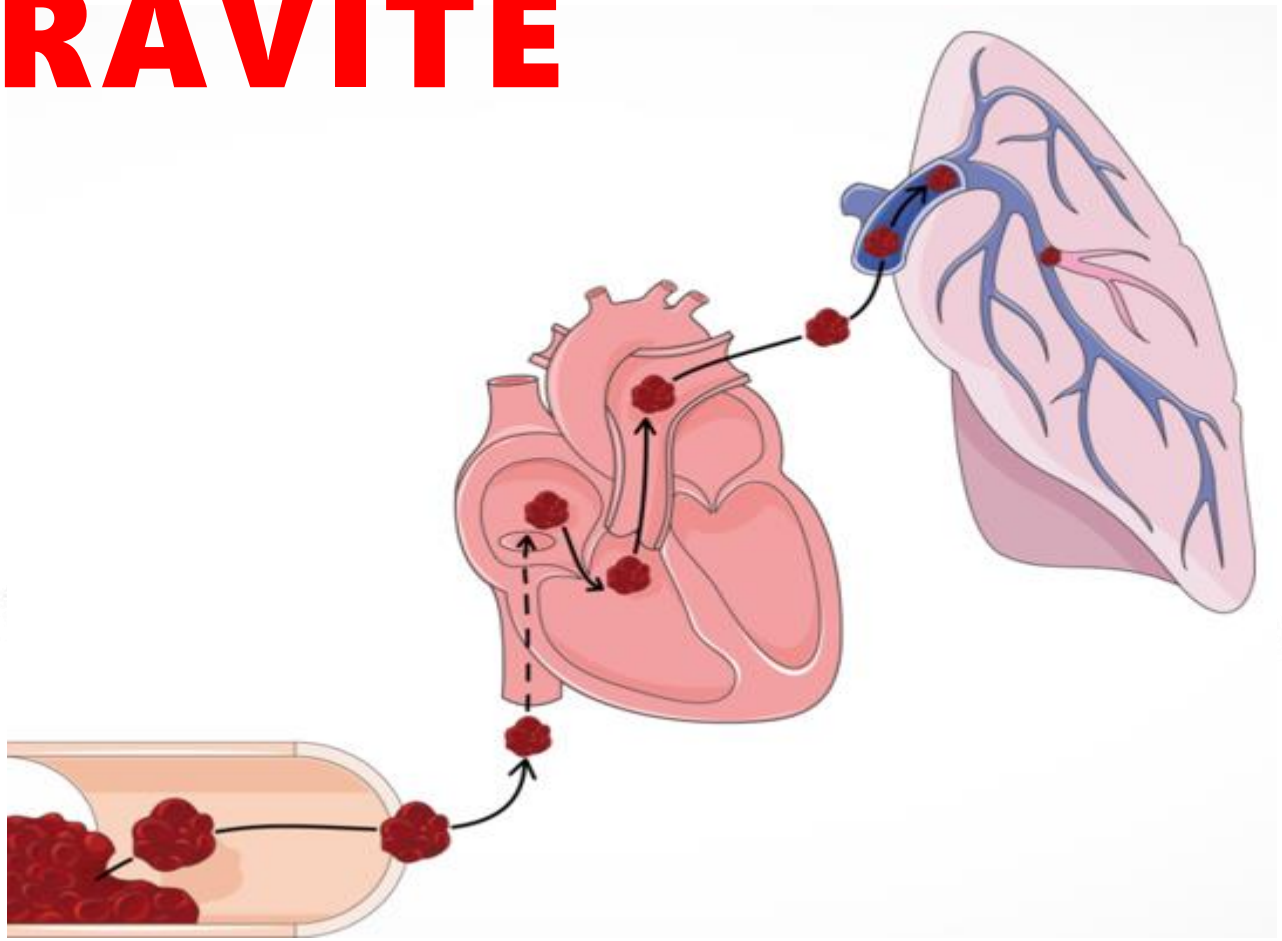
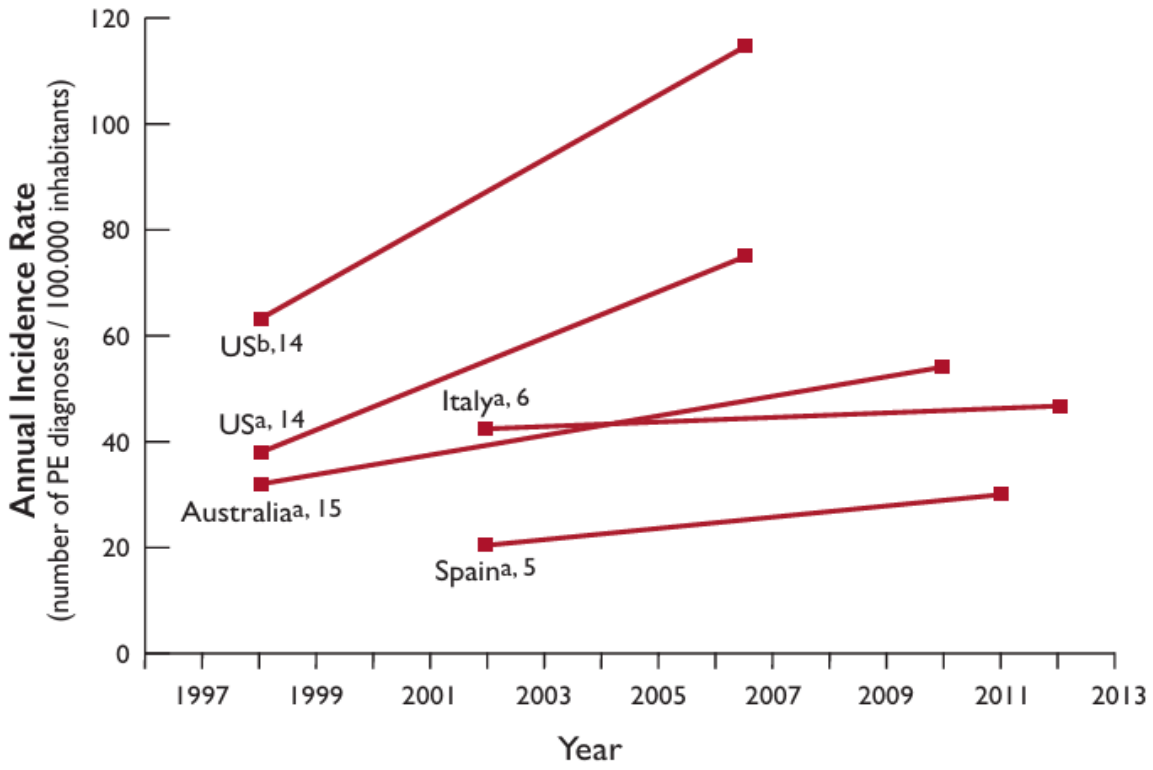
EMBOLIE PULMONAIRE AVEC SIGNES DE GRAVITE

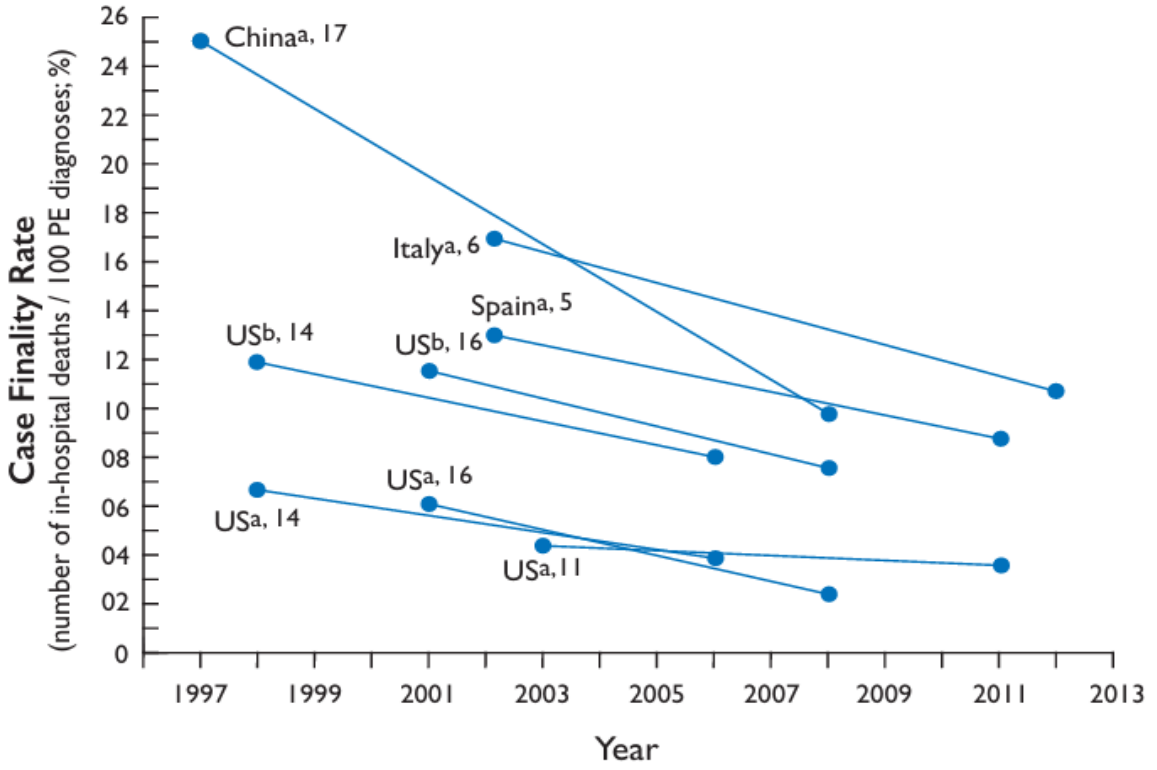
Pr CODJO H. Léopold

FSS/UAC (Bénin)



MORBIDITE ET MORTALITE DE L'EP





Incidence croissante

Mortalité en baisse

MORBIDITE ET MORTALITE DE L'EP

- En France (2010):
  - 15000 décès par an soit **1 décès chaque 35min**
- En Afrique (2017), peu d'études avec des données variables
  - Danwang et al. dans une revue de 21 études africaines
    - **Fréquence : 0.14% et 61.5%;**
    - **Mortalité: 40% et 69.5%.**
- En Côte d'Ivoire (2015) :
    - **Mortalité: 13%**

Evaluation de la prise en charge de l'embolie pulmonaire dans un pays à faible niveau socio-économique : cas du Bénin.

