

Simulation Patient Design (July, 2020) Case of Eclampsia in L&D

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Introduction

Hypertensive disorders (preeclampsia and eclampsia) of pregnancy are a leading cause of maternal morbidity and mortality.¹ Although the incidence of eclampsia has decreased, most likely as a result of implementation of protocols to treat hypertension and administration of magnesium sulfate, the risk of maternal mortality is 0-1.8% in developed countries and up to 14% in developing countries.^{2,3} Compared to a standard operating room (OR) environment, labor and delivery (L&D) suites may be less prepared for emergency medical and airway management in the event of an eclamptic seizure.

The majority of patients commonly have symptoms and/or signs prior to the initial seizure (such as hypertension, headache, visual disturbances, or epigastric pain), however approximately 25% of patients may be asymptomatic prior to the seizure.⁴ Reported risk factors for eclampsia include young maternal age, nulliparity, multiple gestation, molar pregnancy, triploidy, preexisting hypertension, renal or cardiac disease, previous severe preeclampsia or eclampsia, nonimmune hydrops fetalis, and systemic lupus erythematosus.⁵ Maternal complications of eclampsia include pulmonary aspiration, pulmonary edema, cerebrovascular accident, cardiopulmonary arrest, venous thromboembolism, acute renal failure, and death.⁵ The leading cause of maternal mortality in patients with preeclampsia and eclampsia are cerebral causes (63%), followed by hepatic (32%) and pulmonary causes (5%).⁶

Early recognition and treatment is critical in this potentially life-threatening condition. Maintaining the patient's airway and decreasing the risk of aspiration are the initial priorities for the anesthesiologist, followed by treatment for hypertension and seizure control. For acute-onset, severe hypertension, treatment with first-line agents (e.g. labetalol 20 mg IV or hydralazine 5 or 10 mg IV, or immediate-release nifedipine capsules 10 mg PO (if the patient does not have IV access)) should occur within 30–60 minutes of confirmed severe hypertension in order to decrease the risk of maternal stroke.⁷ Magnesium sulfate is administered for seizure prophylaxis.⁸ Maternal and fetal hypoxia, maternal trauma and aspiration pneumonia are serious complications of eclampsia. Airway resuscitation and suction equipment should be readily accessible in labor rooms. Although the seizure may only last a few minutes, the patient should be placed in the lateral position with supplemental oxygen to prevent hypoxemia from hypoventilation.⁹ If there is an overarching reason to intubate the patient (which is very rare), adjunct drugs should be administered along with induction agents to decrease the heightened sympathetic response to laryngoscopy.¹⁰

Eclampsia is associated with increased perinatal mortality, and has been associated with placental abruption, severe fetal growth restriction, and extreme prematurity.⁵ As a result of maternal hypoxemia and lactic acidemia during a seizure, fetal bradycardia often follows a seizure. The fetal bradycardia usually recovers within 2 to 10 minutes, however if it persists longer than approximately 10 minutes, another cause of fetal bradycardia, such as placental abruption or imminent delivery, should be considered.¹¹ Eclampsia itself, is not an indication for cesarean delivery.

Educational rationale: To teach team skills in early recognition and management of eclampsia in an obstetric patient

Target audiences: Nursing, OB, Anesthesiology, OR personnel

Learning objectives: As per Accreditation Council for Graduate Medical Education (ACGME) Core

Competencies: Upon completion of this simulation (including the debrief), learners will be able to:

- *Medical knowledge:* Recognize eclampsia as an emergency and describe eclampsia management
- *Patient care:* List tasks in eclampsia management, including medication administration, airway protection strategies and fetal assessment
- *Practice-based learning and improvement:* Identify equipment and skills necessary to recognize and medically manage a patient with eclampsia
- *Interpersonal and communication skills:* Designate a team leader and effectively communicate with the L&D team utilizing closed loop communication
- *Professionalism:* Demonstrate mutual respect for the expertise of other team members
- *Systems-based practice:* Identify the location of the nearest bag-valve device and back-up airway equipment (e.g. video laryngoscope)

Questions to ask after the scenario:

1. What is the differential diagnosis for a somnolent laboring patient?
2. How was the response to the crisis managed?
3. Did each team member have well-defined roles?
4. Was it clear which steps needed to be taken by the team?
5. Was all the necessary equipment available?
6. Were any barriers identified when caring for this patient?
7. What is the treatment for eclampsia?
8. What factors would lead you to intervene with this patient's airway?
9. What factors might influence the decision for an emergent cesarean delivery?

Assessment Instruments:

1. Learner Knowledge Assessment (Appendix 1)
2. Simulation Activity Evaluation form (Appendix 2)

Equipment needed and set up:

In-situ L&D suite setup

Mannequin with fetal monitoring in place

18 g IV connected to IV fluid

Epidural catheter in-situ, connected to an epidural infusion

Foley catheter

Oxygen with face mask and Ambu bag

Suction with catheter

Monitors: Pulse oximetry, blood pressure, EKG

Magnesium sulfate

Airway equipment in airway box

Simulation Scenario set up:

The case

Ms. Susan Smith is a healthy 33-year-old G1P0 at 38 weeks gestation admitted for induction of labor due to gestational hypertension. Her baseline vital signs include: BP 146/94 mm Hg, HR 93/min, resp 15/min, and oxygen saturation 97% (on room air). She began her induction with a Foley bulb for cervical ripening 12 hours ago, followed with an oxytocin infusion 4 hours ago. Her current cervical exam is 4 cm/50%/-2. The patient had neuraxial labor analgesia with an epidural placed 3 hours ago and she has been comfortable since its initiation. Over the last 20 minutes, the patient has complained of feeling sleepy with blurry vision, and the nurse has just called you because she is concerned about the patient's somnolence.

