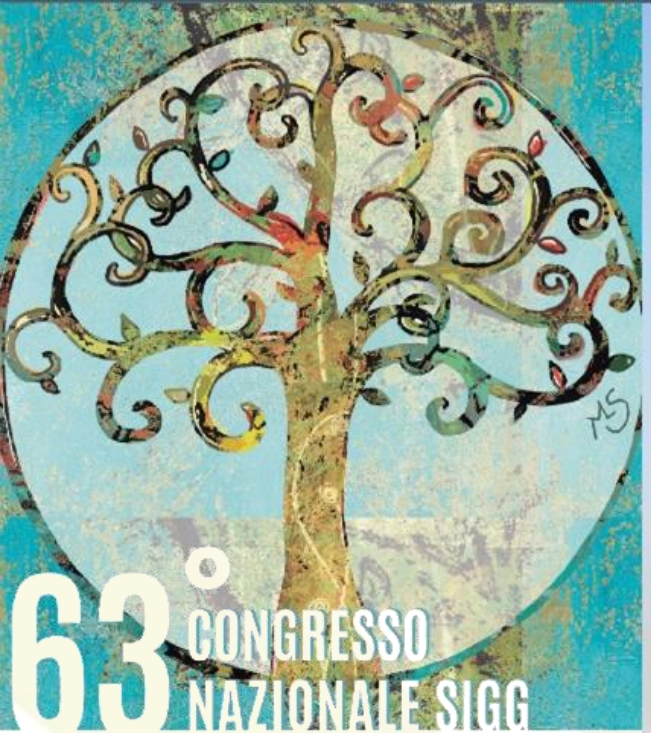


63° CONGRESSO NAZIONALE SIGG

GLI ANZIANI:
LE RADICI DA PRESERVARE

ROMA 28 novembre 01 dicembre 2018 Auditorium della Tecnica, Roma

PREVALENZA DI EMBOLIA POLMONARE NEI REPARTI DI EMERGENZA

Fabio Salvi

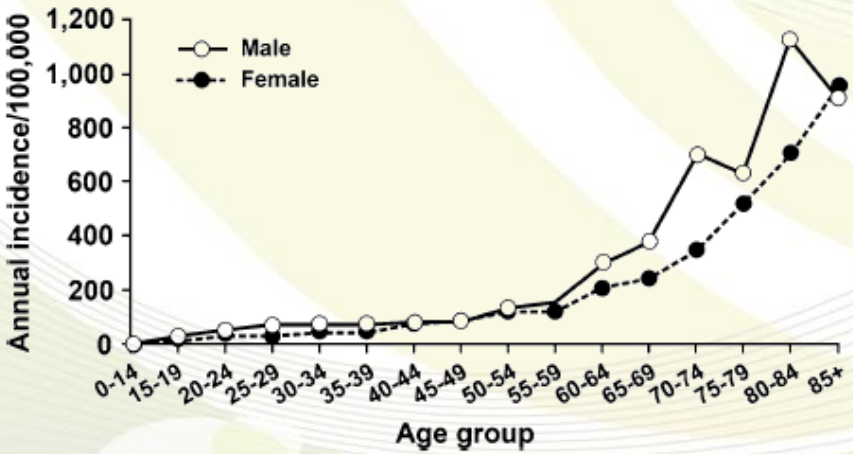
U.O.C. Geriatria, Accettazione Geriatrica, Centro di Ricerca per l'Invecchiamento; IRCCS INRCA, Ancona

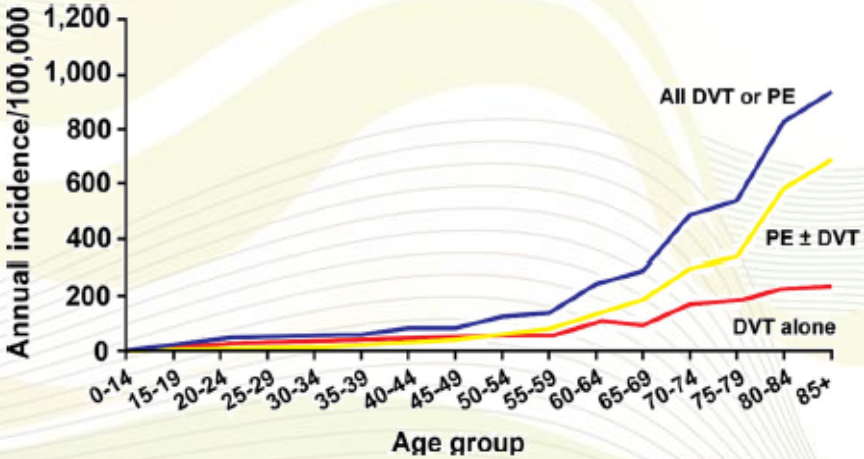
OUTLINE

- Epidemiologia
- Clinica
  - “Mind the PE”
- Diagnosi
  - Clinical Predictors Rules
  - D-dimero
- Risk stratification
  - Il ruolo dell’ecografia
  - Home Treatment

EPIDEMIOLOGIA

- Prevalenza di EP in PS: 1 su 400-1500 pazienti
- Incidenza di EP (in PS): aumenta con l'età del paziente (da 1 su 10.000 pazienti nella terza decade di vita a 1 su 200 pazienti nella nona decade di vita)

