

TTE/TEE Appropriate Indications

(Median Score 7-9)

Indication	Appropriateness Score (1 – 9)
General Evaluation of Structure and Function – Suspected Cardiac Etiology – General	
1. Symptoms potentially due to suspected cardiac etiology, including but not limited to dyspnea, shortness of breath, lightheadedness, syncope, TIA, cardiovascular events.	A (9)
2. Prior testing that is concerning for heart disease (i.e. chest x-ray, baseline scout images for stress echocardiogram, electrocardiogram, elevation of serum BNP)	A (8)
General Evaluation of Structure and Function – Adult Congenital Heart Disease	
3. Assessment of known or suspected adult congenital heart disease including anomalies of great vessels, and cardiac chambers and valves or suspected intracardiac shunt (ASD, VSD, PDA) either in unoperated patient or following repair/operation	A (9)
General Evaluation of Structure and Function – Arrhythmias	
6. Patients who have sustained or non sustained SVT or VT	A (8)
General Evaluation of Structure and Function – LV Function Evaluation	
8. Initial evaluation of LV function following acute myocardial infarction	A (9)
9. Re-evaluation of LV function following myocardial infarction during recovery phase when results will guide therapy	A (8)
General Evaluation of Structure and Function – Pulmonary Hypertension	
10. Evaluation of known or suspected pulmonary hypertension including evaluation of right ventricular function and estimated pulmonary artery pressure	A (8)
Cardiovascular Evaluation in an Acute Setting – Hypertension or Hemodynamic Instability	
11. Evaluation of hypertension or hemodynamic instability of uncertain or suspected cardiac etiology	A (9)
Cardiovascular Evaluation in an Acute Setting – Myocardial Ischemia/Infarction	
12. Evaluation of acute chest pain with suspected myocardial ischemia in patients with nondiagnostic laboratory markers and ECG and in whom a resting echocardiogram can be performed during pain	A (8)
13. Evaluation of suspected complication of myocardial ischemia/infarction, including but not limited to acute mitral regurgitation, hypovolemia, abnormal chest x-ray, VSD, free wall rupture/tamponade, shock, right ventricular involvement, heart failure, or thrombus	A (9)
Cardiovascular Evaluation in an Acute Setting – Respiratory Failure	
14. Evaluation of respiratory failure with suspected cardiac etiology	A (8)
Cardiovascular Evaluation in an Acute Setting – Pulmonary Embolism	
16. Evaluation of patient with known or suspected acute pulmonary embolism to guide therapy (i.e. thrombectomy and thrombolysis)	A (8)
TTE/TEE – Evaluation of Valvular Function – Murmur	
17. Initial evaluation of murmur in patients for whom there is a reasonable suspicion of valvular or structural heart disease	A (9)
TTE/TEE – Evaluation of Valvular Function – Mitral Valve Prolapse	
18. Initial evaluation of patient with suspected mitral valve prolapse	A (9)
TTE/TEE – Evaluation of Valvular Function – Native Valvular Stenosis	
20. Initial evaluation of known or suspected native valvular stenosis	A (9)
TTE/TEE – Evaluation of Valvular Function – Native Valvular Regurgitation	
24. Initial evaluation of known or suspected native valvular regurgitation	A (9)
26. Routine (yearly) re-evaluation of an asymptomatic patient with severe native valvular regurgitation with no change in clinical status	A (8)
27. Re-evaluation of native valvular regurgitation in patients with a change in clinical status	A (9)
TTE/TEE – Evaluation of Valvular Function – Prosthetic Valve	
28. Initial evaluation of prosthetic valve for establishment of baseline after placement	A (9)
30. Re-evaluation of patients with prosthetic valve with suspected dysfunction or thrombosis OR a change in clinical status	A (9)
22. Routine (yearly) evaluation of an asymptomatic patient with severe native valvular stenosis	A (7)
23. Re-evaluation of a patient with native valvular stenosis who has had a change in clinical status	A (9)