Evaluation of pulmonary embolism management in a developping country, the case of Benin.

M. HOUÉNASSI, J. SACCA- VÉHOUNKPE, Y. TCHABI , R. AKINDÈS DOSSOU-YOVO, F. SAÏZONOU, O. BIAOU, M. D'ALMEIDA MASSOUGBODJI, H. AGBOTON.

EP de moyenne gravité	- Présence de signe objectif d'EP - Absence de signe en faveur d'une EP massive et submassive
EP submassive	- Présence de signe objectif d'EP - Présence de signe échoDoppler de cœur pulmonaire aigu - Absence de signe clinique de gravité définis dans l'EP massive
EP massive	Critère d'EP submassive et présence d'un ou de plusieurs des signes cliniques de gravité suivants : état de choc, hypotension artérielle, syncope, insuffisance cardiaque droite aiguë

Cardiologie Tropicale. 2013; 136

Evaluation de la prise en charge de l'embolie pulmonaire dans un pays à faible niveau socio-économique : cas du Bénin.

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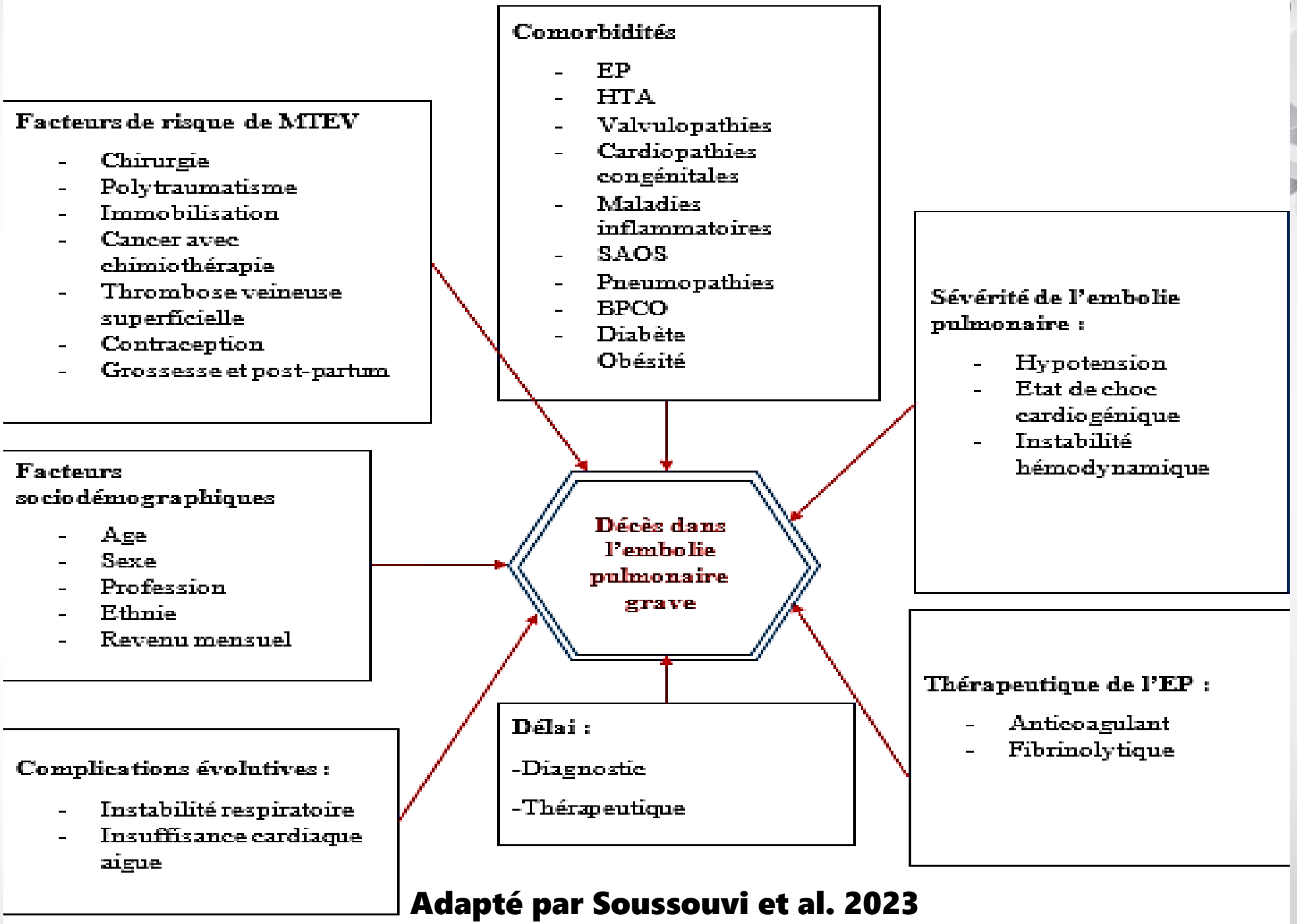
Résultats : Au total 92 patients ont été retenus. L'âge moyen était de 53 ans ± 13,62. Un angioscanner pulmonaire a été réalisé seulement chez 27 patients. L'EP n'a pas été retenue au départ chez 40 patients. Parmi eux un seul a présenté dans l'évolution une récidive des symptômes ayant conduit au diagnostic d'EP. L'EP a été retenue chez 52 patients et sa prévalence était de 01,76 %. Vint deux (22) cas ont été diagnostiqués par angioscanner pulmonaire et 30 par diagnostic indirect. L'EP était massive dans 38,46 %, submassive dans 32,70 % et de moyenne gravité dans 22,84 %. La mortalité a été de 15,38 % principalement favorisée par la survenue de complications hospitalières ($p < 10^{-3}$) dont la fréquence semblait être liée au degré de gravité de l'EP à l'admission (p= 0,048).

Conclusion : Les auteurs concluent que leur stratégie diagnostique est assez efficace mais marquée par un risque de faux négatif. Leur stratégie thérapeutique marquée par l'absence de thrombolyse dans les EP massives a été insuffisante.

Cardiologie Tropicale. 2013; 136

EP

GRAVITE MULTI FACTORIELLE



Adapté par Soussouvi et al. 2023

EMBOLIE PULMONAIRE
→ EFFET MECANIQUE
→ EFFET HUMORAL

RETENTISSEMENT PULMONAIRE

ZONE EMBOLISEE

- ESPACE MORT
  - Hypoxie
  - Hypocapnie
  - Dyspnée
- IRRITATION PLEURALE
  - Douleur thoracique
  - Pleurésie
- BAISSE SURFACTANT
  - Atélectasie
- HISTAMINE + HYPOXIE
  - ↳ INFARTUS PULMONAIRE
    - Hémoptysie
    - condensation pulmonaire

