

Development of an Education Module and Cognitive Aid for Amniotic Fluid Embolism (AFE) Management at a Midwestern Community Hospital: An Evidence-Based Practice Project

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Presenters



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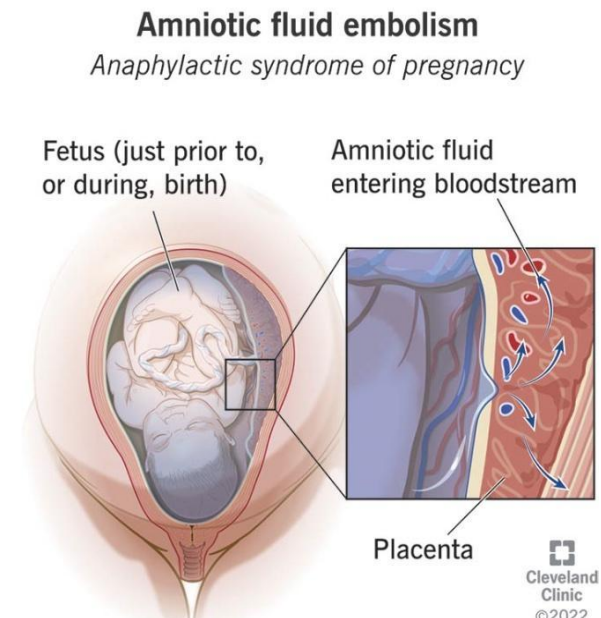
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Objectives

- Understand the clinical presentation and basic management steps of AFE
- Describe the steps in developing an evidence-based practice project to improve provider knowledge and confidence
- Discuss the results of an educational module and cognitive aid implementation on provider knowledge and clinical preparedness for AFE

Background

- An AFE is a **rare** and **life-threatening** obstetric emergency that requires prompt recognition and aggressive multidisciplinary management
- **Low incidence** and **high mortality**
- No existing universal treatment or management protocol



Clinical Significance

- **Affects 2-8** out of every 100,000 deliveries
- **Accounts for 7.5%-10%** of maternal mortality in the U.S
- **20-60%** mortality rate
- Leading cause of peripartum maternal cardiac arrest
- Second leading cause of peripartum maternal mortality
- Provider/facility inexperience
- No risk factors that would modify standard care

Amniotic Fluid Embolism

- Anaphylactoid type reaction to amniotic fluid entering the maternal circulation during labor or immediately postpartum
- Classic triad of symptoms: *hypoxia, hypotension, and coagulopathy*

- **Society of Maternal and Fetal Medicine diagnostic criteria:**
 - Sudden cardiopulmonary collapse or SBP < 90 mmHg
 - Oxygen saturation less than 90%
 - Documentation of evident DIC prior to hemorrhagic or shock-induced coagulopathy
 - Absence of fever (38.0°C) during labor

Current Practice Guidelines

AMNIOTIC FLUID EMBOLISM

START

DIAGNOSIS

Triad

- Hypoxia
- Hypotension
- Consumptive coagulopathy

Premonitory symptoms

- Restlessness
- Agitation

CALL FOR HELP **OB RAPID RESPONSE**

IMMEDIATE

- Team leader** → Identify
- Airway** → Clear?
- Breathing** → SpO₂ + RR
→ Auscultation
- Circulation** → HR + BP
→ Urine output
- Conscious level** → Adequate?
- Position** → Left uterine displacement
- Fetal heart rate** → Monitor
- IV access** → 2 large bore IVs, 16G
- Invasive monitoring** → Arterial line
→ Central line
- Labs** → CBC
→ Coag screen
→ Fibrinogen
→ BMP
→ ABG
→ TEG/ROTEM

Continued on next page

AMNIOTIC FLUID EMBOLISM

TREATMENT

Oxygen → 100% (10 L/min) via non-rebreather facemask or ETT

Hypotension → Cautious IV fluid bolus
→ Administer vasopressor boluses PRN
→ Phenylephrine 100-200 mcg IV
→ Ephedrine 5-10 mg IV
→ Epinephrine 10-100 mcg IV
→ Consider vasopressor infusion
→ Epinephrine 0.01-0.1 mcg/kg/min IV
→ Norepinephrine 0.01-0.1 mcg/kg/min IV
→ Vasopressin 0.01-0.04 units/min IV

