Please follow the QR code to submit questions for:

Annie Sterle, AFE Survivor

Dr. Beth Elfstrand, OBGYN

Alicia Weyrauch, Labor & Delivery RN

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Amniotic Fluid Embolism

Essential Resources for Healthcare Providers and Families

Elizabeth Elfstrand, MD FACOG
Miranda Klassen, AFE Foundation
Annie Sterle, AFE Survivor
We have no disclosures

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Learning Objectives

Outline	immediate response to an AFE
Execute	AFE specimen procurement and case submission to the AFE Registry and Biorepository
Utilize	resources to best support the patient and their family

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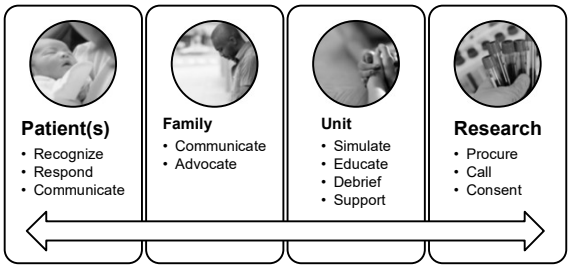
Your Many Roles



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Case Study

3/22 19:00: 29 yr old primigravida admitted for cervical ripening at 39 weeks due to covid pandemic and GDM

A

3/23

- 7:45: Morning nurse arrived, patient told her to call the doctor, and fetal bradychardia noted on monitor
- 7:52 : Moved for STAT C-section
- 8:03 : CS Began
- 8:04 : Baby Delivered
- 8:11 : CPR Began and Code Team Present
- Surgery completed, DIC Noted following dressing application
- 8:31: Second Code Blue with LUCAS support
- 9:01 ECMO support began

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Outcomes

Baby: APGAR 0/3; resuscitated by NICU team; cooled 3 days for suspected HIE, normal MRI, and discharged home 3/29

Mom: DIC managed with massive transfusion protocol in OR – 1g transexamic acid, 8 units each of PRBC, FFP, Cryo, and PLT with EBL >2500 cc; no heparin for ECMO cannulation

ECMO: 52 hrs, unable to wake
MRI with multiple strokes and hemorrhages
Cardiac ICU→ Neuro ICU
Trach and gastrostomy placed for long-term care

4/9: Patient became responsive
4/15: Move to rehab
4/21: Discharged home

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AFE Facts

- Estimated to be 1 in 40,000, mortality 20-40%
- 87% of cases will experience maternal arrest
- Diagnosis based on symptoms, timing, and exclusion of other causes
- No recurrence in subsequent pregnancies
- AKA Anaphylactoid Syndrome of Pregnancy (ASP)

Clark, S. L., et al. "Amniotic Fluid Embolism: Analysis of the National Registry." *American Journal of Obstetrics and Gynecology*, vol. 172, no. 4 Pt 1, Apr. 1995

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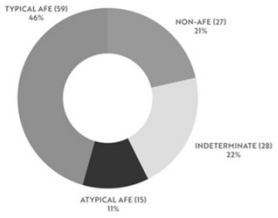
Amniotic Fluid Embolism

- Classic AFE
  - Hypoxia
  - Hypotension
  - Coagulopathy
- Atypical AFE
  - Missing one of above triad



Clark, S. L., et al. "Amniotic Fluid Embolism: Analysis of the National Registry." *American Journal of Obstetrics and Gynecology*, vol. 172, no. 4 Pt 1, Apr. 1995

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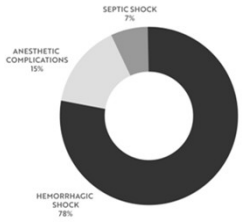
Differential Diagnoses

- Hemorrhage
- Pulmonary embolus
- Anaphylaxis
- High spinal anesthesia
- Cardiomyopathy
- Eclampsia
- Septic shock
- Uterine rupture



Shamshirazz Obstet Gynecol Clin N Am 2016;43:779-90

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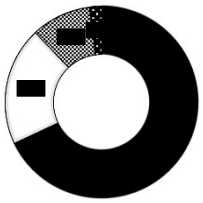
AFE Timing

