Cardiology Update® 2015

Davos, Switzerland 8-12 February 2015

Tuesday, 10 February 2015

Room Davos 2

13:30-15:00	**Afternoon Session 1: Thrombosis and Pulmonary Embolism** Chair: A.J. Camm, London and J. Steffel, Zurich	
13:30	Diagnosis of thrombosis and pulmonary embolism	H. Bounameaux, Geneva
13:52	ESC Guidelines on pulmonary embolism: recommendations and patient management	A. Torbicki, Warszawa
14:14	Comparison of the efficacy and safety of NOACs	R.P. Giugliano, Boston
14:36	Ultrasound-assisted thrombolysis for acute pulmonary embolism	N. Kucher, Berne
15:00-15:30	**Coffee**	

2014 ESC Guidelines on the diagnosis and management of acute pulmonary embolism

Endorsed by the European Respiratory Society (ERS)

Chairpersons: Stavros Konstantinides (Germany/Greece), Adam Torbicki (Poland)

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European Heart Journal (2014):doi:10.1093/eurheartj/ehu283

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Relevant *new* aspects 2014 – staging/management

„PEITHO"

NOACs for PE

Europ Registry

(1) New predisposing factors
(2) Simplification of clinical prediction rules
(3) Age-adjusted D-dimer cut-offs
(4) Sub-segmental/incidental PE
(5) New stratification of mortality risk PE
(6) Enigma of thrombolytic treatment in intermediate risk PE
(7) Initiation of treatment with vitamin K antagonists
(8) PE treatment with non-Vitamin-K-dependent oral ACs
(9) Early discharge and home (outpatient) treatment of PE
(10) Current diagnosis and treatment of CTEPH
(11) Recommendations for PE in cancer/pregnancy

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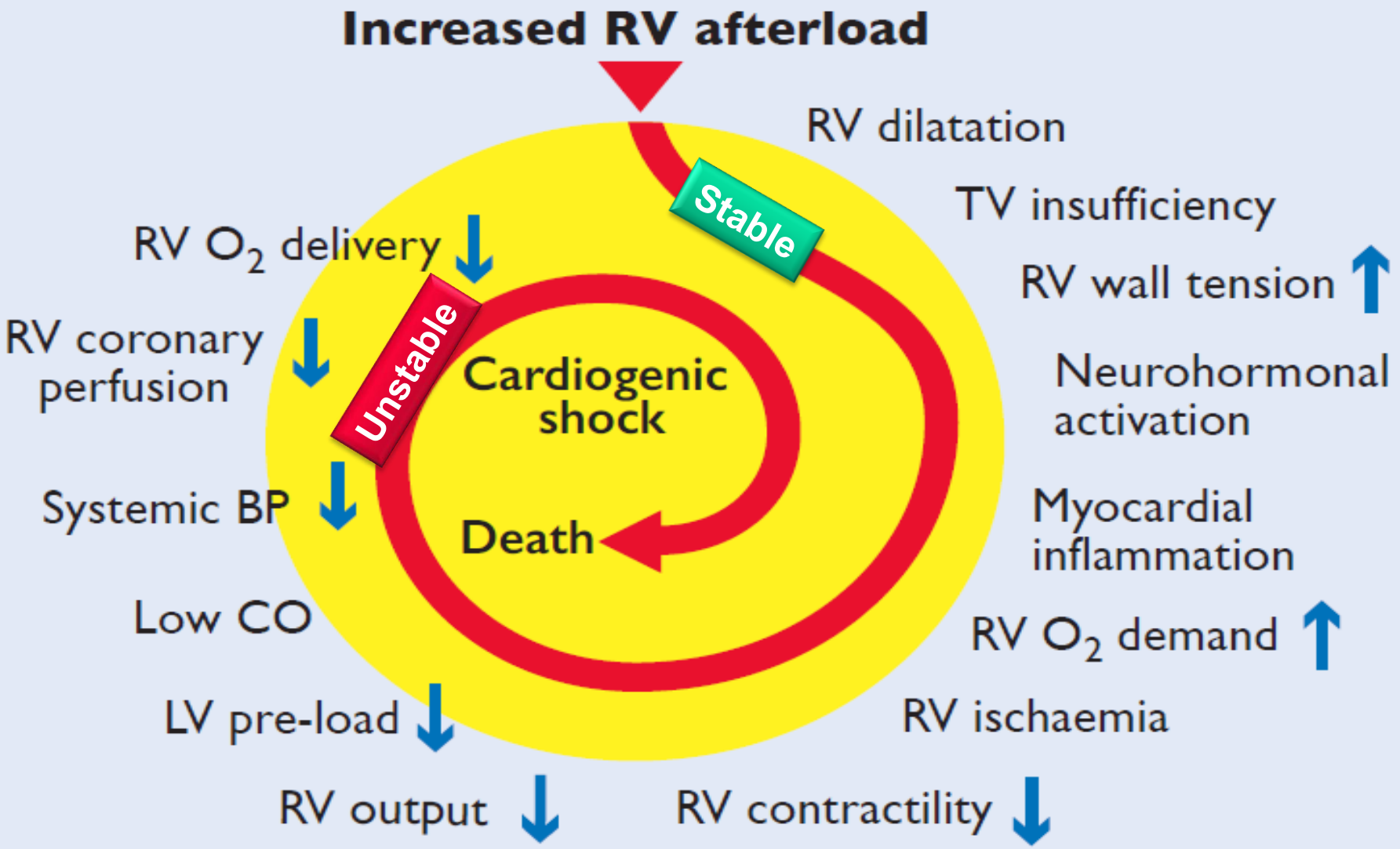
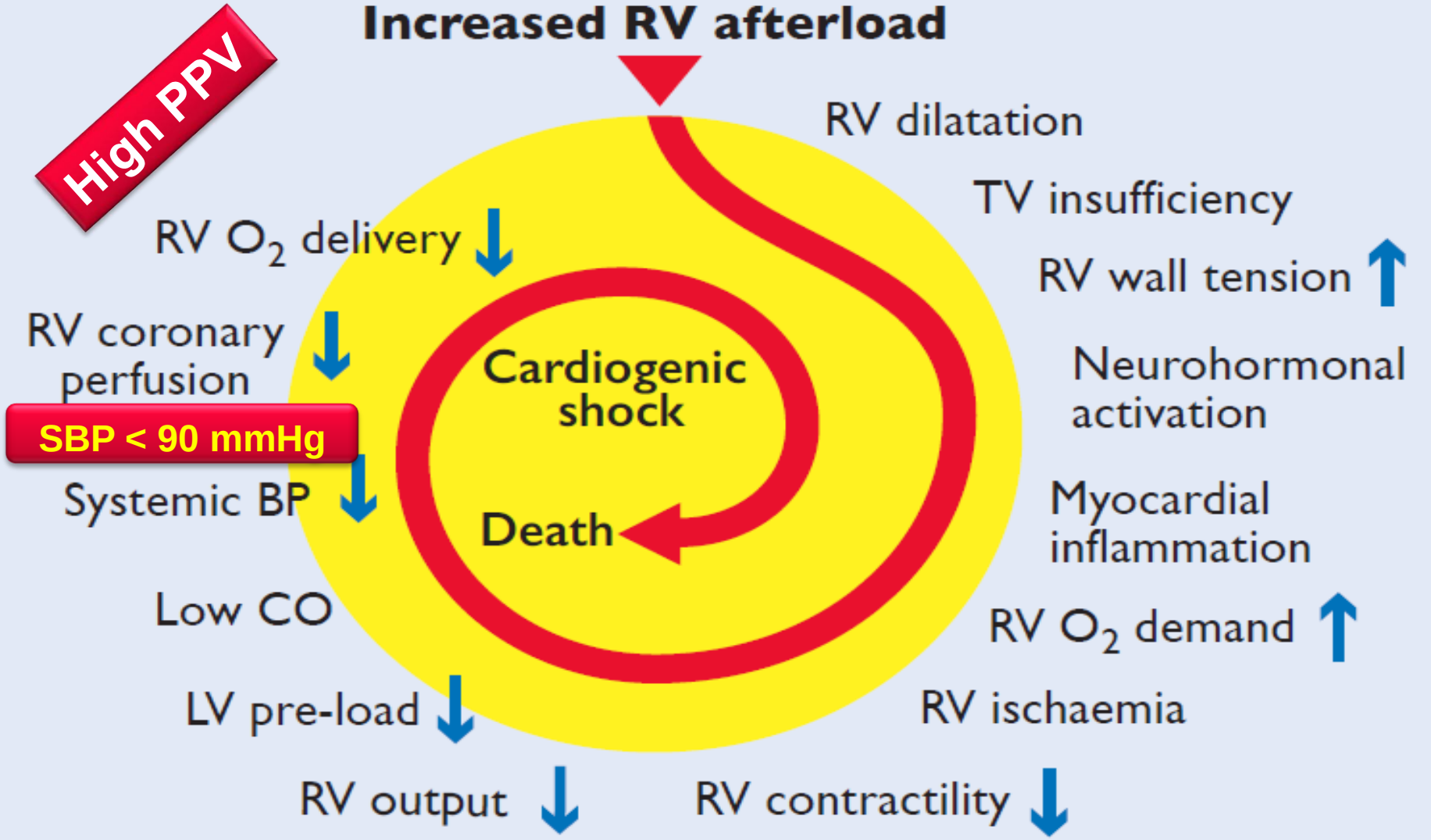


BP = blood pressure; CO = cardiac output; LV = left ventricular; RV = right ventricular; TV = tricuspid valve.



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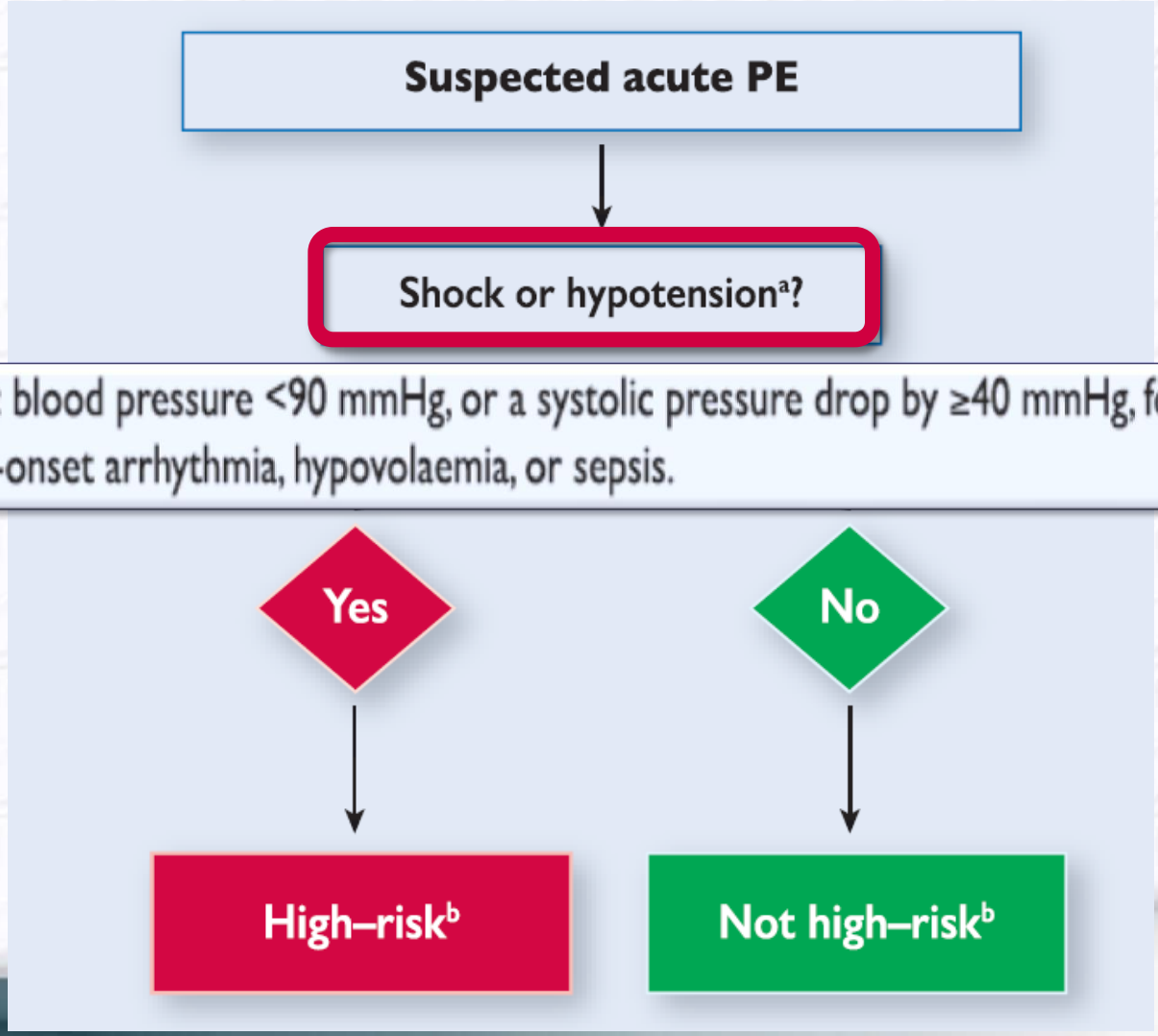
Initial risk stratification of acute PE



