
بسم الله الرحمن الرحيم

Cardiac assessment for renal transplatation

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Prevalence of angiographic significant CAD

-in young nondiabetic ESRD:25%

- in old longstanding diabetic ESRD :85%
- -cardiac death in dialysis patients under 45 y:
- 100 –fold that in general population

Cardiovascular disease (CVD)

The most common cause of death after kidney transplantation worldwide.

The highest event rate in the early postoperative period.

Screening for CVD prior to transplant is common

The clinical utility of screening asymptomatic transplant candidates remains unclear.

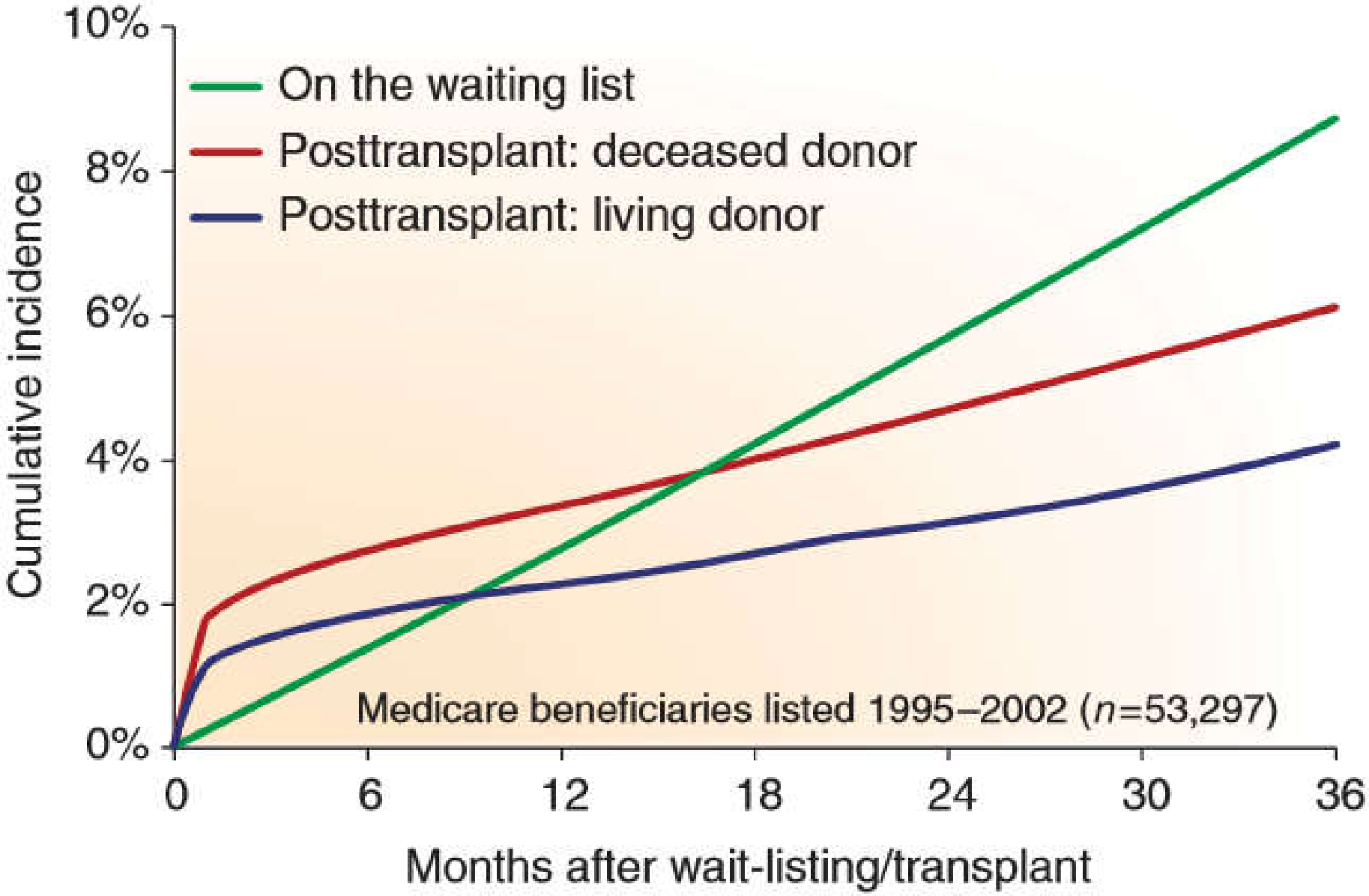


Figure 1 | Waiting list and posttransplant acute myocardial infarction (used with permission from Kasiske *et al.*[4]).