- During labor (60-70%)
- During cesarean section (20%)
- Immediate postpartum (10%)
- Amnio, abortion, D&E (2%)



■During Labor □During C/S ⊠Immediate Postpartum ■Other

Clark, S. L., et al. "Amniotic Fluid Embolism: Analysis of the National Registry." *American Journal of Obstetrics and Gynecology*, vol. 172, no. 4 Pt 1, Apr. 1995, pp

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Correlations seen in AFE Registry

- Instrumentation
- Advanced maternal age
- Polyhydramnios
- Placenta previa
- IVF/ Surrogacy
- Multiple gestation

There are no recognized risk factors with sufficient scientific validity to warrant any alteration in management to avoid or reduce the risk.

Clark, S. Anaphylactoid Syndrome of Pregnancy: Immediate Steps to Save Lives. Contemporary OBGYN 2018

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Signs and Symptoms

- Impending sense of doom
- Fetal compromise
- Altered mental status
- Hypotension
- Respiratory distress, hypoxia
- Nausea and vomiting
- Seizure
- Cardiopulmonary arrest

"Something feels strange"
"I'm not feeling well"
"I can't breathe"
"I feel like I am dying"

Clark, S. L., et al. "Amniotic Fluid Embolism: Analysis of the National Registry." *American Journal of Obstetrics and Gynecology*, vol. 172, no. 4 Pt 1, Apr. 1995

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Pathophysiology

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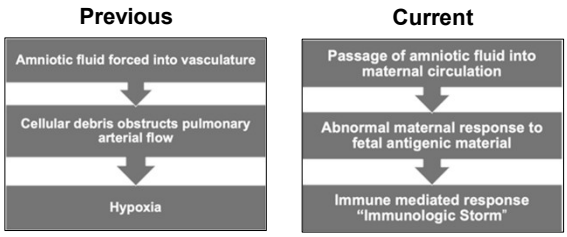
Theories of Cause



Proposed mechanism of amniotic fluid embolism. SIRS, systemic inflammatory response syndrome. Clark. Amniotic Fluid Embolism. Obstet Gynecol 2014.

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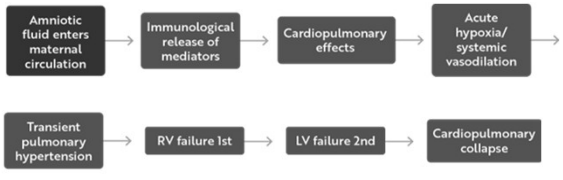
Pathophysiology



www.amnioticfluidembolism.org

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Response

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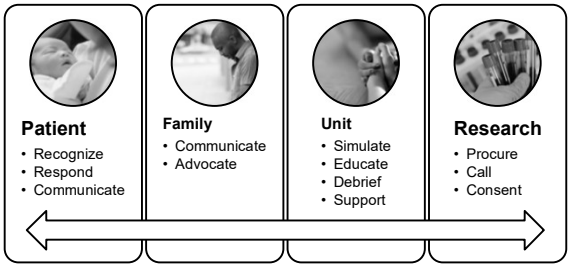
Your Many Roles



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Acute & Subacute

- Rapid recognition and intervention at first symptoms
- Call for help, continue to assess, prepare room
- Participate in the code
- Aid in differential diagnosis
- Procure AFE specimens
- Contact AFE Foundation Hotline
- Communicate with family

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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

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BLOOD PRESSURE

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

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TABLE 1
Components of high-quality cardiopulmonary resuscitation in pregnancy

Components
Rapid chest compressions (100 × minute)
Perform hard compressions, achieving a depth of at least 2 inches
Assure adequate chest recoil between compressions
Minimize interruptions of chest compressions
Avoid prolonged pulse checks (no more than 5—10 seconds)
Resume chest compressions immediately after defibrillating
Switch provider of compressions every 2 minutes to avoid fatigue
Lateral displacement of uterus during resuscitation

SMFM. Amniotic fluid embolism: diagnosis and management. Am J Obstet Gynecol 2016.

Remember chest compressions only deliver 30% CO!

