

7. Echocardiography Appropriate Use Criteria (by Indication)

Table 1. TTE for General Evaluation of Cardiac Structure and Function

Indication		Appropriate Use Score (1–9)
Suspected Cardiac Etiology—General With TTE		
1.	• Symptoms or conditions potentially related to suspected cardiac etiology including but not limited to chest pain, shortness of breath, palpitations, TIA, stroke, or peripheral embolic event	A (9)
2.	• Prior testing that is concerning for heart disease or structural abnormality including but not limited to chest X-ray, baseline scout images for stress echocardiogram, ECG, or cardiac biomarkers	A (9)
Arrhythmias With TTE		
3.	• Infrequent APCs or infrequent VPCs without other evidence of heart disease	I (2)
4.	• Frequent VPCs or exercise-induced VPCs	A (8)
5.	• Sustained or nonsustained atrial fibrillation, SVT, or VT	A (9)
6.	• Asymptomatic isolated sinus bradycardia	I (2)
Lightheadedness/Presyncope/Syncope With TTE		
7.	• Clinical symptoms or signs consistent with a cardiac diagnosis known to cause lightheadedness/presyncope/syncope (including but not limited to aortic stenosis, hypertrophic cardiomyopathy, or HF)	A (9)
8.	• Lightheadedness/presyncope when there are no other symptoms or signs of cardiovascular disease	I (3)
9.	• Syncope when there are no other symptoms or signs of cardiovascular disease	A (7)
Evaluation of Ventricular Function With TTE		
10.	• Initial evaluation of ventricular function (e.g., screening) with no symptoms or signs of cardiovascular disease	I (2)
11.	• Routine surveillance of ventricular function with known CAD and no change in clinical status or cardiac exam	I (3)
12.	• Evaluation of LV function with prior ventricular function evaluation showing normal function (e.g., prior echocardiogram, left ventriculogram, CT, SPECT MPI, CMR) in patients in whom there has been no change in clinical status or cardiac exam	I (1)
Perioperative Evaluation With TTE		
13.	• Routine perioperative evaluation of ventricular function with no symptoms or signs of cardiovascular disease	I (2)
14.	• Routine perioperative evaluation of cardiac structure and function prior to noncardiac solid organ transplantation	U (6)
Pulmonary Hypertension With TTE		
15.	• Evaluation of suspected pulmonary hypertension including evaluation of right ventricular function and estimated pulmonary artery pressure	A (9)
16.	• Routine surveillance (<1 y) of known pulmonary hypertension without change in clinical status or cardiac exam	I (3)
17.	• Routine surveillance (≥1 y) of known pulmonary hypertension without change in clinical status or cardiac exam	A (7)
18.	• Re-evaluation of known pulmonary hypertension if change in clinical status or cardiac exam or to guide therapy	A (9)

A indicates appropriate; I, inappropriate; and U, uncertain.

Table 2. TTE for Cardiovascular Evaluation in an Acute Setting

Indication		Appropriate Use Score (1–9)
Hypotension or Hemodynamic Instability With TTE		
19.	• Hypotension or hemodynamic instability of uncertain or suspected cardiac etiology	A (9)
20.	• Assessment of volume status in a critically ill patient	U (5)
Myocardial Ischemia/Infarction With TTE		
21.	• Acute chest pain with suspected MI and nondiagnostic ECG when a resting echocardiogram can be performed during pain	A (9)
22.	• Evaluation of a patient without chest pain but with other features of an ischemic equivalent or laboratory markers indicative of ongoing MI	A (8)
23.	• Suspected complication of myocardial ischemia/infarction, including but not limited to acute mitral regurgitation, ventricular septal defect, free-wall rupture/tamponade, shock, right ventricular involvement, HF, or thrombus	A (9)

Table 2. Continued

Indication		Appropriate Use Score (1-9)
Evaluation of Ventricular Function after ACS With TTE		
24.	• Initial evaluation of ventricular function following ACS	A (9)
25.	• Re-evaluation of ventricular function following ACS during recovery phase when results will guide therapy	A (9)
Respiratory Failure With TTE		
26.	• Respiratory failure or hypoxemia of uncertain etiology	A (8)
27.	• Respiratory failure or hypoxemia when a noncardiac etiology of respiratory failure has been established	U (5)
Pulmonary Embolism With TTE		
28.	• Suspected pulmonary embolism in order to establish diagnosis	I (2)
29.	• Known acute pulmonary embolism to guide therapy (e.g., thrombectomy and thrombolytics)	A (8)
30.	• Routine surveillance of prior pulmonary embolism with normal right ventricular function and pulmonary artery systolic pressure	I (1)
31.	• Re-evaluation of known pulmonary embolism after thrombolysis or thrombectomy for assessment of change in right ventricular function and/or pulmonary artery pressure	A (7)
Cardiac Trauma With TTE		
32.	• Severe deceleration injury or chest trauma when valve injury, pericardial effusion, or cardiac injury are possible or suspected	A (9)
33.	• Routine evaluation in the setting of mild chest trauma with no electrocardiographic changes or biomarker elevation	I (2)

A indicates appropriate; I, inappropriate; and U, uncertain.

Table 3. TTE for Evaluation of Valvular Function

Indication		Appropriate Use Score (1-9)
Murmur or Click With TTE		
34.	• Initial evaluation when there is a reasonable suspicion of valvular or structural heart disease	A (9)
35.	• Initial evaluation when there are no other symptoms or signs of valvular or structural heart disease	I (2)
36.	• Re-evaluation in a patient without valvular disease on prior echocardiogram and no change in clinical status or cardiac exam	I (1)
37.	• Re-evaluation of known valvular heart disease with a change in clinical status or cardiac exam or to guide therapy	A (9)
Native Valvular Stenosis With TTE		
38.	• Routine surveillance (<3 y) of mild valvular stenosis without a change in clinical status or cardiac exam	I (3)
39.	• Routine surveillance (≥3 y) of mild valvular stenosis without a change in clinical status or cardiac exam	A (7)
40.	• Routine surveillance (<1 y) of moderate or severe valvular stenosis without a change in clinical status or cardiac exam	I (3)
41.	• Routine surveillance (≥1 y) of moderate or severe valvular stenosis without a change in clinical status or cardiac exam	A (8)
Native Valvular Regurgitation With TTE		
42.	• Routine surveillance of trace valvular regurgitation	I (1)
43.	• Routine surveillance (<3 y) of mild valvular regurgitation without a change in clinical status or cardiac exam	I (2)
44.	• Routine surveillance (≥3 y) of mild valvular regurgitation without a change in clinical status or cardiac exam	U (4)
45.	• Routine surveillance (<1 y) of moderate or severe valvular regurgitation without a change in clinical status or cardiac exam	U (6)
46.	• Routine surveillance (≥1 y) of moderate or severe valvular regurgitation without change in clinical status or cardiac exam	A (8)
Prosthetic Valves With TTE		
47.	• Initial postoperative evaluation of prosthetic valve for establishment of baseline	A (9)
48.	• Routine surveillance (<3 y after valve implantation) of prosthetic valve if no known or suspected valve dysfunction	I (3)
49.	• Routine surveillance (≥3 y after valve implantation) of prosthetic valve if no known or suspected valve dysfunction	A (7)
50.	• Evaluation of prosthetic valve with suspected dysfunction or a change in clinical status or cardiac exam	A (9)
51.	• Re-evaluation of known prosthetic valve dysfunction when it would change management or guide therapy	A (9)

Table 3. Continued

Indication		Appropriate Use Score (1-9)
Infective Endocarditis (Native or Prosthetic Valves) With TTE		
52.	• Initial evaluation of suspected infective endocarditis with positive blood cultures or a new murmur	A (9)
53.	• Transient fever without evidence of bacteremia or a new murmur	I (2)
54.	• Transient bacteremia with a pathogen not typically associated with infective endocarditis and/or a documented nonendovascular source of infection	I (3)
55.	• Re-evaluation of infective endocarditis at high risk for progression or complication or with a change in clinical status or cardiac exam	A (9)
56.	• Routine surveillance of uncomplicated infective endocarditis when no change in management is contemplated	I (2)

A indicates appropriate; I, inappropriate; and U, uncertain.

Table 4. TTE for Evaluation of Intracardiac and Extracardiac Structures and Chambers

Indication		Appropriate Use Score (1-9)
57.	• Suspected cardiac mass	A (9)
58.	• Suspected cardiovascular source of embolus	A (9)
59.	• Suspected pericardial conditions	A (9)
60.	• Routine surveillance of known small pericardial effusion with no change in clinical status	I (2)
61.	• Re-evaluation of known pericardial effusion to guide management or therapy	A (8)
62.	• Guidance of percutaneous noncoronary cardiac procedures including but not limited to pericardiocentesis, septal ablation, or right ventricular biopsy	A (9)

A indicates appropriate; and I, inappropriate.

Table 5. TTE for Evaluation of Aortic Disease

Indication		Appropriate Use Score (1-9)
63.	• Evaluation of the ascending aorta in the setting of a known or suspected connective tissue disease or genetic condition that predisposes to aortic aneurysm or dissection (e.g., Marfan syndrome)	A (9)
64.	• Re-evaluation of known ascending aortic dilation or history of aortic dissection to establish a baseline rate of expansion or when the rate of expansion is excessive	A (9)
65.	• Re-evaluation of known ascending aortic dilation or history of aortic dissection with a change in clinical status or cardiac exam or when findings may alter management or therapy	A (9)
66.	• Routine re-evaluation for surveillance of known ascending aortic dilation or history of aortic dissection without a change in clinical status or cardiac exam when findings would not change management or therapy	I (3)

A indicates appropriate; and I, inappropriate.