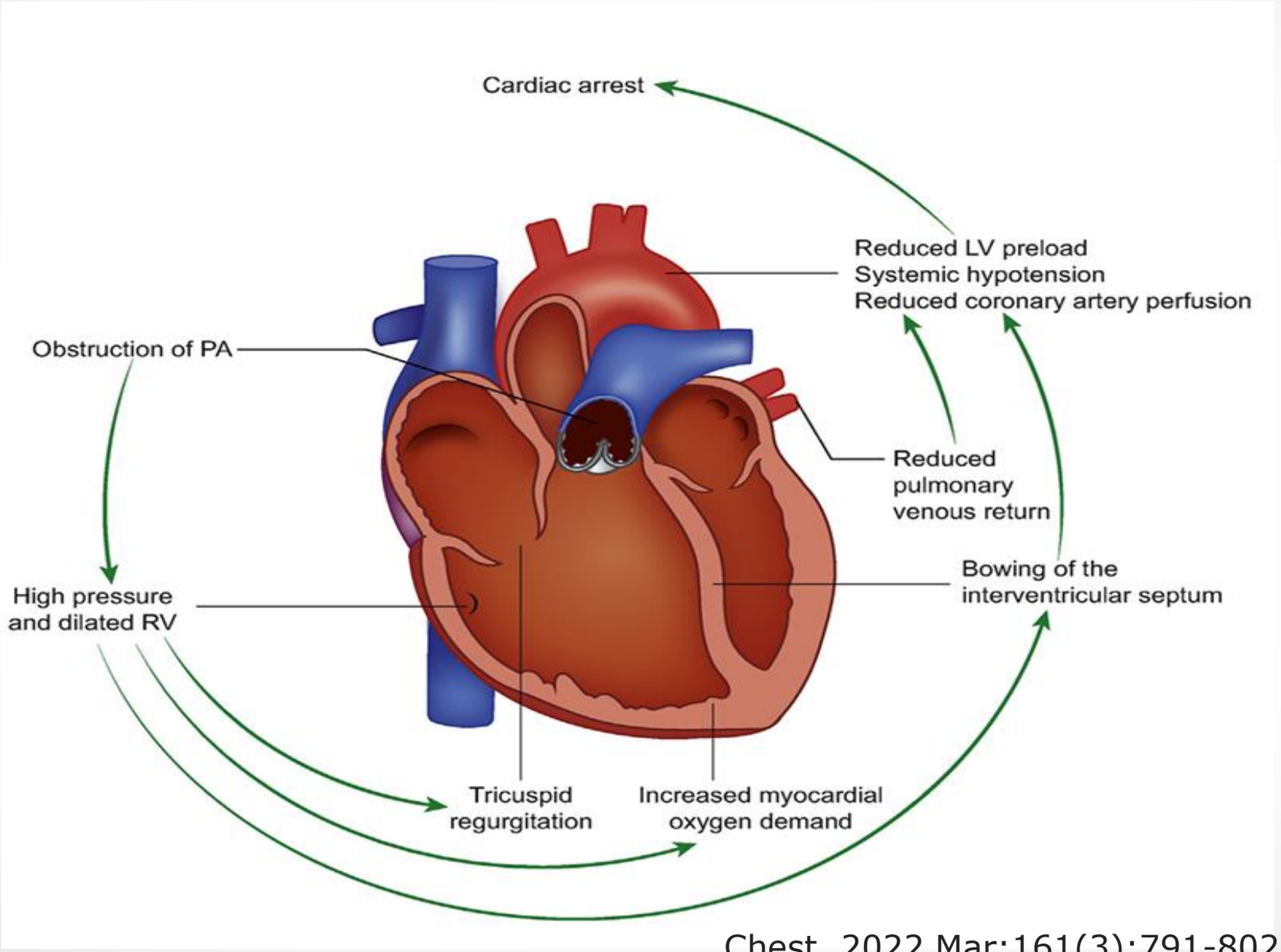
ZONE SAINE

- ↓ VITESSE HEMATIES
  - Hypoxie → DYSPNEE
  (SHUNT)
- BRONCHOCONSTRICTION
  - HYPOXIE (Dyspnée)

RETENTISSEMENT CARDIAQUE

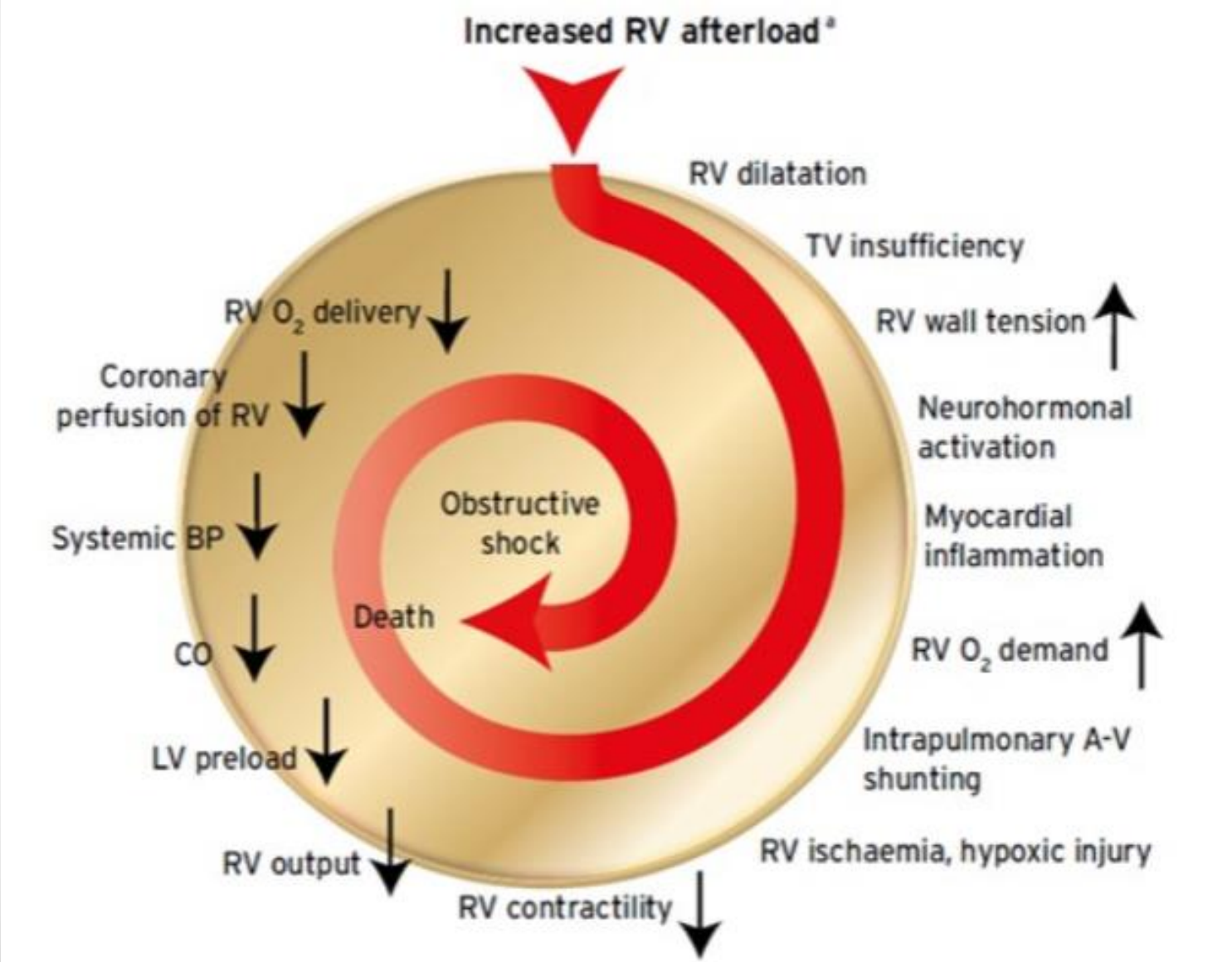
- STIMULATION ADRENERGIQUE
  - Tachycardie
- ↑ POST CHARGE DU VD
  - Dilatation VD
  - Insuffisance Coron D → ECG
  - Dysfonction VD. → ICD aigue
- COMPRESSION AIGUE DU VG
  - Hypotension artérielle
  - choc cardiogénique
  - Syncope.
  - Mort subite.

PHYSIOPATHOLOGIE DE L'EP



Chest. 2022 Mar;161(3):791-802.

PHYSIOPATHOLOGIE DE L'EP



2 CAS DE FIGURES

1. **EP d'emblée à haut risque**
2. **EP à risque intermédiaire**

2019 ESC guidelines on PE

EP D'EMBLEE A HAUT RISQUE

Signes d'appel

(1) Cardiac arrest	(2) Obstructive shock	(3) Persistent hypotension
Need for cardiopulmonary resuscitation	Systolic BP <90 mmHg, or vasopressors required to achieve a BP ≥90 mmHg despite adequate filling status	Systolic BP <90 mmHg, or systolic BP drop ≥40 mmHg, either lasting longer than 15 minutes and not caused by new-onset arrhythmia, hypovolaemia, or sepsis
	And	
	End-organ hypoperfusion (altered mental status; cold, clammy skin; oliguria/anuria; increased serum lactate)	

2019 ESC Guidelines on the diagnosis and management of acute pulmonary embolism

(European Heart Journal 2019 - doi/10.1093/eurheartj/ehz405)

EP D'EMBLEE A HAUT RISQUE

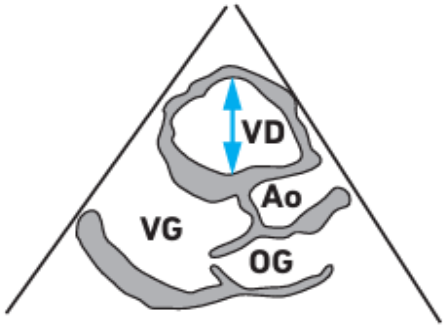
Faire l'echocardiographie transthoracique au lit du malade!

Recommendations	Class	Level
Suspected PE with haemodynamic instability		
In suspected high-risk PE, as indicated by the presence of haemodynamic instability, bedside echocardiography or emergency CTPA (depending on availability and clinical circumstances) are recommended for diagnosis.	I	C
It is recommended that i.v. anticoagulation with UFH, including a weight-adjusted bolus injection, be initiated without delay in patients with suspected high-risk PE.	I	C

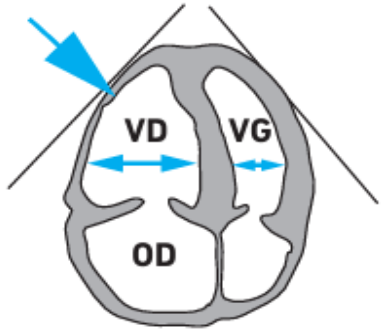
CTPA = computed tomography pulmonary angiography.

