N.B.: Patient may be paralysed but still awake, so when BP is restored, either volatile or IV agents should be given to anaesthetise the patient.

B. GENERAL ANAESTHESIA

Deaths occur usually after failed intubation with subsequent hypoxia or aspiration.

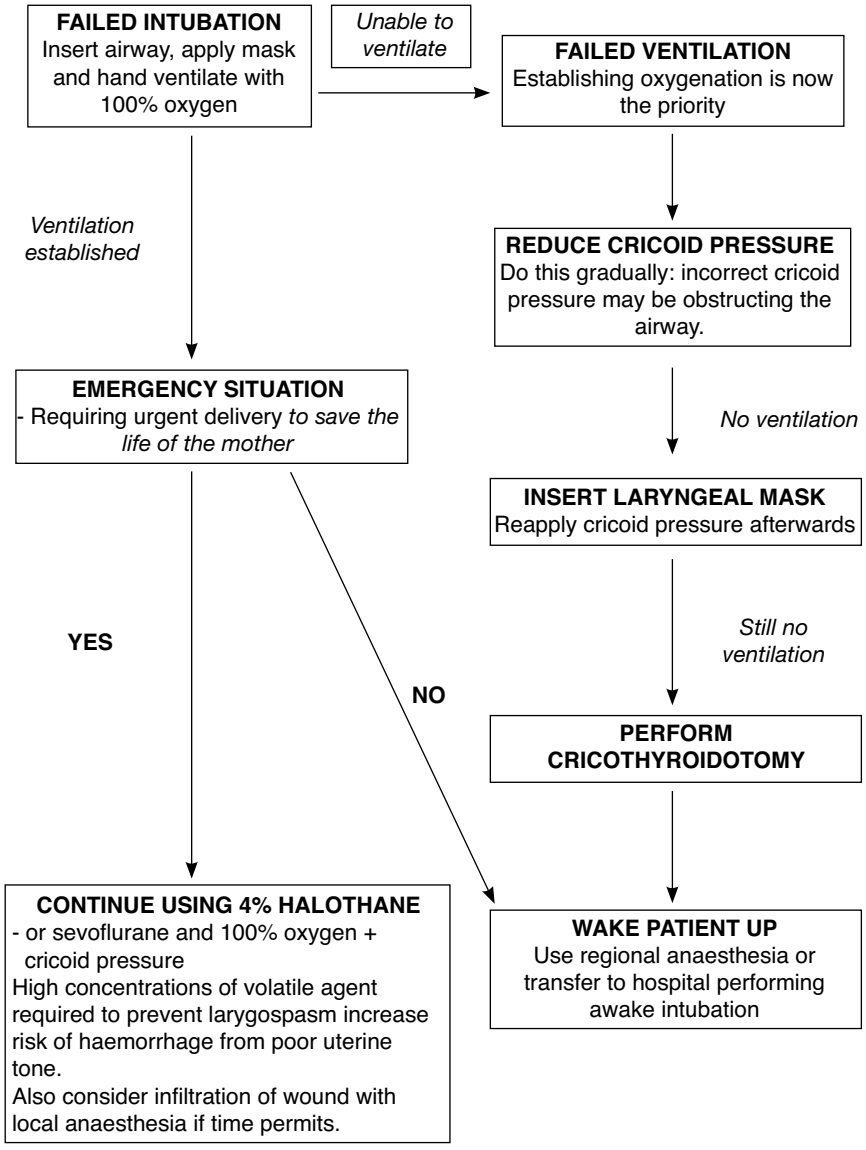
Failed Intubation Drill

- Should be practiced regularly by all those administering and assisting with obstetric anaesthesia, as death can occur within only a few minutes.
- Recognise a failed intubation early and rapidly provide oxygenation before hypoxia ensues. Consider prevention of aspiration after oxygenation is established.

Note:

- Do not try to intubate more than twice (once 7.0 COETT, once 6.0 COETT with better head position or move cricoid pressure more backwards, upward and to the right i.e. "BURP" manoeuvre")
- Call for help
- Do not give a second dose of suxamethonium
- Do not turn the patient onto her side

FAILED INTUBATION DRILL



5.
CARDIAC ARREST IN PREGNANCY

A. Modifications to Basic Life Support:

i. Beyond 20 weeks gestation alleviate aortocaval compression by left lateral tilt of the uterus (e.g. place rolled blanket under right hip).

ii. Airway and Breathing:
- Increased risk of regurgitation: apply cricoid pressure during mask ventilation.

