

La diagnosi della malattia coronarica nello screening del paziente diabetico: come e quando?

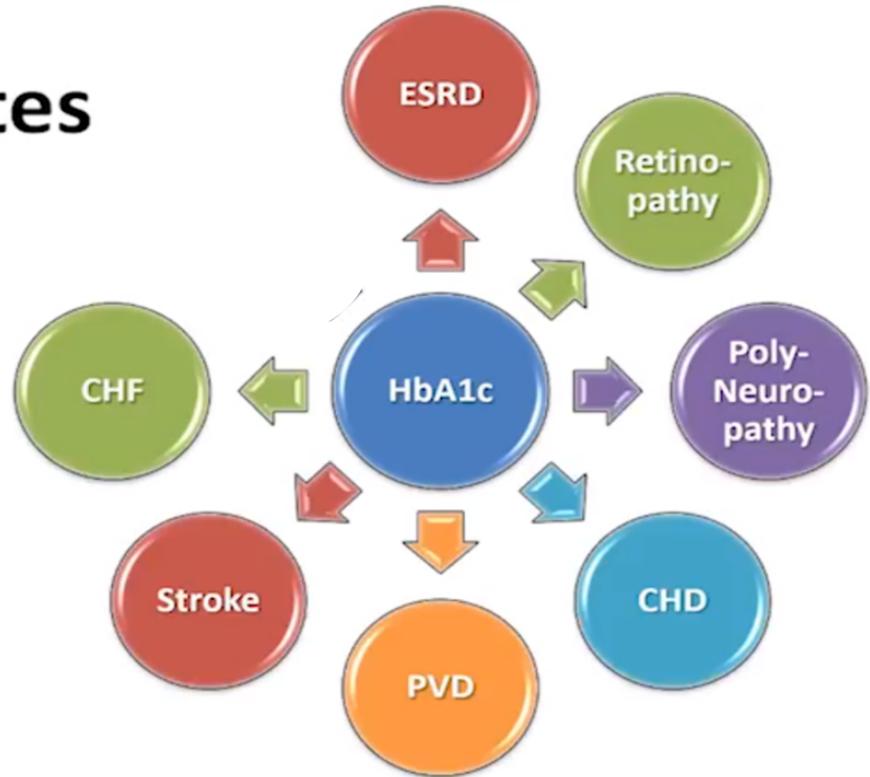
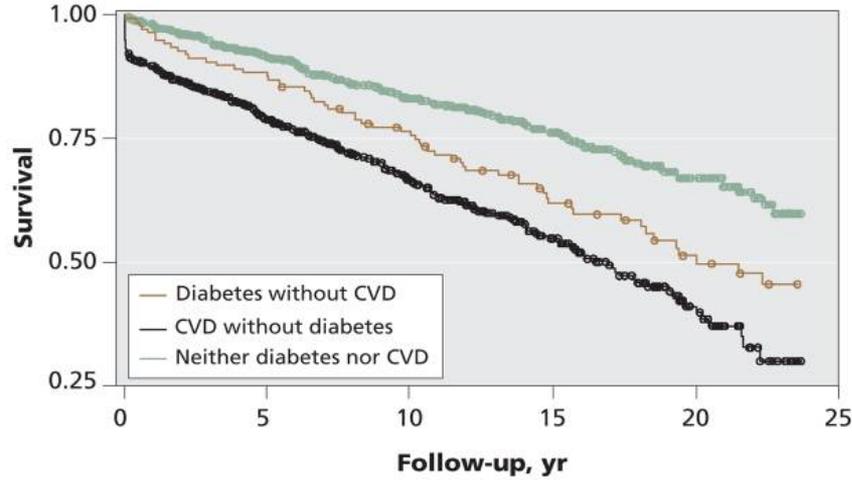
*Prof. Francesco Barillà
Department of Heart and Great Vessels "A. Reale"
"Sapienza" University of Rome*

Type 2 diabetes and CV outcomes

We need more than glucose management!!

Type 2 Diabetes

Unadjusted Kaplan–Meier survival curves for all-cause mortality among men with neither diabetes nor CV disease, men with diabetes and no CV disease, and men with a first acute CV event and no diabetes. Log-rank test: $p < 0.001$



Quando fare uno screening per CAD nel paziente diabetico?