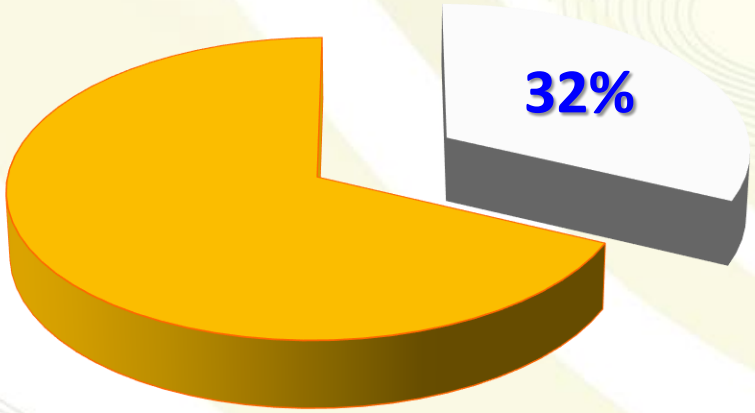


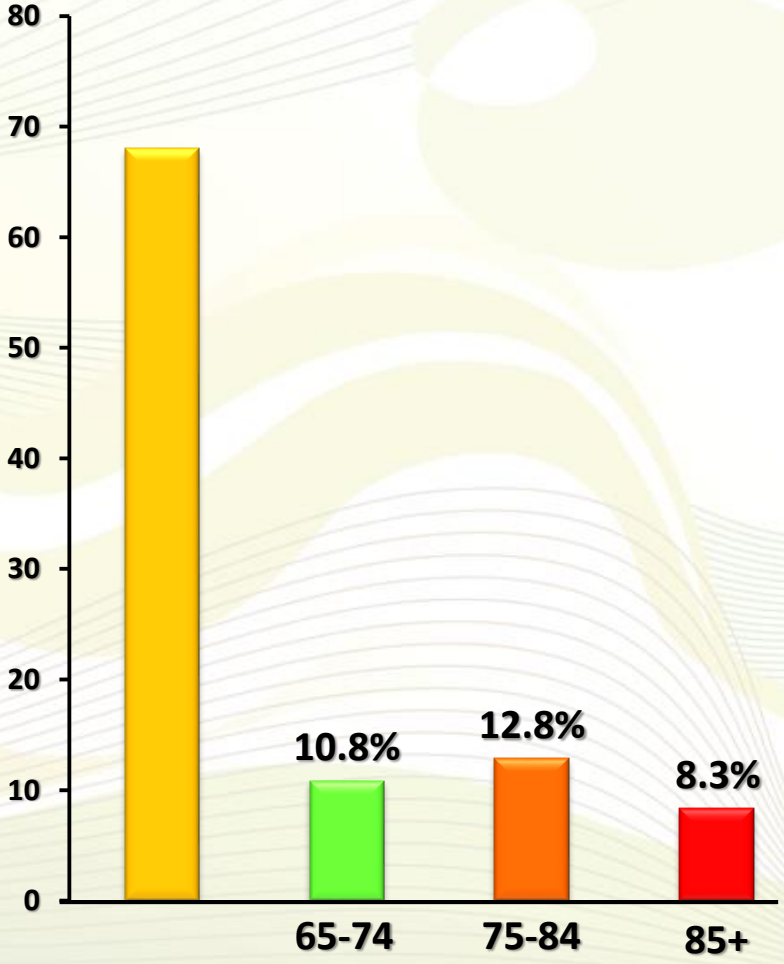


Kline JA, Kabrhel C. J Emerg Med 2015
Heit JA, et al J Thromb Thrombolysis 2016

DATI FLUSSO EmUr

519431 accessi nei PS/PPI della Regione Marche, anno 2015





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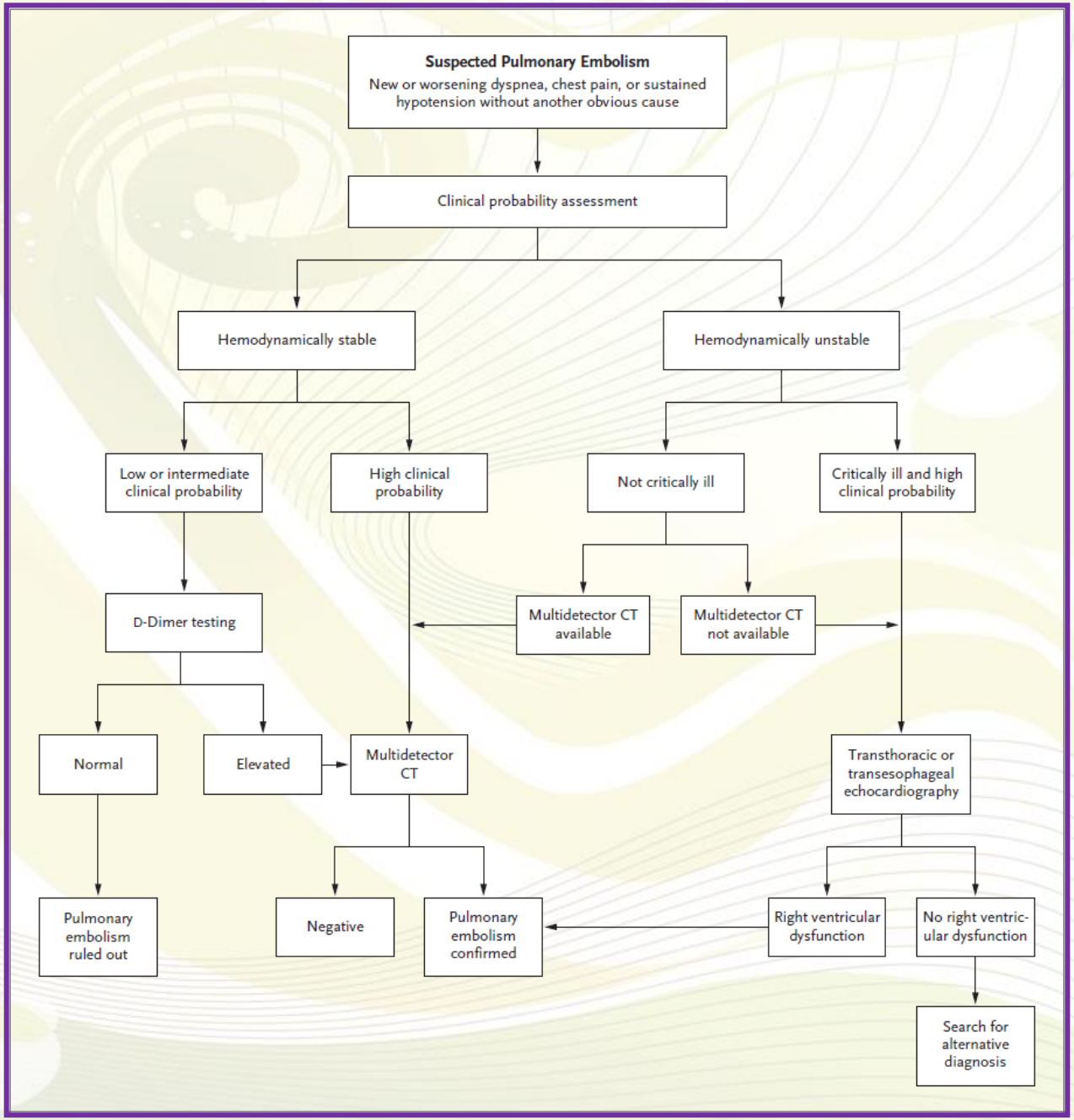
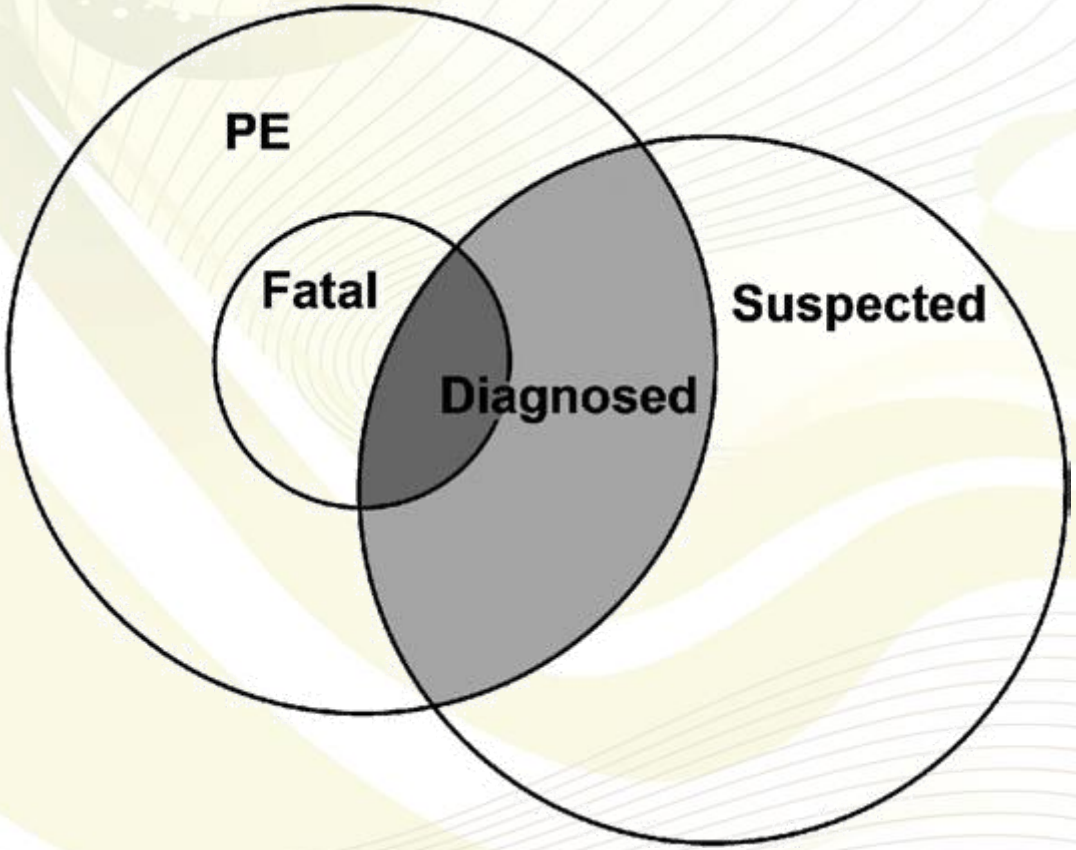


Agnelli G, Becattini C. N Engl J Med 2010



Laack TA, Goyal DG. Emerg Clin N Am 2004

CLINICAL PICTURE

EP should be suspected in all patients who present with new or worsening dyspnea, chest pain, or sustained hypotension without an alternate obvious cause

Feature	PE confirmed (*n* = 1880)	PE not confirmed (*n* = 528)
Dyspnoea	50%	51%
Pleuritic chest pain	39%	28%
Cough	23%	23%
Substernal chest pain	15%	17%
Fever	10%	10%
Haemoptysis	8%	4%
Syncope	6%	6%
Unilateral leg pain	6%	5%
Signs of DVT (unilateral extremity swelling)	24%	18%

Dolore toracico pleuritico: improvvise ed intense fitte, lancinanti o urenti in concomitanza con gli atti respiratori; è esacerbato da respiri profondi, tosse, starnuto e risate. Se l'infiammazione è vicina al diaframma il dolore può essere riferito/irradiato al collo o alla spalla.

Unexplained tachycardia
New onset tachyarrhythmia

ESC Guidelines. Eur Heart J 2014

GERIATRIC PITFALLS

Sintomo	Confondente
Dispnea/tosse/dolore toracico	Comorbilità
Tachicardia	β-bloccanti (calcio-antagonisti) Febbre/sepsi (concomitante) Disidratazione
Emottisi	Neoplasie, TAO/NAO
Sincope	Caduta
Edema arto/i inferiore/i	Scompenso cardiaco, IVC
Ipossia/Ipocapnia	BPCO (ipercapnica)

E IL DELIRIUM?

HYPOACTIVE DELIRIUM CAUSED BY PULMONARY EMBOLUS IN AN ELDERLY ADULT

Soysal P, Isik AT. J Am Geriatr Soc 2014

Pulmonary embolism: a cause of acute confusion in the elderly

Shaw JE, Belfield PW. Postgrad Med J 1991

Patient No./ age (y)/sex	Relevant prior conditions	Psychomotor variant of delerium	Setting in which delirium occurred	Duration of delirium before PE diagnosis	PaO_2 when PE was suspected (mm Hg)	D-dimer[b] (ng/mL)	Imaging test for PE diagnosis[c]	Treatment/ clinical outcome
1/72/M	Mild cognitive impairment Prostatic adenocarcinoma	Hyperactive	Outpatient	35 d	51	NP	Lung scanning	Anticoagulation/ delirium resolved 5 d
2/72/F	None	Hyperactive	Inpatient (RFF, preoperative period)	18 h	59	7750	Lung scanning	Retrievable IVCF, anticoagulation/ delirium resolved 2 d
3/85/M	Severe COPD	Hyperactive	Inpatient (acute exacerbation of COPD)	1 d	47	4370	Lung scanning	Anticoagulation/ delirium resolved 3 d
4/73/F	Hypertension	Hypoactive	Outpatient	2 d	83	650	Lung scanning	Anticoagulation/ delirium resolved 3 d
5/79/M	Mild cognitive impairment	Hyperactive	Inpatient (CS and IHS, post-operative state	20 d	52	18,370	Chest CT	Anticoagulation/ delirium resolved 5 d

Carrascosa MF, et al. Mayo Clin Proc 2009

CLINICAL PRESENTATION

Table 2. Symptoms and primary presenting complaint

Symptom	Percentage and (number)	
	Younger patients (31)	Older patients (29)
Pain	87% (27)	59%[a] (17)
Pain as primary presenting complaint	84% (26)	45%[b] (13)
Collapse	3% (1)	24%[a] (7)
Dyspnoea	58% (18)	59% (17)
Cough	36% (11)	24% (7)
Haemoptysis	23% (7)	14% (4)
Palpitations	3% (1)	7% (2)

Table 3. Clinical findings

Examination parameter	Younger patients	Older patients
Hypotension (mean arterial pressure < 70 mmHg)	0	11 %
Tachycardia (heart rate > 100/min)	21%	31%
Tachypnoea (respiratory rate > 24/min)	8%[a]	8%[a]
Fever (temperature > 37.5°C)	13%[a]	4%[b]
Cyanosis	0	14%[c]
Abnormal lower limb examination	26%	17%
Pleural rub	16%	7%

