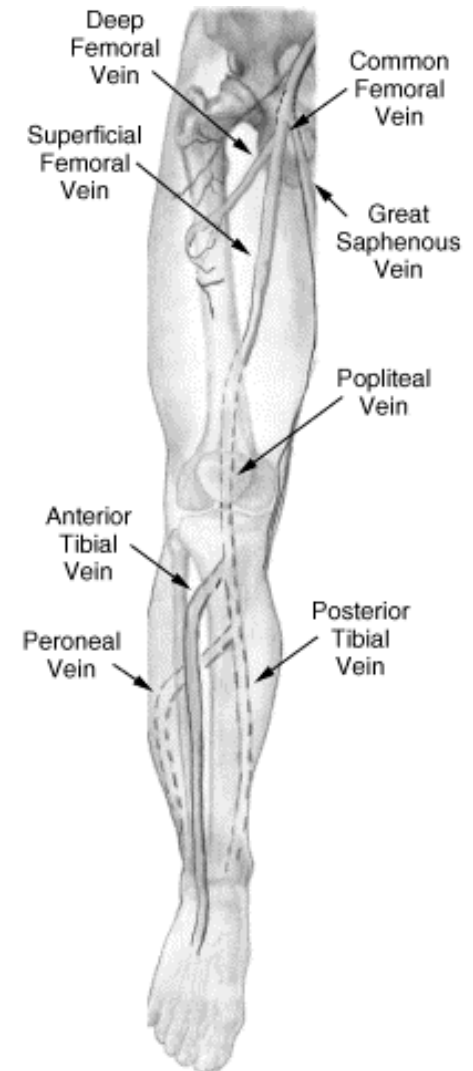


Sistema venoso arti inferiori

- Si riconoscono 4 sistemi venosi
 - **profondo** → *femorali*, profonda, comune e superficiale; *poplitea*; *distali*;
 - **superficiale** → *safene*;
 - **perforante** → vasi che collegano superficiale a profondo;
 - **comunicante** → vasi venosi che collegano le vene superficiali.
- Il 90% del ritorno venoso dagli arti inferiori è veicolato dai vasi venosi profondi.
- I vasi vengono distinti in **prossimali** e **distali**
-



TVP prossimale e distale

La TVP agli arti inferiori si suddivide in:

prossimale

interessa le vene sopra la rima articolare del ginocchio

distale

interessa esclusivamente le vene della gamba

Il sistema venoso profondo arti inferiori: le vene distali

- Due vene tibiali posteriori polpaccio, mediali posteriori
- Due vene tibiali anteriori polpaccio, anteriori
- Due vene peroneali polpaccio, laterali

Il sistema venoso profondo arti inferiori: le vene distali

Le vene muscolari del polpaccio

- vene soleali fanno parte del circolo muscolare del polpaccio, prendono il nome dal muscolo soleo che attraversano.
- vene gemellari fanno parte del circolo muscolare del polpaccio, sono più superficiali rispetto alle soleali, prendono il nome dai muscoli gemelli interno ed esterno che attraversano.

Prevalenza TVP distali

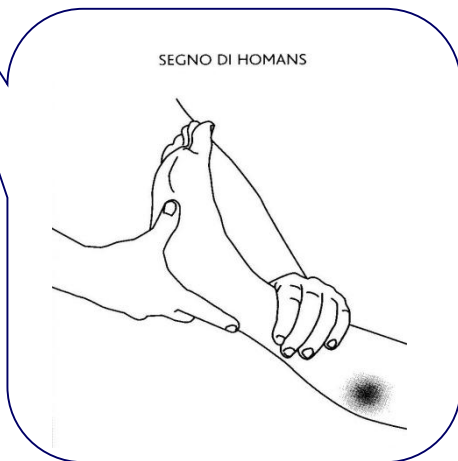
Reference	Patients (<i>n</i>)	Prevalence of DVT [<i>n</i> (%)]		
		All	Proximal	Distal
Elias <i>et al.</i> [22]	623	204 (33)	112 (55)	92 (45)
Schellong <i>et al.</i> [23]	1646	275 (17)	121 (44)	154 (56)
Stevens <i>et al.</i> [24]	445	61 (14)	42 (69)	19 (31)
Subramaniam <i>et al.</i> [25]	526	113 (22)	49 (43)	64 (57)
Pooled estimate	3240	653 (20)	324 (50)	329 (50)

Diagnosi

- Clinica
- Laboratoristica
- Imaging

Segni clinici

- Dolore
- Edema (segno della fovea)
- Senso di peso
- Cianosi
- Aumento della temperatura cutanea
- Evidenza del circolo venoso superficiale
- Segno di *BAUER*
- Segno di *HOMANS*



Segni clinici di TVP



Box 1: Possible causes of pain or swelling of the lower limb

Other

- Cellulitis
- Baker's cyst
- Torn gastrocnemius muscle
- Fracture
- Haematoma
- Acute arterial ischaemia
- Lymphoedema
- Hypoproteinaemia (for example, cirrhosis, nephrotic syndrome)

Venous

- Deep vein thrombosis
- Superficial thrombophlebitis
- Post-thrombotic syndrome
- Chronic venous insufficiency
- Venous obstruction

Frequenza di segni e sintomi

Signs and Symptoms	Source					
	O'Donnell et al ³ Grade A, %†		Haeger ⁴ Grade B, %‡		Molloy et al ¹² Grade A, %†	
	DVT+	DVT-	DVT+	DVT-	DVT+	DVT-
Pain	78	75	90	97	48	23
Tenderness	76	89	84	74	43	35
Edema	78	67	42	32	43	26
Homans sign	56	61	33	21	11	11
Swelling	85	56	41	39
Erythema	24	38

*DVT indicates deep vein thrombosis. The DVT diagnosis was observed by venography. DVT+ indicates those with DVT; and DVT-, those without DVT. Ellipses indicate data not applicable.

†Grade A was an independent blind comparison of sign or symptom with a criterion standard of diagnosis among a large number of consecutive patients suspected of having the target condition.

‡Grade B was an independent blind comparison of sign or symptom with a criterion standard of diagnosis among a small number of consecutive patients suspected of having the target condition.

Test di screening (test 'SnOut')

Lo utilizzo per escludere la malattia con relativa certezza

TEST SnOut :

sensibilità alta, malattia OUT (esclusa)

LR- = < 0.1

Diagnostic approach to patients with suspected DVT: AT 9 ACCP guidelines

In patients with a suspected first lower extremity DVT, the choice of diagnostic tests process should be guided by the clinical assessment of pretest probability

Diagnostic approach to patients with suspected DVT: AT 9 ACCP guidelines

In patients with a suspected first lower extremity DVT, the choice of diagnostic tests process should be guided by the clinical assessment of pretest probability



E.g. Wells rule

Criteri di Wells

CARATTERISTICHE CLINICHE	Punti
Neoplasia maligna attiva (trattata negli ultimi 6 mesi o in trattamento palliativo)	1
Paralisi, paresi o immobilizzazione gessata recente di un arto inferiore	1
Allettamento recente per oltre 3 giorni o chirurgia maggiore nell'ultimo mese	1
Dolorabilità localizzata lungo il decorso dei vasi venosi profondi	1
Aumento volumetrico in toto di un arto inferiore	1
Aumento volumetrico di una gamba (con circonferenza > 3 cm rispetto alla controlaterale)	1
Edema monolaterale fovea-positivo	1
Vene collaterali superficiali non varicose	1
Diagnosi alternativa con probabilità uguale o superiore alla diagnosi di TVP	- 2
PROBABILITA' DI TVP	
Alta	> 2
Intermedia	1 - 2
Bassa	< 1

