

Post-PE syndrome: *can follow-up of PE be optimized?*

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Natural course of PE

50% complete recovery after 6 months

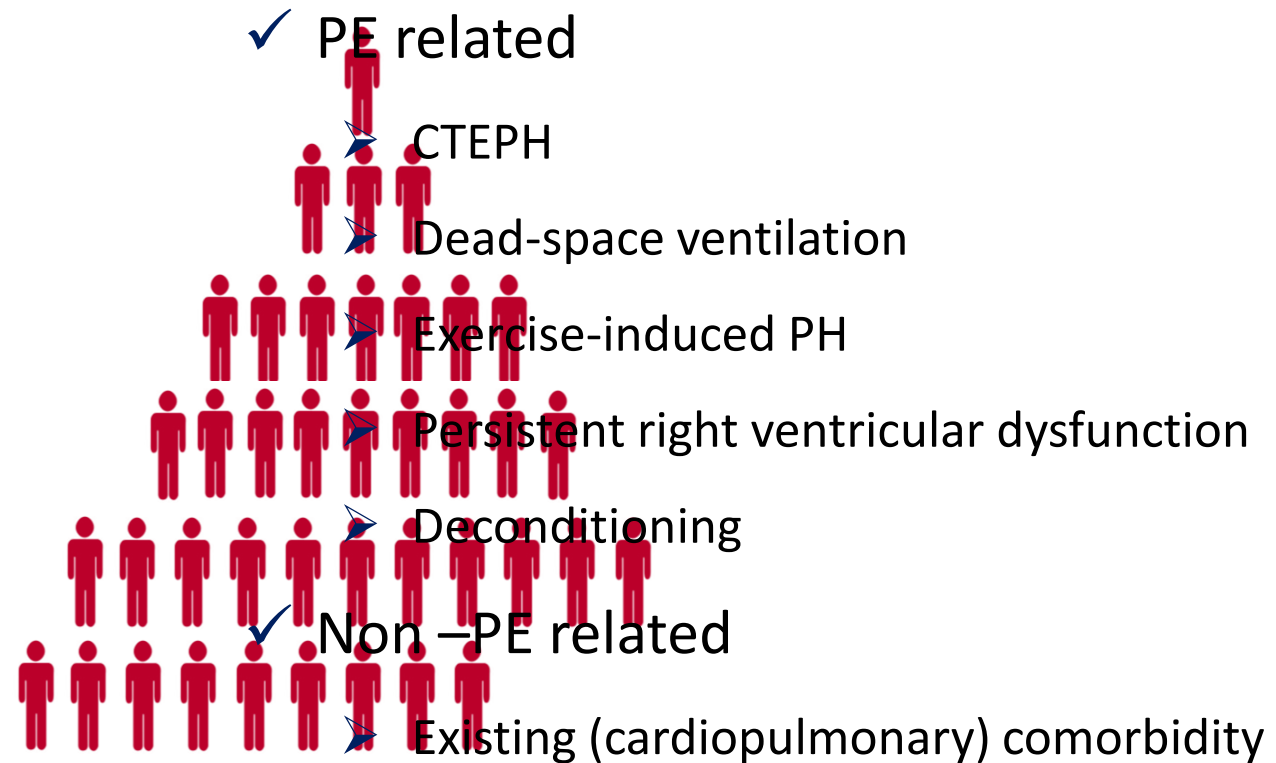


Natural course of PE

50% reports persistent/worsening dyspnea after 6 months



Causes of persistent dyspnea after PE



Causes of persistent dyspnea after PE



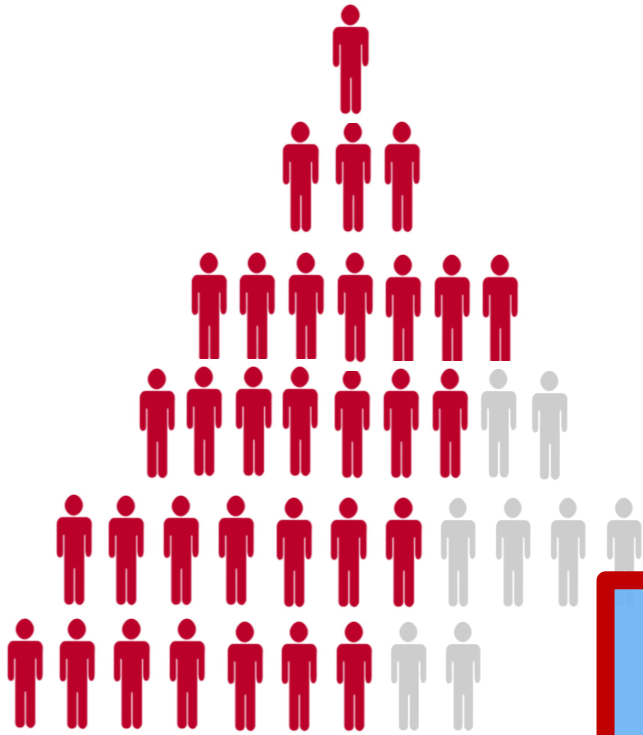
✓ PE related

- CTEPH
- Dead-space ventilation
- Exercise-induced PH
- Persistent right ventricular dysfunction
- Deconditioning

✓ Non –PE related

- Existing (cardiopulmonary) comorbidity

Causes of persistent dyspnea after PE



✓ PE related

- CTEPH
- Dead-space ventilation
- Exercise-induced PH
- Persistent right ventricular dysfunction
- Deconditioning

✓ Non-PE related

Post-PE syndrome

post-PE syndrome

Impact

- ✓ Considerably impaired quality of life related to 'physical functioning'
- ✓ Impaired exercise performance
- ✓ More unemployment and depression
- ✓ Impaired survival

post-PE syndrome

Treatment

- ✓ Pulmonary artery endarterectomy
- ✓ Balloon angioplasty
- ✓ PH targeted therapy
- ✓ Cardiopulmonary rehabilitation

How can follow-up of PE be optimized?

