PE Therapy Indications Checklist

	SOURCE	RISK STRATIFICATION	
		HIGH RISK PE	**INTERMEDIATE-HIGH RISK PE**
		Haemodynamic instability and Evidence of PE or RV dysfunction (PESI class III–V or sPESI ≥1)* (Elevated cardiac troponin levels)*	**Haemodynamic stability and RV dysfunction and Elevated cardiac troponin levels (PESI class III–V or sPESI ≥1)****
		INDICATIONS FOR MECHANICAL THROMBECTOMY	
		☐ **Therapy Goal: RESCUE THERAPY**	☐ **Therapy Goal: SHOCK PREVENTION**
Indications for Catheter Directed Therapies	ESC Guidelines 2019 (1)	☐ Contraindication for systemic thrombolysis ☐ Failure of systemic thrombolysis	☐ Haemodynamic deterioration on anticoagulation treatment (treatment failure) • With or without contraindication to Lytics • With or without bleeding risk
Treatment Failure Due to Lack of Improvement	ESC Consensus Statement 2022 (2)	☐ No haemodynamic improvement achieved 2-4 hours after the completion of full-dose thrombolysis ☐ No haemodynamic improvement is achieved immediately after the completion of the local thrombolysis infusion	☐ Compromised vital signs are not alleviated after 24-48 hours of therapeutic-dose anticoagulation • With or without contraindication to Lytics • With or without bleeding risk

INDICATOR OF RISK

High Bleeding Risk	2, DGK Consensus Paper (3), 4	**Absolute:** ☐ History of haemorrhagic stroke or stroke of unknown origin ☐ Ischaemic stroke in previous 6 months ☐ Central nervous system neoplasm ☐ Major trauma, surgery, or head injury in previous 3 weeks ☐ Bleeding diathesis ☐ Use of ECMO ☐ Active bleeding ☐ Infective endocarditis ☐ Active peptic ulcer ☐ Refractory hypertension (systolic BP >180 mmHg) **Relative:** ☐ Transient ischaemic attack in previous 6 months ☐ Oral anticoagulation ☐ Pregnancy or first postpartum week ☐ Non-compressible puncture sites ☐ Traumatic resuscitation ☐ Advanced liver disease ☐ Infective endocarditis ☐ Other bleeding risk factor: _____
RV Dysfuntion	1, 5, 6, 7, 8	☐ **High RV/LV ratio:** _____ (≥0.9 independent predictor of death, hemodynamic collapse) (For every 0.1 increase, odds ratio for death is 1.14)
High Heart Rate	9, 10, 11, 12	☐ **High Heart rate:** _____ (beats/min) (>100 beats/min predicts an increased risk of all-cause and PE-related mortality)
Elevated Lactate Level	3, 13, 14	☐ **Elevated Lactate level:** _____ (mmol/L) (Patients with lactate level greater than or equal to 2 mmol/L showed higher mortality)
Clot Burden	3, 15, 16	☐ **Large Clot Burden/Load** (>17x Risk of 6-month all-cause mortality) ☐ **Central Clot** (>2x Risk of PE-related mortality)
Normotensive Shock	17, 18, 19, 20, 21	☐ **Low Cardiac index:** _____ (L/min/m^2) (40% of normotensive PE patients were in cardiogenic shock (low CI that is defined as <1.8 L/min/m^2)) (Even 20% of PE patients with sPESI=0 in FLASH were in cardiogenic shock (low CI defined as <2.0 L/min/m^2))
Shock Index	9, 10	☐ **Heart Rate/Syst BP** _____ (Shock Index >1 predicts risk of in-hospital mortality)
Respiratory Rate	2	☐ **Breaths/min** _____ (Elevated respiratory rate >20 breaths/min predicts elevated risk of hemodynamic deterioration)
Blood Pressure	2	☐ **Systolic Blood Pressure** _____ (Low SBP ≤110mmHg predicts elevated risk of hemodynamic deterioration)
Concomitant DVT	22, 23, 24, 25	☐ **Concomitant DVT** (>4X Risk of 90-day PE-related mortality in PE patients with proximal DVT) (>4X Risk of 90-day recurrent VTE in PE patients with proximal DVT)
Composite Shock Score	12	☐ **Composite Shock Score:** _____ /6 (High shock score predicts cardiogenic shock in intermediate-risk PE) ☐ Elevated Troponin ☐ Elevated BNP ☐ Moderate/Severely Reduced RV function ☐ Saddle PE ☐ Concomitant DVT ☐ Tachycardia (>100 beats/min)