Diagnostic approach to patients with suspected DVT: AT 9 ACCP guidelines

In patients with low or moderate pretest probability, D-dimer should be used

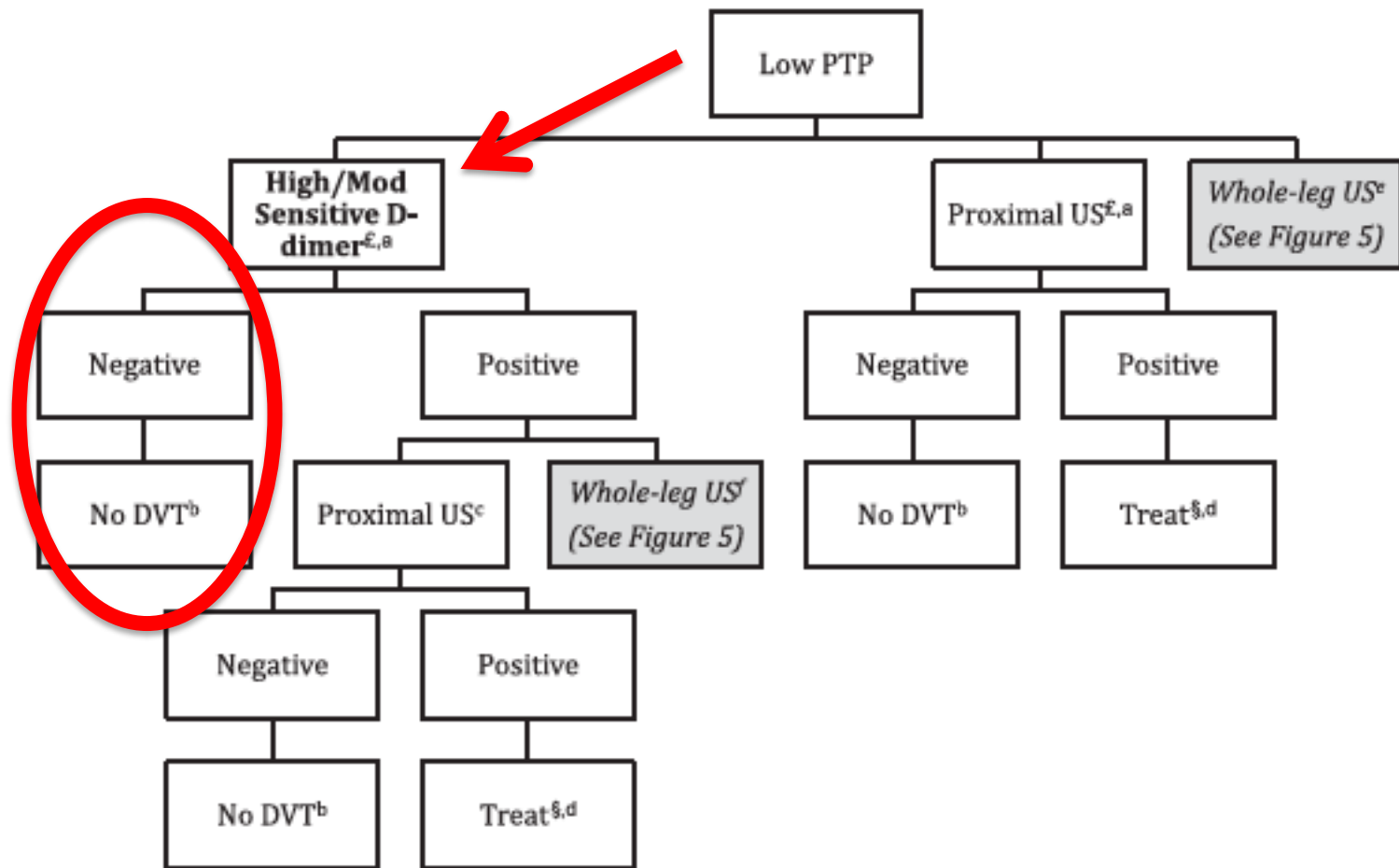
Laboratorio: Dosaggio del D-dimero

Misura il catabolismo della fibrina da parte della plasmina (espressione di attivazione della fibrinolisi)

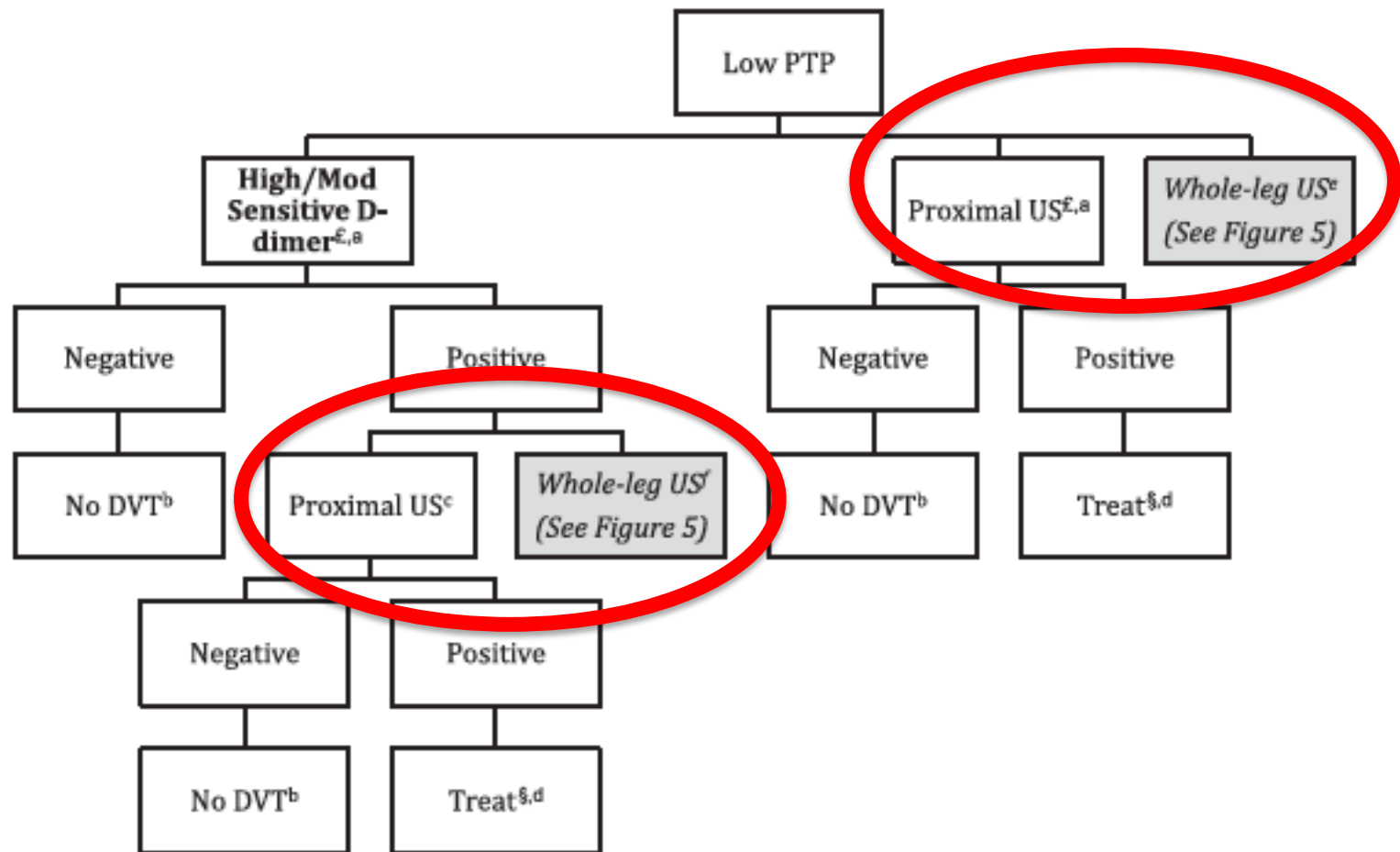
- Non esiste un intervallo di normalità univoco, i valori di riferimento possono differire tra laboratori e dipendono da molti fattori (età, sesso, la popolazione di riferimento, kit laboratorio, concomitanti patologie o uso di farmaci antitrombotici)
- **Elevata sensibilità**
- **Bassa specificità**
- **Elevato valore predittivo negativo (> 97%)**

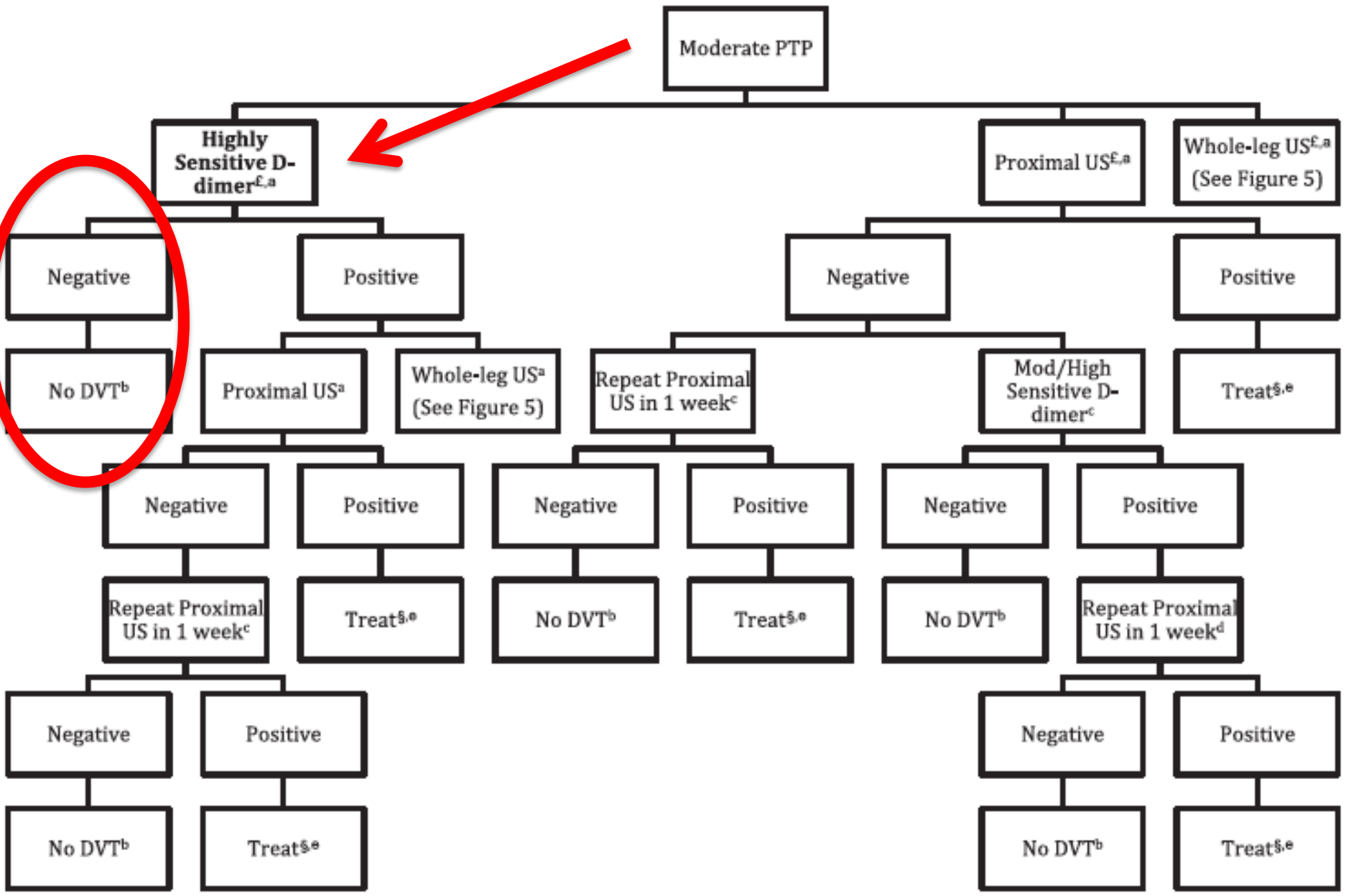
I D-D servono solo per escludere (se negativi) ma non per confermare una diagnosi di TVP

