. *JAMA,* 1998; 280: 913-920.

5. Strickberger SA, Benson DW, Biaggioni I, Callans DJ, Cohen MI, et al. AHA/ACCF Scientific Statement on the Evaluation of Syncope From the American Heart Association Councils on Clinical Cardiology, Cardiovascular Nursing, Cardiovascular Disease in the Young, and Stroke, and the Quality of Care and Outcomes Research Interdisciplinary Working Group; and the American College of Cardiology Foundation In Collaboration With the Heart Rhythm Society. *J Am Coll Cardiol*, 2006; 47: 473-484, doi:10.1016/j.jacc.2005.12.019.

6. Douglas PS, Khandheria B, Stainback RF, Weissman NJ. ACCF/ASE/ACEP/AHA/ASNC/SCAI/SCCT/ SCMR 2008 appropriateness criteria for stress echocardiography. J Am Coll Cardiol 2008; 51:1127– 1147

7. Cheitlin MD, Armstrong WF, Aurigemma GP, Beller GA, Bierman FZ, Davis JL, Douglas PS, Faxon DP, Gillam LD, Kimball TR, Kussmaul WG, Pearlman AS, Philbrick JT, Rakowski H, Thys DM. ACC/AHA/ASE 2003 guideline update for the clinical application of echocardiography: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/ASE Committee to Update the 1997 Guidelines for the Clinical Application of Echocardiography). 2003.

8. Bonow RO, Carabello BA, Chatterjee K, de Leon AC Jr., Faxon DP, Freed MD, Gaasch WH, Lytle BW, Nishimura RA, O'Gara PT, O'Rourke RA, Otto CM, Shah PM, Shanewise JS. ACC/AHA 2006 guidelines for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Develop Guidelines for the Management of Patients With Valvular Heart Disease).

Reviewed: 05/26/2010

Posted: 07/02/2010

93508	Catheter placement in coronary artery(s), arterial coronary conduit(s), and/or venous coronary bypass graft(s) for coronary angiography without concomitant left heart catheterization
93510	Left Heart Catheterization, Retrograde, from the Brachial Artery, Axillary Artery or Femoral Artery; Percutaneous
93511	Left Heart Catheterization, Retrograde, from the Brachial Artery, Axillary Artery or Femoral Artery; Percutaneous by Cutdown
93524	Combined transseptal and retrograde left heart catheterization
93526	Combined right heart catheterization and retrograde left heart catheterization

CareCore Cardiology Management (CCCM) has developed the following guidelines for coronary angiography. These criteria do not apply to left heart catheterizations that will not include a coronary angiogram. The indications for coronary angiography include:

I. Assessment of member with cardiomyopathy

A. Ejection fraction is <50%
   1. Prior abnormal CT angiogram
   2. No prior coronary angiogram
   3. Abnormal imaging stress test indicating ischemia
   4. Normal prior imaging stress test more than one year ago with worsening:
      a. Dyspnea on exertion
      b. Paroxysmal nocturnal dyspnea or
      c. Orthopnea
   5. Normal prior imaging stress test more with new:
      a. Dyspnea on exertion
      b. Paroxysmal nocturnal dyspnea or
      c. Orthopnea
   6. Abnormal prior coronary angiogram and worsening:
      a. Dyspnea on exertion
      b. Paroxysmal nocturnal dyspnea or
      c. Orthopnea
   7. Normal prior coronary angiogram more than five years ago and:
      a. Dyspnea on exertion
      b. Paroxysmal nocturnal dyspnea or
      c. Orthopnea

B. Ejection fraction of 50% or more must have prior non-invasive work-up.
   1. Imaging stress test or
   2. Coronary CT angiography

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

II. Assessment of member with prior coronary revascularization

A. Reoccurrence of symptoms that were identical to the symptoms that led to the revascularization
B. All other symptoms require a non-invasive evaluation, such as imaging stress testing, since a coronary angiogram is not supported by adequate peer-reviewed literature as the initial test.
C. Percutaneous intervention within the last four weeks, planned staged percutaneous intervention, and asymptomatic
    1. Initial percutaneous intervention performed for STEMI (ST elevation myocardial infarction) or ACS (acute coronary syndrome)
    2. Significant left ventricular dysfunction
    3. Renal insufficiency
    4. Complex/prolonged initial percutaneous intervention