Very high-risk	Patients with DM and established CVD or other target organ damage ^a or three or more major risk factors ^b or early onset T1DM of long duration (>20 years)
High-risk	Patients with DM duration ≥ 10 years without target organ damage ^a plus any other additional risk factor ^b
Moderate-risk	Young patients (T1DM <35 years; T2DM <50 years) with DM duration <10 years, without other risk factors

La diagnosi di CAD nei pazienti con diabete è spesso una sfida

- La **diffusione della malattia vascolare**, il coinvolgimento di **piccoli vasi** e le **comorbilità**, limitano spesso l'affidabilità dei test non invasivi (stress test, eco-stress) per la rilevazione dell'ischemia miocardica
- La presenza spesso di **ischemia miocardica silente**, dovuta all'elevata soglia del dolore, può comportare una valutazione errata nella stratificazione del rischio clinico

Characteristics of tests commonly used to diagnose the presence of CAD

	Diagnosis of CAD	
	Sensitivity (%)	Specificity (%)
→ Exercise ECG ^a	45-50	85-90
→ Exercise stress echocardiography	80-85	80-88
→ Exercise stress SPECT	73-92	63-87
→ Dobutamine stress echocardiography	79-83	82-86
→ Dobutamine stress MRI ^b	79-88	81-91
Vasodilator stress echocardiography	72-79	92-95
Vasodilator stress SPECT	90-91	75-84
Vasodilator stress MRI ^b	67-94	61-85
→ Coronary CTA ^c	95-99	64-83
→ Vasodilator stress PET	81-97	74-91

CAD = coronary artery disease; CTA = computed tomography angiography; ECG = electrocardiogram; MRI = magnetic resonance imaging; PET = positron emission tomography; SPECT = single photon emission computed tomography.

^aResults without/minimal referral bias; ^bResults obtained in populations with medium-to-high prevalence of disease without compensation for referral bias; ^cResults obtained in populations with low-to-medium prevalence of disease.

This slide corresponds to Table 12 in the full text.



Stratification of cardiovascular risk in patients with diabetes

Recommendations	Class ^a	Level ^b
Total risk estimation using a risk-estimation system such as SCORE is recommended for asymptomatic adults >40 years of age without evidence of CVD, diabetes, CKD, or familial hypercholesterolaemia.	I	C
Assessment of coronary artery calcium score with computed tomography may be considered as a risk modifier ^c in the cardiovascular risk assessment of asymptomatic subjects. ^{449,457}	IIb	B
Atherosclerotic plaque detection by carotid artery ultrasound may be considered as a risk modifier ^c in the cardiovascular risk assessment of asymptomatic subjects. ⁴⁵⁸	IIb	B
ABI may be considered as a risk modifier ^c in cardiovascular risk assessment. ⁴⁵⁹	IIb	B
In high-risk asymptomatic adults (with diabetes, a strong family history of CAD, or when previous risk-assessment tests suggest a high risk of CAD), functional imaging or coronary CTA may be considered for cardiovascular risk assessment.	IIb	C
In low-risk non-diabetic asymptomatic adults, coronary CTA or functional imaging for ischaemia are not indicated for further diagnostic assessment.	III	C
Routine assessment of microalbuminuria is indicated to identify patients at risk of developing renal dysfunction or at high risk of future CVD. ^{27,38}	I	B
Routine assessment of circulating biomarkers is not recommended for CV risk stratification. ^{27,31,35-37}	III	B

STEP 1

Assess symptoms and perform clinical investigations

We can identified at least 3 clinical scenarios in diabetic patients with suspected CAD

Typical angina

Atypical angina

Non-anginal chest pain



PATIENTS WITH SUSPECTED CAD and STABLE ANGINA AND/OR DYSPNOEA



NEW ONSET HF or REDUCED LV FUNCTION and SUSPECTED CAD



ASYMPTOMATIC SUBJECTS IN WHOM CAD IS DETECTED AT SCREENING

**Step
2**

Resting ECG, biochemistry, chest X-ray in selected patients, echocardiography at rest^b