Coagulopathy → At risk for massive hemorrhage/DIC
→ Initiate MTP (#14) if symptoms of DIC or ongoing hemorrhage (#8) and/or atony, (#25)
→ Early administration of PRBCs, FFP, Pits, cryoprecipitate or fibrinogen concentrate (if indicated)
→ Consider tranexamic acid 1 g IV (over 10 min)

Emergent delivery → Consider

Additional treatments → Consider hydrocortisone 100 mg IV bolus
→ Iloprost 2.5 mcg NEB for pulmonary vasoconstriction

OTHER

1. Definitive airway: Intubate if developing hypoxia/pulmonary edema
2. Invasive monitoring: Place arterial line, consider central line
3. EKG, CXR, TEE/TTE
4. ICU consult
5. Consider ECMO or balloon pump in patients with severe left ventricular failure

DDX

1. Anaphylaxis
2. Sepsis
3. Hemorrhage
4. Embolism (PE, air)

5. Eclampsia
6. Medication reaction (LAST)
7. MI

END

Atropine, Ondansetron, Ketorolac

The “AOK” Protocol



Atropine

- Counteracts the vagal-mediated reflex that results in severe systemic hypotension

Ondansetron

- Inhibits serotonin-mediated platelet aggregation and can help prevent worsening of serotonin mediated pulmonary vasoconstriction

Ketorolac

- Inhibits the activation of thromboxane-2 (a robust stimulator of platelet activation and aggregation and a potent vasoconstrictor that is activated during times of tissue injury and inflammation)

Organizational Need

- Huntley, IL is deemed a micropolitan area with a population of roughly 28,000
- The CDC's Pregnancy Mortality Surveillance System (PMSS) found that among micropolitan areas, pregnancy-related mortality accounted for 21.8 deaths per 100,000 live births from 2017-2019
- Huntley Hospital recently acquired another local hospital's L&D population and now has a 20-bed L&D unit
- Management expressed interest and need for facility specific AFE education