Table 4. Arterial blood gas results

	Younger patients ($n = 21$)	Older patients ($n = 19$)	*P*-value
$PO_2 < 8.0$ kiloPascal	9%	42%	< 0.04
O_2 saturation < 90%	5%	32%	< 0.04
$PCO_2 < 4.0$ kiloPascal	14%	16%	n/s
pH > 7.48	19%	32%	n/s

Table 5. ECG findings

ECG findings	Percentage and (number)	
	Younger patients ($n = 30$)	Older patients ($n = 28$)
S1 Q3 T3	13% (4)	14% (4)
Right bundle branch block	10% (3)	18% (5)
Sinus tachycardia	7% (2)	18% (5)
Atrial fibrillation	3% (1)	7% (2)
Anterior T wave inversion	0	4% (1)
Any of the above findings[a]	33% (10)	61% (17)

Timmons S et al. Age Ageing 2003

CLINICAL PICTURE (2)

Symptoms	Stein (1981/1991)	Goldhaber (1999)	Kucher (ICOPER 2006), Massive PE	Kucher, Non-massive PE	Torbicki (ICOPER 2003), Right heart thrombus	Torbicki (ICOPER 2003), Right heart thrombus negative	RIETE registry (2006)	EMPEROR registry (2011)
Dyspnea	73%	82%	81%	82%	83%	88%	32%	50%
Tachipnea	66%	60%						
Tachicardia	30%	40%						
Chest pain	70%	49%	40%	50%	46%	47%		54% (39% pleuritic and 15% substernal)
Pulmonary infarction							50%	
Upper abdominal pain								11%
Syncope	13%	14%	39%	12%	24%	16%		6%
Cough	37%	20%	9%	21%				23%
Respiratory distress								16%
Hemoptysis	13%	7%	2%	7%				8%
Circolatory collapse (yes/no)					14%	5%	18%	
Fever (>37.8°C)	7%	9%						10%
DVT	11%	54%	32%	50%	40%	53%		24%
ECG/BBDX		16%			27%	13%		
ECG/AF		14%			12%	12%		

Morrone D, Morrone V. Korean Circ J 2018

ORIGINAL ARTICLE

Prevalence of Pulmonary Embolism among Patients Hospitalized for Syncope

RESULTS

A total of 560 patients (mean age, 76 years) were included in the study. A diagnosis of pulmonary embolism was ruled out in 330 of the 560 patients (58.9%) on the basis of the combination of a low pretest clinical probability of pulmonary embolism and negative D-dimer assay. Among the remaining 230 patients, pulmonary embolism was identified in 97 (42.2%). In the entire cohort, the prevalence of pulmonary embolism was 17.3% (95% confidence interval, 14.2 to 20.5). Evidence of an embolus in a main pulmonary or lobar artery or evidence of perfusion defects larger than 25% of the total area of both lungs was found in 61 patients. Pulmonary embolism was identified in 45 of the 355 patients (12.7%) who had an alternative explanation for syncope and in 52 of the 205 patients (25.4%) who did not.

Prandoni P et al. N Engl J Med 2016

JAMA Internal Medicine | Original Investigation | LESS IS MORE

Prevalence of Pulmonary Embolism in Patients With Syncope

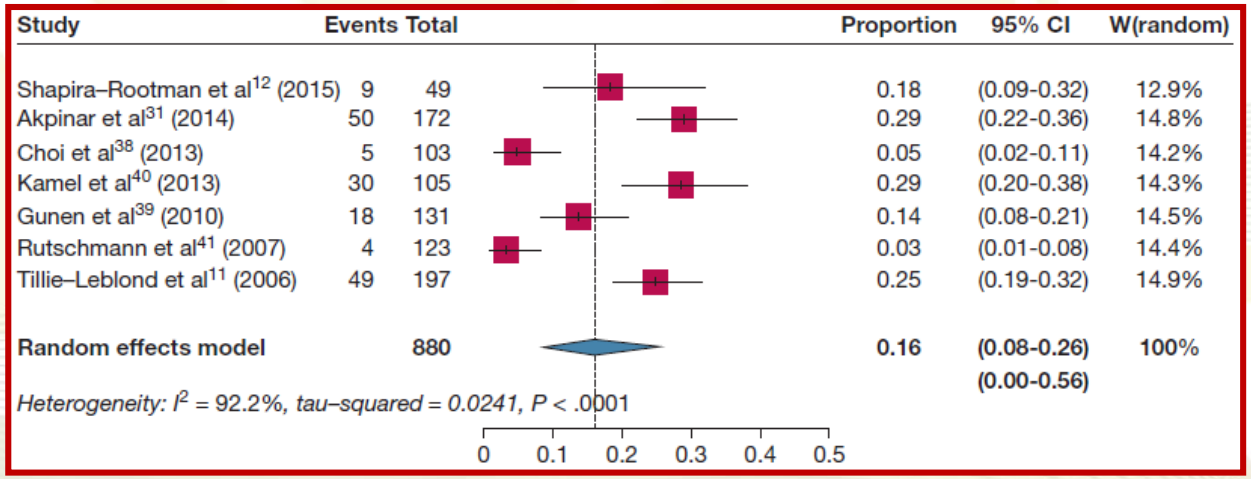
RESULTS A total of 1 671 944 unselected adults who presented to the ED for syncope were included. The prevalence of PE, according to administrative data, ranged from 0.06% (95% CI, 0.05%-0.06%) to 0.55% (95% CI, 0.50%-0.61%) for all patients and from 0.15% (95% CI, 0.14%-0.16%) to 2.10% (95% CI, 1.84%-2.39%) for hospitalized patients. The prevalence of PE at 90 days of follow-up ranged from 0.14% (95% CI, 0.13%-0.14%) to 0.83% (95% CI, 0.80%-0.86%) for all patients and from 0.35% (95% CI, 0.34%-0.37%) to 2.63% (95% CI, 2.34%-2.95%) for hospitalized patients. Finally, the prevalence of venous thromboembolism at 90 days ranged from 0.30% (95% CI, 0.29%-0.31%) to 1.37% (95% CI, 1.33%-1.41%) for all patients and from 0.75% (95% CI, 0.73%-0.78%) to 3.86% (95% CI, 3.51%-4.24%) for hospitalized patients.

Costantino G et al. JAMA Intern Med 2018

EP & pneumonia/BPCO

Table 3. Frequencies of PE.

Groups	Pretest probability for PE		
	Low	Intermediate	High
All (n = 1275)	52/520 (10%)	143/729 (20%)	7/26 (27%)
Pneumonia (n = 113)	3/36 (8%)	8/74 (11%)	0/3 (0%)
Acute cardiac disorder (n = 154)	1/44 (2%)	4/106 (4%)	0/4 (0%)
Comparison group (n = 1008)	48/440 (11%)	131/549 (24%)	7/19 (37%)



Rohacek M, et al. PlosOne 2012

Aleva FE, et al. Chest 2017

OUTLINE

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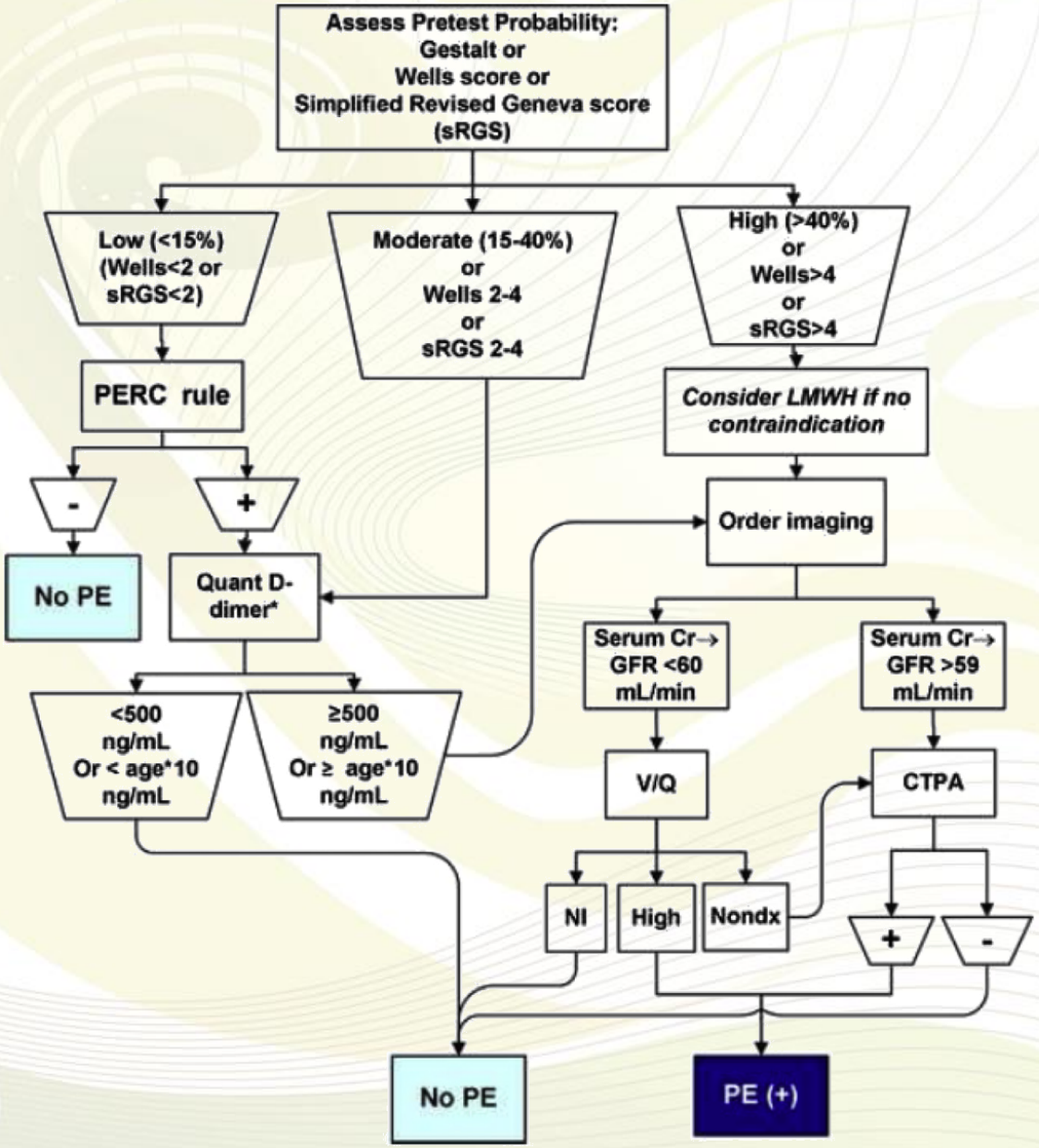