EP D'EMBLEE A HAUT RISQUE

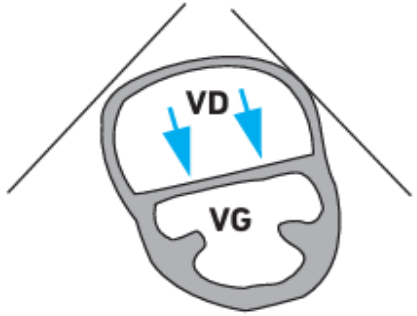
Signes echocardiographiques-Doppler



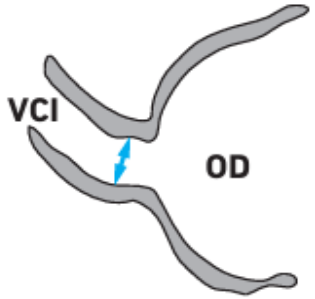
A. VD dilaté, vue grand axe parasternal.



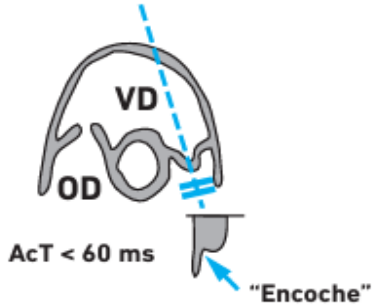
B. VD dilaté avec rapport VD/VG basal > 1,0 et signe de McConnell (**flèche**), vue quatre cavités.

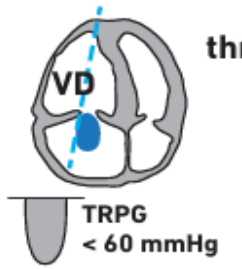


C. Septum interventriculaire aplati (**flèches**), vue petit axe parasternal.

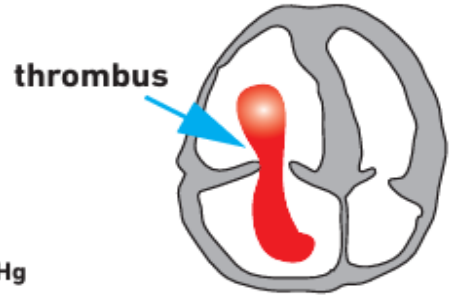


D. VCI distendue avec diminution de la "collapsibilité" inspiratoire, vue sous-costale.

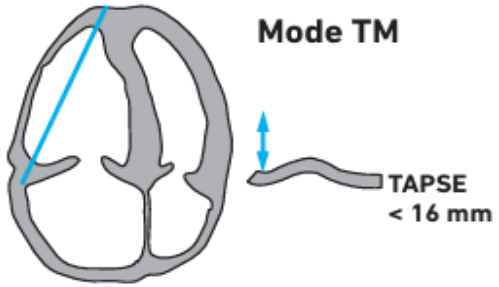




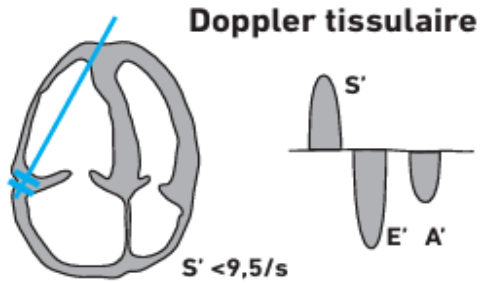
E. Signe 60/60 : coexistence d'un temps d'accélération de l'éjection pulmonaire < 60 ms et d'une "encoche" mésosystolique avec élévation modérée (< 60 mmHg) du gradient systolique maximal à travers la valve tricuspide.



F. Thrombus mobile dans le cœur droit (**flèche**).



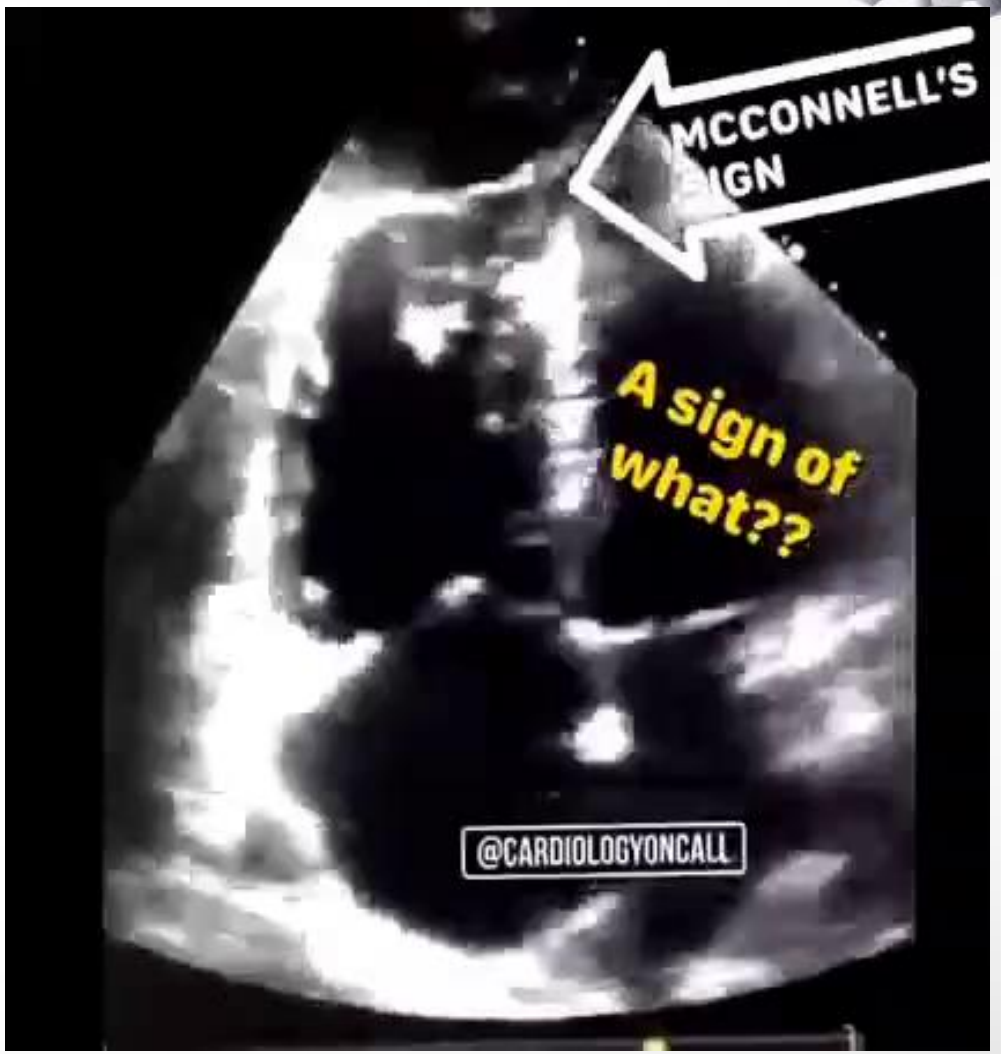
G. TAPSE diminué (< 16 mm) mesuré en mode TM.



H. Diminution du pic de vélocité systolique (S') à l'anneau tricuspide (< 9,5 cm/s).

EP D'EMBLEE A HAUT RISQUE

Signes echocardiographiques-Doppler



EP D'EMBLEE A HAUT RISQUE

Faire l'angioscanner multicoupes si patient deplaçable

	Strengths	Weaknesses/limitations
CTPA	• Readily available around the clock in most centres • Excellent accuracy • Strong validation in prospective management outcome studies • Low rate of inconclusive results (3–5%) • May provide alternative diagnosis if PE excluded • Short acquisition time	• Radiation exposure • Exposure to iodine contrast: – limited use in iodine allergy and hyperthyroidism – risks in pregnant and breast-feeding women – contraindicated in severe renal failure • Tendency to overuse because of easy accessibility • Clinical relevance of CTPA diagnosis of subsegmental PE unknown

CTPA = computed tomography pulmonary angiography.

