

## PULMONARY EMBOLISM MANAGEMENT GUIDELINES

This document is adapted from the NICE guidelines titled  
 “Venous thromboembolic diseases: the management of venous  
 thromboembolic diseases and the role of thrombophilia testing – 2012” -

<http://www.nice.org.uk/guidance/CG144>

**If in doubt, unclear or unsure about any aspects of this document, please refer to the main document of the NICE as described above.**

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# **GUIDELINES FOR THE MANAGEMENT OF PULMONARY EMBOLISM**

## **1. RATIONALE**

The overall annual incidence of Pulmonary Embolism (PE) is 60-70 cases /100,000 of population. Half of these patients will develop Venous Thromboembolism (VTE) whilst in hospital or in long term care; the rest are equally divided between those of unknown cause, and those with recognised risk factors.

Studies have revealed that PE is both under and over diagnosed in clinical practice. This leads to one group of patients failing to receive treatment for a potentially life threatening problem; and the other receiving potentially life threatening treatment for a disease which is not present.

In hospital mortality rates range from 6% to 15%. Studies amongst survivors have shown 7% mortality with in one week, 13% within one month and 18% by three months. A high proportion of early deaths are directly due to PE.

## **2. AIMS**

The aim of this guideline is to ensure that all patients with suspected PE are assessed, diagnosed and treated in line with best practice guidance. These guidelines support the VTE Prevention policy.

## **3. DEFINITIONS**

- **Pulmonary embolism (PE):** A lung embolus (pulmonary embolism) occurs when a blood vessel supplying the lung becomes clogged up by a clot – a lump of coagulated blood. The clot may have travelled in the bloodstream from a vein in the pelvis, abdomen or in the leg; through the veins of the body, through the heart and into the lung. A damaged heart can also be the cause of these clots.
- **Massive pulmonary embolism:** A pulmonary embolism sufficiently large to cause circulatory collapse. Massive PE's are a life threatening emergency.
- **Venous thromboembolism:** Venous thrombosis is a condition in which a blood clot (thrombus) forms in a vein. Blood flow through the affected vein can be limited by the clot, causing swelling and pain. Venous thrombosis most commonly occurs in the 'deep veins' in the legs, thighs, or pelvis. This is known as a deep vein thrombosis. An embolism is created if a part or all of the blood clot in the deep vein breaks off from the site where it is created and travels through the venous system. If the clot lodges in the lung a very serious condition, pulmonary embolism (PE), arises. Venous thrombosis can form in any part of the venous system. However, deep vein thrombosis (DVT) and PE are the most common manifestations of venous thrombosis. DVT and PE are known as venous thromboembolism (VTE). (DH, 2009)
- **Thromboprophylaxis:** Thromboprophylaxis is the treatment to prevent blood clots forming in veins.
  - Mechanical thrombo prophylaxis devices include graduated compression (TED) stockings, intermittent pneumatic compression and venous foot pumps. All increase venous outflow or reduce stasis within the leg veins.
  - Chemical thromboprophylaxis is pharmaceutical intervention to decrease the clotting ability of the blood
- **Thrombolysis:** Treatment that dissolves abnormal blood clots in blood vessels to help improve blood flow and prevent damage to tissues and organs

## 4. RESPONSIBILITIES

### 4.1 Medical Director

The Medical Director has overall clinical responsibility and will report to the Board of Directors and Clinical Governance Committees.

### 4.2 Clinical Leads

All clinical leads are responsible for the implementation within their divisions and specialities.

### 4.3 Admitting Consultant

The admitting consultant is responsible for ensuring compliance with this guideline for their patients.

### 4.4 Junior Doctors

Junior Doctors are responsible for requesting and undertaking relevant investigations and ensuring the correct prescribing of appropriate drugs.

### 4.5 Nurses

Nurses are responsible for ensuring that the appropriate clinical observations are undertaken and acted on accordingly.

## 5. ASSESSMENT OF PATIENTS WITH SUSPECTED PULMONARY EMBOLISM

### 5.1 Pre-disposing factors

The following are major risk factors (relative risk 5-20):

Surgery*:	<ul style="list-style-type: none"><li>Major abdominal/pelvic surgery</li><li>Hip/knee replacement</li><li>Postoperative intensive care</li></ul>
Obstetrics:	<ul style="list-style-type: none"><li>Late pregnancy</li><li>Caesarean section</li><li>Puerperium</li></ul>
Lower limb problems:	<ul style="list-style-type: none"><li>Fracture</li><li>Varicose veins</li></ul>
Malignancy:	<ul style="list-style-type: none"><li>Abdominal/pelvic</li><li>Advanced/metastatic</li></ul>
Reduced mobility:	<ul style="list-style-type: none"><li>Hospitalisation</li><li>Institutional care</li></ul>
Miscellaneous:	<ul style="list-style-type: none"><li>Previous proven VTE</li></ul>

\*Where appropriate prophylaxis is used, relative risk is much lower.

