South Australian Perinatal Practice Guideline

Collapse (Maternal)

Note:

This guideline provides advice of a general nature. This statewide guideline has been prepared to promote and facilitate standardisation and consistency of practice, using a multidisciplinary approach. The guideline is based on a review of published evidence and expert opinion.

Information in this statewide guideline is current at the time of publication.

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Health practitioners in the South Australian public health sector are expected to review specific details of each patient and professionally assess the applicability of the relevant guideline to that clinical situation.

If for good clinical reasons, a decision is made to depart from the guideline, the responsible clinician must document in the patient's medical record, the decision made, by whom, and detailed reasons for the departure from the guideline.

This statewide guideline does not address all the elements of clinical practice and assumes that the individual clinicians are responsible for discussing care with consumers in an environment that is culturally appropriate and which enables respectful confidential discussion. This includes:

- The use of interpreter services where necessary,
- Advising consumers of their choice and ensuring informed consent is obtained,
- Providing care within scope of practice, meeting all legislative requirements and maintaining standards of professional conduct, and
- Documenting all care in accordance with mandatory and local requirements

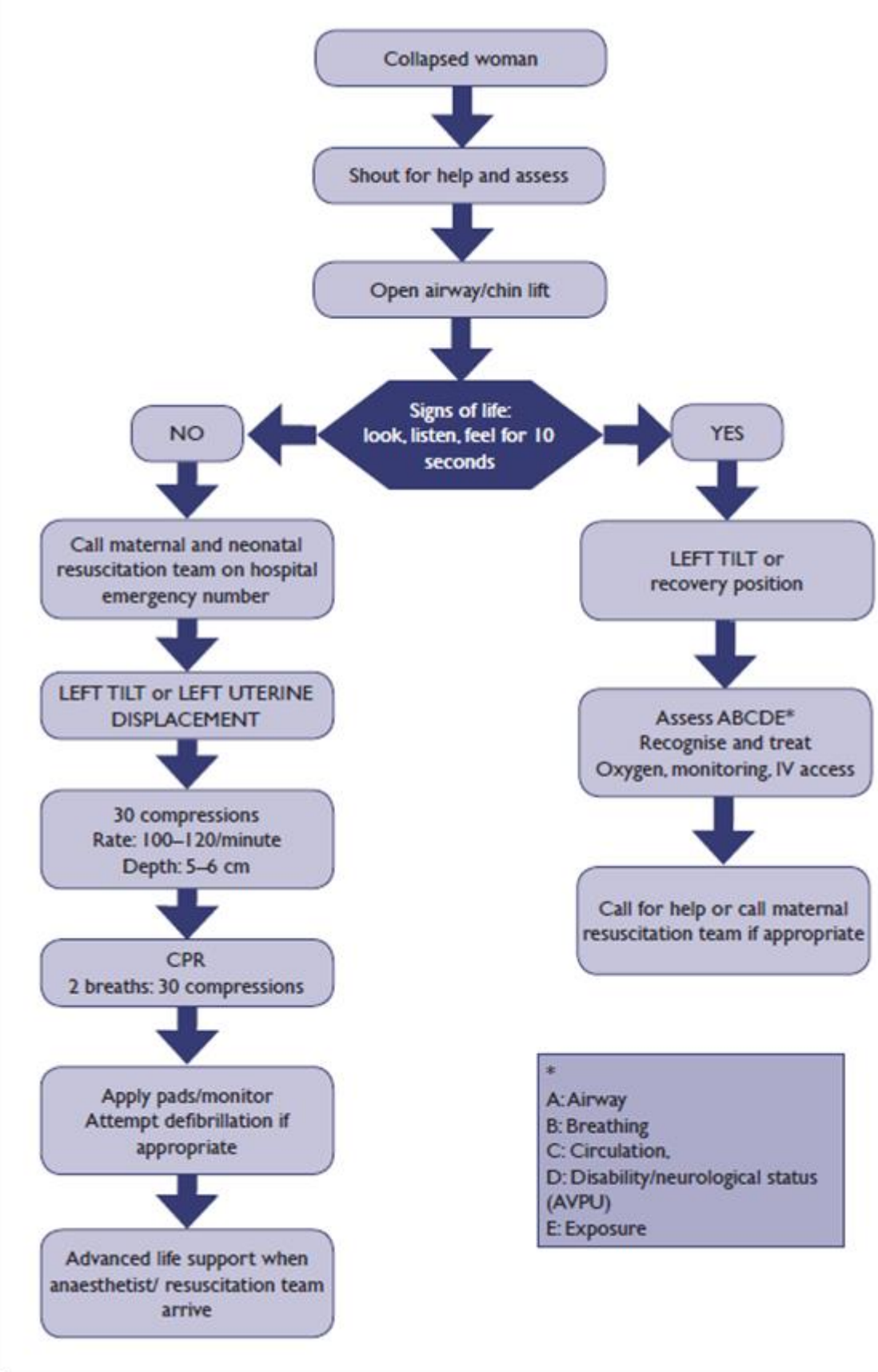
Explanation of the aboriginal artwork:
The Aboriginal artwork used symbolises the connection to country and the circle shape shows the strong relationships amongst families and the Aboriginal culture. The horse shoe shape design shown in front of the generic statement symbolises a woman and those enclosing a smaller horse shoe shape depicts a pregnant woman. The smaller horse shoe shape in this instance represents the unborn child. The artwork shown before the specific statements within the document symbolises a footprint and demonstrates the need to move forward together in unison.