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Resuscitative Delivery

- Consider at 4 minutes, cut at 5
- Relieve aortocaval compression
- Improves CPR effectiveness
- Improves maternal and infant survival
- Perform where patient is
- Anesthesia or abdominal prep not necessary

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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

•Serum Fibrinogen maintain above 150--200 mg/dL

REV 2023

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Amniotic fluid embolism checklist for initial management

This checklist is a sample only. Each facility should modify it to fit the facility-specific circumstances

Manage circulatory collapse
- ☐ ABCs: manage airway, breathing, and circulation
- ☐ Designate a timekeeper to call out times at 1-min intervals
- ☐ If no pulse, start CPR
  - ○ Manually displace uterus or lateral tilt
  - ○ Use backboard
- ☐ Consider move to operating room only if this can be accomplished in 2 min or less
- ☐ If no pulse at 4 min, START perimortem cesarean delivery (resuscitative hysterotomy)
  - ○ Splash prep only, do not wait for antibiotics
  - ○ Goal is to improve chances of resuscitation

Anticipate uterine atony, DIC, hemorrhage
- ☐ Oxytocin prophylaxis plus other uterotonics as needed
- ☐ Consider intraosseous line if needed for large-bore IV access
- ☐ Initiate massive transfusion protocol
  - ○ Cryoprecipitate preferred over FFP to reduce volume overload
- ☐ Consider thromboelastometry if available
- ☐ Tranexamic acid (1 g IV over 10 min) if DIC or hemorrhage occurs

Manage pulmonary hypertension and right ventricular failure (Anesthesiology, Critical Care, or Cardiology)
- ☐ Consider echocardiography (thoracic or esophageal)
- ☐ Avoid fluid overload (eg, 500 mL boluses and reassess)
- ☐ Vasopressor if needed: norepinephrine 0.05–3.3 μg/kg/min
- ☐ Inotropes if needed:
  - ○ Dobutamine 2.5–5.0 μg/kg/min or
  - ○ Milrinone 0.25–0.75 μg/kg/min
- ☐ Pulmonary vasodilator if needed to unload right ventricle
  - ○ Inhaled nitric oxide 5–40 ppm or
  - ○ Inhaled epoprostanol 10–50 ng/kg/min) or
  - ○ IV epoprostanol 1–2 ng/kg/min (via central line) or
  - ○ Sildenafil 20 mg orally (if awake/alert)
- ☐ Consider ECMO if prolonged CPR or refractory right heart failure
- ☐ Wean FiO_2 to maintain O_2 saturation 94% to 98%

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AFE FOUNDATION
AMNIOTIC FLUID EMBOLISM

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Initiatives and Mission

EDUCATION

- AFE Courses
- Simulation Toolkit
- Effective Communication

SUPPORT

- Patients
- Families
- Providers

RESEARCH

- AFE Registry
- Biorepository

Reduce maternal and infant mortality attributed to amniotic fluid embolism while helping those impacted navigate paths forward.

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Preparing For the Unexpected

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Your Many Roles

Patient

- Recognize
- Respond
- Communicate

Family

- Communicate
- Advocate

Unit

- Simulate
- Educate
- Debrief
- Support

Research

- Procure
- Call
- Consent

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AFE: A PRACTICAL APPROACH COURSE

Course covers:
- Historical context
- Pathophysiology
- Management
- Research opportunities
- Supporting families

Course created in collaboration with Clinical Concepts in Obstetrics

**3 hrs. CNE credit available*

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Why Simulation?

- AFE is a rare and catastrophic event
- No actual patient care
- Limited practice with maternal arrest
- Coordinated care and decisive action are necessary
- Greater confidence and resilience during real events
- Uncover gaps or system-based issues before an event

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AFE SIMULATION TOOLKIT

A comprehensive guide for all levels of care with the option to increase fidelity.