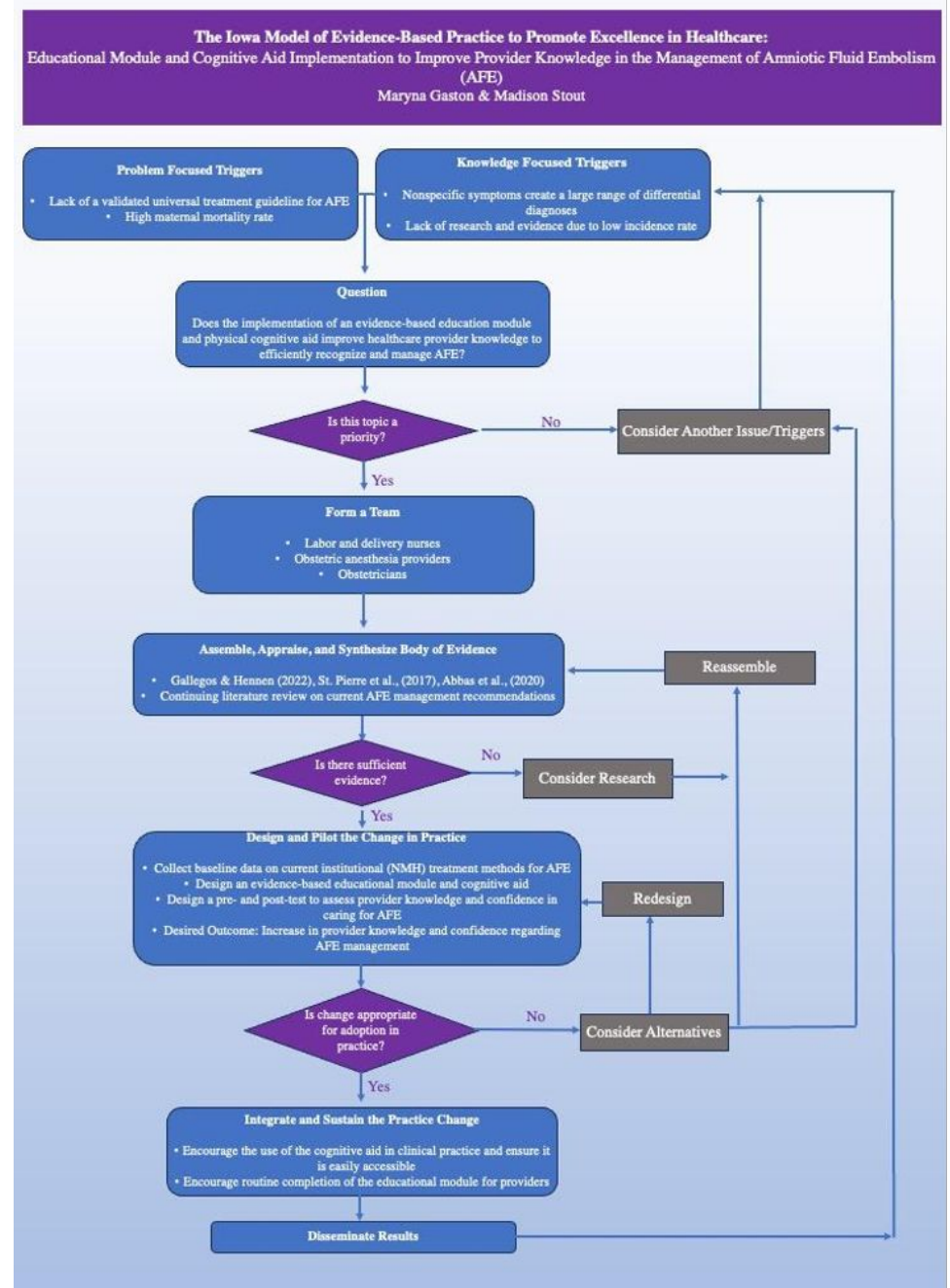
Project Aims

Develop a facility specific web-based educational module and cognitive aid (CA)

Increase provider knowledge and confidence in their ability to recognize and manage AFE

Determine if the web-based educational module improved provider knowledge and confidence levels through pre- and post-assessments

Modified Iowa Model of Evidence-Based Research



Methods

Quality Improvement (QI) determination obtained

In-person and email communication with OB management to determine specific department needs

Educational module and CA were created within the Teachable platform through Skills on Point

Pre- and post-assessments constructed using Qualtrics software

Physical laminated copies of CA posted in various locations on the OB unit

Prospective participants were provided a link to the module via email

Data was collected and analyzed within Qualtrics

Project Overview

- **Design**

- A comparative single group pre- and post-test study was performed from April 29, 2024 through July 1, 2024

- **Sampling**

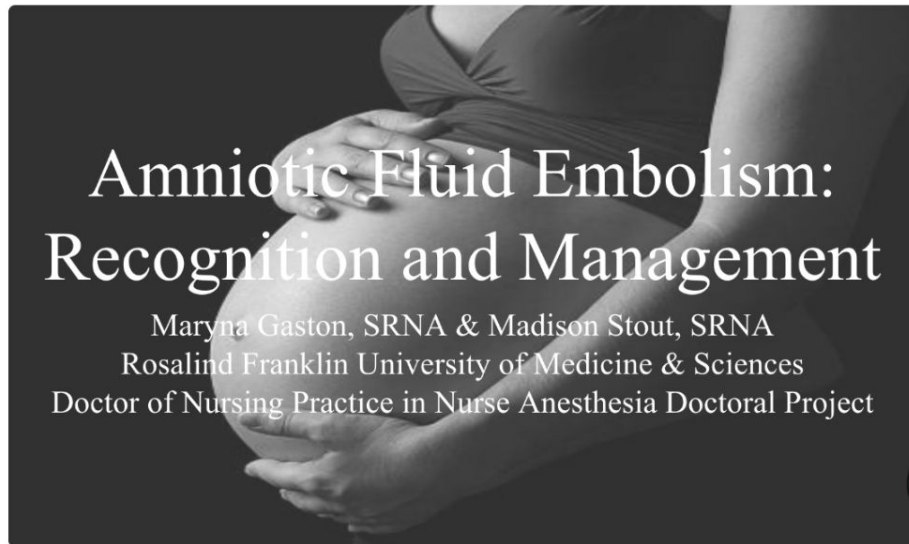
- A link to the education module was sent to all OB anesthesia providers, obstetricians, and labor and delivery nurses via email
- Providers were also notified of project in person

