Maternal 911 in Action: Amniotic Fluid Embolism

"Healthcare organizations should find ways to adapt to the learning tools or initiatives used in high reliability organizations following safety incidents. It is challenging to recommend any specific one as all learning tools have shown considerable promise. However, the way these tools or initiatives are implemented is critical, and so further work is needed to explore how to successfully embed them into healthcare organizations so that everyone at every level of the organization embraces them" (Serou, et al., 2021).

Is something about to happen?

The objective of Maternal 911 in Action is to put real-life events in to practice with the management of each step prior to an actual event. This is not a test of individuals, but a tool to identify and potentially fix gaps within the unit, teamwork, communication and overall reliability.

Every healthcare scenario is to be as realistic as possible and involve the members of the team that would be present during an actual event.

A 911 in Action drill should be practiced in a room consistent with where an actual event would occur. This will make the drill efficient in getting the participants familiar with the room set-up, equipment location, medication available, and may identify improvements in their location for faster retrieval in a real event.

911 in Action is to be as hands-on as possible.

Following the practice event, the team should discuss; what went well, what could be improved, what needs to be changed regarding equipment and supply location, and questions answered so each member has a clear understanding of the event and management.

Maternal 911 in Action Steps to Preparedness

1. Please have conversations with your risk team to have non-discoverable status; this may ensure that protected documents and items cannot be used in a court of law during a malpractice suit.
   - This process is best determined by the hospital attorney or the Risk Management Department and needs to be in place before simulation occurs**.**
   - Simulations and findings may also be considered a quality improvement project and be protected in the same manner other such projects are.
   - Once a process is determined, simulation instructors need to be familiar with how to protect simulations and findings along with consequences of not following the process.
   - Instructors are responsible for explaining what non-discoverable status is to trainees, ensure all in simulation follow the process and understand the consequences violating the process.
2. Simulations are a safe place to learn; therefore, confidentiality is a key part of training.
   - Everyone attending the simulation training must sign a confidentiality form stating they will not discuss the events of the scenario and debriefing (obtain from legal/risk).
   - Whether mistakes are made, or performance is excellent, each trainee needs to understand that anyone at the session from instructors to other trainees to observers will not discuss their performance outside of the training session.
   - Issues that are uncovered for quality improvement will be described, but not attributed or linked with any specific individual.
3. The drill should be as realistic as possible:
   - Mannequins or individuals may be used.
   - Equipment and supplies should be available.
   - Even consider having a colleague simulate a family member.
4. Drills should meet department or unit needs and practices using current evidence-based practice.
5. Those who attend should be the team members who would provide care during an actual event.
6. Explanation of the process should be understood prior to initiation of the action:
   - Provide a case scenario.
   - Participants understand their role is to respond as would be done during an actual event.
   - Individuals should know that the patient's outcome will be based upon their actions.
7. The trainer will provide scenario outcomes in events as participants work through the drill and redirect as appropriate.
8. All procedure performances will be demonstrated through discussion, so the team will be aware of the time and supplies needed for successful completion.
9. Following the event, the team will discuss the process:
   - Debriefing provides a powerful and essential structure for maintaining learning capacity.
   - The team can evaluate what worked well and identify needed improvements.
   - This may include adding or removing equipment, supplies, and medication, etc.
10. Repeating the drill may be necessary until all members are functioning proficiently within their scope of practice.
11. The trainer will have the participant(s) go through the drill until they are competent in the topic and health care delivery.

Serou, N., Sahota, L. M., Husband, A. K., Forrest, S. P., Slight, R. D., & Slight, S. P. (2021). Learning from safety incidents in high-reliability organizations: a systematic review of learning tools that could be adapted and used in healthcare. International Journal for Quality in Health Care, 33(1).

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Maternal 911 in Action
Case Scenario to Post
Amniotic Fluid Embolism

Disclaimer: This is not a test of individuals. This is an opportunity to improve the process, identify and potentially fix gaps within the unit, teamwork, communication, and overall reliability. Let's get started. To start, review the stabilization check list.

Wanita is a 34-year-old G2 P1001 in the second stage of labor with a term fetus at 39 weeks 2 days. She has had an uneventful and unremarkable pregnancy. She has started pushing and is currently at 1+ station. With the third pushing effort she starts to become anxious. She states "I (breath) – can't (breath) – breathe" and becomes anxious. She is now tachypneic.

Trainer's Form: Maternal 911 in Action Case Scenario <u>Amniotic Fluid Embolism</u>

Supplies & Materials:

- Two printed cases (with answers) for the trainer & role-playing family member.
- Consider printing stabilization check list, page 13, basic life support algorithm, page 20, and cardiac arrest algorithm, page 21 to review with the participants
- When simulating in situ see page 14 for a comprehensive list of supplies.
- Consider printing the Simulation Based Training Analysis Template to track any needed changes
- Please have the QR code (page 22) available for the team to complete the post simulation survey

Announcement: This is not a test of individuals. This is an opportunity to improve the process, identify and potentially fix gaps within the unit, teamwork, communication, and overall reliability. Let's get started. To start, let's first review the stabilization check list [7] below (consider printing page 13), basic life support algorithm (page 20) and cardiac arrest algorithm (page 21).