iii. Circulation:
- Chest compressions higher, just above the centre of the sternum (uterus elevates the diaphragm).

iv. Defibrillation:
- Remove fetal or uterine monitors before performing shocks. Use standard DC shocks.

v. Move patient to an operating theatre and call someone experienced in emergency hysterotomy. Beyond 25 weeks gestation, maternal resuscitation is unlikely to be successful unless the baby is surgically removed. The baby is unlikely to survive intact following 3 minutes of cardiopulmonary arrest, although survival after 10 minutes has been documented. **Therefore once appropriate CPR has been commenced the overriding concern is to get the baby delivered in the interest of both mother and baby.**

B. Emergency Hysterotomy (EH)

Consider whenever a pregnant woman arrests and is >20/40 gestation

Perform within minutes if maternal resuscitation is not immediately successful. Primarily performed in order to relieve aortocaval obstruction by delivery of the baby and so improve ***maternal*** resuscitation.

Maternal and fetal factors determining the need for (EH) include:

a. Gestational Age.

<20 weeks- EH not appropriate

20-23 weeks – EH to resuscitate mother. Fetus unlikely to be viable
≥*24-25 weeks* – EH performed to save life of mother and baby.

b. Professional Setting
Rescuer must be competent at EH
Appropriate equipment and personnel to support mother after delivery must be available

C. Modifications to Advanced Cardiovascular Life Support (ACLS):

Whilst the baby is being delivered:

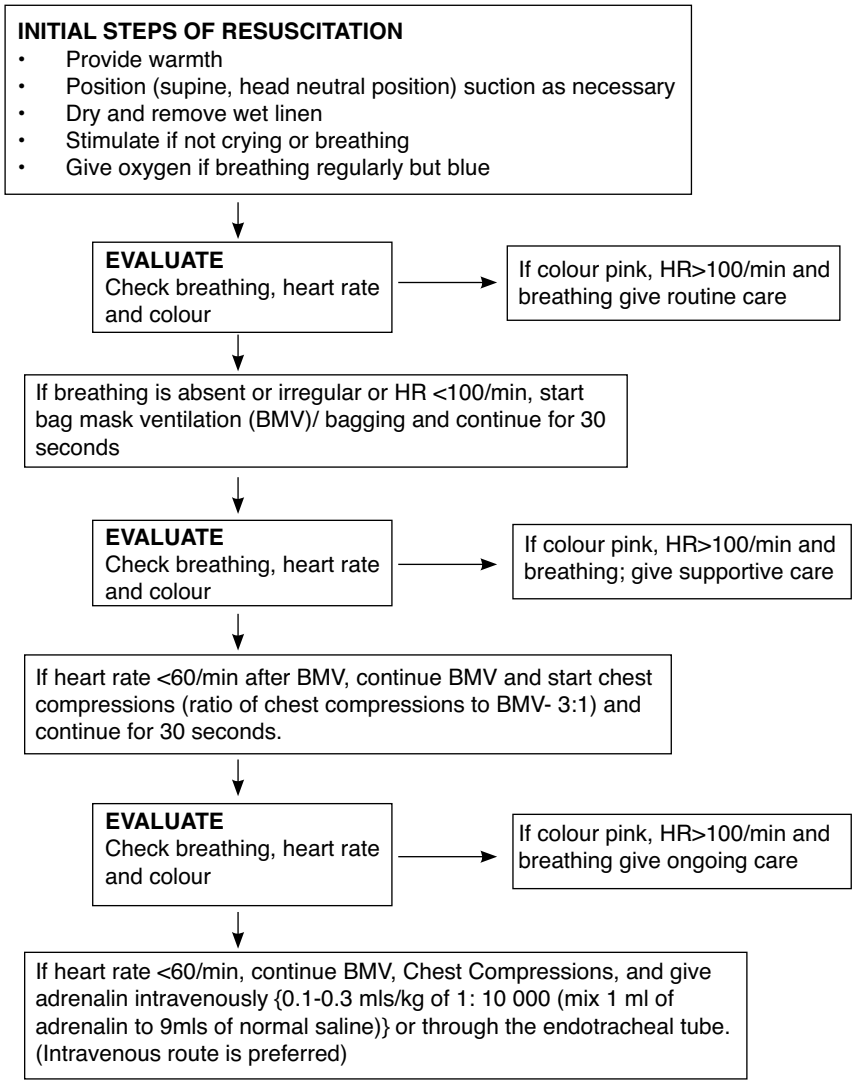
i. Airway:
Secure early. Apply cricoid pressure before and during tracheal intubation.
Use smaller cuffed oral endotracheal tube (7.0 or 6.0mm ID)

ii. Breathing:
Oxygenate and ventilate early (hypoxaemia develops rapidly).
Check endotracheal tube is not in oesophagus using capnograph.