*Table 8/d overleaf. **Table 8/e overleaf.

Society Contraindication Recommendations

Contraindication	Reference	American College of Chest Physicians	AHA	ESC	SIR 2014	CHEST 2016
		a	b	c	d	e
Central nervous system damage or neoplasm or seizure disorder				Absolute	Relative	
Previous ICH		Major	Major	Absolute	Absolute	Major
Structural Intracranial disease		Major	Major			Major
Ischemic stroke within 3-6 months		Major	Major	Absolute	Absolute	Major
Active bleeding		Major	Major	Absolute	Absolute	Major
GI bleeding within 3 mo					Relative	
Bleeding diathesis		Major	Major	Absolute		Major
Recent brain/spinal injury		Major	Major	Absolute	Absolute	Major
Absolute Contraindication to AC					Absolute	
Suspected aortic dissection						
Recent head trauma with fracture or brain injury		Major	Major	Absolute	Absolute	Major
Age >75 y		Relative	Relative			Relative
AC therapy		Relative	Relative	Relative		Relative
Noncompressible vascular punctures			Relative	Relative		
Pregnancy/Recent delivery/lactation		Relative	Relative	Relative	Relative	Relative
Recent invasive procedure/major surgery		Relative	Relative	Absolute	Relative	Relative
Traumatic/Prolonged CPR		Relative	Relative	Relative	Relative	Relative
Recent internal bleeding			Relative			
Recent non-ICH bleeding		Relative	Relative			Relative
Pericarditis or pericardial fluid		Relative	Relative			Relative
Systolic BP >180 or Diastolic BP >110		Relative	Relative	Relative	Relative	Relative
Weight <60kg		Relative	Relative			Relative
Ischemic stroke or transient ischemic attack > 3-6 mo ago		Relative	Relative	Relative		Relative
Diabetic retinopathy		Relative	Relative		Relative	Relative
Female		Relative	Relative			Relative
Black race		Relative	Relative			Relative
Dementia						
Active peptic ulcer disease				Relative		
Infective endocarditis				Relative	Relative	
Advanced liver disease				Relative	Relative	
Organ biopsy					Relative	
Cataract or other eye surgery					Relative	
Severe allergic reaction to lytics, AC, or contrast					Relative	
Known right-to-left cardiac or pulmonary shunt or left heart thrombus					Relative	
Severe dyspnea					Relative	
Acute medical illness precluding safe procedure performance					Relative	
Suspicion of infected venous thrombus					Relative	
Renal failure (eGFR <60 mL/min)					Relative	
Severe thrombocytopenia					Relative	