Wanita is a 34-year-old G2 P1001 in the second stage of labor with a term fetus at 39 weeks 2 days. She has had an uneventful and unremarkable pregnancy. She has started pushing and is currently at 1+ station. With the third pushing effort she starts to become anxious. She states "I (breath) – can't (breath) – breathe" and becomes anxious. She is now tachypneic.

Role playing family member to the laboring woman: Are you alright honey? Focus on your breathing. Then to the staff in a very distressed voice – Somebody do something to help her!

Ask the following:

911 in Action	Answers & Discussion
1. What is your next action?	Vital Signs: BP 72/48, HR 142, O2 Sat 89% Call for help! Initiate an emergency response team (depending on your institution, consider - OB, nursing, anesthesia, peds/NICU, etc.) You recognize the emergency for both mother and baby although you do not understand the cause. Apply oxygen 10L with a non-rebreather

2. Perform a vaginal exam.	Vertex at +1 and completely dilated.
a. What else is indicated?	Start an IV if not already established. Position in the left lateral.
b. Think of CAB's (circulation, airway, breathing) and perform a preliminary assessment of Wanita and the feus.	Try to find clues as to what is causing Wanita's complaints. Confirm the oxygen is properly connected to the wall/tank and to the non-rebreather.
3. The fetal heart rate is now bradycardic.	Communicate: We have a combined emergency for both the mother and fetus.
a. Confirm that the emergency response team has been notified if in the hospital setting. Call for additional staff if in a birthing center.	Discuss the process for an emergency in your setting. Are there any concerns?
b. Perform another vaginal exam	What is the fetal station and position?
4. Re-examine Wanita	There is not a diagnosis. Could this be uterine rupture? Pulmonary embolus? What is happening?

Help is arriving.
In the hospital setting, the surgery team is setting up. Wanita's vitals show a BP 72/40mmHg with a pulse of 155/min. The fetal heart rate remains bradycardic in the 80's. There have been a few contractions since the breathing difficulties started. The vertex cannot be seen, but upon parting the labia it is in view. Now at +2/5 station.

Wanita continues to have shortness of breath. Cyanosis is noted in her fingers and toes. Her chest exam reveals decreased air flow along with scattered rhonchi. She appears very ill. You are concerned that she is going into cardio-pulmonary arrest.

Role playing family member (in a loud voice) Wanita! Wanita! Don't die! Then to the staff: What is wrong with her? What did you do to her? Save her baby!!

911 in Action	**Answers and Discussion**
5. Confirm CPR equipment (crash cart) is in the room.	Be prepared to deal with the deteriorating situation. Confirm the pulse oximeter and BP cuff are in place. Apply ECG leads and be able to monitor the mother.

6. Keep mother and partner/family updated on the situation.	Communicate to family that you're not 100% sure what's going on, but Wanita's vital signs are abnormal, and the baby is distressed. Plan to move to the OR for emergent delivery. Call for anesthesia and Peds. In the birthing center call for emergency services and prepare for transfer.

The ECG reveals a heart rate of 156 bpm, non-specific ST- and T-wave changes, with a right ventricular strain pattern.

Wanita is gasping. Pulse oximetry is now 70% with oxygen running at 10 liters/min. Wanita's BP is 68/38 mmHg and pulse is 150 bpm with irregularities. The fetal heart is in the 70's, still bradycardic. Pediatric and anesthesia caregivers enter the room.

Role playing family member to staff: She is dying. This is not normal. What can you do to fix this and save the baby?

911 in Action	Answers and Discussion
7. The provider and others in attendance assess the situation.	In the hospital setting Anesthesia may considering intubation due to Wanita's deteriorating status. In the birthing center would intubation be performed? By EMS?
a. The provider now checks fetal position.	FHR is bradycardic. Forceps are considered but communicates the fetal position is not low enough at 2/5+ station. In the hospital setting the provider asks to prepare for cesarean delivery.

Wanita becomes non-responsive. Her pulse oximeter is slowly dropping 60-50-40. Her pulse is also dropping and is in the 60's. The fetal heart rate is in the 80's bpm.

Role playing family member: Are you just going to stand there and let her die! Oh, my goodness! Help her!

911 in Action	Answers and Discussion
8. In the hospital, Anesthesia starts a full code on Wanita. The Obstetrician asks for a scalpel.	In a heroic effort to save the fetus the cesarean is performed at bedside. The delivery may also help with maternal resuscitative efforts.
a. The cesarean is completed.	The neonate is hypotonic but makes gasping respiratory efforts as she is moved to the infant warmer to be cared for by Neonatal Resuscitation Program (NRP) trained providers.