Diagnostic approach to patients with suspected DVT: AT 9 ACCP guidelines

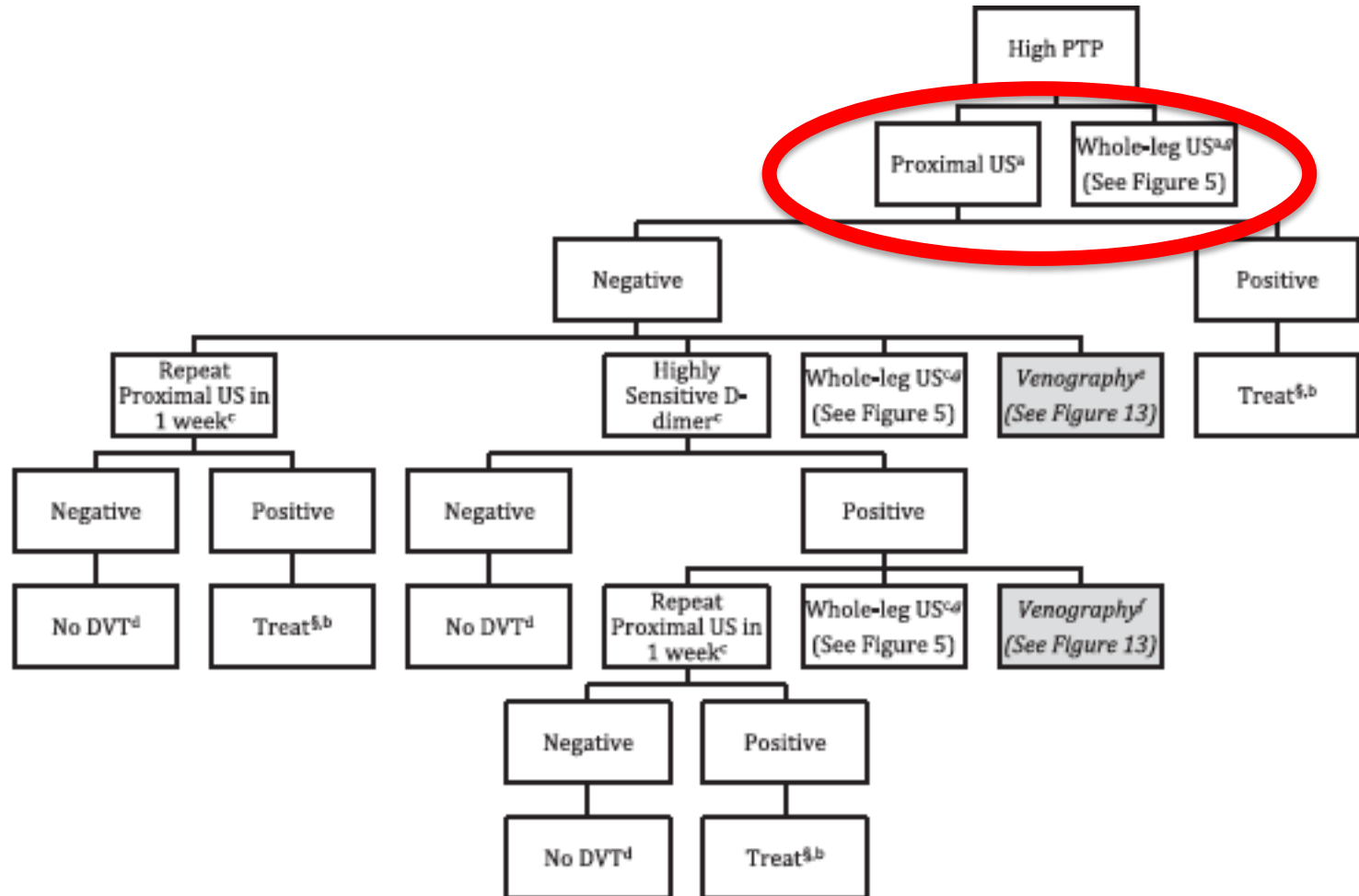


Diagnostic approach to patients with suspected DVT: AT 9 ACCP guidelines





Diagnostic approach to patients with suspected DVT: AT 9 ACCP guidelines



Test di conferma (test 'SpIN')

Lo utilizzo per confermare la malattia con
relativa certezza

TEST SpIN :

specificità alta, malattia IN (diagnosticata)

LR+ \equiv > 10

Accuratezza CUS

	Sensitivity % (95% CI)	Specificity % (95% CI)	Positive likelihood ratio (95 % CI)
All patients	39 (32 to 46)	99 (97 to 100)	42 (13 to 132)
Patients without clinical symptoms of DVT	38 (21 to 36)	99 (97 to 100)	39 (12–130)
Patients with clinical symptoms of DVT	72 (58 to 83)	100 (83 to 100)	+ ∞

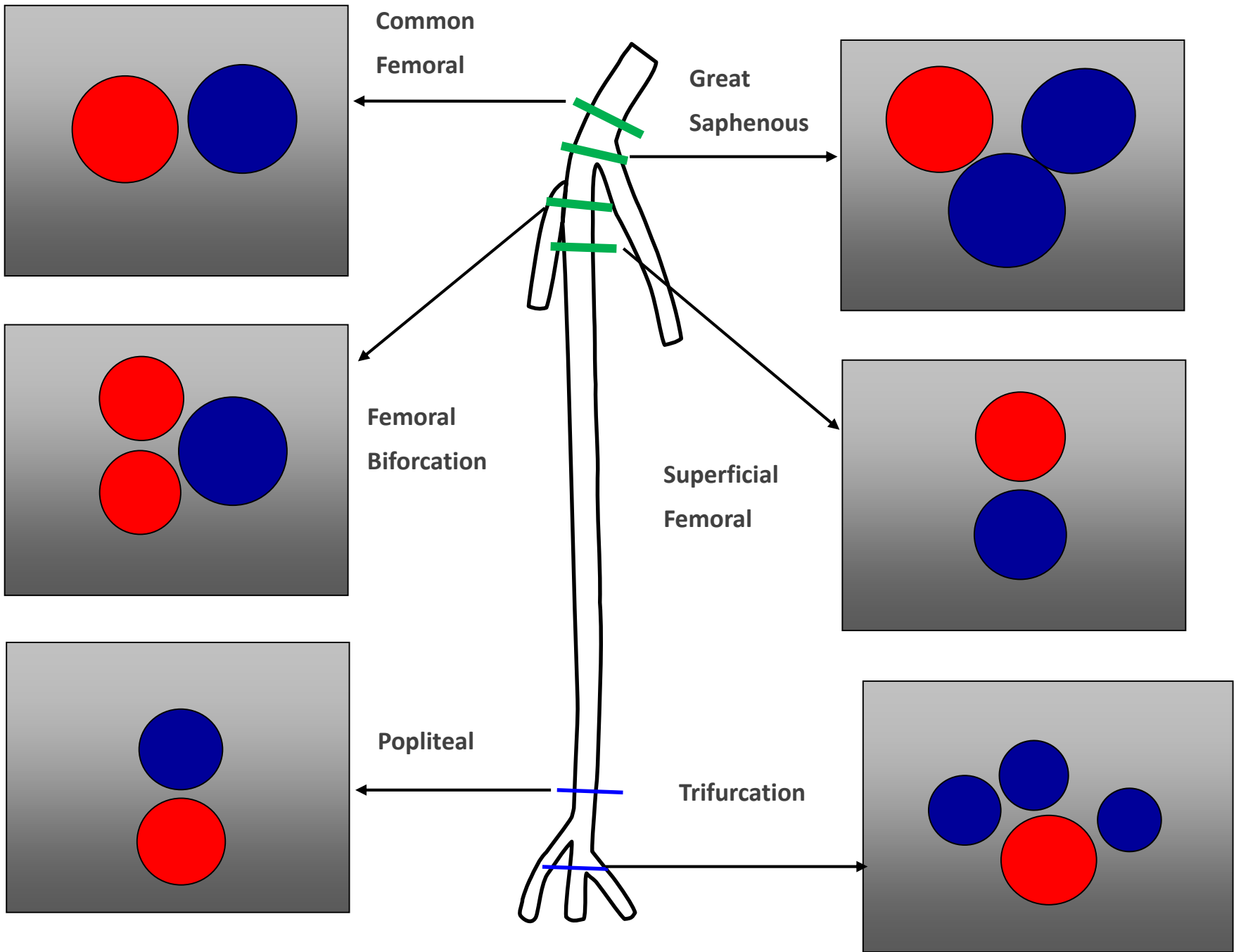
Imaging: CUS

Gli esami ecotomografici sono eseguiti con sonda 5-7.5 Mhz e con apparecchi a scala di grigi convenzionale. In aggiunta si utilizza il duplex o il color Doppler