Study Exclusions

Study Source	PEITHO	HI-PEITHO	SEATTLE-II	Optalyse	SUNSET-sPE	ULTIMA	PEITHO-3
Haemodynamic collapse at presenation (CPR, ECMO, PE shock, persistent hypotension, sepsis)	x	x	x	x		x	
Known significant bleeding risk	x				x	x	x
Recent admin of thrombolytic agents	x	x	x	x		x	x
Recent IVC filter or thrombectomy	x			x			x
Uncontrolled HTN	x					x	
Known hypersensitivity to tPA/AC	x	x		x		x	x
Pregnancy/lactation/recent labor	x	x	x	x	x	x	x
Known coagulation disorder	x						
Any condition that would put pt at increased risk	x		x	x		x	x
ICU admission for non-PE reason		x					
High fever		x					
History of ICH		x	x	x	x		x
History of intraocular bleeding/eye surgery/hemorrhagic retinopathy		x				x	
History of stroke or TIA		x	x	x	x		x
CNS or metastatic cancer		x		x	x		x
Major surgery or trauma		x	x	x	x	x	x
Low platelets/hematocrit		x	x			x	x
Recent LMWH, DOAC, VKA, or antiplatelet admin/INR >1.5-3/aPTT >50 sec		x	x	x		x	x
Short life expectancy 1-12 mo		x	x	x	x	x	x
Recent major bleed/GI bleed			x	x		x	
Renal failure			x	x		x	
History of HIT				x			
Active bleeding					x	x	x
Suspected aortic dissection					x		
Arterior venous malformation						x	
Aneurysm						x	
Large >10mm right atrial or RV thrombus						x	
Hemodynamic instability							x
Recent vascular surgery							x
INR >1.4							x
Severe hepatic disease, portal hypertension, or active hepatitis							x
Recent peptic ulcer							x
Women of childbearing potential without negative pregnancy test and do not use an effective method of birth control							x

Society Contraindication Recommendations References

a. CHEST ACCP 2012 Supplement - Kearon *et al.* Table 11
b. AHA 2019 Scientific Statement - Giri *et al.* Table 2
c. AHA 2011 Scientific Statement - Jaff *et al.* pages 1795-1797
d. ESC 2019 Guidelines - Konstantinides *et al.* Table 10
e. SIR 2014 Quality Improvement Guidelines - Vedantham *et al.* Table 1
f. CHEST 2016 Guideline - Kearon *et al.* Table 15

Study Exclusions References

PEITHO : https://classic.clinicaltrials.gov/ct2/show/NCT00639743
HI PEITHO : https://clinicaltrials.gov/study/NCT04790370
SEATLE II : https://www.clinicaltrials.gov/study/NCT01513759
OPTALYSE : https://clinicaltrials.gov/study/NCT02396758
SUNSET sPE : https://classic.clinicaltrials.gov/ct2/show/NCT02758574
ULTIMA : https://clinicaltrials.gov/study/NCT01166997
PEITHO 3 : https://clinicaltrials.gov/study/NCT04430569

IFU of Lytics

Lytic	Alteplase	Tenecteplase	Urokinase
Current ICH	Contraindication		
Subarachnoid hemorrhage	Contraindication		
Active internal bleeding	Contraindication	Contraindication	Contraindication
Recent intracranial or intraspinal surgery	Contraindication	Contraindication	Contraindication
Recent serious head trauma	Contraindication	Contraindication	Contraindication
Intracranial conditions that increase risk of bleeding like neopalsms, AV malformations or aneurysms	Contraindication	Contraindication	Contraindication
Bleeding diathesis	Contraindication	Contraindication	Contraindication
Uncontrolled hypertension	Contraindication	Contraindication	Contraindication
History of recent stroke	Contraindication		
Avoid intramuscular injections and trauma	Warning/Precaution	Warning/Precaution	Warning/Precaution
Avoid IJ and subclavian venous punctures	Warning/precaution	Warning/Precaution	
Concomitant use of aspirin and heparin	Warning/Precaution		
Major surgery	Warning/Precaution		Warning/Precaution
Cerebrovascular disease	Warning/Precaution		Warning/Precaution
Recent ICH	Warning/Precaution		
Recent GI bleed	Warning/Precaution		Warning/Precaution
Hypertension	Warning/Precaution		
Acute pericarditis	Warning/Precaution		
Subacute bacterial endocarditis	Warning/Precaution		Warning/Precaution
Hemostatic defects	Warning/Precaution		Warning/Precaution
Significant hepatic dysfunction	Warning/Precaution		Warning/Precaution
Pregnancy	Warning/Precaution		Warning/Precaution
Diabetic hemorrhagic retinopathy	Warning/Precaution		Warning/Precaution
Other hemorrhagic opthalmic conditions	Warning/Precaution		
Septic thrombophlebitis	Warning/Precaution		
Advanced age	Warning/Precaution		
Currently receiving anticoagulation	Warning/Precaution		
Known hypersensitivity to ingredients	Warning/Precaution	Potential AE	Warning/Precaution
ICH		Potential AE	
Fatal bleeding		Potential AE	
Recent Trauma			Contraindication
Recent CPR			Contraindication
Concomitant use of thrombolytic agents, AC, or antiplatelets			Warning/Precaution
Extra attention to all potential bleeding sites (including catheter insertion sites, arterial and venous puncture sites, cutdown sites, and other needle puncture sites)			Warning/Precaution
Patient handling			Warning/Precaution
Venipunctures and arterial punctures			Warning/Precaution
Obstetrical delivery			Warning/Precaution
Organ biopsy			Warning/Precaution
Previous puncture of noncompressible wounds			Warning/Precaution
Other condition in which bleeding might constitute a significant hazard or be particularly difficult to manage because of its location			Warning/Precaution
Myocardial infarction			Potential AE
Recurrent PE			Potential AE
Hemiplegia			Potential AE
Stroke			Potential AE
Decreased hematocrit			Potential AE
Substernal pain			Potential AE
Thrombocytopenia			Potential AE
Diaphoresis			Potential AE
Allergtic reaction			Potential AE
Infusion reaction (including hypoxia, cyanosis, dyspnea, tachycardia, hypotension, hypertension, acidosis, fever, chills, rigors, back pain, vomiting, and nausea)			Potential AE

