Chest Pain · Evaluation & Diagnosis

Acute & stable chest pain: triage, risk stratification & testing pathway · point-of-care reference for internal medicine

2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline
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● Class I — recommended ● IIa — reasonable ● IIb — may consider ● III: Harm / No benefit — do not use

1 First: don't miss the life-threatening causes

⚠ Immediately life-threatening → act now

Five emergencies drive the initial workup: **STEMI** (ECG within 10 min of arrival [I]) · **NSTE-ACS** · **acute aortic syndrome** (dissection / intramural haematoma) · **pulmonary embolism** · **oesophageal rupture / tension pneumothorax**. Also consider tamponade, fulminant myopericarditis & sickle-cell chest crisis. Get a 12-lead ECG & **high-sensitivity troponin** early; transport by EMS, not private vehicle [I].

⚠ Chest pain ≠ pain in the chest — read the pattern

Anginal equivalents include pressure / tightness / heaviness in chest, shoulders, arms, neck, back, upper abdomen or jaw, plus dyspnoea & fatigue. **Favours ischaemia:** central, exertional, retrosternal, pressure/squeezing. **Lowers probability:** pleuritic, positional, sharp/fleeting, reproduced by palpation. Drop the word **"atypical"** — describe pain as **cardiac, possibly cardiac, or noncardiac** [I].

2 Initial evaluation — every patient

History + focused exam + 12-lead ECG + cTn [I]

Characterise nature, onset/duration, location/radiation, provoking & relieving factors, associated symptoms; assess CV risk factors. ECG within **10 min** of arrival [I]; serial ECGs if nondiagnostic & suspicion high [I]. Add leads V7–V9 to exclude posterior MI [IIa]. Chest radiograph for alternative causes [I].

▼ is the ECG diagnostic?

STEMI / ST-depression / new LBBB
→ follow STEMI / NSTE-ACS guidelines [I].

Nondiagnostic / normal ECG
→ serial cTn & risk-stratify (a normal ECG does *not* exclude ACS).

Biomarkers — high-sensitivity troponin preferred [I]

hs-cTn enables faster rule-in / rule-out & higher accuracy than conventional assays [I]. Repeat at **1–3 h** (hs-cTn) or **3–6 h** (conventional) after time-zero [I]. A single hs-cTn below the limit of detection can exclude injury if symptoms began ≥3 h before arrival [IIa]. Know your assay's 99th-percentile URL [I]. **CK-MB & myoglobin add nothing** once cTn is available [III: No benefit].

Implement a clinical decision pathway (CDP) to stratify low / intermediate / high risk [I] — HEART, EDACS, ADAPT, NOTR, ESC 0/1-h.

3 Risk strata & ischaemic vs nonischaemic clues

FAVOURS ISCHAEMIA / HIGHER RISK

- Central, retrosternal, pressure, squeezing, heaviness
- Provoked by exertion / emotional stress; relieved by rest
- Builds gradually over minutes; radiates to arm, neck, jaw
- Dyspnoea, diaphoresis, nausea; diabetes, women, elderly
- Ischaemic ECG changes · troponin-confirmed injury · EF < 40%

FAVOURS NONCARDIAC / LOWER RISK

- Sharp, fleeting (seconds), pleuritic or positional
- Reproduced by palpation (costochondral tenderness)
- Localised to a small area; radiates below umbilicus/hip
- Ripping pain to back → suspect aortic syndrome instead
- Normal serial ECG + non-elevated hs-cTn → low risk

CDP risk tiers → disposition

Low (< 1% 30-day death/MACE): discharge without admission or urgent testing [IIa]; outpatient CAC optional.
Intermediate: bedside TTE [I]; observation-unit care [IIa]; further testing per known/unknown CAD.
High (ischaemic ECG, +troponin, EF < 40%, moderate-severe ischaemia, instability, high CDP score): **ICA** [I].

