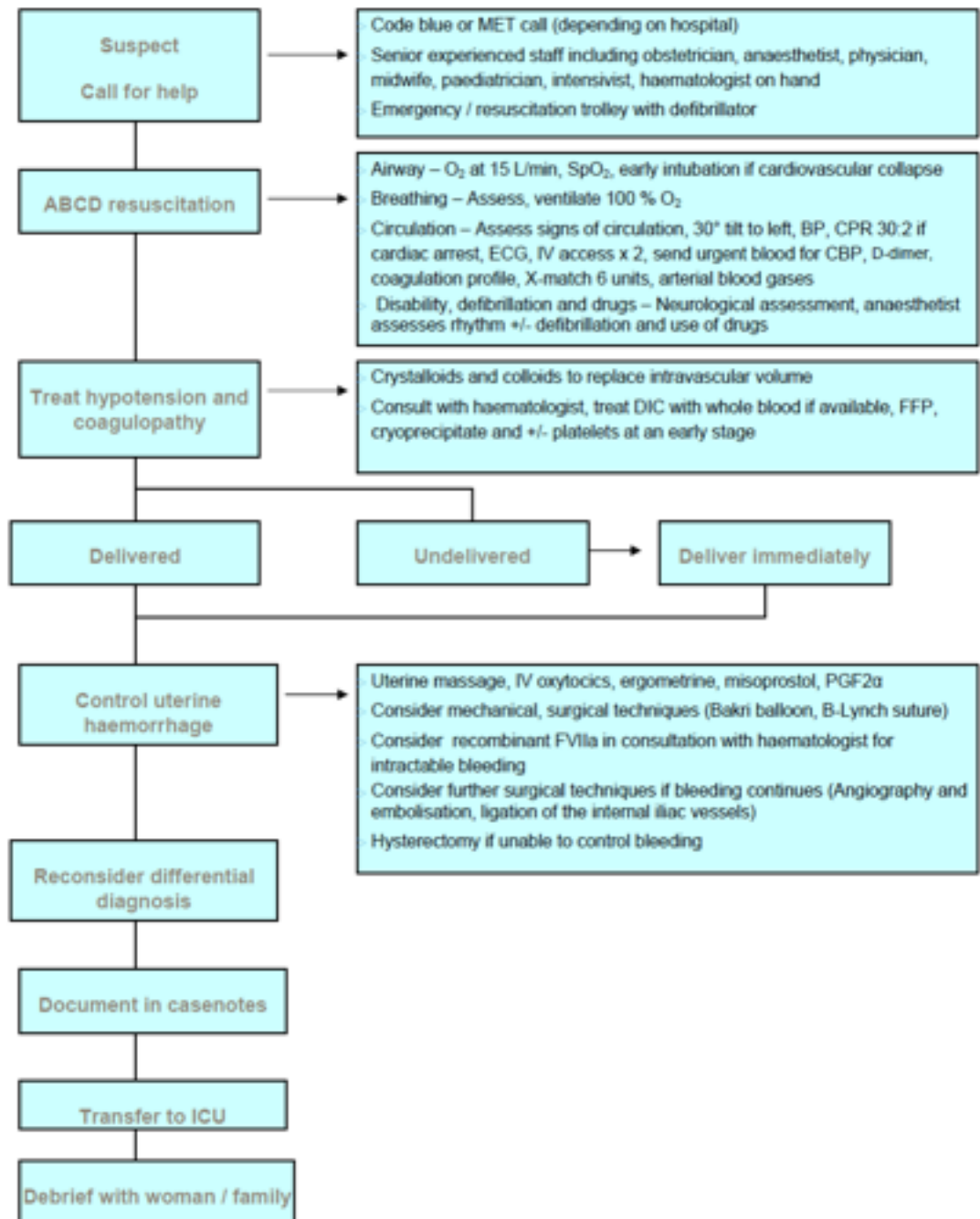


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Basic and advanced life support flow chart