Australian Aboriginal Culture is the oldest living culture in the world yet Aboriginal people continue to experience the poorest health outcomes when compared to non-Aboriginal Australians. In South Australia, Aboriginal women are 2-5 times more likely to die in childbirth and their babies are 2-3 times more likely to be of low birth weight. The accumulative effects of stress, low socio economic status, exposure to violence, historical trauma, culturally unsafe and discriminatory health services and health systems are all major contributors to the disparities in Aboriginal maternal and birthing outcomes. Despite these unacceptable statistics the birth of an Aboriginal baby is a celebration of life and an important cultural event bringing family together in celebration, obligation and responsibility. The diversity between Aboriginal cultures, language and practices differ greatly and so it is imperative that perinatal services prepare to respectfully manage Aboriginal protocol and provide a culturally positive health care experience for Aboriginal people to ensure the best maternal, neonatal and child health outcomes.

Purpose and Scope of Perinatal Practice Guideline (PPG)

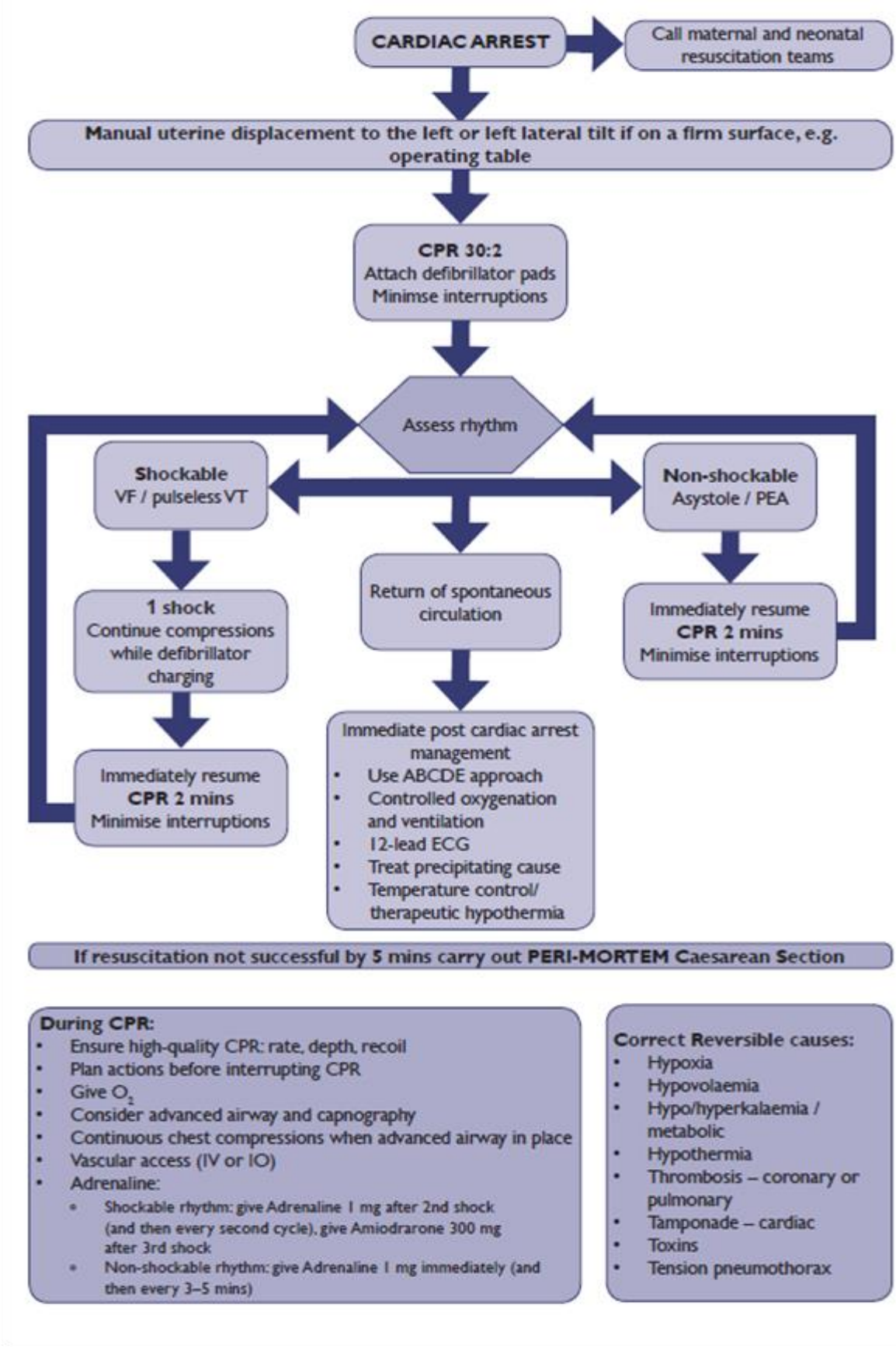
The purpose of this guideline is to give clinicians information on the causes of maternal collapse and subsequent management, including resuscitation algorithms, perimortem caesarean section and post resuscitation care

