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The Casserole Perimortem Caesarean Section Model

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ABSTRACT:

Audience: PGY 1-4 emergency medicine residents, PGY 1-4 obstetrics and gynecology (OB/gyn) residents and medical students intending to pursue these specialties.

Introduction: Perimortem caesarean sections (C-section) are infrequently occurring emergencies with far reaching repercussions for two patients (the fetus and the mother).¹ Emergency physicians and trainees should know the theory and practice of this life saving procedure. Perimortem caesarean section (PCS) have traditionally been taught to residents in didactic lecture formats. Residents rotating on Labor and Delivery are further required to attend cesarean deliveries as a means of achieving competency in performing this procedure. However, the procedural technique of PCS is different from scheduled or even emergency caesarian sections. A review of partial task training models has illustrated a relative paucity of easily reproducible and standardized PCS models.² Thus, we developed an easily reproducible, low cost high-fidelity PCS model to train emergency medicine residents and other trainees.

Objectives: At the end of this 1-hour activity learners will: 1) describe the indications, contraindications and complications of the PCS, and 2) demonstrate the performance of a PCS.

Methods: The PCS casserole model is a partial task trainer that has been designed with an aluminum turkey pan as a base, a gravid uterus designed from insulation foam and “Syn-Skin,” a subcutaneous layer made from gelatin and skin-colored latex. A baby doll simulates a fetus inside a turkey roasting bag with some plain water to simulate amniotic fluid.

Topics: Emergency medicine, obstetrics and gynecology, OB/gyn, perimortem caesarian section.



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Learner Audience:

Medical Students, Interns, Junior Residents, Senior Residents, Attending Physicians

Time Required for Implementation:

Assembly: 15 minutes hand-on time to assemble each PCS trainer

24 hours for Syn-Skin to set

Didactics: 5-10 minutes for learners to practice the procedure on the model

Recommended Number of Learners per instructor: 5-6 learners per instructor in the ideal case scenario. In our pilot, we had 6 learners per model. Each learner contributed to a step of the procedure from start to finish.

Topics:

Emergency medicine, obstetrics and gynecology, OB/gyn, perimortem caesarian section.

Objectives:

At the end of this 1-hour activity learners will:

1. Describe the indications, contraindications and complications of the PCS
2. Demonstrate the performance of a PCS

Linked objectives and methods:

Before the procedure laboratory, learners were expected to review pre-learning materials asynchronously. At the start of the procedure laboratory, learners are quizzed as a group on the indications, contraindications, and complications of the procedure by the facilitator to gauge learner readiness. This fulfilled objective 1 as listed above. Subsequently, learners collaboratively perform the procedure from the initial vertical incision to the delivery and umbilical cord clamping (objective 2 above). In the interest of time and resources, we paired six learners to a model and facilitator. Our senior learners (PGY3) were tasked with performing the procedure whereas the junior learners observed the procedure.* For optimal assessment of competence, one learner per model is preferred. Competence is assessed through direct observation of the procedure using an internally validated procedural checklist.

* The procedure laboratory is offered once every 12 months, and therefore, on a 36-month curriculum cycle, learners get 2 opportunities to observe and one opportunity to physically perform the procedure.

Models were launched on a group of 36 EM PGY1-3 residents who rated them on a 5-point Likert scale (1 least satisfactory to 5 most satisfactory). Half our learners rated the models 4/5 while the rest rated it 5/5. With respect to their comfort with performing the perimortem caesarian sections, 43% learners reported a comfort level of 3/5 and 4/5 on a 5-point Likert scale (1 least comfortable and 5 most comfortable).

Learners also commented on increasing the number of models for future labs. Future laboratories will focus on creating one model per senior (PGY 3) resident.

Recommended pre-reading for instructor:

1. Lew GH, Pulia MS. Emergency childbirth. In: Roberts JR, Custalow CB, Thomsen TW, et al. eds. *Roberts and Hedges' Clinical Procedures in Emergency Medicine*. 6th ed. Philadelphia, PA: Elsevier; 2014:1175-1176.
2. Roe JE III, Hang BS, Lyon D, Sanford JM. Perimortem cesarean delivery. In: Karjane NW, ed. Medscape. WedMD LLC. <http://emedicine.medscape.com/article/83059-overview#a1>. Published May 23, 2017. Accessed June 1, 2017.
3. Boyd A. Peri-mortem C-Section. CORE EM. <https://coreem.net/core/peri-mortem-c-section/>. Published December 2, 2015. Accessed June 1, 2017.
4. Weingart, S. EMCrit conference blast winner: perimortem C-section. EMCrit. <http://emcrit.org/wee/peri-mortem-c-section/>. Published February 12, 2013. Accessed June 1, 2017.