Kline JA, Kabrhel C. J Emerg Med 2015

WELLS SCORE

Variable		Points
Previous PE or DVT		+1.5
Heart rate > 100 bpm		+1.5
Recent surgery or immobilization		+1.5
Clinical signs of DVT		+3
Hemoptysis		+1
Cancer		+1
Alternative diagnosis less likely than PE		+3
Probability of PE	**Score**	**Prevalence of PE**
Low	≤ 4	7.8%
High	> 6	61%

Corrigan D, et al. Clin Exp Emerg Med 2016

GENEVA SCORE

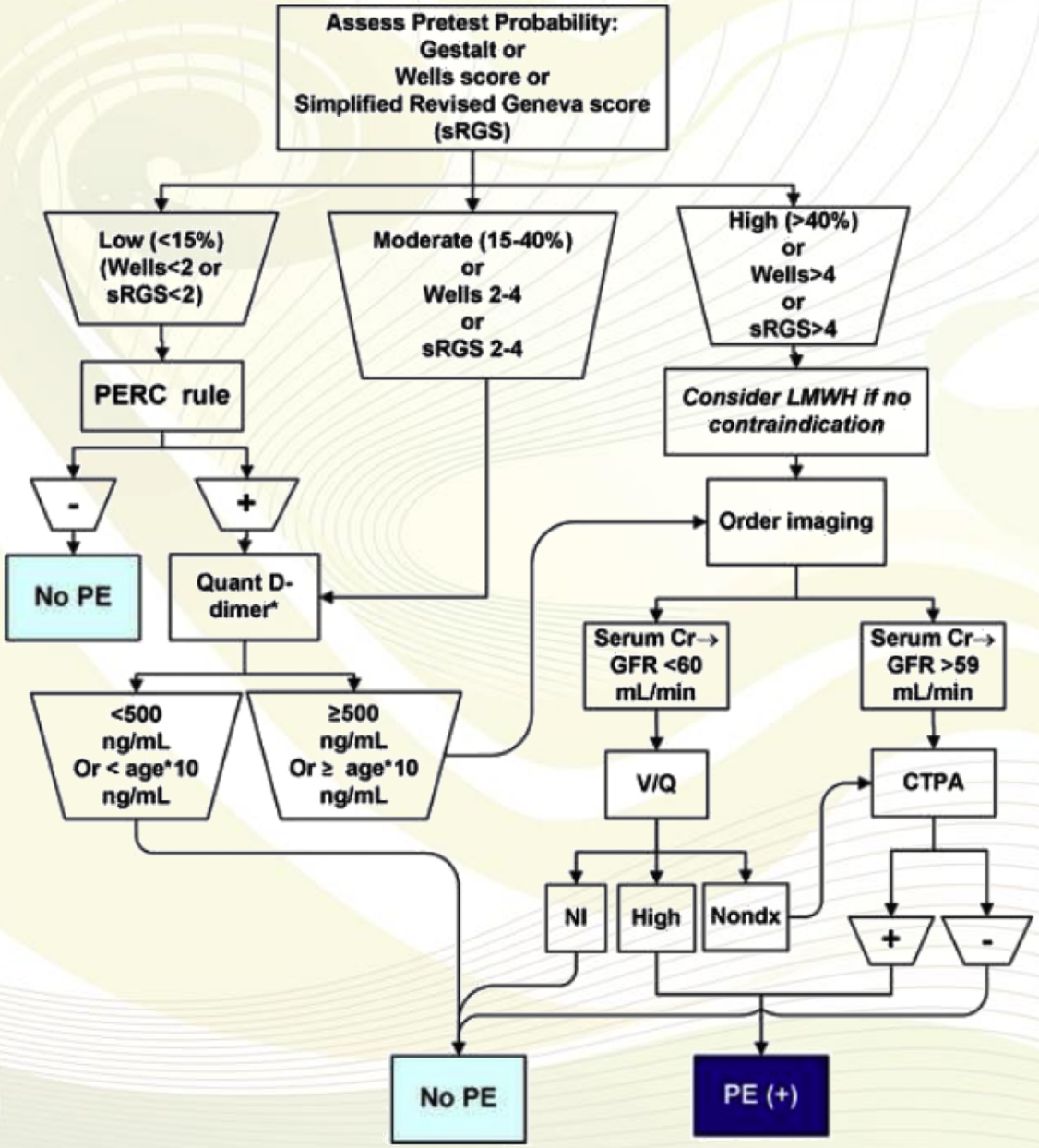
Variable		Points
Age > 65 yr		+1
Previous venous thromboembolism		+3
Surgery requiring anesthesia or fracture of lower limb in the past month		+2
Active malignancy		+2
Unilateral leg pain		+3
Hemoptysis		+2
Unilateral leg edema		+4
Heart rate 75-94 bpm		+3
Heart rate > 95 bpm		+5
Probability of PE	**Score**	**Prevalence of PE**
Low	≤ 3	8%
High	> 11	74%

Corrigan D, et al. Clin Exp Emerg Med 2016

QUALE USARE?

	Wells Score			Geneva		
	Original	Modified	Simplified	Revised	SRGS	Gestalt
Subjective variables	• 'PE most likely diagnosis' requires judgment, is highly weighted, and has only moderate interobserver reliability[69]			• Uses only objective variables		• Relies solely on clinical experience and training
Ease of use	• Fewer variables than Geneva criteria • Simplified Wells easiest to use, but not as widely validated as original scores			• Fully standardized (no reliance on clinician experience)		• No required data or calculator
Accuracy[a]	0.62–0.85[37,39,46,70]	0.74–0.80[39,45,71]	0.72–0.79[39,44,45]	0.65–0.75[42,70,72]	0.69–0.76[42,44–46]	0.77–0.89[71,73]
Failure rate (%)	0.0–1.5[35,45,46]	0.0–1.5[37,45,46]	0.5–1.2[39,44,45]	0.0–2.7[45,72]	0.0–3.1[45,46]	0.7–1.3[57,71]
PPV (%)	19.8–21[37,45]	21[17,37,45]	21[45]	20[45]	21[45]	17–25[74]
NPV (%)[b]	99–99.5[37,44,45]	99[37,45]	99[44,45]	97–99.5[44,45]	97–99.5[42,45]	89–96[74]
Nonapplicable groups	• Pregnancy • Upper limb DVT • Life expectancy <3 mo • No PE symptoms >3 d before presentation • Anticoagulation for >72 h (or low-molecular weight heparin for >24 h in simplified)[39] • Age <18 y • CTPA contraindication[10,32,33]			• Pregnancy • High-risk PE • CTPA contraindication • Life expectancy <3 mo • Current anticoagulation[41,42] • Hospitalized patients		• No absolute contraindications • Accuracy increases with increasing clinical experience[74]

Harder EM, et al. Clin Chest Med 2018



Kline JA, Kabrhel C. J Emerg Med 2015

PERC

1. Clinical low probability (<15% probability of PE based upon gestalt assessment)
2. Age <50 years
3. Pulse <100 beats/min during entire stay in ED
4. Pulse oximetry >94% at near sea level (>92% at altitudes near 5000 feet above sea level)
5. No hemoptysis
6. No prior VTE history
7. No surgery or trauma requiring endotracheal or epidural anesthesia within the last 4 weeks
8. No estrogen use†
9. No unilateral leg swelling‡

