

Learning from MNSI investigations of resuscitative hysterotomy after out of hospital cardiac arrest



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Cardiac arrest is a rare occurrence in pregnancy. When a woman/birthing person* is over 20 weeks' gestation, national guidance¹ recommends that a resuscitative hysterotomy (RH, sometimes called a perimortem caesarean birth or perimortem caesarean section) should be performed as part of the management of cardiac arrest. This is performed to improve the woman's chance of survival by relieving compression on the aorta and vena cava. When the arrest occurs outside the hospital setting (OHCA, out-of-hospital cardiac arrest), the RH procedure may be undertaken by prehospital doctors with appropriate competency and training; otherwise, ambulance personnel aim to transport the woman to a hospital where this can be performed. Currently there is limited evidence on RH in OHCA.

This paper reports the learning points from Healthcare Safety Investigation Branch (HSIB)/Maternity and Newborn Safety Investigations (MNSI) where pregnant women have had a cardiac arrest in the out of hospital setting and underwent a RH, either at the location of collapse in the pre-hospital setting or in the emergency department (ED).

Identifying the learning theme

This paper reports the learning points from 24 HSIB/MNSI investigations, between 1 April 2018 and 30 November 2023, in which women had a resuscitative hysterotomy, in either the pre-hospital or ED setting. Completed reports were analysed for learning points and these were grouped into themes. This briefing shares insights into the unique challenges of OHCA in pregnancy and highlights potential areas for improvement in the prehospital setting and in the ED.



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What we found

Emergency call to the ambulance service

Cardiac arrest in pregnancy was often difficult to recognise in the first 999 call. Some events were classified as requiring a category 2 or 3 ambulance response (lower acuity with expected response time of up to two hours) in the first call and there was a subsequent deterioration into cardiac arrest requiring bystanders to call back. Some women were initially classified as having ‘breathing problems’ or ‘fitting’ but were found to be in cardiac arrest when the first ambulance crew arrived: this resulted in one member of the ambulance crew having to return to the ambulance to collect the advanced life support equipment. It may be useful for crews to take all appropriate equipment to the woman’s location in the first instance to avoid having to return if the call has been under-triaged.

Responding staff were not always aware that they were attending a pregnant woman in cardiac arrest as the only information given was ‘adult cardiac arrest’. Where known, the dispatching ambulance service should update crews with pregnancy status to allow staff to prepare their mental model for resuscitation.

The process of locating the address and obtaining access to secure properties occasionally led to delays in starting advanced life support.

Recognising pregnancy and anticipating deterioration

Pregnancy should be considered in all women of childbearing potential who are in cardiac arrest. There were instances when identifying a pregnancy was difficult or delayed; this may be due to obesity, the concealment of the pregnancy from family members or it not being communicated in the 999 call. Once pregnancy is identified, the first crew should update ambulance control that the woman is pregnant and in confirmed cardiac arrest. This update is needed to obtain further resources with the dispatch of an enhanced care team who can undertake a RH if needed.

The national early warning score version 2 (NEWS2) for non-pregnant adults may not detect physiological deterioration during pregnancy. The Joint Royal Colleges Ambulance Liaison Committee (JRCALC) prehospital maternity decision tool now has Maternity Early Warning Score (MEWS) parameters embedded within it to assess pregnant, suspected pregnant or recently pregnant women.

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In some investigations, the ambulance crew had a prolonged time with the woman at the location of the collapse (up to 50 minutes) before the onset of cardiac arrest. There should be no unnecessary delays in the assessment and treatment of pregnant women at the location of their collapse before conveying to hospital. Unwell pregnant women should always be transported in the ambulance on the stretcher, rather than sat on the chair, in case of deterioration.

Immediate resuscitation

Manual displacement of the uterus (by pushing or pulling the uterus across to the left side) needs to be prioritised early in basic life support once pregnancy is thought to be beyond 20 weeks' gestation (or reaching the umbilicus). In some investigations, this required asking a bystander to help until further resources arrived (explaining to the helper why the procedure was being undertaken).

Defibrillator pads should be applied, the cardiac rhythm checked and if appropriate defibrillated once, before undertaking a resuscitative hysterotomy. In one investigation the cardiac rhythm was not checked before commencing the RH: this is important as a return of spontaneous circulation may be achieved by defibrillation of a shockable cardiac arrest rhythm.

CPR with mechanical devices was frequently utilised during the resuscitation of the pregnant woman, before and after a RH. Not all devices are licensed for use in pregnancy and services should consult the manufacturer's guidelines for their device. If used, care should be taken to correctly place the cup on the sternum and monitor the position throughout the resuscitation, especially during transfers. In one investigation, unexplained injury to the liver and spleen with internal haemorrhage was reported following the use of mechanical CPR. It is important to consider secondary injury to abdominal organs after chest compressions (manual or mechanical) in pregnancy.

Timing and location of RH

The resuscitation team should aim to undertake a RH as quickly as possible: this may be in the prehospital or ED setting. Early dispatch of enhanced care teams who have competency to undertake a RH is therefore critical to trying to achieve this. In some investigations, there was very late dispatch (up to 29 minutes after the initial 999 call), or it was not considered. In some investigations, a decision was taken to transport to a nearby ED when a practitioner who was competent to perform RH was

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at the location of the woman's collapse and all indications for starting a RH were met. Time delays incurred by extrication, transport, and ED handover may add up significantly and reduce the chance of success of the procedure.

