



CSOP 027 – Resuscitative Hysterotomy

Version No: 2.0

Effective date 14/02/22

APPROVALS

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HISTORY

Effective Date	Version No.	Summary of Amendment
March 2017	1.0	Creation of Document
March 2020	1.1	2 further references, nos 4 and 5. Additional section on “general points” page 4
October 2021	2.0	Full rewrite with new literature review, addition of general points, more detail on indications and management, review by Obstetric Consultant.

REFERENCES

Document Reference Number	Document Title
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3	Resuscitation Council/Obstetric Anaesthetist's Association. Obstetric cardiac arrest https://www.resus.org.uk/sites/default/files/2021-08/Maternal%20Cardiac%20Arrest%20QRH%20OAA%20V1.1.pdf
4	Chu JJ, Hinshaw K, Paterson-Brown S, Johnston T, Matthews M, Webb J, Sharpe P. Perimortem caesarean section – why, when and how. The Obstetrician & Gynaecologist. 2018; https://doi.org/10.1111/tog.12493
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8	Beckett VA, Knight M, Sharpe P. The CAPS study: incidence, management and outcomes of cardiac arrest in pregnancy in the UK: a prospective, descriptive study. BJOG 2017;124:1374-1381.



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9	MBRRACE-UK. Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2016-18 (2020). https://www.npeu.ox.ac.uk/assets/downloads/mbrrace-uk/reports/maternal-report-2020/MBRRACE-UK_Maternal_Report_Dec_2020_v10_ONLINE_VERSION_1404.pdf
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Definitions/Acronyms:

Abbreviations/Acronym	Definitions
SOP	Standard Operating Procedure
RH	Resuscitative hysterotomy
ROSC	Return of spontaneous circulation
CCP	Critical Care Paramedic
ED	Emergency Department
CPR	Cardio Pulmonary Resuscitation
MTC	Major Trauma Centre

1. Purpose

The purpose of this SOP is to outline the decision-making process and technique for undertaking a Resuscitative Hysterotomy (RH) and to highlight differences in cardiac arrest management in pregnancy. It is recognised that this is an exceptionally rare but potentially lifesaving intervention. This SOP should be read in conjunction with supporting literature (references 1-6).

2. Scope

Resuscitative hysterotomy was formerly known as “peri-mortem caesarean section” and should be considered in cardiac arrest in pregnancy >20 weeks, when basic and/or advanced life support does not result in early return of spontaneous circulation (ROSC).



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There is evidence that early delivery of the fetus increases the chance of ROSC in the mother. The arrest may be the result of a medical cause such as pulmonary embolus or cardiac arrhythmia, or trauma.

In non-pregnant patients, CPR can achieve a cardiac output of approximately 30% of normal. In late pregnancy this figure is reduced to 10% (due to aorto-caval compression). This can be improved by performing manual displacement of uterus to the left side. Early RH and emptying the uterus decreases aorto-caval compression and thereby increases the efficiency of CPR.

The LUCAS2/3 mechanical CPR device is licensed for use in pregnant patients. Practically this is likely to be difficult if the fundus is above the umbilicus. The patient would need to be supine with manual displacement of the uterus to the left side. Mechanical CPR may be a useful adjunct after the RH procedure.

Indications for RH

To be performed when:

- Gestation assessed to be >20 weeks (i.e. uterus palpable at or above umbilicus)
- Maternal resuscitation deemed appropriate (no injury or condition incompatible with life)
- Ongoing resuscitation/CPR
- Other reversible causes of arrest have been addressed
- BLS/ALS has not resulted in ROSC at 4 minutes post arrest
- HEMS Doctor on scene - double CCP crews should instigate rapid transport to the nearest appropriate receiving hospital.

The Royal College of Obstetricians and Gynaecologists (UK) recommend that if there is no response to correctly performed CPR within 4 minutes of maternal collapse or if resuscitation is continued beyond this, then Resuscitative hysterotomy should be undertaken to assist maternal resuscitation. Ideally delivery should be achieved within 5 minutes of arrest.

