

2009 Appropriateness Criteria for Cardiac Radionuclide Imaging

Table 1. Detection of CAD: Symptomatic		Evaluation of Ischemic Equivalent (Non-Acute)
1.	<ul style="list-style-type: none"> • Low pretest probability of CAD • ECG interpretable AND able to exercise 	I (3)
2.	<ul style="list-style-type: none"> • Low pretest probability of CAD • ECG uninterpretable OR unable to exercise 	A (7)
3.	<ul style="list-style-type: none"> • Intermediate pretest probability of CAD • ECG interpretable AND able to exercise 	A (7)
4.	<ul style="list-style-type: none"> • Intermediate pretest probability of CAD • ECG uninterpretable OR unable to exercise 	A (9)
5.	<ul style="list-style-type: none"> • High pretest probability of CAD • Regardless of ECG interpretability and ability to exercise 	A (8)
Acute Chest Pain		
6.	<ul style="list-style-type: none"> • Possible ACS • ECG—no ischemic changes or with LBBB or electronically ventricular paced rhythm • Low-risk TIMI score • Peak troponin: borderline, equivocal, minimally elevated 	A (8)
7.	<ul style="list-style-type: none"> • Possible ACS • ECG—no ischemic changes or with LBBB or electronically ventricular paced rhythm • High-risk TIMI score • Peak troponin: borderline, equivocal, minimally elevated 	A (7)
8.	<ul style="list-style-type: none"> • Possible ACS • ECG—no ischemic changes or with LBBB or electronically ventricular paced rhythm • Low-risk TIMI score • Negative peak troponin levels 	A (8)
9.	<ul style="list-style-type: none"> • Possible ACS • ECG—no ischemic changes or with LBBB or electronically ventricular paced rhythm • High-risk TIMI score • Negative peak troponin levels 	A (8)
10.	<ul style="list-style-type: none"> • Definite ACS* 	I (1)
Acute Chest Pain (Rest Imaging Only)		
11.	<ul style="list-style-type: none"> • Possible ACS • ECG—no ischemic changes or with LBBB or electronically ventricular paced rhythm • Initial troponin negative • Recent or ongoing chest pain 	A (7)
Table 2. Detection of CAD/Risk Assessment Without Ischemic Equivalent		Asymptomatic
12.	<ul style="list-style-type: none"> • Low CHD risk (ATP III risk criteria) 	I (1)
13.	<ul style="list-style-type: none"> • Intermediate CHD risk (ATP III risk criteria) • ECG interpretable 	I (3)
14.	<ul style="list-style-type: none"> • Intermediate CHD risk (ATP III risk criteria) • ECG uninterpretable 	U (5)
15.	<ul style="list-style-type: none"> • High CHD risk (ATP III risk criteria) 	A (7)
New-Onset or Newly Diagnosed Heart Failure With LV Systolic Dysfunction Without Ischemic Equivalent		
16.	<ul style="list-style-type: none"> • No prior CAD evaluation AND no planned coronary angiography 	A (8)
New-Onset Atrial Fibrillation		
17.	<ul style="list-style-type: none"> • Part of evaluation when etiology unclear 	U (6)
Ventricular Tachycardia		
18.	<ul style="list-style-type: none"> • Low CHD risk (ATP III risk criteria) 	A (7)
19.	<ul style="list-style-type: none"> • Intermediate or high CHD risk (ATP III risk criteria) 	A (8)
Syncope		
20.	<ul style="list-style-type: none"> • Low CHD risk (ATP III risk criteria) 	I (3)
21.	<ul style="list-style-type: none"> • Intermediate or high CHD risk (ATP III risk criteria) 	A (7)
Elevated Troponin		
22.	<ul style="list-style-type: none"> • Troponin elevation without additional evidence of acute coronary syndrome 	A (7)