Recommendations for the use of laboratory, ECG, and imaging testing for CV risk assessment in asymptomatic patients with DM (1)



Recommendations	Class	Level
A resting ECG is indicated in patients with DM diagnosed with hypertension or with suspected CVD.	I	C

1. A **baseline resting ECG** should be performed in individuals with any of the following [Grade D, Consensus]:

- Age >40 years
- Duration of diabetes >15 years and age >30 years
- End organ damage (microvascular, macrovascular)
- Cardiac risk factors

2. A **repeat** resting ECG should be performed **every 2 years** in patients with **diabetes**. [Grade D, Consensus]

Ambulatory electrocardiogram monitoring

Recommendations	Class	Level
Ambulatory ECG monitoring is recommended in patients with chest pain and suspected arrhythmias.	I	C
Ambulatory ECG recording, preferably monitoring with 12 leads, should be considered in patients with suspected vasospastic angina.	IIa	C
Ambulatory ECG monitoring should not be used as a routine examination in patients with suspected CCS.	III	C

Diagnosis or risk stratification in diabetes with suspected CAD

Resting Echocardiography

Recommendations	Class	Level
<p>A resting transthoracic echocardiogram is recommended in all patients for:</p> <ol style="list-style-type: none"> 1. Exclusion of alternative causes of angina; 2. Identification of regional wall motion abnormalities suggestive of CAD; 3. Measurement of LVEF for risk stratification purpose; 4. Evaluation of diastolic function. 	I	B

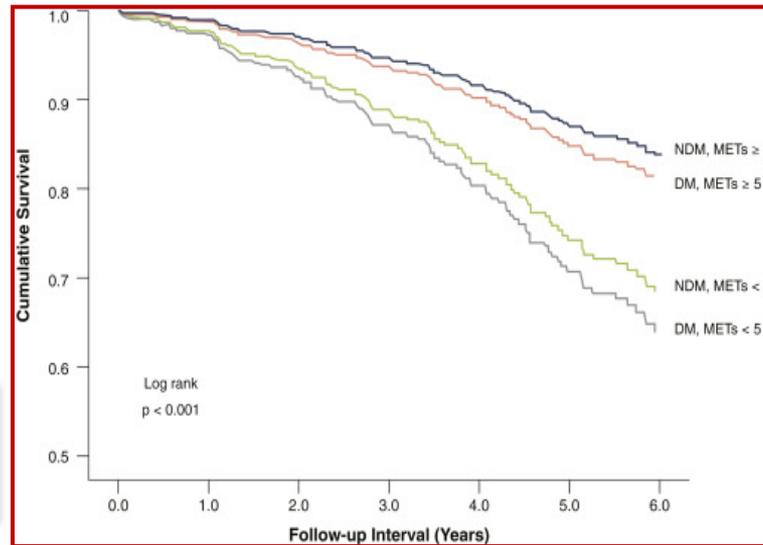
- L'ecocardiografia di base consente di valutare la presenza di anomalie strutturali e funzionali spesso presenti nel paziente diabetico
- L'aumento della massa ventricolare sinistra, la disfunzione diastolica sono segni importanti di danno d'organo e si associano a prognosi peggiore anche nei diabetici asintomatici per CAD

Selecting appropriate tests in diabetics patients with suspected CAD

Use of exercise electrocardiogram

Recommendations	Class	Level
Exercise ECG is recommended for the assessment of exercise tolerance, symptoms, arrhythmias, BP response, and event risk in selected patients. ^a	I	C
Exercise ECG may be considered as an alternative test to rule-in or rule-out CAD when non-invasive imaging is not available.	IIb	B
Exercise ECG may be considered in patients on treatment to evaluate control of symptoms and ischaemia.	IIb	C

^a When this information will have an impact on diagnostic strategy or management.