- Significant associations between positive noninvasive stress tests and future cardiac events
(Early observational study)

Several studies have found no association

Gill et al (2011)
no difference in the rates of MACE or survival in those transplant candidates for periodic DSE or MPS on the waiting list

Welsh et al in 2011 and Lima et al

CAD on coronary angiography

increased risk of future MACE

(not noninvasive screening)

Hage et al

presence and severity of coronary disease on angiography

No difference in survival in kidney transplant candidates.

Table 1 | Summary of RCT evidence for screening or intervening on asymptomatic CAD

Study	*N*	Population	*P*-value
COURAGE[63]	2287	Known CAD	0.62
DIAD[55]	1123	Type 2 diabetes	0.73
CARP[59]	510	Treatable lesions before vascular surgery	0.92
DECREASE II[53,54]	386	High risk before vascular surgery	0.30
DECREASE V[61,54]	101	Treatable lesions before vascular surgery	0.61
Manske *et al.*[52]	26	Treatable lesions before transplantation	<0.01

Cardiac tests

Myocardial perfusion studies (MPS)

Dobutamine stress echocardiograms (DSE)

Biomarkers

Cardiac computed tomography (CT)

Coronary angiography

(sensitivity and specificity of testing for CAD less than general population)

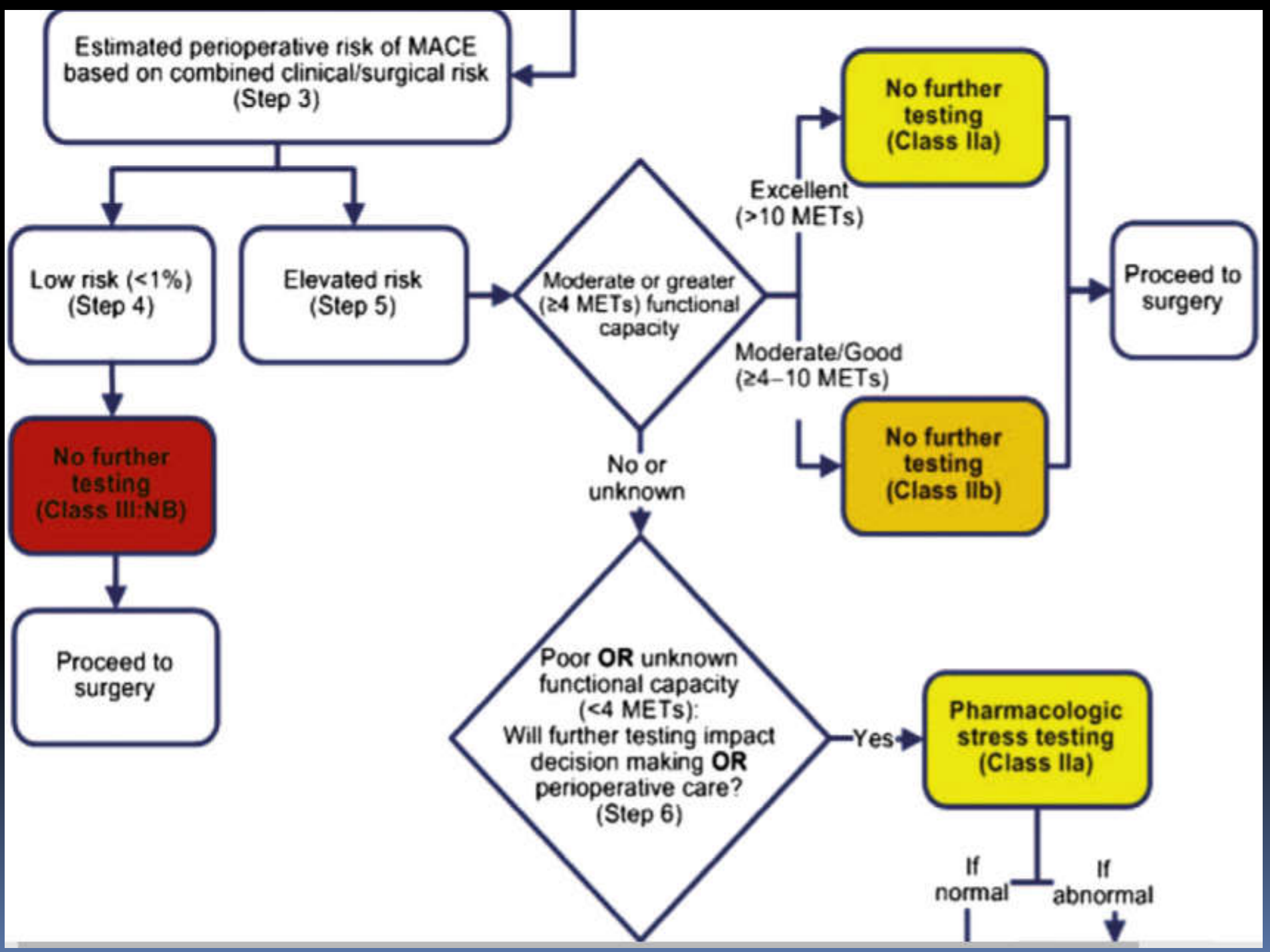
DSE and MPS

Sensitivity and specificity for DSE

37 to 95% and 71 to 95%

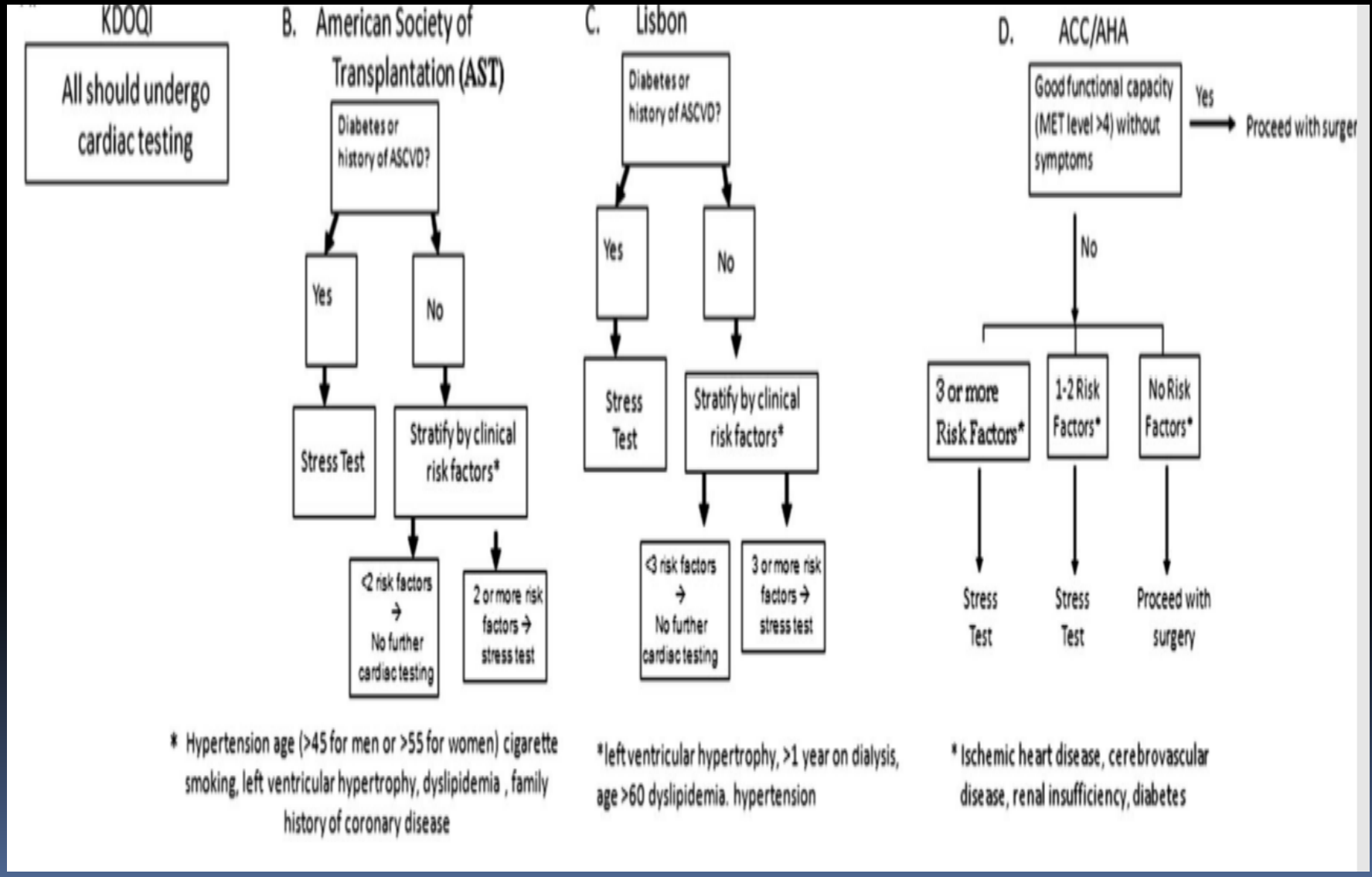
