

Clinical guideline

**Massive pulmonary embolism (haemodynamically unstable PE) — diagnosis and management**

**Diagnosis**

Massive pulmonary embolism (PE) is defined as PE with hypotension (either systolic BP < 90mmHg or a pressure drop  $\geq$ 40 mmHg for more than 15 minutes) that is not caused by a cardiac arrhythmia, hypovolaemia or sepsis.

The diagnosis of PE should be confirmed by CTPA or an ECHO showing either acute right ventricular dysfunction (where there is no other explanation for RV dysfunction) or a free floating thrombus in the right atrium or right ventricle.

**Management**

Patients diagnosed with a massive PE need to be transferred to CCU if they are to be considered for thrombolysis with alteplase. The risks and benefits of thrombolysis should be discussed with the patient when feasible, with the outcome documented in the case notes. Patients should initially be treated with unfractionated heparin (see clinical guideline for unfractionated heparin infusion, available on the intranet, for more details) whilst waiting for tests to confirm a PE. Prior to starting heparin therapy, patients should have a full anticoagulant screen performed (N.B. APTT can be prolonged due to lupus anticoagulant).

1. Consider eligibility for thrombolysis with alteplase:
  - a. Absolute contra-indications — patient currently taking warfarin (seek expert advice); significant bleeding disorder at present or within last 6 months; manifest or recent severe or dangerous bleeding; recent major trauma, surgery or head injury within 3 weeks; recent stroke within 6 months; history of haemorrhagic stroke; GI bleed within 1 month; haemorrhagic diasthesis; aortic dissection; severe liver disease (e.g. known cirrhosis, portal hypertension); any history of CNS damage (e.g. neoplasm); recent puncture of a non-compressible blood vessel; bacterial endocarditis; pericarditis; acute pancreatitis;
  - b. Relative contra-indications (if any of these apply consider risk/benefit and seek expert advice) — BP >180mmHg systolic or >100mmHg diastolic; prolonged chest compression; active peptic ulcer; other significant risk of haemorrhage; pregnant or 1 week post-partum
2. If a patient is eligible for thrombolysis, stop the IV unfractionated heparin (UFH) infusion or low molecular weight heparin (LMWH)
3. The dose of alteplase is given in two parts (see Table 1 for details):
  - a. 10mg given as a slow IV bolus over 1–2 minutes: Reconstitute a 10mg vial with the 10ml water for injection provided to give a 1mg/ml concentration. This can then be withdrawn and given as a slow IV bolus over 1–2 minutes
  - b. An infusion (weight dependent) given over 2 hours: Reconstitute the required vials with water for injection (e.g. add 20ml to the 20mg vial) to produce a 1mg/ml concentration in each vial. Draw up the required volume (to give the

infusion dose indicated in Table 1) in a syringe and administer the dose via a syringe driver over 2 hours

The doses recommended in Table 1 are based on the maximum total dose (IV bolus + infusion) for patients <65kg not exceeding 1.5mg/kg and the total dose for patients ≥65kg being capped at 100mg.

**Table 1: Dosing regimen of alteplase for the treatment of a massive PE**

Weight	IV bolus dose (over 1-2 minutes)	Subsequent IV infusion dose (over 2 hours)	Strengths of vials to use to make up the infusion dose
40kg	10mg	50mg	1 x 50mg vial
45kg	10mg	55mg	1 x 50mg vial + 1 x 10mg vial
50kg	10mg	65mg	1 x 50mg vial + 1 x 20mg vial
55kg	10mg	70mg	1 x 50mg vial + 1 x 20mg vial
60kg	10mg	80mg	2 x 50mg vials
≥65kg	10mg	90mg	2 x 50mg vials

- c. **In the event of a Massive PE causing cardiac arrest:** Give alteplase 50mg IV bolus (over 1-2 minutes) followed by IV UFH if there is a response<sup>1</sup>.

4. Monitoring requirements for patients receiving alteplase:

- a. Patients should be monitored during and for several hours after the infusion for signs of orolingual angioedema. If such reactions occur, the patient should receive appropriate treatment with corticosteroids and anti-histamines; consideration should be given to discontinuing alteplase treatment
- b. Anaphylactic reactions require discontinuation of the infusion and initiation of appropriate treatment
- c. Monitor for injection site haemorrhage (puncture site haemorrhage, catheter site haematoma and catheter site haemorrhage). If severe, discontinuation of alteplase should be considered

5. Following thrombolysis, the patient's APTT should be checked immediately

- a. If the APTT ratio is <2, commence/resume an IV unfractionated heparin infusion (18units/kg/hr using the patient's actual body weight). However, it is advised not to start an UFH infusion within 8 hours of administration of a therapeutic dose of LMWH

- b. If the APTT ratio is  $>2$ , wait and repeat after 4 hours. Continue to repeat 4 hourly until APTT ratio is  $<2$ , then start the IV UFH infusion
  - c. Following commencement of unfractionated heparin, aim for an APTT ratio of 2 (range 1.5–2.5) as per hospital clinical guideline on unfractionated heparin infusion for adult patients (full guideline available on the intranet)
  - d. Commence oral anticoagulation on day 3. Continue heparin therapy for at least 5 days and until INR  $>2$  for 2 consecutive days.
6. If thrombolysis is contraindicated or not suitable, contact the on call thoracic surgeons at Liverpool Heart and Chest Hospital (Options: Surgical embolectomy / interventional embolectomy /clot fragmentation)

## References

1. British Thoracic Society Standards of Care Committee Pulmonary Embolism Guideline Development Group. British Thoracic Society Guidelines for the management of suspected pulmonary embolism. *Thorax* 2003; 58: 470-484
2. Royal Pharmaceutical Society. British National Formulary No. 62, 2011, Chapter 2.8
3. Up-to-date on PE 2011 ([www.uptodate.com](http://www.uptodate.com)).
4. NICE. Venous Thromboembolic Diseases: The Management of Venous Thromboembolic Diseases and the Role of Thrombophilia Testing. NICE Guideline Draft for Consultation October 2011