3-5 Circulatory embolus v.1

Causes: thrombus, fat, amniotic fluid, air/gas.
Signs: hypotension, tachycardia, hypoxemia, decreased $ETCO_2$ **Symptoms:** dyspnoea, anxiety, tachypnoea. Also consider if sudden unexplained loss of cardiac output.

START

❶ Call for help and inform theatre team of problem. Note the time.

❷ Call for cardiac arrest trolley.

❸ Stop all potential triggers. Stop surgery.

❹ Give 100% oxygen and ensure adequate ventilation:
- Maintain the airway and, if necessary, secure it with tracheal tube.

❺ If indicated start CPR immediately (CPR can help disperse air emboli and large thrombi).

❻ Give i.v. crystalloid at a high infusion rate. (Adult: 500-1000 ml, Child: 20 $ml.kg^{-1}$)
- Inotropes may be required to support circulation.

❼ Treat according to suspected embolus type (see Boxes A-D) whilst considering alternative diagnoses (Box E).

❽ Consider investigations to help confirm diagnosis:
- Arterial blood gases (increased $PaCO_2$-$ETCO_2$ gradient).
- Transoesophageal echocardiography (right heart strain, pulmonary arterial emboli).
- Computerised tomography.

❾ If cardiovascular collapse refractory to treatment, consider extra-corporeal membrane oxygenation (ECMO) or intra-aortic balloon counter-pulsation.

❿ Plan transfer of the patient to an appropriate critical care area.

Box A: THROMBOEMBOLISM

Consider thrombolysis e.g. alteplase 10 mg i.v. then 90 mg over 2 h (>65 kg)
Consider surgical removal – consult vascular surgeon
Consider percutaneous removal – consult radiologist

Box B: FAT EMBOLISM

- Petechial rash, desaturation, confusion/irritability if patient conscious
- Supportive measures are mainstay of initial management

Box C: AMNIOTIC FLUID EMBOLISM

- Supportive measures are mainstay of initial management
- Monitor the fetus, if undelivered
- Treat coagulopathy (fresh frozen plasma, cryoprecipitate and/or platelets)
- Consider plasmaphoresis

Box D: AIR/GAS EMBOLISM

- "Mill wheel" murmur may be present
- Discontinue source of air/gas if applicable and discontinue N_2O
- Tell surgeon to flood wound with saline and cover with wet packs
- Lower surgical field to below level of heart if possible
- Place patient in left lateral position if possible
- If central venous catheter in situ, attempt to aspirate air
- Volume loading and Valsalva manoeuvre may help

Box E: ALTERNATIVE DIAGNOSES

Pneumothorax (+/- tension)	Hypovolaemia
Bronchospasm **(→ 3-4)**	Myocardial failure
Pulmonary oedema	Sepsis**(→ 3-14)**
Cardiogenic shock	Bone cement implantation syndrome
	Anaphylaxis **(→ 3-1)**