Simulation pre-brief

- Read the scenario and instruct team members on their role during the simulation
- The learners take their places inside and outside of the labor room
- One nurse is at the bedside with the rest of the team outside
- Simulation driver plays the patient
- Confederate plays the patient's partner

Scenario Details

Trigger	Patient Condition	Action	Done	Time	Comments
Patient in labor bed Epidural running	Altered mental status Somnolent Complaining of blurry vision when prompted	1. Evaluate patient: Request vital signs, IV fluids, Foley catheter + labs (CBC, CMP, urinalysis) 2. Nurse monitors BP + fetal heart rate (FHR)			
Patient seizes (tonic clonic seizure) during evaluation	Seizure (2 min) Vitals undetectable during seizure Patient briefly apneic during seizure, then tachypneic with shallow breathing (resp 22/min) Sats drop to 85%	1. Request help Identify seizure as emergency Notify anesthesiology + OB teams 2. Place patient in lateral position 3. Anesthesia team manages airway with oxygen administration using an Ambu bag 4. Change to non-rebreather facemask when able 5. Team calls for suction set-up + advanced airway equipment 6. Request for magnesium sulfate bolus: Administer 6 g IV bolus IV (over 20 min), followed by 2 g/h infusion			

		<ol style="list-style-type: none"> 7. Stop epidural infusion 8. Discuss differential diagnosis 			
<p>Seizure ends</p> <p>FHR 155/min (with loss of variability)</p> <p>Confederate asks if patient needs to have a cesarean delivery</p>	<p>Patient is postictal Unresponsive for 5 min</p> <p>Sats 88% immediately post-seizure, but improve to 93% (on oxygen)</p> <p>BP 202/99 mm Hg HR 110/min Resp 18/min</p>	<ol style="list-style-type: none"> 1. Maintain patient in lateral position 2. Check vital signs: Patient placed on continuous monitoring (EKG, NIBP q2 min, SpO₂) 3. Discuss need for emergency cesarean delivery (due to FHR tracing?) 4. Continue oxygen administration + prepare for advanced airway 5. Continue magnesium infusion 6. Optimize maternal hemodynamics and positioning: BP, oxygenation, left uterine displacement 7. Assessment for airway injury/bleeding secondary to the seizure 			
<p>Patient regains consciousness, however she is drowsy</p> <p>FHR improved</p>	<p>Sats 95% (on oxygen)</p>	<ol style="list-style-type: none"> 1. Continue oxygen 2. Evaluate patient 			
<p>Resolution</p>	<p>Patient stabilizes: BP 140/88 mm Hg HR 90/min Sats 96% (on oxygen) Resp 12/min FHR 130/min</p> <p>Precipitous delivery</p>	<ol style="list-style-type: none"> 1. Discuss follow-up 2. Discuss the patient's disposition including: <ol style="list-style-type: none"> a) Continuation of magnesium therapy b) Vital sign monitoring and targets c) Anti-hypertensive goals d) Potential need for ICU care 			

Appendix 1

Obstetric Interdisciplinary Team Simulation

Name of simulation: _____

Date: _____

OB Nursing Anes

Each item has two components. The “Before the simulation” column (left side) examines your perspective at the beginning of the simulation. The “End of Simulation” column (right side) is to evaluate your perspective at the completion of the simulation.

1. How would you rate your knowledge of the differential diagnosis for altered mental status in a pregnant patient?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none					Knowledgeable		Little/none					Knowledgeable	

2. How would you rate your knowledge of risk factors for eclampsia?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none					Knowledgeable		Little/none					Knowledgeable	

3. How would you rate your knowledge of the location of emergency airway equipment closest to the labor rooms?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none					Knowledgeable		Little/none					Knowledgeable	

4. How would you rate your knowledge of eclampsia management?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none					Knowledgeable		Little/none					Knowledgeable	

5. How would you rate your knowledge of fetal heart tracings during and after eclampsia?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none					Knowledgeable		Little/none					Knowledgeable	

Appendix 2

SIMULATION ACTIVITY EVALUATION FORM

DATE OF SIMULATION: _____

OCCUPATION: Consultant PG Yr 1 2 3 4 STUDENT NURSE MIDWIFE OTHER

SPECIALTY: _____ YEARS IN PRACTICE: _____

Please rate the following aspects of this training program using the scale listed below:

1 = Poor 2 = Suboptimal 3 = Adequate 4 = Good 5 = Excellent

Use "N/A" if you did not experience or otherwise cannot rate an item

INTRODUCTORY MATERIALS

Orientation to the simulation	1	2	3	4	5	N/A
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PHYSICAL SPACE

Realism of the simulation space	1	2	3	4	5	N/A
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EQUIPMENT

Satisfaction with the mannequin	1	2	3	4	5	N/A
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SCENARIOS

Realism of the scenario	1	2	3	4	5	N/A
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Ability of the scenario to test <i>technical</i> skills	1	2	3	4	5	N/A
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Ability of the scenario to test <i>behavioral</i> skills	1	2	3	4	5	N/A
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Overall quality of the debriefing	1	2	3	4	5	N/A
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DID YOU FIND THIS USEFUL?

To improve your clinical practice?	1	2	3	4	5	N/A
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To improve your teamwork skills?	1	2	3	4	5	N/A
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To improve your VERBAL communication?	1	2	3	4	5	N/A
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To improve your NONVERBAL communication?	1	2	3	4	5	N/A
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FACULTY

Quality of instructors	1	2	3	4	5	N/A
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Simulation as a teaching method	1	2	3	4	5	N/A
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COMMENTS

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