If there is no practitioner available to perform prehospital RH, crews should be supported to plan early for extrication and rapidly transfer to the nearest appropriate ED with CPR ongoing. It is acknowledged that extrication and chest compressions during transport may be challenging.

Decision-making and futility

The decision to undertake a time-critical RH should be guided by the perceived benefit to resuscitation of the woman. Therefore, ultrasound should not be used to assess viability of the fetus before deciding if a RH is indicated in an obstetric cardiac arrest.

There were multiple findings where resuscitation of the woman and/or baby was appropriately stopped at the location of her collapse, when all reversible causes had been addressed including a RH. When a RH has been undertaken, there is no return of circulation, and if the cardiac arrest time has been significant, clinicians should consider futility before transferring women with ongoing resuscitation.

There were several investigations where resuscitation was stopped for futility reasons shortly after thrombolysis was administered. Before undertaking thrombolysis, clinicians should be certain, beyond all reasonable doubt, that it would be appropriate to continue resuscitation for > 60 minutes as per ALS guidelines. Following thrombolysis, significant bleeding may occur from the hysterotomy which will require surgical obstetric intervention in hospital.

After pre-hospital RH

The placenta commonly did not deliver after RH, and in one investigation repeated attempts led to uterine inversion. Only one attempt is recommended, and if this fails it is acceptable to leave the placenta in situ, until surgical management can be performed in the hospital setting.

All prehospital clinicians should be familiar with and follow the established newborn life support guidelines for resuscitation.

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Following a pre-hospital RH it is important to make frequent assessments for any occult blood loss (from the hysterotomy wound or from the birth canal) during transfer. Obstetric haemorrhage should be treated with tranexamic acid and volume resuscitation (with blood products where available), as well as consideration of uterotonic medications.

Emergency department management

In several investigations, it was evident that not all EDs had processes for summoning immediate obstetric team support via the '2222' emergency bleep system, which led to a delay in starting a RH. EDs should check they have systems in place before they need to use them. In some investigations, the ED did not have immediate access to blood and blood products when required, and in one investigation, there was a delay in accessing neonatal resuscitation equipment.

Examples of good practice included:

- allocating a member of staff to manage the large number of clinicians attending the ED - minimising unnecessary staff exposure, noise, and distraction
- briefing teams before the ambulance arrival
- allocation of a team leader and roles for the maternal resuscitation
- having a separate team leader for the neonatal resuscitation.

Learning from RH

Accurate documentation of the full resuscitation immediately after the event was not always performed. Full documentation, including print outs or uploads of monitor data, is essential to support learning.

Ambulance crews found it beneficial when ambulance officers attended in person to offer support after termination of resuscitation at the location of a woman's collapse or after handover at hospital.

Staff must check that debriefs are held in a private area which cannot be overheard by relatives. This includes after handover at hospital. Some reports identified that not all staff involved in a RH had the opportunity to attend a debrief, and this had an impact on their wellbeing.

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Interhospital transfers

The investigations included the care of a pregnant woman who deteriorated into cardiac arrest during transfer between intensive care units. Intensive care teams should ensure suitable seniority and skillset of clinicians for transfers of critically unwell pregnant women. Before the transfer, briefing and plans for a cardiac arrest should include plans for accessing a practitioner who is able to perform a RH, in the event of deterioration.

Supporting the family and other bystanders

It should be acknowledged that bystanders, including family members, may be asked to support chest compressions or manual displacement of the uterus early in resuscitation when resources are limited.

It is important to ensure that the family is kept updated throughout the resuscitation: it can be helpful to assign a specific healthcare professional for this role. During resuscitation, it is important to keep communications between team members professional, as they may be overheard and recalled by those witnessing the arrest, leading to further distress.

Families reported being treated with compassion, having time with the woman and baby when resuscitation was stopped at the location of collapse before transportation of the bodies to the local hospital mortuary. Families commented on the value of the support from hospital bereavement teams. This should be facilitated for all families including when resuscitation is stopped at the location of the woman's collapse.

In some investigations, family members experienced additional distress when returning home to the location of the RH. Where possible, attempts should be made to protect the home environment from soiling during any interventions and, if given permission from the police, staff should be delegated to clean any contamination before leaving the location of the woman's collapse.

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Outcomes

In this cohort of 24 maternal deaths, six women survived to ICU admission when RH was performed up to 59 minutes post cardiac arrest. Eight babies survived to NICU admission when RH was performed up to 51 minutes after the maternal arrest and survived to hospital discharge when RH was performed up to 35 minutes (unknown neurological outcome).

Safety prompts

1. How can the ambulance service clinical decision support system be improved to support 999 call handlers to identify cardiac arrest and identify that a woman may be pregnant?
2. Does your prehospital organisation have a standard operating procedure for RH, and a training programme for competency in this skill?
3. What is the current process for providing pastoral and psychological support to prehospital clinicians who have attended an obstetric cardiac arrest?
4. Does your hospital have a 2222 emergency bleep call that summons immediate senior obstetric, midwifery, anaesthetic/critical care and neonatal support when an obstetric cardiac arrest is expected or arrives in your emergency department?
5. Do you simulate obstetric cardiac arrest in the setting relevant to your area(s) of practice, including prehospital, emergency department and intensive care?

*Throughout this report, MNSI uses the word woman to describe women and people who use maternity and newborn services. MNSI acknowledges that not all pregnant or birthing people identify as women or mothers. This position reflects the Supreme Court ruling in April 2025 that the legal definition of a woman is based on biological sex.

Further reading

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