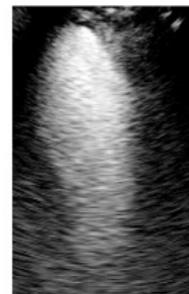
Diagnosis or risk stratification in diabetes with suspected CAD

Stress echocardiography or nuclear imaging

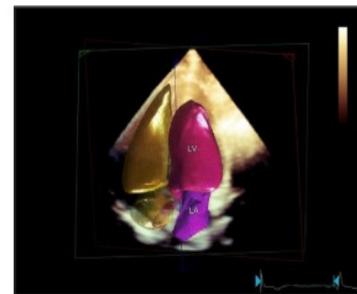
Pharmacologic stress echocardiography or nuclear imaging should be used in individuals with diabetes in whom resting ECG abnormalities **preclude the use of exercise ECG stress testing** (eg. LBBB or ST-T abnormalities) [Grade D, Consensus]. In addition, individuals who require stress testing and are **unable to exercise** should undergo pharmacologic stress echocardiography or nuclear imaging [Grade C, Level 3]



(a)

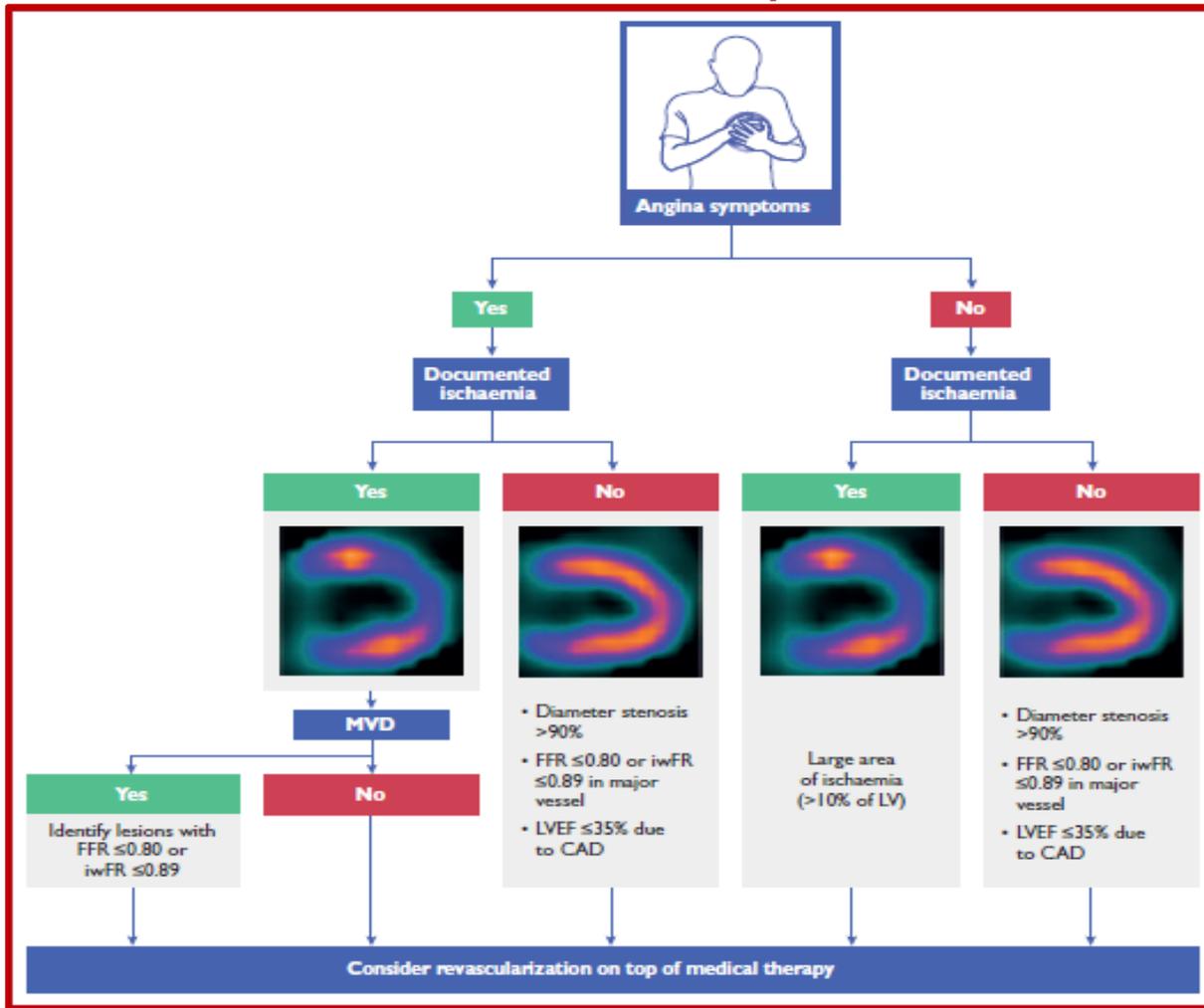


(b)