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Introduction

- > Maternal cardiac arrest is a rare event, estimated to occur in approximately 1 in 20-30,000 pregnancies.
- > Maternal cardiovascular collapse in pregnancy is likely to be far more common, but the incidence is unknown as morbidity data are not routinely collected (McDonnell 2009; RCOG 2011)
- > In recent years, demographic changes such as an increase in
 - > average maternal age
 - > body mass index (BMI)
 - > caesarean delivery rate
 - > incidence in multiple gestations
 - > the incidence of serious underlying co-morbidities

have increased the likelihood that clinicians will be required to manage maternal collapse

- > It is essential that all caregivers are skilled in initial effective resuscitation techniques and medical staff are able to investigate and diagnose the cause of the collapse to allow appropriate, directed continuing management

Definition

- > Maternal collapse refers to “an acute event involving the cardiorespiratory systems and / or brain, resulting in a reduced or absent conscious level (and potentially death), at any stage in pregnancy and up to six weeks after delivery” (RCOG 2011 p. 2)

Causes of maternal collapse

- > Vasovagal syncope and postural hypotension are the most common causes of maternal collapse (Adair 2006)
- > Causes with significant associated morbidity include:
 - > Haemorrhage (including intra-abdominal)
 - > Thromboembolism
 - > Amniotic fluid embolism
 - > Aortic dissection
 - > Cardiac disease e.g. arrhythmias, myocardial infarction, cardiomyopathy
 - > Sepsis
 - > Drug toxicity / overdose
 - > Eclampsia
 - > Intracranial haemorrhage
 - > Anaphylaxis

Other causes

- > Hypoglycaemia

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- > Other metabolic / electrolyte disturbances
- > Other causes of hypoxia such as airway obstruction secondary to aspiration / foreign body, air embolism, tension pneumothorax, cardiac tamponade secondary to trauma and hypothermia.
- > Systematic consideration of the causes of collapse can enable skilled rescuers to identify the causes of collapse in the hospital setting, and where the cause is reversible, survival can be improved
- > The common reversible cause of collapse in any woman can be remembered using the 'aide memoires' of the 4H's and the 4T's, with the addition of eclampsia and intracranial haemorrhage (RCOG 2011)

Table I Common reversible causes of collapse

Reversible cause		Cause in pregnancy
4H's	Hypovolaemia	Bleeding (may be concealed) or relative hypovolaemia of dense spinal block; septic or neurogenic shock
	Hypoxia	Pregnant patients become hypoxic more quickly
	Hypo / hyperkalaemia and other electrolyte disturbances	No more likely
	Hypothermia	No more likely
4T's	Thromboembolism	AFE, PE, air embolus, MI
	Toxicity	Local anaesthetic, magnesium, other
	Tension pneumothorax	Following trauma, suicide attempt
	Tamponade (cardiac)	Following trauma, suicide attempt
Eclampsia and pre-eclampsia		Includes intracranial haemorrhage

Adapted from: Royal College of Obstetricians and Gynaecologists (RCOG). Maternal collapse in pregnancy and the puerperium. Green-top Guideline No. 56. January 2011. London: RCOG Press 2011; p. 4.

Diagnosis

- > Presumptive - based on clinical presentation

Management

- > Prompt resuscitation whilst considering the differential diagnosis

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- > Treatment involves supporting the respiratory and cardiovascular systems and correction of clotting abnormalities as required
- > As chest compressions are not as effective after 20 weeks of gestation, there should be early recourse to delivery of the fetus and placenta to improve maternal outcome if CPR is not effective (RCOG 2011)
- > Early involvement of senior experienced staff, including obstetrician, anaesthetist, physician, midwife(s), paediatrician, haematologist and intensivist, depending on the nature of the suspected diagnosis, is essential to optimise outcome
 - > Early liaison with haematology staff as required
- > The most senior person should take charge and assign roles and responsibilities to all other individuals
- > Recruit as many people as possible to assist during resuscitation e.g. to record events, drugs given, someone to make urgent phone calls, to organise transport of laboratory samples, to bring blood (products) to the site of resuscitation, and additional staff to support family members and significant others