Indication	Appropriateness Score (1 – 9)
TTE/TEE – Evaluation of Valvular Function – Infective Endocarditis (Native or Prosthetic Valves)	
31. Initial evaluation of suspected infective endocarditis (native and/or prosthetic valve) with positive blood cultures or a new murmur	A (9)
33. Re-evaluation of infective endocarditis in patients with any of the following: virulent organism, severe hemodynamic lesion, aortic involvement, persistent bacteremia, a change in clinical status or symptomatic deterioration	A (9)
TTE/TEE – Evaluation of Intra and Extra Cardiac Structures and Chambers	
34. Evaluation for cardiovascular source of embolic event (PFO/ASD, thrombus, neoplasm).	A (8)
35. Evaluation of cardiac mass (suspected tumor or thrombus)	A (9)
36. Evaluation of pericardial conditions including but not limited to: pericardial mass, effusion, constrictive pericarditis, effusive-constrictive conditions, patients post-cardiac surgery, or suspected pericardial tamponade	A (9)
TTE/TEE – Evaluation of Aortic Disease –	
37. Known or suspected Marfan disease for evaluation of proximal aortic root and/or mitral valve	A (9)
Evaluation of Hypertension, Heart Failure or Cardiomyopathy – Hypertension	
38. Initial evaluation of suspected hypertensive heart disease	A (8)
Evaluation of Hypertension, Heart Failure or Cardiomyopathy – Heart Failure	
41. Initial evaluation of known or suspected heart failure (systolic or diastolic)	A (9)
43. Re-evaluation of known heart failure (systolic or diastolic) to guide therapy in a patient with a change in clinical status	A (9)
Evaluation of Hypertension, Heart Failure or Cardiomyopathy – Pacing Device Evaluation	
44. Evaluation for dysynchrony in a patient being considered for CRT	A (8)
45. Patient with known implanted pacing device with symptoms possibly due to suboptimal pacing device settings to re-evaluate for dysynchrony and/or revision of pacing device settings	A (8)
Evaluation of Hypertension, Heart Failure or Cardiomyopathy – Hypertrophic Cardiomyopathy	
46. Initial evaluation of known or suspected hypertrophic cardiomyopathy	A (9)
48. Re-evaluation of known hypertrophic cardiomyopathy in a patient with a change in clinical status to guide or evaluate therapy	A (9)
Evaluation of Hypertension, Heart Failure or Cardiomyopathy – Cardiomyopathy (Other)	
49. Evaluation of suspected restrictive, infiltrative, or genetic cardiomyopathy	A (9)
50. Screening study for structure and function in first degree relatives of patients with inherited cardiomyopathy	A (8)
Evaluation of Hypertension, Heart Failure or Cardiomyopathy – Therapy with Cardiotonic Agents	
51. Baseline and serial re-evaluations in patients undergoing therapy with cardiotonic agents	A (8)
Use of Transesophageal Echocardiogram (TEE) as the Initial Test – Common Uses	
52. Evaluation of suspected acute aortic pathology including dissection/trauma	A (9)
53. Guidance during percutaneous non-coronary cardiac interventions including but not limited to septal ablation in patients with hypertrophic cardiomyopathy, mitral valvuloplasty, PFO/ASD closure, radiofrequency ablation	A (9)
54. To determine mechanism of regurgitation and determine suitability of valve repair	A (8)
55. To diagnose/manage endocarditis with a moderate or high pre-test probability (e.g., bacteremia, especially staphylococcal or fungemia)	A (8)
56. Persistent fever in patient with intra-cardiac device	A (9)
Use of Transesophageal Echocardiogram (TEE) as the Initial Test – Common Uses - Atrial Fibrillation/Flutter	
57. Evaluation of patient with atrial fibrillation/flutter to facilitate clinical decision making with regards to anticoagulation and/or cardioversion and/or radiofrequency ablation	A (9)

TTE/TEE Uncertain Indications

(Median Score 4-6)

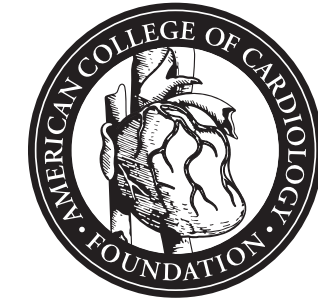
Indication	Appropriateness Score (1 – 9)
Use of Transesophageal Echocardiogram (TEE) as the Initial Test – Embolic Event	
59. Evaluation for cardiovascular source of embolic event in a patient who has a normal transthoracic echo and normal electrocardiogram and no history of atrial fibrillation/flutter	U (6)

TTE/TEE Inappropriate Indications

(Median Score 1-3)