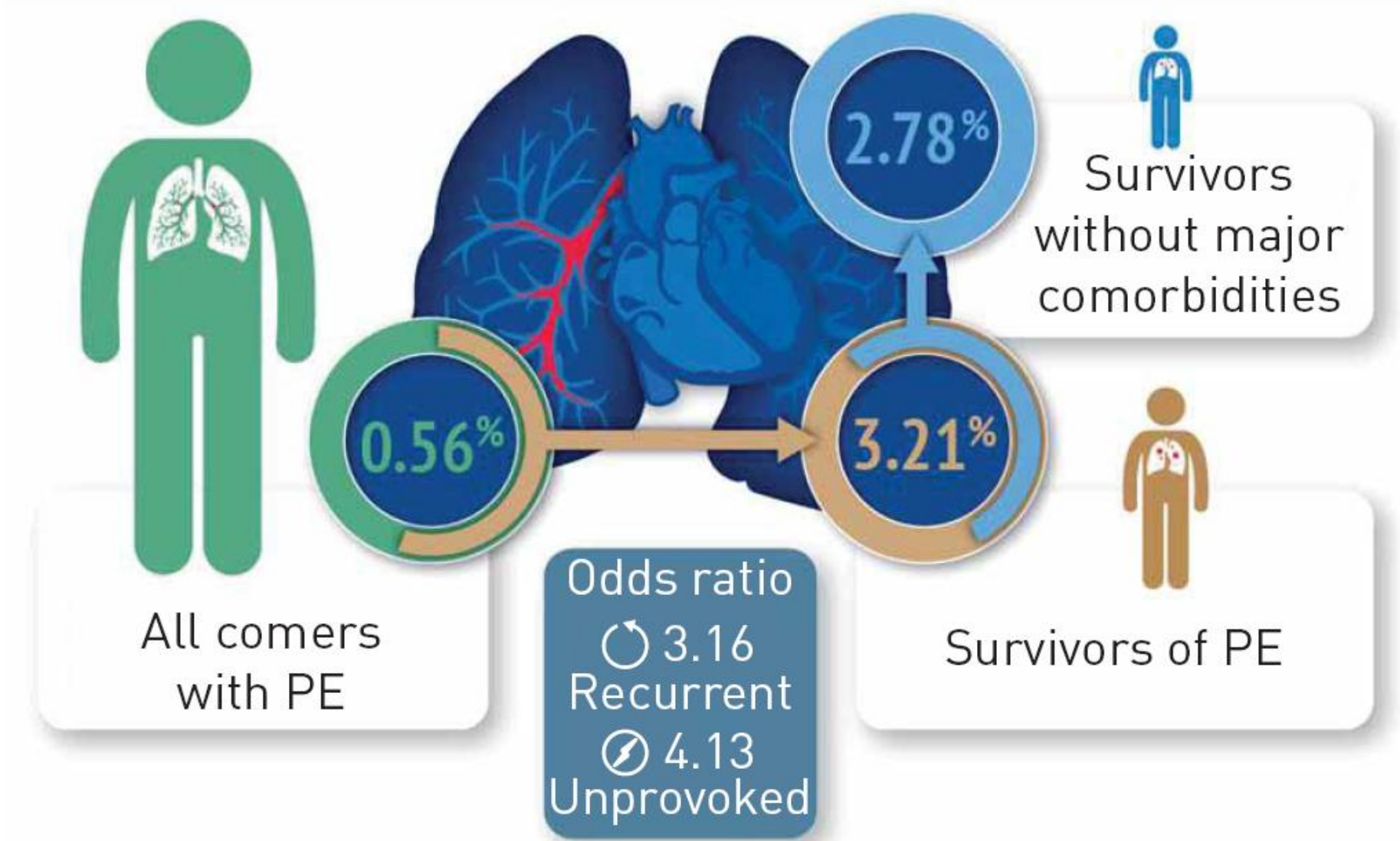
1

Earlier CTEPH detection

2

Awareness for chronic functional limitations

Occurrence of CTEPH after PE

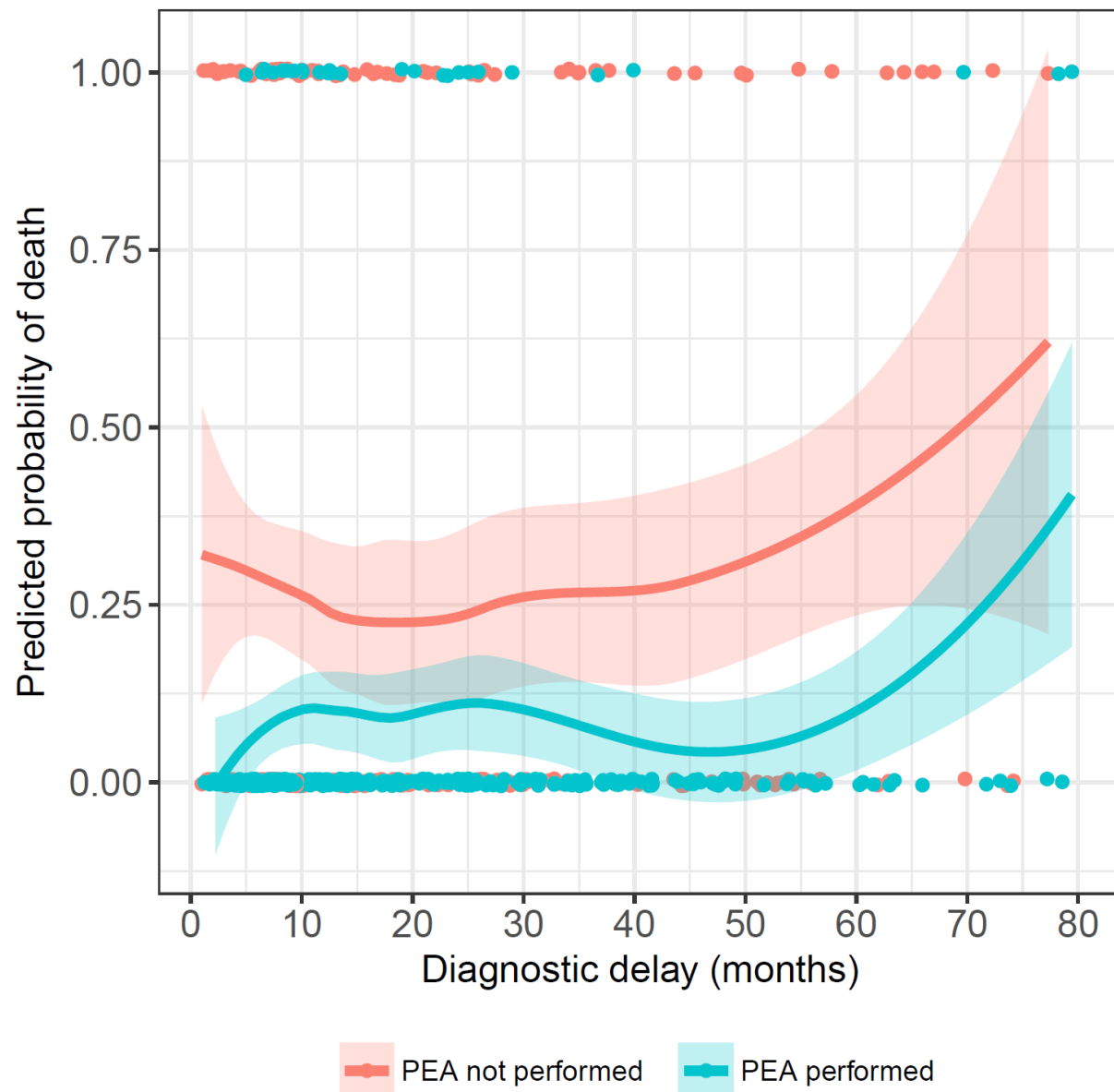


Is current practice sufficient?

Current practice

- ✓ No guideline recommendations
- ✓ Large differences between countries and institutions
- ✓ Diagnostic delay > 1 year!

How *bad* is delayed diagnosis of CTEPH?



Longer delay associated with:

- ✓ Higher mPAP (5 mmHg per tertile)
- ✓ Higher mortality (HR 1.60, 95%CI 1.02-2.50)

Dutch analysis of Healthcare utilization in work-up of CTEPH after PE

- ✓ Median diagnostic delay 24 months (IQR 12-49 months)
- ✓ 4 different physicians, 13 consultations before correct diagnosis
- ✓ Suggestive diagnostic results remained unrecognized
work-up not in accordance with guideline recommendation



SATISFACTORY



**NEEDS
IMPROVEMENT**

Strategies for earlier CTEPH detection

1

Look better at index CTPA

2

Consider risk factors to identify patient at higher risk

3

Pay attention to patients with functional limitations

CTEPH frequently misclassified as acute PE

French cohort study of 146 PE-survivors



7 were diagnosed with CTEPH (4.8%)



5 of 7 had sPAP of 62–102 mmHg
at baseline



All 7 had ≥ 2 signs of CTEPH at baseline
(vs 20% of patients who did not develop CTEPH)