(c)

Functional Testing: Nuclear Imaging



Appropriate test for diagnosis CAD in diabetics patients

Computed tomography coronary angiography (CTCA)

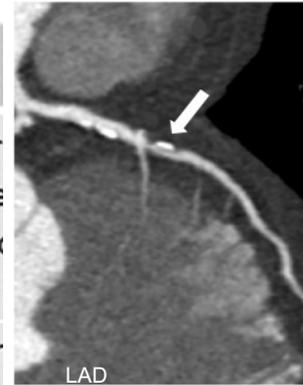
Recommendations

CTCA or functional imaging (radionuclide myocardial perfusion imaging, stress cardiac magnetic resonance imaging, or echocardiography) may be considered for screening of CAD in asymptomatic patients with DM.

CAC score with CT may be considered as a risk modifier in the assessment of asymptomatic patients with DM at moderate risk.

Coronary CTA should be considered as an alternative to invasive angiography if another non-invasive test is equivocal or non-diagnostic.

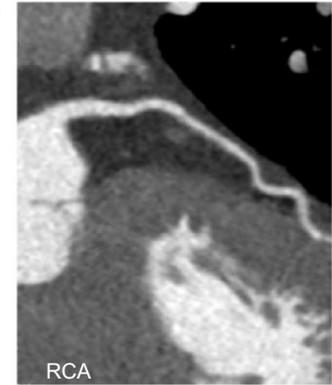
Coronary CTA is not recommended when extensive coronary artery disease, irregular heart rate, significant obesity, inability to cooperate with breath-hold commands, or any other conditions make obtaining good quality images unlikely.



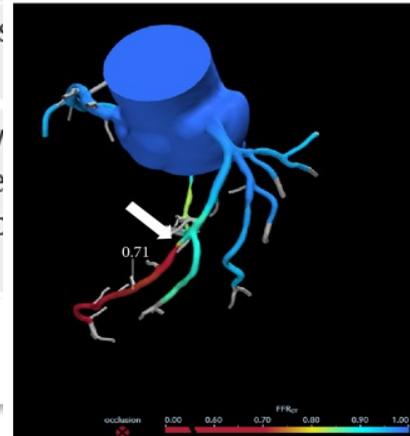
(a)



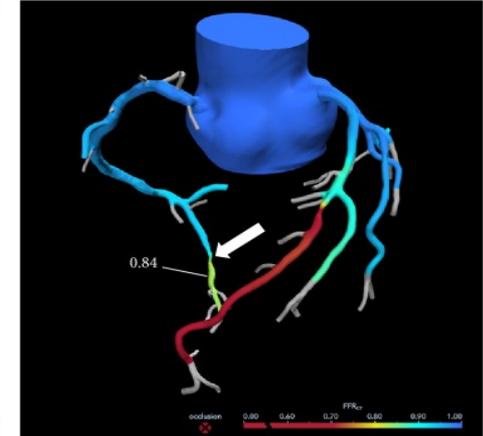
(b)



(c)



(d)



(e)

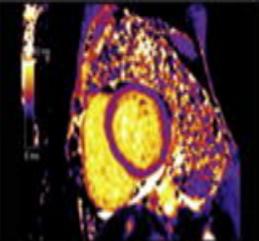
Graphic representation of FFR_{CT} calculation. Following LAD stenosis (white arrow), the value is 0.71. (e) Following RCA stenosis (white arrow), the value is 0.84.

Appropriate test for diagnosis CAD in diabetics patients

CMR may be considered in patients with an inconclusive echocardiographic test.