Flowchart 1: Basic Life Support Algorithm



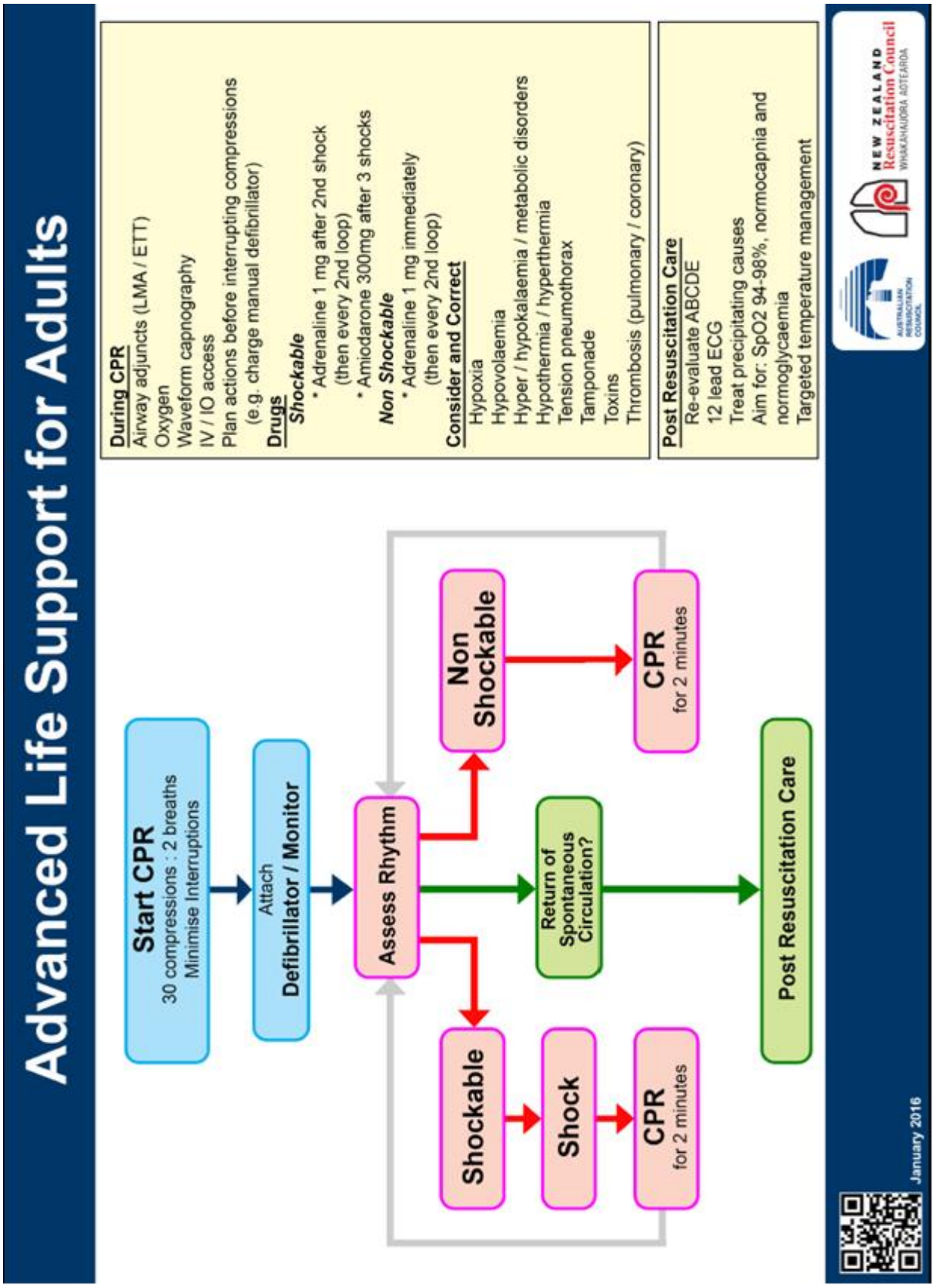
BLS Algorithm, PROMPT Course Manual (Australian & New Zealand Edition), 2013, p15.
***Note: Use local processes for enlisting emergency assistance.**

Flowchart 2: Advanced Life Support Algorithm



ALS Algorithm. PROMPT Course Manual (Australian & New Zealand Edition), 2013, p28.

Flowchart 3: ALS for Adults (Australian Resuscitation Council)



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Summary of Practice Recommendations

The following practices will decrease the chance of collapse and improve survival

- The use of RADAR (Rapid Detection And Response) charts assists in the early detection and management of deteriorating patients
- Consider the common causes - Vasovagal syncope and postural hypotension
- Consider possible causes of collapse using the 5 H's (Head, Heart, Hypoxia, Haemorrhage, wHole body Hazards)
- Follow ABCDEs of resuscitation (Airway, Breathing, Circulation, Disability, Defibrillator, Drugs, Exposure and Environmental control)
- Involve experienced clinicians and use a Primary Obstetric Survey as part of initial resuscitation. Avoid aortocaval compression by using a lateral wedge or manual displacement of the uterus
- Consider the common reversible causes of cardiac arrest: 4H's & 4T's and eclampsia
- 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.
- Continue CPR throughout perimortem caesarean section continue post-delivery of the baby until directed otherwise
- If resuscitation is successful, initiate post resuscitation specific care, including consideration of therapeutic hypothermia
- Ensure detailed documentation. If not contemporaneous due to lack of staff numbers, ensure notes are written as soon as possible after the event.
- After the event, ensure adequate counselling and debriefing for the woman and her family / support person(s)
- After the event, ensure adequate debriefing and counselling for the staff involved (consider the Employee Assistance Scheme)