- **Participants**

- 42 providers were provided the link to participate
- 20 providers enrolled in the module
- 5 providers completed the module
 - 3 nurses, 1 obstetrician, 1 certified registered nurse anesthetist (CRNA), 0 anesthesiologists

Web-Based Education Module

Amniotic Fluid Embolism Recognition and Management



Introduction: 1 / 1

Introduction to AFE

[Start Lesson](#)

Module Content

01	Part One	<ul style="list-style-type: none">• AFE pathology overview• Progression of AFE• Statistics of AFE• The Problem AFE presents
02	Part Two	<ul style="list-style-type: none">• Associated risk factors• Signs and Symptoms• Diagnostic Criterion• Differential diagnoses
03	Part Three	<ul style="list-style-type: none">• AOK overview• AOK case studies
04	Part Four	<ul style="list-style-type: none">• Immediate management of AFE• Immediate treatment of AFE• Hospital-specific OB initiatives
05	Part Five	<ul style="list-style-type: none">• CA introduction• PDF copy of CA

AFE Cognitive Aid

AMNIOTIC FLUID EMBOLISM

RECOGNITION AND MANAGEMENT CHECKLIST

CONSIDER AMNIOTIC FLUID EMBOLISM IF THERE IS SUDDEN RESPIRATORY DISTRESS AND/OR CARDIOVASCULAR COLLAPSE IN A LABORING OR POST-PARTUM PATIENT

SIGNS & SYMPTOMS

CLASSIC TRIAD

HYPOXIA
HYPOTENSION
COAGULOPATHY

EARLY SYMPTOMS

ANXIETY
AGITATION
IMPENDING DOOM
CONFUSION

DYSPNEA
NAUSEA
VOMITING
FETAL DISTRESS

CALL RAPID RESPONSE # 5-5555
OBTAIN OB EMERGENCY CART

IMMEDIATE MANAGEMENT

1. **CALL FOR HELP** - IDENTIFY POSSIBLE AFE
2. SECURE AIRWAY, BREATHING, CIRCULATION (ABCs)
3. INITIATE AOK PROTOCOL (ATROPINE, ONDANSETRON, & KETOROLAC)
4. POSITION PATIENT IN LEFT UTERINE DISPLACEMENT
5. MONITOR FETAL HEART RATE
6. OBTAIN 2 LARGE BORE IVs
7. CONSIDER PLACING AN ARTERIAL OR CENTRAL LINE
8. COLLECT LABS
 - CBC, COAGS, FIBRINOGEN, BMP, ABG, TEG/ROTEM



IMMEDIATE TREATMENT

OXYGENATION

- **100% O2** VIA NON-REBREATHER OR ETT
- **INTUBATE** IF CONCERN FOR HYPOXIA OR PULMONARY EDEMA



HEMODYNAMICS

- **IV FLUID BOLUSES**
 - CRYSTALLOID/COLLOID
- **VASOPRESSORS**
 - PHENYLEPHRINE, NOREPINEPHRINE, EPHEDRINE, VASOPRESSIN
- **INOTROPES**
 - EPINEPHRINE, MILRINONE, DOBUTAMINE



COAGULOPATHY

- **INITIATE MTP** (CALL BLOOD BANK: **654-0807**)
- **ADMINISTER UTEROTONICS** IF NEEDED
- **ADMINISTER 1g TRANEXAMIC ACID**