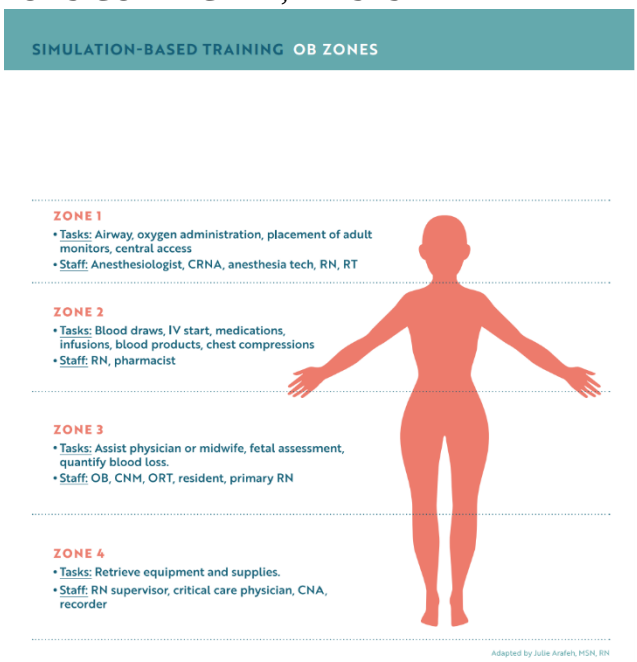
Ten minutes after birth the neonate is breathing on her own and has Apgar score of 4 & 9. Wanita is being ventilated. Her BP is 89/52mmHg and her O2 sat is 82%. She continues to bleed from the surgical site that is in the process of being closed. She is being moved to the OR for further surgery.

Wanita's arterial blood gases show a pO2 of 50, a pCO2 of 30, a pH of 7.26 and a HCO3- of 18 mEq/l (from hypoxemia, tachypnea and metabolic acidosis).

An hour later, Wanita is in the ICU and requires ventilation. Central lines have been inserted with inotropes running due to the continued hypotension. There has been evidence of pulmonary hypertension and she is developing signs of left sided heart failure. Uterine atony responded after B-Lynch sutures were placed. Laboratory studies are indicative of consumptive coagulopathy and is being treated with blood products. The spiral CT has been ordered. Wanita and her family have been kept informed of the critical situation and provided with support.

Let's break it down into Breathing, Blood Pressure and Bleeding [7]

- DO NOT RUSH, EMPHASIS IS ON DOING ACTIONS CORRECTLY, THIS IS PRACTICE ○ If the unit has a process for role delegation, follow that process to determine who will be performing which tasks.
- If there is no process, then have the trainees divide tasks.
    - Who is the leader and what should happen when the leader arrives in the room?
    - If there is more than one leader, how do leaders coordinate their actions and orders?
    - Have trainees determine what information needs to be communicated, who needs the information?
        - Family: Where are they? Who is communicating with them?
    - If time allows have the trainees walk through the process another time with the emphasis on delegating roles, identifying the leader, clear communication.



See page 15 for a larger version [7].

Breathing

- Describe how the patient would look in this situation, how they determine whether a patient is in respiratory distress.
    - Discuss priorities: maternal respiratory distress vs fetal bradycardia.
- Walk through the actions in the checklist in a slow deliberate manner.

Blood Pressure

- Describe how the patient would look in this situation, how they determine a patient is severely hypotensive vs cardiac arrest.
- Walk through the actions in the checklist in a slow deliberate manner.

Bleeding

- Describe how the patient would look in this situation, how they determine a patient is developing disseminated intravascular coagulation.
- Have MTP checklist, components, and equipment available for trainees.
- Walk through the actions in both the AFE checklist and MTP checklist in a slow deliberate manner.

After the Maternal 911 in Action drill:

1. What will occur next?
2. Discuss the importance of documenting.
3. Discussion with the patient and/or her family.
4. Documentation of the event.

After the Maternal 911 in Action drill, the trainer will lead the team through the debriefing process. The tool on page 19 may be helpful to complete with this section [7].

1. What went well for the team?
2. What did we learn through this drill?
3. What would we do differently in a real-life situation?
4. Did we have any issues; equipment, processes, communication, understanding?
5. Who is going to follow-up to resolve the problems and/or contact those who need to assist in making changes?
6. What time frame will be allowed for completion of this project?
7. How will changes be communicated to the team?
8. After the training is adjourned, the instructors should conduct a review of the simulation among themselves:
    - Anything during the session that did not work as planned or should be changed?
    - Do any changes need to be made to the instructor roles and tasks during the scenario?
    - Do any supplies need to be replaced?
        - Who will be responsible for findings that need to be communicated with unit administration urgently? (Example: Upon opening what was labeled as an emergency hysterectomy instrument set it was found to be instruments for a pediatric surgical case)

Discussion (for all):