Sensitivity and specificity for MPS

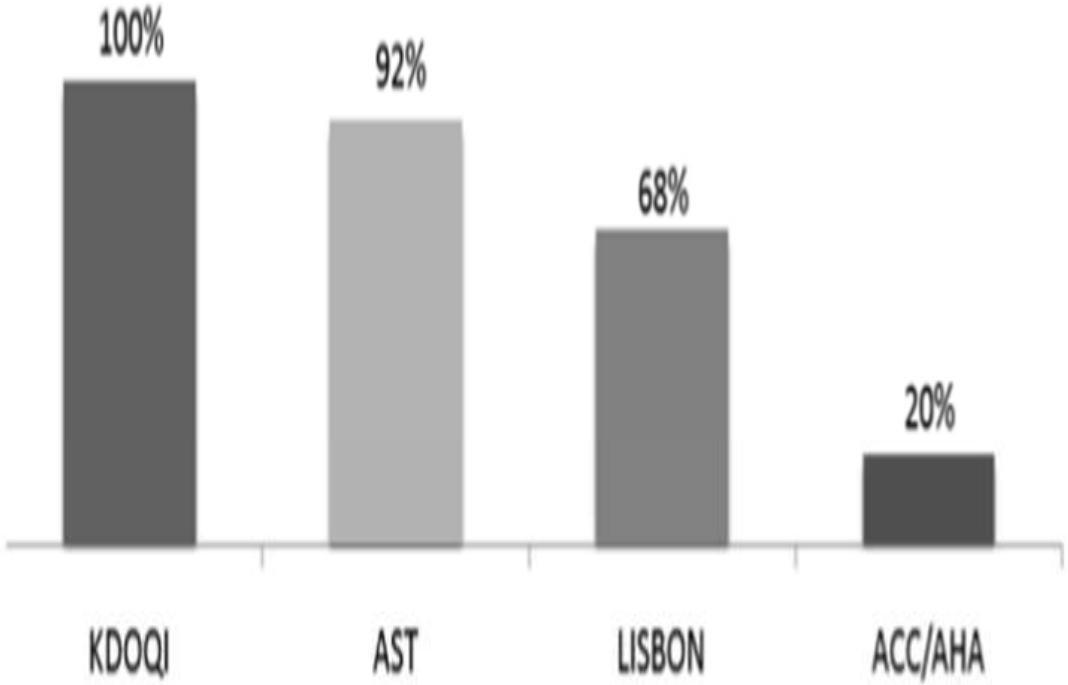
37 to 80% and 37 to 73%


Estimated perioperative risk of MACE based on combined clinical/surgical risk (Step 3)
Low risk (<1%) (Step 4)
Elevated risk (Step 5)
No further testing (Class III:NB)
Proceed to surgery
Moderate or greater (≥4 METs) functional capacity
Excellent (>10 METs)
Moderate/Good (≥4–10 METs)
No further testing (Class IIa)
No further testing (Class IIb)
Proceed to surgery
No or unknown
Poor OR unknown functional capacity (<4 METs): Will further testing impact decision making OR perioperative care? (Step 6)
Yes
Pharmacologic stress testing (Class IIa)
If normal
If abnormal

