CHEST PAIN

The five that kill · exclude them first, then risk-stratify with the right score

ECG IN 10 MINUTES
before anything else

THE FIVE THAT KILL *exclude these before you reach for a differential*

ACS

Pressure, exertional, radiating to jaw or arm, diaphoresis. **ECG within 10 minutes** and serial troponin. **A normal first ECG does not exclude it** — repeat it if the pain continues or changes.

PULMONARY EMBOLISM

Pleuritic pain, dyspnea, tachycardia, hypoxia. **Wells or Geneva first, then D-dimer only if probability is low or intermediate**; CTPA if the probability is high or the D-dimer is positive.

AORTIC DISSECTION

Abrupt, maximal at onset, tearing, radiating to the back. Pulse or blood-pressure differential, new aortic regurgitation, focal deficit. **CT angiography** of the aorta.

TAMPONADE

Beck's triad (hypotension, raised JVP, muffled sounds), **pulsus paradoxus over 10 mmHg**, electrical alternans. **Bedside echo makes the diagnosis**; pericardiocentesis treats it.

TENSION PNEUMOTHORAX

Sudden pain, severe dyspnea, absent breath sounds, tracheal shift, shock. **A clinical diagnosis — do not wait for the film.** Needle decompression, then a chest drain.

THE FIRST TEN MINUTES *the order that catches the time-critical causes*

1. **ECG within 10 minutes of arrival**, and repeat at 15–30 minutes if pain persists or the picture changes. **Compare with an old ECG if one exists.** Look specifically for **ST elevation, new left bundle branch block, and the posterior MI pattern** (tall R and ST depression in V1–V3, which needs posterior leads V7–V9). **Right-sided leads in inferior MI** before you give any nitrate.
2. **Vital signs in both arms.** A **systolic differential, a pulse deficit, or a new diastolic murmur** moves aortic dissection to the front of the queue and changes everything downstream, because anticoagulating a dissection is catastrophic.
3. **High-sensitivity troponin at 0 and 1–2 hours.** Use your laboratory's assay-specific thresholds; **the change between samples matters more than a single absolute value. Troponin marks myocardial injury, not infarction** — PE, sepsis, heart failure, myocarditis, tachyarrhythmia, chronic kidney disease and dissection all raise it.
4. **Bedside ultrasound and a chest film.** Echo for effusion, right ventricular strain and regional wall-motion abnormality; lung ultrasound for pneumothorax. **Widened mediastinum on the film supports dissection but its absence does not exclude it.**
5. **Then, and only then, risk-stratify.** Scores are for patients in whom you have already excluded the immediately lethal causes — **they are not a substitute for that exclusion.**

RIGHT SCORE, RIGHT DECISION *each score answers one question only*

Score	Population	Bands	The one decision it answers
HEART	Undifferentiated chest pain **in the emergency department**	**0–3 low** (MACE roughly 2%) · **4–6 moderate** (roughly 15–20%) · **7–10 high** (roughly 50%)	**Disposition.** Low with negative serial troponins can go home with follow-up. **It does not tell you when to take an admitted patient to the catheter laboratory** — that is the commonest misuse of this score.
GRACE	**Confirmed NSTE-ACS**, already admitted	**≤ 108 low · 109–139 intermediate · ≥ 140 high**	**Timing of the invasive strategy. GRACE ≥ 140 is the guideline trigger for an early invasive approach, within 24 hours.** Intermediate risk is managed invasively during the admission. This is the score for the cath-timing question, not HEART.
TIMI	**Unstable angina or NSTEMI**	Seven equally weighted variables; **0–1 low, 6–7 high** (14-day event rate roughly 5% rising to over 40%)	**Prognosis, and who gains most from an invasive strategy and more intensive antithrombotics.** Simpler than GRACE but less discriminating, so **where guidelines specify a threshold for invasive timing they use GRACE**, not TIMI.
Wells / PERC	Suspected **pulmonary embolism**	Wells sets pre-test probability; **PERC applies only once probability is already low**	**Whether to test at all.** PERC is a rule-out for low-probability patients, not a probability score. **D-dimer belongs in low or intermediate probability**, never as a screen in high probability — there, image regardless.
ADD-RS	Suspected **aortic dissection**	One point each for high-risk **condition**, **pain feature**, and **examination finding**	**Whether to image now. Two or three features means immediate CT angiography.** Zero or one with a negative D-dimer makes dissection unlikely.

The trap: these scores were derived in different populations to answer different questions, and their numbers are not interchangeable. **Applying a HEART band to a cath-timing decision, or a GRACE band to an emergency-department discharge, is the classic error.** Check that the score named actually matches the decision in front of you.

DON'T FORGET THESE

ESOPHAGEAL RUPTURE

Boerhaave: forceful vomiting, then severe pain, then subcutaneous emphysema. Mortality climbs steeply with delay. **CT with oral contrast**; it is a surgical emergency and is missed because it mimics ACS.

THE COMMON, NON-LETHAL CAUSES

Musculoskeletal, reflux, anxiety, herpes zoster (pain can precede the rash by days), pneumonia and pericarditis. **Reproducible tenderness lowers but does not exclude ACS** — a meaningful minority of infarcts have a reproducible chest wall.

WHO PRESENTS ATYPICALLY

Women, people with diabetes, the elderly, and postoperative patients present with dyspnea, fatigue, nausea or confusion rather than pain. **Keep the threshold for an ECG and a troponin low in these groups**; this is where infarcts are missed.

PEARLS & PITFALLS

- **ECG within 10 minutes, and repeat it.** A single normal tracing in ongoing pain is not reassurance, it is an incomplete test.
- **Check the blood pressure in both arms before you anticoagulate.** Treating a dissection as ACS is the catastrophic version of this miss.
- **Troponin means myocardial injury, not infarction.** Interpret the delta and the clinical context, never a lone number.
- **HEART is for disposition; GRACE is for cath timing.** Swapping them is the classic score error on this presentation.
- **Tension pneumothorax is diagnosed at the bedside.** If you are waiting on the chest film, you have already waited too long.
- **Reproducible chest wall tenderness does not exclude ACS**, and neither does relief with a gastrointestinal cocktail.

References: ESC 2023 guidelines for acute coronary syndromes · 2021 ACC/AHA chest pain evaluation and diagnosis guideline · Backus et al. HEART score validation, *Int J Cardiol* 2013 · GRACE risk model · Rogers et al. ADD risk score, *Circulation* 2011 · ESC 2019 acute pulmonary embolism.

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