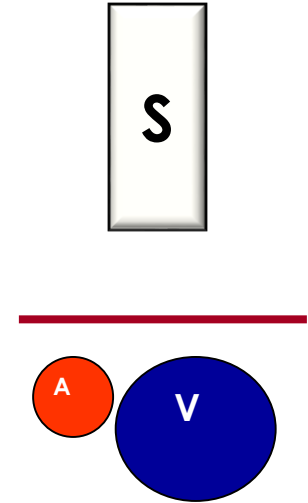
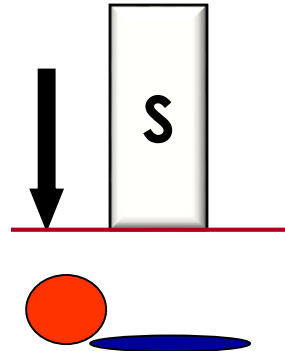
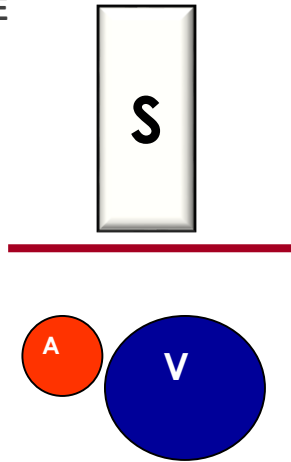


Imaging: CUS

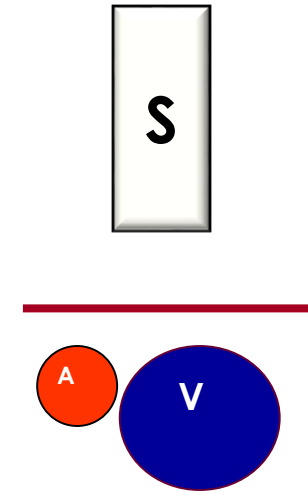
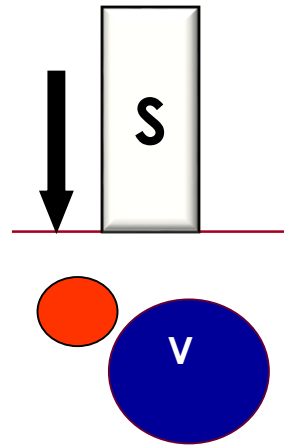
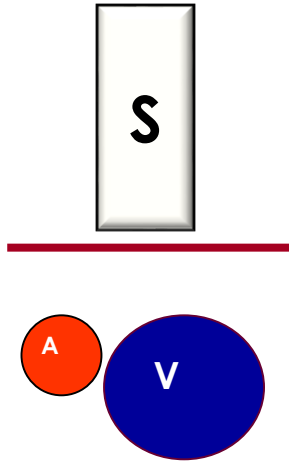
- Compressione fino a modifica lume venoso
- Verifica variazione lume venoso
 - collabimento completo: reperto normale
 - assenza di collabimento completo: TVP
- Studio dei vasi venosi in scansione trasversa (inguine, poplite):
 - vena femorale comune all'inguine
 - vena femorale superficiale alla coscia
 - vena poplitea al livello della fossa poplitea, sino alla sua triforcazione



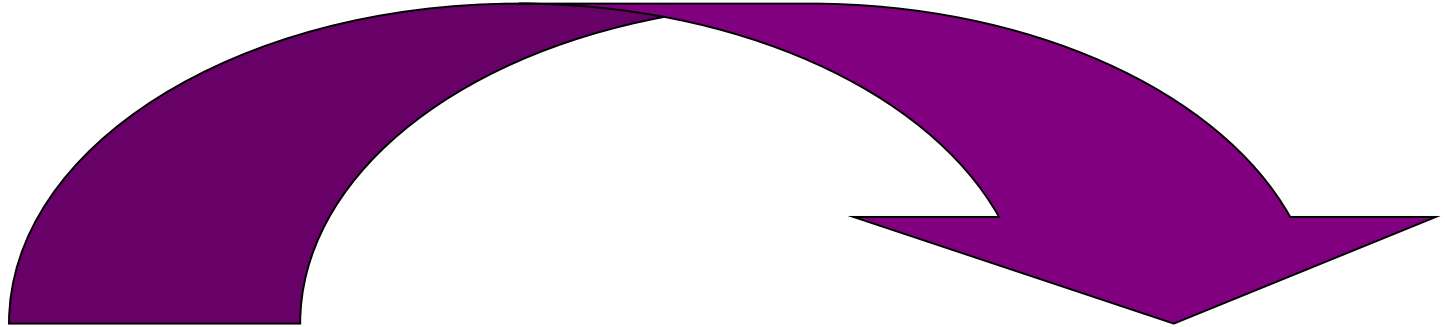
NORMALE



TROMBOSI
OCCLUDENTE



Posizione del paziente



Pros and cons of limited vs whole-leg CUS

- Limited-CUS (proximal veins only)

PROS: simple, fast, highly reproducible

CONS: repeat testing after 5-7 days

- Whole-leg CUS (proximal and distal veins)

PROS: conclusive after a single evaluation

CONS: experienced operator, possibly unnecessary diagnosis of isolated distal DVT

Limited CUS vs whole-leg CUS: 3-month incidence of symptomatic VTE in patients with normal diagnostic workup

- Bernardi et al (JAMA 2008):
 - Limited CUS: 0.9%; 95% CI 0.3%-1.8%
 - Whole-leg CUS: 1.2%; 95% CI 0.5%-2.2%
- Gibson et al (JTH 2009):
 - Limited CUS: 2.0%; 95% CI 0.6%-5.1%
 - Whole-leg CUS: 1.2%; 95% CI 0.2%-4.3%