Follow the ABCDEs of basic life support

- > Assessment is carried out by primary survey to identify and prioritise life threatening complications during initial resuscitation and secondary survey is performed if required when the woman has been stabilised
- > Ensure a safe environment
- > Attempt to get a verbal response from the woman (indicates LOC, respiratory status)
- > Turn the woman onto her back, avoid aortocaval compression by using a left lateral wedge / tilt (if uterine size more than 20 weeks of gestation) or manually displace the uterus
- > Administer high flow oxygen (15 L / min)
- > Commence monitoring immediately, including SpO₂, automated blood pressure recording, insert indwelling catheter asap without hindering basic life support

In the event of cardiac arrest, follow standard Advanced Life Support measures

- > Consider common, reversible causes of maternal cardiopulmonary arrest throughout the resuscitation process, so that continuing treatment can be directed towards the specific cause of collapse
 - > Call code blue or MET (depending on hospital)
 - > Obtain emergency / resuscitation trolley with defibrillator / (PPH box as required refer to the PPG 'Postpartum haemorrhage for suggested PPH box contents')

Airway

- > Open airway, check for obstruction, head tilt, chin lift
- > Add high flow oxygenation (15 L / min) as soon as possible (asap) and early intubation when a skilled person is available (use effective cricoid pressure)

Breathing

- > Assess breathing by looking, listening and feeling for the movement of air (no longer than 10 seconds)

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Circulation

If no circulation

- > Commence CPR at a ratio of 30 chest compressions followed by 2 ventilations with facemask
- > If a strong pulse cannot be obtained after several cycles of chest compressions, preparations for perimortem caesarean delivery should begin (see below)
- > IV access - insert two 16 gauge cannulae, send urgent blood for CBP, D-dimer, coagulation profile, X-match 6 units, arterial blood gases

Circulation present but no breathing (respiratory arrest)

- > Continue rescue breathing at a rate of 10 breaths per minute
- > Recheck circulation after 10 breaths
- > If the woman starts to breathe on her own but remains unconscious, turn her into the recovery position and apply oxygen at 15 litres per minute

Fluid resuscitation

- > Treat hypotension with warmed crystalloid, colloid and blood products as required
 - > Use a temperature controlled warming device (e.g. blood warmer) for rapid infusion of fluids (if available use a device that combines both pressure and warming)
- > In cases of rapid, ongoing blood loss, liaise with haematologist for urgent release of blood products (for further fluid resuscitation guidelines for massive blood loss, refer to the PPG 'massive blood transfusion')
 - > In cases of ongoing rapid blood loss, infuse no more than 2 litres of warmed crystalloid and 1.5 litres colloids (3.5 litres total) until blood is available (RCOG 2009)
- > Use caution with fluid replacement volume in the presence of preeclampsia and eclampsia as fluid overload can contribute to poor outcome (for further information, refer to the PPG 'fluid management and monitoring in severe preeclampsia')
- > Use pressor agents as necessary
- > Consider pulmonary artery catheterisation in patients who are haemodynamically unstable
- > Continue resuscitation efforts until a decision is taken regarding need for emergency caesarean section or perimortem caesarean section

Disability, defibrillator and drugs

- > Initial neurological assessment using Glasgow coma scale and pupillary response ([see appendix I](#))
- > Preferably, use an automated external defibrillator (AED). Attach AED as soon as possible, analyse ECG rhythm, charge AED and defibrillate as indicated
- > If using a manual defibrillator, the medical officer or an accredited clinician assesses the rhythm as shockable or non-shockable and institutes defibrillation as required. Airway and IV access are secured and defibrillation sequence and use of drugs is decided. Immediately resume CPR 30:2 for 2 minutes