Table 6. TTE for Evaluation of Hypertension, HF, or Cardiomyopathy

Indication		Appropriate Use Score (1-9)
Hypertension With TTE		
67.	• Initial evaluation of suspected hypertensive heart disease	A (8)
68.	• Routine evaluation of systemic hypertension without symptoms or signs of hypertensive heart disease	I (3)
69.	• Re-evaluation of known hypertensive heart disease without a change in clinical status or cardiac exam	U (4)

Table 6. Continued

Indication		Appropriate Use Score (1-9)
HF With TTE		
70.	• Initial evaluation of known or suspected HF (systolic or diastolic) based on symptoms, signs, or abnormal test results	A (9)
71.	• Re-evaluation of known HF (systolic or diastolic) with a change in clinical status or cardiac exam without a clear precipitating change in medication or diet	A (8)
72.	• Re-evaluation of known HF (systolic or diastolic) with a change in clinical status or cardiac exam with a clear precipitating change in medication or diet	U (4)
73.	• Re-evaluation of known HF (systolic or diastolic) to guide therapy	A (9)
74.	• Routine surveillance (<1 y) of HF (systolic or diastolic) when there is no change in clinical status or cardiac exam	I (2)
75.	• Routine surveillance (≥1 y) of HF (systolic or diastolic) when there is no change in clinical status or cardiac exam	U (6)
Device Evaluation (Including Pacemaker, ICD, or CRT) With TTE		
76.	• Initial evaluation or re-evaluation after revascularization and/or optimal medical therapy to determine candidacy for device therapy and/or to determine optimal choice of device	A (9)
77.	• Initial evaluation for CRT device optimization after implantation	U (6)
78.	• Known implanted pacing device with symptoms possibly due to device complication or suboptimal pacing device settings	A (8)
79.	• Routine surveillance (<1 y) of implanted device without a change in clinical status or cardiac exam	I (1)
80.	• Routine surveillance (≥1 y) of implanted device without a change in clinical status or cardiac exam	I (3)
Ventricular Assist Devices and Cardiac Transplantation With TTE		
81.	• To determine candidacy for ventricular assist device	A (9)
82.	• Optimization of ventricular assist device settings	A (7)
83.	• Re-evaluation for signs/symptoms suggestive of ventricular assist device-related complications	A (9)
84.	• Monitoring for rejection in a cardiac transplant recipient	A (7)
85.	• Cardiac structure and function evaluation in a potential heart donor	A (9)
Cardiomyopathies With TTE		
86.	• Initial evaluation of known or suspected cardiomyopathy (e.g., restrictive, infiltrative, dilated, hypertrophic, or genetic cardiomyopathy)	A (9)
87.	• Re-evaluation of known cardiomyopathy with a change in clinical status or cardiac exam or to guide therapy	A (9)
88.	• Routine surveillance (<1 y) of known cardiomyopathy without a change in clinical status or cardiac exam	I (2)
89.	• Routine surveillance (≥1 y) of known cardiomyopathy without a change in clinical status or cardiac exam	U (5)
90.	• Screening evaluation for structure and function in first-degree relatives of a patient with an inherited cardiomyopathy	A (9)
91.	• Baseline and serial re-evaluations in a patient undergoing therapy with cardiotoxic agents	A (9)

A indicates appropriate; I, inappropriate; and U, uncertain.

Table 7. TTE for Adult Congenital Heart Disease

Indication		Appropriate Use Score (1-9)
92.	• Initial evaluation of known or suspected adult congenital heart disease	A (9)
93.	• Known adult congenital heart disease with a change in clinical status or cardiac exam	A (9)
94.	• Re-evaluation to guide therapy in known adult congenital heart disease	A (9)
95.	• Routine surveillance (<2 y) of adult congenital heart disease following complete repair <ul style="list-style-type: none"> ◦ without a residual structural or hemodynamic abnormality ◦ without a change in clinical status or cardiac exam 	I (3)
96.	• Routine surveillance (≥2 y) of adult congenital heart disease following complete repair <ul style="list-style-type: none"> ◦ without residual structural or hemodynamic abnormality ◦ without a change in clinical status or cardiac exam 	U (6)
97.	• Routine surveillance (<1 y) of adult congenital heart disease following incomplete or palliative repair <ul style="list-style-type: none"> ◦ with residual structural or hemodynamic abnormality ◦ without a change in clinical status or cardiac exam 	U (5)
98.	• Routine surveillance (≥1 y) of adult congenital heart disease following incomplete or palliative repair <ul style="list-style-type: none"> ◦ with residual structural or hemodynamic abnormality ◦ without a change in clinical status or cardiac exam 	A (8)

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Table 8. TEE

Indication		Appropriate Use Score (1–9)
TEE as Initial or Supplemental Test—General Uses		
99.	• Use of TEE when there is a high likelihood of a nondiagnostic TTE due to patient characteristics or inadequate visualization of relevant structures	A (8)
100.	• Routine use of TEE when a diagnostic TTE is reasonably anticipated to resolve all diagnostic and management concerns	I (1)
101.	• Re-evaluation of prior TEE finding for interval change (e.g., resolution of thrombus after anticoagulation, resolution of vegetation after antibiotic therapy) when a change in therapy is anticipated	A (8)
102.	• Surveillance of prior TEE finding for interval change (e.g., resolution of thrombus after anticoagulation, resolution of vegetation after antibiotic therapy) when no change in therapy is anticipated	I (2)
103.	• Guidance during percutaneous noncoronary cardiac interventions including but not limited to closure device placement, radiofrequency ablation, and percutaneous valve procedures	A (9)
104.	• Suspected acute aortic pathology including but not limited to dissection/transsection	A (9)
105.	• Routine assessment of pulmonary veins in an asymptomatic patient status post pulmonary vein isolation	I (3)
TEE as Initial or Supplemental Test—Valvular Disease		
106.	• Evaluation of valvular structure and function to assess suitability for, and assist in planning of, an intervention	A (9)
107.	• To diagnose infective endocarditis with a low pretest probability (e.g., transient fever, known alternative source of infection, or negative blood cultures/atypical pathogen for endocarditis)	I (3)
108.	• To diagnose infective endocarditis with a moderate or high pretest probability (e.g., staph bacteremia, fungemia, prosthetic heart valve, or intracardiac device)	A (9)
TEE as Initial or Supplemental Test—Embolic Event		
109.	• Evaluation for cardiovascular source of embolus with no identified noncardiac source	A (7)
110.	• Evaluation for cardiovascular source of embolus with a previously identified noncardiac source	U (5)
111.	• Evaluation for cardiovascular source of embolus with a known cardiac source in which a TEE would not change management	I (1)
TEE as Initial Test—Atrial Fibrillation/Flutter		
112.	• Evaluation to facilitate clinical decision making with regard to anticoagulation, cardioversion, and/or radiofrequency ablation	A (9)
113.	• Evaluation when a decision has been made to anticoagulate and not to perform cardioversion	I (2)

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Table 9. Stress Echocardiography for Detection of CAD/Risk Assessment: Symptomatic or Ischemic Equivalent

Indication		Appropriate Use Score (1–9)
Evaluation of Ischemic Equivalent (Nonacute) With Stress Echocardiography		
114.	• Low pretest probability of CAD • ECG interpretable and able to exercise	I (3)
115.	• Low pretest probability of CAD • ECG uninterpretable or unable to exercise	A (7)
116.	• Intermediate pretest probability of CAD • ECG interpretable and able to exercise	A (7)
117.	• Intermediate pretest probability of CAD • ECG uninterpretable or unable to exercise	A (9)
118.	• High pretest probability of CAD • Regardless of ECG interpretability and ability to exercise	A (7)

Table 9. Continued

Indication		Appropriate Use Score (1–9)
Acute Chest Pain With Stress Echocardiography		
119.	<ul style="list-style-type: none"> • Possible ACS • ECG: no ischemic changes or with LBBB or electronically paced ventricular rhythm • Low-risk TIMI score • Negative troponin levels 	A (7)
120.	<ul style="list-style-type: none"> • Possible ACS • ECG: no ischemic changes or with LBBB or electronically paced ventricular rhythm • Low-risk TIMI score • Peak troponin: borderline, equivocal, minimally elevated 	A (7)
121.	<ul style="list-style-type: none"> • Possible ACS • ECG: no ischemic changes or with LBBB or electronically paced ventricular rhythm • High-risk TIMI score • Negative troponin levels 	A (7)
122.	<ul style="list-style-type: none"> • Possible ACS • ECG: no ischemic changes or with LBBB or electronically paced ventricular rhythm • High-risk TIMI score • Peak troponin: borderline, equivocal, minimally elevated 	A (7)
123.	<ul style="list-style-type: none"> • Definite ACS 	I (1)

A indicates appropriate; and I, inappropriate.