ADDITIONAL TREATMENTS

- **HYDROCORTISONE IV BOLUS**
- **PULMONARY VASODILATORS** (ILOPROST, NITRIC OXIDE, SILDENAFIL)
- **EMERGENT DELIVERY OF FETUS**
- **ECMO OR BALLOON PUMP** FOR PATIENTS WITH REFRACTORY CARDIOGENIC SHOCK

DIFFERENTIAL DIAGNOSES

- MATERNAL HEMORRHAGE
- SEPSIS
- ANAPHYLAXIS
- LAST
- ECLAMPSIA
- EMBOLUS (PE, air)
- MI

Knowledge Assessment and Self-Efficacy Survey

Knowledge Assessment	Self-Efficacy Survey
<ul style="list-style-type: none">•10 question multiple choice questions with four possible answer choices	<ul style="list-style-type: none">•Modified after the PPHSE and tailored specifically to AFE
<ul style="list-style-type: none">•Questions written by the authors based on content provided in the education module	<ul style="list-style-type: none">•Eight statements using a continuous Likert Scale from 1 (never) to 8 (always)

RESULTS



Knowledge Assessment Scores (mean percentages)

Nurses (n=3)

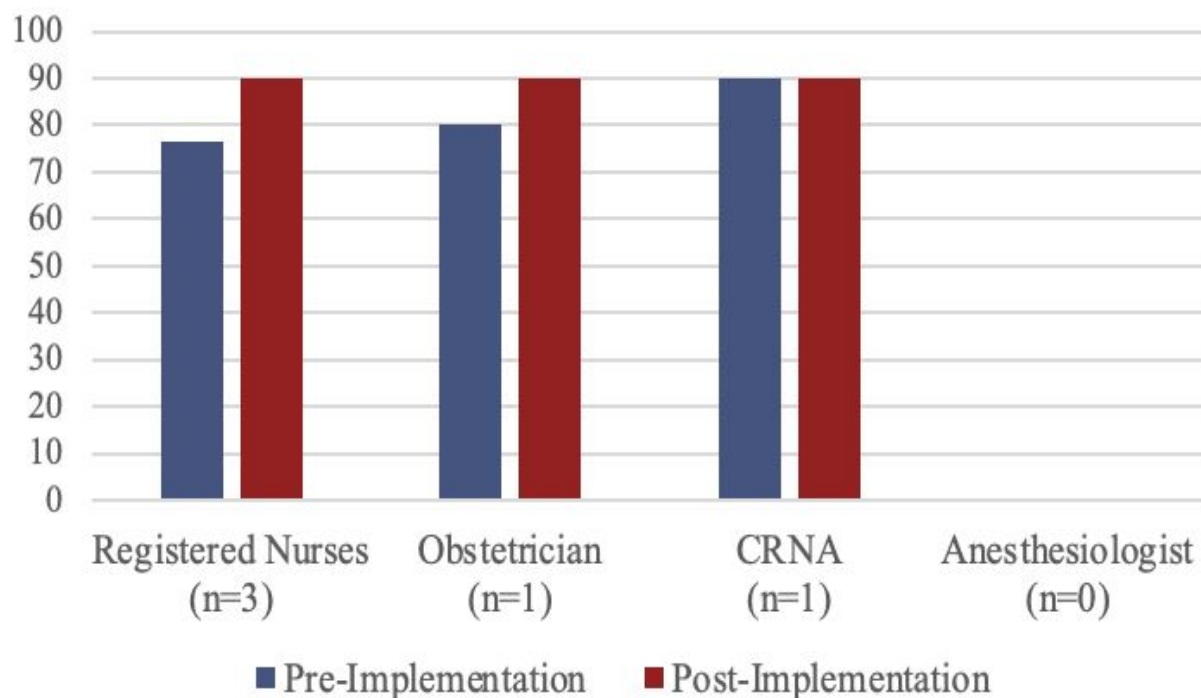
- Pre-test: 76.7%
- Post-test: 90%

Obstetrician (n=1)

