Learn simply

Cardiopulmonary Resuscitation

Passion profession same

CPR in pregnancy[1]

- Be aware of the physiologic changes in pregnancy which may predispose to acute cardiovascular collapse[2]
- Understand risk factors for cardiovascular collapse[3]

Confirm acute cardiovascular collapse

Initial interventions

- **Call for help. Call a code!**[4,5]
- **C – Circulation** (place 2 large-bore iv, initiate fluid resuscitation, order blood products)
- **A – Airway** (turn patient on her side, ensure airway is patent, consider early intubation)
- **B – Breathing** (ensure patient is breathing; if not, perform chest compressions/CPR while preparing for intubation and ventilation)

Subsequent management

- √ CBC, liver/renal function tests, coagulation profile
- **√ EKG, arterial blood gas,** CXR, toxicology screen
- Consider differential diagnosis and manage accordingly[3]
- **Continue aggressive CPR, including early intubation and left lateral tilt**

Initial resuscitation efforts successful

- Transfer to ICU
- Confirm gestational age and fetal well-being[6]
- Search for an underlying cause

Resuscitation unsuccessful

Confirm gestational age and fetal well-being[6]

Gestational age <24 weeks and/or nonviable fetus

- **Continue aggressive CPR**
- Consider emptying the uterus within 5–10 min to facilitate CPR[7]
- Transfer to ICU once stable
- Continue to search for an underlying cause

Gestational age ≥24 weeks and a viable fetus

- **Empty the uterus within 5–10 min**[7]
- Pediatrics present at delivery
- Continue aggressive CPR
- Transfer to ICU once stable
- Continue to search for an underlying cause

1. Cardiovascular collapse may occur in pregnancy as it does in nonpregnant women. Obstetricians should be able to anticipate, diagnose, and manage cardiac arrest in pregnancy, although it is rare (estimated to occur in <1:20,000 pregnancies).

2. Physiologic adaptations in the mother occur in response to the demands of pregnancy. Pregnancy represents a high-flow, low resistance state characterized by a high cardiac output (CO) and low systemic vascular resistance. CO increases by 50% of non-pregnant values, and the uterus receives up to 30% of CO each minute compared with 2–3% in the non-gravid patient. Hypoxia and acidosis can develop rapidly in pregnancy because of a higher basal metabolic rate, decreased functional residual capacity, and fetal oxygen requirements. Pregnancy is also associated with a dilutional anemia. All these factors limit the ability of a pregnant woman to meet the demands of acute cardiovascular collapse.

3. Moreover, significant aortocaval compression occurs after 20 weeks of gestation due to the rapidly enlarging uterus. In the supine position, this uterine obstruction can lead to sequestration of up to 30% of circulating blood volume, decreasing venous return, causing supine hypotension, and decreasing effectiveness of thoracic compressions during CPR. Pregnant women are also at increased risk of aspiration chemical pneumonitis (Mendelson syndrome).

1. The American Heart Association (AHA) has developed a mnemonic (BEAUCHOPS) for the factors contributing to cardiac arrest in pregnancy: Bleeding/DIC, Embolism, Anesthetic complications, Uterine atony, Cardiac disease, Hypertension, Other, Placental abruption/previa, Sepsis. Management should be tailored to the likely cause.
2. For example, empiric broad-spectrum antibiotics should be started immediately if septic shock is suspected. If massive blood loss is suspected, the source of the blood loss should be identified and stopped, fluid resuscitation should be started, and coagulopathy aggressively treated.

3. Immediate and effective communication is critically important during maternal cardiac arrest, because of the number of teams that must be mobilized and coordinated. All response team members should be familiar with the location of critical equipment. Protocols should be developed and systems tested in periodic multidisciplinary emergency drills. Deficiencies should be addressed.

4. A common error is a failure to “close the loop” of communication leading to redundancy of effort and a delay in critical interventions. The use of periodic “time-outs” during CPR may help to coordinate and optimize care. During the brief time-out, the leader or timer/documenter should review the working diagnosis, the interventions that have been completed, and the goals and priorities moving forward. Chest compressions should not be interrupted.

1. Chest compressions should be started immediately to optimize maternal and fetal outcomes. Optimal compressions should be hard (achieving a depth of 5 cm), fast (100/min), and uninterrupted. The 2010 AHA guidelines now recommend C-A-B (compressions, airway, breathing) rather than A-B-C. Left uterine displacement is recommended if the uterus is palpable at or above the umbilicus in order to minimize the adverse effects of vena caval compression by the gravid uterus.

2. The CO produced from chest compressions is optimized when the patient is placed on a firm surface (backboard). CPR should be performed while a defibrillator or automated external defibrillator (AED) is readied for use. Defibrillation should be performed as soon as possible using the same energy settings as for nonpregnant patients. Defibrillation is safe for the fetus.
3. Fetal monitors should ideally be removed, but defibrillation should not be unnecessarily delayed as the risk of an electrical burn is minimal. In sudden cardiac arrest with ventricular fibrillation, the earlier defibrillation occurs, the greater the chance of survival. Although many interventions have not been well studied in pregnancy, few are contraindicated when the alternative is death. These include inotrope and vasopressor medications (which may reduce uteroplacental blood flow) and thrombolytics (for the acute management of myocardial infarction and pulmonary embolism).

1. Initial efforts at maternal resuscitation should not be delayed to document fetal wellbeing. Fetal monitoring is not necessary and may distract staff or unnecessarily delay maternal CPR efforts.
2. CPR does not adequately perfuse the uterus, and fetal survival is unlikely if >10 minutes have passed since loss of maternal vital signs. Based on isolated case reports, cesarean delivery should be considered for both maternal and fetal benefit approximately 4 minutes after a woman has experienced cardiopulmonary arrest in the third trimester (so-called perimortem cesarean delivery and the "4-minute rule"). In this emergency setting, patient consent is not required. Similarly, taking the time to transport the patient to the operating room is not recommended. A vertical skin incision should be performed and the uterine contents should be evacuated immediately. If the fetus is viable, it should be passed over to the waiting pediatricians. Adequate maternal analgesia is essential, and this can be rapidly achieved though general anesthesia since the patient is typically intubated.
3. The uterus should be rapidly closed using a single full-thickness suture. The abdomen should be left open (covered with a sterile transparent sheet) to ensure that the uterus does not fill with blood, thereby further impairing CPR. The skin can be closed at a later time. CPR should be continued throughout this procedure.

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