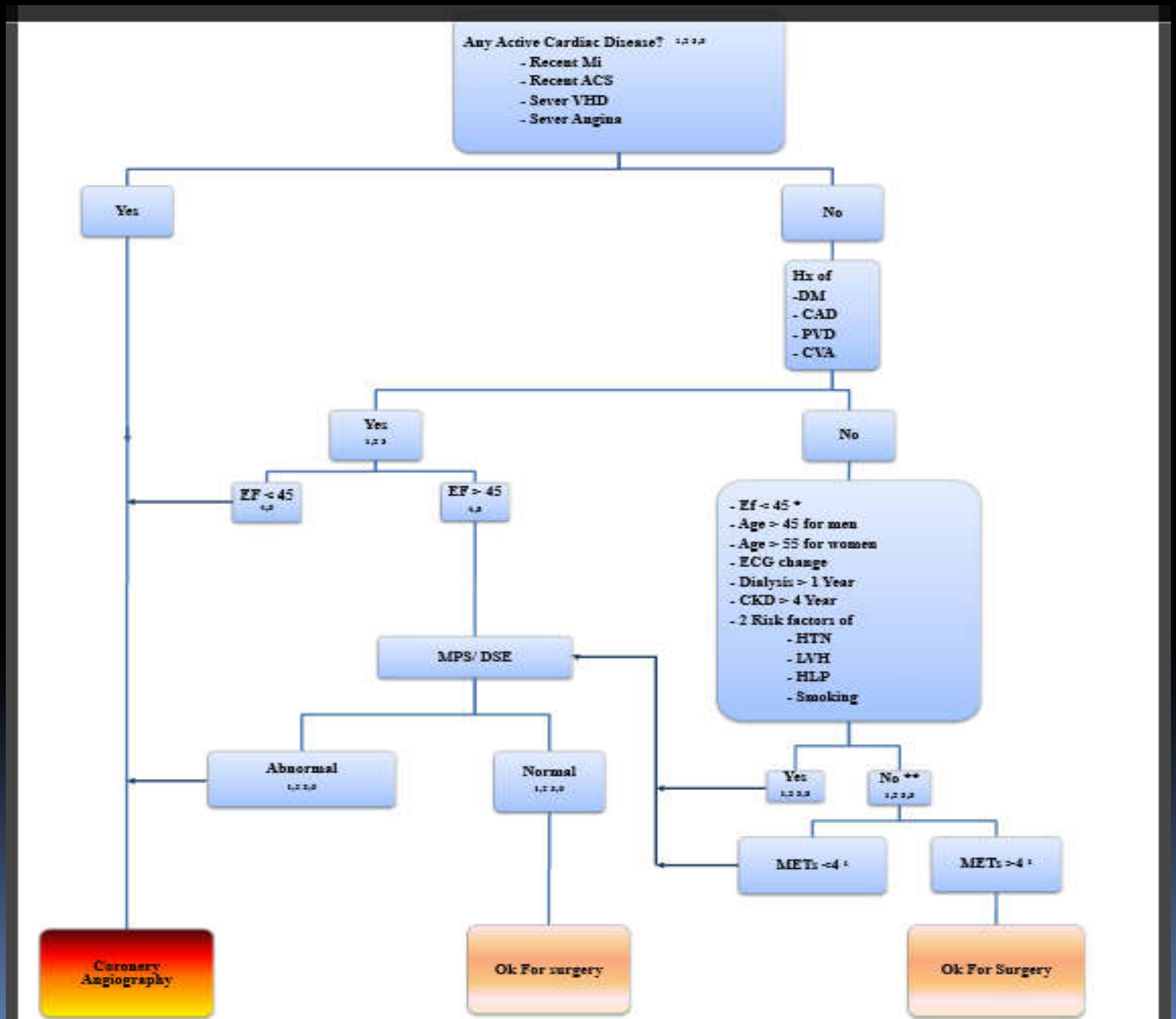
Guideline Recommended CAD Screening for Kidney Transplant Candidates: Source of Confusion