iii. Circulation:
Use standard ACLS guidelines for resuscitation drugs.

iv. Differential Diagnosis:
   A. Same reversible causes of cardiac arrest that occur in the non-pregnant patient.
   B. Others more specific to pregnancy:
      a. Excess Magnesium sulphate. Especially if oliguric. Treat with calcium gluconate (1 ampoule or 1g).
      b. Acute coronary syndromes.
      c. Pre-eclampsia/eclampsia.
      d. Aortic dissection (e.g. Marfan's syndrome)
      e. Pulmonary embolism (fibrinolytics where life-threatening)
      f. Trauma and Drug overdose e.g. murder and suicide

6.
ALGORITHM FOR NEONATAL RESUSCITATION



- If there is no gasping or breathing after 20 minutes of ventilation, or gasping but no breathing after 30 minutes of ventilation, stop all procedures.
- Provide emotional support to family

REMEMBER TO AVOID THE FOLLOWING:

- Slap, blow on, or pour cold water on the baby
- Hold the baby upside down
- Routinely suction the mouth and nose of a well baby
- Use "heavy" suctioning of the back of the throat of any baby
- Give injections of respiratory stimulants or routine sodium bicarbonate

TESTING / FIREDRILL FOR NEONATAL RESUSCITATION

Testing objectives

- To ensure that the candidate can safely and effectively perform neonatal resuscitation.

Preparation

- Level surface e.g. radiant warmer, table
- Heat source e.g. radiant warmer, or heater
- Warm dry towels
- Mannequin
- Resuscitation equipment
  - Suction catheters
  - Oxygen source
  - Stethoscope
  - Mask- different sizes
  - Resuscitator bag with reservoir
  - Laryngoscopes with straight blades
  - Spare bulbs for laryngoscopes
  - Endotracheal tube sizes 2.5, 3.0, 3.5
  - Adrenalin ampoules
  - Normal saline solution
  - Syringes

- Needles
- Intravenous catheters
- Feeding tube

Candidate should demonstrate the following successfully

	Yes	No
Airway		
• Head position		
• Clearing the airway when necessary		
	☐	☐
Breathing	☐	☐
• Checks for breathing		
• Bag valve mask ventilation (mask size appropriate, good seal, position)	☐	☐
• Chest moving with bag mask ventilation and/ or heart rate increasing	☐	☐
Circulation	☐	☐
• Checks for heart rate		
• Chest compressions (check technique, check ratio is 3:1 with BMV)	☐	☐
• Adrenalin administration when appropriate	☐	☐
Others	☐	☐
• Oral intubation when appropriate e.g. for adrenalin administration		
• Insertion of umbilical venous catheter		
	☐	☐
	☐	☐

7.
BREECH PRESENTION - LABOUR AND DELIVERY

Elective caesarean section is the safest method of delivery for a baby with a breech presentation. Women with breech presentation at 38 weeks should be admitted to hospital for elective caesarean section

Admission of a woman with breech presentation in labour

1. Transfer the mother from a clinic or community health centre to hospital
2. Exclude fetal abnormality or multiple pregnancy, by ultrasound if necessary
3. Attempt external cephalic version if there are no contraindications
4. Estimate fetal weight and pelvic adequacy
5. Determine cervical dilatation and station of presenting part
6. Perform caesarean section unless suitable for vaginal delivery (below)

Vaginal breech delivery

Some women may prefer vaginal breech delivery, and some may arrive at hospital or at a community health centre in advanced labour. The most experienced person available must personally supervise vaginal breech delivery.

Breech presentation suitable for vaginal delivery

- Mother understands and accepts vaginal delivery
- Operator experienced and confident with vaginal breech delivery
- No signs of pelvic contraction on clinical assessment
- Estimated fetal weight less than 3.5 kg
- Frank or complete breech
- Presenting part at or below the level of ischial spines
- Labour progress ≥1 cm per hour

Dead and grossly abnormal babies, and those with estimated weight <1 kg should be delivered vaginally

