

North Bristol N.H.S Trust
Directorate of Women and Children's Health

Maternity Guideline

Cardiopulmonary Resuscitation In Pregnancy

Best Practice Points

- 1. All staff involved in intrapartum care should be familiar with basic life support guidelines for the pregnant patient and should follow them during resuscitation attempts.**
- 2. 30 degree left lateral tilt should be used to minimise aortocaval compression and maximise cardiac output.**
- 3. Caesarean section should be performed after 4 minutes of unsuccessful resuscitation.**
- 4. Senior obstetric, anaesthetic and neonatal staff should be involved as early as possible.**
- 5. Record keeping should be meticulous ensuring that treatment given and timings are clearly identified.**

Cardiac Arrest in Pregnancy

Cardiopulmonary Resuscitation

Background

Cardiac arrest in pregnancy is thought to occur in approximately 1:30,000 maternities (1) so cardiac arrest during late pregnancy or delivery is even more rare. However, when it does occur maternal and fetal survival rates are low. Exact figures are not known but it has been suggested that the figure for maternal survival is around 40% (2). This is at least partly because the events leading to cardiac arrest tend to be overwhelming and incurable, but another factor of major importance is that the physiological changes of pregnancy hamper resuscitative efforts.

Possible causes of cardiac arrest at term

Obstetric Causes

Massive Haemorrhage
Amniotic Fluid Embolism
Eclampsia/HELLP syndrome
Peripartum cardiomyopathy

Non - Obstetric Causes

Pulmonary embolism
Septic shock
Cardiovascular disease
Myocardial infarction
Trauma
Anaesthetic complications

Resuscitation In Pregnancy

In the event of maternal cardiorespiratory arrest, resuscitation should begin immediately and should follow current basic and advanced life support guidelines (see appendix). Physiological changes of pregnancy and the presence of the fetus demand some additions to the normal algorithms:

30° left lateral tilt of the mother
Early tracheal intubation
Perimortem Caesarean section

These are explained below.

Physiological changes of pregnancy

The following is a list of the major physiological and anatomical changes that make resuscitation in pregnancy difficult and steps that can be taken to minimise their effects.

- Compression of the aorta and inferior vena cava by the uterus, decreases cardiac output by 25-30% in the supine position
- In late pregnancy the uterus receives approximately one tenth of the cardiac output.

During resuscitation tilt the mother approximately 30° to the left in order to reduce aortocaval compression. This can be achieved by placing pillows or a purpose made wedge under the patient's right side, moving the uterus to the left by manual displacement or by raising the right hip.

Cardiac compressions produce a maximum of 30% of the normal cardiac output (3) in non-pregnant patients in the supine position. When a pregnant patient is tilted the efficiency of compressions is reduced further but the detrimental effect of aortocaval compression is greater than that of left tilt.

- Maternal cardiac output increases by 40-50% in late pregnancy to satisfy oxygen demands of the fetoplacental unit.
- Oxygen storage is reduced due to decreased functional residual capacity of the lungs

Hypoxia occurs very rapidly. For this reason, early tracheal intubation is helpful although attempts at intubation should not override oxygen delivery.

- Changes in gastric emptying and sphincter tone increase the risk of aspiration of stomach contents into the lungs.

Intubation will also protect the airway from aspiration of gastric contents but see caveat above.

Perimortem Caesarean Section

The concept of perimortem Caesarean section was introduced in 1986. The thinking behind it is that resuscitation is ineffective in the third trimester because of aortocaval compression and that timely delivery will optimise outcome for mother and baby. A recent review (4) has supported this hypothesis. Perimortem Caesarean section should be initiated within 4 minutes of cardiac arrest if resuscitation is unsuccessful, in order that cardiac output may be re-established within 5 minutes. This will minimise the danger of hypoxic neurological damage to the mother. Surgical packs should be available on the central delivery suite and on the antenatal wards such that transfer to theatre is not necessary until after the baby is delivered. The neonatal resuscitation team should be present at delivery.

Further Care

The neonatal team will take charge of the baby. The mother should be transferred to ITU/HDU. Early involvement of ITU specialists is essential.

Relatives should be kept fully informed of events by senior staff.

Records should be reviewed to make sure they are complete and any further retrospective information should be added once the patient is stable.