Table 10. Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent)

Indication		Appropriate Use Score (1–9)
General Patient Populations With Stress Echocardiography		
124.	<ul style="list-style-type: none"> • Low global CAD risk 	I (1)
125.	<ul style="list-style-type: none"> • Intermediate global CAD risk • ECG interpretable 	I (2)
126.	<ul style="list-style-type: none"> • Intermediate global CAD risk • ECG uninterpretable 	U (5)
127.	<ul style="list-style-type: none"> • High global CAD risk 	U (5)

I indicates inappropriate; and U, uncertain.

Table 11. Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent) in Patient Populations With Defined Comorbidities

Indication		Appropriate Use Score (1–9)
New-Onset or Newly Diagnosed HF or LV Systolic Dysfunction With Stress Echocardiography		
128.	<ul style="list-style-type: none"> • No prior CAD evaluation and no planned coronary angiography 	A (7)
Arrhythmias With Stress Echocardiography		
129.	<ul style="list-style-type: none"> • Sustained VT 	A (7)
130.	<ul style="list-style-type: none"> • Frequent PVCs, exercise induced VT, or nonsustained VT 	A (7)
131.	<ul style="list-style-type: none"> • Infrequent PVCs 	I (3)
132.	<ul style="list-style-type: none"> • New-onset atrial fibrillation 	U (6)
Syncope With Stress Echocardiography		
133.	<ul style="list-style-type: none"> • Low global CAD risk 	I (3)
134.	<ul style="list-style-type: none"> • Intermediate or high global CAD risk 	A (7)
Elevated Troponin With Stress Echocardiography		
135.	<ul style="list-style-type: none"> • Troponin elevation without symptoms or additional evidence of ACS 	A (7)

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Table 12. Stress Echocardiography Following Prior Test Results

Indication		Appropriate Use Score (1-9)
Asymptomatic: Prior Evidence of Subclinical Disease With Stress Echocardiography		
136.	• Coronary calcium Agatston score <100	I (2)
137.	• Low to intermediate global CAD risk • Coronary calcium Agatston score between 100 and 400	U (5)
138.	• High global CAD risk • Coronary calcium Agatston score between 100 and 400	U (6)
139.	• Coronary calcium Agatston score >400	A (7)
140.	• Abnormal carotid intimal medial thickness (≥ 0.9 mm and/or the presence of plaque encroaching into the arterial lumen)	U (5)
Coronary Angiography (Invasive or Noninvasive) With Stress Echocardiography		
141.	• Coronary artery stenosis of unclear significance	A (8)
Asymptomatic or Stable Symptoms With Stress Echocardiography Normal Prior Stress Imaging Study		
142.	• Low global CAD risk • Last stress imaging study <2 y ago	I (1)
143.	• Low global CAD risk • Last stress imaging study ≥ 2 y ago	I (2)
144.	• Intermediate to high global CAD risk • Last stress imaging study <2 y ago	I (2)
145.	• Intermediate to high global CAD risk • Last stress imaging study ≥ 2 y ago	U (4)
Asymptomatic or Stable Symptoms With Stress Echocardiography Abnormal Coronary Angiography or Abnormal Prior Stress Study No Prior Revascularization		
146.	• Known CAD on coronary angiography or prior abnormal stress imaging study • Last stress imaging study <2 y ago	I (3)
147.	• Known CAD on coronary angiography or prior abnormal stress imaging study • Last stress imaging study ≥ 2 y ago	U (5)
Treadmill ECG Stress Test With Stress Echocardiography		
148.	• Low-risk treadmill score (e.g., Duke)	I (1)
149.	• Intermediate-risk treadmill score (e.g., Duke)	A (7)
150.	• High-risk treadmill score (e.g., Duke)	A (7)
New or Worsening Symptoms With Stress Echocardiography		
151.	• Abnormal coronary angiography or abnormal prior stress imaging study	A (7)
152.	• Normal coronary angiography or normal prior stress imaging study	U (6)
Prior Noninvasive Evaluation With Stress Echocardiography		
153.	• Equivocal, borderline, or discordant stress testing where obstructive CAD remains a concern	A (8)

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Table 13. Stress Echocardiography for Risk Assessment: Perioperative Evaluation for Noncardiac Surgery Without Active Cardiac Conditions

Indication		Appropriate Use Score (1–9)
Low-Risk Surgery With Stress Echocardiography		
154.	• Perioperative evaluation for risk assessment	I (1)
Intermediate-Risk Surgery With Stress Echocardiography		
155.	• Moderate to good functional capacity (≥ 4 METs)	I (3)
156.	• No clinical risk factors	I (2)
157.	• ≥ 1 clinical risk factor • Poor or unknown functional capacity (< 4 METs)	U (6)
158.	• Asymptomatic < 1 y post normal catheterization, noninvasive test, or previous revascularization	I (1)
Vascular Surgery With Stress Echocardiography		
159.	• Moderate to good functional capacity (≥ 4 METs)	I (3)
160.	• No clinical risk factors	I (2)
161.	• ≥ 1 clinical risk factor • Poor or unknown functional capacity (< 4 METs)	A (7)
162.	• Asymptomatic < 1 y post normal catheterization, noninvasive test, or previous revascularization	I (2)

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Table 14. Stress Echocardiography for Risk Assessment: Within 3 Months of an ACS

Indication		Appropriate Use Score (1–9)
STEMI With Stress Echocardiography		
163.	• Primary PCI with complete revascularization • No recurrent symptoms	I (2)
164.	• Hemodynamically stable, no recurrent chest pain symptoms, or no signs of HF • To evaluate for inducible ischemia • No prior coronary angiography since the index event	A (7)
165.	• Hemodynamically unstable, signs of cardiogenic shock, or mechanical complications	I (1)
UA/NSTEMI With Stress Echocardiography		
166.	• Hemodynamically stable, no recurrent chest pain symptoms, or no signs of HF • To evaluate for inducible ischemia • No prior coronary angiography since the index event	A (8)
ACS—Asymptomatic Postrevascularization (PCI or CABG) With Stress Echocardiography		
167.	• Prior to hospital discharge in a patient who has been adequately revascularized	I (1)
Cardiac Rehabilitation With Stress Echocardiography		
168.	• Prior to initiation of cardiac rehabilitation (as a stand-alone indication)	I (3)

A indicates appropriate; and I, inappropriate.

Table 15. Stress Echocardiography for Risk Assessment: Postrevascularization (PCI or CABG)

Indication		Appropriate Use Score (1–9)
Symptomatic With Stress Echocardiography		
169.	• Ischemic equivalent	A (8)
Asymptomatic With Stress Echocardiography		
170.	• Incomplete revascularization • Additional revascularization feasible	A (7)
171.	• < 5 y after CABG	I (2)
172.	• ≥ 5 y after CABG	U (6)
173.	• < 2 y after PCI	I (2)
174.	• ≥ 2 y after PCI	U (5)
Cardiac Rehabilitation With Stress Echocardiography		
175.	• Prior to initiation of cardiac rehabilitation (as a stand-alone indication)	I (3)

A indicates appropriate; I, inappropriate; and U, uncertain.

Table 16. Stress Echocardiography for Assessment of Viability/Ischemia

Indication		Appropriate Use Score (1–9)
Ischemic Cardiomyopathy/Assessment of Viability With Stress Echocardiography		
176.	<ul style="list-style-type: none"> • Known moderate or severe LV dysfunction • Patient eligible for revascularization • Use of dobutamine stress only 	A (8)

A indicates appropriate.

Table 17. Stress Echocardiography for Hemodynamics (Includes Doppler During Stress)

Indication		Appropriate Use Score (1–9)
Chronic Valvular Disease—Asymptomatic With Stress Echocardiography		
177.	• Mild mitral stenosis	I (2)
178.	• Moderate mitral stenosis	U (5)
179.	• Severe mitral stenosis	A (7)
180.	• Mild aortic stenosis	I (3)
181.	• Moderate aortic stenosis	U (6)
182.	• Severe aortic stenosis	U (5)
183.	• Mild mitral regurgitation	I (2)
184.	• Moderate mitral regurgitation	U (5)
185.	<ul style="list-style-type: none"> • Severe mitral regurgitation • LV size and function not meeting surgical criteria 	A (7)
186.	• Mild aortic regurgitation	I (2)
187.	• Moderate aortic regurgitation	U (5)
188.	<ul style="list-style-type: none"> • Severe aortic regurgitation • LV size and function not meeting surgical criteria 	A (7)
Chronic Valvular Disease—Symptomatic With Stress Echocardiography		
189.	• Mild mitral stenosis	U (5)
190.	• Moderate mitral stenosis	A (7)
191.	• Severe mitral stenosis	I (3)
192.	• Severe aortic stenosis	I (1)
193.	<ul style="list-style-type: none"> • Evaluation of equivocal aortic stenosis • Evidence of low cardiac output or LV systolic dysfunction (“low gradient aortic stenosis”) • Use of dobutamine only 	A (8)
194.	• Mild mitral regurgitation	U (4)
195.	• Moderate mitral regurgitation	A (7)
196.	<ul style="list-style-type: none"> • Severe mitral regurgitation • Severe LV enlargement or LV systolic dysfunction 	I (3)
Acute Valvular Disease With Stress Echocardiography		
197.	• Acute moderate or severe mitral or aortic regurgitation	I (3)
Pulmonary Hypertension With Stress Echocardiography		
198.	<ul style="list-style-type: none"> • Suspected pulmonary artery hypertension • Normal or borderline elevated estimated right ventricular systolic pressure on resting echocardiographic study 	U (5)
199.	• Routine evaluation of patients with known resting pulmonary hypertension	I (3)
200.	• Re-evaluation of patient with exercise-induced pulmonary hypertension to evaluate response to therapy	U (5)

A indicates appropriate; I, inappropriate; and U, uncertain.