III. Assessment of member with known or suspected coronary artery disease

A. High pretest probability assessment (Rule 1 below) and no heart catheterization, coronary CT angiogram, routine exercise stress test, nuclear stress test or echo stress test, a coronary angiogram is medically necessary.
B. Member with heart catheterization or coronary CT angiogram in the last 2 years:
    1. Prior coronary CT angiogram (CCTA)
        a. Normal CCTA does not require a catheterization as there is no peer-reviewed literature to support this indication.
        b. Abnormal CCTA
            i. Chest pain AND non-obstructive coronary artery disease or uninterpretable CCTA due to extensive coronary artery calcification, AND high pretest probability assessment (See Rule 1).
            ii. Prior CCTA showing a proximal left anterior descending or left main stenosis of 50% or more
            iii. Prior CCTA showing a right coronary or left circumflex stenosis of 50% or more and new or changed chest pain or dyspnea on exertion
    2. Prior coronary angiogram
        a. Abnormal AND new or changed chest pain or dyspnea on exertion.
C. Positive stress test (routine exercise stress test, nuclear stress test or echo stress test)
    1. If a member had an imaging stress test in the last three (3) months that showed reversible ischemia, a coronary angiogram is medically necessary.
    2. If a member had a positive routine exercise stress test in the last three (3) months, a coronary angiogram is medically necessary.
    3. Negative imaging stress test for reversible ischemia, but WITH chest pain, if the Pre-Test Probability Assessment (Rule 1 below) places the member at high pre-test risk based on the character of chest pain, age, and sex, a coronary angiogram is medically necessary.
    4. Routine exercise stress test that was not positive, but WITH chest pain, if the Pre-Test Probability Assessment (Rule 1 below) places the member at high pre-test risk based on the character of chest pain, age, and sex, a coronary angiogram is medically necessary.

IV. Assessment of member with congestive heart failure [A and B, C, or D]

A. To meet criteria for congestive heart failure, one of the following must be documented:

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

1. Pulmonary vascular congestion on chest X-ray
2. Hospitalization for congestive heart failure with documented weight loss and symptom improvement with diuretics.
3. Outpatient congestive heart failure management with documented weight loss and symptom improvement with diuretics

B. No prior coronary angiogram or CCTA has been performed since the onset of congestive heart failure.
C. Prior catheterization or coronary CT angiogram
   1. Coronary CT Angiography (CCTA) was abnormal
   2. Coronary angiogram showed coronary artery disease or was more than five (5) years ago and no coronary disease was documented AND worsening:
      a. Dyspnea on exertion
      b. Paroxysmal nocturnal dyspnea or
      c. Orthopnea
D. Imaging stress test
   1. Abnormal (indicative of ischemia) since the onset of congestive heart failure
   2. Normal since the onset of congestive heart failure, and there are new symptoms of:
      a. Dyspnea on exertion
      b. Paroxysmal nocturnal dyspnea or
      c. Orthopnea
   3. Normal greater than one year ago and since the onset of congestive heart failure, and there are worsening symptoms of:
      a. Dyspnea on exertion
      b. Paroxysmal nocturnal dyspnea or
      c. Orthopnea

V. Assessment of member with valvular heart disease

A. A coronary angiogram is medically necessary for the assessment of the coronary arteries prior to valve replacement surgery.

VI. Assessment of member with cardiac arrest/ventricular tachycardia

A. Coronary angiogram is medically necessary for assessment of the coronary arteries in a member with cardiac arrest or ventricular tachycardia.