Unsuccessful Resuscitation

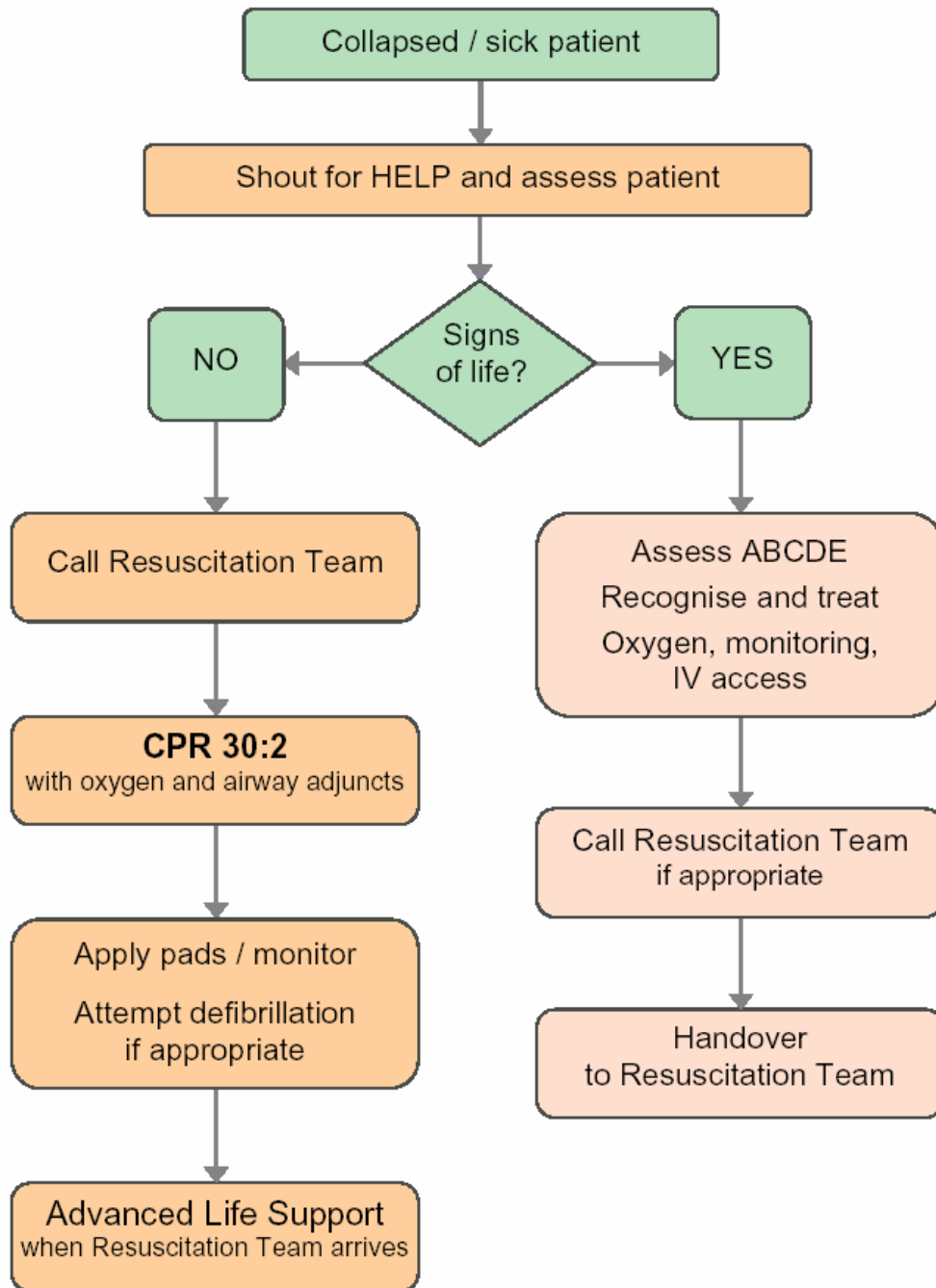
In the event of unsuccessful resuscitation the bereavement team should also be involved. The head of midwifery and the clinical director should be informed. Refer to “maternal death” guidelines for further information.