Table 18. Contrast Use in TTE/TEE or Stress Echocardiography

Indication		Appropriate Use Score (1–9)
201.	<ul style="list-style-type: none"> • Routine use of contrast • All LV segments visualized on noncontrast images 	I (1)
202.	<ul style="list-style-type: none"> • Selective use of contrast • ≥ 2 contiguous LV segments are not seen on noncontrast images 	A (8)

A indicates appropriate; and I, inappropriate.

8. Echocardiography Appropriate Use Criteria (by Appropriate Use Rating)

Table 19. Appropriate Indications (Median Score 7–9)

Indication	Appropriate Use Score (1–9)
TTE for General Evaluation of Cardiac Structure and Function Suspected Cardiac Etiology—General	
1.	• Symptoms or conditions potentially related to suspected cardiac etiology including but not limited to chest pain, shortness of breath, palpitations, TIA, stroke, or peripheral embolic event A (9)
2.	• Prior testing that is concerning for heart disease or structural abnormality including but not limited to chest X-ray, baseline scout images for stress echocardiogram, ECG, or cardiac biomarkers A (9)
TTE for General Evaluation of Cardiac Structure and Function Arrhythmias	
4.	• Frequent VPCs or exercise-induced VPCs A (8)
5.	• Sustained or nonsustained atrial fibrillation, SVT, or VT A (9)
TTE for General Evaluation of Cardiac Structure and Function Lightheadedness/Presyncope/Syncope	
7.	• Clinical symptoms or signs consistent with a cardiac diagnosis known to cause lightheadedness/presyncope/syncope (including but not limited to aortic stenosis, hypertrophic cardiomyopathy, or HF) A (9)
9.	• Syncope when there are no other symptoms or signs of cardiovascular disease A (7)
TTE for General Evaluation of Cardiac Structure and Function Pulmonary Hypertension	
15.	• Evaluation of suspected pulmonary hypertension including evaluation of right ventricular function and estimated pulmonary artery pressure A (9)
17.	• Routine surveillance (≥ 1 y) of known pulmonary hypertension without change in clinical status or cardiac exam A (7)
18.	• Re-evaluation of known pulmonary hypertension if change in clinical status or cardiac exam or to guide therapy A (9)
TTE for Cardiovascular Evaluation in an Acute Setting Hypotension or Hemodynamic Instability	
19.	• Hypotension or hemodynamic instability of uncertain or suspected cardiac etiology A (9)
TTE for Cardiovascular Evaluation in an Acute Setting Myocardial Ischemia/Infarction	
21.	• Acute chest pain with suspected MI and nondiagnostic ECG when a resting echocardiogram can be performed during pain A (9)
22.	• Evaluation of a patient without chest pain but with other features of an ischemic equivalent or laboratory markers indicative of ongoing MI A (8)
23.	• Suspected complication of myocardial ischemia/infarction, including but not limited to acute mitral regurgitation, ventricular septal defect, free-wall rupture/tamponade, shock, right ventricular involvement, HF, or thrombus A (9)
TTE for Cardiovascular Evaluation in an Acute Setting Evaluation of Ventricular Function After ACS	
24.	• Initial evaluation of ventricular function following ACS A (9)
25.	• Re-evaluation of ventricular function following ACS during recovery phase when results will guide therapy A (9)
TTE for Cardiovascular Evaluation in an Acute Setting Respiratory Failure	
26.	• Respiratory failure or hypoxemia of uncertain etiology A (8)
TTE for Cardiovascular Evaluation in an Acute Setting Pulmonary Embolism	
29.	• Known acute pulmonary embolism to guide therapy (e.g., thrombectomy and thrombolytics) A (8)
31.	• Re-evaluation of known pulmonary embolism after thrombolysis or thrombectomy for assessment of change in right ventricular function and/or pulmonary artery pressure A (7)
TTE for Cardiovascular Evaluation in an Acute Setting Cardiac Trauma	
32.	• Severe deceleration injury or chest trauma when valve injury, pericardial effusion, or cardiac injury are possible or suspected A (9)
TTE for Evaluation of Valvular Function Murmur or Click	
34.	• Initial evaluation when there is a reasonable suspicion of valvular or structural heart disease A (9)
37.	• Re-evaluation of known valvular heart disease with a change in clinical status or cardiac exam or to guide therapy A (9)

Table 19. Continued

Indication		Appropriate Use Score (1-9)
TTE for Evaluation of Valvular Function		
Native Valvular Stenosis		
39.	• Routine surveillance (≥ 3 y) of mild valvular stenosis without a change in clinical status or cardiac exam	A (7)
41.	• Routine surveillance (≥ 1 y) of moderate or severe valvular stenosis without a change in clinical status or cardiac exam	A (8)
46.	• Routine surveillance (≥ 1 y) of moderate or severe valvular regurgitation without change in clinical status or cardiac exam	A (8)
TTE for Evaluation of Valvular Function		
Prosthetic Valves		
47.	• Initial postoperative evaluation of prosthetic valve for establishment of baseline	A (9)
49.	• Routine surveillance (≥ 3 y after valve implantation) of prosthetic valve if no known or suspected valve dysfunction	A (7)
50.	• Evaluation of prosthetic valve with suspected dysfunction or a change in clinical status or cardiac exam	A (9)
51.	• Re-evaluation of known prosthetic valve dysfunction when it would change management or guide therapy	A (9)
TTE for Evaluation of Valvular Function		
Infective Endocarditis (Native or Prosthetic Valves)		
52.	• Initial evaluation of suspected infective endocarditis with positive blood cultures or a new murmur	A (9)
55.	• Re-evaluation of infective endocarditis at high risk for progression or complication or with a change in clinical status or cardiac exam	A (9)
TTE for Evaluation of Intracardiac and Extracardiac Structures and Chambers		
57.	• Suspected cardiac mass	A (9)
58.	• Suspected cardiovascular source of embolus	A (9)
59.	• Suspected pericardial conditions	A (9)
61.	• Re-evaluation of known pericardial effusion to guide management or therapy	A (8)
62.	• Guidance of percutaneous noncoronary cardiac procedures including but not limited to pericardiocentesis, septal ablation, or right ventricular biopsy	A (9)
TTE for Evaluation of Aortic Disease		
63.	• Evaluation of the ascending aorta in the setting of a known or suspected connective tissue disease or genetic condition that predisposes to aortic aneurysm or dissection (e.g., Marfan syndrome)	A (9)
64.	• Re-evaluation of known ascending aortic dilation or history of aortic dissection to establish a baseline rate of expansion or when the rate of expansion is excessive	A (9)
65.	• Re-evaluation of known ascending aortic dilation or history of aortic dissection with a change in clinical status or cardiac exam or when findings may alter management or therapy	A (9)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy		
Hypertension		
67.	• Initial evaluation of suspected hypertensive heart disease	A (8)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy		
HF		
70.	• Initial evaluation of known or suspected HF (systolic or diastolic) based on symptoms, signs, or abnormal test results	A (9)
71.	• Re-evaluation of known HF (systolic or diastolic) with a change in clinical status or cardiac exam without a clear precipitating change in medication or diet	A (8)
73.	• Re-evaluation of known HF (systolic or diastolic) to guide therapy	A (9)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy		
Device Evaluation (Including Pacemaker, ICD, or CRT)		
76.	• Initial evaluation or re-evaluation after revascularization and/or optimal medical therapy to determine candidacy for device therapy and/or to determine optimal choice of device	A (9)
78.	• Known implanted pacing device with symptoms possibly due to device complication or suboptimal pacing device settings	A (8)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy		
Ventricular Assist Devices and Cardiac Transplantation		
81.	• To determine candidacy for ventricular assist device	A (9)
82.	• Optimization of ventricular assist device settings	A (7)
83.	• Re-evaluation for signs/symptoms suggestive of ventricular assist device-related complications	A (9)
84.	• Monitoring for rejection in a cardiac transplant recipient	A (7)
85.	• Cardiac structure and function evaluation in a potential heart donor	A (9)