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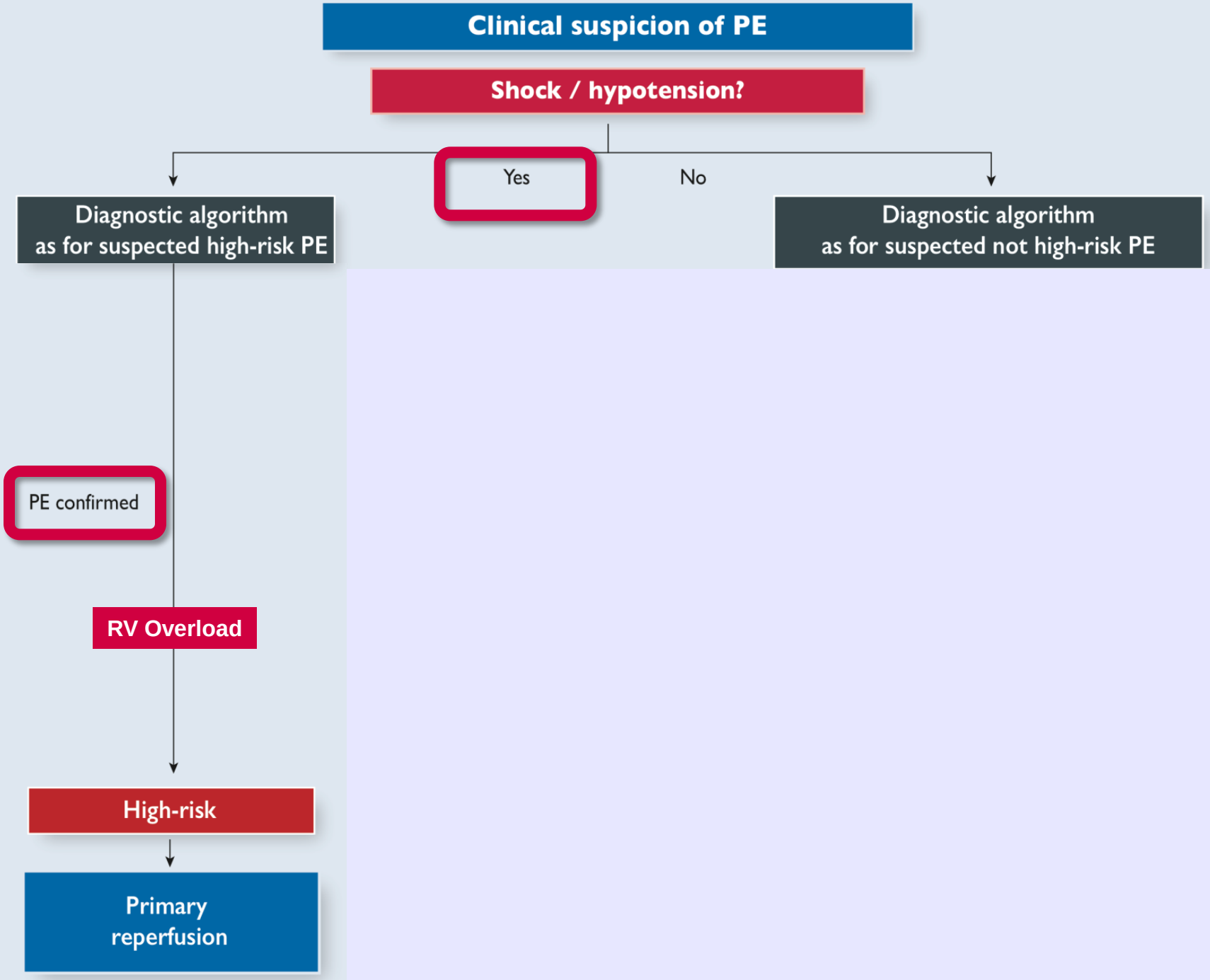
Clinical suspicion of PE
Shock / hypotension?
Yes
No
Diagnostic algorithm as for suspected high-risk PE
Diagnostic algorithm as for suspected not high-risk PE
PE confirmed
RV Overload
High-risk
Primary reperfusion

Recommendations for acute phase treatment

PE with shock or hypotension (high-risk)		
It is recommended to initiate intravenous anticoagulation with UFH without delay in patients with high-risk PE.	I	C
Thrombolytic therapy is recommended.	I	B
Surgical pulmonary embolectomy is recom[illegible]or patients in whom thrombolysis is contraindicat[illegible]s failed.[c]	I	C
Percutaneous catheter-dire[illegible]atment should be considered as an alternative to surgical pulmonary embolectomy for patients in whom full-dose systemic thrombolysis is contraindicated or has failed.[c]	IIa	C

Primary reperfusion

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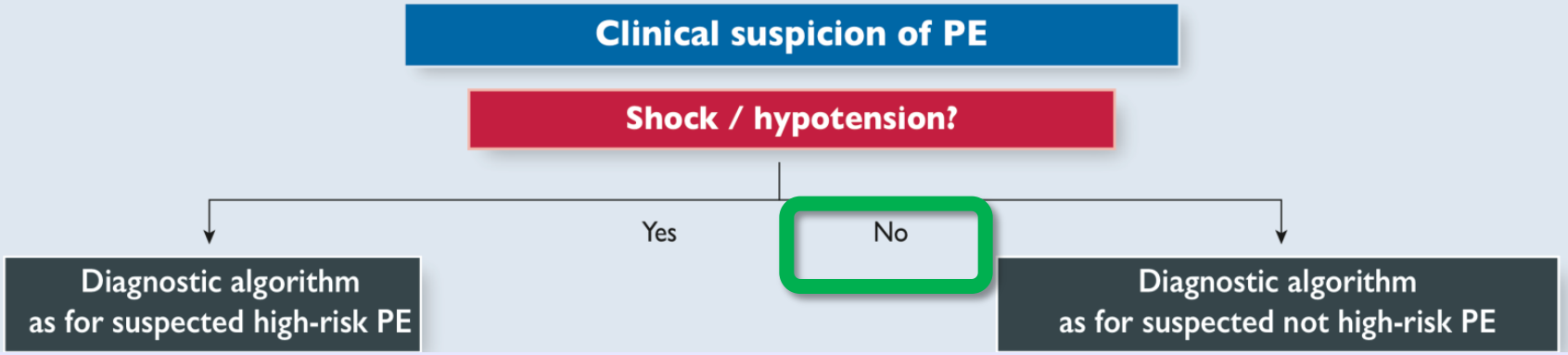
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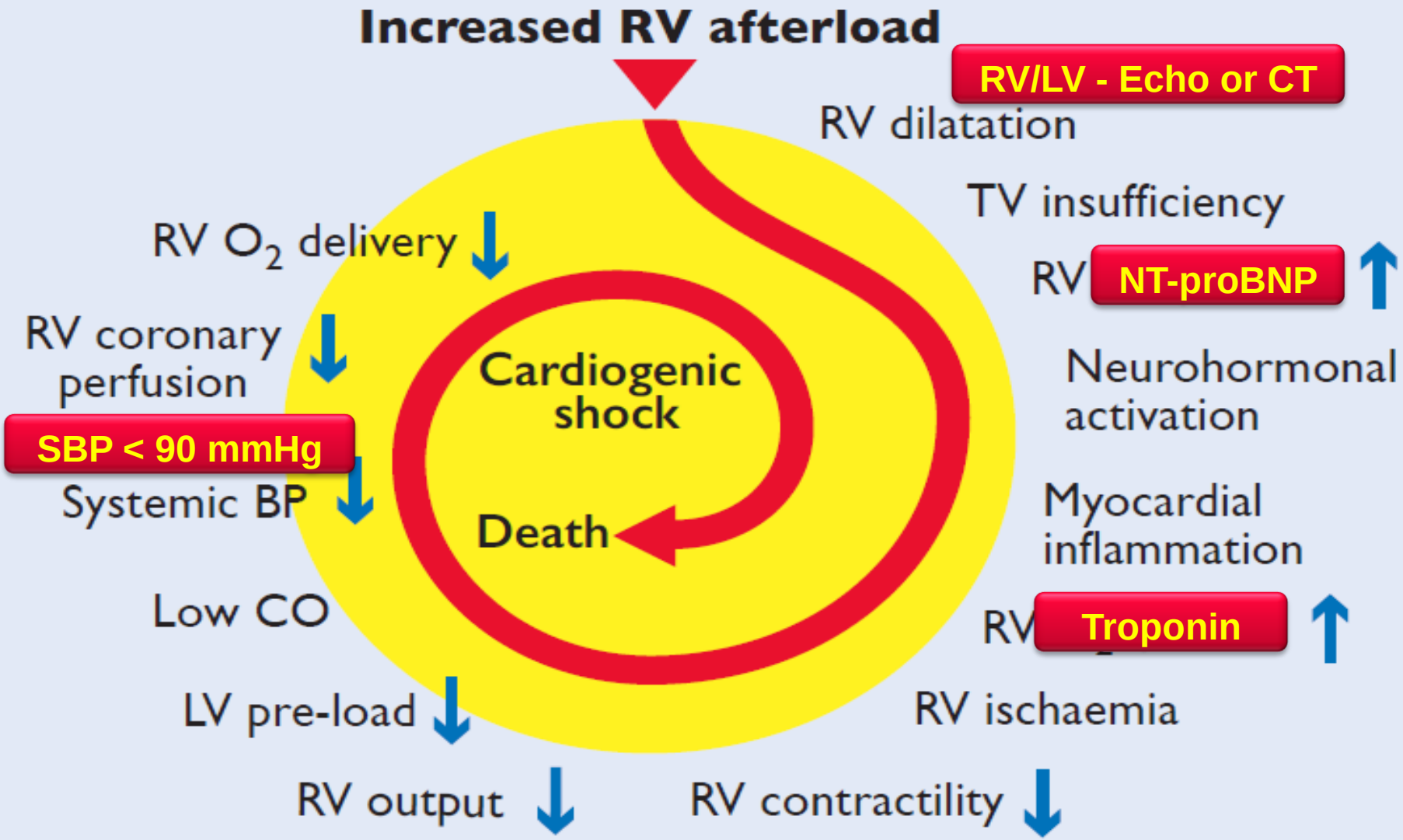
Diagnostic algorithm
as for suspected not high-risk PE



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Original and simplified pulmonary embolism severity index (PESI)

Parameter	Original version	Simplified version
Age	Age in years	1 point (if age >80 years)
Male sex	+10 points	–
Cancer	+30 points	1 point
Chronic heart failure	+10 points	1 point
Chronic pulmonary disease	+10 points	
Pulse rate ≥110 b.p.m.	+20 points	1 point
Systolic blood pressure <100 mmHg	+30 points	1 point
Respiratory rate >30 breaths per minute	+20 points	–
Temperature <36 °C	+20 points	–
Altered mental status	+60 points	–
Arterial oxyhaemoglobin saturation <90%	+20 points	1 point

patient related

PE related

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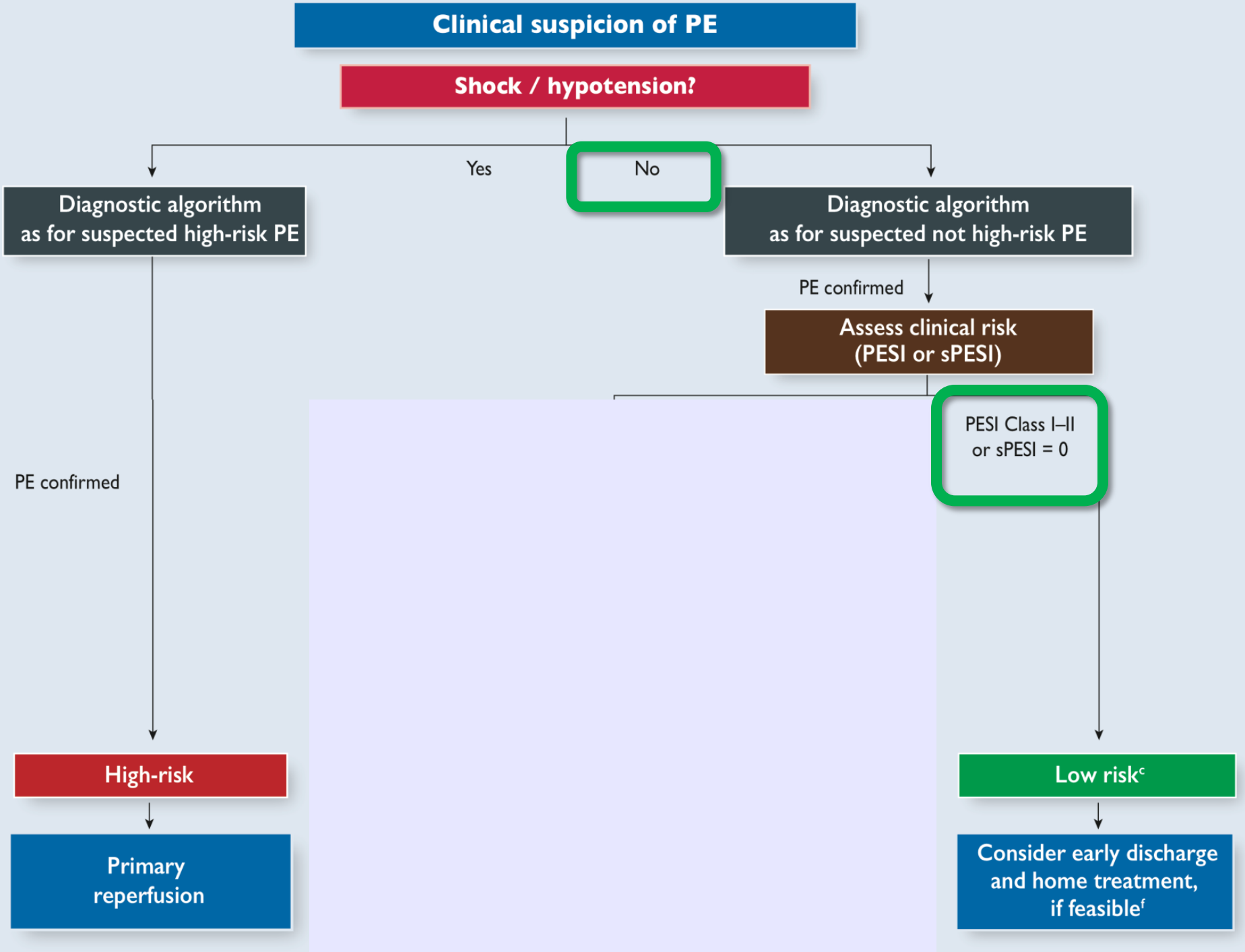
Clinical suspicion of PE
Shock / hypotension?
Yes
No
Diagnostic algorithm as for suspected high-risk PE
Diagnostic algorithm as for suspected not high-risk PE
PE confirmed
Assess clinical risk (PESI or sPESI)
PESI Class I–II or sPESI = 0
PE confirmed
High-risk
Primary reperfusion
Low risk[c]
Consider early discharge and home treatment, if feasible[f]