Staff Debrief

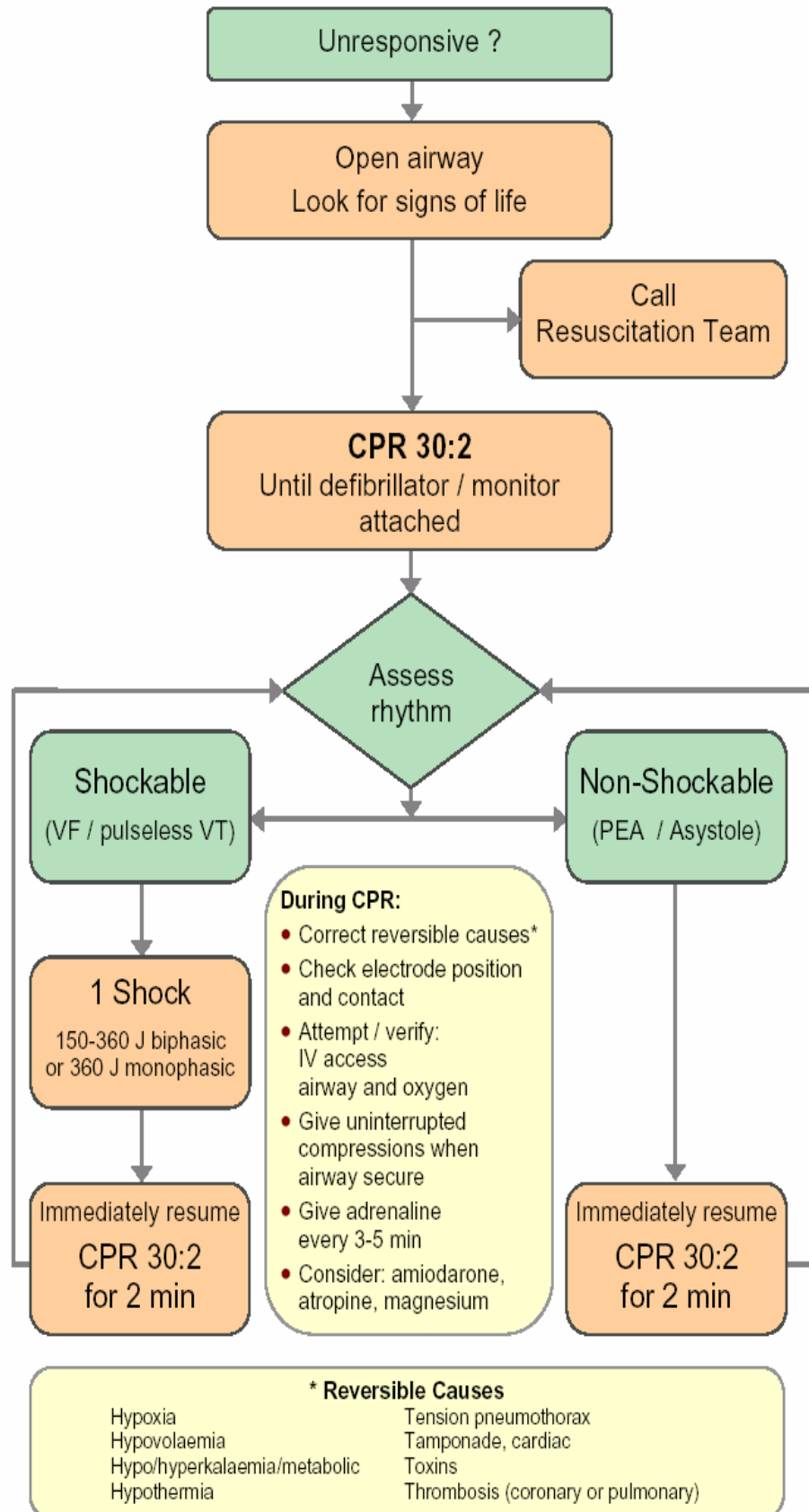
All staff involved in a maternal cardiac arrest should be involved in a formal debrief. This should be organised by senior midwifery and medical staff.

Appendix 1: basic life support and advanced life support algorithms

In-hospital resuscitation



Adult Advanced Life Support Algorithm



References

1. Chesnut DH ed. *Obstetric Anaesthesia: Principles and Practice*
2. American Heart Association. *ACLS Provider Manual and BLS Manual*, 2001
3. Sanders AB, Meislin HW, Ewy GA. The physiology of cardiopulmonary resuscitation. *JAMA* 1984; **252**:328
4. Katz V, Balderston K, DeFreest M. Perimortem caesarean delivery: Were our assumptions correct? *Am J Obs & Gyne* (2005) **192**, 1916-21

Maternal Cardiac Arrest & Cardiopulmonary Resuscitation

Protocol for Resuscitation

An immediate response is essential. Once respiratory or cardiac arrest has been diagnosed, the woman must be positioned appropriately and basic life support started.

- Left lateral tilt 15-30° to reduce aorto-cava compression.
- 4 - 5 minute rule: if resuscitation is not immediately successful, prepare for Caesarean Section, delivering baby within **5** minutes of cardiac arrest to facilitate maternal resuscitation.

For all in-hospital cardiac arrests, ensure that:

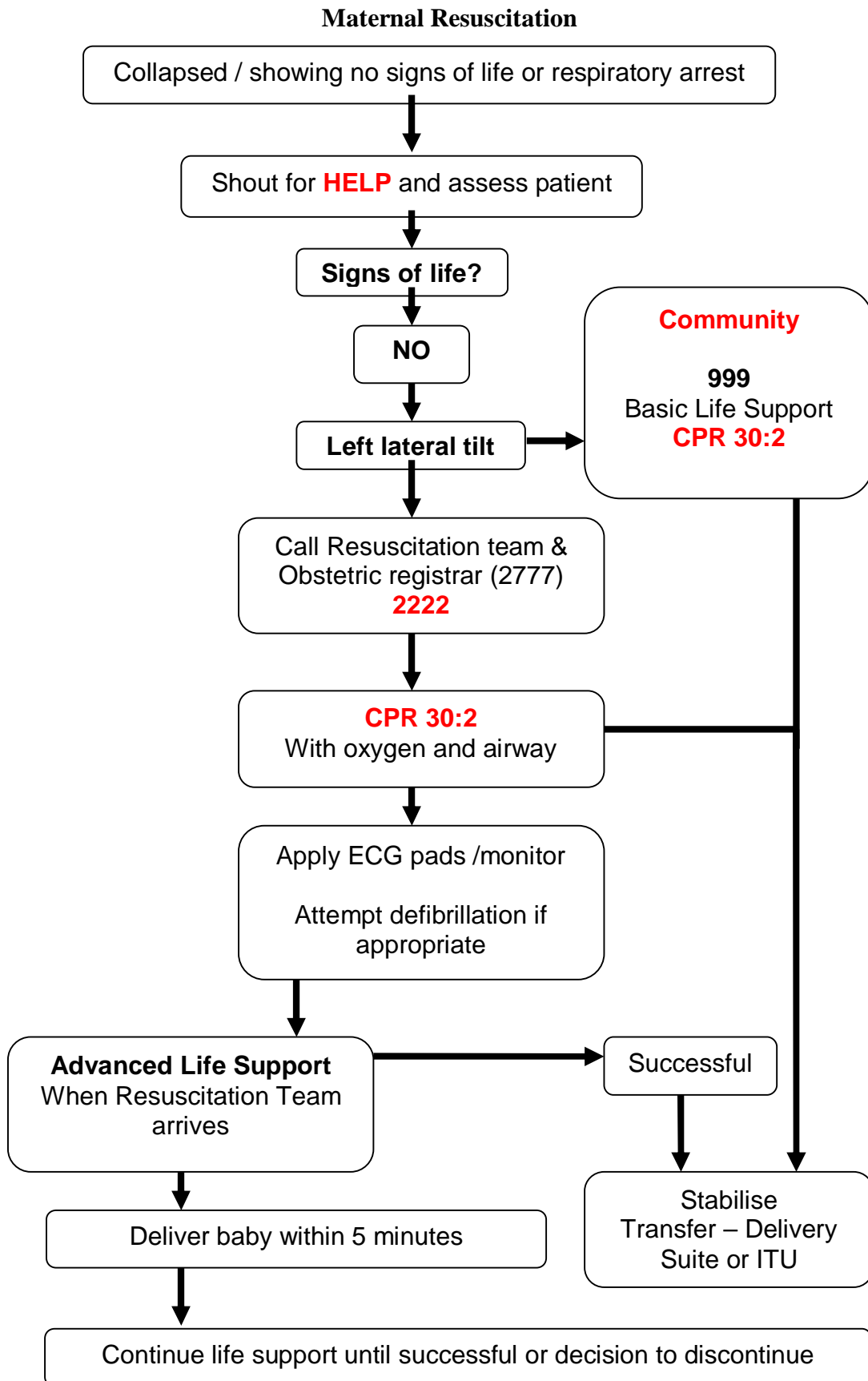
- Cardiorespiratory arrest is recognised immediately.
- Help is summoned using a standard telephone number **2222**, state '**Maternal cardiac arrest**'.
- BLS is commenced immediately using adjuncts, such as pocket mask, and if indicated, defibrillation attempted as soon as possible (within 3 minutes at the most).

Logistics

- Cardiac arrest team plus obstetric registrar (2777)
- Anaesthetic team
- Paediatric team
- Additional help
- Individuals to be responsible for:
 - Record keeping
 - Timing
 - Communication
 - Runner / porters / transport

Obtain arrest Caesarean Section box (Delivery Suite store room)

- Surgical gloves
- Scalpel
- Spencer Wells artery forceps x 4
- Artery forceps
- Chlorhexidine skin prep
- Sponge holders + sponges
- Swabs
- Emergency drugs tray (fridge)



Audit and Reporting Standards

- Daily checking and cleaning of equipment.
- Weekly checking of cardiopulmonary arrest drugs.
- Audit of all cardiopulmonary arrests as per RCHT guidance.
- All cases will be reviewed through the risk management process.

Ward to send data to relevant national audits, e.g., National Audit of Paediatric Resuscitation.

Audit should include periods of 'debriefing' after resuscitation attempts.

Where audit has identified deficiencies, steps must be taken to improve performance.

References

BMJ 2003; 327: 1277-1279 (29 November), doi:10.1136/bmj.327.7426.1277

Resuscitation Council UK 2008

BMJ 2003; 327: 1277-1279 (29 November), doi:10.1136/bmj.327.7426.1277

S. Cohen, L. Andes, B. Carvalho (2008) Assessment of knowledge regarding cardiopulmonary resuscitation of pregnant women. *International Journal of Obstetric Anesthesia*, Volume 17, Issue 1, January, pp 20 - 25

The Royal College of Anaesthetists, The Royal College of Physicians of London, The Intensive Care Society, The Resuscitation Council (UK) (2008) *Cardiopulmonary Resuscitation, Standards for Clinical Practice and Training*