Toolkit includes:
- AFE Checklist
- Sample agenda
- Supply list
- Case scenario
- Guidelines for skills review
- Metrics and evaluation tools

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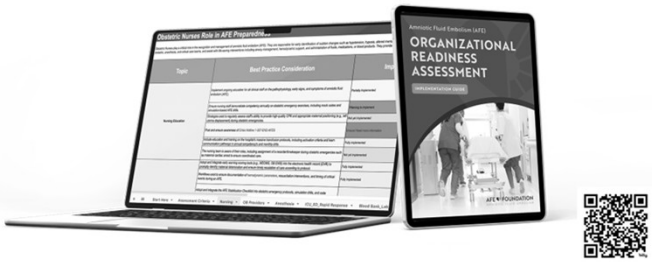
Readiness Assessment



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Badge Buddy

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AFE Hotline

1-307-END-AFES

- 24/7 support
- Guidance on specimen collection
- No HIPAA violation
- Crisis support for all impacted

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Effective Communication

- **A** Acknowledge Emotions
- **F** Formulate Plan
- **E** Execute Communication


EFFECTIVE COMMUNICATION
WHEN DELIVERING BAD NEWS TO THE PATIENT

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Crisis Support


Shutterstock


Amniotic Fluid Embolism

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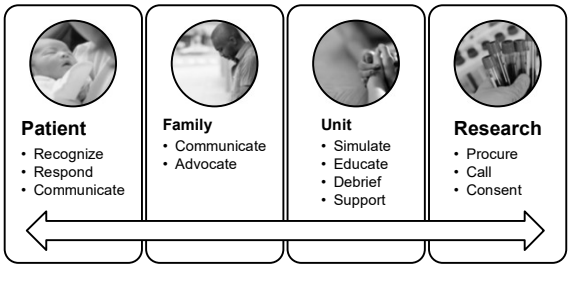
Your Many Roles



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AFE Registry and Biorepository

- International registry
- Largest database of AFE cases 250+
- Retrospective case review
- Specimen studies underway
- 13 publications + abstracts


Miranda Klassen

Transform AFE to be predictable, preventable, and treatable

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AFE Specimens

- Maternal blood previously collected for clinical care before onset of symptoms (i.e.,T&S,Coags)
- Research dedicated blood taken during event before MTP
- Pathological specimens from the placenta
- Autopsy specimens

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Collecting Research Dedicated Specimens During An AFE

During a possible or presumed AFE event, AND before transfusion:

1. Collect/Draw 5ml in red top tube
2. Collect /Draw 5 ml in purple/lavender tube
3. Set aside and finish clinical care
4. Have a team member call the AFE Hotline

AFE diagnosis is not needed before specimen collection

Immediately begin to degrade

Timing is critical to collect and process

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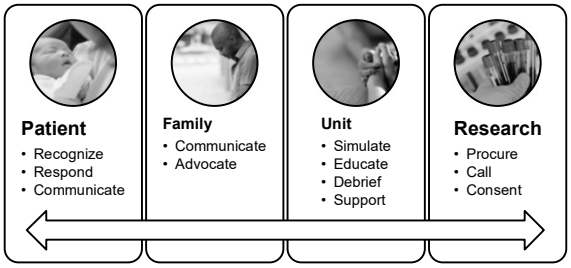
Your Many Roles



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Interprofessional Plan of Care

- Maximize maternal-infant bonding
- Preservation of memories
- Arrange breastfeeding opportunities if aligned with patients' goals
- Anticipate, assess, and respond to signs of mental health symptoms
- Support assessment
- Complete AFE Clinical Summary Form

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Patient Discharge

- Assess patient's readiness and emotions
- Coordinate continuity of care to enhance understanding
- Utilize AFE Clinical Summary Form
- Invite care team to be introduced
- Provide support resources
- Consider home health
- Schedule 6 week debrief with OBGYN

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When a Loss Occurs

- Advocate for autopsy
- Assess support system
- Provide AFE crisis support
- Attend service if appropriate
- Participate in RCA
- Family debrief 6-8 weeks

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Support for AFE Survivors

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Support for Those Grieving

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Support for Staff

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Key Takeaways

Outline	immediate response to an AFE
Execute	AFE specimen procurement and case submission to the AFE Registry and Biorepository
Utilize	resources to best support the patient and their family

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Questions

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Wrap-Up

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