1. What is the incidence and mortality of an amniotic fluid embolism (AFE)?
    a. 1-12/100,000 deliveries
    b. Maternal mortality of 10-90% with neurologic injury in as many at 85%
    c. Neonatal mortality is 20-60% [1,2]
2. Risk factors associated with AFE:
    a. Precipitous or tumultuous labor
    b. Advanced maternal age
    c. Cesarean and instrumented delivery
    d. Placenta previa and abruption
    e. Grand multiparity (five or more live or stillborn births)
    f. Cervical lacerations
    g. Fetal distress
    h. Eclampsia

i. Medical induction of labor [1]

3. Pathophysiology
    a. The cause of AFE is unknown.
    b. Amniotic fluid/fetal debris is believed to enter maternal circulation through the endocervical veins, the placental insertion site, or a site of uterine trauma [3].
    c. It is more frequently associated with uterine trauma, such as seen in miscarriages, abortions, amniocentesis, and vaginal and cesarean deliveries.
        - Enhanced communication between amniotic fluid sac and the maternal venous circulation seems necessary.
        - Amniotic fluid with mucin, fetal debris, vernix, lanugo, fetal hair and fetal squamous cells coated with white cells blood cells and granular debris is present in confirmed diagnoses.
        - If meconium is present, the response may be more dramatic.
    d. Once it reaches maternal circulation, it can precipitate cardiogenic shock, respiratory failure, and, most likely, an inflammatory and anaphylactoid response.
    e. The exact nature of the response is unknown but probably immune mediated: direct myocardial depressant effect, vasospastic mediators (histamines, prostaglandins, serotonin etc.) leading to shock and anaphylactoid state.
        a. The hemodynamic response appears biphasic:
            a. Initial pulmonary hypertension and right ventricular failure (1st hour).
            b. Followed by left ventricular failure of an unclear mechanism.
            c. Effects of hypotension and hypoxemia lead to multiple organ failure: cardiovascular collapse, renal insufficiency, hepatic failure, seizures and coma. [4,5]
        b. Effects on hematological system (potent thromboplastin and antifibrinolytic activity) trigger clotting in the pulmonary vasculature and result in consumptive coagulopathy (DIC).
4. Clinical features:
    a. There appear to be phases of clinical symptoms with the first phase being characterized by acute respiratory failure and cardiac arrest. Then the second phase, if the patient survives, is seen with evidence of severe hemorrhagic shock with DIC (Disseminated Intravascular Coagulation) [2]
    b. General:
        i. Can occur at any point during labor and delivery, including during cesarean delivery.
        ii. Clinical manifestations are variable making diagnosis difficult.
        iii. Sudden, unexplained peripartum respiratory distress, cardiovascular collapse, and coagulopathy.
        iv. Bleeding secondary to coagulopathy or uterine atony (common).
    c. Presentation:
        i. Dyspnea (tachypnea).

ii. Cyanosis.
iii. Seizures or seizure-like activity.
iv. Fetal bradycardia.
v. Hypotension. [6]
vi. Anxiety, feeling of dread.

5. Given all this education, let's go through a second scenario [7]. This starts on page 17 and then we will review the check list with a check-list debriefing.

References:

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5. Shechtman M, Ziser A, Markovits R, Rozenberg B. Amniotic fluid embolism: early findings of transesophageal echocardiography. Anesth Analg 1999; 89:1456.
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7. Amniotic Fluid Embolism Foundation. (2023, July 19). *AFE Research and Education Clinicians - Amniotic Fluid Embolism Foundation*. https://amnioticfluidembolism.org/

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SIMULATION-BASED TRAINING STABILIZATION CHECKLIST

AFE HOTLINE: **307-END-AFES**

BREATHING

Recognition: Acute shortness of breath, increasing respiratory rate and need for oxygen to keep SpO2 at >95%

Response:

- ☐ Activate Rapid Response Team (RRT)
- ☐ Crash cart to bedside
- ☐ Move bed away from headwall
- ☐ Frequent vital signs including respiratory rate
- ☐ Auscultate breath sounds
- ☐ Set up ambu bag and suction
- ☐ Start O2 by non-rebreather face mask
- ☐ Plan for ongoing ventilation if intubated
- ☐ Continuous SpO2

BLOOD PRESSURE

$MAP = [SBP + 2\,(DBP)] / 3$ or $MAP = \frac{1}{3}(SBP - DBP) + DBP$

Recognition: Unexplained acute onset hypotension (MAP <65mmHg) or cardiac arrest

Response:

DECLINING BLOOD PRESSURE

- ☐ Activate Active Rapid Response Team (RRT)
- ☐ Frequent vital signs
- ☐ Uterine displacement
- ☐ Functioning 18 g IV
- ☐ IV fluid bolus

CARDIAC ARREST

- ☐ Call Obstertic Code Blue (ensure Neo/Peds team is notified)
- ☐ Note time of pulselessness and begin chest compressions
- ☐ Manual left uterine displacement, remove fetal monitor
- ☐ Assemble ambu bag, begin CPR per BLS guidelines
- ☐ Crash cart to bedside
- ☐ Roll patient to place backboard and apply defibrillator leads
- ☐ Analyze rhythm (can use AED)
- ☐ Follow AED instructions or ACLS algorithm for identified rhythm
- ☐ Prepare for intubation ASAP
- ☐ Deliver within five minutes of pulselessness if >20 weeks gestation or fundus at umbilicus