EP D'EMBLEE A HAUT RISQUE

Signes scanographiques

EP D'EMBLEE A HAUT RISQUE

Test non recommandés

	Strengths	Weaknesses/limitations
Planar V/Q scan	• Almost no contraindications • Relatively inexpensive • Strong validation in prospective management outcome studies	• Not readily available in all centres • Interobserver variability in interpretation • Results reported as likelihood ratios • Inconclusive in 50% of cases • Cannot provide alternative diagnosis
V/Q SPECT	• Almost no contraindications • Lowest rate of non-diagnostic tests (<3%) • High accuracy according to available data • Binary interpretation ("PE" vs "no PE")	• Variability of techniques • Variability of diagnostic criteria • Cannot provide alternative diagnosis • No validation in prospective management outcome studies
Pulmonary angiography	• Historical gold standard	• Invasive procedure • Not readily available in all centres

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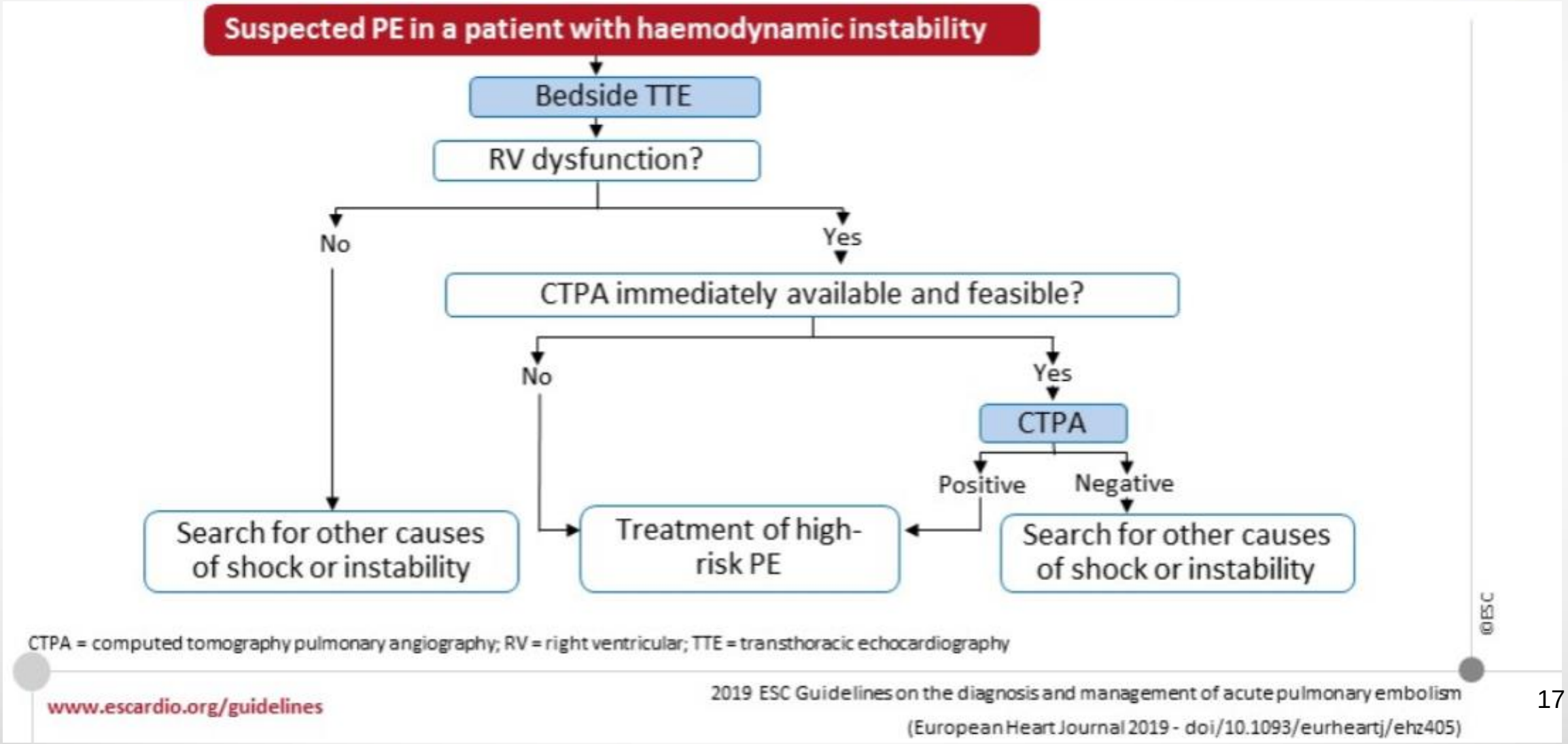
2019 ESC Guidelines on the diagnosis and management of acute pulmonary embolism

(European Heart Journal 2019 - doi/10.1093/eurheartj/ehz405)

EP D'EMBLEE A HAUT RISQUE

Stratégie diagnostique



CTPA = computed tomography pulmonary angiography; RV = right ventricular; TTE = transthoracic echocardiography

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EP A RISQUE INTERMEDIAIRE

Score de PESI (Pulmonary Embolism Severity Index) Simplifié

Parameter[a,b]	Score
Age > 80 years	1
History of cancer	1
Chronic cardiopulmonary disease	1
Pulse ≥ 110 bpm	1
Systolic blood pressure < 100 mm Hg	1
Arterial oxyhemoglobin saturation level < 90%	1

0 points = 30-day mortality risk 1.0% (95% CI, 0.0%-2.1%).[b]
≥ 1 point(s) = 30-day mortality risk 10.9% (95% CI ,8.5%-13.2%).[b]

a. Jiménez D, et al. *Arch Intern Med*. 2010;170:1383-1389.
b. Konstantinides SV, et al. *Eur Heart J*. 2014;35:3033-3069, 3069a-3069k.

EP A RISQUE INTERMEDIAIRE

Autres scores

Supplementary Table 4 **Scores for advanced risk stratification**

	Bova score[12–15]		FAST score[13,16,17]	
	Parameter	**Score points**	**Item**	**Score points**
	Elevated cardiac troponin	2	H-FABP ≥6 ng/mL or elevated cardiac troponin	1.5
	RV dysfunction (TTE or CTPA)[a]	2	Syncope	1.5
	Heart rate ≥110 b.p.m.	1	Heart rate ≥100 b.p.m.	2
	Systolic BP 90–100 mmHg	2		
Risk classes				
Low risk	0–2 points	≤4 points[b]	<3 points	
Intermediate-low risk	3–4 points			
Intermediate-high risk	>4 points	>4 points[b]	≥3 points	

Scores for advanced stratification of PE-related risk in patients presenting without haemodynamic instability.

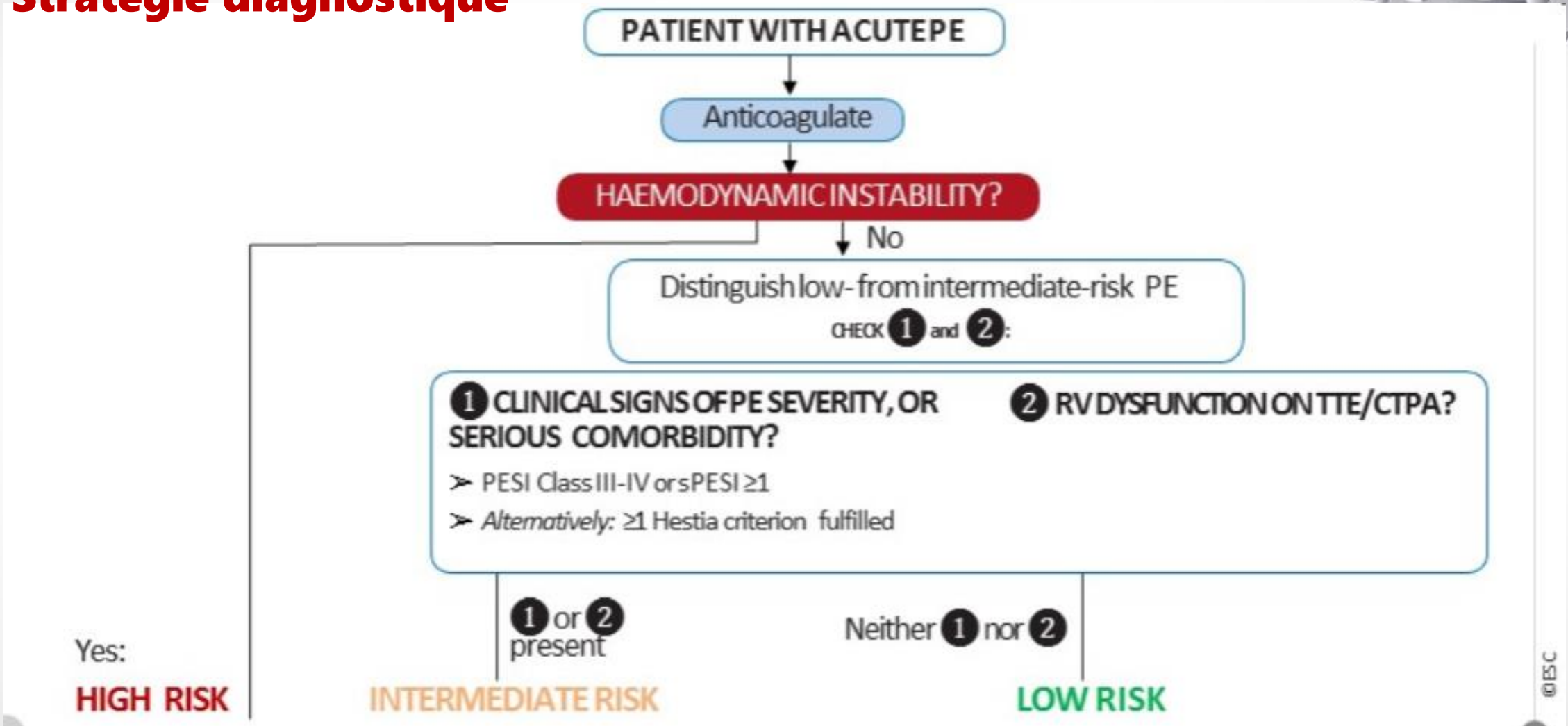
BP = blood pressure; b.p.m. = beats per minute; CTPA = computed tomography pulmonary angiography; FAST = H-FABP (or high-sensitivity troponin T), Syncope, Tachycardia; H-FABP = heart-type fatty acid-binding protein; PE = pulmonary embolism; RV = right ventricular; TTE = transthoracic echocardiography.