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ESC Guidelines

Table 8 Classification of pulmonary embolism severity and the risk of early (in-hospital or 30 day) death

Early mortality risk		Indicators of risk			
		Haemodynamic instability[a]	Clinical parameters of PE severity and/or comorbidity: PESI class III–V or sPESI ≥1	RV dysfunction on TTE or CTPA[b]	Elevated cardiac troponin levels[c]
High		+	(+)[d]	+	(+)
Intermediate	Intermediate–high	-	+[e]	+	+
	Intermediate–low	-	+[e]	One (or none) positive	
Low		-	-	-	Assesment optional; if assessed, negative

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BP = blood pressure; CTPA = computed tomography pulmonary angiography; H-FABP = heart-type fatty acid-binding protein; NT-proBNP = N-terminal pro B-type natriuretic peptide; PE = pulmonary embolism; PESI = Pulmonary Embolism Severity Index; RV = right ventricular; sPESI = simplified Pulmonary Embolism Severity Index; TTE = transthoracic echocardiogram.

[a] One of the following clinical presentations (*Table 4*): cardiac arrest, obstructive shock (systolic BP <90 mmHg or vasopressors required to achieve a BP >_90 mmHg despite an adequate filling status, in combination with end-organ hypoperfusion), or persistent hypotension (systolic BP <90 mmHg or a systolic BP drop >_40 mmHg for >15 min, not caused by new-onset arrhythmia, hypovolaemia, or sepsis).

[b] Prognostically relevant imaging (TTE or CTPA) findings in patients with acute PE, and the corresponding cut-off levels, are graphically presented in *Figure 3*, and their prognostic value is summarized in Supplementary Data *Table 3*.

[c] Elevation of further laboratory biomarkers, such as NT-proBNP >_600 ng/L, H-FABP >_6 ng/mL, or copeptin >_24 pmol/L, may provide additional prognostic information. These markers have been validated in cohort studies but they have not yet been used to guide treatment decisions in randomized controlled trials.

[d] Haemodynamic instability, combined with PE confirmation on CTPA and/or evidence of RV dysfunction on TTE, is sufficient to classify a patient into the high-risk PE category. In these cases, neither calculation of the PESI nor measurement of troponins or other cardiac biomarkers is necessary.

[e] Signs of RV dysfunction on TTE (or CTPA) or elevated cardiac biomarker levels may be present, despite a calculated PESI of III or sPESI of 0. Until the implications of such discrepancies for the management of PE are fully understood, these patients should be classified into the intermediate-risk category.