Abbreviations

AED	Automated external defibrillator
AFE	Amniotic fluid embolism
ALS	Advanced Life Support
asap	As soon as possible
AVPU	Alert; responsive to Voice; responsive to Painful stimuli; Unresponsive
BLS	Basic Life Support
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
IO	Intraosseous
IV	Intravenous
L	Litre(s)
LOC	Level of consciousness
MET	Medical Emergency Team
Min	Minute
O_2	Oxygen
PPH	Postpartum haemorrhage
RCOG	Royal College of Obstetrics and Gynaecology
ROTEM	rotational thromboelastometry
SpO_2	Oxygen saturation measured by pulse oximetry
VF	Ventricular fibrillation
VT	Ventricular tachycardia

Definitions

Maternal Collapse	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[1 (p. 2)]

Introduction

Maternal cardiac arrest is a rare event, estimated to occur in approximately 1 in 20-30,000 pregnancies[1]. The following demographic changes have increased the likelihood that clinicians will be required to manage maternal collapse[2]:

- Increased average maternal age
- Increased average body mass index (BMI)
- Increased caesarean delivery rate
- Increased incidence of serious underlying co-morbidities

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.

Causes of maternal collapse

Vasovagal syncope and postural hypotension are the most common causes of maternal collapse[3]. Consider using the 5 Hs to ascertain cause:

Possible causes of maternal collapse[4]	
Head	Eclampsia, epilepsy, cerebrovascular accident, vasovagal response
Heart	Myocardial infarction, arrhythmias, peripartum cardiomyopathy, congenital heart disease, dissection of thoracic aorta
Hypoxia	Asthma, pulmonary embolism, pulmonary oedema, anaphylaxis
Haemorrhage	Abruption, uterine atony, genital tract trauma, uterine rupture, uterine inversion, ruptured aneurysm
Whole body and Hazards	Hypoglycaemia, amniotic fluid embolism, septicaemia, trauma, complications of anaesthesia, drug toxicity

Reducing the risk of maternal collapse[5]

Antenatal

Undertake comprehensive antenatal assessment and care planning.

Ensure women who develop significant medical complications in pregnancy have urgent referral to appropriate specialist / multidisciplinary team management.

Develop local algorithms for the investigation of symptoms such as chest pain, calf tenderness and breathlessness.

Pre-existing significant medical conditions

Optimise care with multidisciplinary team management for patients of concern.

Document a multidisciplinary plan as early as possible. This should include:

- The frequency of investigations for monitoring
- Red flag symptoms requiring urgent specialist review
- A plan for birth (place of birth, gestation and mode)
- Any special care required in the puerperium

Inpatient care

Utilise 'Rapid Detection and Response' charts. The use of early warning charts and escalation guidelines including involvement of senior medical staff (intensivist, physician) assists in the early detection and timely management of the deteriorating patient.

In rapidly deteriorating cases, ensure urgent referral and escalation of care to critical care team and obstetric consultant.

For rural sites, seek early consultation and advice via the Perinatal Advice Line (PAL) on telephone 137 827. Coordination of maternal transfer or retrieval by MedSTAR in consultation with the PAL obstetrician is also facilitated via the PAL telephone number.

Diagnosis

Presumptive - based on clinical presentation

Management

General Considerations

Prompt resuscitation whilst considering the differential diagnosis.

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.[1]

Early involvement of senior experienced staff where possible, including obstetrician, anaesthetist, physician, midwife(s), neonatologist/paediatrician, haematologist and intensivist, depending on the nature of the suspected diagnosis, is essential to optimise outcome.