- Pre-test: 80%
- Post-test: 90%

CRNA (n=1)

- Pre-test: 90%
- Post-test: 90%



Self-Efficacy Scores (medians)

Nurses (n=3)

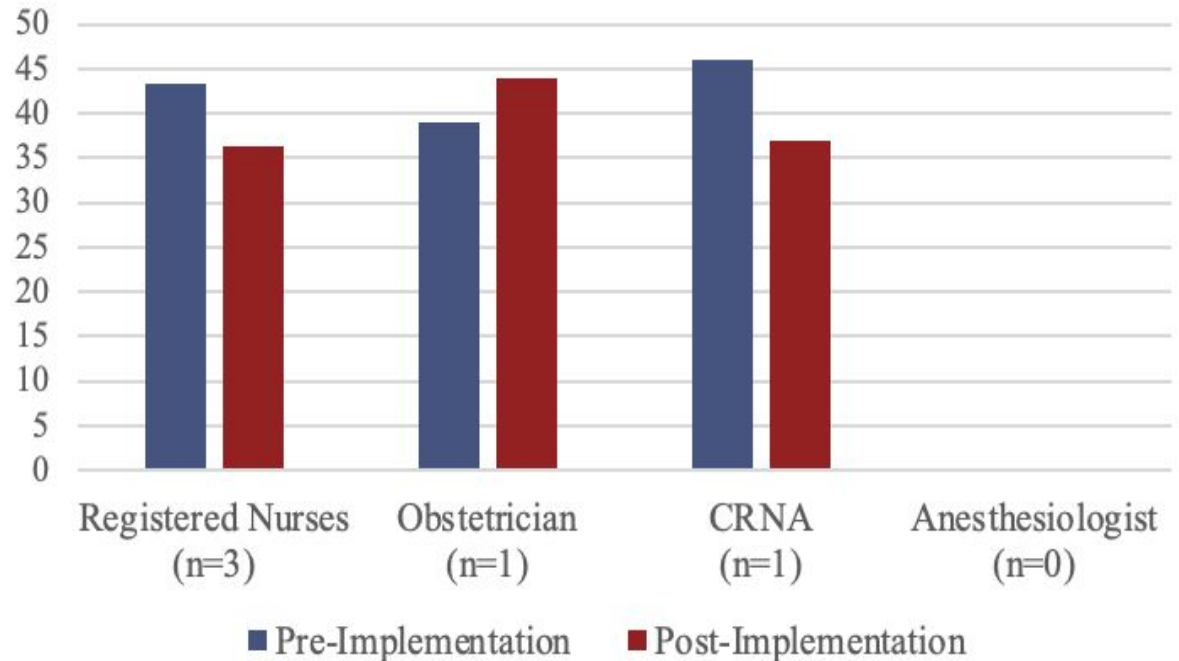
- Pre-test: 43.3
- Post-test: 36.3

Obstetrician (n=1)

- Pre-test: 39
- Post-test: 44

CRNA (n=1)

- Pre-test: 46
- Post-test: 37



Note: Medians reported, a lower score indicates higher self-efficacy

Barriers to Implementation

- Lack of engagement and participation
- Lack of participation incentive
- Time requirement
- Anesthesia group turnover
- Software issues



Clinical Impact and Sustainability

- Clinical significance in the absence of statistical significance reflected by overall increase in knowledge and confidence scores
- Staff encouraged to reference the physical CAs posted throughout OB unit and operating rooms
- Module and CA will be available free of charge for anyone to access at EBP Connect

Translation to Practice

- Educational modules and CAs have proven to be effective in increasing provider knowledge and confidence to perform in real-life crises
- CAs can provide a visual to more efficient, streamlined care and reduce the chance of human error in the event of an emergency
- Better outcomes due to individualized care and increased vigilance in at-risk patients

Recommendations to Improve Implementation

- Increased time frame for data collection to allow for larger sample size
- Implementation at a larger singular or multiple institutions
- In-person educational presentation with time dedicated to pre- and post-assessment completion to increase participation

References