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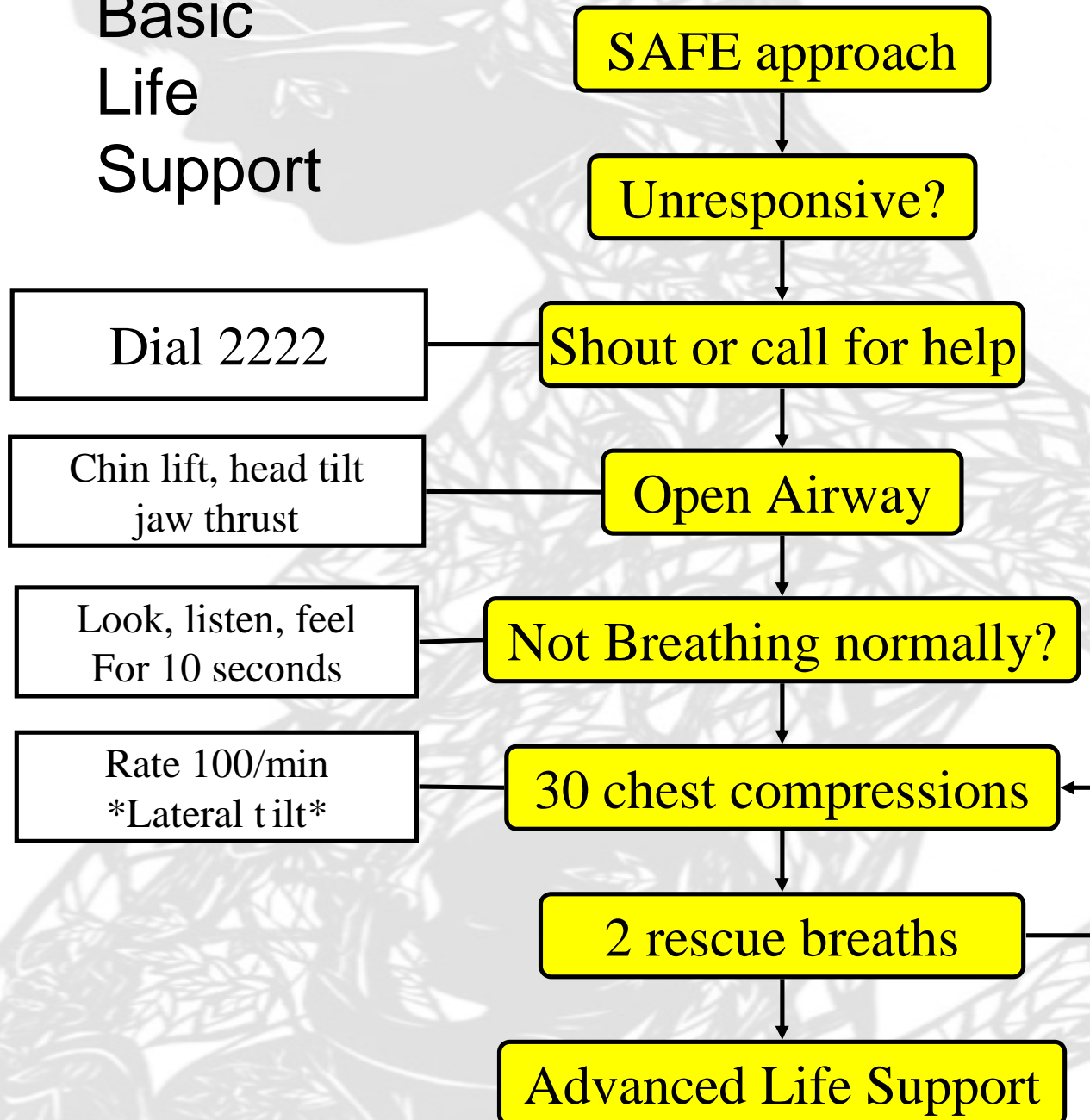
Guidelines for cardiopulmonary resuscitation and emergency cardiac care. Emergency Cardiac Care Committee and Subcommittees, American Heart Association. Part IV. Special resuscitation situations

JAMA. 1992;268:2242-2250. The journal of the American Medical Association

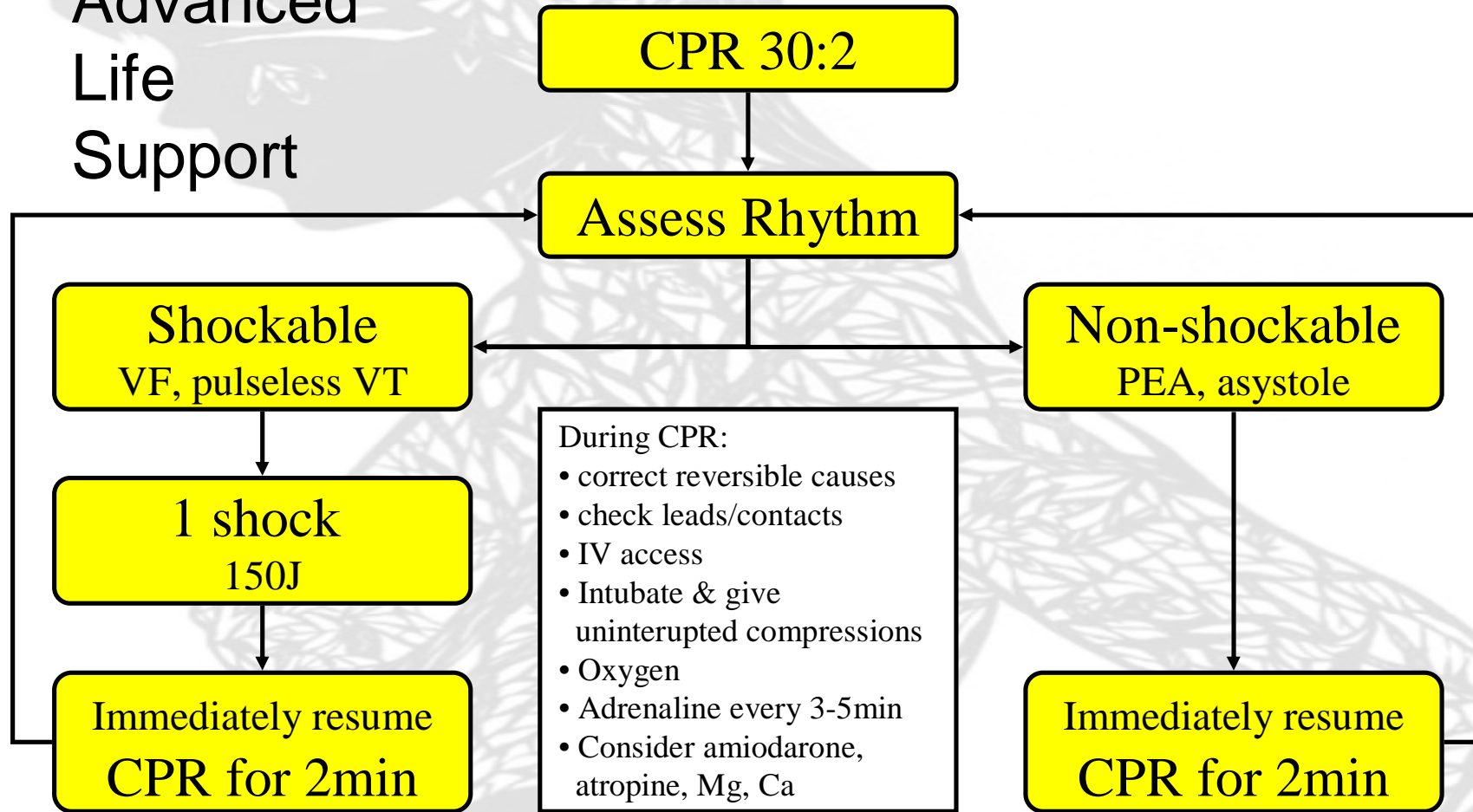
Oxford positioning technique improves haemodynamic stability and predictability of block height of spinal anaesthesia for elective caesarean section. *International Journal of Obstetric Anaesthesia*, Volume 8, Issue 4, Pages 242 - 248 M. Stoneham Nuffield