Learner responsible content (LRC):

1. Roe JE III, Hang BS, Lyon D, Sanford JM. Perimortem cesarean delivery. In: Karjane NW, ed. Medscape. WedMD LLC. <http://emedicine.medscape.com/article/83059-overview#a1>. Published May 23, 2017. Accessed June 1, 2017.
2. Boyd A. Peri-mortem C-Section. CORE EM. <https://coreem.net/core/peri-mortem-c-section/>. Published December 2, 2015. Accessed June 1, 2017.
3. Weingart, S. EMCrit conference blast winner: perimortem C-section. EMCrit. <http://emcrit.org/wee/peri-mortem-c-section/>. Published February 12, 2013. Accessed June 1, 2017.



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Implementation Methods:

1. Lew GH, Pulia MS. Emergency childbirth. In: Roberts JR, Custalow CB, Thomsen TW, et al. eds. *Roberts and Hedges' Clinical Procedures in Emergency Medicine*. 6th ed. Philadelphia, PA: Elsevier; 2014:1175-1176.
2. Weingart, S. EMCrit conference blast winner: perimortem C-section. EMCrit. <http://emcrit.org/wee/perimortem-c-section/>. Published February 12, 2013. Accessed June 1, 2017.
3. Pre-Lab Quiz Questions in small group open discussion.
4. Small group hands-on skills lab or high-fidelity simulation case.
 - a. Use PCS Critical Action Checklist during hands-on skills lab

List of items required to replicate this innovation:

1. Large Oval Aluminum Turkey Pans
2. Turkey Oven Roasting Plastic bags (Can use 1 gallon zipper storage bags also)
3. Zipties
4. Small baby doll
5. Heat Shrink Tubing
6. Carpet pad (We used Spillmaster 3/8-inch Gold Frothed Polyurethane Carpet Pad SKU 701-1306 from Menards)
7. Spray paint
8. Handheld industrial stapler
9. Towels
10. Gelatin
11. Skin colored latex
12. Duct tape or thick scotch tape
13. Marker
14. Scissors

Approximate cost of items to create this innovation:

Each model costs between \$15-20.

Detailed methods to construct this innovation:

1. Skin and Subcutaneous Tissue "Syn-Skin"
 - a. A thick layer of skin colored latex is smeared onto an 18" x 24" sheet of aluminum foil. The edges are turned up to create a giant well.
 - b. After it has dried overnight, gelatin mixed in warm water is poured over the aluminum foil. These are left to set for 2 hours.



2. The carpet pad is cut into 24" x 24" squares. Squares are spray painted flesh color. They are then folded into



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a funnel shape and stapled in the back to create a roughly conical "uterus" pocket. Excess foam is trimmed away.



3. Heat shrink tubing is inserted into the belly of a toy doll. The contraction is placed inside a turkey roasting plastic bag filled with a slight amount of water. The opening is sealed using zip-ties so that it doesn't leak.



4. The baby-plastic bag is placed inside the foam uterus. The top part of the foam uterus is sealed using staples.



5. The uterus is kept inside the turkey pan and stabilized on each side via rolled up kitchen towels or regular towels.
6. The Syn-Skin is removed carefully from the aluminum and placed on top of the turkey pan. Sides are folded down and taped at the bottom to create the gravid abdomen.



7. A belly button is drawn in using a permanent marker.
8. Final Product: <https://youtu.be/nm3M4XGbVyM>





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Results and tips for successful implementation:

Models should be used within 2 days; otherwise, the gelatin will start to decompose.

Make sure to cover to protect the floor where procedures will be performed because the fluid tends to leak similar to a real-life cesarean section. Finally, the turkey casserole can also be implanted within a birthing simulator and the procedure performed during a live high-fidelity simulation.