New strategies with new AC drugs

Heparin
Fondaparinux

Initial overlap between two standard Tx

AVK

Switch from standard parenteral Tx to new oral agent

Heparin
Fondaparinux

Dabigatran, Edoxaban

One oral agent with dose modification for LT prevention

Apixaban,
Rivaroxaban

New strategies with new AC drugs

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Initial overlap between two standard Tx

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Dabigatran, Edoxaban

One agent with dose modification for LT prevention

Apixaban,
Rivaroxaban

Recommendations: acute phase treatment

PE without shock or hypotension (intermediate or low risk)[c]		
Anticoagulation - new oral anticoagulants		
As an alternative to the combination of parenteral anticoagulation with a VKA, anticoagulation with rivaroxaban (15 mg twice daily for 3 weeks, followed by 20 mg once daily) is recommended.	I	B
As an alternative to the combination of parenteral anticoagulation with a VKA, anticoagulation with apixaban (10 mg twice daily for 7 days, followed by 5 mg twice daily) is rec nded.	I	B
As an alternative to VKA treat administration of dabigatran (150 mg twice daily, or 110 mg twice daily for patients >80 years of age or those under concomitant verapamil treatment) is recommended following acute-phase parenteral anticoagulation.	I	B[d]
As an alternative to VKA treatment, administration of edoxaban* is recommended following acute-phase parenteral anticoagulation.	I	B
New oral anticoagulants (rivaroxaban, apixaban, dabigatran, edoxaban) are not recommended in patients with severe renal impairment.[e]	III	A

NOACs

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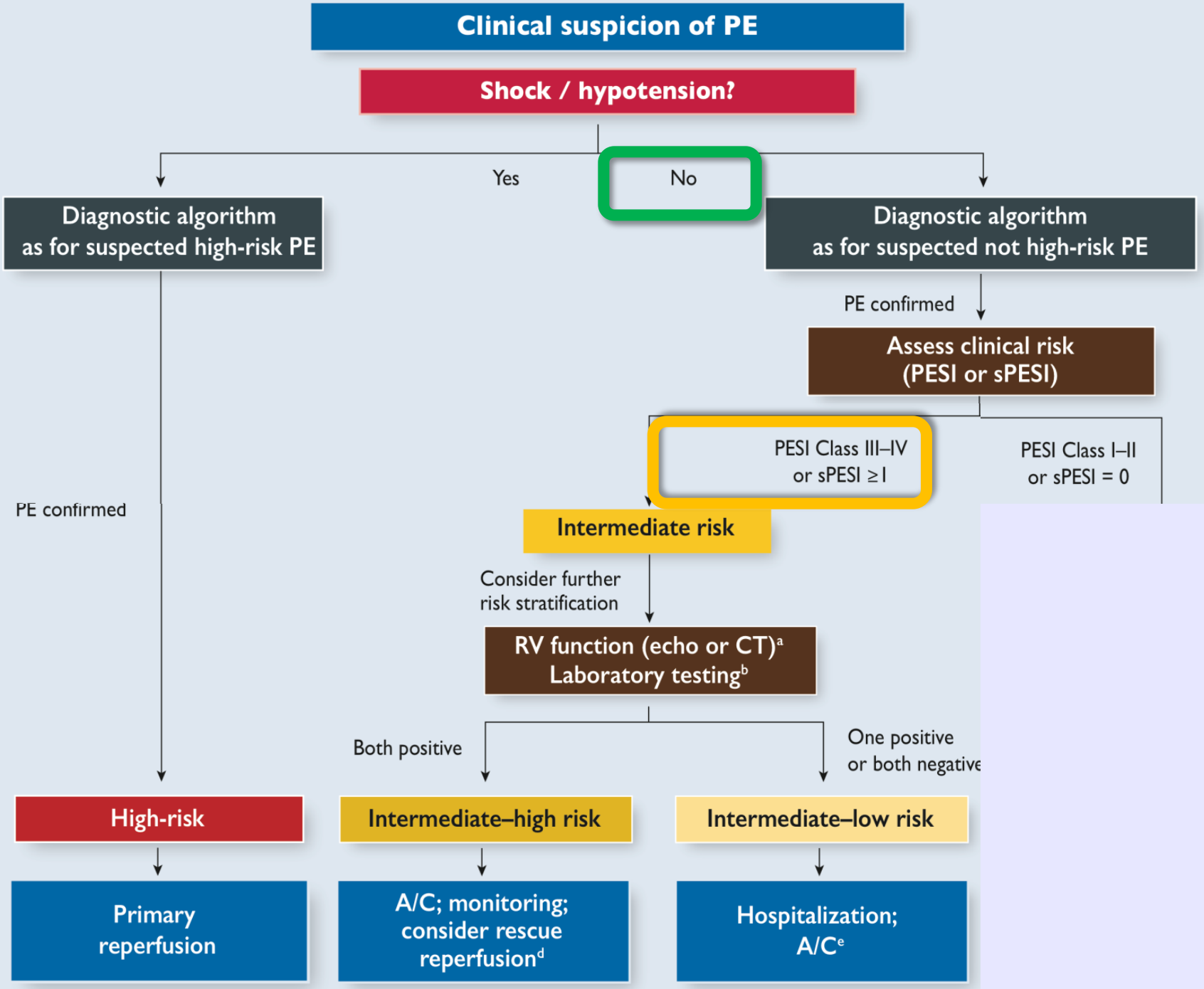
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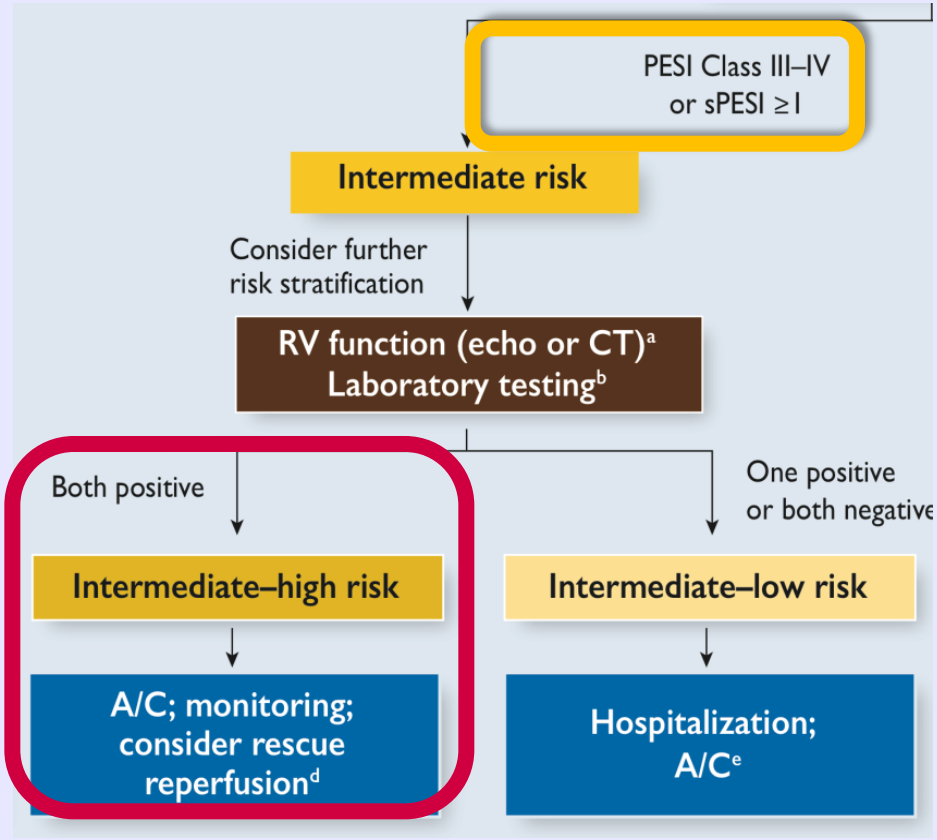
Shock / hypotension?
Yes
No
Diagnostic algorithm as for suspected high-risk PE
Diagnostic algorithm as for suspected not high-risk PE
PE confirmed
Assess clinical risk (PESI or sPESI)
PESI Class III–IV or sPESI ≥ I
PESI Class I–II or sPESI = 0
PE confirmed
Intermediate risk
Consider further risk stratification
RV function (echo or CT)[a] Laboratory testing[b]
Both positive
One positive or both negative
High-risk
Intermediate–high risk
Intermediate–low risk
Primary reperfusion
A/C; monitoring; consider rescue reperfusion[d]
Hospitalization; A/C[e]

Risk-adjusted management algorithm



PEITHO: Secondary efficacy outcomes

	Tenecteplase (n=506)		Placebo (n=499)		*P* value
	n	(%)	n	(%)	
All-cause mortality within 7 days	6	(1.2)	9	(1.8)	0.43
Hemodynamic collapse within 7 days	8	(1.6)	25	(5.0)	0.002

ITT population

The PEITHO Investigators

PEITHO: Safety outcomes (within 7 days of randomization)

	Tenecteplase (n=506)		Placebo (n=499)		*P* value
	n	(%)	n	(%)	
Non-intracranial bleeding					
Major	32	(6.3)	6	(1.5)	<0.001
Minor	165	(32.6)	43	(8.6)	<0.001
Strokes by day 7	**12**	**(2.4)**	**1**	**(0.2)**	**0.003**
Hemorrhagic	10		1		
Ischemic	2		0		

ITT population

PEITHO: Other clinical outcomes (within 7 days)

	Tenecteplase (n=506)		Placebo (n=499)		*P* value
	n	(%)	n	(%)	
PE recurrence	1	(0.2)	5	(1.0)	0.12
Intubation / mechanical ventilation	8	(1.6)	15	(3.0)	0.13
Open-label thrombolysis	4	(0.8)	23	(4.6)	<0.001

ITT population

Recommendations: acute phase treatment

PE without shock or hypotension (intermediate or low risk)[c]		
Reperfusion treatment		
Routine use of primary systemic thrombo[l]ot recommended in patients without shock or hypoten[s]i	III	B
Close monitoring is recom[m]its with intermediate-high-risk PE to permit early [d]aemodynamic decompensation and timely initiation of re[s]reperfusion therapy.	I	B
Thrombolytic therapy should be considered for patients with intermediate-high-risk PE and clinical signs of haemodynamic decompensation.	IIa	B
Surgical pulmonary embolectomy may be considered in intermediate-high-risk patients, if the anticipated risk of bleeding under thrombolytic treatment is high.[f]	IIb	C
Percutaneous catheter-directed treatment may be considered in intermediate-high-risk patients, if the anticipated risk of bleeding under thrombolytic treatment is high.[f]	IIb	B