Table 3. Risk Assessment With Prior Test Results and/or Known Chronic Stable CAD		Asymptomatic OR Stable Symptoms Normal Prior Stress Imaging Study
23.	<ul style="list-style-type: none"> • Low CHD risk (ATP III risk criteria) • Last stress imaging study done less than 2 years ago 	I (1)
24.	<ul style="list-style-type: none"> • Intermediate to high CHD risk (ATP III risk criteria) • Last stress imaging study done less than 2 years ago 	I (3)
25.	<ul style="list-style-type: none"> • Low CHD risk (ATP III risk criteria) • Last stress imaging study done more than or equal to 2 years ago 	I (3)
26.	<ul style="list-style-type: none"> • Intermediate to high CHD risk (ATP III risk criteria) • Last stress imaging study done more than or equal to 2 years ago 	U (6)
Asymptomatic OR Stable Symptoms		
Abnormal Coronary Angiography OR Abnormal Prior Stress Imaging Study, No Prior Revascularization		
27.	<ul style="list-style-type: none"> • Known CAD on coronary angiography OR prior abnormal stress imaging study • Last stress imaging study done less than 2 years ago 	I (3)
28.	<ul style="list-style-type: none"> • Known CAD on coronary angiography OR prior abnormal stress imaging study • Last stress imaging study done more than or equal to 2 years ago 	U (5)
Prior Noninvasive Evaluation		
29.	<ul style="list-style-type: none"> • Equivocal, borderline, or discordant stress testing where obstructive CAD remains a concern 	A (8)
New or Worsening Symptoms		
30.	<ul style="list-style-type: none"> • Abnormal coronary angiography OR abnormal prior stress imaging study 	A (9)
31.	<ul style="list-style-type: none"> • Normal coronary angiography OR normal prior stress imaging study 	U (6)
Coronary Angiography (Invasive or Noninvasive)		
32.	<ul style="list-style-type: none"> • Coronary stenosis or anatomic abnormality of uncertain significance 	A (9)
Asymptomatic		
Prior Coronary Calcium Agatston Score		
33.	<ul style="list-style-type: none"> • Agatston score less than 100 	I (2)
34.	<ul style="list-style-type: none"> • Low to intermediate CHD risk • Agatston score between 100 and 400 	U (5)
35.	<ul style="list-style-type: none"> • High CHD risk • Agatston score between 100 and 400 	A (7)
36.	<ul style="list-style-type: none"> • Agatston score greater than 400 	A (7)
Duke Treadmill Score		
37.	<ul style="list-style-type: none"> • Low-risk Duke treadmill score 	I (2)
38.	<ul style="list-style-type: none"> • Intermediate-risk Duke treadmill score 	A (7)
39.	<ul style="list-style-type: none"> • High-risk Duke treadmill score 	A (8)
Table 4. Risk Assessment: Preoperative Evaluation for Noncardiac Surgery Without Active Cardiac Conditions		
Low-Risk Surgery		
40.	<ul style="list-style-type: none"> • Preoperative evaluation for noncardiac surgery risk assessment 	I (1)
Intermediate-Risk Surgery		
41.	<ul style="list-style-type: none"> • Moderate to good functional capacity (greater than or equal to 4 METs) 	I (3)
42.	<ul style="list-style-type: none"> • No clinical risk factors† 	I (2)
43.	<ul style="list-style-type: none"> • Greater than or equal to 1 clinical risk factor • Poor or unknown functional capacity (less than 4 METs) 	A (7)
44.	<ul style="list-style-type: none"> • Asymptomatic up to 1 year postnormal catheterization, noninvasive test, or previous revascularization 	I (2)
Vascular Surgery		
45.	<ul style="list-style-type: none"> • Moderate to good functional capacity (greater than or equal to 4 METs) 	I (3)
46.	<ul style="list-style-type: none"> • No clinical risk factors† 	I (2)
47.	<ul style="list-style-type: none"> • Greater than or equal to 1 clinical risk factor • Poor or unknown functional capacity (less than 4 METs) 	A (8)
48.	<ul style="list-style-type: none"> • Asymptomatic up to 1 year postnormal catheterization, noninvasive test, or previous revascularization 	I (2)
Table 5. Risk Assessment: Within 3 Months of an Acute Coronary Syndrome		
STEMI		
49.	<ul style="list-style-type: none"> • Primary PCI with complete revascularization • No recurrent symptoms 	I (2)
50.	<ul style="list-style-type: none"> • Hemodynamically stable, no recurrent chest pain symptoms or no signs of HF • To evaluate for inducible ischemia • No prior coronary angiography 	A (8)
51.	<ul style="list-style-type: none"> • Hemodynamically unstable, signs of cardiogenic shock, or mechanical complications 	I (1)
UA/NSTEMI		
52.	<ul style="list-style-type: none"> • Hemodynamically stable, no recurrent chest pain symptoms or no signs of HF • To evaluate for inducible ischemia • No prior coronary angiography 	A (9)
ACS–Asymptomatic Postrevascularization (PCI or CABG)		
53.	<ul style="list-style-type: none"> • Evaluation prior to hospital discharge 	I (1)
Cardiac Rehabilitation		
54.	<ul style="list-style-type: none"> • Prior to initiation of cardiac rehabilitation (as a stand-alone indication) 	I (3)