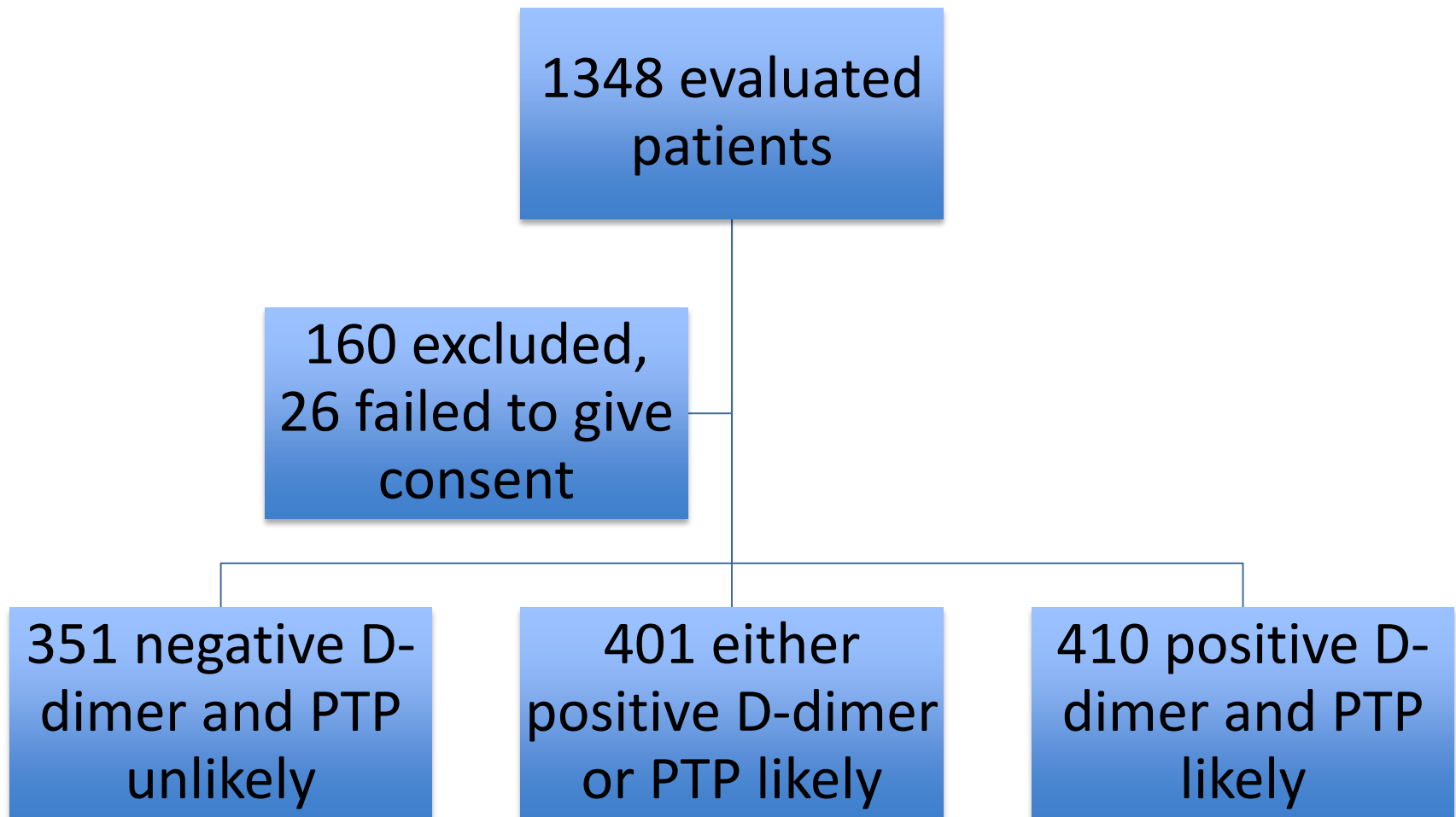
Issues with limited CUS

- A serial examination is required in at least 70% of patients
- Only 1% to 6% of patients who undergo the second examination are subsequently diagnosed with DVT

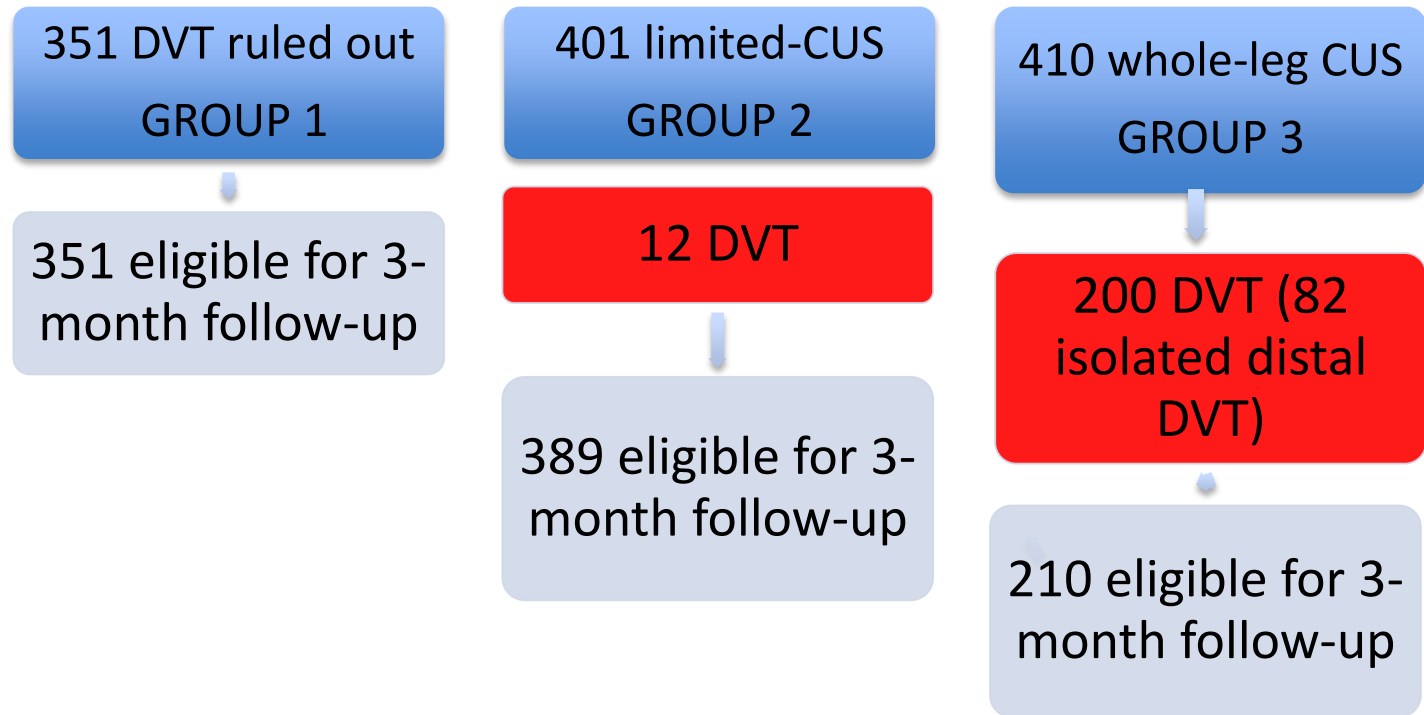
Issues with whole-leg CUS

- The use of whole-leg CUS in all symptomatic patients is associated with a 4% to 15% absolute increase in the diagnosis of DVT due to the detection of isolated clots in the deep calf veins
- The prognostic relevance of these clots remains uncertain: only 8% to 15% of untreated isolated distal DVT will extend into the proximal veins

PALLADIO study 1162 enrolled patients



Results: 950 patients followed-up



No patient lost to follow-up, 3 died because of underlying malignancy, 26 protocol violation

Results of the primary analysis

Overall incidence of VTE at 3 months:
0.87% (95% CI 0.44-1.70%)

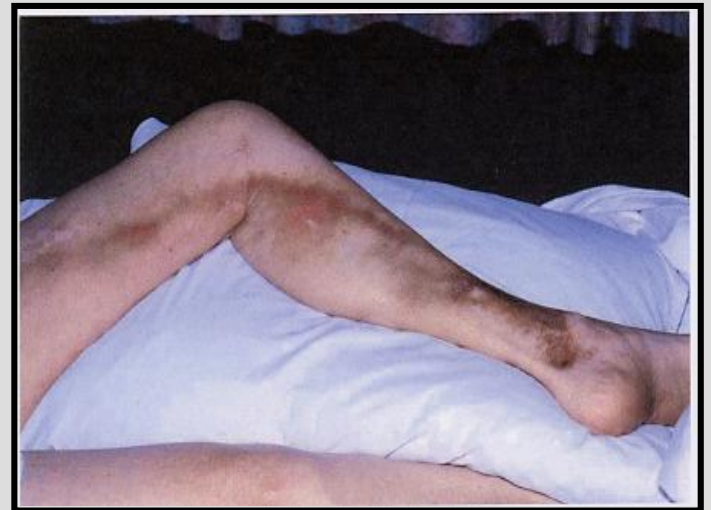
Incidence of VTE Group 1: 0.28% (0.05-1.60%)

Incidence of VTE Group 2: 1.08% (0.42-2.74%)

Incidence of VTE Group 3: 1.49% (0.51-4.27%)

Proportion of patients requiring whole-leg CUS: 35%

Incidence of isolated distal DVT: 7% (38% of all DVTs)



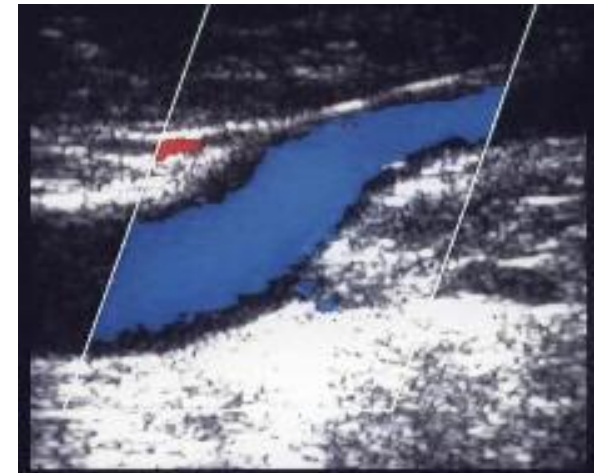
DIAGNOSI CLINICA: segni clinici di rubor, calor, tumor, dolor lungo il decorso anatomico delle vene superficiali e/o presenza di un cordone sottocutaneo palpabile, duro, caldo e dolente.



