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

<table>
<thead>
<tr>
<th>Obstetric Causes</th>
<th>Non - Obstetric Causes</th>
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<tbody>
<tr>
<td>Massive Haemorrhage</td>
<td>Pulmonary embolism</td>
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<tr>
<td>Amniotic Fluid Embolism</td>
<td>Septic shock</td>
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<tr>
<td>Eclampsia/HELLP syndrome</td>
<td>Cardiovascular disease</td>
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<tr>
<td>Peripartum cardiomyopathy</td>
<td>Myocardial infarction</td>
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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

Collapsed / sick patient

Shout for HELP and assess patient

NO

Signs of life?

YES

Call Resuscitation Team

CPR 30:2
with oxygen and airway adjuncts

Apply pads / monitor
Attempt defibrillation if appropriate

Advanced Life Support when Resuscitation Team arrives

Assess ABCDE
Recognise and treat
Oxygen, monitoring, IV access

Call Resuscitation Team if appropriate

Handover to Resuscitation Team
Adult Advanced Life Support Algorithm

Unresponsive?

Open airway
Look for signs of life

Call Resuscitation Team

CPR 30:2
Until defibrillator / monitor attached

Assess rhythm

Shockable
(VF / pulseless VT)

1 Shock
150-360 J biphasic or 360 J monophasic

Immediately resume
CPR 30:2 for 2 min

During CPR:
- Correct reversible causes*
- Check electrode position and contact
- Attempt / verify: IV access, airway and oxygen
- Give uninterrupted compressions when airway secure
- Give adrenaline every 3-5 min
- Consider: amiodarone, atropine, magnesium

Non-Shockable
(PEA / Asystole)

Immediately resume
CPR 30:2 for 2 min

* Reversible Causes
- Hypoxia
- Hypovolaemia
- Hypo/hyperkalaemia/metabolic
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis (coronary or pulmonary)
References


3. Sanders AB, Meislin HW, Ewy GA. The physiology of cardiopulmonary resuscitation. *JAMA* 1984; 252:328