The team leader is usually the most senior person and should take charge and coordinate the resuscitation - delegate tasks and assign roles and responsibilities to other individuals within the team.

Recruit as many people as necessary to assist during resuscitation e.g. to record events, drugs given, regularly call out time elapsed, make urgent phone calls, organise transport of laboratory samples, bring blood (products) to the site of resuscitation and additional staff to support family members and significant others.

Initial Management: Follow the ABCDEs of basic life support

Assessment is carried out by **primary survey** to identify and prioritise life-threatening complications **during initial resuscitation.**

- Follow BLS Algorithm (see flowchart 1)
- Ensure a safe environment

After the BLS algorithm, consider using the Primary Obstetric Survey:

Primary Obstetric Survey [4 p18]

Head	How responsive is the woman? Is she alert, responsive to voice, responsive to painful stimuli or unresponsive (AVPU)? Is the woman fitting?
Heart	What is the capillary refill like? What is the pulse rate and rhythm? Is there a murmur?
Chest	Is there good bilateral air entry? What are the breath sounds like? Is the trachea central?
Abdomen	Is there an 'acute' abdomen (rebound and guarding)? Is there tenderness (uterine or non-uterine)? Is the fetus alive? Is there a need for a laparotomy or delivery?
Vagina	Is there bleeding? What is the stage of labour? Is there an inverted uterus?

Assess responsiveness of the woman to voice and/or pain.

If no response, seek immediate help using local hospital / health facility procedures or by calling 000 if outside of these.

If no response, turn the woman onto her back, avoid aortocaval compression by using a left lateral wedge / tilt less than 30° (if uterine size more than 20 weeks of gestation) or manually displace the uterus to the left.[4]

Airway

Open airway, check for obstruction, jaw thrust and chin lift.

Add high flow oxygenation (15 L / min) as soon as possible and early intubation when a skilled person is available (use effective cricoid pressure).

Breathing

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

Circulation

Circulation present but no breathing (respiratory arrest)

1. Continue rescue breathing at a rate of 10 breaths per minute
2. Recheck circulation after 10 breaths
3. If the woman starts to breathe on her own but remains unconscious, turn her into the recovery position
4. Administer high flow oxygen (15 L / min)

If no circulation

1. Commence CPR at a ratio of 30 chest compressions followed by 2 ventilations with facemask (change rescuer every 2 minutes if possible to prevent ineffective compressions due to exhaustion)
2. Commence monitoring immediately, including SpO_2, automated blood pressure recording

Ongoing Management: Further key treatment decisions

Re-evaluate and continue to support the airway, breathing and circulation of the woman. Consider the need for intensive care support.

Follow ALS algorithm (see flowchart 2).

Consider common, reversible causes of maternal cardiopulmonary arrest (the 4H's and the 4T's, with the addition of eclampsia and intracranial haemorrhage[1]) throughout the resuscitation process, so that continuing treatment can be directed towards the specific cause of collapse.

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 women 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: RCOG[1(p4)]

Disability, defibrillator and drugs

Initial neurological assessment using Glasgow Coma Scale and pupillary response (see Appendix 1).

Defibrillator – apply gel pads and view rhythm to decide if a shock should be given.

Secure airway and IV access and decide defibrillation and use of drugs sequence.

Preferably, use an automated external defibrillator (AED). 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.

Immediately resume CPR 30:2 for 2 minutes.

Shocks – every 2 minutes if VF or pulseless VT.