Technique of delivery

1. Put the mother in lithotomy position
2. Perform an episiotomy after infiltration of the perineum with local anaesthetic
3. Encourage spontaneous breech delivery and only assist in keeping the fetal back facing upwards
4. For extended knees, assist by flexing at the knees and gently delivering each leg
5. After delivery of the trunk, allow the breech to hang, pull the cord down and cover the delivered parts with a cloth
6. As the scapulae appear, be ready to assist with delivery of the arms
7. Deliver the arms if necessary by running the fingers from the fetal back over the shoulder and sweeping the arms down in front of the chest, and then out
8. The neck will deliver up to the nape
9. Deliver the head by lying the fetus over the right forearm (right-handed midwife or doctor) and inserting the right middle finger into the baby's mouth, with the index and ring fingers supporting the cheek, to flex the head
10. Simultaneously, the left hand exerts suprapubic pressure to flex the head (Wigand-Martin method) or pushes directly onto the occiput to assist flexion (Mauriceau-Smellie-Veit method)
11. Ease the baby out, with gentle traction, and continuous flexion as described
12. Should the fetal back face downwards after delivery of the arms, the head may be trapped. The best chance of delivery is to swing the fetus anteriorly over the maternal abdomen to flex the head

    ❒ ***Breech delivery technique video in WHO Reproductive Health Library (also videos on ECV, vacuum, C/S technique)***

8.
CORD PROLAPSE

If the fetus is alive (fetal heart heard) and viable (estimated weight ≥1 kg):

1. Call for assistance
2. Explain the problem to the mother
3. Perform vaginal examination:

If the cervix is fully dilated and the fetal head has engaged in the pelvis, immediately deliver the baby, by vacuum extraction if necessary

If the cervix is not fully dilated, make arrangements for urgent caesarean section and/or transfer to hospital and proceed as follows:

1. Replace the cord in the vagina or wrap it in warm wet towels
2. Handle the cord as little as possible
3. With the fingers, push the presenting part off the cord. Do not remove the fingers from the vagina if the presenting part compresses the cord
4. Insert an indwelling urinary catheter, at least size 18
5. Fill the mother's bladder with 500ml normal saline and clamp the catheter
6. Give oxygen to the mother by face mask at 6 L/minute
7. Start an intravenous infusion of Ringer-Lactate
8. Give hexoprenaline 10 micrograms IV as a single dose
9. Place the mother in a left lateral Sims position*
10. Make accurate notes of all that was done, with times
11. Before starting the caesarean section, make sure the fetus is alive (heart beat, cord pulsation)
12. If the baby is dead, or not yet viable, and there is no other indication for caesarean section, await vaginal delivery

* *If the head is engaged in the pelvis or bladder filling fails to relieve cord compression, put the mother in a knee-elbow position*

9.
SHOULDER DYSTOCIA

This occurs with large babies (usually >3.5 kg) when delivery of the head is not followed by delivery of the shoulders.

Emergency management is as follows:

1. Call for at least 2 assistants to help with delivery
2. Explain the problem to the mother
3. Immediately move the mother to the edge or end of the delivery bed
4. Tell the mother to hyperflex the hip joints (McRoberts' position) with the help of assistants. Her knees should almost touch her shoulders
5. Cut a wide episiotomy
6. Apply suprapubic pressure to force the anterior shoulder under the symphysis pubis
7. Push the head downwards to apply traction on the anterior shoulder. Do not stretch the neck, and avoid forceful jerking movements
8. If unsuccessful at this stage, deliver the posterior arm by locating the posterior shoulder in the vagina and sweeping the arm in front of the fetal chest. Once the posterior arm is delivered, proceed to deliver the anterior shoulder as mentioned above.
9. If this fails, rotate the baby through 180 degrees through a face-to-pubis position, to bring the posterior shoulder forward and make it anterior. It important to hold both the arm and head together to facilitate rotation and reduce the risk of injury. Rotation is by rotary pressure on shoulders.
10. If delivery has not been achieved so far, the baby is likely to die
11. If the baby is dead, await spontaneous delivery, although breaking the clavicle(s) may assist the process

10.
THE MANAGEMENT OF SEVERE PREGNANCY RELATED SEPSIS

Pregnancy related sepsis includes:

- Abortion
- Puerperal sepsis

The principles in the management of a patient with pregnancy related sepsis are:

- To resuscitate the patient
- To empty the uterus
- To remove the septic focus

When examining any woman with pregnancy related sepsis, the organ systems must be systematically evaluated for signs of organ dysfunction.

If there is any abnormal clinical finding, indicating organ failure, prompt special investigations must be done to confirm such organ failure and start supportive treatment. If these investigations cannot be done or supportive treatment cannot be offered, the patient must be referred to a higher level of care, without delay.