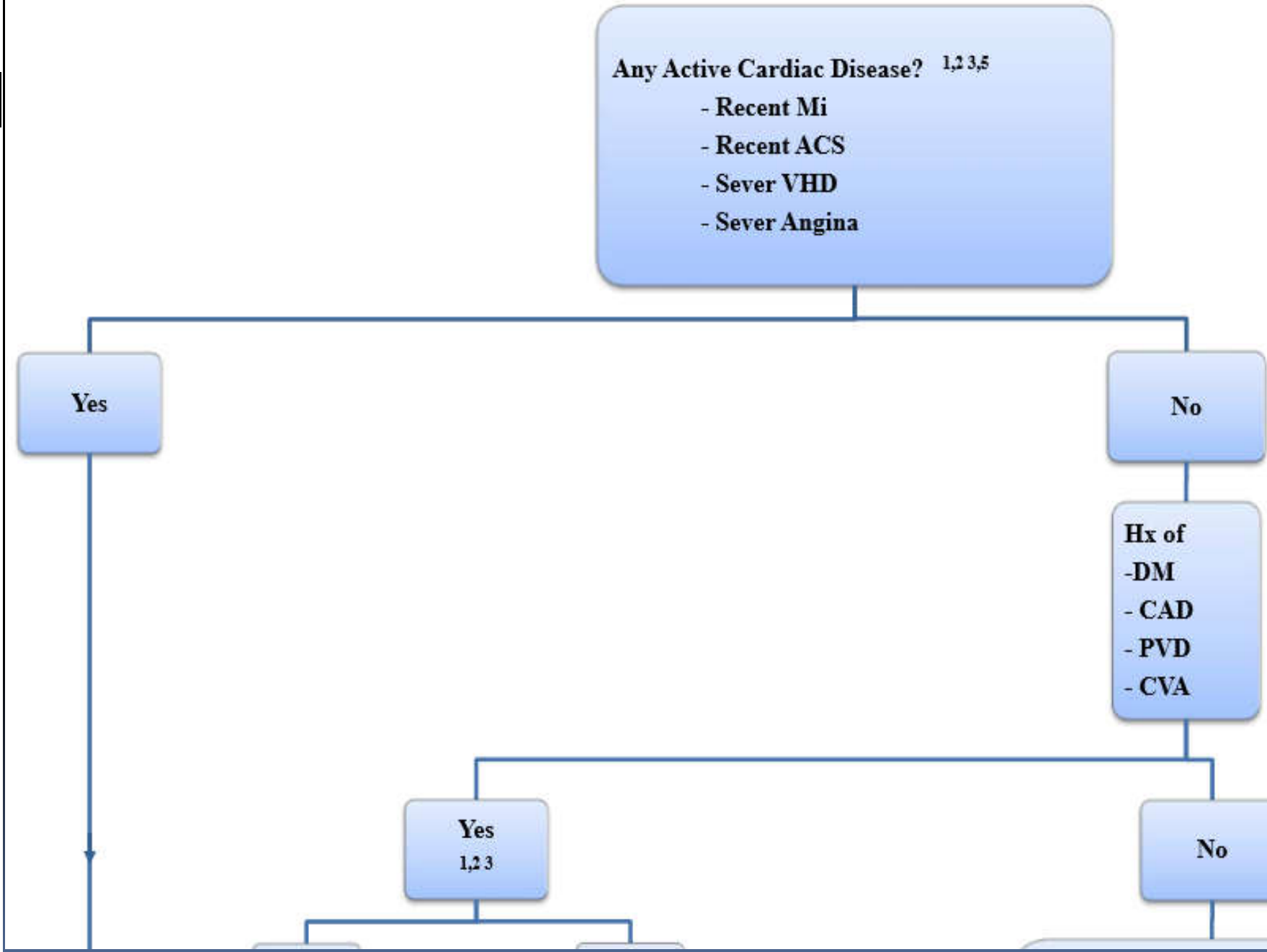
Reference	Recommendations
2012 AHA Scientific Statement	*Consider non-invasive testing in candidates with no active cardiac disease on the basis of risk factors (≥3) regardless of functional status* Risk factors: DM, prior CV disease, dialysis > 1 year, LVH, age > 60, smoking, HTN dyslipidemia
2007 ACC/AHA Perioperative Guidelines for Noncardiac Surgery	*No testing if functional status ≥ 4 METS. Non-invasive testing if < METS or unknown based upon at least 1-2 risk factors*: ischemic heart disease, heart failure, DM, renal insufficiency, cerebrovascular disease
2007 Lisbon Conference	*Non-invasive testing in high-risk patients:* DM, known cardiovascular disease, multiple risk factors
2005 NKF/KDOQI Guidelines	*Annual non-invasive testing for DM known CAD, prior PCI, CABG.* *Non-invasive testing every 2 years in high-risk non-diabetics*: ≥ 2 traditional risk factors, history of CAD, EF ≤ 40, PVD
2001 AST Guidelines	*Non-invasive testing for high-risk patients*: DM, CAD or ≥ risk factors. Angiogram in those with positive stress test, revascularization for those with critical lesions
2000 European Best Practice Guidelines	*Thallium stress in prior MI or high risk, angiography in those with + stress test, revascularization for significant lesions*