Table 19. Continued

Indication		Appropriate Use Score (1–9)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy Cardiomyopathies		
86.	• Initial evaluation of known or suspected cardiomyopathy (e.g., restrictive, infiltrative, dilated, hypertrophic, or genetic cardiomyopathy)	A (9)
87.	• Re-evaluation of known cardiomyopathy with a change in clinical status or cardiac exam or to guide therapy	A (9)
90.	• Screening evaluation for structure and function in first-degree relatives of a patient with an inherited cardiomyopathy	A (9)
91.	• Baseline and serial re-evaluations in a patient undergoing therapy with cardiotoxic agents	A (9)
TTE for Adult Congenital Heart Disease		
92.	• Initial evaluation of known or suspected adult congenital heart disease	A (9)
93.	• Known adult congenital heart disease with a change in clinical status or cardiac exam	A (9)
94.	• Re-evaluation to guide therapy in known adult congenital heart disease	A (9)
98.	• Routine surveillance (≥ 1 y) of adult congenital heart disease following incomplete or palliative repair <ul style="list-style-type: none"> ◦ with residual structural or hemodynamic abnormality ◦ without a change in clinical status or cardiac exam 	A (8)
TEE as Initial or Supplemental Test—General Uses		
99.	• Use of TEE when there is a high likelihood of a nondiagnostic TTE due to patient characteristics or inadequate visualization of relevant structures	A (8)
101.	• Re-evaluation of prior TEE finding for interval change (e.g., resolution of thrombus after anticoagulation, resolution of vegetation after antibiotic therapy) when a change in therapy is anticipated	A (8)
103.	• Guidance during percutaneous noncoronary cardiac interventions including but not limited to closure device placement, radiofrequency ablation, and percutaneous valve procedures	A (9)
104.	• Suspected acute aortic pathology including but not limited to dissection/transsection	A (9)
TEE as Initial or Supplemental Test—Valvular Disease		
106.	• Evaluation of valvular structure and function to assess suitability for, and assist in planning of, an intervention	A (9)
108.	• To diagnose infective endocarditis with a moderate or high pretest probability (e.g., staph bacteremia, fungemia, prosthetic heart valve, or intracardiac device)	A (9)
TEE as Initial or Supplemental Test—Embolus Event		
109.	• Evaluation for cardiovascular source of embolus with no identified noncardiac source	A (7)
TEE as Initial Test—Atrial Fibrillation/Flutter		
112.	• Evaluation to facilitate clinical decision making with regards to anticoagulation, cardioversion, and/or radiofrequency ablation	A (9)
Stress Echocardiography for Detection of CAD/Risk Assessment: Symptomatic or Ischemic Equivalent Evaluation of Ischemic Equivalent (Nonacute)		
115.	• Low pretest probability of CAD • ECG uninterpretable or unable to exercise	A (7)
116.	• Intermediate pretest probability of CAD • ECG interpretable and able to exercise	A (7)
117.	• Intermediate pretest probability of CAD • ECG uninterpretable or unable to exercise	A (9)
118.	• High pretest probability of CAD • Regardless of ECG interpretability and ability to exercise	A (7)
Stress Echocardiography for Detection of CAD/Risk Assessment: Symptomatic or Ischemic Equivalent Acute Chest Pain		
119.	• Possible ACS • ECG: no ischemic changes or with LBBB or electronically paced ventricular rhythm • Low-risk TIMI score • Negative troponin levels	A (7)
120.	• Possible ACS • ECG: no ischemic changes or with LBBB or electronically paced ventricular rhythm • Low-risk TIMI score • Peak troponin: borderline, equivocal, minimally elevated	A (7)
121.	• Possible ACS • ECG: no ischemic changes or with LBBB or electronically paced ventricular rhythm • High-risk TIMI score • Negative troponin levels	A (7)
122.	• Possible ACS • ECG: no ischemic changes or with LBBB or electronically paced ventricular rhythm • High-risk TIMI score • Peak troponin: borderline, equivocal, minimally elevated	A (7)

Table 19. Continued

Indication		Appropriate Use Score (1-9)
Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent) in Patient Populations With Defined Comorbidities New-Onset or Newly Diagnosed HF or LV Systolic Dysfunction		
128.	• No prior CAD evaluation and no planned coronary angiography	A (7)
Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent) in Patient Populations With Defined Comorbidities Arrhythmias		
129.	• Sustained VT	A (7)
130.	• Frequent PVCs, exercise-induced VT, or nonsustained VT	A (7)
Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent) in Patient Populations With Defined Comorbidities Syncope		
134.	• Intermediate or high global CAD risk	A (7)
Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent) in Patient Populations With Defined Comorbidities Elevated Troponin		
135.	• Troponin elevation without symptoms or additional evidence of ACS	A (7)
Stress Echocardiography Following Prior Test Results Asymptomatic: Prior Evidence of Subclinical Disease		
139.	• Coronary calcium Agatston score >400	A (7)
Stress Echocardiography Following Prior Test Results Coronary Angiography (Invasive or Noninvasive)		
141.	• Coronary artery stenosis of unclear significance	A (8)
Stress Echocardiography Following Prior Test Results Treadmill ECG Stress Test		
149.	• Intermediate-risk treadmill score (e.g., Duke)	A (7)
150.	• High-risk treadmill score (e.g., Duke)	A (7)
Stress Echocardiography Following Prior Test Results New or Worsening Symptoms		
151.	• Abnormal coronary angiography or abnormal prior stress imaging study	A (7)
Stress Echocardiography Following Prior Test Results Prior Noninvasive Evaluation		
153.	• Equivocal, borderline, or discordant stress testing where obstructive CAD remains a concern	A (8)
Stress Echocardiography for Risk Assessment: Perioperative Evaluation for Noncardiac Surgery Without Active Cardiac Conditions Vascular Surgery		
161.	• ≥ 1 clinical risk factor • Poor or unknown functional capacity (<4 METs)	A (7)
Stress Echocardiography for Risk Assessment: Within 3 Months of an ACS STEMI		
164.	• Hemodynamically stable, no recurrent chest pain symptoms, or no signs of HF • To evaluate for inducible ischemia • No prior coronary angiography since the index event	A (7)
Stress Echocardiography for Risk Assessment: Within 3 Months of an ACS UA/NSTEMI		
166.	• Hemodynamically stable, no recurrent chest pain symptoms, or no signs of HF • To evaluate for inducible ischemia • No prior coronary angiography since the index event	A (8)
Stress Echocardiography for Risk Assessment: Postrevascularization (PCI or CABG) Symptomatic		
169.	• Ischemic equivalent	A (8)
Stress Echocardiography for Risk Assessment: Postrevascularization (PCI or CABG) Asymptomatic		
170.	• Incomplete revascularization • Additional revascularization feasible	A (7)

Table 19. Continued

Indication		Appropriate Use Score (1–9)
Stress Echocardiography for Assessment of Viability/Ischemia Ischemic Cardiomyopathy/Assessment of Viability		
176.	<ul style="list-style-type: none"> Known moderate or severe LV dysfunction Patient eligible for revascularization Use of dobutamine stress only 	A (8)
Stress Echocardiography for Hemodynamics (Includes Doppler During Stress) Chronic Valvular Disease—Asymptomatic		
179.	<ul style="list-style-type: none"> Severe mitral stenosis 	A (7)
185.	<ul style="list-style-type: none"> Severe mitral regurgitation LV size and function not meeting surgical criteria 	A (7)
188.	<ul style="list-style-type: none"> Severe aortic regurgitation LV size and function not meeting surgical criteria 	A (7)
Stress Echocardiography for Hemodynamics (Includes Doppler During Stress) Chronic Valvular Disease—Symptomatic		
190.	<ul style="list-style-type: none"> Moderate mitral stenosis 	A (7)
193.	<ul style="list-style-type: none"> Evaluation of equivocal aortic stenosis Evidence of low cardiac output or LV systolic dysfunction (“low gradient aortic stenosis”) Use of dobutamine only 	A (8)
195.	<ul style="list-style-type: none"> Moderate mitral regurgitation 	A (7)
Contrast Use in TTE/TEE or Stress Echocardiography		
202.	<ul style="list-style-type: none"> Selective use of contrast ≥2 contiguous LV segments are not seen on noncontrast images 	A (8)

A indicates appropriate.

Table 20. Uncertain Indications (Median Score 4–6)

Indication		Appropriate Use Score (1–9)
TTE for General Evaluation of Cardiac Structure and Function Perioperative Evaluation		
14.	<ul style="list-style-type: none"> Routine perioperative evaluation of cardiac structure and function prior to noncardiac solid organ transplantation 	U (6)
TTE for Cardiovascular Evaluation in an Acute Setting Hypotension or Hemodynamic Instability		
20.	<ul style="list-style-type: none"> Assessment of volume status in a critically ill patient 	U (5)
TTE for Cardiovascular Evaluation in an Acute Setting Respiratory Failure		
27.	<ul style="list-style-type: none"> Respiratory failure or hypoxemia when a noncardiac etiology of respiratory failure has been established 	U (5)
TTE for Evaluation of Valvular Function Native Valvular Regurgitation		
44.	<ul style="list-style-type: none"> Routine surveillance (≥3 y) of mild valvular regurgitation without a change in clinical status or cardiac exam 	U (4)
45.	<ul style="list-style-type: none"> Routine surveillance (<1 y) of moderate or severe valvular regurgitation without a change in clinical status or cardiac exam 	U (6)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy Hypertension		
69.	<ul style="list-style-type: none"> Re-evaluation of known hypertensive heart disease without a change in clinical status or cardiac exam 	U (4)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy HF		
72.	<ul style="list-style-type: none"> Re-evaluation of known HF (systolic or diastolic) with a change in clinical status or cardiac exam with a clear precipitating change in medication or diet 	U (4)
75.	<ul style="list-style-type: none"> Routine surveillance (≥1 y) of HF (systolic or diastolic) when there is no change in clinical status or cardiac exam 	U (6)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy Device Evaluation (Including Pacemaker, ICD, or CRT)		
77.	<ul style="list-style-type: none"> Initial evaluation for CRT device optimization after implantation 	U (6)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy Cardiomyopathies		
89.	<ul style="list-style-type: none"> Routine surveillance (≥1 y) of known cardiomyopathy without a change in clinical status or cardiac exam 	U (5)