The literature does not support a maximum duration of resuscitation prior to RH. However, the longer the duration, the worse the outcome is likely to be. Neonatal survivors have been reported after resuscitation of 30 minutes. Despite this, intervening as early as possible provides the best survival opportunity.



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Assessing fundal height

Fundal height can be used to estimate the gestation in an unconscious woman. At 12-14 weeks the uterus becomes palpable out of the pelvis in the lower abdomen: at 20-22 weeks the fundus (i.e. the 'top') of the uterus is at the level of the umbilicus: and by 38 weeks the uterus reaches the costal margin. In multiple pregnancies, the fundus may be higher – the key is whether the fundus is at, or above the umbilicus as to whether RH will benefit the patient.

If the fundal height is below the umbilicus, there are no obstetric interventions that will improve outcome for either the mother or baby. RH should not be performed in these patients. The patient should be managed as a standard medical or traumatic cardiac arrest.

Note: women usually have their own pregnancy records (paper-based or digital) and attending relatives may also know the gestation.

General Points when treating pregnant patients

Airway

- There is an increased risk of regurgitation and aspiration due to relaxation of the oesophageal sphincter by pregnancy hormones, delayed gastric emptying and increased intragastric pressure from the pregnant uterus. Early intubation with a cuffed endotracheal tube is preferred over a supraglottic airway device, with early decompression of the stomach by an orogastric tube.
- Intubation may be more difficult due to soft tissue oedema and the use of a smaller diameter endotracheal tube should be considered.
- Rapid desaturation may occur during intubation attempts due to a reduced functional residual capacity. Ensure adequate pre-oxygenation and consider nasal apnoeic oxygenation.
- In patients with hypovolaemia, RSI with drugs should be avoided until volume replacement has been established.
- If surgical cricothyroidotomy is indicated, a vertical incision may be necessary if landmarks cannot be palpated.



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Breathing

- Hypoxia is more likely in pregnant women due to increased oxygen consumption and reduced functional residual capacity. Oxygen must be administered to all pregnant patients who are unwell.
- The diaphragm rises by up to 4cm as the uterus enlarges. Thoracostomy and chest drain insertion should be performed high (in the 3rd or 4th intercostal space) to reduce the risk of abdominal or diaphragmatic penetration.

Circulation

- After 20 weeks (fundal height at level of umbilicus) the pregnant uterus will compress the aorta and inferior vena cava in a supine position, which may lead to a reduction in venous return and therefore cardiac output. This can be prevented by using a left lateral tilt of 15 degrees on a scoop stretcher with blankets/firm support underneath the right side of the scoop.
- However, in cardiac arrest when chest compressions are necessary, the preferred technique is the supine position with manual displacement of the uterus to the left (using a member of staff to push or pull the uterus across with their hands).
- Blood may be shunted from the uterine and placental circulation into the maternal circulation to compensate for maternal hypovolaemia to the detriment of the fetus. Significant haemorrhage (>1.5 litres) may occur before signs of hypovolaemia become evident. Tachycardia and low normal blood pressures should raise suspicion for hypovolaemia and the need for fluid resuscitation.
- The uterine circulation is entirely dependent on the maternal blood pressure so a target systolic blood pressure of at least 90mmHg must be maintained by fluid resuscitation.
- There is significantly increased vascularity of the pelvis which means pelvis fractures may easily cause life-threatening blood loss. Pregnant patients with a suspected unstable pelvic fracture should have a pelvic binder applied as per standard management.
- If intraosseous access is required, the humeral site (above the diaphragm) should be used rather than the tibia. Avoid femoral trauma lines due to compression by the gravid uterus.