IIb

C

Magnetic Resonance Imaging		High accuracy to detect abnormal left ventricular function and tissue characteristics, high cost, not widely available	Delayed gadolinium hyper-enhancement and abnormal T1 mapping in asymptomatic patients are predictive of events.
----------------------------	---	--	---

- **La CMR consente la caratterizzazione tissutale, la presenza di fibrosi (frequente nei pazienti con diabete di lunga data), ed una più accurata valutazione della funzione ventricolare sinistra**

	Diagnosis of CAD	
	Sensitivity (%)	Specificity (%)
Dobutamine stress MRI ^b	79-88	81-91

Appropriate tests for diagnosis CAD in diabetics patients

Recommendations

Class

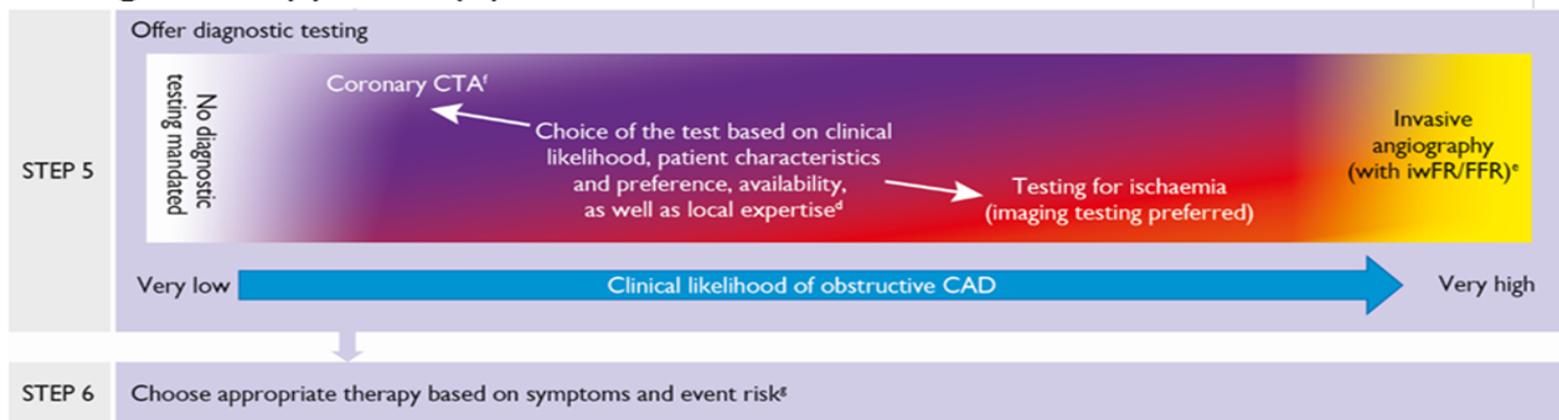
Level

Invasive angiography is recommended as an alternative test to diagnose CAD in patients with a high clinical likelihood, severe symptoms refractory to medical therapy or typical angina at a low level of exercise, and clinical evaluation that indicates high event risk. Invasive functional assessment must be available and used to evaluate stenoses before revascularization, unless very high grade (>90% diameter stenosis).

I

B

Diagnostic approach (2)



^d Ability to exercise, individual test-related risks, and likelihood of obtaining diagnostic test result. ^e High clinical likelihood and symptoms inadequately responding to medical treatment, high event risk based on clinical evaluation (such as ST-segment depression, combined with symptoms at a low workload or systolic dysfunction indicating CAD), or uncertain diagnosis on non-invasive testing. ^f Functional imaging for myocardial ischaemia if coronary CTA has shown CAD of uncertain grade or is non-diagnostic. ^g Consider also angina without obstructive disease in the epicardial coronary arteries (see section 6 of full text).

©ESC

Take home message

Come scegliere il test diagnostico più appropriato per il paziente appropriato?