Table 20. Continued

Indication	Appropriate Use Score (1–9)	
TTE for Adult Congenital Heart Disease		
96.	<ul style="list-style-type: none"> • Routine surveillance (≥ 2 y) of adult congenital heart disease following complete repair <ul style="list-style-type: none"> ◦ without residual structural or hemodynamic abnormality ◦ without a change in clinical status or cardiac exam 	U (6)
97.	<ul style="list-style-type: none"> • Routine surveillance (< 1 y) of adult congenital heart disease following incomplete or palliative repair <ul style="list-style-type: none"> ◦ with residual structural or hemodynamic abnormality ◦ without a change in clinical status or cardiac exam 	U (5)
TEE as Initial or Supplemental Test—Embolic Event		
110.	<ul style="list-style-type: none"> • Evaluation for cardiovascular source of embolus with a previously identified noncardiac source 	U (5)
Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent) General Patient Populations		
126.	<ul style="list-style-type: none"> • Intermediate global CAD risk • ECG uninterpretable 	U (5)
127.	<ul style="list-style-type: none"> • High global CAD risk 	U (5)
Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent) in Patient Populations With Defined Comorbidities Arrhythmias		
132.	<ul style="list-style-type: none"> • New-onset atrial fibrillation 	U (6)
Stress Echocardiography Following Prior Test Results Asymptomatic: Prior Evidence of Subclinical Disease		
137.	<ul style="list-style-type: none"> • Low to intermediate global CAD risk • Coronary calcium Agatston score between 100 and 400 	U (5)
138.	<ul style="list-style-type: none"> • High global CAD risk • Coronary calcium Agatston score between 100 and 400 	U (6)
140.	<ul style="list-style-type: none"> • Abnormal carotid intimal medial thickness (≥ 0.9 mm and/or the presence of plaque encroaching into the arterial lumen) 	U (5)
Stress Echocardiography Following Prior Test Results Asymptomatic or Stable Symptoms Normal Prior Stress Imaging Study		
145.	<ul style="list-style-type: none"> • Intermediate to high global CAD risk • Last stress imaging study ≥ 2 y ago 	U (4)
Stress Echocardiography Following Prior Test Results Asymptomatic or Stable Symptoms Abnormal Coronary Angiography or Abnormal Prior Stress Study No Prior Revascularization		
147.	<ul style="list-style-type: none"> • Known CAD on coronary angiography or prior abnormal stress imaging study • Last stress imaging study ≥ 2 y ago 	U (5)
Stress Echocardiography Following Prior Test Results New or Worsening Symptoms		
152.	<ul style="list-style-type: none"> • Normal coronary angiography or normal prior stress imaging study 	U (6)
Stress Echocardiography for Risk Assessment: Perioperative Evaluation for Noncardiac Surgery Without Active Cardiac Conditions Intermediate-Risk Surgery		
157.	<ul style="list-style-type: none"> • ≥ 1 clinical risk factor • Poor or unknown functional capacity (< 4 METs) 	U (6)
Stress Echocardiography for Risk Assessment: Postrevascularization (PCI or CABG) Asymptomatic		
172.	<ul style="list-style-type: none"> • ≥ 5 y after CABG 	U (6)
174.	<ul style="list-style-type: none"> • ≥ 2 y after PCI 	U (5)
Stress Echocardiography for Hemodynamics (Includes Doppler During Stress) Chronic Valvular Disease—Asymptomatic		
178.	<ul style="list-style-type: none"> • Moderate mitral stenosis 	U (5)
181.	<ul style="list-style-type: none"> • Moderate aortic stenosis 	U (6)
182.	<ul style="list-style-type: none"> • Severe aortic stenosis 	U (5)
184.	<ul style="list-style-type: none"> • Moderate mitral regurgitation 	U (5)
187.	<ul style="list-style-type: none"> • Moderate aortic regurgitation 	U (5)

Table 20. Continued

Indication		Appropriate Use Score (1–9)
Stress Echocardiography for Hemodynamics (Includes Doppler During Stress) Chronic Valvular Disease—Symptomatic		
189.	• Mild mitral stenosis	U (5)
194.	• Mild mitral regurgitation	U (4)
Stress Echocardiography for Hemodynamics (Includes Doppler During Stress) Pulmonary Hypertension		
198.	• Suspected pulmonary hypertension • Normal or borderline elevated estimated right ventricular systolic pressure on resting echocardiographic study	U (5)
200.	• Re-evaluation of patient with exercise-induced pulmonary hypertension to evaluate response to therapy	U (5)

U indicates uncertain.

Table 21. Inappropriate Indications (Median Score 1–3)

Indication		Appropriate Use Score (1–9)
TTE for General Evaluation of Cardiac Structure and Function Arrhythmias		
3.	• Infrequent APCs or infrequent VPCs without other evidence of heart disease	I (2)
6.	• Asymptomatic isolated sinus bradycardia	I (2)
TTE for General Evaluation of Cardiac Structure and Function Lightheadedness/Presyncope/Syncope		
8.	• Lightheadedness/presyncope when there are no other symptoms or signs of cardiovascular disease	I (3)
TTE for General Evaluation of Cardiac Structure and Function Evaluation of Ventricular Function		
10.	• Initial evaluation of ventricular function (e.g., screening) with no symptoms or signs of cardiovascular disease	I (2)
11.	• Routine surveillance of ventricular function with known CAD and no change in clinical status or cardiac exam	I (3)
12.	• Evaluation of LV function with prior ventricular function evaluation showing normal function (e.g., prior echocardiogram, left ventriculogram, CT, SPECT MPI, CMR) in patients in whom there has been no change in clinical status or cardiac exam	I (1)
TTE for General Evaluation of Cardiac Structure and Function Perioperative Evaluation		
13.	• Routine perioperative evaluation of ventricular function with no symptoms or signs of cardiovascular disease	I (2)
TTE for General Evaluation of Cardiac Structure and Function Pulmonary Hypertension		
16.	• Routine surveillance (<1 y) of known pulmonary hypertension without change in clinical status or cardiac exam	I (3)
TTE for Cardiovascular Evaluation in an Acute Setting Pulmonary Embolism		
28.	• Suspected pulmonary embolism in order to establish diagnosis	I (2)
30.	• Routine surveillance of prior pulmonary embolism with normal right ventricular function and pulmonary artery systolic pressure	I (1)
TTE for Cardiovascular Evaluation in an Acute Setting Cardiac Trauma		
33.	• Routine evaluation in the setting of mild chest trauma with no electrocardiographic changes or biomarker elevation	I (2)
TTE for Evaluation of Valvular Function Murmur or Click		
35.	• Initial evaluation when there are no other symptoms or signs of valvular or structural heart disease	I (2)
36.	• Re-evaluation in a patient without valvular disease on prior echocardiogram and no change in clinical status or cardiac exam	I (1)
TTE for Evaluation of Valvular Function Native Valvular Stenosis		
38.	• Routine surveillance (<3 y) of mild valvular stenosis without a change in clinical status or cardiac exam	I (3)
40.	• Routine surveillance (<1 y) of moderate or severe valvular stenosis without a change in clinical status or cardiac exam	I (3)
TTE for Evaluation of Valvular Function Native Valvular Regurgitation		
42.	• Routine surveillance of trace valvular regurgitation	I (1)
43.	• Routine surveillance (<3 y) of mild valvular regurgitation without a change in clinical status or cardiac exam	I (2)