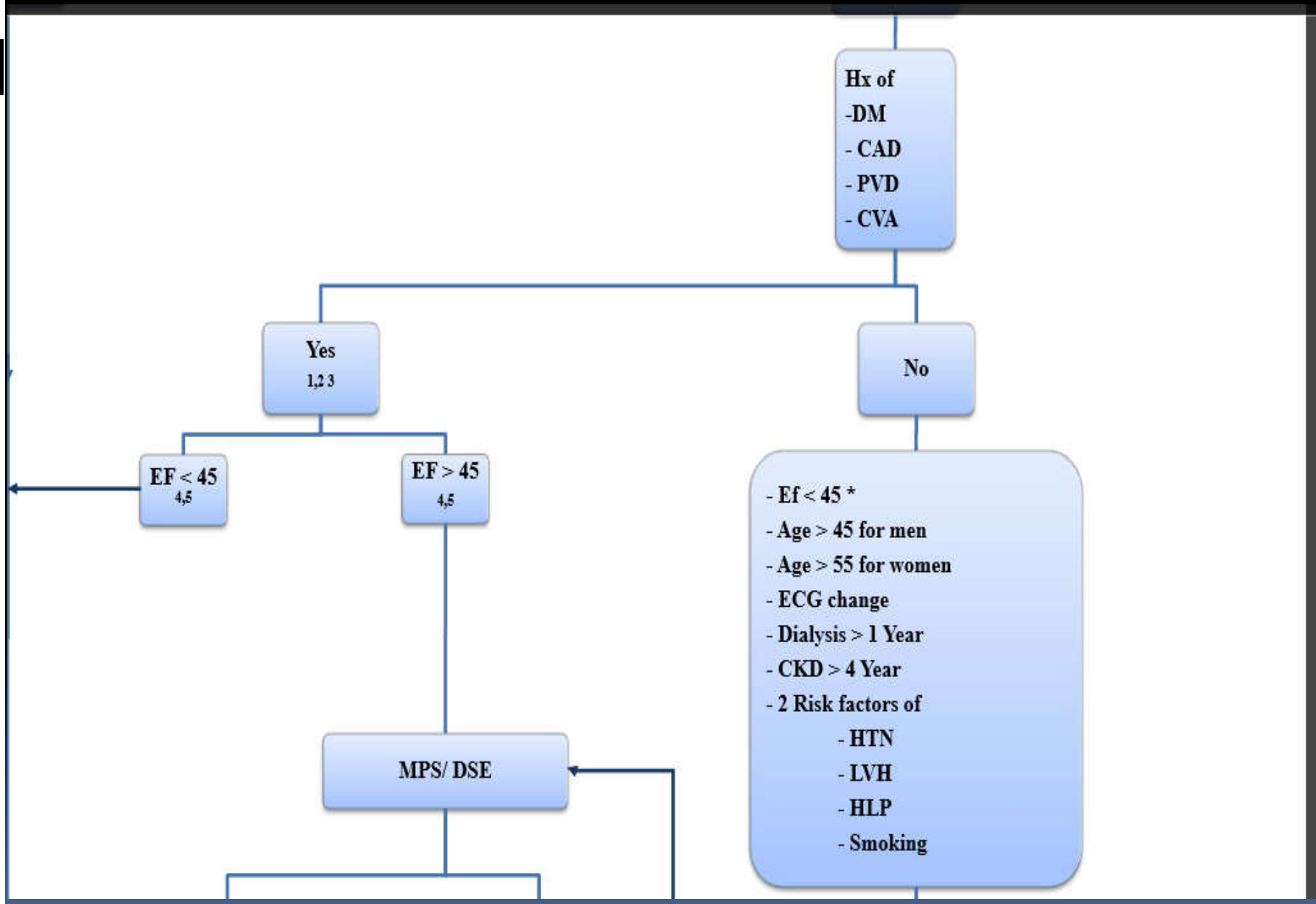

KDOQI
All should undergo cardiac testing
B. American Society of Transplantation (AST)
Diabetes or history of ASCVD?
Yes
No
Stress Test
Stratify by clinical risk factors*
<2 risk factors → No further cardiac testing
2 or more risk factors → stress test
C. Lisbon
Diabetes or history of ASCVD?
Yes
No
Stress Test
Stratify by clinical risk factors*
<3 risk factors → No further cardiac testing
3 or more risk factors → stress test
D. ACC/AHA
Good functional capacity (MET level >4) without symptoms
Yes
Proceed with surger
No
3 or more Risk Factors*
1-2 Risk Factors*
No Risk Factors*
Stress Test
Stress Test
Proceed with surgery
* Hypertension age (>45 for men or >55 for women) cigarette smoking, left ventricular hypertrophy, dyslipidemia , family history of coronary disease
*left ventricular hypertrophy, >1 year on dialysis, age >60 dyslipidemia. hypertension
* Ischemic heart disease, cerebrovascular disease, renal insufficiency, diabetes



. | Predicted rates of cardiac evaluation in renal transplant candidates when the four national guidelines are applied.


Any Active Cardiac Disease?
- Recent Mi
- Recent ACS
- Sever VHD
- Sever Angina
Yes
No
Hx of
-DM
- CAD
- PVD
- CVA
Yes
No
EF < 45
EF > 45
- Ef -< 45 *
- Age > 45 for men
- Age > 55 for women
- ECG change
- Dialysis > 1 Year
- CKD > 4 Year
- 2 Risk factors of
- HTN
- LVH
- HLP
- Smoking
MPS/ DSE
Abnormal
Normal
Yes
No **
METs <4
METs >4
Coronery Angiography
Ok For surgery
Ok For Surgery


Any Active Cardiac Disease? 1,2 3,5
- Recent Mi
- Recent ACS
- Sever VHD
- Sever Angina
Yes
No
Hx of
-DM
- CAD
- PVD
- CVA
Yes
1,2 3
No