BLEEDING

(SBP-DBP=PP)

Recognition: Pulse pressure <30mmHg or declining blood pressure, maternal tachycardia, bleeding

Response:

- ☐ Notify physician, anesthesiologist, & charge RN or activate Rapid Response Team (RRT)
- ☐ Activate Massive Transfusion Protocol (MTP)

Order Labs:

- ☐ BNP
- ☐ Cardiac enzymes
- ☐ CBC
- ☐ CMP
- ☐ Coagulation panel
- ☐ Fibrinogen
- ☐ Type and Cross

Products Given:

- ☐ 6 PRBC
- ☐ 6 FFP
- ☐ 6 Platelets
- ☐ Cryo as needed
- ☐ TXA as needed

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SIMULATION-BASED TRAINING SUPPLY LIST

PATIENT CARE SUPPLIES

- BP cuff
- Pulse oximeter sensor
- ECG leads
- Fetal monitoring transducers, belts, cables/cords
  Consider external and internal monitors
- Patient gown for manikin or actor
- Armband with simulated patient name
- IV supplies: poles, pumps, tubing, bags of various sizes for meds and volume replacement
- Blood bags in quantity and component available to unit, cooler if used
- Blood tubing
- Syringes and needless adapters to draw up medications
- Blood drawing supplies: blood tubes, butterfly or needle, and vacutainer
- Suction tubing and yankauer
- Oxygen tubing
- Non re-breather oxygen mask
- BIPAP or other oxygen delivering equipment used on the unit
- Warm blanket or warming device
- Miscellaneous supplies:
  - Emesis bag
  - Extra pillow
  - Stethoscope
  - Gloves (various sizes)

NEONATAL SUPPLIES

- Infant warmer
- Infant blankets
- Infant positive pressure ventilation supplies
- ECG and monitor
- Pulse oximeter sensor

EMERGENCY SUPPLIES

- Mock code cart with simulated drugs (Epi) and defibrillator with pads and end tidal CO2 detector
- Backboard
- Emergency intubation kit (if unit has one)
- Video laryngoscope (if unit has access to one)
- Blood warmer and pump or rapid infuser with tubing
- Mock hemorrhage cart
- Resuscitative CS kit
  - Scalpel
  - Kelly and cord clamps
  - Scissors
  - Blanket
- Mock neonatal code cart including Epi and resuscitation fluids

SIMULATION SUPPLIES

- Manikin or low cost task trainer
- Fetal manikin
- Neonatal manikin
- Video and audio recording equipment
- Vests or item to distinguish trainees from staff working on the unit and instructors
- Sign to inform patient and family about SBT
- Agenda
- Instructor task list
- Paperwork file with extra forms
  - Sign in sheets
  - Video consent and confidentiality forms
  - Checklists
  - Scenario
  - Evaluation forms or QR code that links to one
  - Blank paper for notes, pens and paper
  - Printed ECG rhythms, if not electronic
  - Printed FHR tracings, if not electronic
  - AHA code algorithms
  - Printed vital signs, if not electronic
  - Printed pictures of patient/neonatal appearance, if no high fidelity manikin that can change appearance

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SIMULATION-BASED TRAINING OB ZONES

ZONE 1

- Tasks: Airway, oxygen administration, placement of adult monitors, central access
- Staff: Anesthesiologist, CRNA, anesthesia tech, RN, RT

ZONE 2

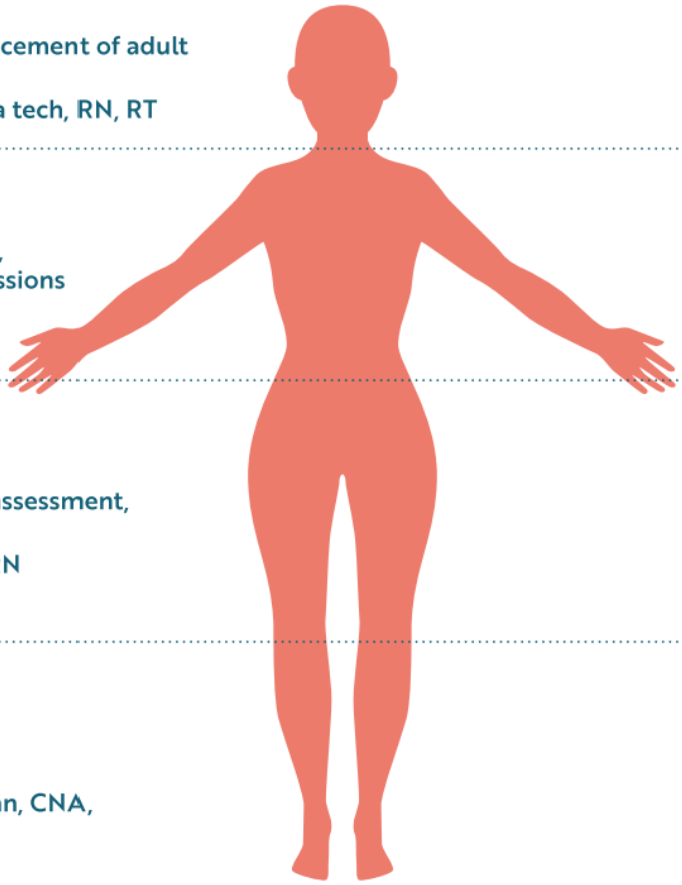
- Tasks: Blood draws, IV start, medications, infusions, blood products, chest compressions
- Staff: RN, pharmacist