Table 21. Continued

Indication		Appropriate Use Score (1–9)
TTE for Evaluation of Valvular Function Prosthetic Valves		
48.	• Routine surveillance (<3 y after valve implantation) of prosthetic valve if no known or suspected valve dysfunction	I (3)
TTE for Evaluation of Valvular Function Infective Endocarditis (Native or Prosthetic Valves)		
53.	• Transient fever without evidence of bacteremia or a new murmur	I (2)
54.	• Transient bacteremia with a pathogen not typically associated with infective endocarditis and/or a documented nonendovascular source of infection	I (3)
56.	• Routine surveillance of uncomplicated infective endocarditis when no change in management is contemplated	I (2)
TTE for Evaluation of Intracardiac and Extracardiac Structures and Chambers		
60.	• Routine surveillance of known small pericardial effusion with no change in clinical status	I (2)
TTE for Evaluation of Aortic Disease		
66.	• Routine re-evaluation for surveillance of known ascending aortic dilation or history of aortic dissection without a change in clinical status or cardiac exam when findings would not change management or therapy	I (3)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy Hypertension		
68.	• Routine evaluation of systemic hypertension without symptoms or signs of hypertensive heart disease	I (3)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy HF		
74.	• Routine surveillance (<1 y) of HF (systolic or diastolic) when there is no change in clinical status or cardiac exam	I (2)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy Device Evaluation (Including Pacemaker, ICD, or CRT)		
79.	• Routine surveillance (<1 y) of implanted device without a change in clinical status or cardiac exam	I (1)
80.	• Routine surveillance (≥ 1 y) of implanted device without a change in clinical status or cardiac exam	I (3)
TTE for Evaluation of Hypertension, HF, or Cardiomyopathy Cardiomyopathies		
88.	• Routine surveillance (<1 y) of known cardiomyopathy without a change in clinical status or cardiac exam	I (2)
TTE for Adult Congenital Heart Disease		
95.	• Routine surveillance (<2 y) of adult congenital heart disease following complete repair <ul style="list-style-type: none"> ◦ without a residual structural or hemodynamic abnormality ◦ without a change in clinical status or cardiac exam 	I (3)
TEE as Initial or Supplemental Test—General Uses		
100.	• Routine use of TEE when a diagnostic TTE is reasonably anticipated to resolve all diagnostic and management concerns	I (1)
102.	• Surveillance of prior TEE finding for interval change (e.g., resolution of thrombus after anticoagulation, resolution of vegetation after antibiotic therapy) when no change in therapy is anticipated	I (2)
105.	• Routine assessment of pulmonary veins in an asymptomatic patient status post pulmonary vein isolation	I (3)
TEE as Initial or Supplemental Test—Valvular Disease		
107.	• To diagnose infective endocarditis with a low pretest probability (e.g., transient fever, known alternative source of infection, or negative blood cultures/atypical pathogen for endocarditis)	I (3)
TEE as Initial or Supplemental Test—Embolic Event		
111.	• Evaluation for cardiovascular source of embolus with a known cardiac source in which a TEE would not change management	I (1)
TEE as Initial Test—Atrial Fibrillation/Flutter		
113.	• Evaluation when a decision has been made to anticoagulate and not to perform cardioversion	I (2)
Stress Echocardiography for Detection of CAD/Risk Assessment: Symptomatic or Ischemic Equivalent Evaluation of Ischemic Equivalent (Nonacute)		
114.	• Low pretest probability of CAD • ECG interpretable and able to exercise	I (3)
Stress Echocardiography for Detection of CAD/Risk Assessment: Symptomatic or Ischemic Equivalent Acute Chest Pain		
123.	• Definite ACS	I (1)

Table 21. Continued

Indication		Appropriate Use Score (1–9)
Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent) General Patient Populations		
124.	• Low global CAD risk	I (1)
125.	• Intermediate global CAD risk • ECG interpretable	I (2)
Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent) in Patient Populations With Defined Comorbidities Arrhythmias		
131.	• Infrequent PVCs	I (3)
Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent) in Patient Populations With Defined Comorbidities Syncope		
133.	• Low global CAD risk	I (3)
Stress Echocardiography Following Prior Test Results Asymptomatic: Prior Evidence of Subclinical Disease		
136.	• Coronary calcium Agatston score <100	I (2)
Stress Echocardiography Following Prior Test Results Asymptomatic or Stable Symptoms Normal Prior Stress Imaging Study		
142.	• Low global CAD risk • Last stress imaging study <2 y ago	I (1)
143.	• Low global CAD risk • Last stress imaging study ≥2 y ago	I (2)
144.	• Intermediate to high global CAD risk • Last stress imaging study <2 y ago	I (2)
Stress Echocardiography Following Prior Test Results Asymptomatic or Stable Symptoms Abnormal Coronary Angiography or Abnormal Prior Stress Study No Prior Revascularization		
146.	• Known CAD on coronary angiography or prior abnormal stress imaging study • Last stress imaging study <2 y ago	I (3)
Stress Echocardiography Following Prior Test Results Treadmill ECG Stress Test		
148.	• Low-risk treadmill score (e.g., Duke)	I (1)
Stress Echocardiography for Risk Assessment: Perioperative Evaluation for Noncardiac Surgery Without Active Cardiac Conditions Low-Risk Surgery		
154.	• Perioperative evaluation for risk assessment	I (1)
Stress Echocardiography for Risk Assessment: Perioperative Evaluation for Noncardiac Surgery Without Active Cardiac Conditions Intermediate-Risk Surgery		
155.	• Moderate to good functional capacity (≥4 METs)	I (3)
156.	• No clinical risk factors	I (2)
158.	• Asymptomatic <1 y post normal catheterization, noninvasive test, or previous revascularization	I (1)
Stress Echocardiography for Risk Assessment: Perioperative Evaluation for Noncardiac Surgery Without Active Cardiac Conditions Vascular Surgery		
159.	• Moderate to good functional capacity (≥4 METs)	I (3)
160.	• No clinical risk factors	I (2)
162.	• Asymptomatic <1 y post normal catheterization, noninvasive test, or previous revascularization	I (2)
Stress Echocardiography for Risk Assessment: Within 3 Months of an ACS STEMI		
163.	• Primary PCI with complete revascularization • No recurrent symptoms	I (2)
165.	• Hemodynamically unstable, signs of cardiogenic shock, or mechanical complications	I (1)
Stress Echocardiography for Risk Assessment: Within 3 Months of an ACS ACS—Asymptomatic Postrevascularization (PCI or CABG)		
167.	• Prior to hospital discharge in a patient who has been adequately revascularized	I (1)

Table 21. Continued

Indication	Appropriate Use Score (1-9)
Stress Echocardiography for Risk Assessment: Within 3 Months of an ACS Cardiac Rehabilitation	
168. • Prior to initiation of cardiac rehabilitation (as a stand-alone indication)	I (3)
Stress Echocardiography for Risk Assessment: Postrevascularization (PCI or CABG) Asymptomatic	
171. • <5 y after CABG	I (2)
173. • <2 y after PCI	I (2)
Stress Echocardiography for Risk Assessment: Postrevascularization (PCI or CABG) Cardiac Rehabilitation	
175. • Prior to initiation of cardiac rehabilitation (as a stand-alone indication)	I (3)
Stress Echocardiography for Hemodynamics (Includes Doppler During Stress) Chronic Valvular Disease—Asymptomatic	
177. • Mild mitral stenosis	I (2)
180. • Mild aortic stenosis	I (3)
183. • Mild mitral regurgitation	I (2)
186. • Mild aortic regurgitation	I (2)
Stress Echocardiography for Hemodynamics (Includes Doppler During Stress) Chronic Valvular Disease—Symptomatic	
191. • Severe mitral stenosis	I (3)
192. • Severe aortic stenosis	I (1)
196. • Severe mitral regurgitation • Severe LV enlargement or LV systolic dysfunction	I (3)
Stress Echocardiography for Hemodynamics (Includes Doppler During Stress) Acute Valvular disease	
197. • Acute moderate or severe mitral or aortic regurgitation	I (3)
Stress Echocardiography for Hemodynamics (Includes Doppler During Stress) Pulmonary Hypertension	
199. • Routine evaluation of patients with known resting pulmonary hypertension	I (3)
Contrast Use in TTE/TEE or Stress Echocardiography	
201. • Routine use of contrast • All LV segments visualized on noncontrast images	I (1)

I indicates inappropriate.

Visual representations (flow diagrams) for all indications are included in the Online Appendix. Selected flow diagrams for several categories of indications are included here (Figs. 1 to 6).

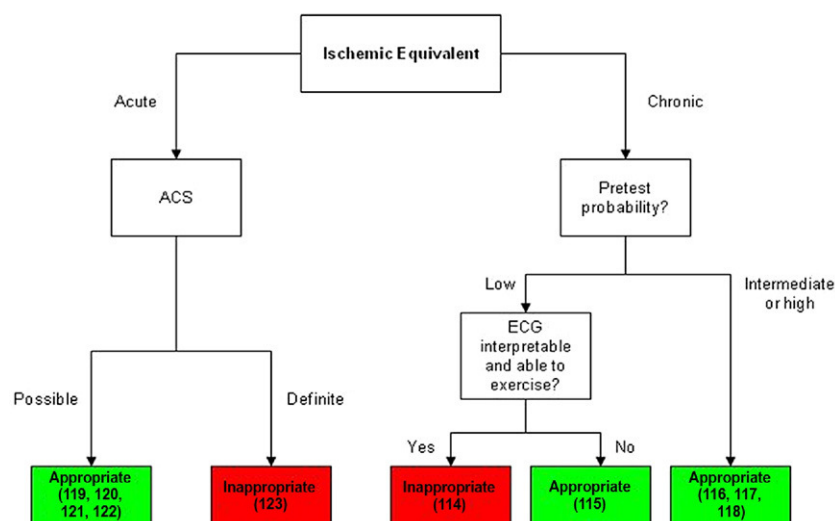


Figure 1. Stress Echocardiography for Detection of CAD/Risk Assessment: Symptomatic or Ischemic Equivalent