[a]Parameters and cut-off values varied among studies from which the Bova score was derived; see *Figure 3* and *Supplementary Table 3*.

[b]If the Bova score is dichotomized.[13,14]

EP A RISQUE INTERMEDIAIRE

Stratégie diagnostique



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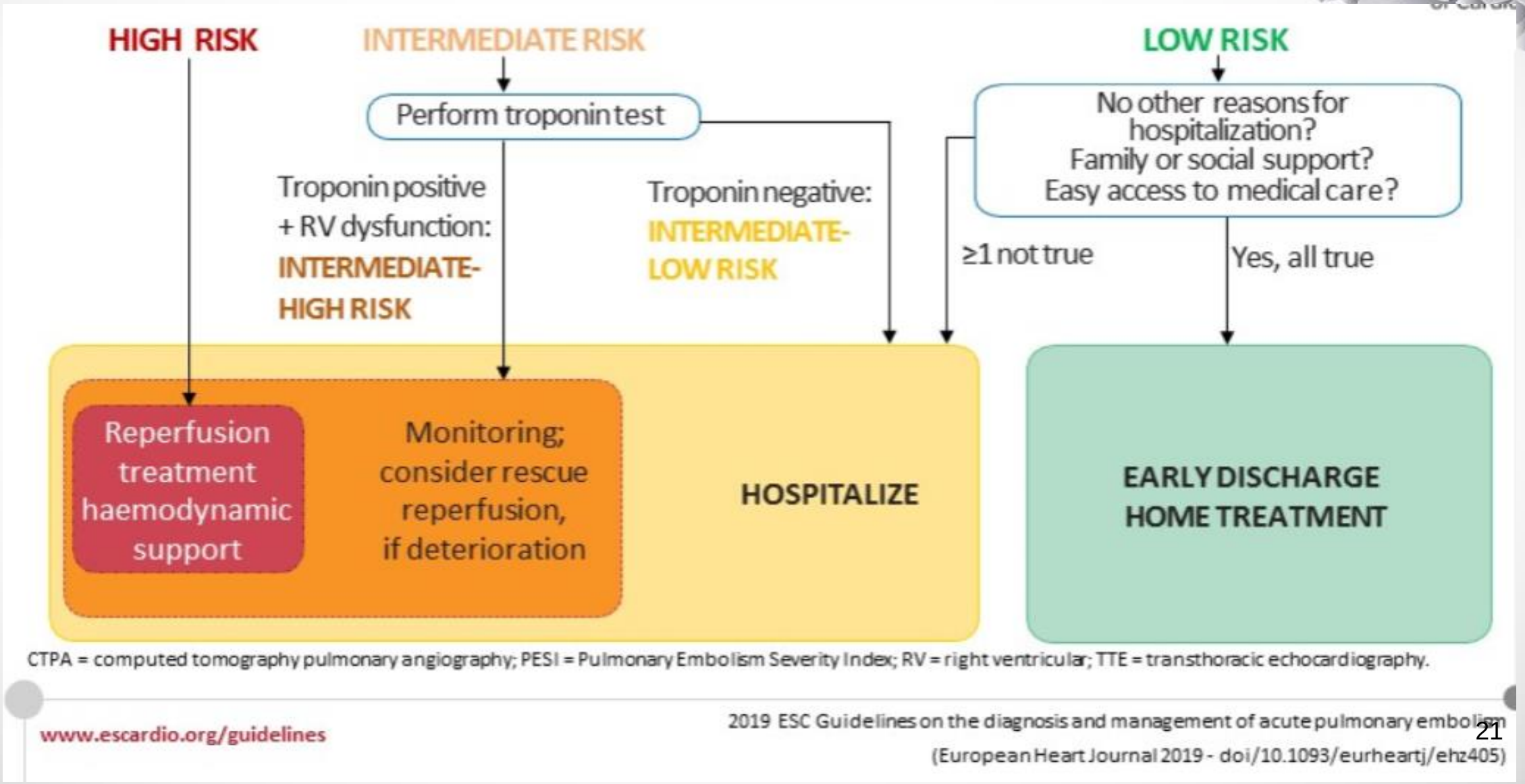
EP D'EMBLEE A RISQUE INTERMEDIAIRE

Stratégie diagnostique



CTPA = computed tomography pulmonary angiography; PESI = Pulmonary Embolism Severity Index; RV = right ventricular; TTE = transthoracic echocardiography.

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2019 ESC Guidelines on the diagnosis and management of acute pulmonary embolism (European Heart Journal 2019 - doi/10.1093/eurheartj/ehz405)

EP ET RISQUE HEMORRAGIQUE

Toujours l'évaluer avant d'initier le traitement antithrombotique

HAS-BLED[48,49]	Uncontrolled hypertension	1	0–2: low
	Abnormal liver/renal function	1	≥3: high
	Previous stroke	1	
	Bleeding history or predisposition	1	
	Labile INR (time in therapeutic range <60%)	1	
	Age >65 years	1	
	Concomitant drugs or alcohol	1	

TRAITEMENT DE L'EP

Support hémodynamique

Strategy	Properties and use	Caveats
Volume optimization		
Cautious volume loading, saline, or Ringer's lactate, up to 500 mL over 15–30 min	Consider in patients with normal-to-low central venous pressure (due, for example, to concomitant hypovolaemia)	Volume loading can overdistend the RV, worsen ventricular interdependence, and reduce CO

CO = cardiac output; RV = right ventricle/ventricular.

TRAITEMENT DE L'EP

Support hémodynamique

Vasopressors and inotropes		
Norepinephrine, 0.2–1.0µg/kg/min	Increases RV inotropy, systemic BP; promotes positive ventricular interactions; restores coronary perfusion gradient	Excessive vasoconstriction may worsen tissue perfusion
Dobutamine, 2–20 µg/kg/min	Increases RV inotropy, lowers filling pressures	May aggravate arterial hypotension if used alone, without a vasopressor; may trigger or aggravate arrhythmias

BP = blood pressure; RV = right ventricular.

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TRAITEMENT DE L'EP

Assistance respiratoire

1. Oxygénothérapie si SaO2 ≤90%
2. Ventilation non invasive
3. Intubation (a éviter au mieux)
4. Extra Corporal Membrane Oxygenation

Mechanical circulatory support		
Veno-arterial ECMO/ extracorporeal life support	Rapid short-term support combined with oxygenator	Complications with use over longer periods (>5–10 days), including bleeding and infections; no clinical benefit unless combined with surgical embolectomy; requires an experienced team

ECMO = extracorporeal membrane oxygenation; RV = right ventricular.

TRAITEMENT DE L'EP

Préferer HNF chez patient instable

	modalités	surveillance
HNF	IV[1]. Bolus de 80 UI/kg puis perfusion de 18UI/kg/h adaptée au TCA (1,5 à 2,5 fois le témoin) équivalent à une héparinémie entre 0,3 et 0,6 UI, 6 h après chaque changement de posologie, et au moins une fois / j	Plaquettes 2 fois / sem.
HBPM	SC[2]. A dose curative tinzaparine 175 UI/kg x 1/j enoxaparine 100 UI/ kg x2/j dalteparine* 100 UI/kg x 2/j nadroparine* 171 UI/kg x 1 /j	Pas de surveillance
Fonda-parinux	SC. Une fois / jour 5 mg si poids < 50kg, 7,5 mg si poids entre 50 et 100 Kg, 10 mg si poids > 100 kg	Pas de surveillance plaquettaire

TRAITEMENT DE L'EP

Thrombolytiques

Molecule	Regimen	Contraindications to fibrinolysis
Recombinant tissue-type plasminogen activator (rtPA)	100 mg over 2 h	**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 • Active bleeding
	0.6 mg/kg over 15 min (maximum dose 50 mg)	
Streptokinase	250,000 IU as a loading dose over 30 min, followed by 100,000 IU/h over 12–24 h	
	Accelerated regimen: 1.5 million IU over 2 h	

TRAITEMENT DE L'EP

Thrombolytiques

ABSOLUTE	RELATIVE
Ischemic stroke in last 6 months	Transient ischemic attack in the last 6 months
Central nervous system neoplasm	Pregnancy or first postpartum week
History of hemorrhagic stroke	Oral anticoagulation
Major trauma, surgery, head injury in last 3 weeks	Traumatic resuscitation
Bleeding diathesis/active bleeding	Use of ECMO
	Advanced liver disease
	Infective endocarditis
	Active peptic ulcer
	Refractory hypertension (systolic BP > 180)

ECMO indicates extracorporeal membrane oxygenation.

TRAITEMENT DE L'EP A HAUT RISQUE

Revasculariser en urgence

Recommendations	Class	Level
It is recommended that anticoagulation with UFH, including a weight-adjusted bolus injection, be initiated without delay in patients with high-risk PE.[a]	I	C
Systemic thrombolytic therapy is recommended for high- risk PE.	I	B
Surgical pulmonary embolectomy is recommended for patients with high-risk PE, in whom thrombolysis is contraindicated or has failed.	I	C

[a] After haemodynamic stabilization of the patient, continue anticoagulation as in intermediate- or low-risk PE.
UFH = unfractionated heparin.