ZONE 3

- Tasks: Assist physician or midwife, fetal assessment, quantify blood loss.
- Staff: OB, CNM, ORT, resident, primary RN

ZONE 4

- Tasks: Retrieve equipment and supplies.
- Staff: RN supervisor, critical care physician, CNA, recorder



Adapted by Julie Arafeh, MSN, RN

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SIMULATION-BASED TRAINING SCENARIO LOGISTICS

Initial Team: Primary nurse in labor room

Expected interventions and Progression of Scenario: (Bolded items are trainee actions; Non-bolded items are manikin responses.)

INITIAL SCENE IN OR	PATIENT PROGRESSION
Patient: "I feel faint, I am having trouble catching my breath" Anxious	BP100/70, P96, R22, SaO2 96% FHR 130 bpm minimal variability

AFE BEGINS		
SCENARIO EVENTS	**APPROPRIATE ACTIONS**	**INAPPROPRIATE ACTIONS**
Step 1 Breathing		
1 min later: Patient: "Am I going to die" Increasingly anxious BP80/50, P120, R35, SaO2 88% FHR slowly declines to 70 bpm	**Call for help or rapid response team**	**No call for help or call one person for help**
Patient: Not talking, breathing fast and difficult	**O2, non-rebreather at 10L** Cont. VS & SpO2, BP q 5 min **Intubation done, tube placement confirmed, chest auscultated** BP70/50, P120, R35, SaO2 90%	**No O2 or at <10L** No plan for intubation, **no intubation or no confirmation of tube placement** BP 70/50, P130, R40, SaO2 86%
Step 2 Blood pressure		
Patient: Unchanged with breathing labored until intubated	BP 60/30 P130 **IV fluid bolus**	BP 60/30 P150 R40 SaO2 84% **No IV fluid bolus**
Patient: Has small seizure, after seizure in asystole cardiac arrest	Call OB Code Blue **Chest compressions, ventilations** **Remove wedge, initiate LUD** Fetal monitors removed **Crash cart, defib pads/backboard, analyze rhythm, no shock** **Epi given** **Resus CS prep, done in 5 min** **Why did this happen to this pt. at this time (Hs & Ts)** BP0/0 P0 R0	Delayed or not done or not done correctly: calling code, **chest compressions, ventilations, LUD, crash cart in room, rhythm analysis, Epi, resus CS done at >10 min, backboard placed, No or delayed discussion of Hs & Ts** Fetal monitors not removed, BP0/0 P0 R0
	If neonatal resuscitation team called with OB code then trainees are not responsible for neonatal resuscitation	If neonatal team not called at time of OB code the trainees will need to begin neonatal resuscitation

	Return of spontaneous circulation (ROSC) ROSC occurs after Resus CS BP 80/65 P 90 R Pt attempting breaths	ROSC does not occur if: inadequate ventilation and chest compressions, resuscitative delivery not done. ROSC occurs after 2 cycles of CPR following resuscitative delivery. If ROSC: BP 70/50 P90 R 0-Pt not attempting breaths
Step 3 Bleeding		
Bleeding is noted at abdominal incision and IV sites after 1 minute of ROSC	**MTP ordered, 2nd IV started or prepped for blood administration, VS continuous, BP q min, warming blanket placed, Labs: coag and fibrinogen sent, quantification of blood loss started** After IVF, blood: BP 100/70 P90 SaO2 90% T 35.5° C (96° F)	Delayed, not done or not done correctly: **MTP ordered, 2nd IV started or prepped for blood administration, VS continuous, BP q min, warming blanket placed, Labs: coag and fibrinogen sent, quantification of blood loss started** VS do not change until actions above done correctly then change slowly

- Respiratory stress (Breathing)
  - What circumstances allowed the team to complete the items on the checklist? OR What circumstances prevented the team from completing the items on the checklist?
  - Are there issues or processes on the unit currently that would prevent the team from completing the checklist?
  - What could be done to make it easier for any team on the unit at any time of day to follow the checklist?
- Declining blood pressure and cardiac arrest (Blood pressure)
  - There are a few metric recommendations for cardiac arrest set by publications of the American Heart Association.
  - Here is a comparison of scenario times to recommended times:
    - Begin chest compressions once pulselessness is established.
      - Scenario time to start chest compressions:
    - Analyze heart rhythm and defibrillate if needed at two minutes after established pulselessness.
      - Scenario time of rhythm analysis:
    - Administer Epinephrine by 5 minutes after established pulselessness
      - Scenario time of epinephrine administration:

- Complete resuscitative CS by five minutes after established pulselessness
    - Scenario time of completion of resuscitative CS:
- What allowed the team to meet the recommended times? What prevented the team from meeting the recommended times?
- What can be done on the unit to ensure the recommended times are met?
- What circumstances allowed the team to complete the items on the checklist? OR What circumstances prevented the team from completing the items on the checklist?
- Are there issues or processes on the unit currently that would prevent the team from completing the checklist?
- What could be done to make it easier for any team on the unit at any time of day to follow the checklist?