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Table 6. Risk Assessment: Postrevascularization (Percutaneous Coronary Intervention or Coronary Artery Bypass Graft)		Symptomatic
55.	• Evaluation of ischemic equivalent	A (8)
Asymptomatic		
56.	• Incomplete revascularization • Additional revascularization feasible	A (7)
57.	• Less than 5 years after CABG	U (5)
58.	• Greater than or equal to 5 years after CABG	A (7)
59.	• Less than 2 years after PCI	I (3)
60.	• Greater than or equal to 2 years after PCI	U (6)
Cardiac Rehabilitation		
61.	• Prior to initiation of cardiac rehabilitation (as a stand-alone indication)	I (3)
Table 7. Assessment of Viability/Ischemia		Ischemic Cardiomyopathy/Assessment of Viability
62.	• Known severe LV dysfunction	A (9)
Table 8. Evaluation of Ventricular Function		Evaluation of LV Function
63.	• Assessment of LV function with radionuclide angiography (ERNA or FP RNA) • In absence of recent reliable diagnostic information regarding ventricular function obtained with another imaging modality	A (8)
64.	• Routine* use of rest/stress ECG-gating with SPECT or PET MPI	A (9)
65.	• Routine* use of stress FP RNA in conjunction with rest/stress gated SPECT MPI	I (3)
66.	• Selective use of stress FP RNA in conjunction with rest/stress gated SPECT MPI • Borderline, mild, or moderate stenoses in 3 vessels OR moderate or equivocal left main stenosis in left dominant system	U (6)
Use of Potentially Cardiotoxic Therapy (e.g., Doxorubicin)		
67.	• Serial assessment of LV function with radionuclide angiography (ERNA or FP RNA) • Baseline and serial measures after key therapeutic milestones or evidence of toxicity	A (9)