4 Additional testing — guided by the clue (after Hx / exam / ECG / cTn)

SCENARIO	FIRST-LINE	FURTHER / ADD-ON OPTIONS
Intermediate-risk, no known CAD	CCTA to exclude plaque / obstructive CAD [I], or stress imaging (echo · PET/SPECT MPI · CMR) or exercise ECG [I]	FFR-CT for 40–90% proximal/mid stenosis [IIa] · stress imaging if CCTA inconclusive [IIa] · ICA if moderate-severe ischaemia [I]
Intermediate-risk, known CAD	Optimise GDMT before more testing [I]; stress imaging for new/worse symptoms [IIa]	ICA for high-risk CAD / worsening symptoms [I] · CCTA for nonobstructive progression [IIa] · FFR-CT [IIa]
Suspected acute aortic syndrome	CT angiography of chest/abdomen/pelvis [I]	TEE or CMR if CT contraindicated/unavailable [I] · TTE may show effusion / AR / flap
Suspected pulmonary embolism	CTA with PE protocol in stable patients [I]	Pretest probability + D-dimer guides imaging [I] · V/Q as second-line · echo for RV strain
Suspected myopericarditis	CMR with gadolinium to distinguish from MINOCA [I]	TTE for wall-motion / effusion [I] · cardiac CT for pericardial thickening [IIb]
Suspected valvular disease	TTE for presence, severity & cause of VHD [I]	TEE (3D) if TTE inadequate [I] · CMR if echo nondiagnostic [IIa]
Stable, no known CAD	Pretest-probability model to find low-risk [I]; CCTA for intermediate-high risk [I]	CAC or exercise ECG if low risk [IIa] · stress imaging [I] · FFR-CT for 40–90% stenosis [IIa]

Don't routinely test in low-risk patients: for acute or stable chest pain deemed low risk, urgent/early stress imaging or anatomic testing is *not* needed [III]. Honour warranty periods — normal CCTA (no plaque/stenosis) 2 y; normal stress test 1 y. CK-MB / myoglobin added to cTn [III]; delayed transfer from office for testing [III: Harm].

5 Pathway-specific & special populations

High-risk acute chest pain — stepwise

1. Designate high risk: new ischaemic ECG, +troponin, EF < 40%, moderate-severe ischaemia, instability, high CDP score [I]
2. Invasive coronary angiography for the full extent & severity of obstructive CAD [I]
3. If troponin+ but CCTA/ICA show no obstruction → CMR or echo for MINOCA / myocarditis [IIa]

Known CAD with stable chest pain

1. Optimise GDMT first; defer testing where possible [I]
2. Moderate-severe ischaemia despite GDMT → ICA to guide therapy [I]
3. Stress PET/SPECT, CMR or echo for diagnosis & risk [I]; add MBFR on PET/CMR [I]

Special populations — one-liners

- **Prior CABG, no ACS** → stress imaging or CCTA for graft patency [I]; ICA if nondiagnostic [I]
- **On dialysis, unremitting pain** → EMS transfer to acute care [I]
- **Cocaine / methamphetamine** → consider as cause; standard risk stratification [IIa]
- **Sickle cell disease** → EMS transfer [I]; exclude ACS / acute chest syndrome [I]
- **Recurrent, workup negative** → evaluate GI causes [IIa]; refer to CBT for anxiety/panic [IIa]
- **INOCA** → invasive coronary function testing [IIa]; stress PET/CMR with MBFR [IIa]

6 Shared decisions & cost-value

CHOOSING THE RIGHT TEST (FIGURE 6)

CCTA favoured	age <65 · rule out obstructive CAD
Stress imaging favoured	age ≥65 · suspect scar/ischaemia
PET over SPECT (if available)	↑ accuracy · MBFR
Lowest-cost test	exercise ECG / CAC
Pregnant / child-bearing age	minimise ionising radiation

SHARED DECISION-MAKING

Low-risk acute chest pain → patient decision aids (e.g. Chest Pain Choice) improve understanding & risk communication [I]. Intermediate-risk → shared decision-making on admit vs observe vs outpatient follow-up reduces low-value testing [I].

KEY CAUTIONS

Relief with nitroglycerin is **not** diagnostic of ischaemia. Up to 6% of evolving ACS have a normal initial ECG. "Known CAD" now includes nonobstructive plaque — optimise prevention, don't overlook it. High-risk CAD = left main ≥50% or 3-vessel ≥70%.

Remember

The chest-pain trap is **over-testing the low-risk & under-recognising the dangerous**. Get an ECG within **10 minutes** and **hs-cTn** early on everyone; a normal ECG does not exclude ACS. Use a **structured CDP** to stratify risk — low-risk patients (< 1% 30-day MACE) need **no urgent testing** and can go home. Reserve CCTA, stress imaging & ICA for intermediate-to-high pretest probability. Say **cardiac / possibly cardiac / noncardiac** — never "atypical".