Initial doses of drugs to be considered during cardiac arrest [4(p29)]

Feature	Drug to be considered
Cardiac Arrest	1mg adrenaline (epinephrine) IV: For shockable rhythms give after second shock then every second cycle For non-shockable rhythms give immediately and then every 3-5 minutes
VF / VT	300 mg amiodarone IV after 3rd shock
Opiate overdose	400 – 800 micrograms naloxone IV
Magnesium toxicity	10 mL of 10% calcium gluconate IV (see *Magnesium Sulphate Infusion Regimen* PPG available at: http://www.sahealth.sa.gov.au/perinatal)
Local anaesthetic toxicity	1.5 mL/kg 20% lipid emulsion (e.g. intralipid®, clinoleic®) IV (see *Local Anaesthetic Toxicity* PPG available at: http://www.sahealth.sa.gov.au/perinatal)

Fluid resuscitation

IV access - insert two 16 gauge cannulae and send urgent blood for:

- CBP
- extended coagulation studies or ROTEM
- X-match 6 units
- arterial blood gases
- blood glucose level

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 or call Transfusion Services for the Massive Transfusion Pack according to local guidelines and availability (also see *Blood Transfusion* PPG available at: http://www.sahealth.sa.gov.au/perinatal).

Continue resuscitation efforts until a decision is taken regarding need for emergency caesarean section or perimortem caesarean section.

Exposure and environmental control

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

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.[1]

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.[1]

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[1]

- Continue CPR during perimortem caesarean section and afterwards, to improve the chance of a successful neonatal and maternal outcome[7]
- Limited equipment is required to facilitate the delivery of the baby (e.g. a surgical scalpel, Mayo scissors and forceps). Sterile preparation and drapes are unlikely to improve survival[7]
- 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 there is ongoing intractable bleeding (coagulopathy), consider aortic compression as a temporary measure to maintain cardiac output. To perform aortic compression, the experienced operator's fist is placed over the umbilicus and pushed downward toward the spine.

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 should be undertaken in a 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.

Post resuscitation care

- Continue ABCDE approach
- Control oxygenation (SpO_2 94-98%) and ventilation. Avoid hyperoxia
- Temperature and glucose control. Consider therapeutic hypothermia
- Perform 12 lead ECG
- Identify and treat precipitating causes

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.

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 all medical and midwifery staff involved in the management of the emergency. Staff should be reminded of the Employee Assistance Scheme and given information on how to access it.

Provide adequate counselling to the woman / family as soon as possible and arrange further follow-up.

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/

Appendix 1: Glasgow Coma Score[11]

Eye opening (E)	
None To pain To speech Spontaneous	1 = Even to supra-orbital pressure 2 = Pain from sternum / limb / supra-orbital pressure 3 = Non-specific response, not necessarily to command 4 = Eyes open, not necessarily aware
Verbal response (V)	
None Extension Flexor response Withdrawal Localizes pain Obeys commands	1 = To any pain; limbs remain flaccid 2 = Shoulder adducted and shoulder and forearm rotated internally 3 = Withdrawal response or assumption of hemiplegic posture 4 = Arm withdraws to pain, shoulder abducts 5 = Arm attempts to remove supra-orbital / chest pressure 6 = Follows simple commands
Motor response (M)	
None Incomprehensible Inappropriate Confused Oriented	1 = No verbalization of any type 2 = Moans / groans, no speech 3 = Intelligible, no sustained sentences 4 = Converses but confused, disoriented 5 = Converses and oriented
Total = E+V+M	

The Glasgow coma scale provides a score in the range 3-15 and is the most widely used scoring system used in quantifying a patient's level of consciousness.

Patients with scores 3-8 are usually in a coma.

Determine the best eye opening response, the best verbal response and the best motor response. If intubated, score the verbal response as V=intubated.

The total score is the sum of the scores in three categories.

Consider CT scan if there is a reduction in score of 2 or more on GCS, or if the score is less than.[13]

Pupil response

Before assessing the woman's pupil's reaction to light, note and document the size, shape and equality of the pupils.

Using a pen torch, move the light source from the outer aspect of the eye towards the pupil. The pupil should constrict quickly. Assess each pupil and document on neurological chart.

Record

- '+' for brisk pupil reaction
- 'S' for sluggish pupil reaction
- 'C' if eye is closed due to orbital oedema
- Exclude any pre-existing pupil irregularities in the woman.
- Consider any possible effect from medications e.g. atropine and opiates effect pupil size

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