TRAITEMENT DE L'EP A RISQUE INTERMEDIAIRE

Revasculariser en urgence si aggravation

Recommendations	Class	Level
Reperfusion treatment		
Rescue thrombolytic therapy is recommended for patients with haemodynamic deterioration on anticoagulation treatment.	I	B
As an alternative to rescue thrombolytic therapy, surgical embolectomy or percutaneous catheter- directed treatment should be considered for patients with haemodynamic deterioration on anticoagulation treatment.	IIa	C
Routine use of primary systemic thrombolysis is not recommended in patients with intermediate- or low-risk PE.	III	B

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TRAITEMENT DE DE L'EP A HAUT RISQUE

Revasculariser en urgence

Table 1 Indications for surgical pulmonary embolectomy

Massive or submassive PE with any of the following:

Contraindication to thrombolytic therapy

- History of intracranical hemorrhage
- Intracranial malignancy, mass, or aneurysm
- Cerebrovascular accident with the past 3 months
- Major surgery within the past 1 month
- Brain or spinal surgery within the past 2 months

Failed thrombolytic therapy

Patent foramen ovale

Pregnancy

Right heart failure or cardiogenic shock

Thrombus-in-transit within the right sided heart chambers

TRAITEMENT DE L'EP A HAUT RISQUE

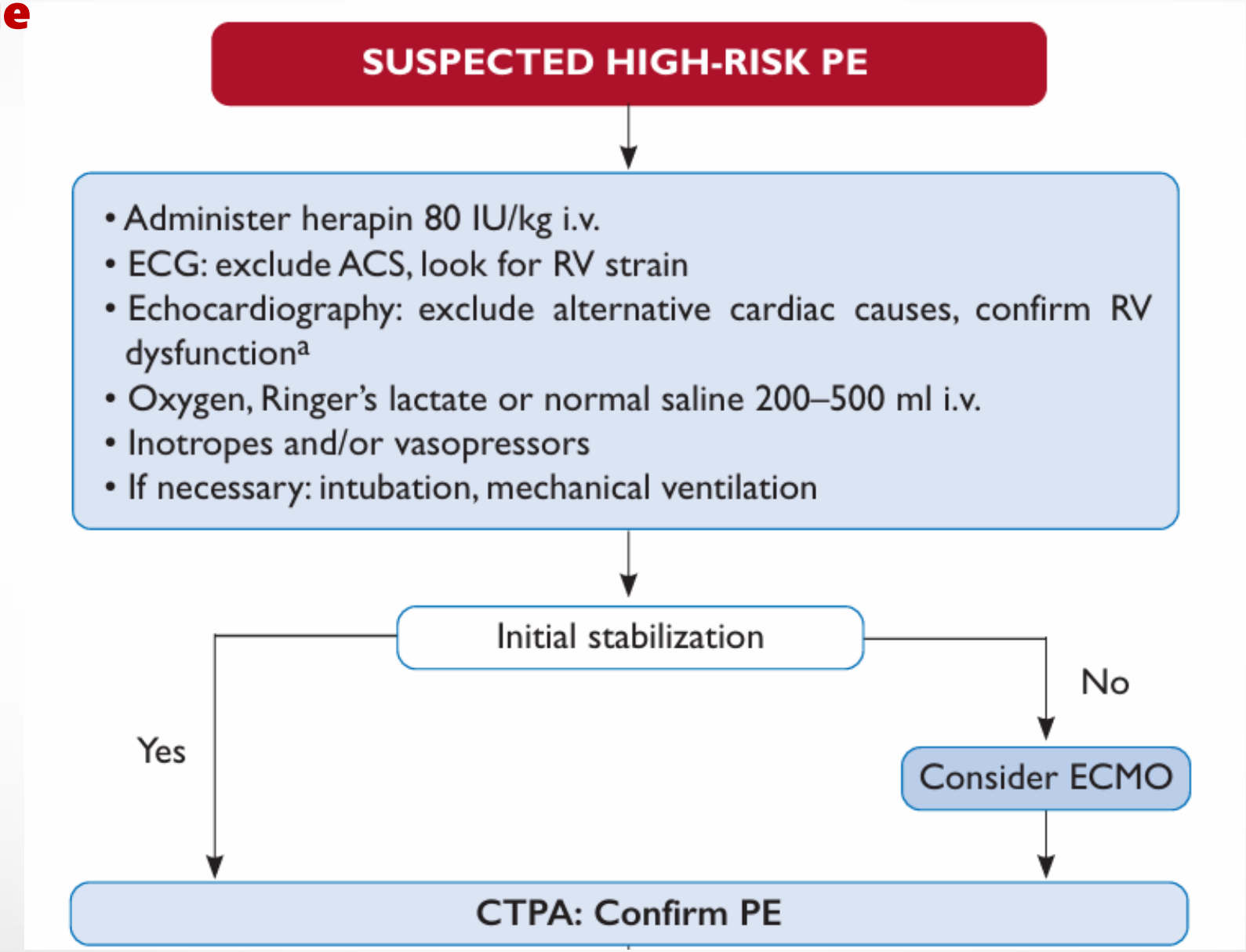
Recommendations for inferior vena cava (IVC) filters

ESC European Society of Cardiology

Recommendations	Class	Level
IVC filters should be considered in patients with acute PE and absolute contraindications to anticoagulation.	IIa	C
IVC filters should be considered in case of PE recurrence despite therapeutic anticoagulation.	IIa	C
Routine use of IVC filters is not recommended.	III	A