Systematic evaluation of post abortion patients for the presence of organ dysfunction:

The approach to a patient with puerperal sepsis and abortion is the same. The patient needs to be examined thoroughly according to each different organ system and if any abnormalities are detected the special investigations are as follows:

- **Central Nervous System**
  Clinical signs: Confusion, delirium, decreased level of consciousness, Glasgow Coma Scale < 14/15

For puerperal sepsis:
– Signs of meningitis or encephalitis

Special investigations:
– Blood glucose
– Blood gas analysis or pulse oximetry
– If indicated, investigation for brain abscess or septic emboli
– Lumbar puncture

Supportive treatment:
– Treatment of underlying sepsis

- **Circulatory system**
  Clinical signs: Hypotension < 90 mm Hg systolic pressure, tachycardia >100 beats per minute, cold and clammy extremities, pulmonary oedema, hepatomegaly, arrhythmias

  Special investigations:
  – Chest X-ray,
  – Possibly an ECG

  Supportive treatment:
  – Adequate venous access, possibly with a high flow line or central venous pressure monitoring,
  – Fluid replacement
  – Inotrope support

- **Respiratory system**
  Clinical signs: Tachypnoea > 22 breaths per minute use of the accessory respiratory muscles, central or peripheral cyanosis

  For puerperal sepsis:
  – Crepitations
  – Wheezes
  – Dullness on percution

  Special investigations:
  – Pulse oximetry (saturation < 90%),
  – Blood gas analysis (pao_2 < 3 times Fio2, acidosis, and alkalosis),

- X-ray
- Sputum for MCS
- VQ scan if pulmonary embolism is suspected

Supportive treatment:
- Oxygen via nasal prongs or facemask,
- CPAP mask,
- Intubation
- Ventilation

- **Gastrointestinal and hepatic systems**
  Clinical signs:
  - Jaundice
  - Hepatomegaly
  - Ileus
  - Peritonitis

  For puerperal sepsis:
  - Signs of wound infection if delivered via caesarean section

  Special investigations:
  - Blood glucose
  - Raised liver enzymes ALT, AST, LDH
  - Standing Chest X ray

  Supportive treatment:
  - Treatment of the underlying sepsis
  - Laparotomy if bowel injury is suspected

- **Renal System**
  NB: The patient must have an indwelling catheter, and the urinary output must be carefully measured and recorded.

  Clinical signs:
  - Oliguria (<1ml urine/kg/hr or <30ml/hr),
  - Anuria
  - Very concentrated urine

For puerperal sepsis:
- Renal angle tenderness
- Fever
- Tenderness over the bladder

Special investigations:
- Urine dipstix,
- Raised urea and creatinine
- Urine MCS

Supportive treatment:
- Rehydration and fluid replacement.
- If there is progressive renal failure - diuretics, dialysis

- **Genital System**
  Clinical signs:
  - Pus or foul-smelling products of conception
  - Very tender uterus
  - Peritonism
  - Signs of trauma or
  - Foreign body
  - An open cervical os

  For puerperal sepsis:
  - Sub-involuted tender uterus
  - Foul smelling and excessive lochia
  - Open cervical os
  - Septic episiotomy scar

  Special investigations:
  - Pre-evacuation culdocentesis
  - Prompt evacuation of uterus
  - Examination for non-genital sepsis
  - Possibly hysterectomy, to remove the origin of the sepsis

- **Haematological system**
  Clinical signs:
  - Pallor
  - Petechiae
  - Bruising

- Bleeding from the gums or infusion sites
- Deep venous thrombosis

For puerperal sepsis:
- Signs of thromboflebitis and pelvic vein trhombosis

Special investigations:
- Low Hb (<10g/dl),
- Hematocrit (<30%),
- Low or high white cell count,
- Low platelet count (<$100x10^9/1$),
- Raised fibrinogen degradation products or D-dimmers,
- Prolonged INR or PTT
- Duplex Doppler

Supportive treatment:
- Blood transfusion if needed,
- Treatment of DIC, with either fresh frozen plasma or heparin

- **Immunological system (any of the following)**
  Clinical signs:
  - Pyrexia > 38ºC,
  - Lymphadenopathy

  Special investigations:
  - Increased or decreased white cell count,
  - HIV-testing

  Supportive treatment:
  - Aggressive treatment of the underlying sepsis

- **Endocrine System (Thyroid, Breasts, Diabetes)**
  For puerperal sepsis:
  - Examine the breasts for mastitis or abses

  Special investigation:
  - Blood glucose

  Supportive treatment:
  - Correction of any metabolic abnormalities

DEFINITIONS:

Abortion: The ending of pregnancy before the fetus is viable.