Monitoring & Rescue reperfusion

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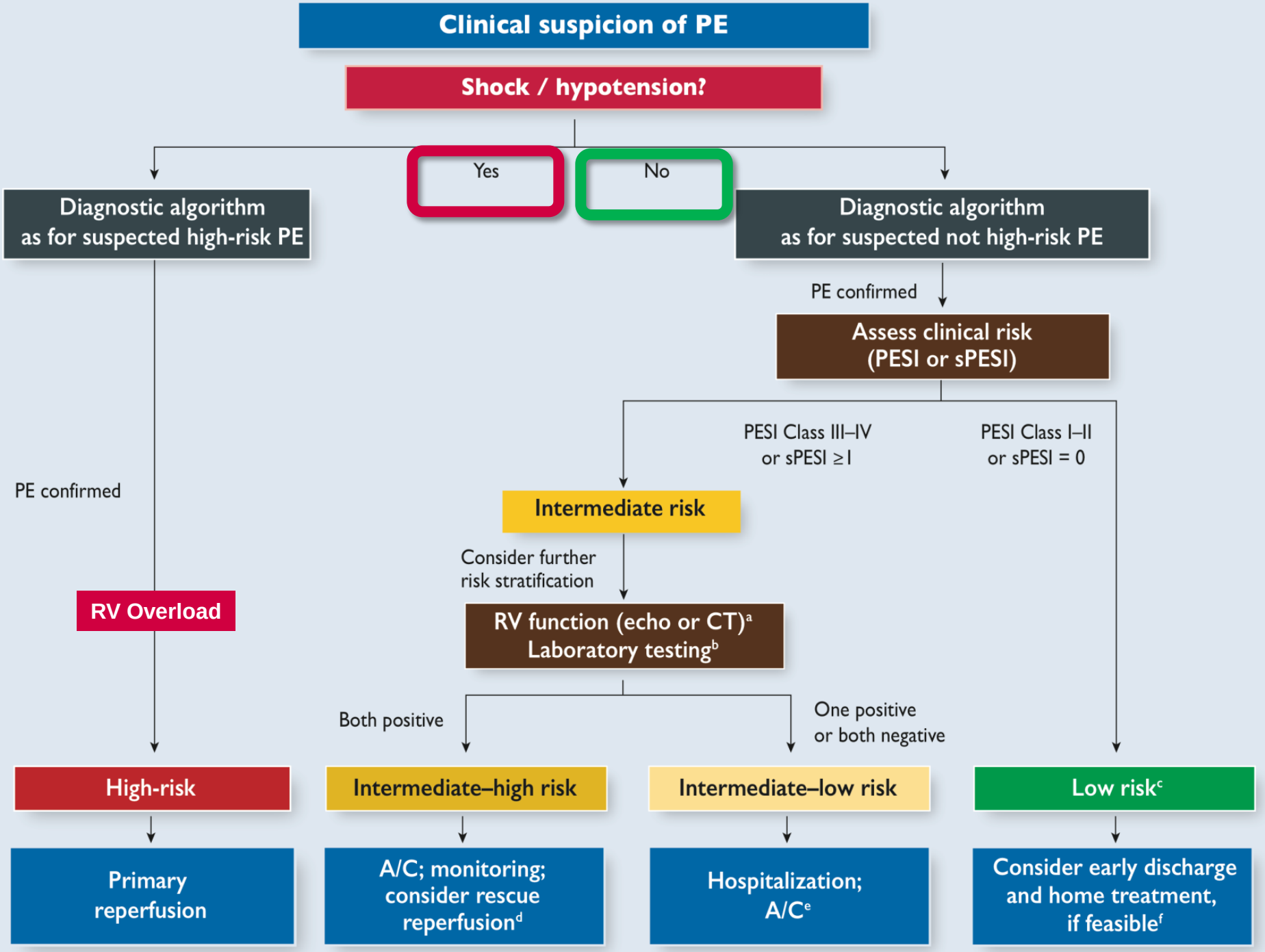
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Intermediate risk
Consider further risk stratification
RV Overload
RV function (echo or CT)[a] Laboratory testing[b]
Both positive
One positive or both negative
High-risk
Intermediate–high risk
Intermediate–low risk
Low risk[c]
Primary reperfusion
A/C; monitoring; consider rescue reperfusion[d]
Hospitalization; A/C[e]
Consider early discharge and home treatment, if feasible[f]

Recommendations: duration of treatment

For patients with PE secondary to a transient (reversible) risk factor, oral anticoagulation is recommended for 3 months.	I	B
For patients with unprovoked PE, oral anticoagulation is recommended for at least 3 months.	I	A
Extended oral anticoagulation should be considered for patients with a first episode of unprovoked PE and low bleeding risk.	IIa	B
Anticoagulation treatment of indefinite duration is recommended for patients with a second episode of unprovoked PE.	I	B
Rivaroxaban (20 mg once daily), dabigatran (150 mg twice daily, or 110 mg twice daily for patients >80 years of age or those under concomitant verapamil treatment) or apixaban (2.5 mg twice daily) should be considered as an alternative to VKA (except for patients with severe renal impairment) if extended anticoagulation treatment is necessary.[c]	IIa	B[d]
In patients who receive extended anticoagulation, the risk–benefit ratio of continuing such treatment should be reassessed at regular intervals.	I	C
In patients who refuse to take or are unable to tolerate any form of oral anticoagulants, aspirin may be considered for extended secondary VTE prophylaxis.	IIb	B

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Recommendations for CTEPH

In PE survivors with persistent dyspnoea, diagnostic evaluation for CTEPH should be considered.	IIa	C
Screening for CTEPH in asymptomatic survivors of PE is currently not recommended.	III	C
It is recommended that in all patients with CTEPH the assessment of operability and decisions regarding other treatment strategies be made by a multidisciplinary team of experts.	I	C
Life-long anticoagulation is recommended in all patients with CTEPH.	I	C
Surgical PEA is recommended for patients with CTEPH.	I	C
Riociguat is recommended in symptomatic patients who have been classified as having inoperable CTEPH by a CTEPH team including at least one experienced PEA surgeon, or have persistent/recurrent CTEPH after surgical treatment.	I	B
Off-label use of drugs approved for PAH may be considered in symptomatic patients who have been classified as having inoperable CTEPH by a CTEPH team including at least one experienced PEA surgeon.	IIb	B

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Recommendations for PE in pregnancy

Suspicion of PE in pregnancy warrants formal diagnostic assessment with validated methods.	I	C
D-dimer measurement may be performed in order to avoid unnecessary irradiation, as a negative result has a similar clinical significance as in non-pregnant patients.	IIb	C
Venous compression ultrasonography may be considered in order to avoid unnecessary irradiation, as a diagnosis of proximal DVT confirms PE.	IIb	C
Perfusion scintigraphy may be considered to rule out suspected PE in pregnant women with normal chest X-ray.	IIb	C
CT angiography should be considered if the chest X-ray is abnormal or if lung scintigraphy is not readily available.	IIa	C
A weight-adjusted dose of LMWH is the recommended therapy during pregnancy in patients without shock or hypotension.	I	B

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Recommendations for PE in cancer

Incidental PE in patients with cancer should be managed in the same manner as symptomatic PE.	IIa	C
Negative D-dimer levels have the same negative diagnostic value as in non-cancer patients.	IIa	B
For patients with PE and cancer, weight-adjusted subcutaneous LMWH should be considered for the first 3 to 6 months.	IIa	B
For patients with PE and cancer, extended anticoagulation (beyond the first 3 to 6 months) should be considered for an indefinite period or until the cancer is cured.	IIa	C

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Beware of PE ...

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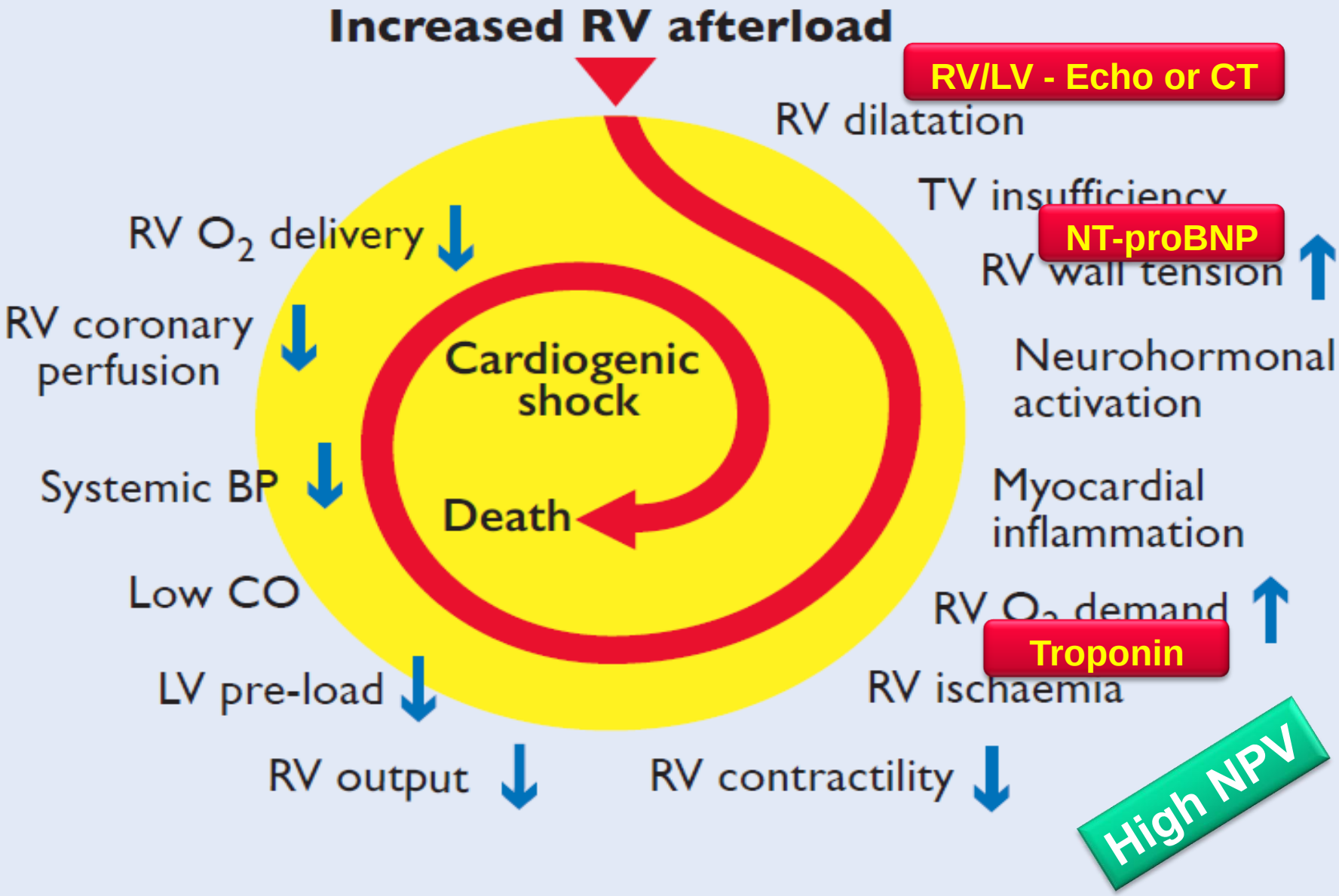

BP = blood pressure; CO = cardiac output; LV = left ventricular; RV = right ventricular; TV = tricuspid valve.

Classification of early mortality risk

Early mortality risk		Risk parameters and scores			
		Shock or hypotension	PESI Class III-V or sPESI >1[a]	Signs of RV dysfunction on an imaging test[b]	Cardiac laboratory biomarkers[c]
High		+	(+)[d]	+	(+)[d]
Intermediate	Intermediate–high	-	+	Both positive	
	Intermediate–low	-	+	Either one (or none) positive[e]	
Low		-	-	Assessment optional; if assessed, both negative[e]	

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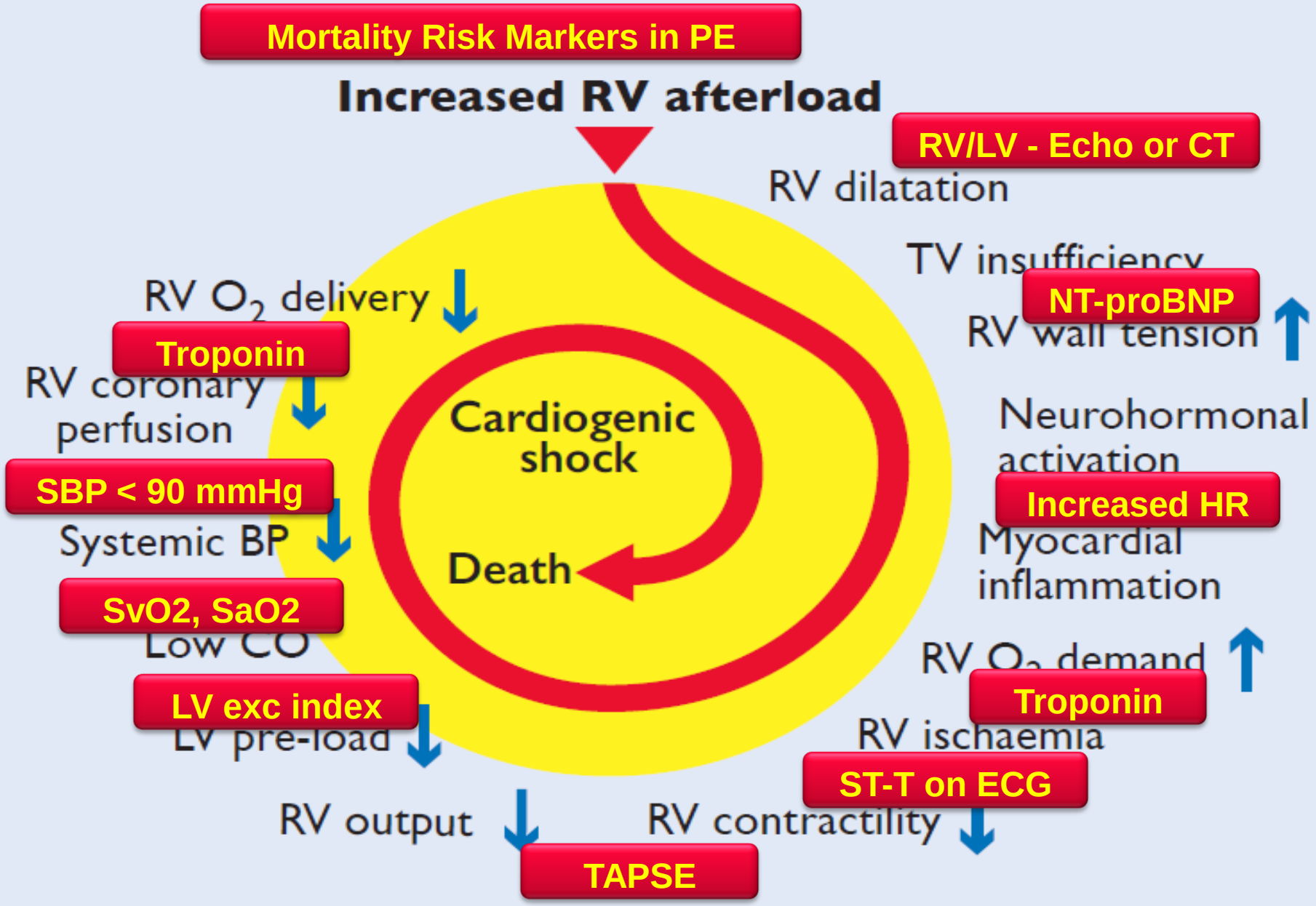