Hx of
-DM
- CAD
- PVD
- CVA
Yes
1,2 3
No
EF < 45
4,5
EF > 45
4,5
- Ef < 45 *
- Age > 45 for men
- Age > 55 for women
- ECG change
- Dialysis > 1 Year
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- 2 Risk factors of
- HTN
- LVH
- HLP
- Smoking
MPS/ DSE

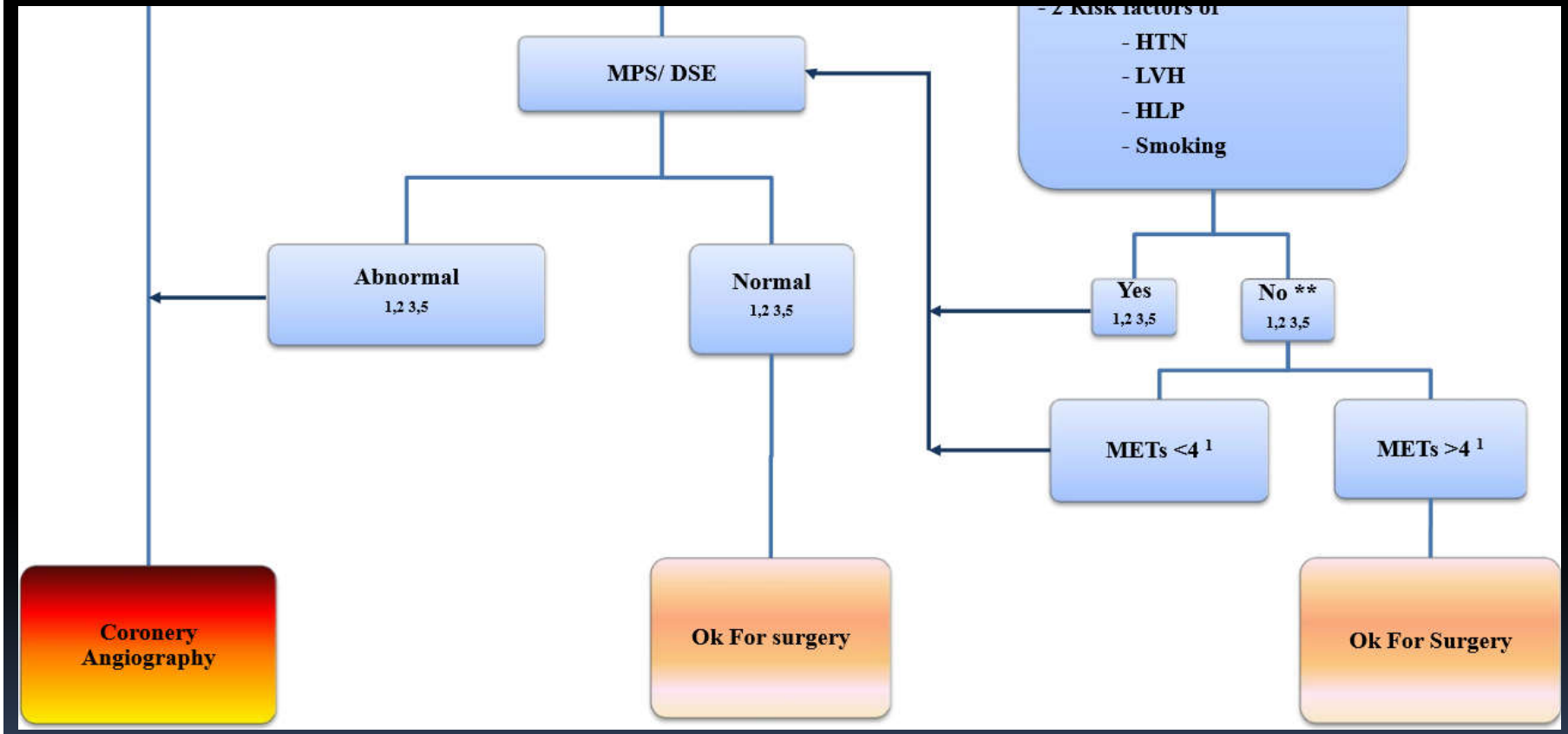
- 2 Risk factors of
- HTN
- LVH
- HLP
- Smoking
MPS/ DSE
Abnormal
1,2 3,5
Normal
1,2 3,5
Yes
1,2 3,5
No **
1,2 3,5
METs <4 1
METs >4 1
Coronery Angiography
Ok For surgery
Ok For Surgery

Figure 6. Treatment Algorithm for the Timing of Elective Noncardiac Surgery in Patients With Coronary Stents