Safe abortion: Any abortion where the temperature is ≤ 37.2^{0}C, the pulse is < 90 beats per minute, the respiratory rate is <20 breaths per minute, the uterine size is < 12 weeks, and the ward haemoglobin concentration is >10g/dl. Furthermore, there are no clinical signs of infection, no system or organ failure and no suspicious findings on evacuation of the uterus.

An **unsafe abortion** is defined as anything else.

Puerperal sepsis is defined as pyrexia of ≥38^{0}C, on two separate occasions within the first fourteen days post-delivery, the first 24 hours excluded, if observations are taken on a 4-6 hourly basis.

Assessment and evaluation of the severity of sepsis complicating an abortion:

Three categories of abortion, with regard to the clinical severity thereof, can be distinguished:

1. **Low Risk Abortion:**
   - Temperature ≤ 37,2^0 C
   - Pulse <90 beats per minute
   - Respiratory rate <20 breaths per minute
   - Ward haemoglobin >10g/dl
   - No clinical signs of infection;
   - No system- or organ failure; and
   - No suspicious findings on evacuation of the uterus

2. **Moderate Risk: Unsafe Abortion**
   - Temperature 37,3-37,9^0 C, or
   - Offensive products of conception, or
   - Localised peritonitis
   - Uterine size 12 – 16 weeks
   - Pulse 90- 119 beats per minute
   - Respiratory rate 20-24 breaths per minute.

3. **High Risk (Severe) Unsafe Abortion**
   - Temperature ≥ 38^0 C, or
   - Respiratory rate > 24 breaths per minute
   - Organ failure, or
   - Peritonitis, or
   - Pulse ≥ 120 beats per minute, or
   - Presence of a foreign body or mechanical injury, on evacuation of the uterus, or
   - Systolic blood pressure <90 mmHg
   - Uterine size >16 weeks

Management at different levels of care of abortion:
Abortion below 14 weeks can be evacuated with the fetus still in utero. In a patient with an abortion more than 14 weeks the fetus needs to be delivered before evacuation of the uterus.

Prevention of Puerperal Sepsis
Part of the management of puerperal sepsis is the prevention. These include identification of women at high risk for example prolonged labour, pre labour rupture of membranes and immunocompromised women. The correct use of prophylactic and therapeutic antibiotics at time of caesarean section and normal vaginal delivery is also important.

The following should be checked before discharge:
Ward haemoglobin concentration,
Rhesus status
Syphilis serology should be known,
Counselling for HIV-testing should be provided and the test carried out Contraceptive advice must be given..

1. **Level 1** (excluding sub-district hospitals with 24-hour theatre facilities and blood available)

   Abortion (safe abortions only)
   i. Prompt evacuation of the uterus, preferably by manual vacuum aspiration (MVA) under local anaesthesia.
   ii. Antibiotic prophylaxis

Puerperal sepsis

i. Referral to next level for postpartum temperature.
ii. Start on triple antibiotics

2. **Level 1** (sub-district hospitals with 24-hour theatre facilities and blood available) and **Level 2**

Abortions:

a. resuscitation of the patient
b. prompt evacuation of the uterus, preferably by MVA, but with the facilities for evacuation in theatre, for moderately unsafe abortions
c. Antibiotics in therapeutic dosage, for unsafe abortions
d. Referral of all patients, where there is dysfunction of 2 or more organ systems, and/or where it is contemplated to change antibiotics. Such patients may require urgent laparotomy.

Puerperal sepsis:

a. Intravenous antibiotic coverage, special investigations to localise origin of sepsis, prophylactic anticoagulation for pelvic thrombophlebitis. Referral if poor or no response on treatment.
b. Laparotomy should be considered instead of changing antibiotics and any case where there is 2 or more organ system dysfunction and the patient should be referred.

3. **Level 3:**

Abortion:

a. Prompt evacuation of the uterus in theatre, for high risk abortions, and evaluation of the need for hysterectomy.

b. Supportive care, for single – or multi – organ failure, in an ICU or high care facility.
c. Careful evaluation of the need for laparotomy, where there is dysfunction of 2 or more organ systems, and/or where it is contemplated to change antibiotics.

Puerperal sepsis:

a. Prompt theatre evacuation of uterus if a vaginal delivery occurred and evaluation for hysterectomy
b. Post caesarean section, evaluation for hysterectomy

c. Supportive care for single or multiple organ failure in an ICU or high care facility.
d. Laparotomy should be considered instead of changing antibiotics and any case where there is 2 or more organ system dysfunction.