- Bleeding (Bleeding)
    - What circumstances allowed the team to complete the items on the checklist? OR What circumstances prevented the team from completing the items on the checklist?
    - Are there issues or processes on the unit currently that would prevent the team from completing the checklist?
    - What could be done to make it easier for any team on the unit at any time of day to follow the checklist?
    - Are there any other issues on the unit that would prevent staff from responding effectively and efficiently to AFE that we have not discussed?
    - Are there any processes currently on the unit that are helpful to staff in an emergency that need to be preserved?

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SIMULATION-BASED TRAINING ANALYSIS TEMPLATE

Topic of SBT:

Date(s) of training:

Number of trainees: *This section can be broken down by discipline or job title if this is relevant to the findings*

1. METRICS

METRIC	FINDING	COMMENTS
(Example) Time Anesthesiologist called to time in room	(Example) 6 minutes	(Example) Anesthesiologist needs pager that works in the OR to decrease response time to OB

2. SYSTEMS ISSUES AND PROCESSES UNCOVERED

ISSUE OR PROCESS	REPORTED TO	SUGGESTION FOR IMPROVEMENT
(Example) Instrument labeled incorrectly	(Example) Unit manager and sterile supply dept	(Example) Inform OB surgical staff of incorrect label, have 2 sets in case one is incorrect

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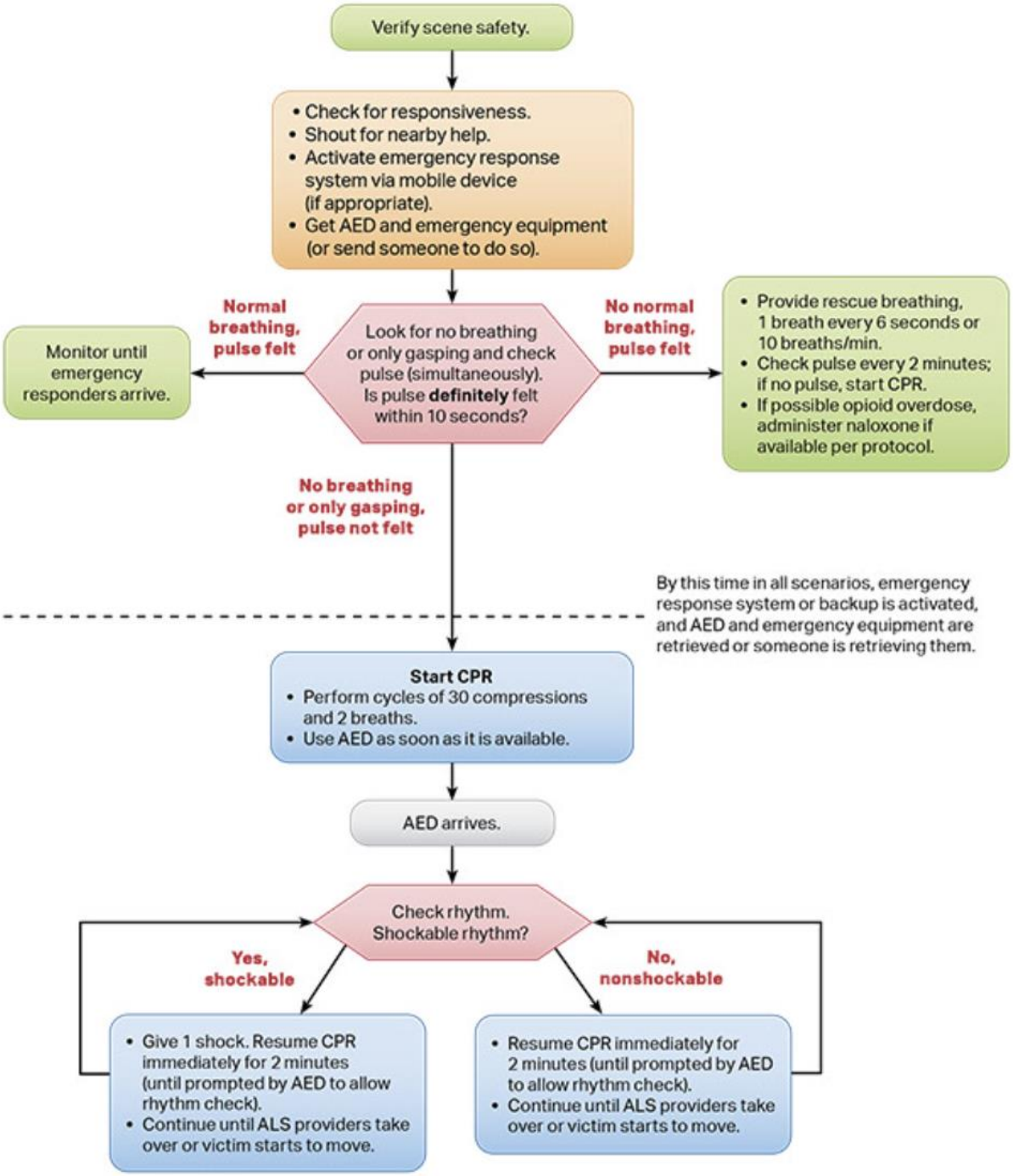
Adult Basic Life Support Algorithm for Healthcare Providers