Look better at index CTPA

50 PE patients with
baseline RV
dysfunction, no CTEPH

50 PE patients,
diagnosed with CTEPH
in follow-up



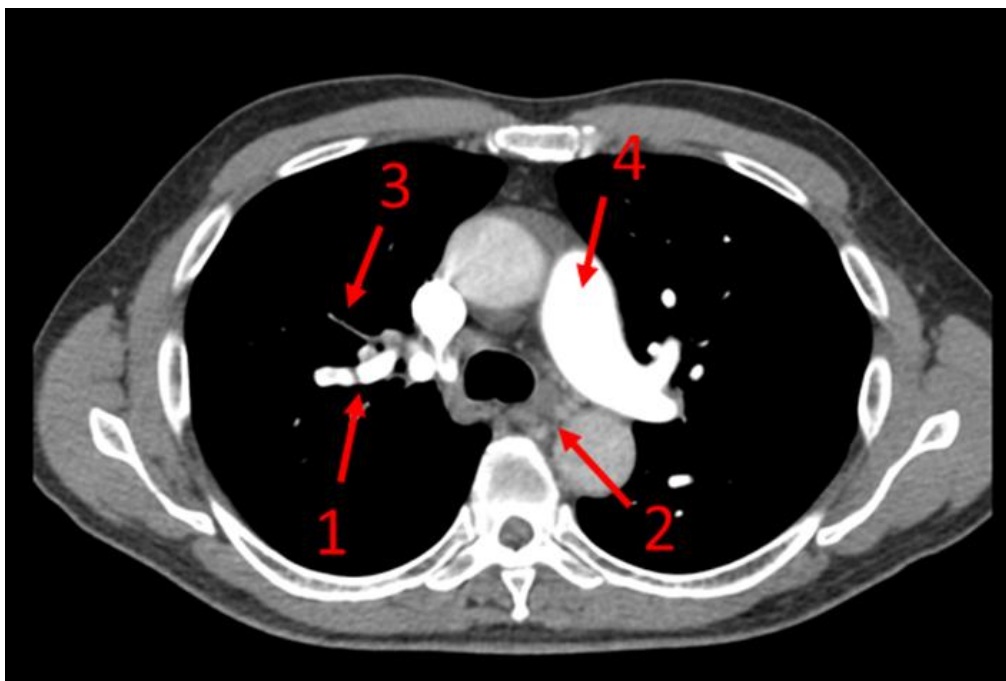
Blinded reading of index CTPA by 3 expert radiologists