Observations post procedure
The specific type of observation need to be described in detail and the frequency specified to ensure that the patient is monitored optimally. Any change or abnormality should be communicated with the attending physician.

Basic guidelines for observations

1. **Post-uncomplicated evacuation of uterus/MVA**
   a. blood pressure, pulse rate, respiratory rate, checks on excessive vaginal bleeding, directly post-procedure
   b. Ward haemoglobin concentration must be checked within 24 hours of delivery and must be known before the patient is discharged
   c. Temperature, blood pressure, pulse rate, respiratory rate, and vaginal pad checks – hourly for 2 hours, and then 6 hourly until discharge, if normal.

2. **Abortion complicated by single – or multi-organ dysfunction**
   a. Continuous or at least every 15-30 minutes' evaluation of the blood pressure, respiratory rate, and pulse rate, according to the ICU – or high care protocol of the facility. Temperature and urinary output hourly, as well as other parameters, such as central venous pressure.

REFERRAL CRITERIA

Level 1 / Community or primary health care level, sub-district hospitals (without 24 hour theatre facilities):

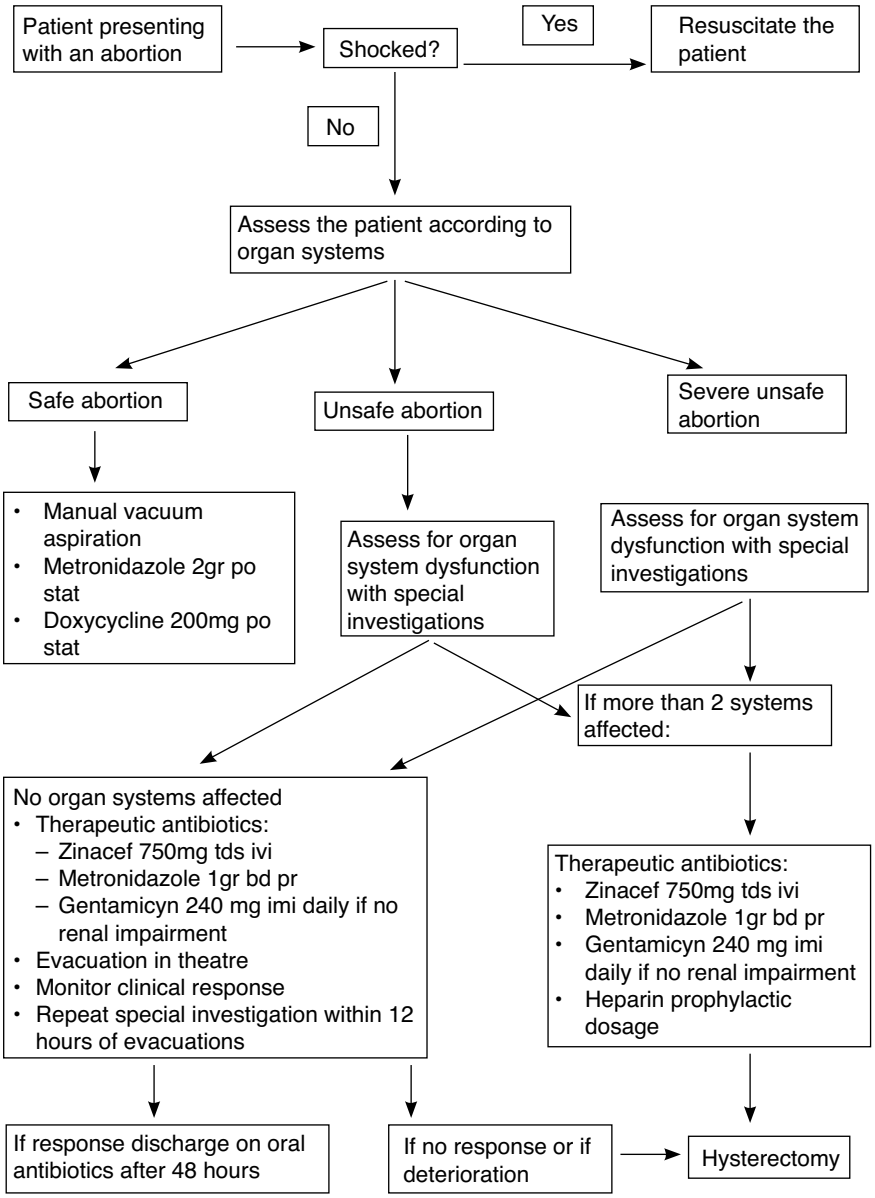
Postpartum sepsis:
referral of any case where the sepsis is thought to be from genital origin.