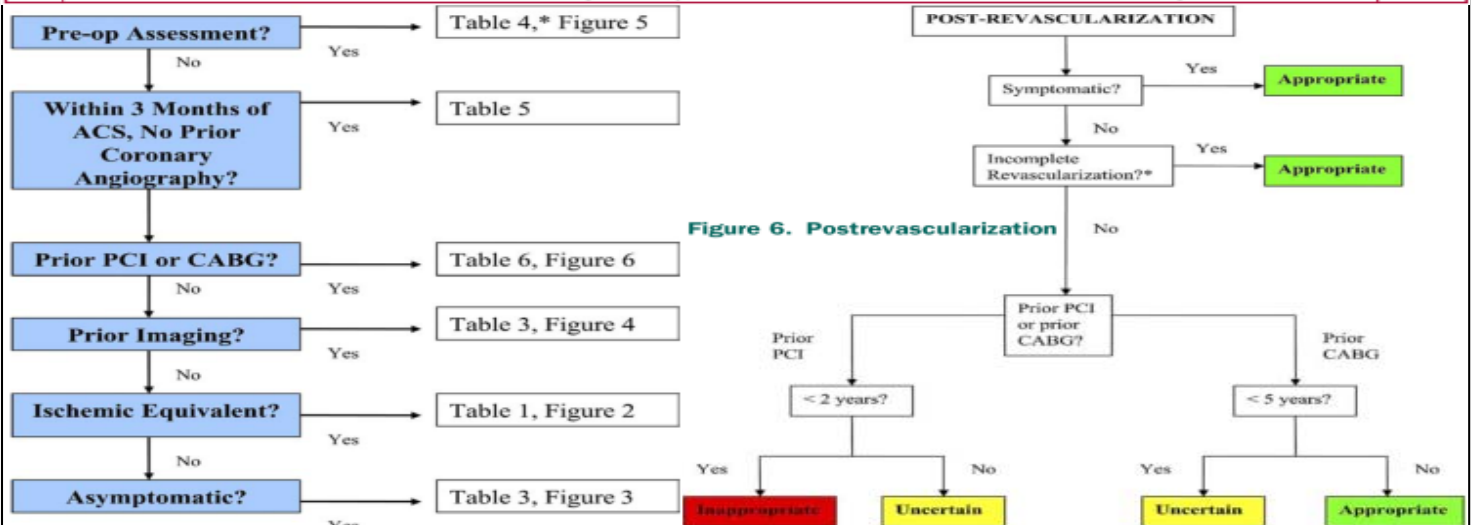
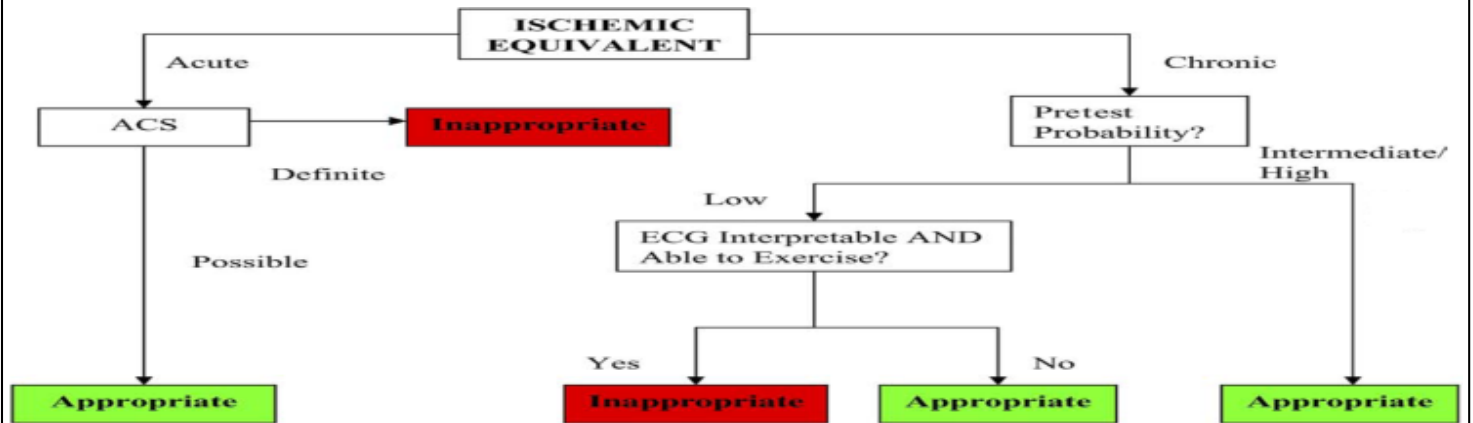


Figure 1. Hierarchy of Potential Test Ordering Based on Clinical Presentation
For those pts who may be classified into > 1 of the clinical indication tables and/or algorithms, this flow chart places clinical conditions into a hierarchy to aid in assessing appropriateness for radionuclide imaging. *Symptomatic pts who are being considered for a preop evaluation for noncardiac surgery should begin down the algorithm as if "No."

Following revascularization with PCI or CABG in a more chronic (>3 months) setting, recurrence of symptoms or presence of incomplete revascularization were felt to be appropriate indications for RNI. For asymptomatic pts < 2 yrs after PCI, RNI was rated inappropriate. For asymptomatic pts at < 5 yrs after CABG or those ≥ 2 yrs after PCI, RNI was rated uncertain. If CABG was performed > 5 years ago, RNI is appropriate. *Assumes that additional revascularization is feasible.



Pts with an ischemic equivalent, consisting of symptoms associated with CAD or ECG findings, were divided based on the likelihood of CAD. If pts had intermediate or high likelihood for CAD, RNI was appropriate. RNI was also appropriate for pts at low likelihood if they were unable to exercise or had an uninterpretable ECG. For pts with suspected ACS, RNI was appropriate irrespective of TIMI score or troponin levels.