1. Signs of acute PE
2. Signs of chronic PE
3. Signs of PH
4. CTEPH yes/no

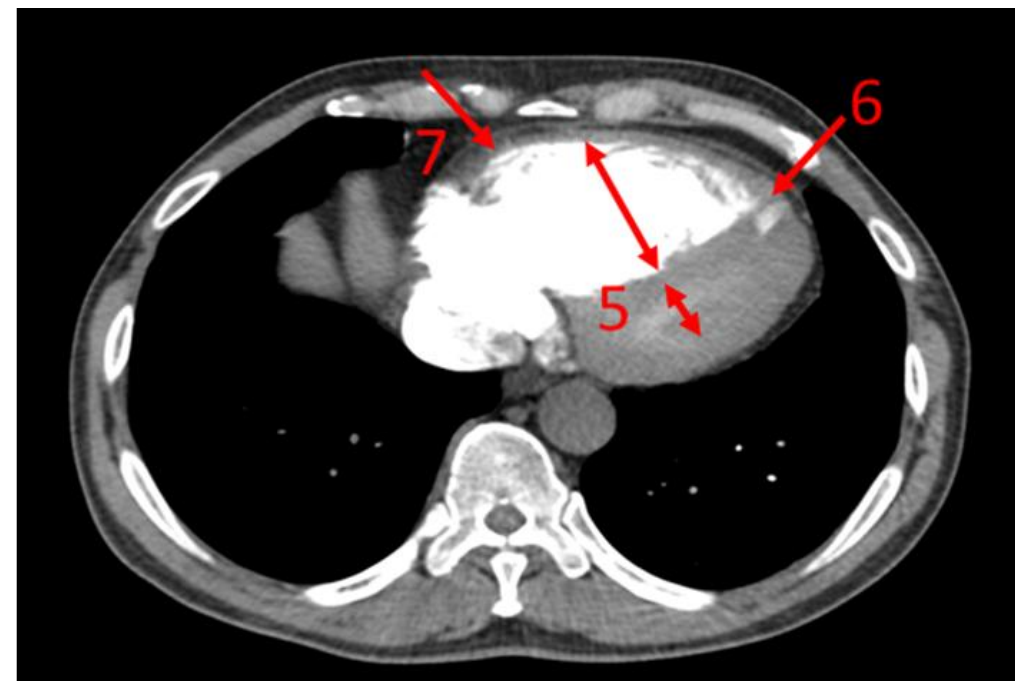
Look better at index CTPA

- ✓ Sensitivity 72% (95%CI 58-84%), specificity 94% (95% CI 83-99%)
- ✓ Signs of *acute* PE in 74% of cases and 98% of controls
- ✓ 6 independent predictors
 - presence of ≥ 3 ~96% of CTEPH
 - C-statistic 0.93

Look better at index CTPA



1. Webs
2. Dilated bronchial arteries
3. Arterial retraction
4. Dilated pulmonary artery



5. RV/LV diameter ratio >1
6. Flattening of the interventricular septum
7. RV hypertrophy

Consider risk factors for CTEPH

Clinical conditions implicated with a higher risk of CTEPH

Thyroid replacement therapy

Malignancy

(Recurrent) Venous thromboembolism

Antiphospholipid antibodies

High FVIII

Non-O blood group

Ventriculo-atrial shunt

Infected pacemaker leads

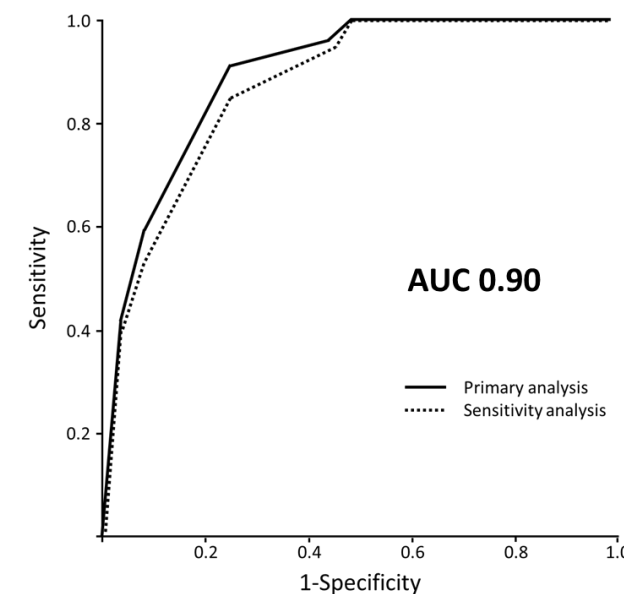
Indwelling venous catheters and leads

Splenectomy

Chronic inflammatory disorders

CTEPH prediction score

Unprovoked PE	+6 points
Hypothyroidism	+3 points
Diagnostic delay >2 weeks	+3 points
RV dysfunction	+2 points
Diabetes Mellitus	-3 points
Thrombolytic therapy	-3 points



Which test in which patient.....?