Department of Anaesthetics, John Radcliffe Hospital, Oxford OX3 9DU, UK
Available online 27 October 2003.

Basic Life Support



Advanced Life Support



- During CPR:**
- correct reversible causes
 - check leads/contacts
 - IV access
 - Intubate & give uninterrupted compressions
 - Oxygen
 - Adrenaline every 3-5min
 - Consider amiodarone, atropine, Mg, Ca

- Reversible Causes**
- | | |
|---------------------------|--|
| Hypoxia | Tension Pneumothorax |
| Hypovolaemia | Tamponade |
| Hyperkalaemia (metabolic) | Toxic (Local anaesthetic) |
| Hypothermia | Thromboembolism (pulmonary & amniotic) |
| | Eclampsia |

Changes in Pregnancy affecting resuscitation

⌘ Aortocaval compression

90% of mothers at term will have complete vena caval occlusion. Maintain 15° to 30° lateral tilt throughout resuscitation to improve resuscitative efforts.

- **Changes in lung function and ventilation.**

Pregnant women have a smaller FRC and larger O₂ consumption, and so desaturate more quickly. Pregnant women are more difficult to ventilate due to increased abdominal pressures. They are also more likely to aspirate. For these 2 reasons it is important to attempt intubation early on in a cardiac arrest scenario.

Ž Call for help

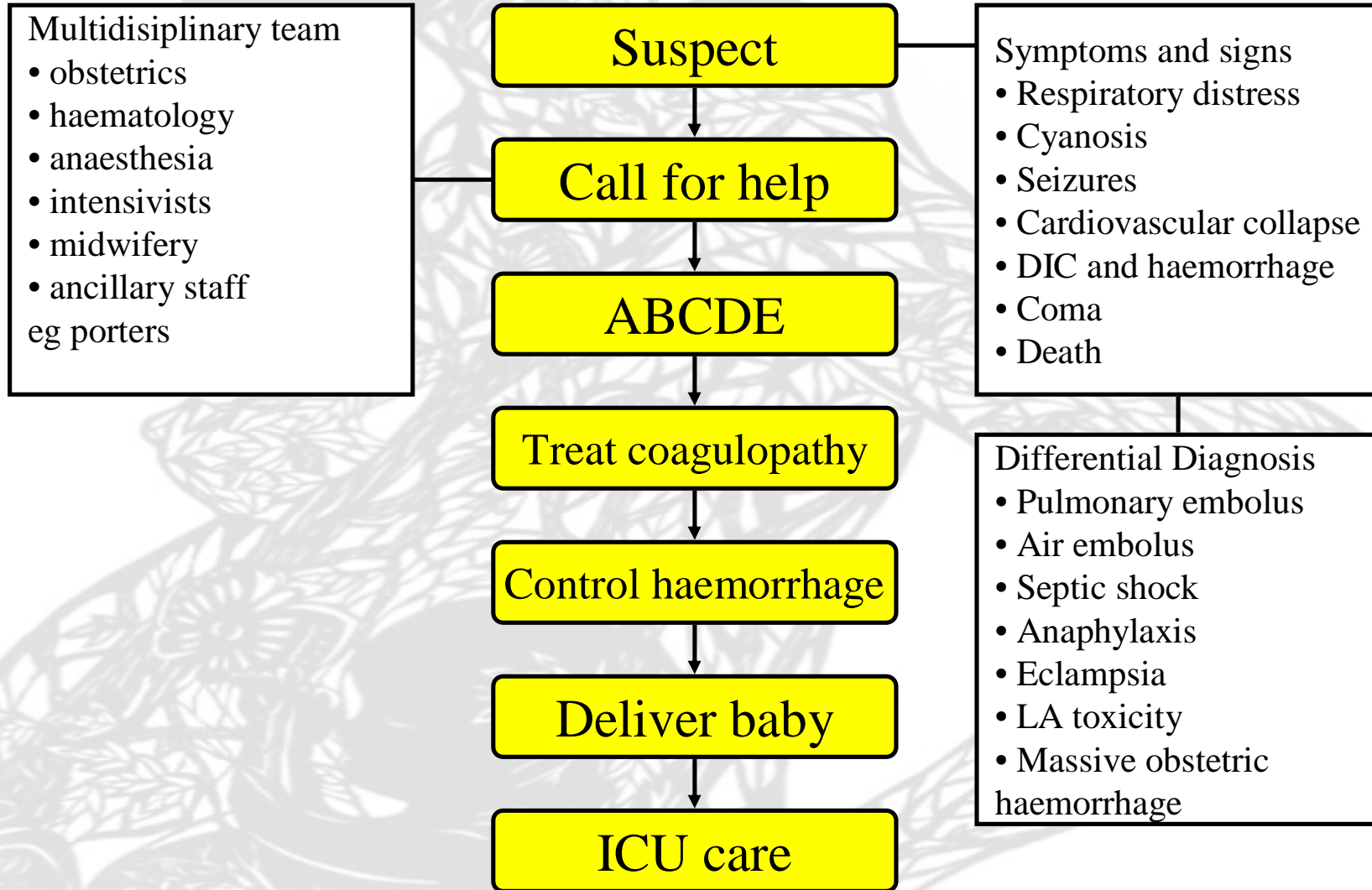
The 2222 call for Cresswell must include involvement of the Obstetricians, Anaesthetists and Paediatricians.