The following are minor risk factors (relative risk 2-4):

Cardiovascular:	<ul style="list-style-type: none"><li>Congenital heart disease</li><li>Congestive cardiac failure</li><li>Hypertension</li><li>Superficial venous thrombosis</li><li>Indwelling central vein catheter</li></ul>
Oestrogens:	<ul style="list-style-type: none"><li>Oral contraceptive</li></ul>

Miscellaneous	<ul style="list-style-type: none"> <li>▪ Hormone replacement therapy</li> <li>▪ COPD</li> <li>▪ Neurological disability</li> <li>▪ Occult malignancy</li> <li>▪ Thrombotic disorders</li> <li>▪ Long distance sedentary travel</li> <li>▪ Obesity</li> <li>▪ Other (Inflammatory bowel disease, nephritic syndrome, chronic dialysis, myeloproliferative disorders, paroxysmal nocturnal haemoglobinuria)</li> </ul>
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## 5.2 Clinical assessment of probability of suspected pulmonary embolism

All patients where PE suspected should have their clinical probability assessed and documented within the medical notes. If pulmonary embolism is excluded an alternative explanation must always be sought.

### 5.2.1 When to suspect pulmonary embolism

The clinical patterns of PE include:

- Sudden collapse with raised JVP (faintness and/or hypotension)
- Pulmonary haemorrhage syndrome (pleuritic pain and/or haemoptysis)
- Isolated dyspnoea (i.e. no cough/sputum/chest pain)

PE can be missed in the following groups of patients:

- Those with severe cardio-respiratory disease
- Elderly patients
- Patients with isolated dyspnoea

## 5.3 Wells score

Patients with a suspected DVT should have their risk assessed using the TWO LEVEL Wells Risk Probability Scoring System, which takes into account the patient's history, the clinical findings (see **Annex A**). Scoring may need to be repeated if a patient presents with a change in symptoms, persistent symptoms or is not responding to treatment.

## 5.4 Investigations for suspected pulmonary embolism

The following tests should be undertaken in all patients where PE is suspected:

- Routine blood tests
- ABG; ABG on air should be checked even where the saturation level appears normal
- ECG
- Chest x-ray

### 5.4.1 D-Dimer -

The following should be taken into consideration before a D-Dimer is requested:

- Consider assay of D-Dimer only after assessment of clinical probability.
- It is inappropriate to perform D-Dimer if the clinical probability is high.
- A D-Dimer is not a screening investigation.

A negative D-Dimer reliably excludes PE if the clinical probability is low.

## 5.4.2 CT pulmonary angio (CTPA)

### Diagnostic investigations for pulmonary embolism

Ideally a CTPA should be performed within **1 hour** in suspected massive PE, and **24 hours** in non-massive PE (BTS – 2003). However, at this point in time, in this Trust, the facility to perform CTPA out of hours within 24 hours for a suspected non-massive PE is variable, particularly over the weekends

The request for an urgent CTPA should be made after discussion with a senior member of the team.

#### When to request a CTPA:

- Request without D-Dimer if massive PE is suspected
- Request if probability on 2 level Wells score is “Likely” (No need for a D-Dimer)
- Request if probability on 2 level Wells score is “Unlikely” but D-Dimer is positive
- “Unlikely” probability on a two level Wells score with a negative D-Dimer will not normally require CTPA

Requests for CTPA will be rejected if it does not include the clinical probability (WELLS score) and where appropriate the D-Dimer result.

Patients with a good quality negative CTPA do not require further investigation or treatment for PE.

## 5.4.3 Q Scan

Q scan’s remain a suitable investigation for patients within suspected PE they:

- are pregnant or lactating
- under 40 years old with no existing lung disease
- have a normal chest x-ray and the clinical probability is low

There is invariably a problem with timing as the isotope needs to be ordered and supplies are short.

## 5.4.4 Leg ultrasound scan

Where there are signs and symptoms of both DVT and PE a leg ultrasound scan can clearly be requested as a first line investigation in place of lung imaging.

## 6. TREATMENT OF PULMONARY EMBOLISM

### 6.1 Treatment for suspected pulmonary embolism

#### 6.1.1 Heparin

Commence Enoxaparin 1.5mg per kg of body weight sub-cutaneously once daily on suspicion of PE, pending investigations to confirm or refute the diagnosis.

Cease treatment when diagnosis excluded or when target INR achieved with Warfarin. Generally 5 days of low molecular weight heparin (LMWH) recommended.

For patients with severe renal impairment or established renal failure (e-GFR <30 ml/min/1.73 m<sup>2</sup>) offer unfractionated heparin (UFH) with dose adjustments based on the APTT or LMWH with dose adjustments based on anti-Xa assay.