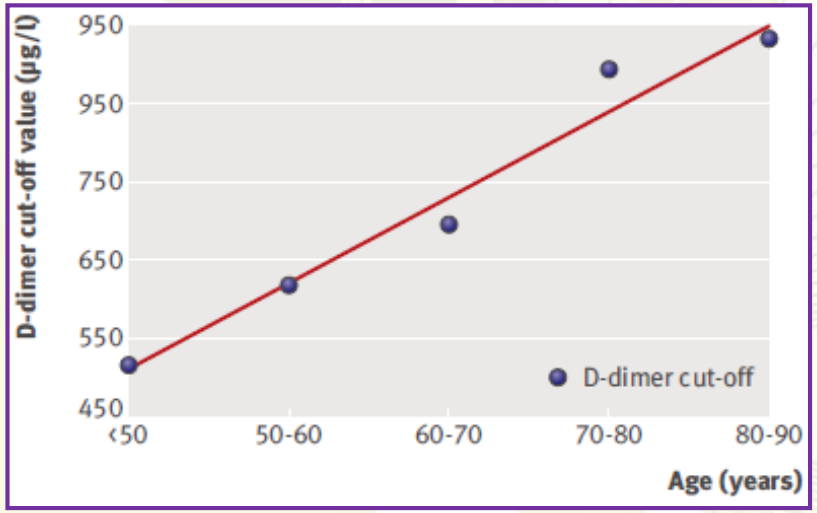
Kline JA, Kabrhel C. J Emerg Med 2015

D-dimero

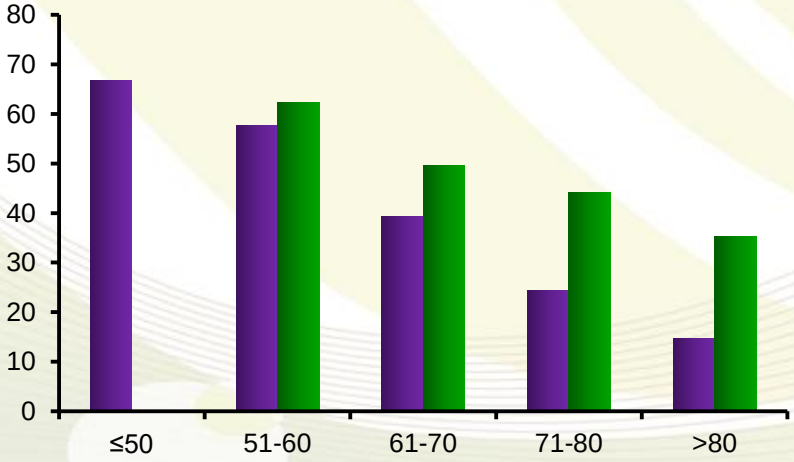
False Positives	False Negatives*
Patient factors: • Increasing age: (60–69 years [OR 2.6], 70–79 years [OR 4.5], ≥80 years [OR 10.5]) • Cocaine use (OR 2.0) • Immobility: general (OR 2.3), limb (OR 2.8), or neurologic (OR 3.0) • Hemoptysis (OR 2.0) • Hemodialysis (OR 2.2) • Malignancy, active (OR 2.6) • Rheumatoid arthritis (OR 2.8) • Systemic lupus erythematosus (OR 2.1) • Sickle cell disease (OR 24.2) • Pregnancy and postpartum state: (2nd trimester [OR 7.3], 3rd trimester [OR 51.3], postpartum [OR 4.2]) • Surgery (<4 weeks prior): abdominal (OR 3.5), chest (OR 2.7), orthopedic (OR 2.2), other surgery (OR 3.2)	Patient factors: • Concomitant anticoagulation† • Symptoms lasting more than 5 days • Subsegmental PE • Isolated pulmonary infarction • Chronic PE System and machine issues: • Wrong sample • Severe lipemia or hemolysis • Protein degradation by proteolysis that can occur with prolonged time from sample draw to analysis

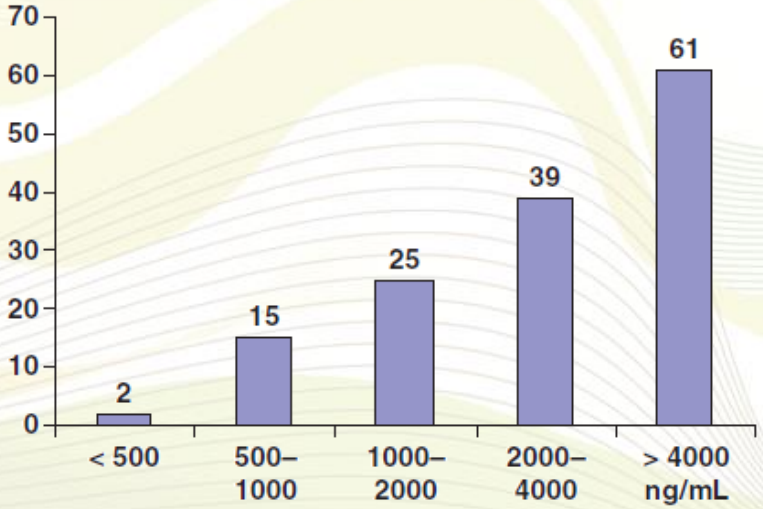
Nemec M et al. Acad Emerg Med 2010

D-dimero



Study population (n = 1515)	CDR ≤4 (n = 994) (66)	CDR >4 (n = 521) (34)
PE prevalence, %	129/994 (13)	195/521 (37)
DD <500 (n = 529)	4/449 (0.9)	6/80 (8)
DD 500–1000 (n = 276)	21/175 (12)	19/101 (19)
DD 1000–2000 (n = 297)	40/191 (21)	35/106 (33)
DD 2000–4000 (n = 236)	32/118 (27)	60/118 (51)
DD >4000 (n = 177)	32/61 (53)	75/116 (65)