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„respiratory infection'

„acute coronary syndrome"

dyspnea

pleural pain
fever
hemophtysis
pleural effusion
atelectasis

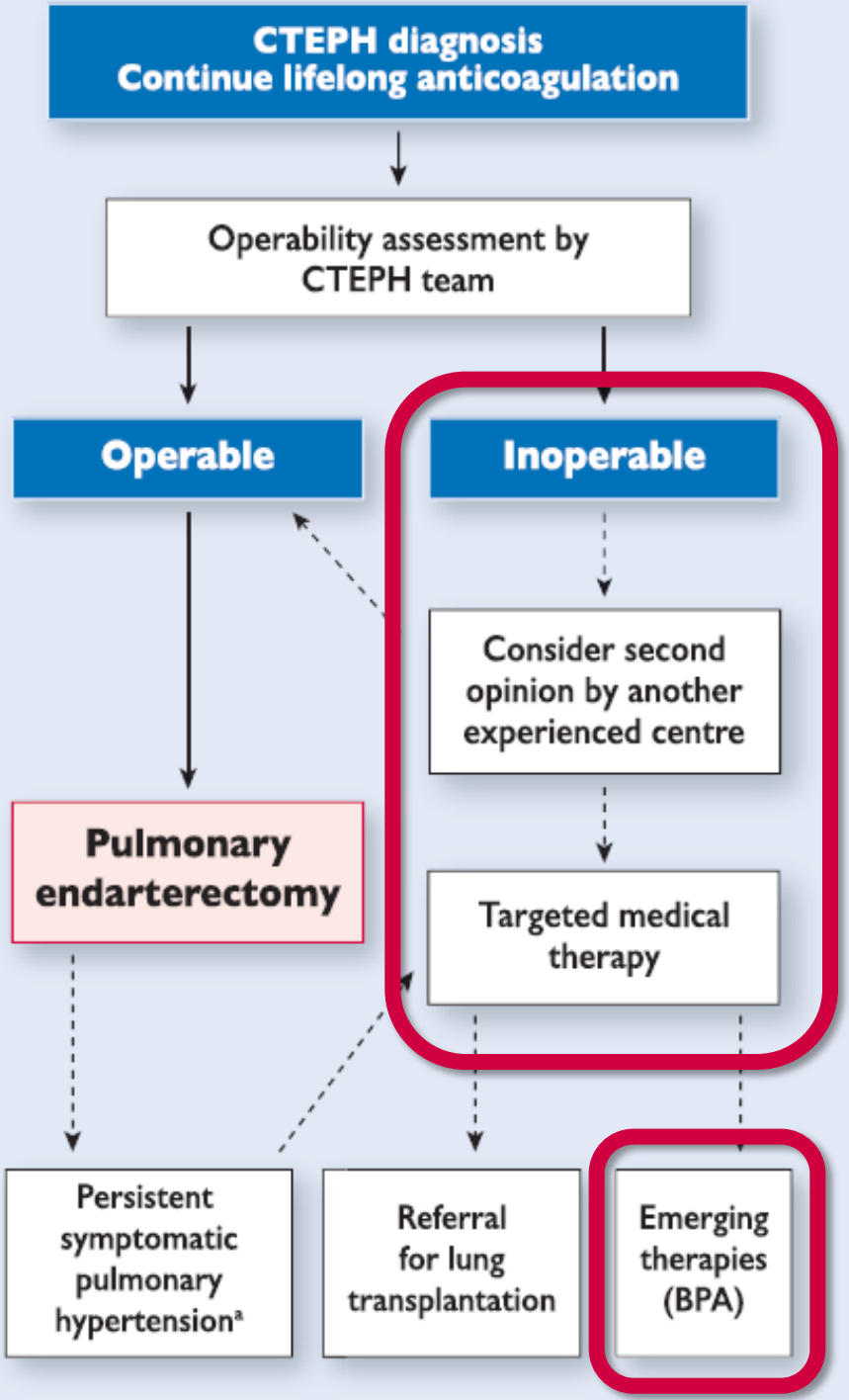
angina
tachycardia
low BP
ST-T changes
TnT, BNP

risk factors often „subclinical"

leg pain
oedema

shock
hypotension
syncope

Algorithm for the **treatment** of chronic thromboembolic pulmonary hypertension



Recommendations for prognostic assessment

Initial risk stratification of suspected or confirmed PE based on the presence of shock or persistent hypotension is recommended to identify patients at high-risk of early mortality.	I	B

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Recommendations for prognostic assessment

Initial risk stratification of suspected or confirmed PE based on the presence of shock or persistent hypotension is recommended to identify patients at high-risk of early mortality.	I	B
In patients not at high-risk, use of a validated clinical risk prediction score, preferably the PESI or sPESI, should be considered to distinguish between low- and intermediate-risk PE.	IIa	B

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Recommendations for prognostic assessment

Initial risk stratification of suspected or confirmed PE based on the presence of shock or persistent hypotension is recommended to identify patients at high-risk of early mortality.	I	B
In patients not at high-risk, use of a validated clinical risk prediction score, preferably the PESI or sPESI, should be considered to distinguish between low- and intermediate-risk PE.	IIa	B
In patients at intermediate risk, assessment of the right ventricle with echocardiography or CT, and of myocardial injury using a laboratory biomarker, should be considered for further risk stratification.	IIa	B

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Thrombolytic treatment of PE

Approved thrombolytic regimens for pulmonary embolism	
Streptokinase	250 000 IU as a loading dose over 30 minutes, followed by 100 000 IU/h over 12–24 hours
	Accelerated regimen: 1.5 million IU over 2 hours
Urokinase	4400 IU/kg as a loading dose over 10 min, followed by 4400 IU/kg per hour over 12–24 hours
	Accelerated regimen: 3 million IU over 2 hours
rtPA	100 mg over 2 hours; or
	0.6 mg/kg over 15 minutes (maximum dose 50 mg)

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Parenteral anticoagulation for PE

LMWHs and pentasaccharide (fondaparinux) approved for the treatment of pulmonary embolism		
	Dosage	**Interval**
Enoxaparin	1.0 mg/kg or 1.5 mg/kg[a]	Every 12 hours Once daily[a]
Tinzaparin	175 U/kg	Once daily
Dalteparin	100 IU/kg[b] or 200 IU/kg[b]	Every 12 hours[b] Once daily
Nadroparin[c]	86 IU/kg or 171 IU/kg	Every 12 hours Once daily
Fondaparinux	5 mg (body weight <50 kg); 7.5 mg (body weight 50–100 kg); 10 mg (body weight >100 kg)	Once daily

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Recommendations for acute phase treatment

PE without shock or hypotension (intermediate or low risk)[c]		
Anticoagulation - combination of parenteral treatment with VKA		
Initiation of parenteral anticoagulation is recommended without delay in patients with high or intermediate clinical probability of PE while diagnostic work-up is ongoing.	I	C
LMWH or fondaparinux is the recommended form of acute phase parenteral anticoagulation for most patients.	I	A
In parallel to parenteral anticoagulation, treatment with a VKA is recommended, targeting an INR of 2.5 (range 2.0–3.0).	I	B

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Recommendations: Venous filters

Recommendations for venous filters	Class[a]	Level[b]
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 levels of anticoagulation.	IIa	C
Routine use of IVC filters in patients with PE is not recommended.	III	A

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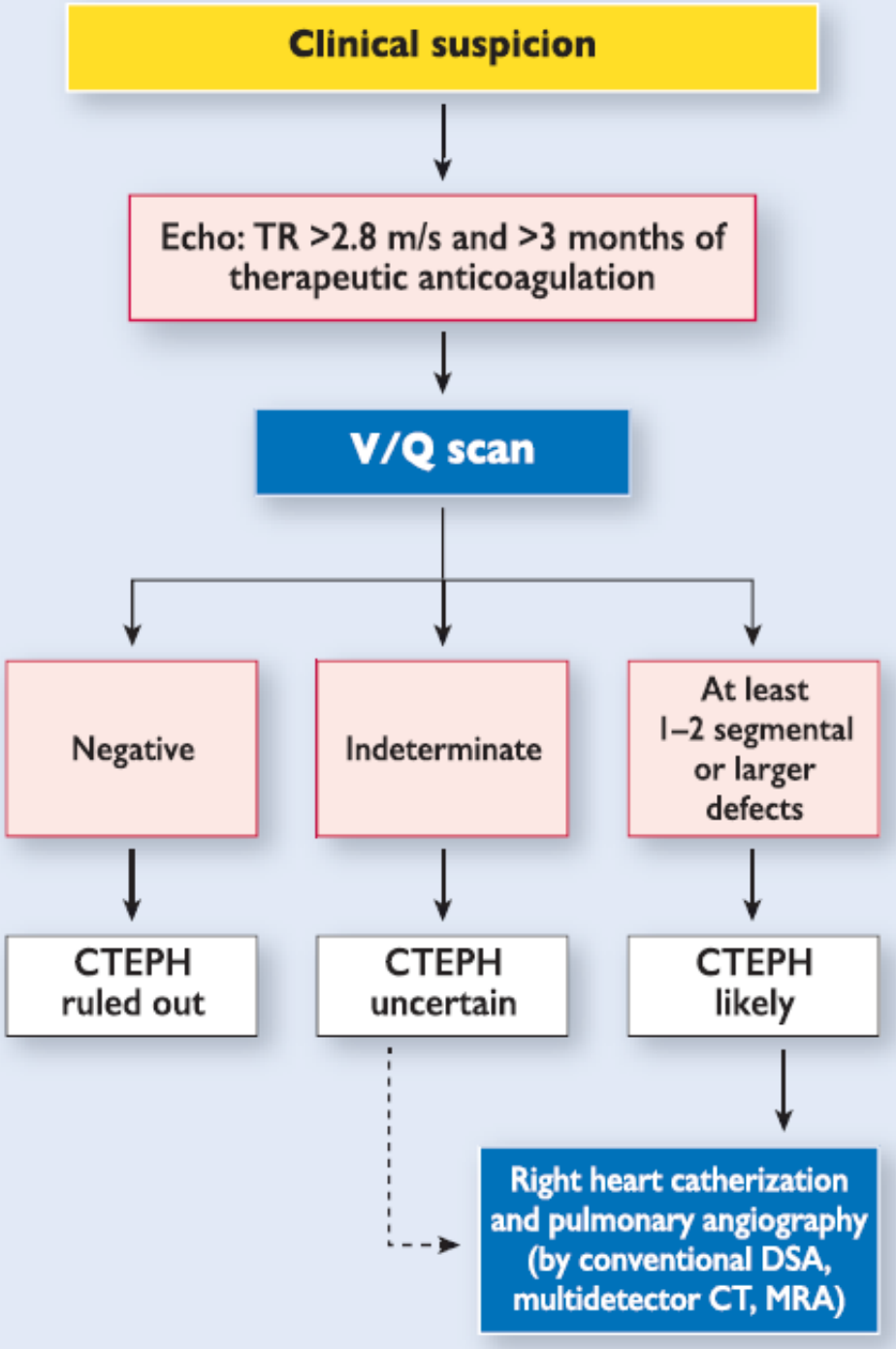
Algorithm for the diagnosis of chronic of thromboembolic pulmonary hypertension