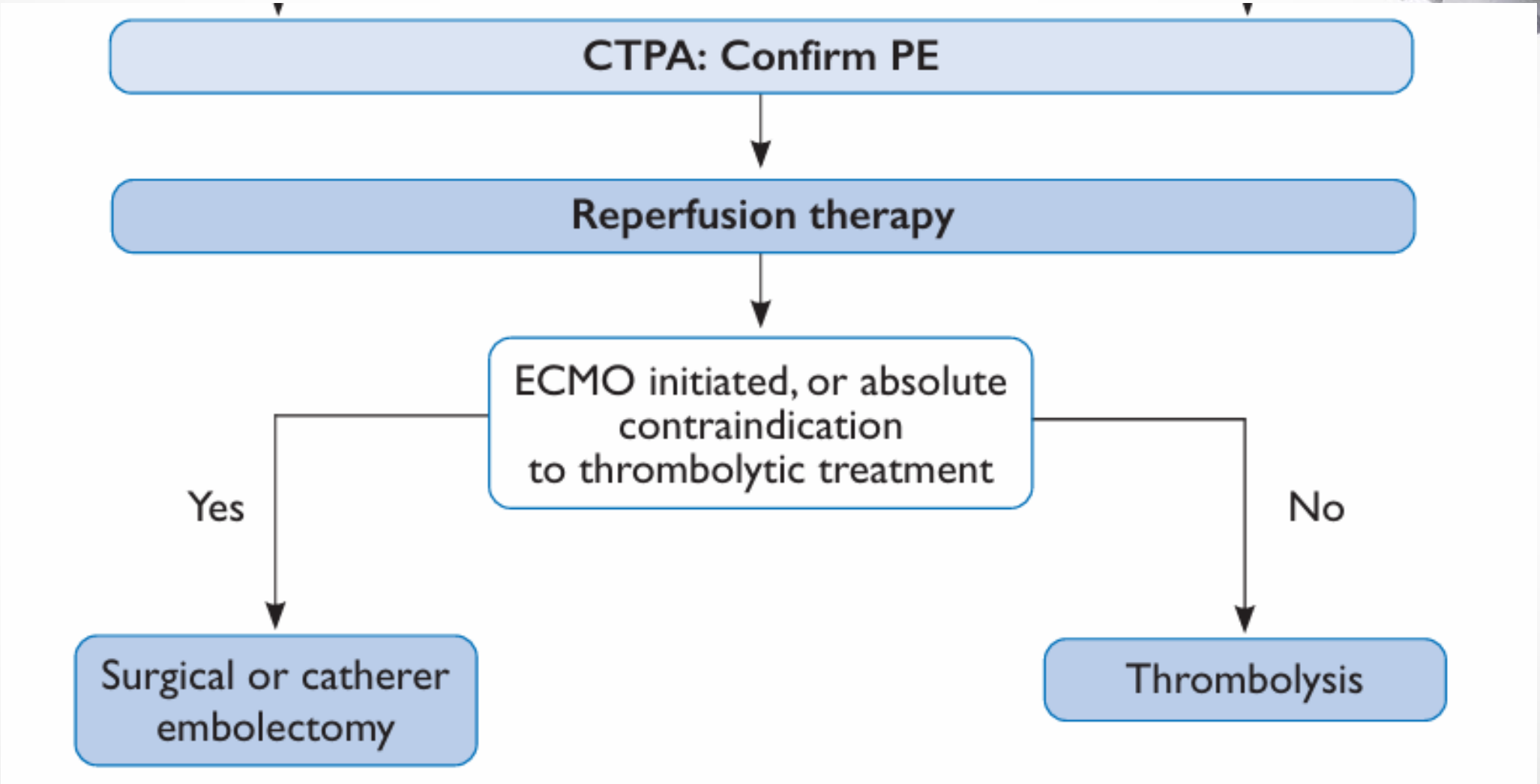
TRAITEMENT DE DE L'EP A HAUT RISQUE

En pratique



TRAITEMENT DE L'EP A HAUT RISQUE

En pratique



TRAITEMENT DE L'EP A HAUT RISQUE

En pratique

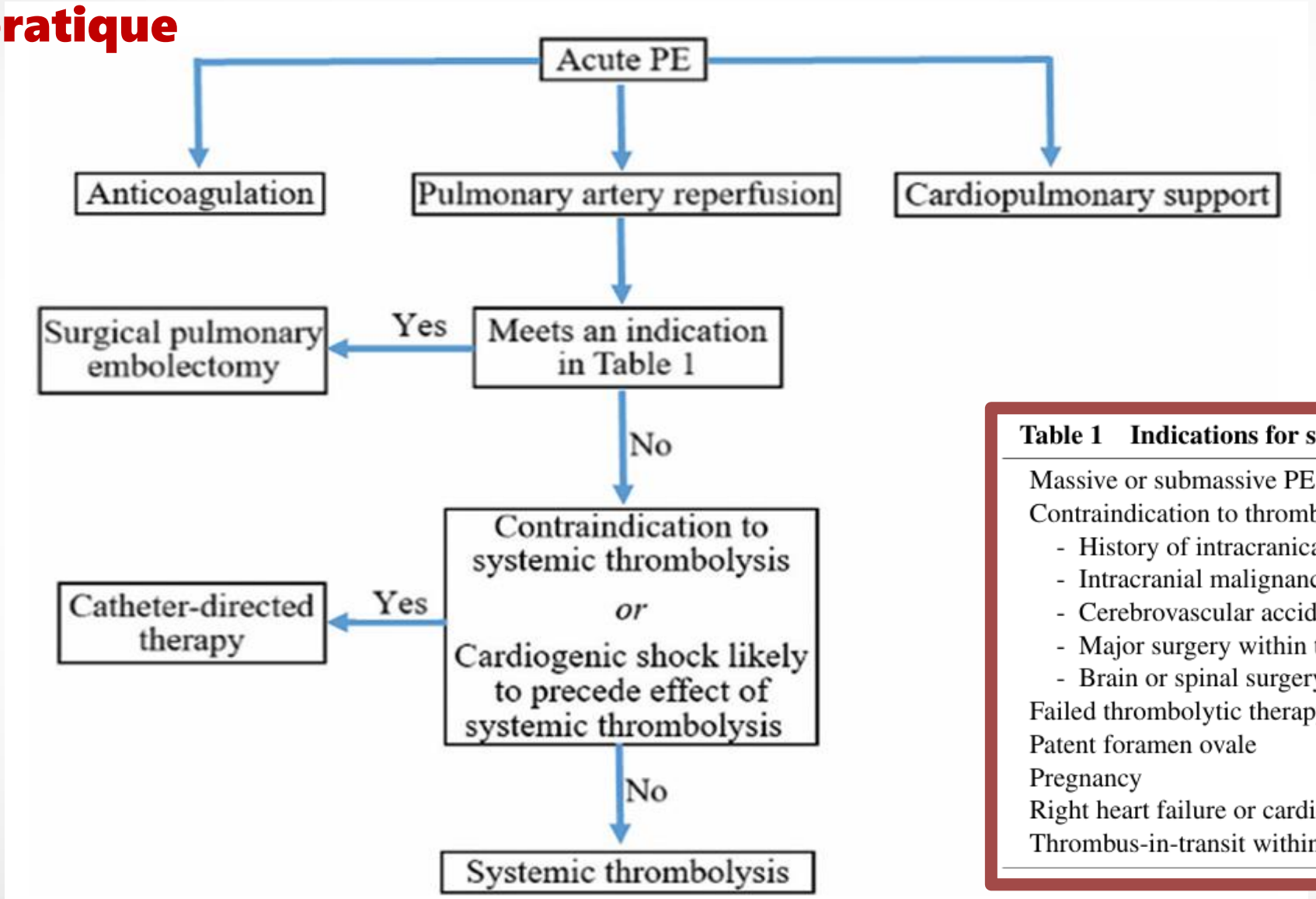
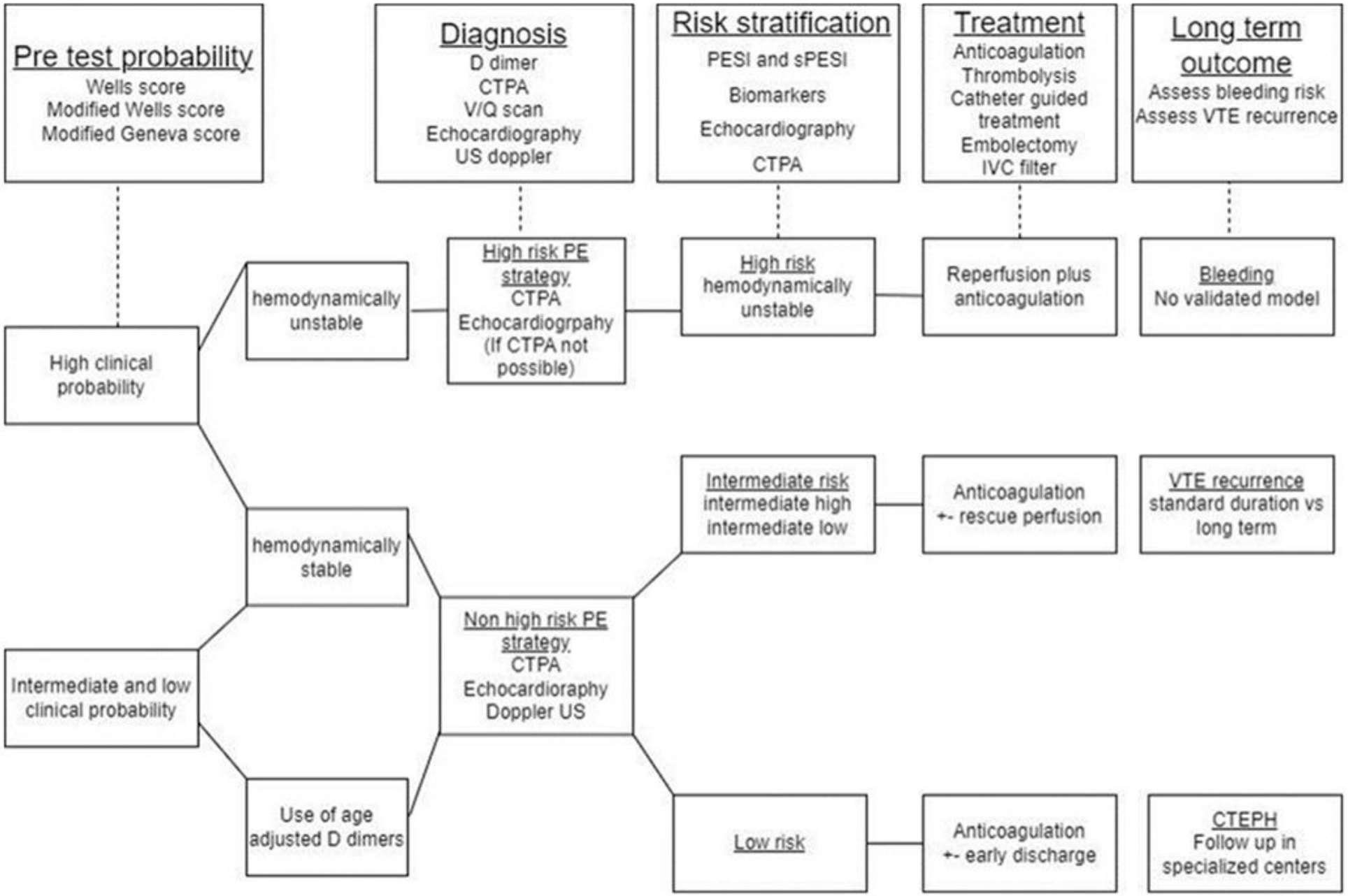


Fig. 2 Acute PE reperfusion algorithm. PE: pulmonary embolism

Table 1 Indications for surgical pulmonary embolectomy

Massive or submassive PE with any of the following:
Contraindication to thrombolytic therapy
- History of intracranical hemorrhage
- Intracranial malignancy, mass, or aneurysm
- Cerebrovascular accident with the past 3 months
- Major surgery within the past 1 month
- Brain or spinal surgery within the past 2 months
Failed thrombolytic therapy
Patent foramen ovale
Pregnancy
Right heart failure or cardiogenic shock
Thrombus-in-transit within the right sided heart chambers


Pre test probability
Wells score
Modified Wells score
Modified Geneva score
Diagnosis
D dimer
CTPA
V/Q scan
Echocardiography
US doppler
Risk stratification
PESI and sPESI
Biomarkers
Echocardiography
CTPA
Treatment
Anticoagulation
Thrombolysis
Catheter guided treatment
Embolectomy
IVC filter
Long term outcome
Assess bleeding risk
Assess VTE recurrence
High clinical probability
hemodynamically unstable
High risk PE strategy
CTPA
Echocardiogrpahy (If CTPA not possible)
High risk hemodynamically unstable
Reperfusion plus anticoagulation
Bleeding
No validated model
hemodynamically stable
Intermediate and low clinical probability
Use of age adjusted D dimers
Non high risk PE strategy
CTPA
Echocardioraphy
Doppler US
Intermediate risk
intermediate high
intermediate low
Anticoagulation
+- rescue perfusion
VTE recurrence
standard duration vs long term
Low risk
Anticoagulation
+- early discharge
CTEPH
Follow up in specialized centers


Merci