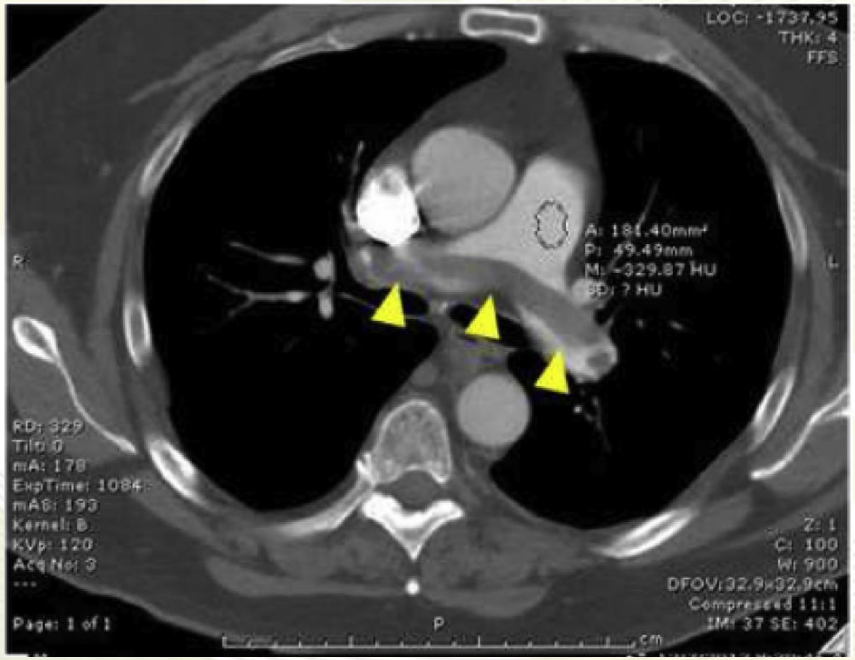


Douma RA, et al. BMJ 2010
Schouten HJ, et al. BMJ 2013

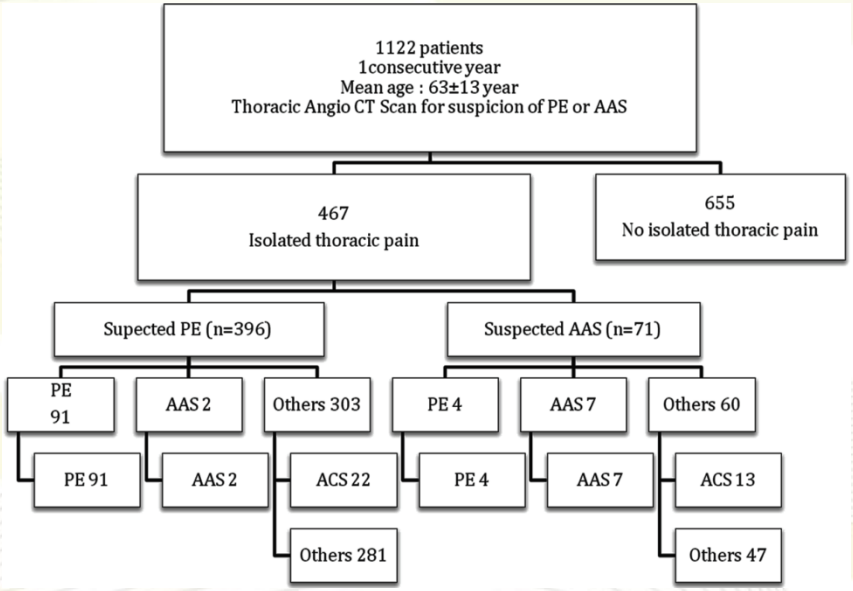
Tick LW et al. J Intern Med 2008

IMAGING

ANGIO-TC POLMONARE



TRIPLE RULE OUT



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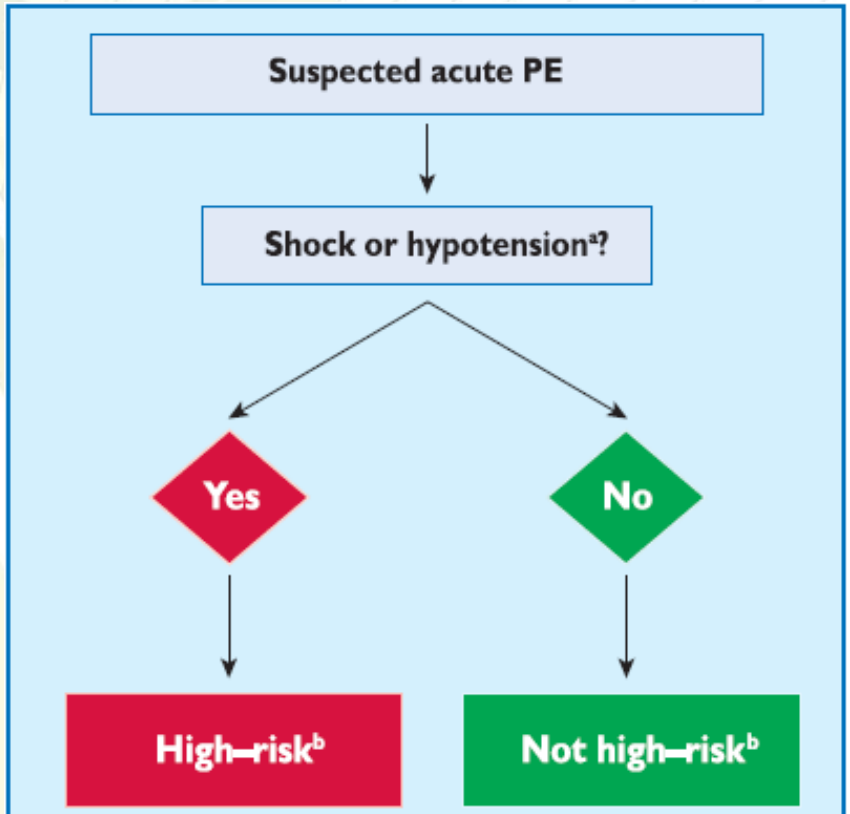
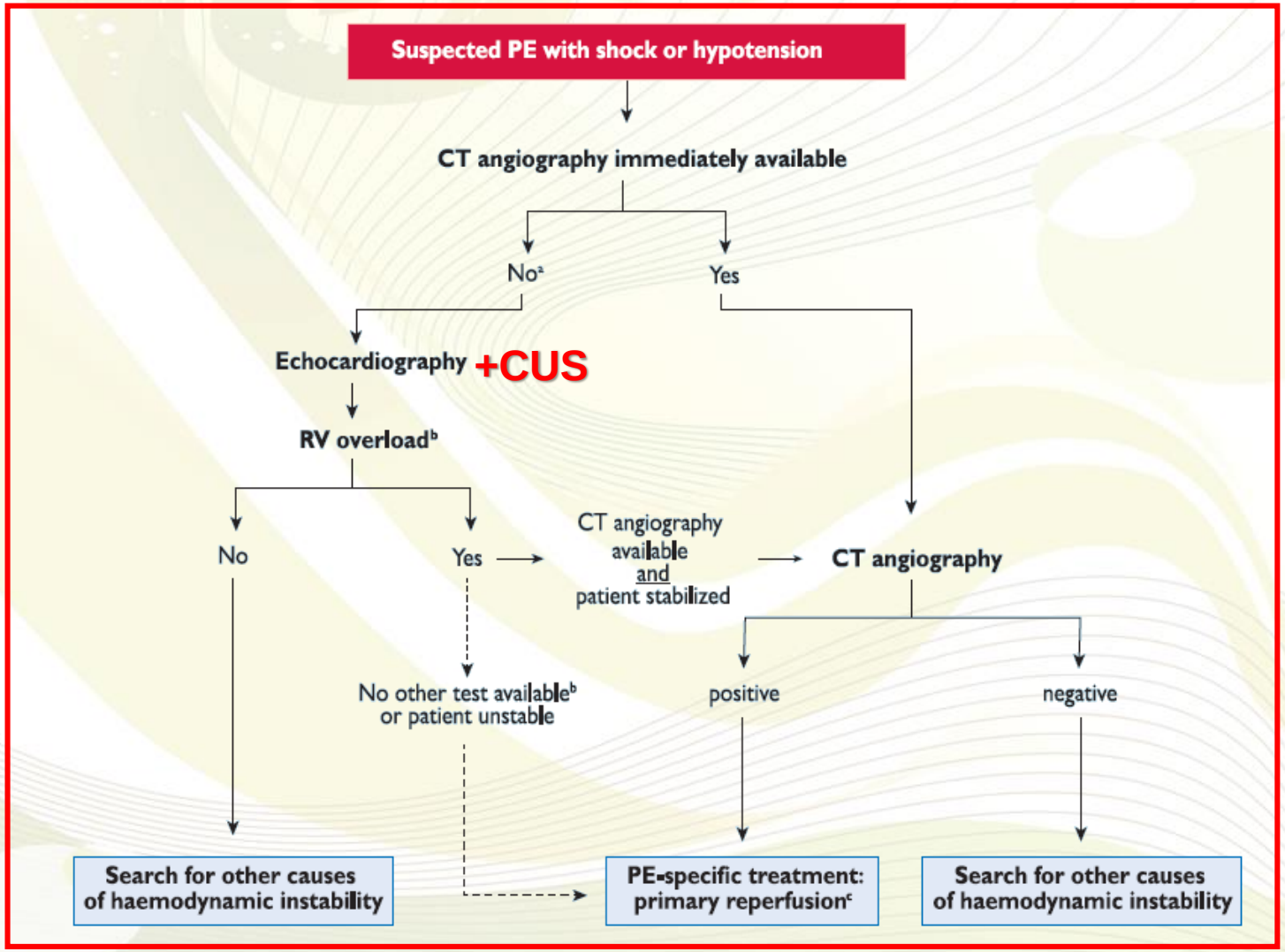
RISK STRATIFICATION



PE = pulmonary embolism.
[a]Defined as systolic blood pressure <90 mm Hg, or a systolic pressure drop by ≥40 mm Hg, for >15 minutes, if not caused by new-onset arrhythmia, hypovolaemia, or sepsis.
[b]Based on the estimated PE-related in-hospital or 30-day mortality.

ESC Guidelines. Eur Heart J 2014

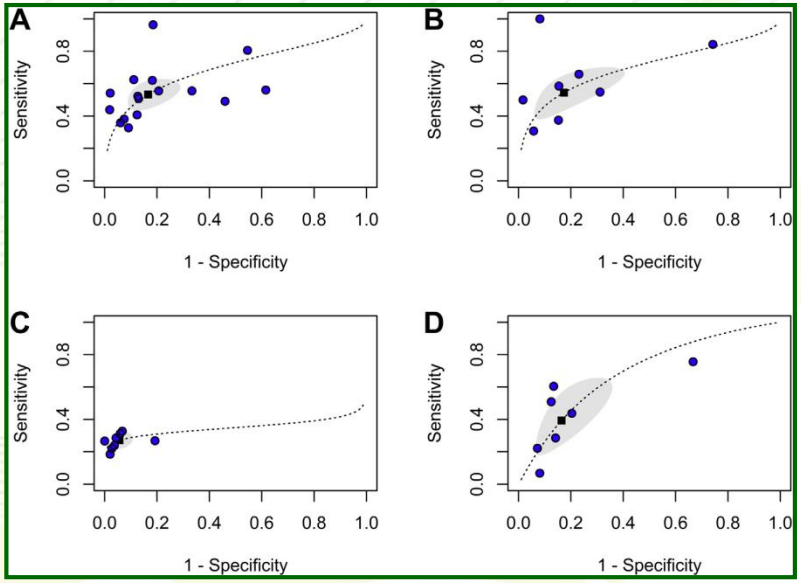
ALGORITMO ESC GL

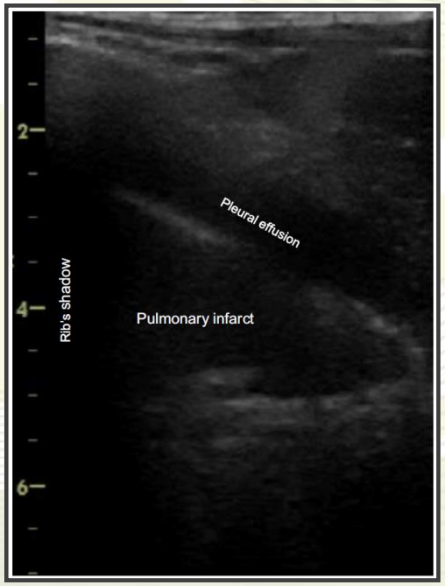


ESC Guidelines. Eur Heart J 2014

ECOGRAFIA & PE

- Venous US (CUS)
- Echocardiography
  - RH strain
  - RV/LV ratio
  - Abnormal/paradoxical septal motion
  - RH strain curve for TR/insufficiency
- Lung scan
  - Pneumonia
  - Pulmonary infarct
  - Pleural effusion



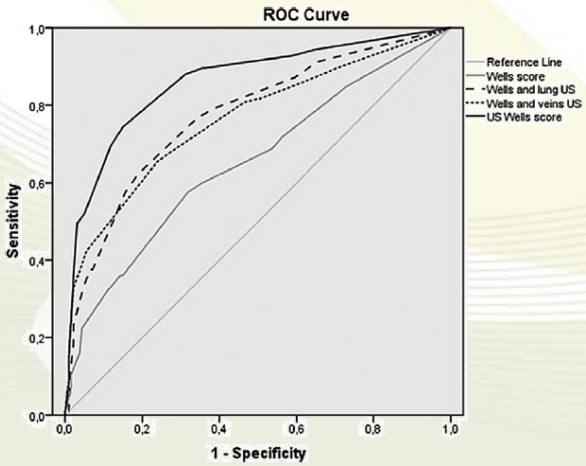


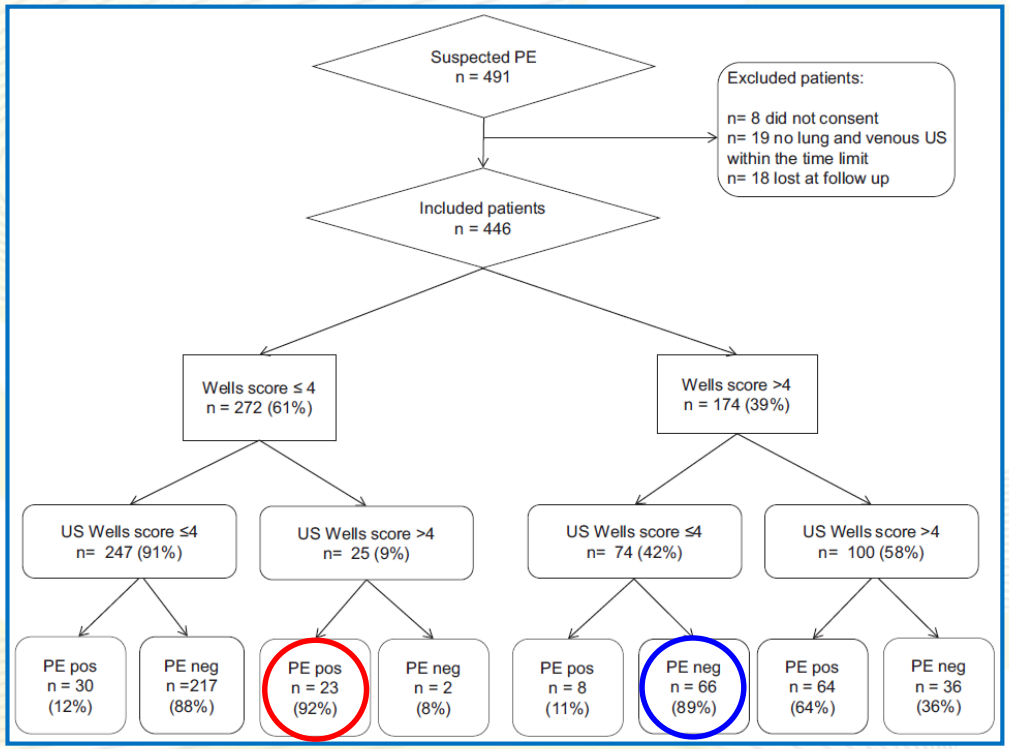
Fields JM, et al. J Am Soc Echocardiogr 2017