For patients with increased risk of bleeding consider UFH as above

Be aware that heparins are of animal origin and this may be of concern to some patients on the basis of their religion or belief. In such cases, consider offering synthetic alternatives based on clinical judgement after discussing their suitability, advantages and disadvantages with the patient.

## **6.2 Treatment for confirmed pulmonary embolism - As above, plus as follows...**

### **6.2.1 Supportive treatment**

- Oxygen to keep saturation level within the target range as recommended in the oxygen policy (i.e. 88-92% in patients who are liable to have or develop hypercapnoea and 94-98% in all other patients)
- Analgesia
- Fluid
- Inotropes as necessary

### **6.2.2 Warfarin**

- Commence when diagnosis of PE is confirmed as per anticoagulation chart
- Target INR = 2-3
- Explain the risks and benefits of Warfarin to patient and document the discussion in the medical notes.
- Prior to discharge arrange monitoring of INR and prescribing of Warfarin by patient's GP.

### **6.2.3 RIVAROXABAN –**

**Rivaroxaban is recommended as an option for treating pulmonary embolism in adults instead of using Heparin and Warfarin (NICE technology appraisal guidance 297 – June 2013)**

**For the initial treatment of acute pulmonary embolism, the recommended dosage of Rivaroxaban is 15 mg twice daily for the first 21 days then followed by 20 mg once daily for continued treatment.**

## **6.3 Treatment of probable massive pulmonary embolism**

A massive PE is likely if the following are present:

- Collapse/hypotension; and
- Unexplained hypoxia; and
- Engorged neck veins; and
- Right ventricular gallop (often)

Thrombolysis is the treatment of choice in massive PE causing circulatory collapse and should ideally be initiated after a diagnosis of is confirmed, either by CTPA or beside Echo. However this is not always possible and often the decision to thrombolyse is purely clinical.

The decision should be Consultant led as although it is a life-saving treatment there are significant risks.

### **6.3.1 Thrombolysis regimens**

There are various regimens for thrombolysis; however the recommended protocols is:

- 10mg bolus alteplase administered over 1-2 minutes
- 90mg infusion of alteplase administered over 2 hours

Where the patient weighs <65kg the total dose should not exceed 1.5mg/kg. It can be administered in the same way as above but with an amended infusion rate.

LMWH should be discontinued prior to thrombolysis. Any invasive procedures should be avoided where possible.

Following completion of thrombolysis, IV unfractionated Heparin is required and should start when the post thrombolysis APTT is <2 and continued for 48 hours.

The FBC and APTT must be checked regularly.

### 6.3.2 Thrombolysis in cardiac arrest situation

If a patient presents with a probable massive PE with cardiac arrest the following should followed:

- Commence cardiopulmonary resuscitation
- Alteplase 50mg IV. This may be life saving, therefore any contraindications to thrombolysis under these circumstances rarely require consideration.
- Reassess after 30 minutes.

### 6.4 Treatment of pulmonary embolism in pregnancy

The following treatment guidelines should be followed for pregnant women:

- Enoxaparin should be given for the duration of the pregnancy
- Warfarin **should not** be given during pregnancy due to its teratogenic effect although its use preclude breast feeding.
- Approaching delivery discuss with the obstetric team and consider either of the following:
  - Substitute with unfractionated heparin, the effect of which can be reversed readily.
  - 6 hours before delivery stop or reduce heparin dose
- After delivery, commence Warfarin and continue Enoxaparin until target INR is achieved.
- Prescribe Warfarin for 6 weeks after delivery, or for 3 months after the initial episode.

### 6.5 Treatment of pulmonary embolism in patients with malignancy

The following treatment guidelines should be followed for patients with malignancy:

- Initial treatment is standard with Enoxaparin and Warfarin.
- The duration of treatment is arbitrary.
- Relative risk of recurrence is 3 and that of bleeding is 6.
- If PE is recurrent in spite of adequate anticoagulation the options are:
  - Aim for a higher INR range of 3.0 to 3.5; this will also increase the risk of bleeding.
  - Switch to long term LMWH

Where a patient with malignancy is currently undergoing chemotherapy it is advisable to discuss management with the treating oncologist. In many circumstances it is preferable to continue with LMWH and not Warfarin whilst chemotherapy is in progress.

## 7. ARRANGEMENTS FOR FOLLOW-UP

Prior to discharging patients their GP surgery must be contacted and arrangements made for INR checks and the prescribing of Warfarin.

### 7.1 Duration of Warfarin treatment

Treatment should be for three to six months, or longer, depending upon the circumstances, as described below.