Secondo la probabilità pre-test o clinica di CAD, possiamo decidere di usare un test non invasivo, la TAC coronarica o direttamente la CG selettiva

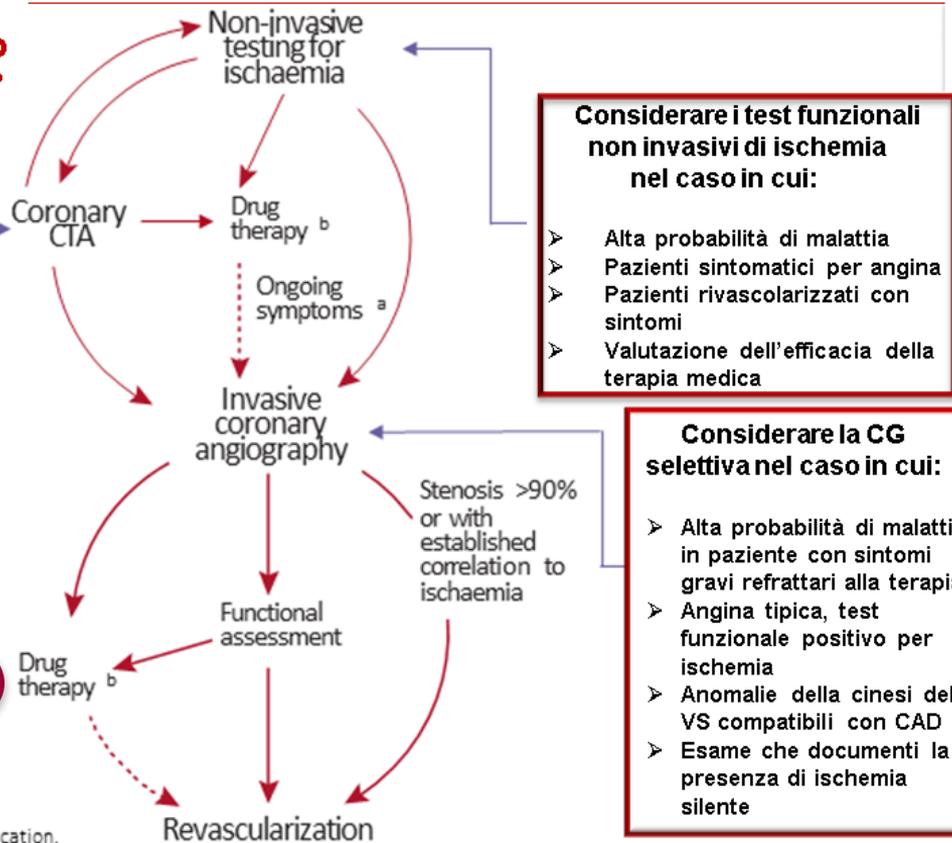
Considerare la CTA nel caso in cui:

- Bassa probabilità di malattia
- Non storia clinica di CAD
- Test non invasivi dubbi

Grazie per l'attenzione

^a Consider microvascular angina.

^b Antianginal medications and/or risk-factor modification.



Considerare i test funzionali non invasivi di ischemia nel caso in cui:

- Alta probabilità di malattia
- Pazienti sintomatici per angina
- Pazienti rivascularizzati con sintomi
- Valutazione dell'efficacia della terapia medica

Considerare la CG selettiva nel caso in cui:

- Alta probabilità di malattia in paziente con sintomi gravi refrattari alla terapia
- Angina tipica, test funzionale positivo per ischemia
- Anomalie della cinesi del VS compatibili con CAD
- Esame che documenti la presenza di ischemia silente

Quando fare uno screening CV nel paziente diabetico?

- Pazienti con sintomi tipici o atipici per CAD o sintomatici per dispnea (da causa imprecisata)
- Pazienti con alta probabilità pre-test di malattia CV
- Pazienti a rischio molto elevato anche in assenza di sintomi anginosi
- Pazienti a rischio elevato asintomatici, con forte familiarità per CAD

- **La diagnosi di CAD nei pazienti con diabete è spesso una sfida**

La *diffusione della malattia vascolare*, il coinvolgimento di *piccoli vasi* a causa di anomalie metaboliche e le *comorbilità*, limitano spesso l'affidabilità dei test non invasivi (stress test, eco-stress) per la rilevazione dell'ischemia miocardica.

Inoltre, la presenza spesso di *ischemia miocardica silente*, dovuta all'elevata soglia del dolore, può comportare una valutazione errata nella stratificazione del rischio clinico