Indication	Appropriateness Score (1 – 9)
General Evaluation of Structure and Function – Adult Congenital Heart Disease	
4. Routine (yearly) evaluation of asymptomatic patients with corrected ASD, VSD or PDA more than one year after successful correction	I (3)
General Evaluation of Structure and Function – Arrhythmias	
5. Patients who have isolated APC or PVC without other evidence of heart disease	I (2)
General Evaluation of Structure and Function – LV Function Evaluation	
7. Evaluation of LV function with prior ventricular function evaluation within the past year with normal function (such as prior echocardiogram, LV gram, SPECT, cardiac MRI) in patients in whom there has been no change in clinical status	I (2)
Cardiovascular Evaluation in an Acute Setting – Pulmonary Embolism	
15. Initial evaluation of patient with suspected pulmonary embolism in order to establish diagnosis	I (3)
TTE/TEE – Evaluation of Valvular Function – Mitral Valve Prolapse	
19. Routine (yearly) re-evaluation of mitral valve prolapse in patients with no or mild mitral regurgitation and no change in clinical status	I (2)
TTE/TEE – Evaluation of Valvular Function – Native Valvular Stenosis	
21. Routine (yearly) re-evaluation of an asymptomatic patient with mild native AS or mild-moderate native MS and no change in clinical status	I (2)
TTE/TEE – Evaluation of Valvular Function – Native Valvular Regurgitation	
25. Routine (yearly) re-evaluation of native valvular regurgitation in an asymptomatic patient with mild regurgitation, no change in clinical status and normal LV size	I (2)
TTE/TEE – Evaluation of Valvular Function – Prosthetic Valve	
29. Routine (yearly) evaluation of a patient with a prosthetic valve in whom there is no suspicion of valvular dysfunction and no change in clinical status	I (3)
TTE/TEE – Evaluation of Valvular Function – Infective Endocarditis (Native or Prosthetic Valves)	
32. Evaluation of native and/or prosthetic valves in patients with transient fever but without evidence of bacteremia or new murmur	I (2)

Indication	Appropriateness Score (1 – 9)
Evaluation of Hypertension, Heart Failure or Cardiomyopathy – Hypertension	
39. Routine evaluation of patients with systemic hypertension without suspected hypertensive heart disease	I (3)
40. Re-evaluation of a patient with known hypertensive heart disease without a change in clinical status	I (3)
Evaluation of Hypertension, Heart Failure or Cardiomyopathy – Heart Failure	
42. Routine (yearly) re-evaluation of patients with heart failure (systolic or diastolic) in whom there is no change in clinical status	I (3)
Evaluation of Hypertension, Heart Failure or Cardiomyopathy – Hypertrophic Cardiomyopathy	
47. Routine (yearly) evaluation of hypertrophic cardiomyopathy in a patient with no change in clinical status	I (3)
Use of Transesophageal Echocardiogram (TEE) as the Initial Test – Common Uses - Atrial Fibrillation/Flutter	
58. Evaluation of patient with atrial fibrillation/flutter for left atrial thrombus or spontaneous contrast when a decision has been made to anticoagulate and not to perform cardioversion	I (3)



American College
of Cardiology Foundation



APPROPRIATENESS CRITERIA FOR TRANSTHORACIC (TTE) AND TRANSESOPHAGEAL (TEE) ECHOCARDIOGRAPHY

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Appropriateness Criteria for TTE/TEE

The test characteristics of transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) have long been recognized as beneficial for defining cardiac structure and function. The relative ease of use and low risk of TTE/TEE compared to other cardiovascular imaging techniques provide many advantages, but also could create opportunities for overuse and misuse in patients who may not obtain a benefit or who could have achieved a similar benefit without the addition of the test.

In particular, inappropriate use may prompt potentially harmful and costly downstream testing and treatment such as unwarranted coronary revascularization or unnecessary repeat follow-up. Concerns about inappropriate use exist among those who pay for these services and clinical leaders who evaluate the effectiveness of testing, as well as patients and their physicians.

In an effort to address these concerns and respond to the need for the rational use of imaging services in the delivery of high quality care, the American College of Cardiology Foundation (ACCF) and the American Society of Echocardiography (ASE) along with the American College of Chest Physicians, American College of Emergency Physicians, American Society of Nuclear Cardiology, The Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, and The Society for Cardiovascular Magnetic Resonance, conducted an appropriateness review of indications or clinical scenarios for TTE/TEE. The resulting Appropriateness Criteria rate the indications as Appropriate, Inappropriate and Uncertain.

Frequently Asked Questions

What were the key findings of the Appropriateness Criteria for TTE/TEE?

TTE/TEE are well-established tests with many applicable indications. They were generally considered reasonable when conducting an initial evaluation of cardiac structure and ventricular function. The majority of inappropriate indications were for indications that included routine annual testing.

Given the large range of potential indications for echocardiography, how were indications chosen for review?