Exposure and environmental control

- > The woman must be undressed to allow for a full physical examination

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- > The woman must always be kept warm. Hypothermia is one of the main dangers in contributing to worsening acidosis, coagulopathy and infection
 - > Maintain body heat with forced air warming blanket or space blanket

Perimortem caesarean section

- > Irreversible brain damage can occur in the pregnant woman within 4-6 minutes as the gravid uterus impairs venous return and reduces cardiac output secondary to aortocaval compression. Delivery of the fetus and placenta reduces oxygen consumption, improves venous return and cardiac output, facilitates chest compressions and makes ventilation easier (RCOG 2011)
- > If there is no response to correctly performed cardiopulmonary resuscitation (CPR) within 4 minutes of maternal collapse, delivery should be undertaken to assist maternal resuscitation. This should be achieved within 5 minutes of the collapse (RCOG 2011)
- > Perimortem caesarean section should not be delayed by moving the woman – it should be performed by the obstetrician where resuscitation is taking place as it is primarily in the interests of maternal, not fetal survival (RCOG 2011)
 - > Continue CPR during perimortem caesarean section and afterwards, to improve the chance of a successful neonatal and maternal outcome (Grady et al. 2011)
 - > Limited equipment is required to effect delivery of the baby (e.g. a surgical scalpel, Mayo scissors and forceps). Sterile preparation and drapes are unlikely to improve survival (Grady et al. 2011).
 - > Maternity units should consider having a pre prepared perimortem caesarean section kit available at all times (e.g. a surgical scalpel, Mayo scissors and forceps)
 - > The operator should use the incision that will facilitate the most rapid access
 - > Anaesthetic / intensivist support to protect airway, supervise CPR and help to determine the underlying cause
- > Once the uterus is empty, if ongoing intractable bleeding (coagulopathy), consider aortic compression as a temporary measure to maintain cardiac output

Resuscitation and perimortem caesarean section is successful:

- > Ensure appropriate sedation / general anaesthetic to provide amnesia and pain relief and transfer to operating theatre to complete the operation
- > Postpartum care in tertiary centre with adult intensive care facilities
- > Significant maternal / neonatal morbidity is associated with some causes of maternal collapse e.g. AFE, aortic dissection, cardiac disease
- > Provide adequate counselling to the woman / family as soon as possible and arrange further follow-up

Resuscitation and perimortem caesarean section unsuccessful:

- > Consider if post-mortem required before any medical devices such as intravenous lines or tubes are removed
- > In the event of a maternal death, notify the Coroner
- > Provide adequate counselling to the partner / family as soon as possible

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Documentation and debriefing

- > Contemporaneous note-keeping is difficult in an emergency resuscitation situation, unless there is a nominated person dedicated to this task
- > Detailed retrospective notes should be written by those involved in the emergency as soon as possible after the event
- > After the event, debriefing is recommended for family and significant others, as well as all medical and midwifery staff involved in the management of the emergency
- > Notify hospital management in accordance with local Clinical Governance guidelines and complete a Safety Learning System (SLS) notification

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Useful reference

Australian Resuscitation Council - Available from URL: <http://www.resus.org.au/>

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Abbreviations

AED	Automated external defibrillator
AFE	Amniotic fluid embolism
asap	As soon as possible
BMI	Body mass index
BP	Blood pressure
CBP	Complete blood picture
CPR	Cardiopulmonary resuscitation
DIC	Disseminated intravascular coagulation
ECG	electrocardiograph
et al.	And others
FFP	Fresh frozen plasma
FVIIa	Factor seven a
IV	Intravenous
L	Litre(s)
LOC	Level of consciousness
MET	Medical Emergency Team
Min	Minute
O ₂	Oxygen
PGF _{2α}	Prostaglandin F ₂ alpha
PPH	Postpartum haemorrhage
RCOG	Royal College of Obstetrics and Gynaecology
SpO ₂	Oxygen saturation measured by pulse oximetry

Version control and change history

PDS reference: OCE use only

Version	Date from	Date to	Amendment
1.0	20 Sept 11	current	Original version