DIAGNOSI STRUMENTALE:

ultrasonografia per compressione con/senza

ECD



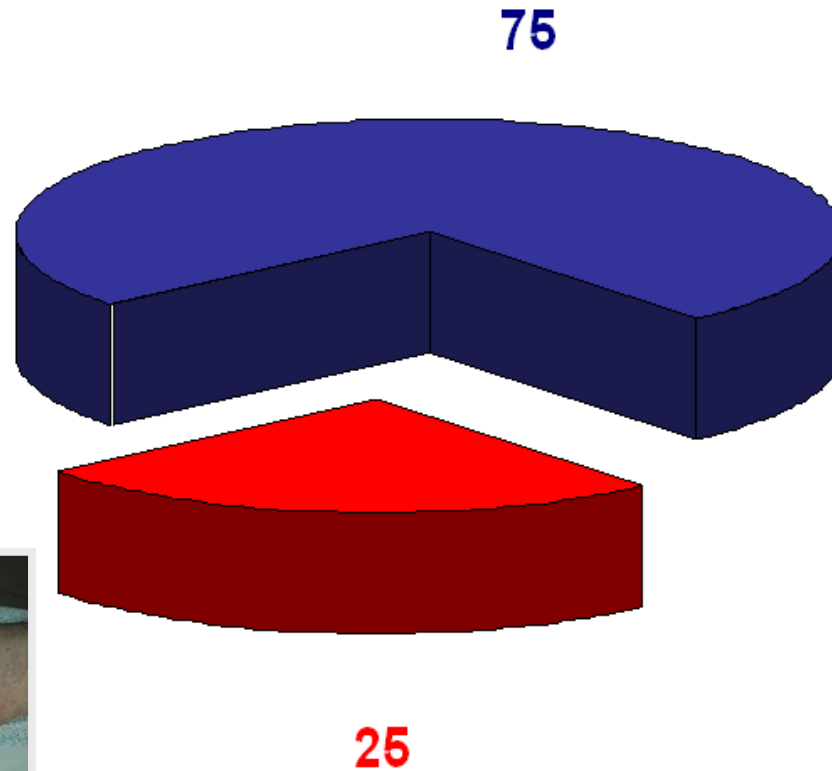
Superficial Venous Thrombosis and Venous Thromboembolism

A Large, Prospective Epidemiologic Study

Patients with symptomatic SVT
($n = 844$)

Patients with DVT or
symptomatic PE at
inclusion ($n = 210$)

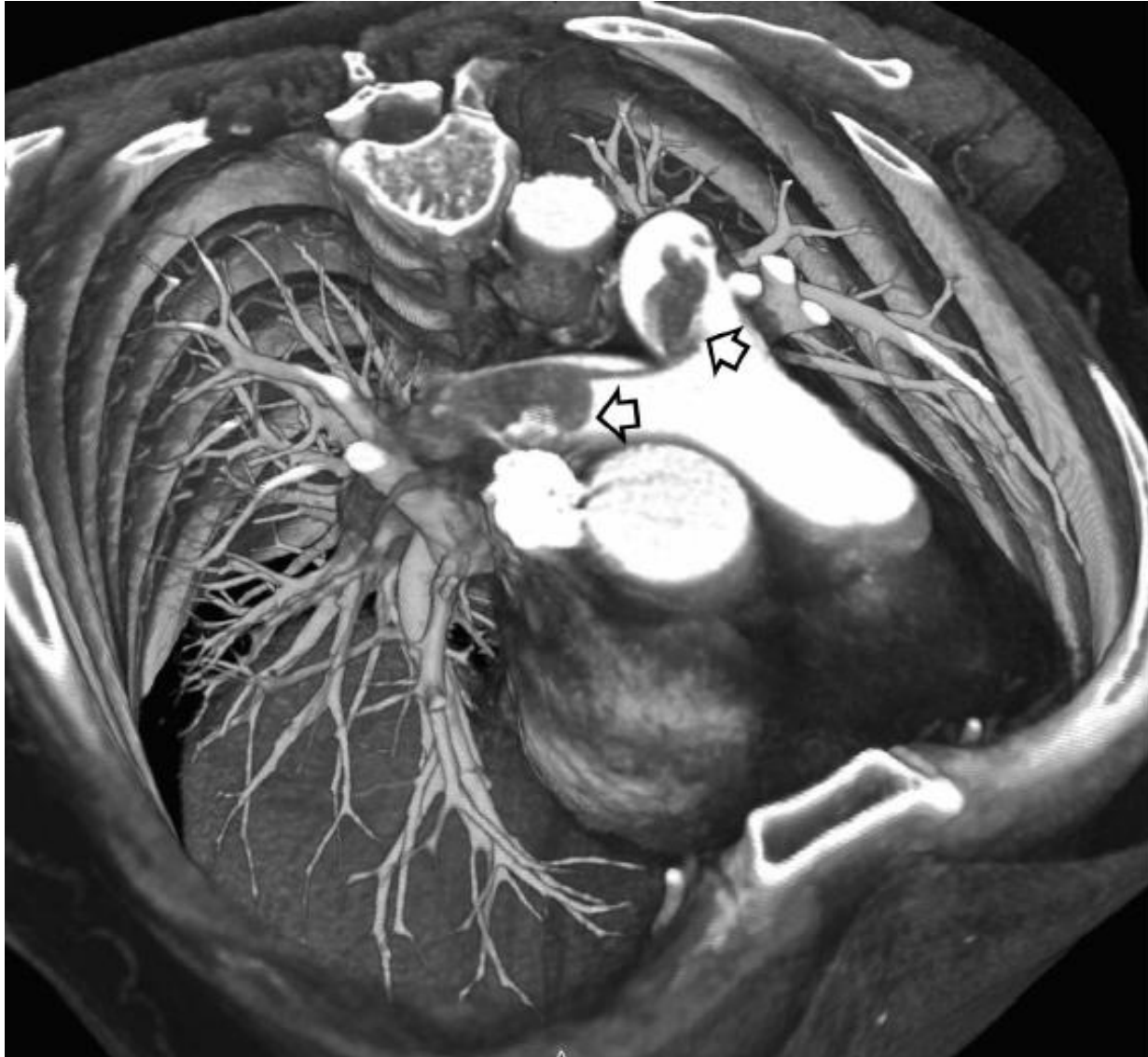
■ DVT or PE
■ SVT only



ICARO STUDY

- 494 pazienti ambulatoriali
- Prevalenza di TVP: 79/494 (16%)

Embolia polmonare



Diagnosi di embolia polmonare

“To diagnose pulmonary embolism, one must think of pulmonary embolism as a diagnostic possibility”

Samuel Goldhaber, Circulation 2003

**Sospetto clinico di
embolia polmonare**



angio-TC polmonare multistrato

EP

No EP

PIOPED II: angio-CT

Multidetector Computed Tomography for Acute Pulmonary Embolism

Paul D. Stein, M.D., Sarah E. Fowler, Ph.D., Lawrence R. Goodman, M.D., Alexander Gottschalk, M.D., Charles A. Hales, M.D., Russell D. Hull, M.B., B.S., M.Sc., Kenneth V. Leeper, Jr., M.D., John Popovich, Jr., M.D., Deborah A. Quinn, M.D., Thomas A. Sos, M.D., H. Dirk Sostman, M.D., Victor F. Tapson, M.D., Thomas W. Wakefield, M.D., John G. Weg, M.D., and Pamela K. Woodard, M.D., for the PIOPED II Investigators*

Sensibilità: 83%

BACKGROUND

The accuracy of multidetector computed tomography (MDCT) for the diagnosis of acute pulmonary embolism (PE) is uncertain.

METHODS

The Prospective, Multidetector Computed Tomography for Acute Pulmonary Embolism (PIOPED II) study was a multicenter, prospective, multi-

phasic study of MDCT for the diagnosis of acute pulmonary embolism. We used a composite reference test to confirm or rule out the diagnosis of pulmonary embolism.

RESULTS

Among 824 patients with a reference diagnosis and a completed CT study, CTA was inconclusive in 51 because of poor image quality. Excluding such inconclusive studies, the sensitivity of CTA was 83 percent and the specificity was 96 percent. Positive predictive values were 96 percent with a concordantly high or low probability on clinical assessment, 92 percent with an intermediate probability on clinical assess-

Specificità: 96%

ment of Research, St. Joseph Hospital, Pontiac, Mich.; Department of Medicine, Henry Ford Hospital, Detroit (P.D.S.); Department of Radiology, Michigan State University, East Lansing (A.G.); the Department of Medicine, Massachusetts General Hospital, and Harvard Medical School—both in Boston (C.A.H., D.A.Q.); the Department of Medicine, University of Calgary, Calgary, Alta., Canada (R.D.H.); the Department of Medicine, Emory University, Atlanta (K.V.L.); the Department of Medicine, Henry Ford Hospital, Detroit (J.P.); the Department of Radiology, Weill Cornell Medical Col-

lege of Wisconsin, Milwaukee (L.R.G.); the Department of Radiology, Michigan State University, East Lansing (A.G.); the Department of Medicine, Massachusetts General Hospital, and Harvard Medical School—both in Boston (C.A.H., D.A.Q.); the Department of Medicine, University of Calgary, Calgary, Alta., Canada (R.D.H.); the Department of Medicine, Emory University, Atlanta (K.V.L.); the Department of Medicine, Henry Ford Hospital, Detroit (J.P.); the Department of Radiology, Weill Cornell Medical Col-

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Exposure to Low-Dose Ionizing Radiation from Medical Imaging Procedures

Reza Fazel, M.D., M.Sc., Harlan M. Krumholz, M.D., S.M., Yongfei Wang, M.S., Joseph S. Ross, M.D.,
Jersey Chen, M.D., M.P.H., Henry H. Ting, M.D., M.B.A., Nilay D. Shah, Ph.D., Khurram Nasir, M.D., M.P.H.,
Andrew J. Einstein, M.D., Ph.D., and Brahmajee K. Nallamothu, M.D., M.P.H.