Implementation Video:

<https://youtu.be/nm3M4XGbVyM>

References/suggestions for further reading:

1. Lew GH, Pulia MS. Emergency childbirth. In: Roberts JR, Custalow CB, Thomsen TW, et al. eds. *Roberts and Hedges' Clinical Procedures in Emergency Medicine*. 6th ed. Philadelphia, PA: Elsevier; 2014:1175-1176.
2. Sampson CS, Renz NR, Wagner JC. An inexpensive and novel model for perimortem cesarean section. *Simul Healthc*. 2013;8(1):49-51. doi: 10.1097/SIH.0b013e318271489c
3. Roe JE III, Hang BS, Lyon D, Sanford JM. Perimortem cesarean delivery. In: Karjane NW, ed. Medscape. WedMD LLC. <http://emedicine.medscape.com/article/83059-overview#a1>. Published May 23, 2017. Accessed June 1, 2017.
4. Boyd A. Peri-mortem C-Section. CORE EM. <https://coreem.net/core/peri-mortem-c-section/>. Published December 2, 2015. Accessed June 1, 2017.
5. Weingart, S. EMCrit conference blast winner: peri-mortem C-section. EMCrit. <http://emcrit.org/wee/peri-mortem-c-section/>. Published February 12, 2013. Accessed June 1, 2017.



INSTRUCTOR MATERIALS

Perimortem Caesarian Section Pre-Lab Quiz Questions (Performed as a Small Group Open Discussion)

1. **What is the goal of perimortem C-section?**
 - Resuscitative hysterotomy is performed for the mother (not fetus) in cardiac/traumatic arrests.
2. **What are the indications of perimortem C section?**
 - Gravid patient in traumatic or cardiac arrest.
 - Fundal height above umbilicus or 24cm.
3. **What are the contraindications?**
 - Known GA < 24 weeks.
 - Spontaneous ROSC.
4. **What are the potential complications and how do you avoid them?**
 - Bladder injury (ideally place Foley prior to procedure to decompress bladder, but may not be possible depending on time).
 - Fetal injury (uterine walls are fairly thin, so make incisions using scissors not scalpel).
 - Hemorrhagic shock (avoid the lateral aspects of the abdominal wall when making incision and also when blunt dissecting down).
5. **What is the pathophysiology underlying perimortem C-section?**
 - Perimortem C-section decreases physiological demands on mother by:
 - Decompressing the IVC which leads to improved venous return and thereby improved maternal cardiac filling pressures.
 - Improved respiratory dynamics as diaphragm is lowered post procedure.
6. **What equipment is required to perform the procedure?**
 - Scalpel, large scissors, hemostat, sterile gauze or ED thoracotomy kit
 - Suction
 - Betadine
 - Sterile garb.
7. **What should you do prior to performing the perimortem C-section?**
 - Patient should ideally be intubated, on a monitor, with 2 large bore IVs and a Foley; however, none of these should delay the procedure beyond 5-minute post arrest.



INSTRUCTOR MATERIALS

Perimortem Caesarian Section Critical Action Checklist

Learner: _____

	Yes	No
1. Verbalizes the goal of PCS*		
2. Recognizes indications for PCS*		
3. Recognized contraindications for PCS*		
4. Describe the complications of PCS*		
5. Describes the pathophysiology underlying procedure*		
6. Verbalizes equipment necessary to perform procedure*		
* Items 1-6 are assessed using Questions 1-6 in Pre-Lab Quiz Questions/Small Group Discussion		
7. Verbalizes need for OB, Neonatal/Pediatrics notification		
8. Verbalizes need for continuous CPR		
9. Demonstrates application of a betadine bath		
10. Uses a 10-blade scalpel to make a vertical incision through abdominal wall from uterine fundus to symphysis pubis.		
11. Bluntly dissects through all abdominal wall layers down to the peritoneum		
12. Retracts abdominal walls laterally on either side		
13. Uses a scalpel to make small vertical incision through peritoneum and then extends it with a scissor.		
14. Uses a scalpel to make small vertical incision through lower uterine segment		
15. Pulls the uterine wall up using two fingers and then uses scissors to extend the uterine incision vertically to the fundus.		
16. Fetus: a) Delivers the fetus b) suction the nose and mouth c) clamps and cuts the cord.		
17. Performs procedure within 5 minutes.		