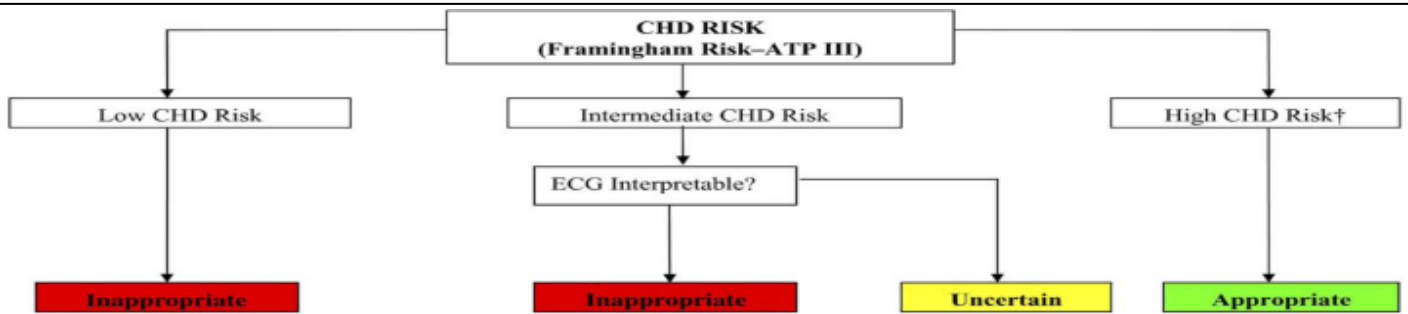


Figure 3. Potential Applications for Asymptomatic* Patients

Only in high CHD risk pts was RNI felt to be appropriate; those with intermediate risk & uninterpretable ECG were uncertain. Syncopal did not alter appropriateness separate from CHD risk; low-risk pts inappropriate & high-risk appropriate.

*Asymptomatic pts with the following clinical indications are appropriate (or uncertain) for RNI and do not require risk assessment by either step: 1) new-onset or newly diagnosed CHF with low LVEF without ischemic equivalent who have not had prior CAD evaluation AND have no planned cath (A); 2) VT (A); 3) ↑ troponin without other evidence of ACS (A); 4) new-onset a fib (U). †Includes DM or presence of other clinical atherosclerotic disease, including peripheral arterial disease, AAA, carotid artery disease, & renal artery disease.