VII. Prior cardiac transplant

VIII. Planned closure of atrial septal defect or patent foramen ovale

IX. Constrictive pericarditis

X. Aortic dissection

XI. Acute coronary syndrome

This indication applies to health plans that require medical necessity determinations for the following inpatient indications:

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

A. STEMI (ST elevation myocardial infarction)
B. NSTEMI (non-ST elevation myocardial infarction)
C. Chest pain as the indication for hospitalization (cardiac biomakers negative)

XII. Congenital heart disease

Rule 1: Determination of pretest probability for coronary disease based on chest pain

The following assessment is used to determine the pre-test probability of coronary artery disease based on a description of the character of chest pain, member age and sex. This assessment will define the chest pain as typical angina, atypical angina, and non-anginal chest pain.

Pre-Test Probability of CAD by Age, Gender, and Symptoms					
Age Years	**Gender**	**Typical/Definite Angina Pectoris**	**Atypical/Probable Angina Pectoris**	**Nonanginal Chest Pain**	**Asymptomatic**
30- 39	Men	Intermediate	Intermediate	Low	Very low
	Women	Intermediate	Very low	Very low	Very low
40- 49	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Low	Very low	Very low
50- 59	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Intermediate	Low	Very low
≥ 60	Men	High	Intermediate	Intermediate	Low
	Women	High	Intermediate	Intermediate	Low
		High : Greater than 90% pre-test probability	**Intermediate:** Between 10% and 90% pre-test probability	**Low:** Between 5% and 10% pre-test probability	**Very Low:** Less than 5% pre-test probability
Typical angina (definite) : 1) Substernal chest pain or discomfort that is 2) provoked by exertion or emotional stress and 3) relieved by rest and/or nitroglycerin.					
Atypical angina (probable): Chest pain or discomfort that lacks one of the characteristics of definite or typical angina.					
Non-anginal chest pain: Chest pain or discomfort that meets one or none of the typical angina characteristics.					

The pre-test probability is thus defined as high, intermediate, low, or very low. This is applied to the criteria sets for determination of the need for coronary angiography.

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com

References:

1. Bashore TM, Bates ER, Berger PB, Clark DA, Cusma JT, Dehmer GJ, Kern MJ, Laskey WK, O'Laughlin MP, Oesterle S, Popma JJ. Cardiac catheterization laboratory standards: a report of the American College of Cardiology Task Force on Clinical Expert Consensus Documents (ACC/SCA&I Committee to Develop an Expert Consensus Document on Cardiac Catheterization Laboratory Standards), *J Am Coll Cardiol*, 2001; 37: 2170 -214.

2. Brindis RG, Douglas PS, Hendel RC, Peterson ED, Wolk MJ, Allen JM, Patel MR, Raskin IE. ACCF/ASNC appropriateness criteria for single-photon emission computed tomography myocardial perfusion imaging (SPECT MPI): a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group and the American Society of Nuclear Cardiology, *J Am Coll Cardiol*, 2005; 46: 1587- 605.

3. Klocke FJ, Baird MG, Bateman TM, Berman DS, Carabello BA, Cerqueira MD, DeMaria AN, Kennedy JW, Lorell BH, Messer JV, O'Gara PT, Russell RO Jr., St. John Sutton MG, Udelson JE, Verani MS, Williams KA. ACC/AHA/ASNC guidelines for the clinical use of cardiac radionuclide imaging: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/ASNC Committee to Revise the 1995 Guidelines for the Clinical Use of Radionuclide Imaging), 2003, *American College of Cardiology Web Site,* Accessed at: http://www.acc.org/clinical/guidelines/radio/rni_fulltext.pdf.

4. Mollet NR, Cademartiri F, van Mieghem CAG, Runza G, McFadden EP, Baks T, Serruys PW, Krestin GP, de Feyter PJ. High-Resolutions spiral computed tomography coronary angiography in patients referred for diagnostic conventional coronary angiography, *Circulation*, 2005; 112: 2318-2323.

Reviewed: 04/07/2010, 05/26/2010, 07/21/2010

Posted: 07/02/2010

400 Buckwalter Place Boulevard, Bluffton, SC 29910 (800) 918-8924 www.carecorenational.com