- **Perimortem Caesarean Section**

Should be considered in an arrest. The obstetrician should commence within 4 minutes of the onset of arrest with the intention of delivery by 5 minutes. It can be done outwith theatre, and if there is an improvement in mother's condition, control of haemorrhage can then be attempted in theatre. It is said to improve the mother's oxygenation and circulation.

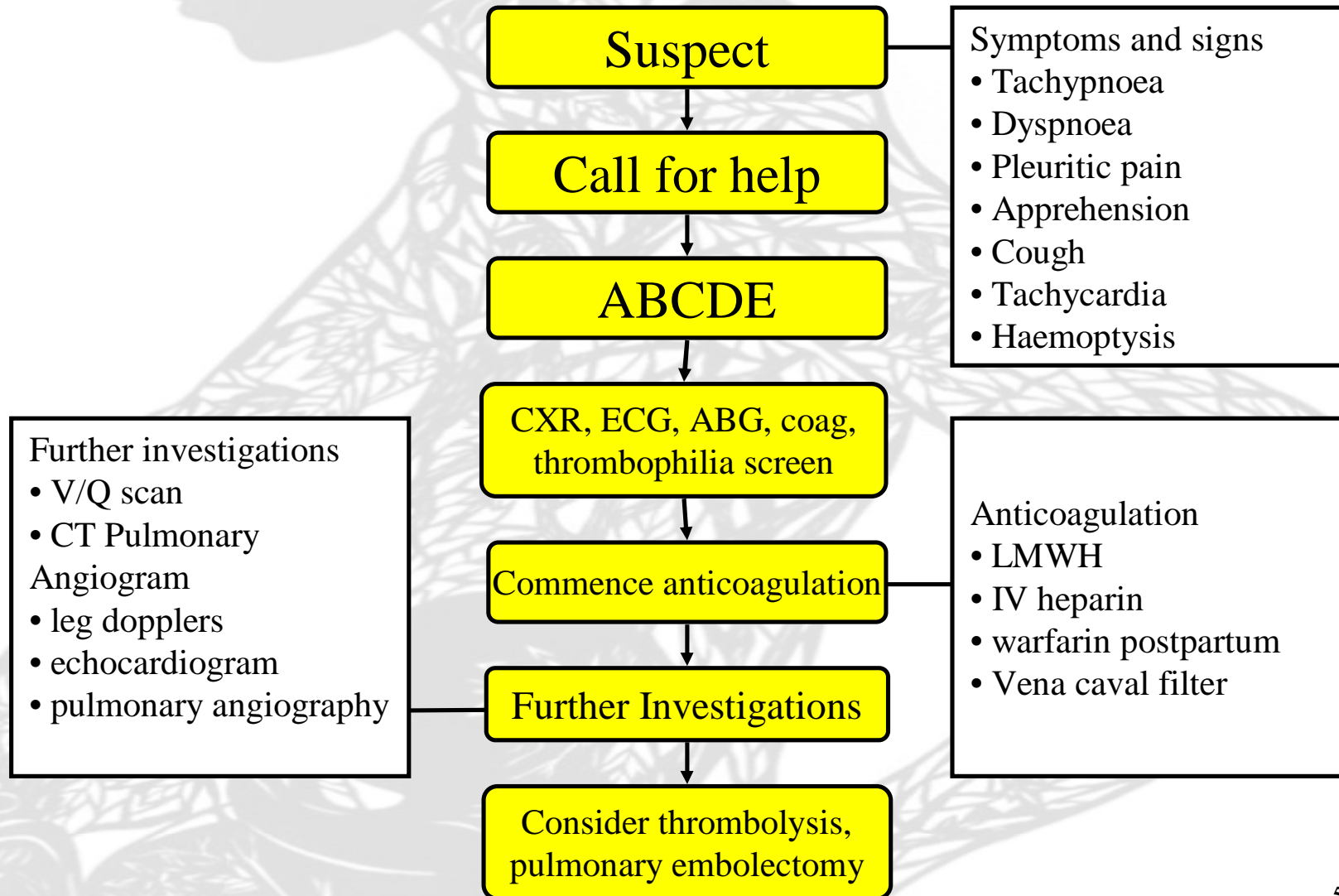
Amniotic Fluid Embolism

Quick reference Guide



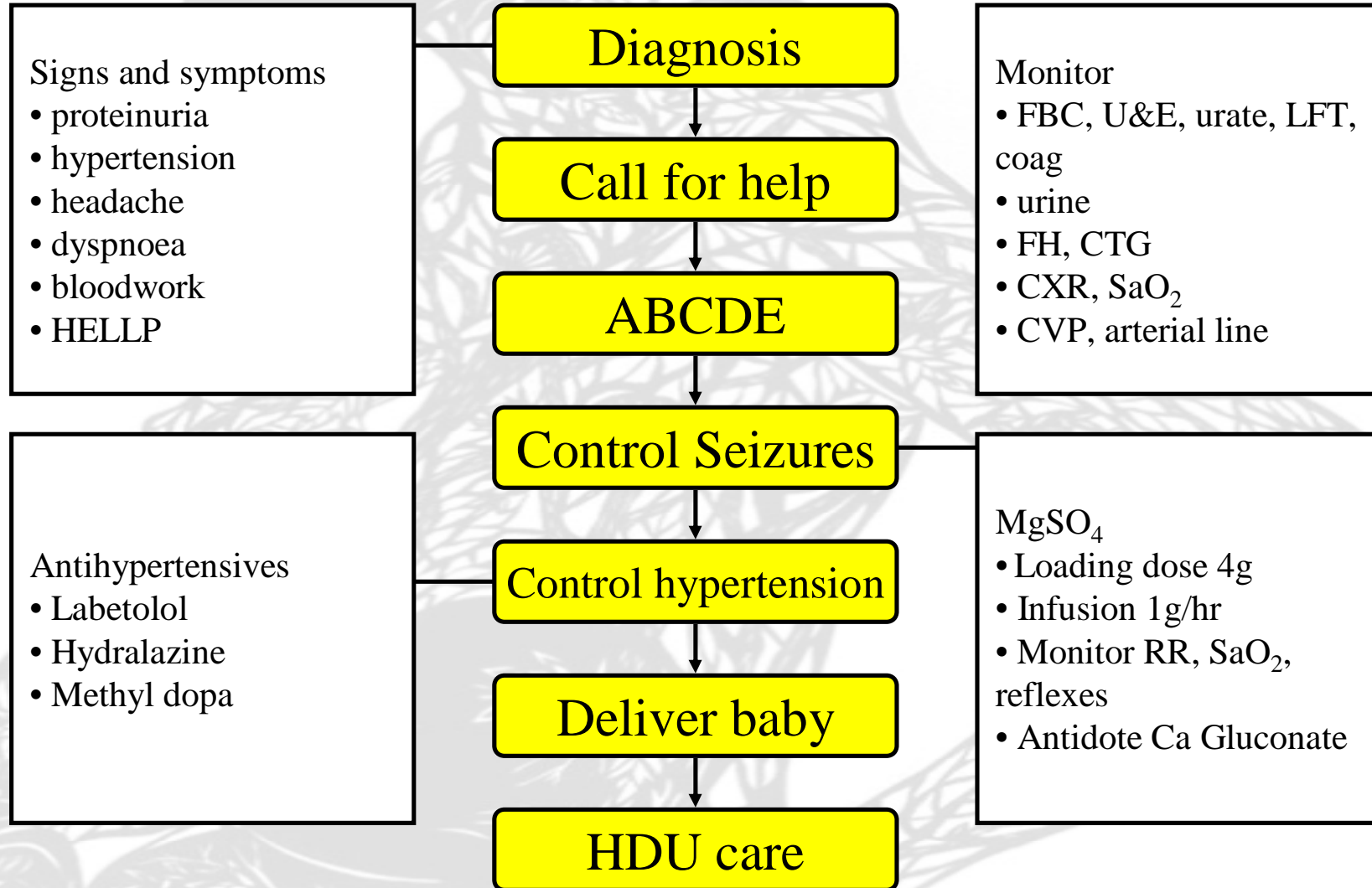
Pulmonary Embolism

Quick Reference Guide



Pre-eclampsia / Eclampsia

Quick Reference Guide



Massive Obstetric Haemorrhage

Quick Reference Guide