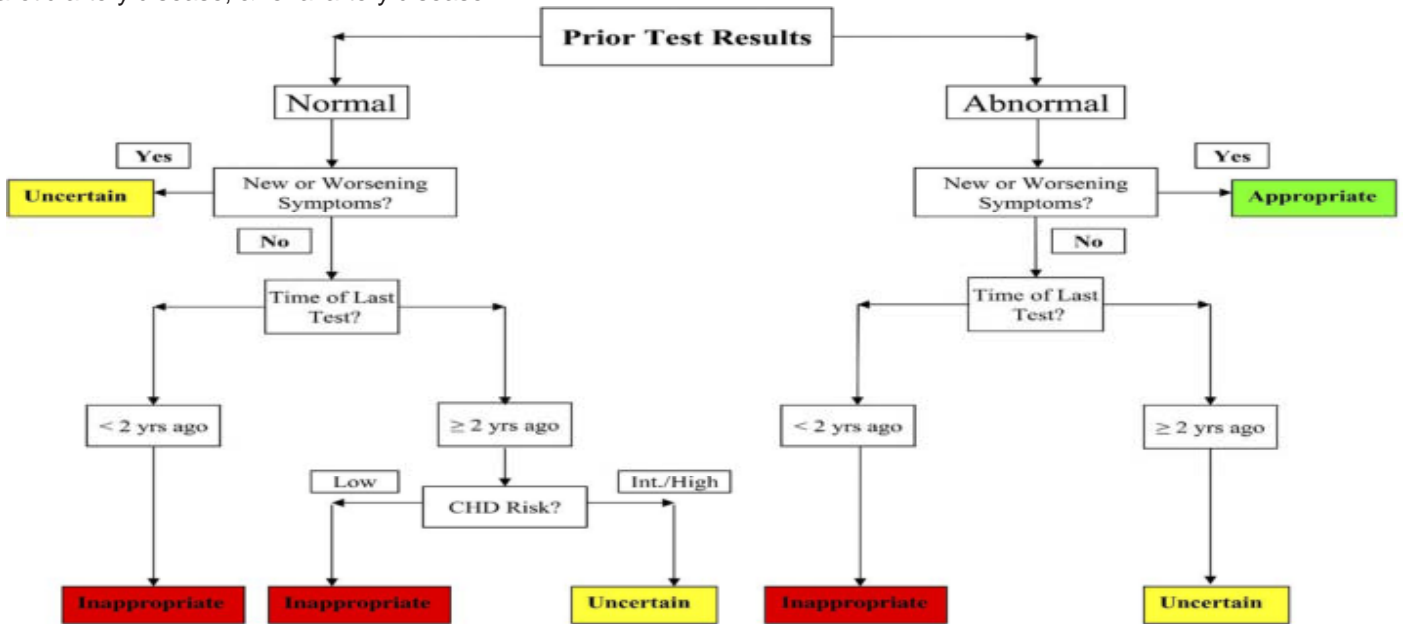


Figure 4. Prior Test Results*

When new or worsening symptoms were present, RNI was (A) if prior abnormal results were present; uncertain if prior study was normal. RNI was (I) when no or stable symptoms were present if prior test results were known, except when performed > 2 yrs later, and only if an abnormal study was previously present or if the pt was at intermediate or greater CHD risk. In those circumstances, RNI was (U). *RNI is appropriate if prior test results were uncertain in the following 2 scenarios: 1) Coronary stenosis or anatomic abnormality of uncertain significance by cath; OR 2) Equivocal, borderline, or discordant stress testing where obstructive CAD remains a concern.

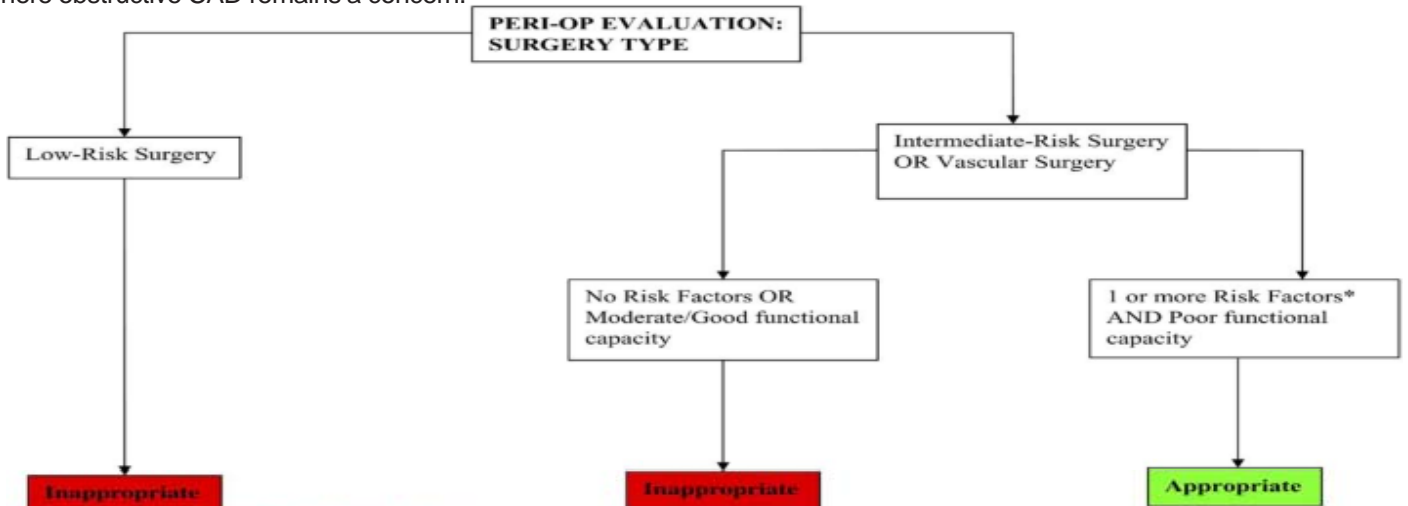


Figure 5. Perioperative Evaluation

RNI was felt to be inappropriate for preop risk assessment except in intermediate risk or vascular surgery when at least 1 risk factor is present and the pt has poor or unknown functional capacity. Additionally, pts who are asymptomatic up to 1 yr post normal cath, noninvasive test, or previous revascularization in the setting of intermediate risk or vascular surgery were also (I) for RNI. *History of ischemic heart disease, compensated or prior heart failure, cerebrovascular disease, diabetes mellitus (requiring insulin), or renal insufficiency (Cr >2.0).