Diagnostic Performance of Wells Score Combined With Point-of-care Lung and Venous Ultrasound in Suspected Pulmonary Embolism

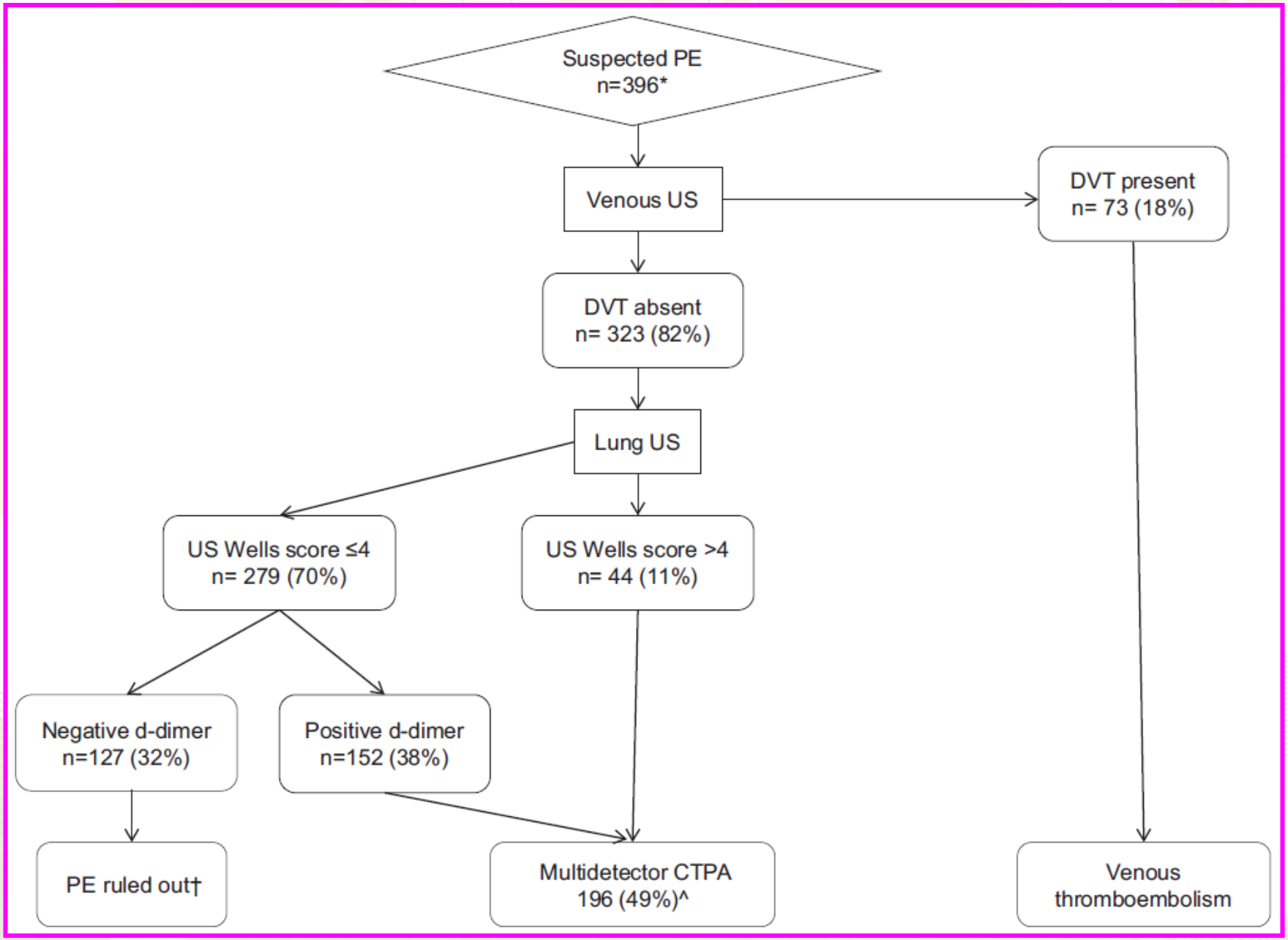
Ws	USWs	Points
Signs and symptoms of DVT	Venous ultrasound positive for DVT	+3
Alternative diagnosis less likely than PE	Alternative diagnosis less likely than PE after lung ultrasound	+3
Heart rate > 100 beats/min		+1.5
Immobilization > 3 d or surgery in the previous 4 wk		+1.5
Previous, objectively diagnosed PE or DVT		+1.5
Hemoptysis		+1
Malignancy on treatment, treated within 6 mo, or in palliative therapy		+1

DVT = deep venous thrombosis; PE = pulmonary embolism.