The British Thoracic Society recommend the following duration of therapy. (Thorax – 2003:58;470-484)

Category of PE	Duration of treatment
PE with temporary risk factor	3 months
First idiopathic PE	3 months
Other categories of PE	6 months
Previous PE or DVT	Long term

**Note:** The guidelines published by the American College of Chest Physicians (8<sup>th</sup> Edition) recommends review of patients under the 3 month category described above with a view to extending their duration of therapy for longer period in low risk group for bleeding. (Chest – 2008; 133 (6 Suppl); 454S- 545S)

In Yeovil District Hospital, the preferred option for duration of anticoagulation therapy is 6 months unless risk of bleeding and its effects are unacceptably high.

Patients in the category of previous PE or DVT, the anticoagulation should generally be continued long term.

### 7.2 Echocardiographic assessment

Consider periodical echocardiographic assessment of pulmonary arterial pressure in the following groups of patients:

- Patients showing evidence of raised pulmonary artery pressure in the initial echocardiogram
- Patients with large/multiple PE
- Survivors of massive PE

### 7.3 Thrombophilia screen

Consider checking for thrombophilia screen 6 weeks after ceasing Warfarin under the following circumstances:

- Patients under 50 years of age presenting with recurrent idiopathic PE
- Where symptomatic VTE has been proven in several members of the family in more than one generation.

### 7.4 Patients with malignancy

Many patients with malignancy develop VTE disease, but few patients with VTE have occult malignancy.

However, NICE recommends that in all patients with unprovoked PE who are not already known to have cancer, a careful physical examination, CXR, Full Blood Count, serum calcium, liver function test and urine analysis is required. A consideration should also be given to further investigate for cancer with an abdomino-pelvic CT scan (and a mammogram for women) in patients above the age of 40 years.

## 8. IMPLEMENTATION, MONITORING AND EVALUATION

This guideline will be implemented, monitored and evaluated in line with the Policy on Procedural Documents.

## 9. APPLICABILITY

This guideline applies to all staff with managerial or clinical responsibility for the management of patients with suspected, or confirmed, pulmonary embolism.

## 10. REFERENCES

- Thorax – 2003;58;470-484
- Chest – 2008; 133 (6 Suppl); 454S- 545S
- BMJ – 2011;342;d2758
- VTE Prevention policy
- “Venous thromboembolic diseases: the management of venous thromboembolic diseases and the role of thrombophilia testing – 2012” -

<http://www.nice.org.uk/guidance/CG144>

- “Rivaroxaban for treating pulmonary embolism and preventing recurrent venous thromboembolism” – Nice technology appraisal guidance 287

[guidance.nice.org.uk/ta287](http://guidance.nice.org.uk/ta287)

## 11. EQUALITY IMPACT ASSESSMENT

This policy has been assessed and implemented in line with the policy on procedural documents and an equality impact has been carried out to ensure the policy is fair and does not discriminate any staff groups. See **Annex B**

**ANNEX A – TWO LEVEL WELLS SCORE**

**Two-level PE Wells score<sup>a</sup>**

<b>Clinical feature</b>	<b>Points</b>
Clinical signs and symptoms of DVT (minimum of leg swelling and pain with palpation of the deep veins)	3
An alternative diagnosis is less likely than PE	3
Heart rate > 100 beats per minute	1.5
Immobilisation for more than 3 days or surgery in the previous 4 weeks	1.5
Previous DVT/PE	1.5
Haemoptysis	1
Malignancy (on treatment, treated in the last 6 months, or palliative)	1
<b>Clinical probability simplified scores</b>	
PE <i>likely</i>	5 points or more points
PE <i>unlikely</i>	4 points or less

## ANNEX B – EQUALITY IMPACT ASSESSMENT TOOL

To be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval.

Name of Document: **GUIDELINES FOR THE MANAGEMENT OF PULMONARY EMBOLISM**

		Yes/No	Comments
1.	Does the policy/guidance affect one group less or more favourably than another on the basis of:		
	• Race	No	
	• Ethnic origins (including gypsies and travellers)	No	
	• Nationality	No	
	• Gender	No	
	• Culture	No	
	• Religion or belief	No	
	• Sexual orientation including lesbian, gay and bisexual people	No	
	• Age	No	
	• Disability	No	
2.	Is there any evidence that some groups are affected differently?	No	
3.	If you have identified potential discrimination, are any exceptions valid, legal and/or justifiable?	No	
4.	Is the impact of the policy/guidance likely to be negative?	No	
5.	If so can the impact be avoided?	-	
6.	What alternatives are there to achieving the policy/guidance without the impact?	-	
7.	Can we reduce the impact by taking different action?	-	

For advice or if you have identified a potential discriminatory impact of this procedural document, please refer it to The Equality & Diversity Lead, Yeovil Academy, together with any suggestions as to the action required to avoid/reduce this impact.

**Revised and updated by Dr R.K. Sinha (Respiratory Physician) – September 2014  
(Following consultation and agreement with the physician group)**