Level 1:
Sub-district hospitals (i.e. hospitals which have blood products available, 24h anaesthetic capabilities and expertise to perform theatre evacuations of a uterus) and Level 2 district or regional hospitals.

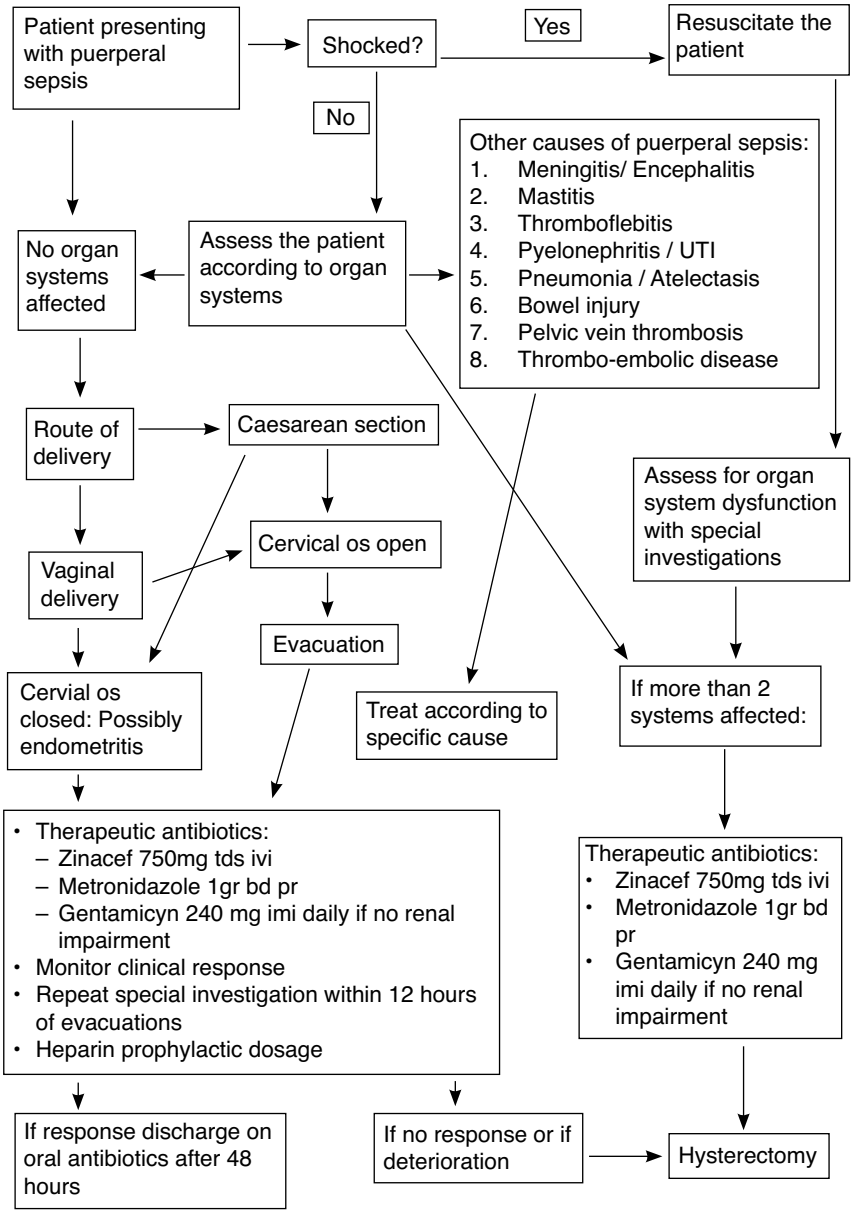
- Referral of any patient with signs of organ failure except anaemia, or if supportive treatment not available if needed.
- Referral of any patient (septic abortion or puerperal sepsis) with a poor or no response on intravenous antibiotics for genital sepsis.

Level 2:
(i.e. institutions with 24h consultant and intensive care /high care facilities available, which can provide adequate treatment and support for single or multiple organ failure patients whether post-abortion or postpartum patients) and Level 3/ Tertiary or central hospitals.

ALGORITHM FOR MISCARRIAGE (ABORTION)



ALGORITHM FOR MANAGEMENT OF PEURPERAL SEPSIS



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