Recommendations for diagnosis

Suspected PE with shock or hypotension		
In suspected high-risk PE, as indicated by the presence of shock or hypotension, emergency CT angiography or bedside transthoracic echocardiography (depending on availability and clinical circumstances) is recommended for diagnostic purposes.	I	C
In patients with suspected high-risk PE and signs of RV dysfunction who are too unstable to undergo confirmatory CT angiography, bedside search for venous and/or pulmonary artery thrombi with CUS and/or TOE may be considered to further support the diagnosis of PE if immediately available.	IIb	C
Pulmonary angiography may be considered in unstable patients admitted directly to the catheterization laboratory, in case coronary angiography has excluded an acute coronary syndrome and PE emerges as a probable diagnostic alternative.	IIb	C

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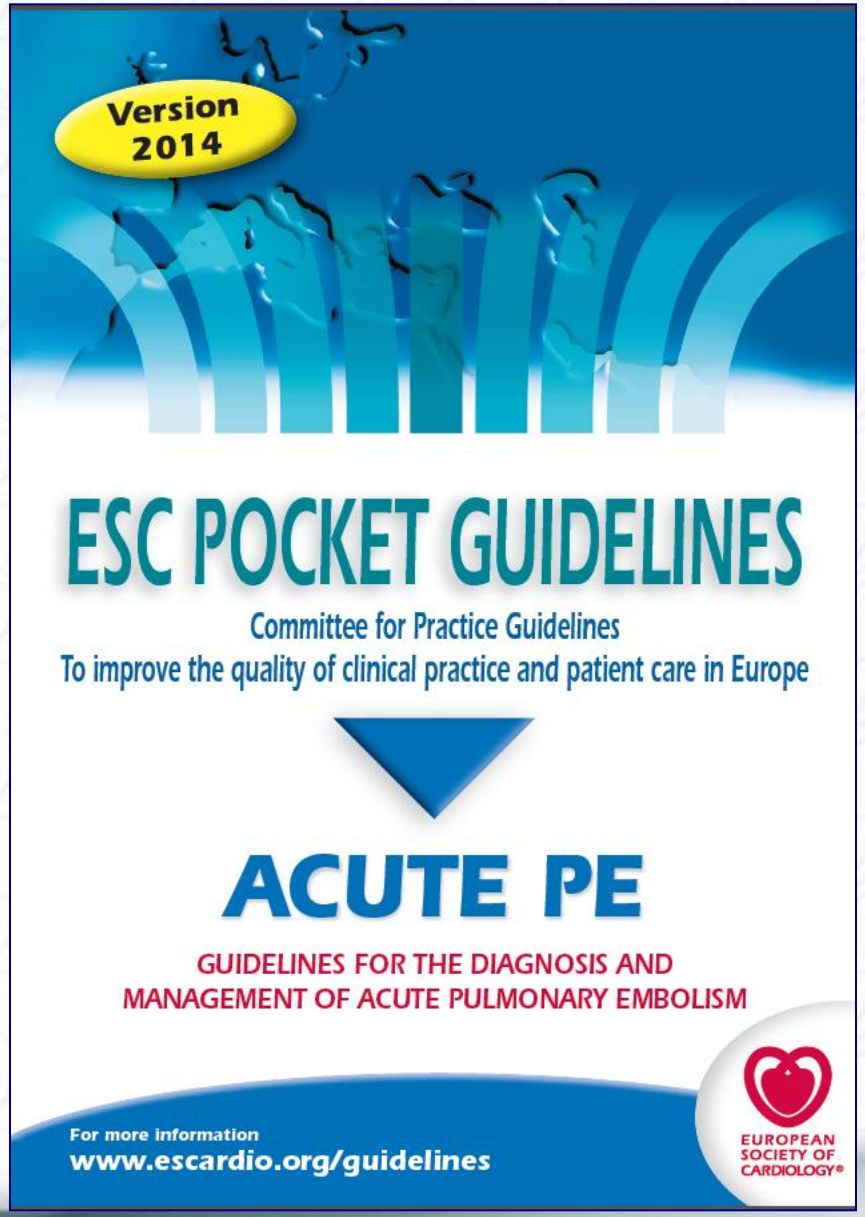
Recommendations for diagnosis

Suspected PE without shock or hypotension		
The use of validated criteria for diagnosing PE is recommended.	I	B
Clinical evaluation		
It is recommended to base the diagnostic strategy on clinical probability assessed either by clinical judgement or a validated prediction rule.	I	A
D-dimer		
Plasma D-dimer measurement is recommended in outpatients / emergency department patients with low or intermediate clinical probability, or PE-unlikely, to reduce the need for unnecessary imaging and irradiation, preferably using a highly sensitive assay.	I	A
In low clinical probability or PE-unlikely patients, normal D-dimer level using either a highly or moderately sensitive assay excludes PE.	I	A
Further testing may be considered in intermediate probability patients with a negative moderately sensitive assay.	IIb	C
D-dimer measurement is not recommended in patients with high clinical probability, as a normal result does not safely exclude PE even when using a highly sensitive assay.	III	B



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Recommendations for diagnosis

Lower limb CUS		
Lower limb CUS in search of DVT may be considered in selected patients with suspected PE to obviate the need for further imaging tests if the result is positive.	**IIb**	**B**
CUS showing a proximal DVT in a patient with clinical suspicion of PE confirms PE.	**I**	**B**
If CUS shows only a distal DVT, further testing should be considered to confirm PE.	**IIa**	**B**
Pulmonary angiography		
Pulmonary angiography may be considered in cases of discrepancy between clinical evaluation and results of non-invasive imaging tests.	**IIb**	**C**
MRA		
MRA should not be used to rule out PE.	**III**	**A**

European Heart Journal (2014):doi:10.1093/eurheartj/ehu283

D-dimer in elderly patients: variable cut-off?

- New cut-off value proposed based on retrospective analysis of 2 cohorts including 5132 consecutive patients with suspected PE
- **New D-dimer cut-off value:**
  - ≤ 50 years-old 500 ng/mL
  - > 50 years-old Patient age X 10
    (e.g. 78-year-old patient, cut-off 780 ng/mL)

- Age-adjusted cut-off would increase the diagnostic yield of D-dimer by 10% (from 25 to 35% of all patients tested)

Douma et al., BMJ 2010;340:c1475

Prospective validation of D-dimer age-adjusted cut-off: the ADJUST study

- **Aim**: prospectively validate whether an age-adjusted D-dimer cutoff (age × 10 in patients 50 years or older) is associated with an increased diagnostic yield of D-dimer in elderly patients with suspected PE.
- **Setting**: multicenter, prospective management outcome study in 19 centers in Belgium, France, the Netherlands, and Switzerland
- **Diagnostic strategy**:
  - clinical probability assessed by simplified revised Geneva score or 2-level Wells score for PE combined with highly sensitive D-dimer measurement
  - CT angiography in patients with D-dimer result above age-adjusted cut-off
- **Outcome**: failure rate of the diagnostic strategy
  - Thromboembolic events during the 3-month follow-up in patients not treated with anticoagulants based on a negative age-adjusted D-dimer cutoff result

Righini et al. JAMA. 2014 (April 23-30);311:1117-1124

Incidental PE

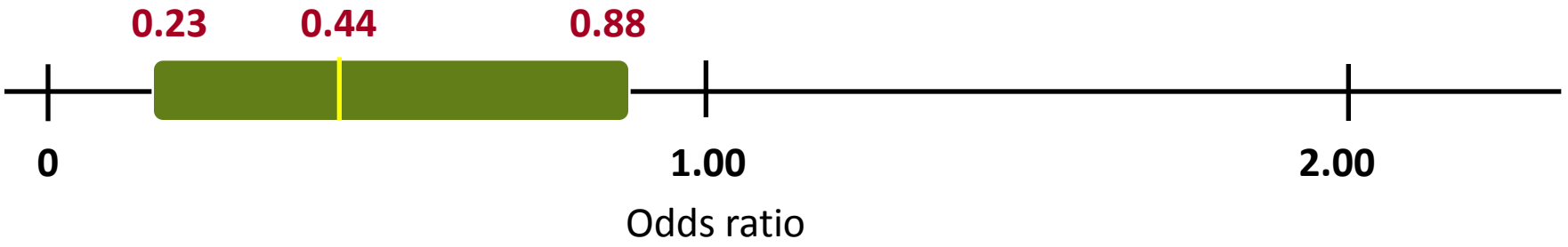
- PE found on chest CT done for other reasons than suspected PE in the absence of symptoms of PE
- Metaanalysis of 12 studies (4 prospective, 8 retrospective) including 10289 patients

	Incidental PE, %	Incidental PE, %	OR
Outpatients vs. **inpatients**	1.2% (0.5,2.1)	4.0% (2.7-5.6)	4.3 (2.6,7.0)
Cancer vs. non cancer	3.1% (2.2,4.1)	2.5% (1.1-4.5)	1.8 (1.2,2.8)
≥ 5 mm slice CT vs. **< 5 mm slice CT**	2.0% (1.0,3.4)	3.0% (2.0,4.0)	NA
Overall	**2.6% (1.9,3.4)**		

Dentali et al., Thromb Res 2010;125:518-522

PEITHO: Primary efficacy outcome

	Tenecteplase (n=506)		Placebo (n=499)		*P* value
	n	(%)	n	(%)	
All-cause mortality or hemodynamic collapse within 7 days of randomization	13	(2.6)	28	(5.6)	0.015



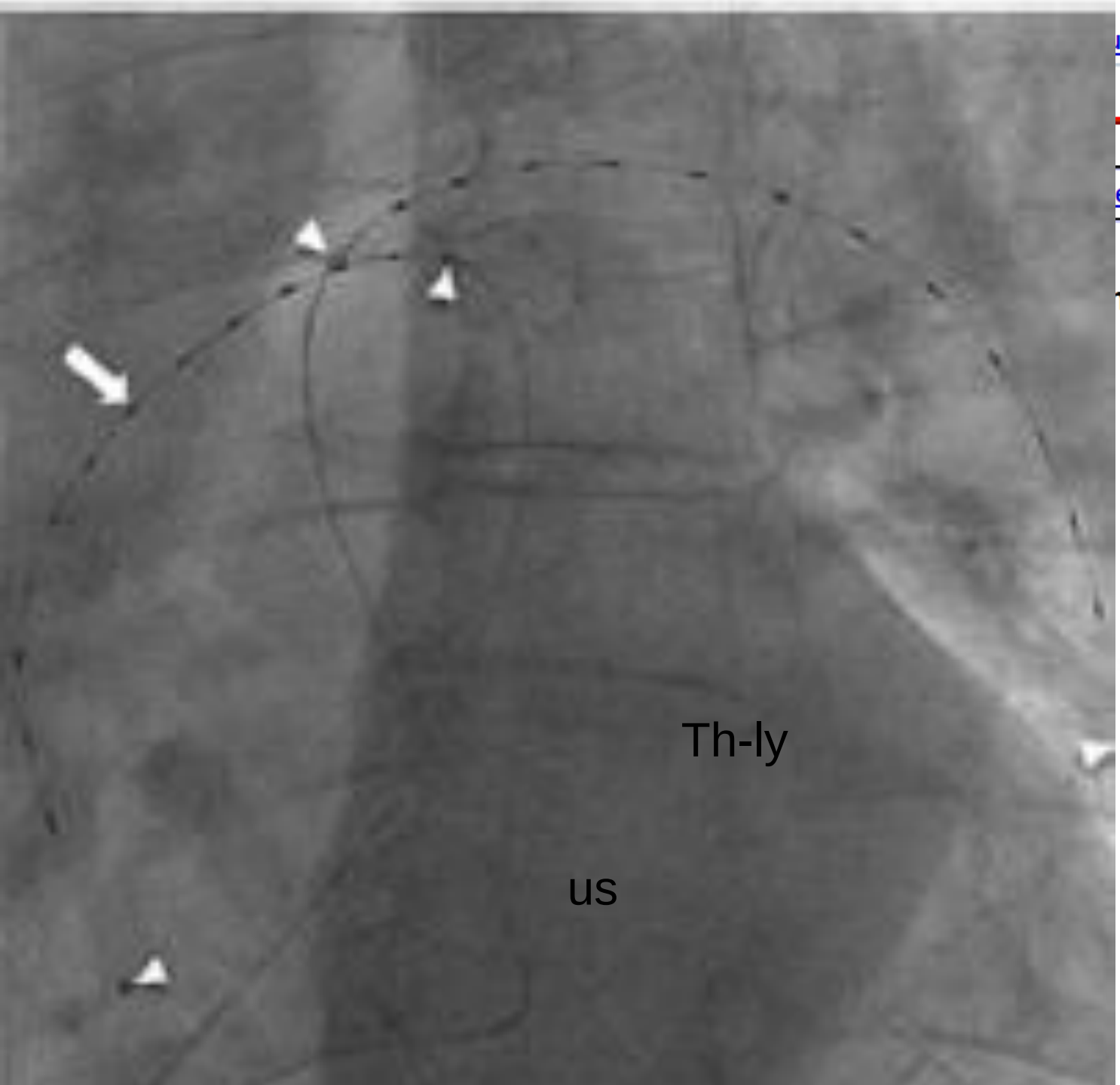
Thrombolysis superior

ITT population

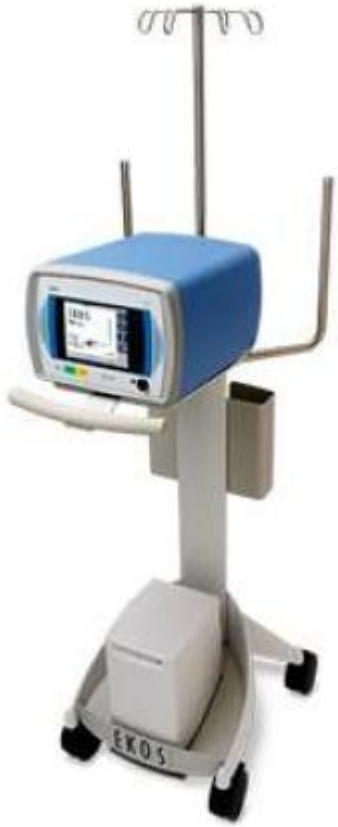
PEITHO: Secondary efficacy outcomes

	Tenecteplase (n=506)		Placebo (n=499)		*P* value
	n	(%)	n	(%)	
All-cause mortality within 7 days	**6**	**(1.2)**	**9**	**(1.8)**	**0.43**
Hemodynamic collapse within 7 days	**8**	**(1.6)**	**25**	**(5.0)**	**0.002**
Need for CPR	1		5		
Hypotension / blood pressure drop	8		18		
Catecholamines	3		14		
Resulted in death	1		6		