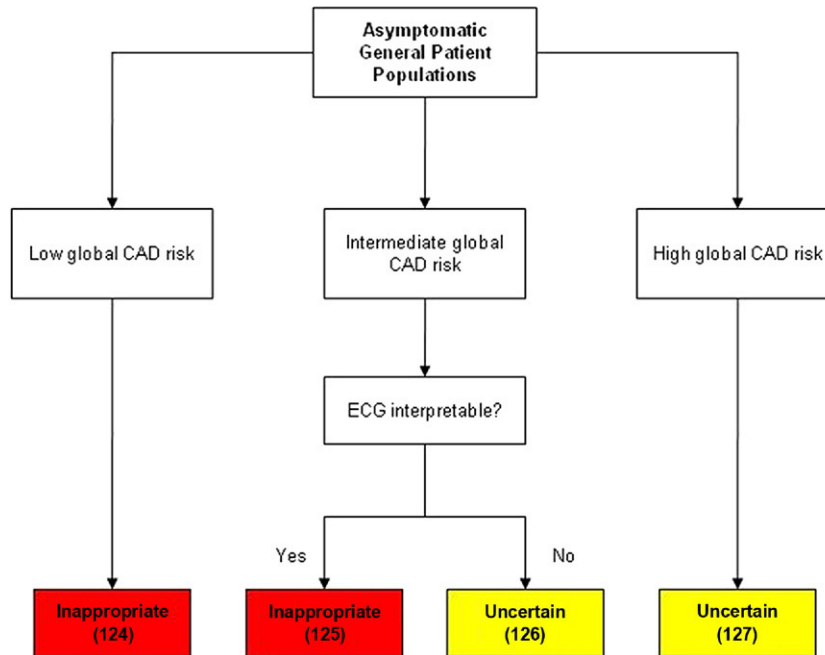


Figure 2. Stress Echocardiography for Detection of CAD/Risk Assessment: Asymptomatic (Without Ischemic Equivalent)

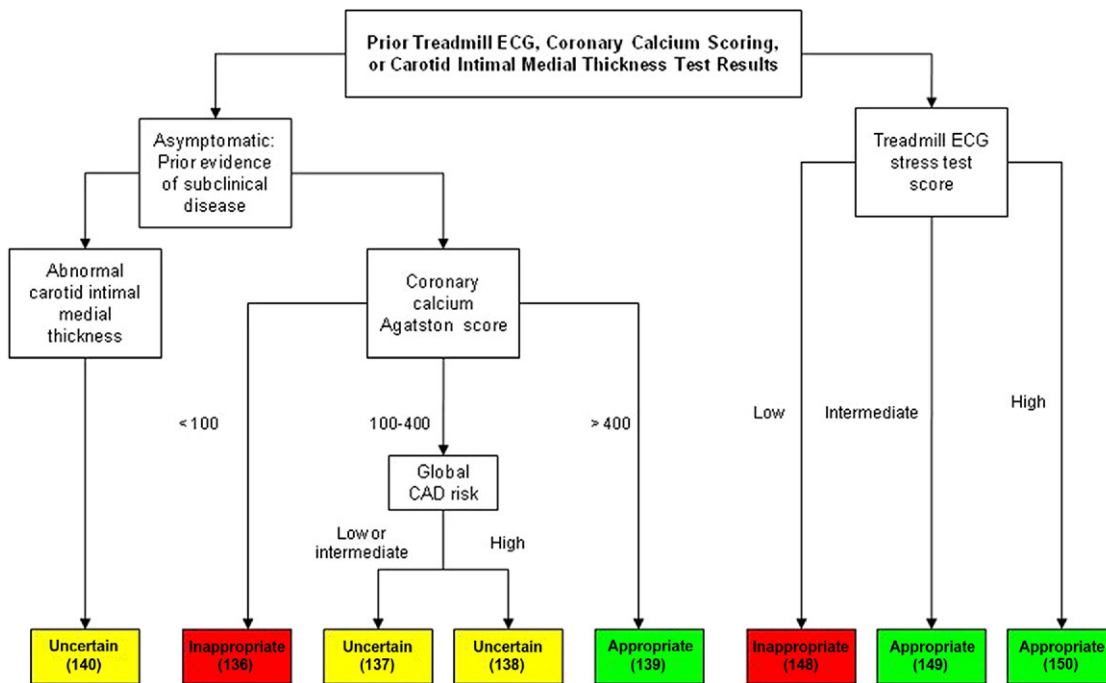


Figure 3. Stress Echocardiography Following Prior Treadmill ECG, Coronary Calcium Scoring, or Carotid Intimal Medial Thickness Test Results

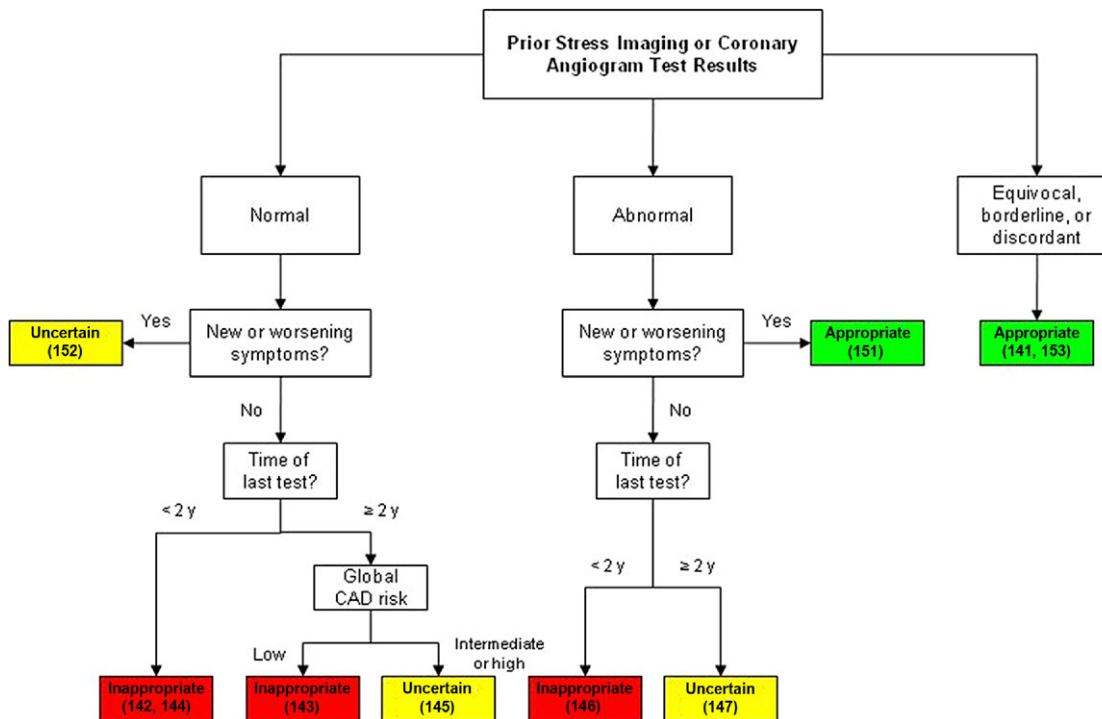


Figure 4. Stress Echocardiography Following Prior Stress Imaging or Coronary Angiogram Test Results

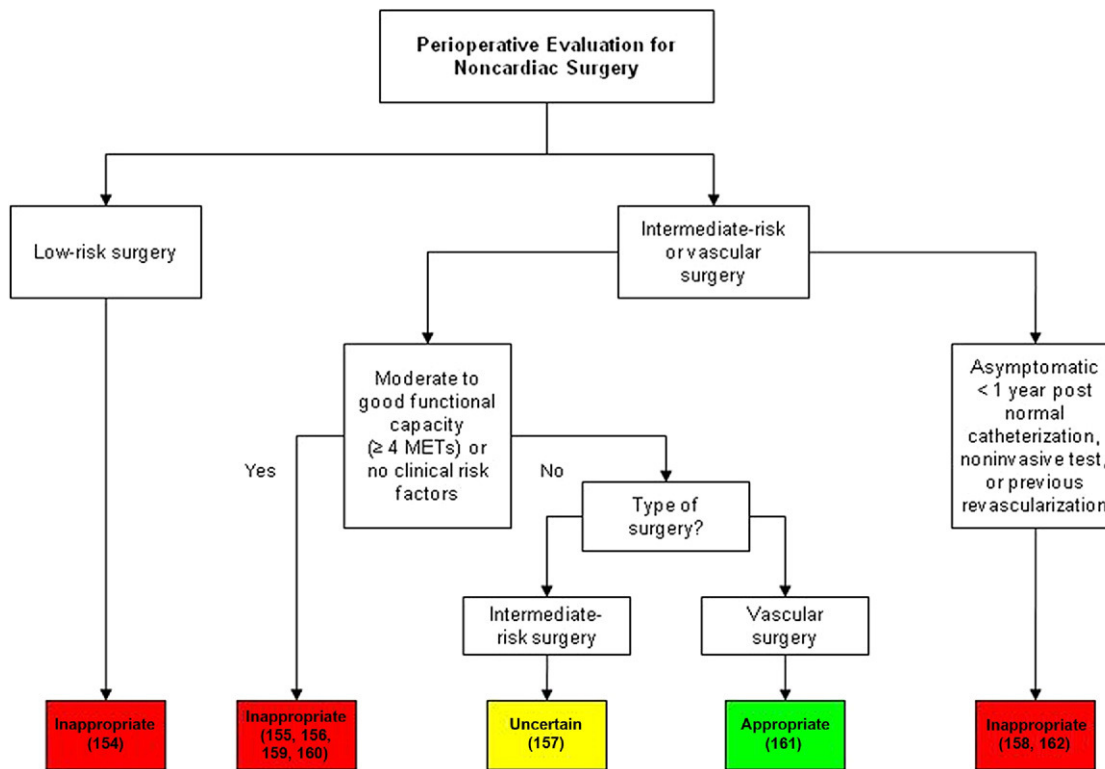


Figure 5. Stress Echocardiography for Risk Assessment—Perioperative Evaluation for Noncardiac Surgery Without Active Cardiac Conditions