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3. Cardiac arrest management

Medical cardiac arrest:

- Confirm cardiac arrest
- Lie flat and apply manual displacement of uterus to the left
- Commence CPR and Advanced Life Support
- Apply defibrillation pads and assess cardiac rhythm. – defibrillate if shockable rhythm with standard energy levels and pad placement.
- Maintain airway and ventilation with 100% oxygen
- IV access above the diaphragm, and drugs as per ALS
- Consider and treat all reversible causes
- If known >20 weeks pregnancy or uterus palpable above umbilicus start RH within 4 minutes of arrest if no return of spontaneous circulation. This should occur even if all reversible causes have not yet been excluded and regardless of the underlying rhythm.
- If the patient has been in prolonged prehospital arrest before the arrival of the critical care team and ALS has already been established by the ambulance crew then RH may need to be performed without further delay.

Traumatic cardiac arrest

- Confirm cardiac arrest
- Lie flat and apply manual displacement of uterus to the left
- Commence CPR
- Apply defibrillation pads and assess cardiac rhythm. – defibrillate if shockable rhythm
- Intubation and ventilation with 100% oxygen
- Consider bilateral thoracostomies in 3rd/4th ICS
- Splint long bone fractures/pelvis, provide external haemorrhage control
- IV access above the diaphragm and fluid resuscitation
- Perform resuscitative thoracotomy if indicated
- Consider all reversible causes
- If known >20 weeks pregnancy or uterus palpable above umbilicus start RH within 4 minutes of arrest if no return of spontaneous circulation.
- If the patient has been in prolonged prehospital arrest before the arrival of the critical care team and ALS has already been established by the ambulance crew then RH may need to be performed without further delay.



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Technique

1. Use scalpel to make midline vertical incision from umbilicus to symphysis pubis through skin, subcutaneous fat, the linea alba between the rectus abdominus muscles, and then parietal peritoneum into the abdominal cavity.
2. The bladder lies over the lower segment of the uterus
3. Therefore make a vertical incision in the upper segment of the uterus with a scalpel (i.e. in the midline at the front of the uterus) and extend upwards with scissors. The upper segment is 2 to 3cm thick. Try to avoid injury to the fundus of the bladder, which can reach the upper margin of the lower segment. If the placenta is in the way, cut through it. Once most of the muscle fibres have been cut, it can be helpful to stretch the uterine incision with the fingers to provide a wide, open access point.
4. Take care to avoid cuts to the baby if possible. Locate a presenting part of the baby (head, bottom or foot) and lift out of the uterus. Do not pull on an arm. Use fundal pressure to aid delivery.
5. Clamp the cord twice (Spencer Wells forceps) and cut immediately between the two clamps with paramedic shears.
6. Pass the baby to a member of the team for NLS resuscitation.
7. Apply direct pressure to the edges of the uterine incision if there is any bleeding
8. Have one attempt to separate the placenta from the uterus, remove and keep in a clinical waste bag. If this is not possible, leave the placenta in situ.
9. Pack the open abdomen with large gauze swabs/haemostatic gauze.
10. Continue maternal resuscitation.
11. If ROSC, consider TXA.
12. **Note:** PHEA will be required if the patient has a sustained ROSC.

It should be remembered that RH is undertaken to preserve maternal life. However, once the baby is delivered, simultaneous resuscitation of both mother and baby must be commenced. The baby should be handed to a second clinician/team who is trained to begin neonatal resuscitation. Consider the requirement for early mobilisation of additional critical care resources.

The mother and baby should be triaged to the nearest emergency department able to effectively treat both obstetric emergencies and neonates. Where the arrest is the result of trauma, transportation to a MTC with these facilities is preferable.



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4 Post incident debrief

This type of incident is likely to be one of the most stressful incidents attended by pre-hospital teams. There will almost certainly be external scrutiny of the incident from a number of sources including the Coroner, Health Service Investigation Board (HSIB), and MBRRACE.

Take time to debrief those on scene/at hospital in accordance with usual practice and use the opportunity to consider if any of the ambulance staff or TAAS personnel need to be signposted towards additional support. Contact the on-call clinical supervisor and have a very low threshold for the crew to come off-line to debrief and recover before continuing their shift.

On return to the airbase complete a surgical skills debrief form and comprehensive TAAS database entry. Ensure the print out from the defibrillator and monitor is included in the TAASbase entry.

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