1 Confirm suspected CTEPH

➤ **ESC algorithm**

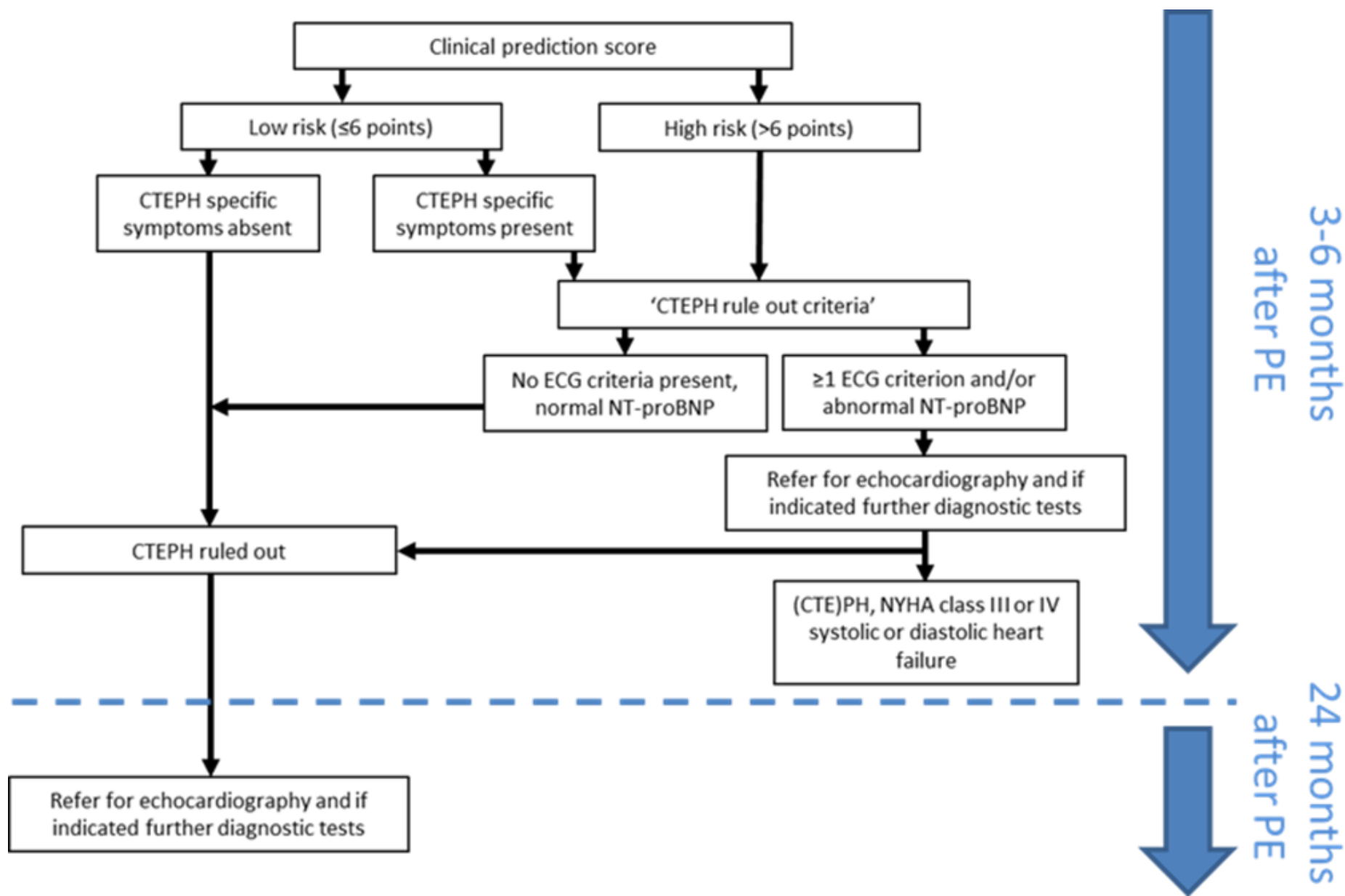
2 Rule out CTEPH in patients with risk factors but no symptoms

➤ **ECG/BNP, VQ or echocardiogram**

3 Confirm cause of mild/atypical long term symptoms

➤ **CPET, spirometry or echocardiography**

InShape II algorithm: NCT02555137



Awareness for chronic functional limitations

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Review Article

Measuring functional limitations after venous thromboembolism: A call to action

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Post-PE syndrome is prevalent and has major impact on patients' lives

Early recognition of CTEPH is challenging

Higher awareness for post-PE syndrome is needed