The indications for this review were purposefully broad and drawn from common applications or anticipated uses, as well as current clinical practice guidelines. However, as with the appropriateness criteria for other imaging modalities, they are not exhaustive due to the complexity and number of the potential clinical situations. Current disease-based guidelines include additional recommendations concerning the use of echocardiography that are not included in the set of indications presented in the document. For example, the Chronic Stable Angina guideline includes a Class III recommendation discouraging the use of echocardiography for symptomatic patients with a normal ECG, no history of MI, and without symptoms or signs suggestive of chronic heart failure. The recommendations of such guidelines remain a part of ACC/AHA clinical policy, and should continue to guide care.

What assumptions are made about the performance of the TTE/TEE?

To prevent any nuances of interpretation, all indications were assumed to be for adult patients (18 years of age or older). In addition, it was assumed that the test was performed

and interpreted by a qualified individual in a facility that is proficient in the imaging technique. In general, it is assumed that TEE is appropriately used as an adjunct or subsequent test to TTE when suboptimal TTE images preclude obtaining a diagnostic study. The indications for which TEE may reasonably be the test of first choice include, but are not limited to the indications presented in the TEE Table 7. Additional assumptions about the exam and report, including the use of color flow, are included in the document prior to the rating tables.

What does the term “suspected” mean when included in an indication?

Many of the indications use the term “suspected” in providing the rationale for the TTE/TEE order. The indications were written in this way so that a patient-specific detailed differential diagnosis process leading to the suspicion by individual physicians could be implied without listing the multiple pathways leading to the suspicion. In general, the term is meant to capture reasonable clinical concern for structural or functional heart disease based on but not limited to findings on history, physical exam findings or other prior test results. Determination by the ordering physician of the reason for suspicion is expected even if the specific reasons have not been articulated in the appropriateness document.

If TTE/TEE is inappropriate for a patient based on one indication, is the patient also eligible for testing for any other reason?

Echocardiography tests, like many imaging tests, may provide additional useful information beyond the primary purpose outlined by an individual indication. Members of the technical panel were asked specifically not to consider implicit or additional information

outside the scope of an individual indication in their appropriateness rankings. As such, the entire list of indications should be reviewed to assess the full range of potential appropriate reasons for ordering an echo for an individual patient. For example, a patient with premature ventricular contractions may be an appropriate candidate for an echocardiogram if the physician suspects cardiomyopathy. Yet, indication 5 rates as inappropriate the performance of the test for patients in whom there is no evidence of other heart disease. However, a review of Table 6 reveals a range of appropriate reasons for ordering an echocardiography for a patient in whom there is a suspicion of cardiomyopathy.

Does an inappropriate rating for routine (yearly) testing imply that TTE/TEE is appropriate one year and one day following a previous exam?

The majority of indications for routine testing were written to include a timeframe of one year. The reason for the limited timeframe often was the lack of data about the correct frequency of testing beyond one year. The expectation is not that after 366 days the test immediately becomes appropriate but rather additional physician judgment and patient circumstances will dictate the exact interval between testing. Part of the implementation of the criteria will include further data collection about test ordering intervals and their impact on care. Repeat testing beyond one year should be justified not only by the time duration since the last test, but also by the existence of a logical clinical rationale for testing and an expected change from the previous echocardiographic findings.

How should the cardiovascular community use these new criteria?

The Appropriateness Criteria for TTE/TEE should help guide physicians in determining when and how often to use the tests. Ordering forms containing essential information for determining appropriateness may be used to construct periodic feedback reports to physician groups and their referral base to educate each other and outside stakeholders on the appropriateness and value of current utilization patterns.

It is expected that services performed for appropriate indications will receive reimbursement. In contrast, services performed for inappropriate indications may require additional documentation to justify payment because of unique circumstances or the clinical profile of the patient. Lastly, uncertain indications are those where the opinions of the panel vary, the data may be conflicting or vary across patient populations, and additional research is clearly desirable, but for which reimbursement should not be limited.

What does the ACCF hope to accomplish with its Appropriateness Criteria publications?

Appropriateness criteria publications reflect an ongoing effort by the College to critically and systematically create, review and categorize clinical situations where diagnostic tests and procedures are utilized by physicians caring for patients with cardiovascular diseases. The process is based on current understanding of the technical capabilities of the imaging modalities examined. Although not intended to be entirely comprehensive, the indications are meant to identify common scenarios encompassing the majority of contemporary practice. To date, criteria exist for SPECT MPI, CCT and CMR and TEE and TTE. For more information, visit www.acc.org.