Pulmonary Embolism

ESC 2019 and AHA/ACC 2026 risk classes, diagnosis, anticoagulation, lysis, catheter therapy and RV support

RISK CLASSES: ESC 2019 AND AHA/ACC 2026

Mapping approximate (CMAJ 2026); R modifier: hypoxemia or rising O_2 need.

ESC 2019	AHA/ACC 2026	DEFINING FEATURES
Low	A, B	A: incidental. B: PESI I–II or sPESI 0
Intermediate-low	C1, C2	PESI III–V or sPESI ≥1; RV strain, biomarker: none or one
Intermediate-high	C3	Score up plus RV dysfunction and troponin (AHA/ACC: or BNP)
Intermediate-high	D1, D2	D1 transient hypotension; D2 normotensive shock (lactate >2)
High	E1, E2	Shock or SBP <90 (or fall ≥40) >15 min; E2: refractory, arrest

- RV dysfunction: RV/LV ≥1.0 on CT or echo, TAPSE <16 mm, McConnell or 60/60 sign
- Biomarkers: troponin, NT-proBNP ≥600 pg/mL; lactate ≥2 mmol/L predicts complications (ESC 2019)
- sPESI, 1 point each: age >80, cancer, chronic heart or lung disease, HR ≥110, SBP <100, SaO_2 <90%; 0 = 1.0% 30-day mortality, ≥1 = 10.9%

DIAGNOSIS: UNSTABLE VS STABLE

PATIENT	APPROACH
Shock or hypotension	Heparin now; bedside echo or CTPA, whichever is faster
Unstable, CT not feasible	RV overload on echo, no other cause: treat as high risk
Stable, gestalt <15%	All 8 PERC criteria negative: no testing
Stable, Wells ≤4	D-dimer: age × 10 µg/L over age 50, or YEARS
Stable, Wells >4	CTPA; D-dimer cannot exclude PE
Contrast allergy or severe CKD	V/Q scan; proximal DVT on ultrasound confirms VTE

YEARS: no items (DVT signs, hemoptysis, PE most likely) and D-dimer <1,000 ng/mL, or any item and <500, excludes PE. A normal echo cannot exclude PE when stable.

ANTICOAGULATION

- Start during workup if probability is intermediate or high (ESC 2019)
- LMWH over UFH in C1 to E1 (AHA/ACC 2026, Class 1; 2a if a procedure is likely): enoxaparin 1 mg/kg every 12 h
- UFH 80 units/kg, then 18 units/kg/h: E2, ECMO, CrCl ≤30; ESC 2019 also when reperfusion is planned
- Alteplase: hold heparin, restart at aPTT ≤2× normal (US label); ESC 2019 lets UFH run
- DOAC once stable, after 2–3 days if intermediate-high (ESC 2019); not in pregnancy or antiphospholipid syndrome

REPERFUSION AND THE PE RESPONSE TEAM

THERAPY	DOSE OR METHOD	AHA/ACC 2026 USE
Systemic alteplase	100 mg IV over 2 h (label)	First choice in E2; 2a in E1; 2b in D, C3
Arrest or extremis	50 mg bolus common, or 0.6 mg/kg (max 50) over 15 min	CPR 60–90 min after a lytic (ESC 2019)
Catheter-directed lysis	Low-dose alteplase via PA catheters	2a in E1; 2b in C2 to D
Mechanical thrombectomy	Large-bore aspiration, no lytic	2a in E1; 2b in C2 to D
Surgical embolectomy	Lysis failed or contraindicated	2a in E1; 2b in D
VA-ECMO	Bridge to reperfusion or recovery	2a in E2

Systemic lysis is harmful in A to C2. PEITHO (tenecteplase, intermediate-high): death or collapse 2.6% vs 5.6%, hemorrhagic stroke 2.0% vs 0.2%. HI-PEITHO (2026): catheter lysis 4.0% vs 10.3%, no intracranial bleeds. PERT review: Class 1 for C to E.

Absolute contraindications (ESC 2019): hemorrhagic or unexplained stroke, ischemic stroke in 6 months, CNS tumor, major trauma, surgery or head injury in 3 weeks, bleeding diathesis, active bleeding.

SUPPORTING THE FAILING RV

- Fluids: none if CVP is high; ≤500 mL over 15–30 min only if CVP is low (ESC 2019)
- Norepinephrine first: keeps aortic above RV pressure; vasopressin second
- Dobutamine for low output once MAP holds; inhaled NO or epoprostenol as a bridge
- Oxygen for SaO_2 <90%; high-flow nasal cannula or NIV rather than intubation

SAFETY Intubation can trigger arrest: induction drops SVR, positive pressure cuts venous return, apnea raises CO_2 and PVR. If unavoidable: norepinephrine running, expert operator, preoxygenate, reduced-dose etomidate or ketamine, VT 6 mL/kg, plateau <30, low PEEP, ECMO team aware.

NURSING: MONITORING AND BLEEDING WATCH

- Trend HR, BP, shock index (HR ÷ SBP >1), lactate, urine output, O_2 need; escalate early
- Before lysis: 2 IVs, CBC, fibrinogen, aPTT, type and screen; lines first, then no IM or noncompressible sticks
- During and after: frequent neuro checks and vitals; check sites, urine, stool, flank pain
- Headache, vomiting, new deficit or falling GCS: stop lytic and heparin, stat head CT
- Major bleeding: cryoprecipitate to fibrinogen ≥150 mg/dL, tranexamic acid, protamine for UFH

EXAM TIP Exams test: hypotension, not clot size, decides lysis; normotensive RV strain plus troponin: anticoagulate, monitor, rescue if worse; no big fluid boluses.

Sources (25) are listed with links at icubasics.com/sheets/pulmonary-embolism.html. For education and exam preparation only. Not medical advice; follow current guidelines and your institution's protocols. ICU Basics is an independent study aid not affiliated with any certifying body.