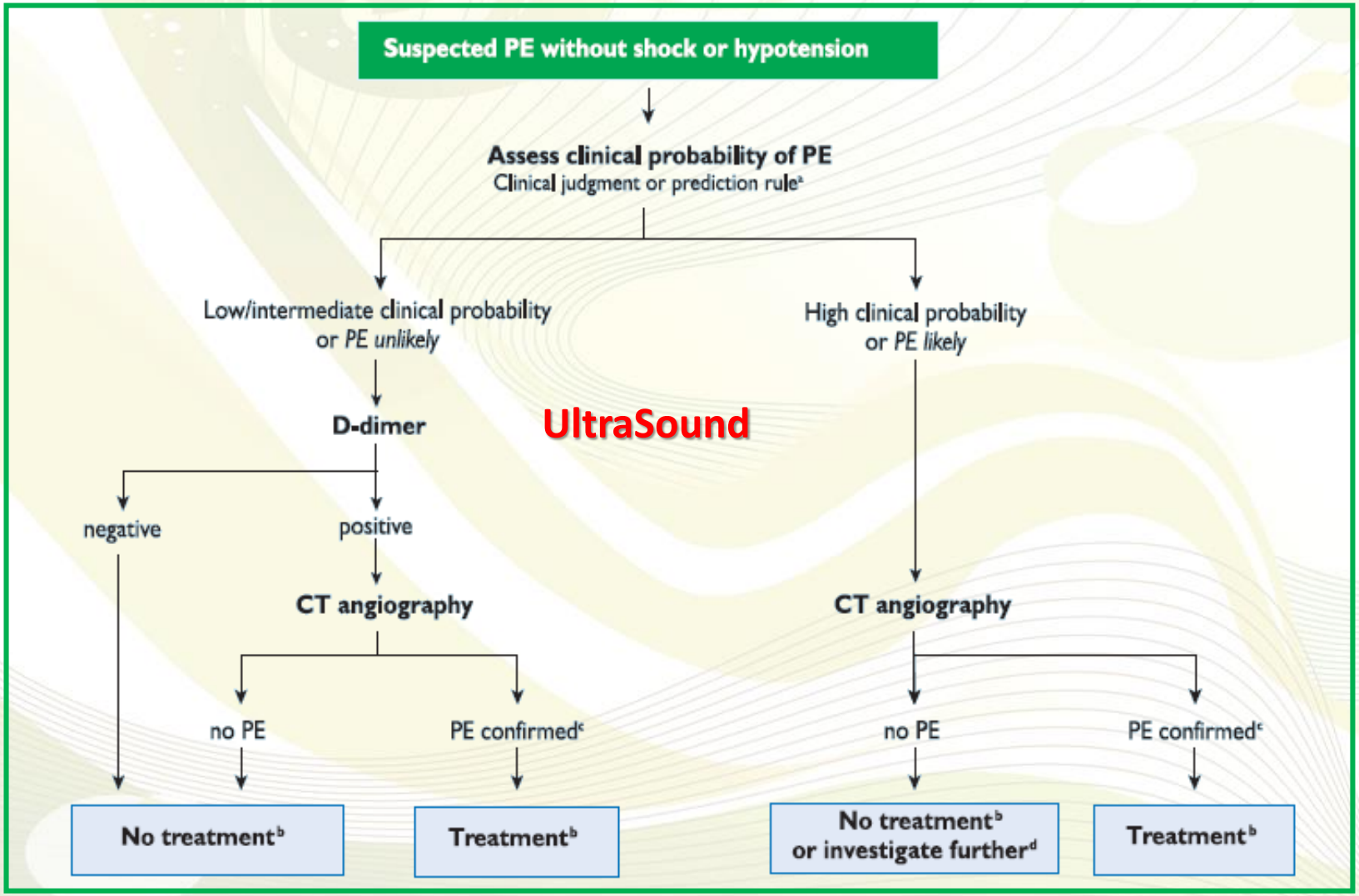


Nazerian P, et al. Acad Emerg Med 2016



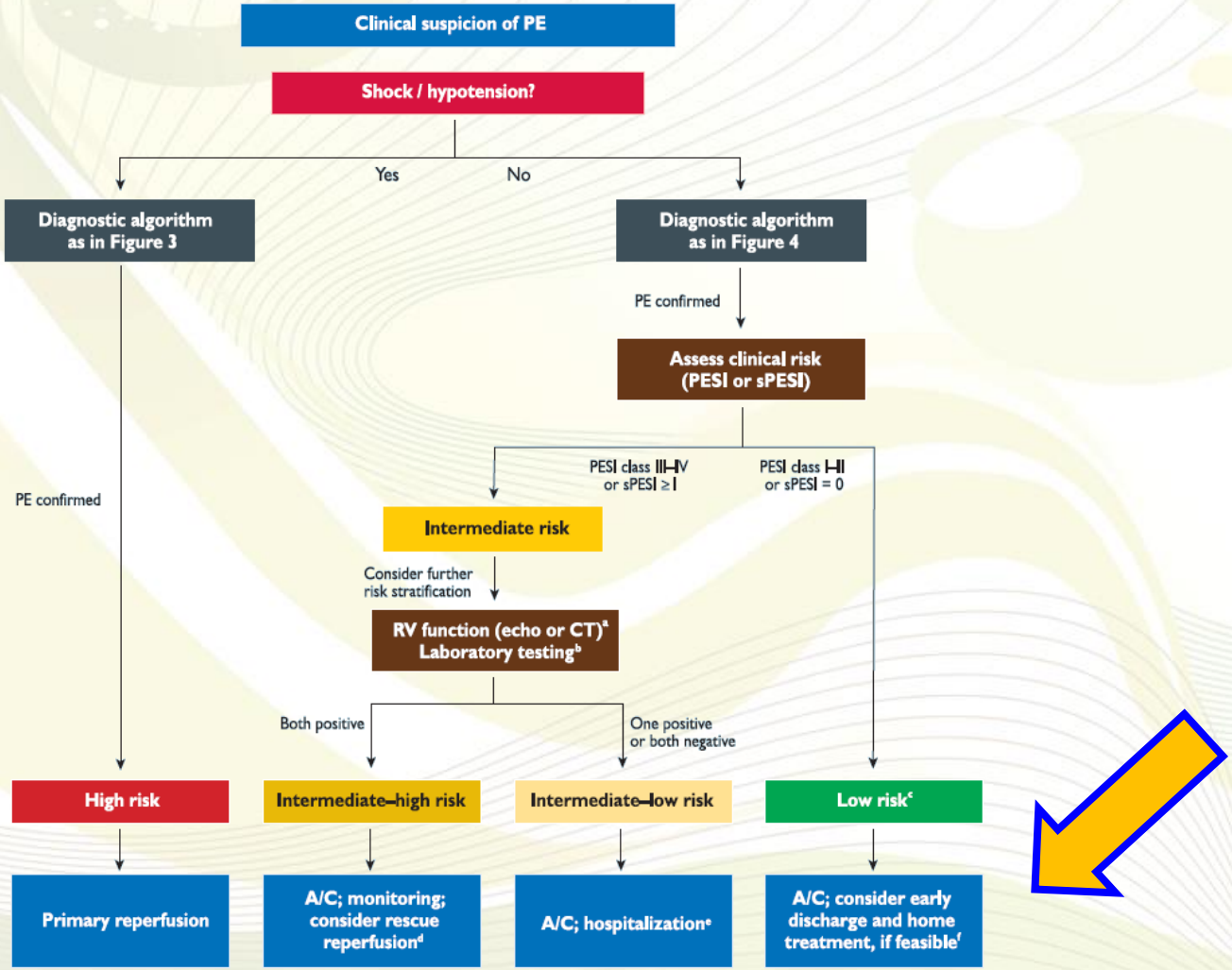
Nazerian P, et al. Acad Emerg Med 2016

ALGORITMO PE STABILE



ESC Guidelines. Eur Heart J 2014

TERAPIA (ALGORITMO)



ESC Guidelines. Eur Heart J 2014

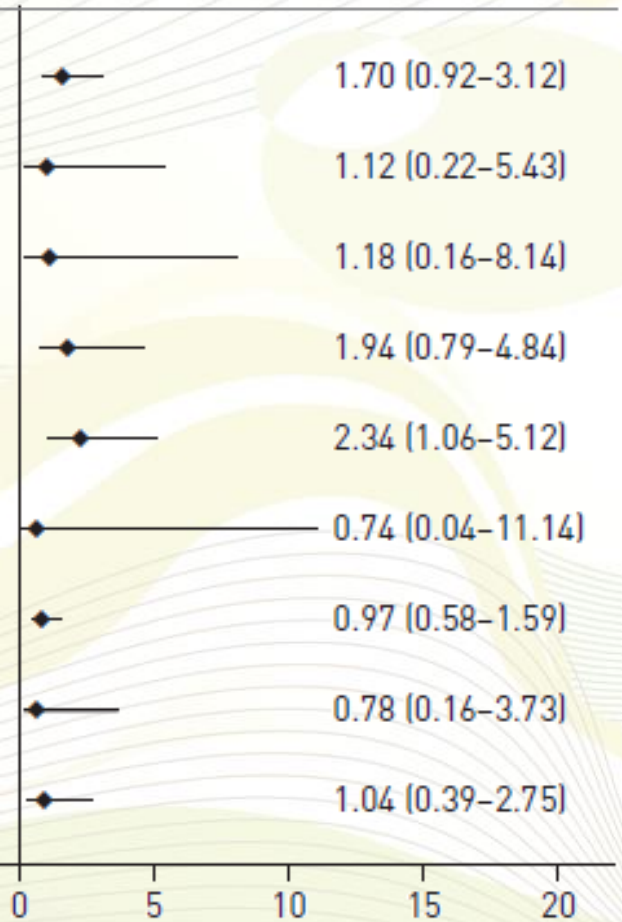
PESI/sPESI

Parameter	Original version[214]	Simplified version[218]
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 mm Hg	+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
	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%) **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%)	**0 points**= 30-day mortality risk 1.0% (95% CI 0.0%–2.1%) **≥1 point(s)**= 30-day mortality risk 10.9% (95% CI 8.5%–13.2%)

ESC Guidelines. Eur Heart J 2014

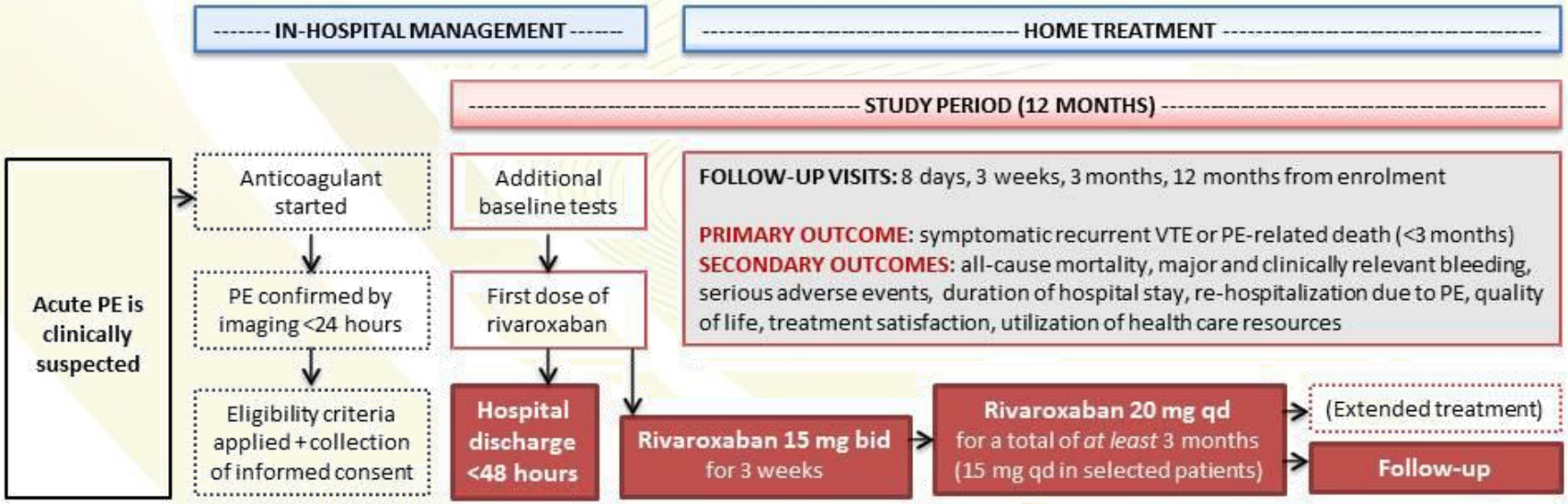
HOME TREATMENT

Outcome	Cohort	Studies n	Patients n	Events n	Absolute risk % (95% CI)
Recurrence	Home treatment	13	1657	33	1.70 (0.92–3.12)
Recurrence	Early discharge	3	256	3	1.12 (0.22–5.43)
Recurrence	Hospital treatment	4	329	6	1.18 (0.16–8.14)
Mortality	Home treatment	13	1657	49	1.94 (0.79–4.84)
Mortality	Early discharge	3	256	6	2.34 (1.06–5.12)
Mortality	Hospital treatment	5	383	8	0.74 (0.04–11.14)
Bleeding	Home treatment	12	1555	15	0.97 (0.58–1.59)
Bleeding	Early discharge	3	256	2	0.78 (0.16–3.73)
Bleeding	Hospital treatment	5	383	4	1.04 (0.39–2.75)



Zondag W, et al. Eur Resp J 2013

HOT-PE TRIAL



Basco S, et al. Thromb Haemost 2016

TAKE-HOME MESSAGES

- Mind the PE
  - ✓ Sospettare (sempre)
  - ✓ Verificare (il giusto)
- Mind the echo
  - ✓ CUS
  - ✓ Heart
  - ✓ Lung
- Mind the Home possibility
  - ✓ Per pazienti selezionati, a bass(issim)o rischio

Grazie per l'atten