ITT population



nbolism



2014 version

2014 ESC Guidelines

on the Diagnosis & Management of

ACUTE PULMONARY EMBOLISM

Chairpersons: Stavros Konstantinides (Germany/Greece), Adam Torbicki (Poland)

www.escardio.org/guidelines

European Heart Journal
(2014):doi:10.1093/eurheartj/ehu283

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Predisposing factors for venous thromboembolism

Strong risk factors (odds ratio >10)
Fracture of lower limb
Hospitalization for heart failure or atrial fibrillation/flutter (within previous 3 months)
Hip or knee replacement
Major trauma
Myocardial infarction (within previous 3 months)
Previous venous thromboembolism
Spinal cord injury
Moderate risk factors (odds ratio 2–9)
Arthroscopic knee surgery
Auto-immune diseases
Blood transfusion
Central venous lines
Chemotherapy
Congestive heart or respiratory failure
Erythropoiesis-stimulating agents
Hormone replacement therapy (depends on formulation)
In vitro fertilization

New !

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European Heart Journal (2014):doi:10.1093/eurheartj/ehu283

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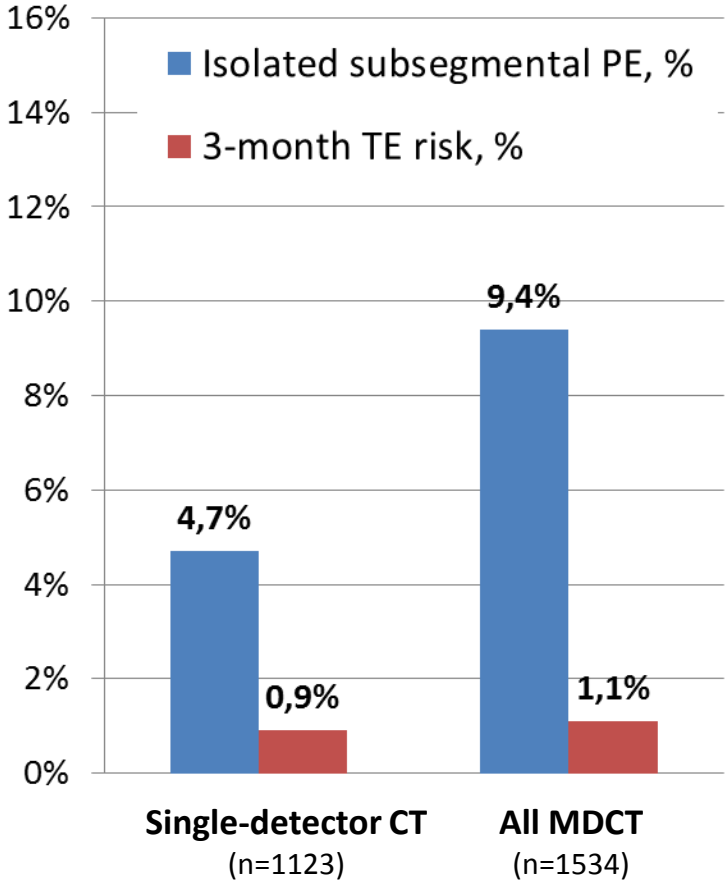
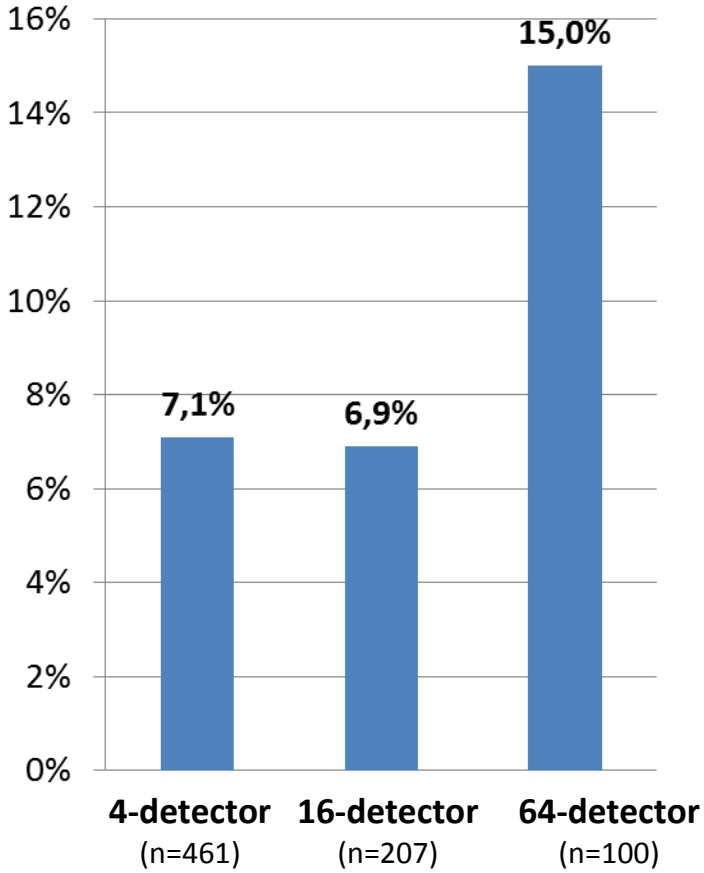
Isolated subsegmental PE: metaanalysis

NB: Definition not uniform: single vs. multiple subsegmental clots





J Thromb Haemost 2010;8:1716-22

Diagnostic tests confirming PE:
not high-risk /considering clinical probability

Diagnostic criterion	Clinical probability of PE				
	Low	Intermediate	High	PE unlikely	PE likely
Confirmation of PE					
Chest CT angiogram showing at least segmental PE	+	+	+	+	+
High probability V/Q scan	+	+	+	+	+
CUS showing proximal DVT	+	+	+	+	+

European Heart Journal (2014):doi:10.1093/eurheartj/ehu283

Original and simplified pulmonary embolism severity index (PESI)

Parameter	Original version	Simplified version
	Risk strata[a]	
	Class I: ≤65 points very low 30-day mortality risk (0–1.6%) Class II: 66–85 points low mortality risk (1.7–3.5%)	0 points = 30-day mortality risk 1.0% (95% CI 0.0%–2.1%)
	Class III: 86–105 points moderate mortality risk (3.2–7.1%) Class IV: 106–125 points high mortality risk (4.0–11.4%) Class V: >125 points very high mortality risk (10.0–24.5%)	≥1 point(s) = 30-day mortality risk 10.9% (95% CI 8.5%–13.2%)

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Diagnosis of PE in pregnancy

Estimated radiation absorbed in procedures for diagnosing pulmonary embolism[a]

Test	Estimated foetal radiation exposure (mSv)	Estimated maternal radiation exposure to breast tissue (mSv)
Chest X-ray	<0.01	0.01
Perfusion lung scan with Technetium-99m labelled albumin		
Low dose: 40 MBq	0.11–0.20	0.28–0.50
High dose: 200 MBq	0.20–0.60	1.20
Ventilation lung scan	0.10–0.30	<0.01
Computed tomographic angiography	0.24–0.66	10–70

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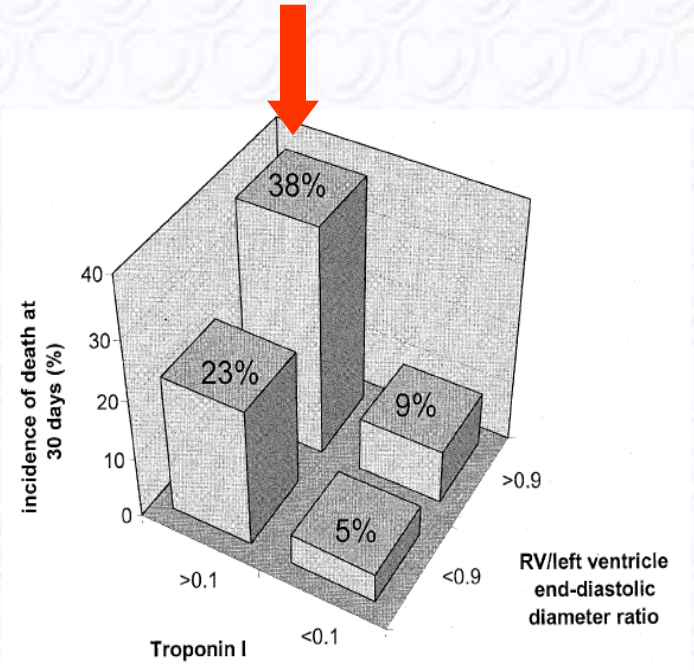
Test or biomarker	Cut-off value	NPV, % (95% CI)	PPV, % (95% CI)
Echocardiography	Various criteria of RV dysfunction	98 (96–99)	8 (6–10)
CT angiography	RV/LV ≥1.0	93 (89–96)	8 (5–14)
	RV/LV ≥0.9	97 (94–99)	7 (5–10)
BNP	75–100 pg/mL	98 (94–99)	14 (9–21)
NT-proBNP	600 pg/mL	99 (97–100)	7 (5–19)
Troponin I	Different assays/ cut-off values	NR	NR
Troponin T	Different assays/cut-off values[c]	NR	NR
	14 pg/mL[d]	98 (95–99)	9 (6–12)
H-FABP	6 ng/mL	99 (94–99)	28 (13–47)



RV/LV>0.9 and cTnI>0,1ug/L.

Scridon T et al. Am J Cardiol 2005

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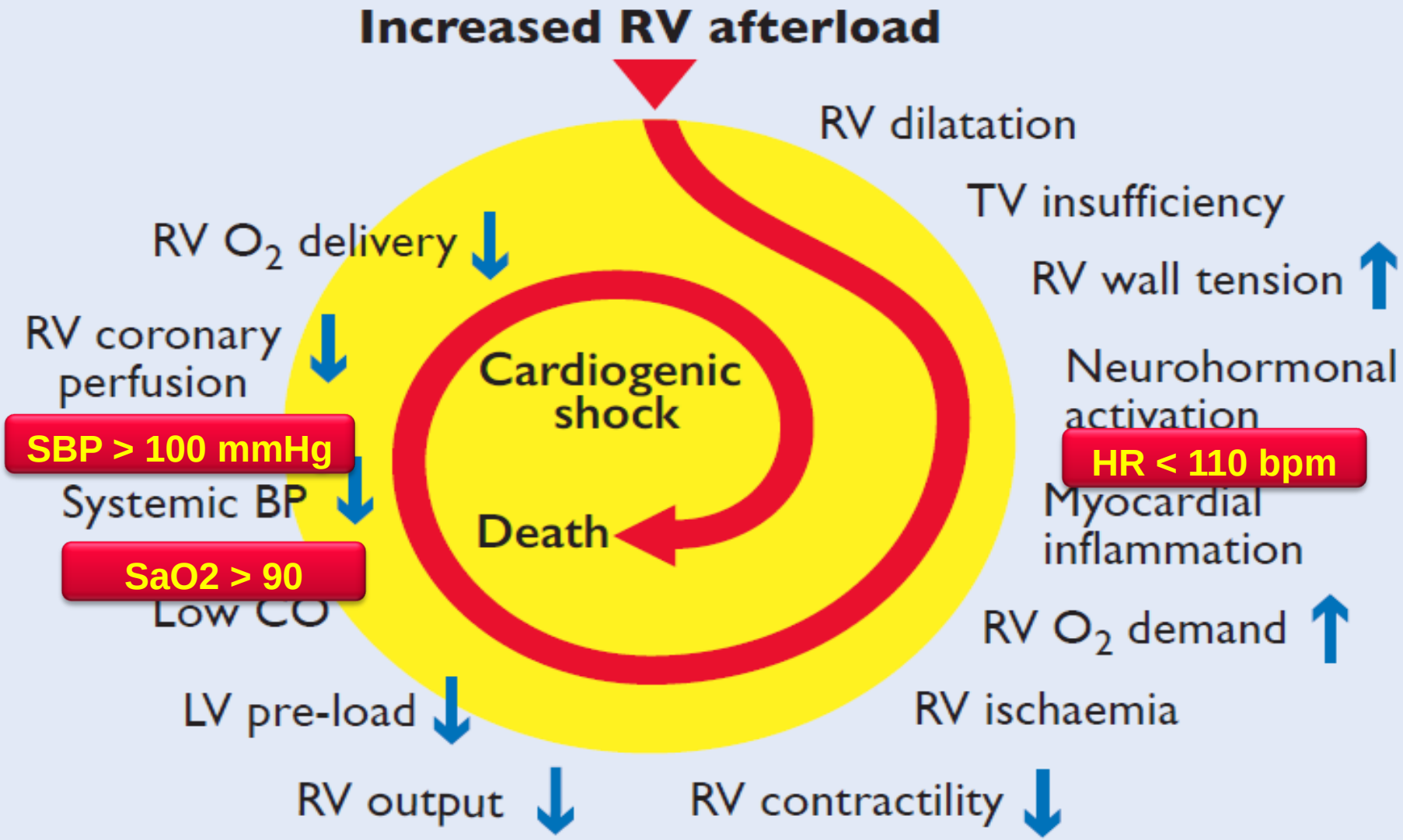

BP = blood pressure; CO = cardiac output; LV = left ventricular; RV = right ventricular; TV = tricuspid valve.