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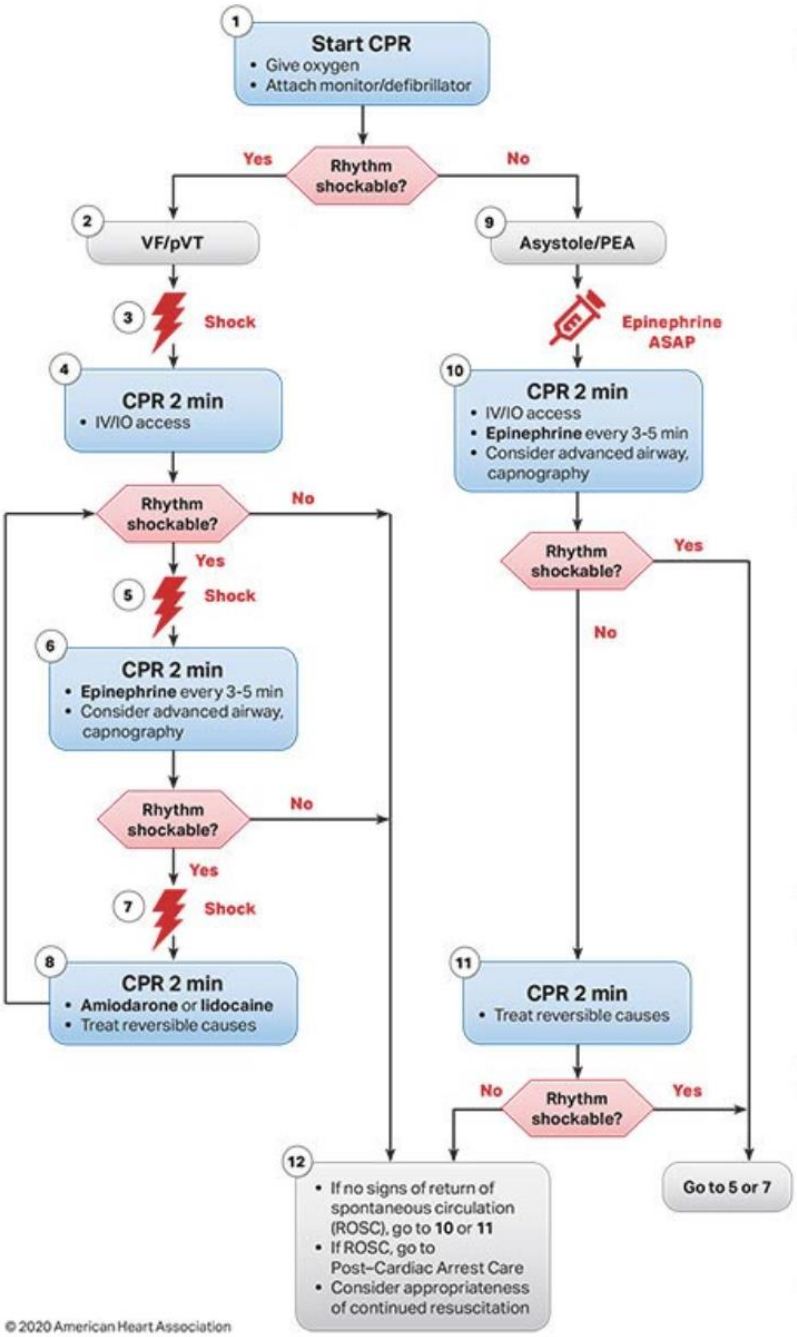
Adult Cardiac Arrest Algorithm (VF/pVT/Asystole/PEA)



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CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If P_{ETCO_2} is low or decreasing, reassess CPR quality.

Shock Energy for Defibrillation

- **Biphasic**: Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic**: 360 J

Drug Therapy

- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.
  or
  Lidocaine IV/IO dose: First dose: 1-1.5 mg/kg. Second dose: 0.5-0.75 mg/kg.

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

To help the Maternal 911 team improve simulations please have your team scan the QR code to complete a post simulation survey.