ABSTRACT

BACKGROUND

The growing use of imaging procedures in the United States has raised concerns about exposure to low-dose ionizing radiation in the general population.

METHODS

We identified 952,420 nonelderly adults (between 18 and 64 years of age) in five health care markets across the United States between January 1, 2005, and December 31, 2007. Utilization data were used to estimate cumulative effective doses of radiation from imaging procedures and to calculate population-based rates of exposure, with annual effective doses defined as low (≤ 3 mSv), moderate (>3 to 20 mSv),

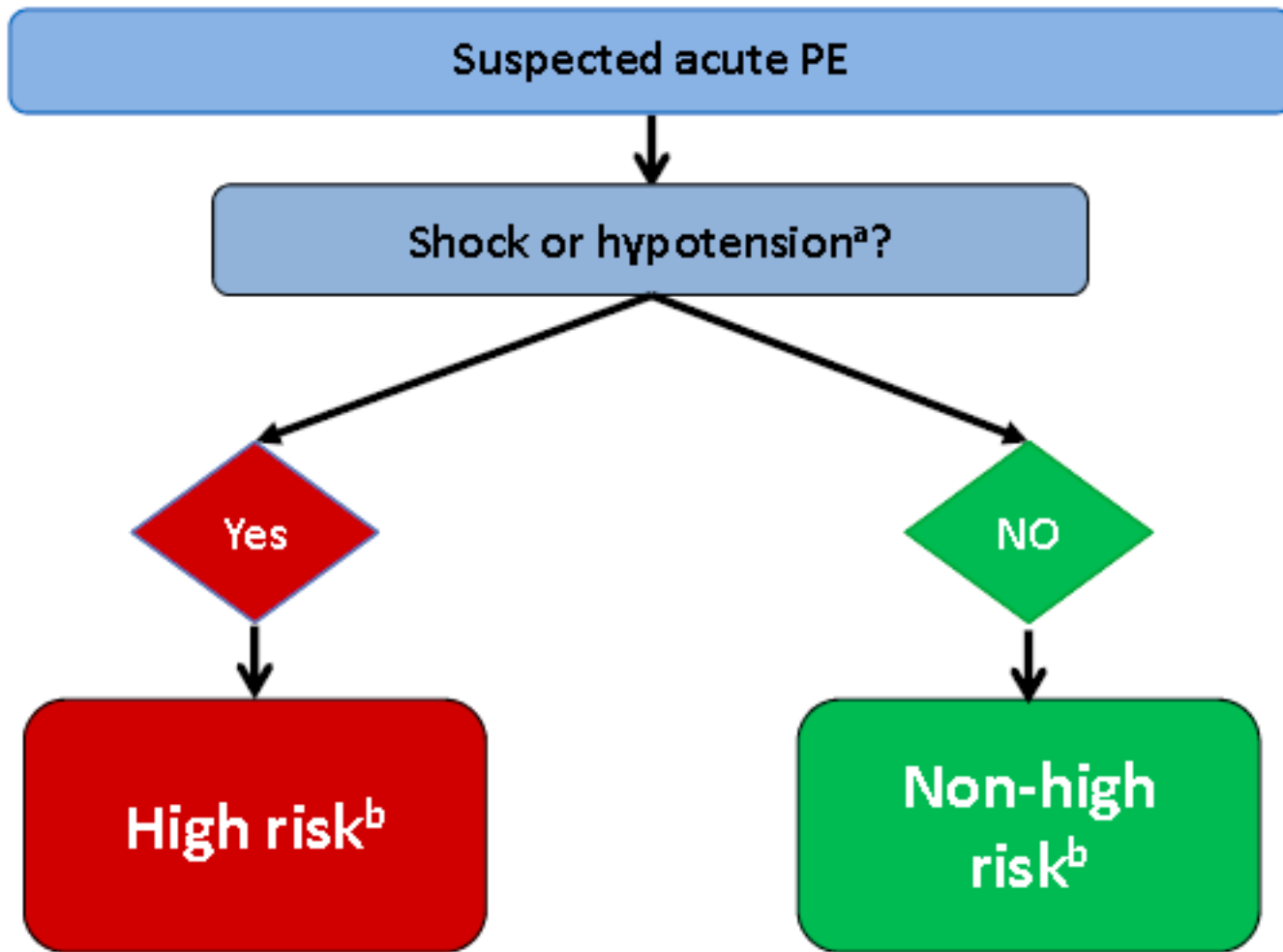
From the Division of Cardiology, Department of Medicine, Emory University School of Medicine, Atlanta (R.F.); the Section of Cardiovascular Medicine, Department of Medicine (H.M.K., Y.W., J.C.), the Robert Wood Johnson Clinical Scholars Program, Department of Medicine (H.M.K.), and the Section of Health Policy and Administration, School of Public Health (H.M.K.), Yale University School of Medicine; and the Center for Outcomes Research and Evaluation, Yale New Haven Hospital

Diagnosi di embolia polmonare

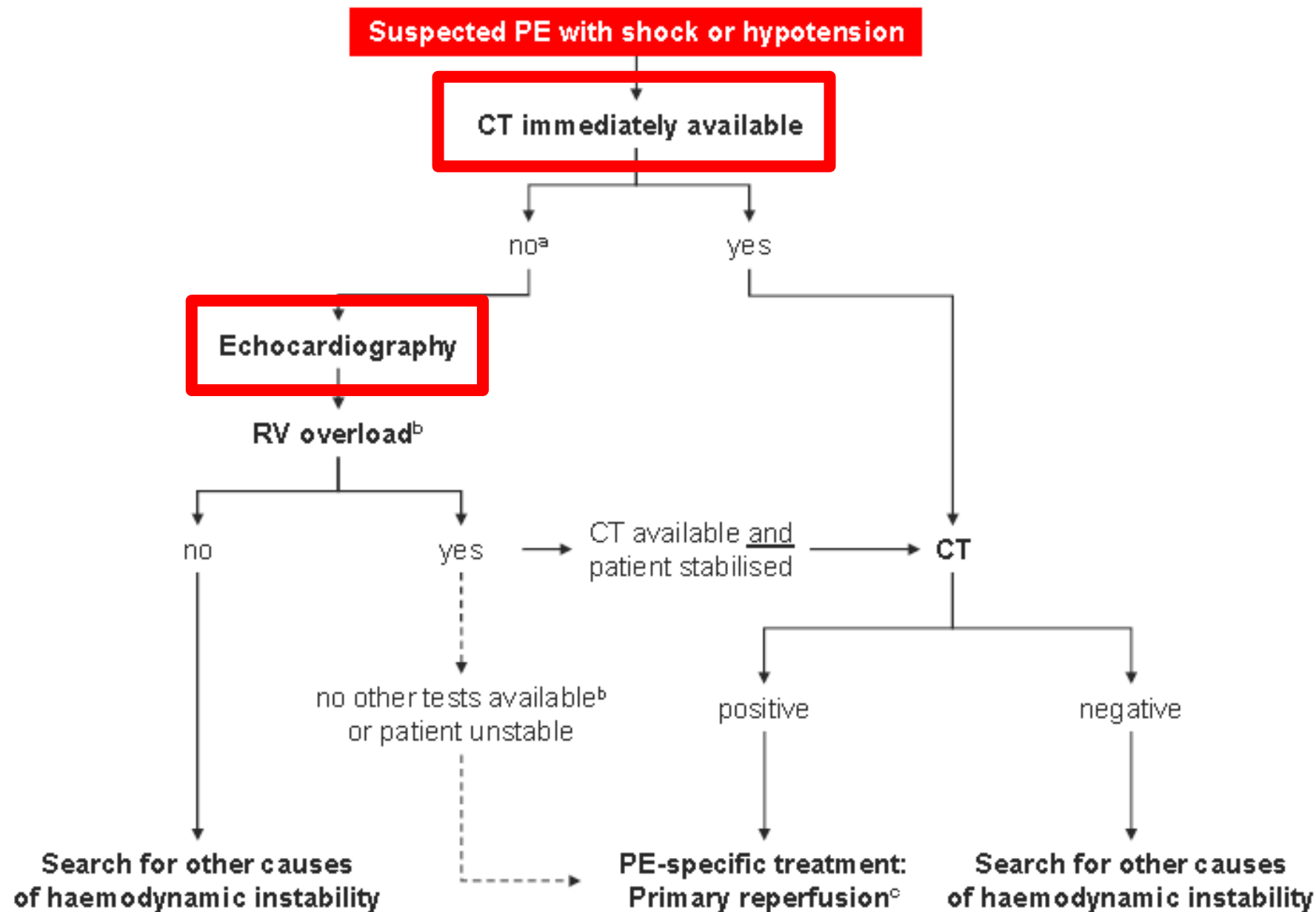
- Probabilità clinica pre-test
- D-dimero