Classification of early mortality risk

Early mortality risk		Risk parameters and scores			
		Shock or hypotension	PESI Class III-V or sPESI >1[a]	Signs of RV dysfunction on an imaging test[b]	Cardiac laboratory biomarkers[c]
High		+	(+)[d]	+	(+)[d]
Intermediate	Intermediate–high	-	+	Both positive	
	Intermediate–low	-	+	Either one (or none) positive[e]	

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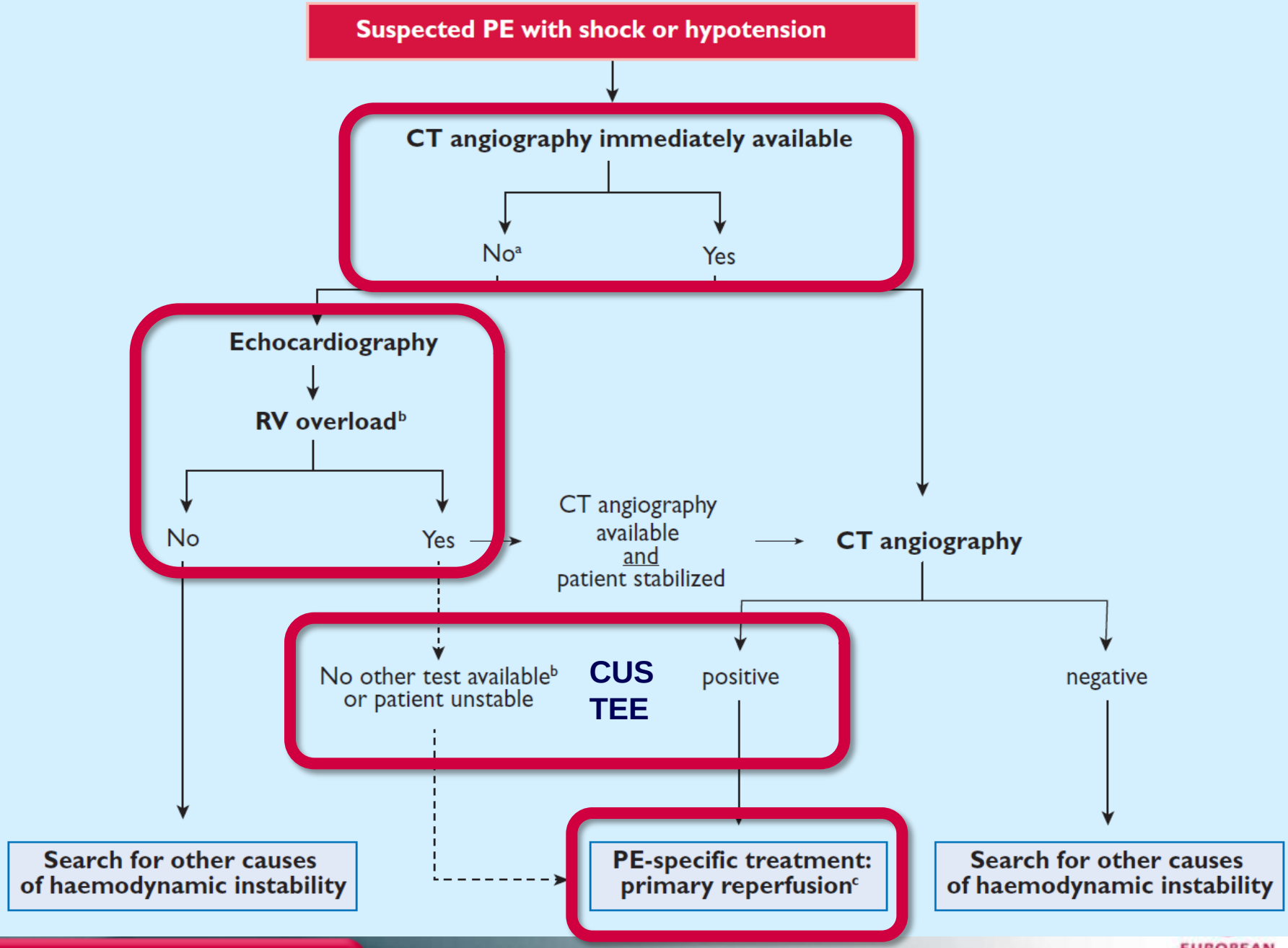

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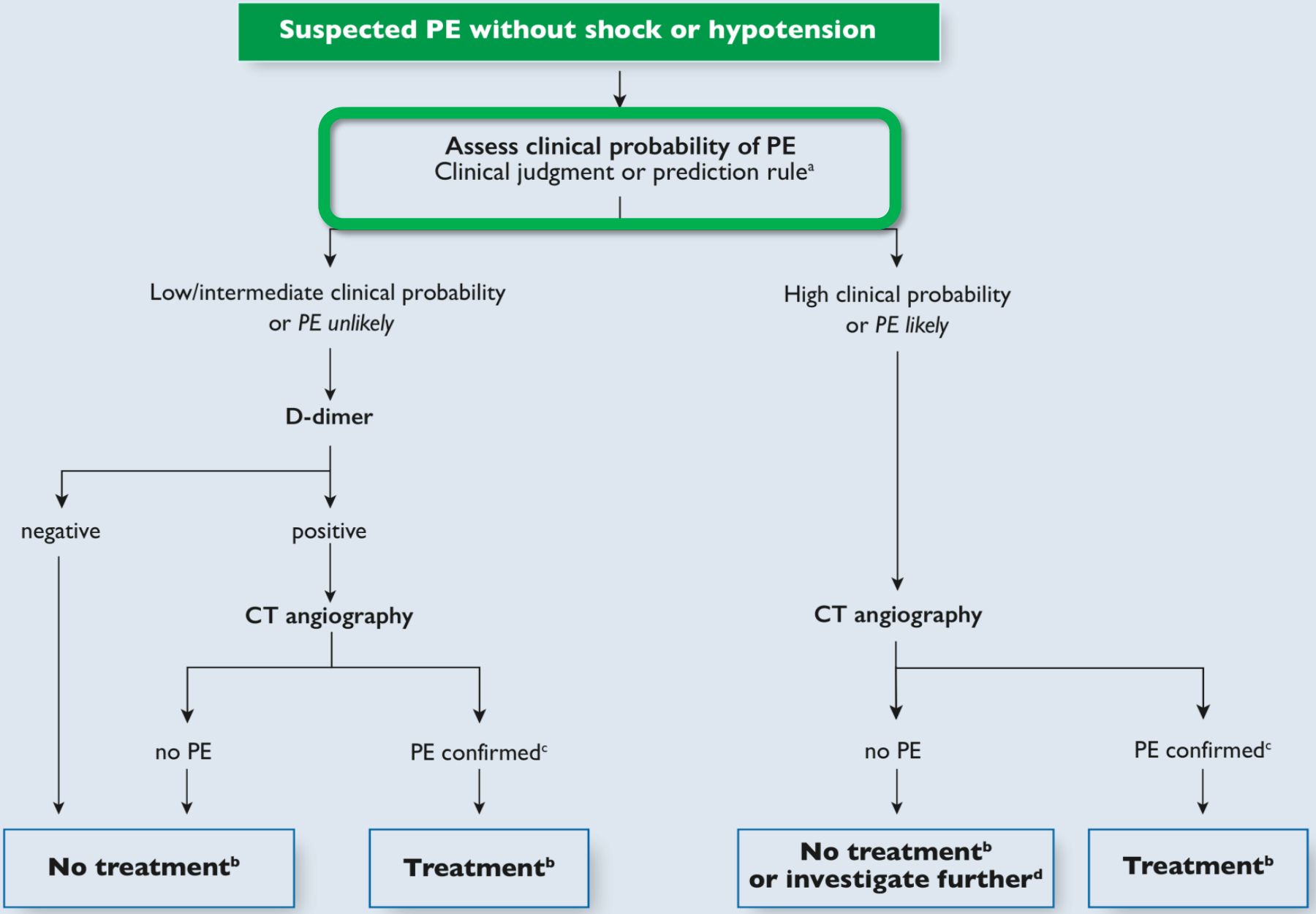

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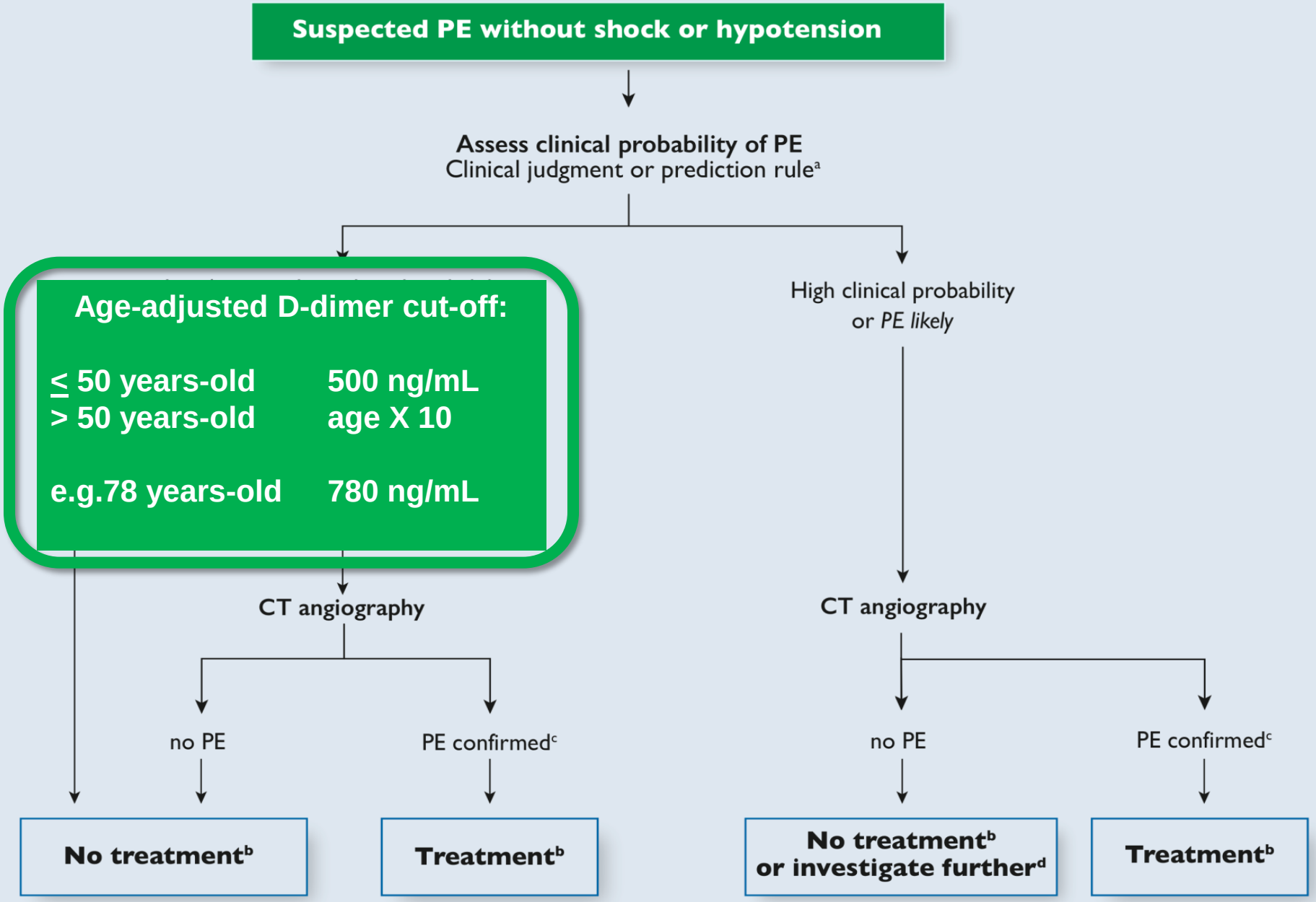

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