# Pulmonary Embolus (PE)

## Definition of pulmonary embolus/embolism (PE)
- Embolus (usually from a thrombus in the deep veins of the leg or pelvis) which lodges in the pulmonary arteries

## Epidemiology of pulmonary embolism (PE)
- 1 per 1000 people per year
- Commoner in older people
- 20% higher in black people, 30% lower in Asian
- 25% unprovoked, 50% temporary risk factors, 25% have underlying malignancy

## Risk factors for pulmonary embolus (PE)
- Previous VTE
- Patient
  - Age > 60
  - Obesity
- Situation
  - Immobility
  - Prolonged travel
- Condition
  - Acute medical illness
  - Surgery – especially lower limb orthopaedic surgery
  - Malignancy
  - Thrombophilia
  - Pregnancy
  - OCP/HRT

## Presentations of pulmonary embolism (PE)
- **Non-massive PE**
  - Pain (pleuritic)
  - SOB
  - Tachypnoeic – 85%
  - Fever – 40%
  - Tachycardia – 30%
  - Localised pleural rub and/or coarse crackles
  - Haemoptysis (may be delayed up to 3 or more days)
- **Massive PE**
  - Central chest pain
  - Collapse
  - Haemodynamic compromise
  - AF
  - Raised JVP with prominent a-wave (contraction of distended atria)
  - Failure: RV heave, gallop rhythm, widely split second heart sound

## Differential diagnosis of pulmonary embolism (PE)
- Acute coronary syndromes (ACS)
- Pneumothorax
- Pneumonia
- Aortic dissection
- Cardiac tamponade

**Well’s score in pulmonary embolism (PE)**

- Use Well’s score to assess probability of PE (see below)
- Low or Medium probability: do a D-Dimer. If negative, look for another cause of symptoms.
- High probability: do a CTPA/VQ scan

<table>
<thead>
<tr>
<th>Factor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinically suspected DVT</td>
<td>3</td>
</tr>
<tr>
<td>Alternative diagnosis less likely than PE</td>
<td>3</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>1.5</td>
</tr>
<tr>
<td>Immobilisation/surgery in previous four weeks</td>
<td>1.5</td>
</tr>
<tr>
<td>History of DVT or PE</td>
<td>1.5</td>
</tr>
<tr>
<td>Haemoptysis</td>
<td>1</td>
</tr>
<tr>
<td>Malignancy (treatment in preceding 6 months or palliative stage)</td>
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**Interpretation of the Well’s score in pulmonary embolism (PE)**

- 0-4 = PE unlikely
- > 4 = PE likely

**Investigation of pulmonary embolism (PE):**

- ABG
- Bloods
  - Including D-dimer (depending on Well’s score) clotting and troponin
- CXR
  - May show wedge infarction
  - Atelectasis (due to collapse of non-perfused alveoli, which then don’t make surfactant)
  - Pleural effusion
  - Rule out consolidation
- ECG
  - Right ventricular strain
    - ST depression and T-wave inversion in right-sided chest leads, V1-V3 (also limb leads I, II and AvF potentially)
    - Classic S1 Q3 T3 pattern, which is rare.
- CTPA
  - Positive predictive value 96% with high Wells score
  - 92% with moderate Wells score
  - 58% with low Wells (BMJ 2013).
  - Also varies with size of PE (PPV 97% with main or lobular, 68% with segmental, 25% with subsegmental)
- V/Q can be done if poor renal function, young age or pregnant
  - Needs a normal CXR beforehand
  - Can rule out PE if normal
- USS to look for pelvis/femoral vein clots
- Echoardiography
  - May show dilated RV or clot in RV outflow tract
MRA can also be done if CT contraindicated (e.g. due to contrast)
Further investigations if PE
  - If over 40 years old: PSA in men, mammography in women to look for underlying malignancy (as well as full history to looking for underlying malignancy)
  - Consider CT CAP and colonoscopy if any suspicion

**Staging of pulmonary embolus (PE)**
- Massive: Embolus in the RV outflow tract
- Non-Massive: Embolus in a terminal vessel

**Initial management of pulmonary embolism (PE)**
- ABCDE
  - Oxygen
  - IV access
  - Bloods
  - ECG and CXR
- Analgesia
- Thrombolysis if haemodynamic compromise
  - Usually alteplase
    - Dosage in (peri)/arrest situation is different to that in hypotension – see local guidelines
- Anticoagulation
  - Fondaparinux (10a inhibitor) or treatment dose heparin (UFH or LMWH) depending on local guidelines

**Further management of pulmonary embolism (PE)**
- Oral anticoagulation
  - Warfarin or Rivaroxaban
  - Continue LMWH if malignancy or pregnant
- IVC Filter
  - Consider in patients who cannot have anti-coagulation treatment or who develop new PEs despite conventional treatment
  - Not a long term solution.
- Embolectomy

**Complications of pulmonary embolism (PE)**
- Post-thrombotic syndrome
- Recurrence
- Chronic thromboembolic pulmonary hypertension
- Right heart failure

**Prognosis of pulmonary embolism (PE)**
- 30% overall mortality but very dependent on severity
Common questions concerning PE

What are the risk factors for pulmonary embolus (PE)?
- Previous VTE
- Patient
  - Age > 60
  - Obesity
- Situation
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- Condition
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  - Surgery – especially lower limb orthopaedic surgery
  - Malignancy
  - Thrombophilia
  - Pregnancy
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What is the Well’s score in pulmonary embolism (PE)?
- The Well’s score assesses the probability of PE with given presentations.
- The score it gives defines probability of PE
- This then dictates further investigations.

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- 0-4: PE unlikely
  - Do a D-Dimer – if negative, look for other causes of symptoms
- > 4 = PE likely
  - Do a CTPA or V/Q scan

What are the chances of PE in malignancy?
- If patient over 40 then there is a 10-25% chance of malignancy
  - Therefore ensure thorough history, examination, CXR and bloods
  - Organise CT abdo/pelvis plus PSA in men, mammography in women

What potential strategies are there for patients who develop PE despite adequate anti-coagulation?
- Increase INR target to 3-4
- Switch to LMWH
- IVC filter

Who should have thrombophilia testing?
- Do not offer to patients who are continuing on anti-coagulation treatment: only in patients whom there is a plan to stop anti-coagulation
- Consider testing for anti-phospholipid in patients with unprovoked PE
- Consider testing for hereditary thrombophilia in patient with unprovoked PE with first degree relatives who have a history of VTE
- See haematology pages for further details

Is there any evidence for thrombolysis in stable patients who have evidence of right ventricular...
dysfunction?
- Solid evidence of the benefit of this is still lacking
- However some centres have started to do it as it appears that the risks of thrombolysis may not be as great as previously thought