- TC spirale
- Scintigrafia polmonare

- Ecografia per compressione/ECD
- Ecocardiografia



a. <90 mmHg or a drop of >40 mmHg for >15 minutes



Suspected PE without shock or hypotension

Assess clinical probability of PE
Clinical judgment or prediction rule^a

low/intermediate clinical probability
or *PE unlikely*

high clinical probability
or *PE likely*

D-dimer

negative

positive

No treatment^b

CT angiography

CT angiography

no PE

PE confirmed^c
Treatment^b

no PE

No treatment^b

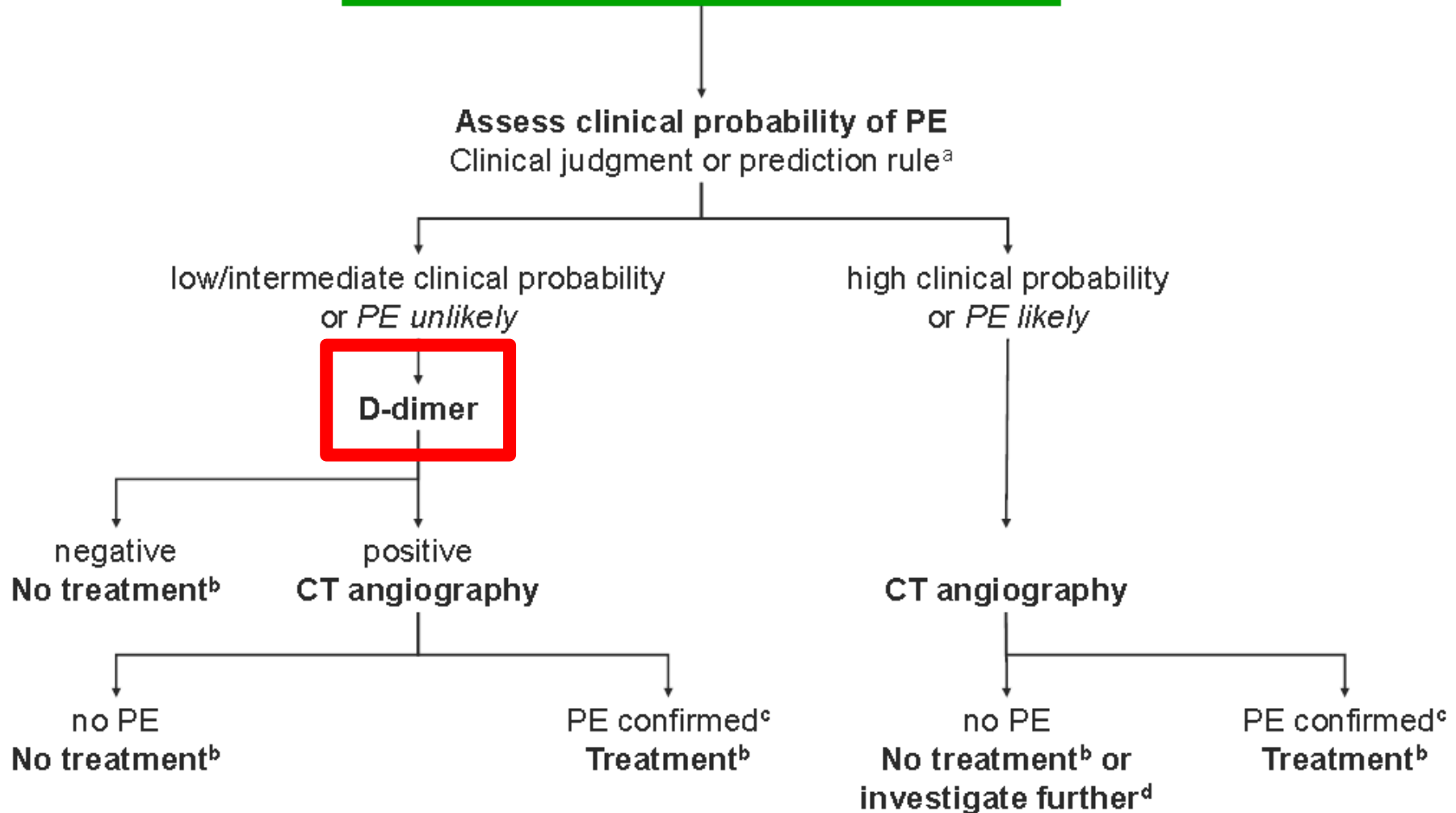
**No treatment^b or
investigate further^d**

PE confirmed^c
Treatment^b

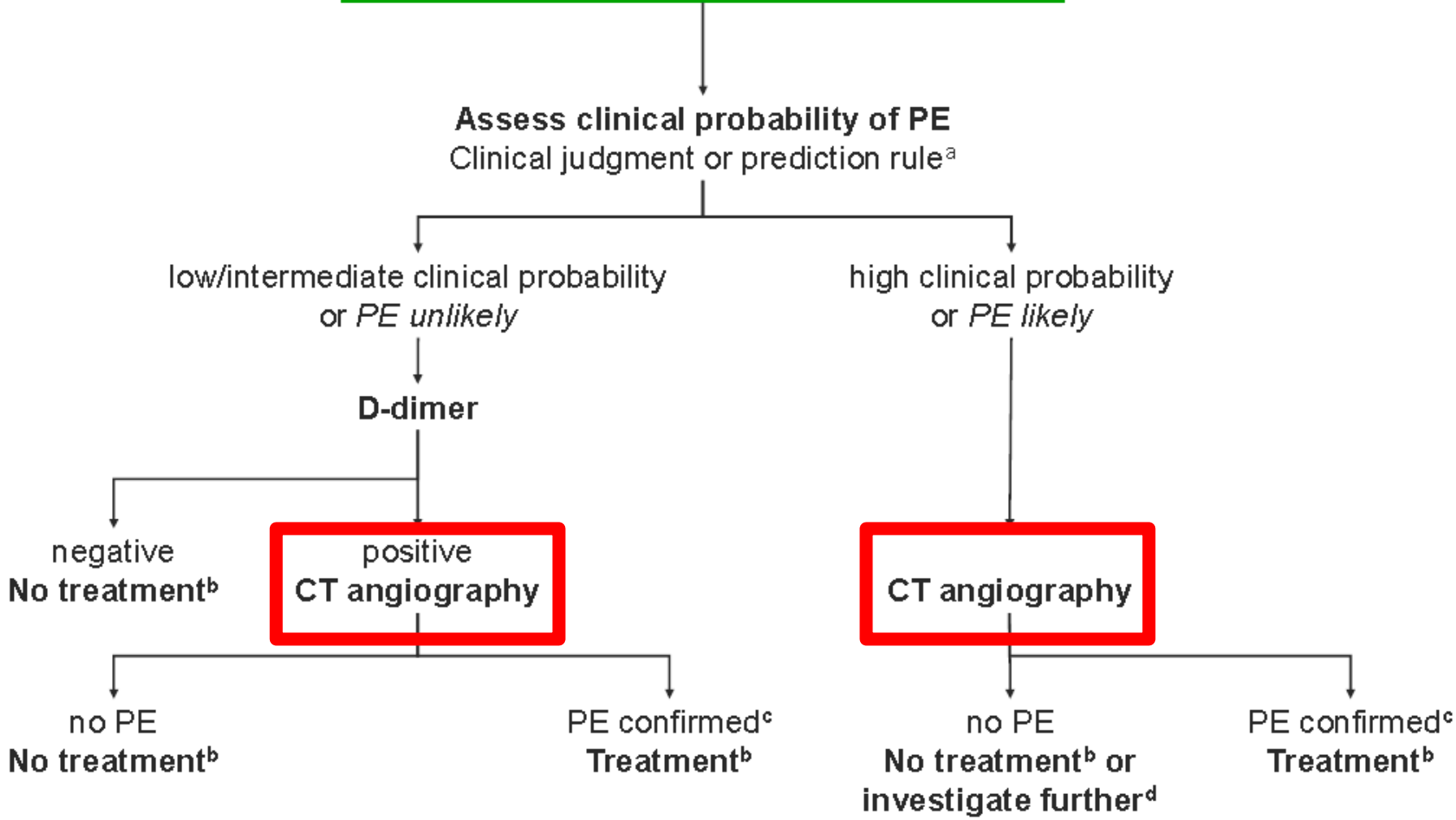
Clinical prediction rules for pulmonary embolism

Wells rule	Points
Previous PE or DVT	1
Heart rate ≥ 100 b.p.m.	1
Surgery or immobilization within the past 4 weeks	1
Haemoptysis	1
Active cancer	1
Clinical signs of DVT	1
Alternative diagnosis less likely than PE	1

Suspected PE without shock or hypotension



Suspected PE without shock or hypotension



IM - DEBATE

Should lung scan be abandoned for pulmonary embolism diagnosis in the age of multislice spiral CT? No

Massimo Miniati · Simonetta Monti

IM - DEBATE

Should lung scan be abandoned for pulmonary embolism diagnosis in the age of multislice spiral CT? Yes

Edwin J. R. van Beek

Risk stratification-driven clinical management

Hemodynamically stable

Stratify for adverse outcome

Markers of RV Dysfunction

Echocardiography

MDCT

Markers of Injury

Troponin

BNP

