

Authors: Ronak Shah, MD, Elvera Baron, MD, Daniel Katz, MD, Icahn School of Medicine at Mount Sinai
Editors: Sonal Zambare, MD, Kokila Thenuwara, MD, Stephanie Byerly, MD, Gillian Abir, MBChB

Introduction

It is important to recognize that a high neuraxial block or total spinal can occur following a spinal or an epidural placement. Thus, a high neuraxial block can occur regardless of the location of an epidural or spinal placement along the vertebral column. It is vital to recognize and appropriately manage a high neuraxial block, as it can be detrimental to both the mother and the fetus.

A high neuraxial block in obstetric anesthesia is defined as the spread of local anesthesia above T4 level. The symptoms and degree of severity vary based on how high up the spine the local anesthetic spreads. If left untreated, a high neuraxial block can progress to a total spinal. The term “total spinal” is used whenever there is loss of consciousness secondary to the intracranial spread of local anesthetic via the CSF.¹

As compared to a standard operating room environment, labor and delivery suites may be suboptimally prepared for emergency medical and airway management. Development of high neuraxial level or a total spinal simulation therefore, could lead to early recognition and appropriate treatment of this potentially life-threatening condition.

Educational Rationale: To teach team skills for early recognition and correct management of an obstetric patient who develops symptoms of high neuraxial block or total spinal

Target Audiences: Nursing teams, Obstetricians, Anesthesiologists, labor and delivery supporting 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:* Describe common signs and symptoms of high neuraxial block/total spinal in an obstetric patient
- *Patient care:* Describe events that could predispose a specific patient to development of a high neuraxial block/total spinal
- *Practice-based learning and improvement:* Identify the equipment and skills necessary to recognize and medically manage an obstetric patient who developed high neuraxial block/total spinal.
- *Interpersonal and communication skills:* Successfully designate an appropriate team leader, effectively and clearly communicate with labor and delivery teams to keep an obstetric patient and her baby safe
- *Professionalism:* Demonstrate mutual respect for the expertise of other team members
- *Systems-based practice:* Identify the location of the nearest bag-valve device, airway box, back-up airway equipment (e.g. video laryngoscope and fiberoptic scope), and code cart with

defibrillator. Name the contents of the airway box and recognize additional support personnel needed. Recognize existing barriers within the system (such as shortages of equipment, personnel, knowledge gaps, institution specific protocols) that need to be developed or modified to improve patient outcomes.

Questions to ask after the scenario:

- What was the response like during this crisis?
- Did each member of the team have well-defined roles?
- Were the steps that needed to be taken by the team clear?
- Was all of the necessary equipment readily available, and was it able to fit into the room?
- What were some of the barriers to caring for this patient?
- If the patient had a difficult airway, how would that be managed?
- In the event that the patient required emergent cesarean delivery, how would that be organized?
- How was the management of the partner?

Assessment Instruments:

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

Equipment needed and set up:

***In-situ* labor and delivery suite setup**

- Mannequin set up in left lateral decubitus position with fetal monitoring in place
- 18 Gauge IV in hand with Normal saline (that should contain an access port)
- Epidural catheter *in-situ*, currently connected to an ongoing epidural PCEA pump (does not have to be in the simulator, can be simply laid behind, or for full effect, can place the catheter tip in a small bag or container of clear fluid)

Simulation Scenario set up:

The case

Mrs. Dayna Demor is a healthy 32-year-old G1P0, who had her epidural placed in the seated position 45 minutes ago. Negative aspiration and test dose were documented in the medical record without any complications. The patient did not achieve complete relief with the initial medication bolus, and was given a second clinician bolus through the PCEA pump just prior to your arrival to “catch up”. The patient is now laying in the left lateral decubitus position.

Simulation pre-brief

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

Total Spinal Scenario

Trigger	Patient Condition	Action	Done	Time	Comments
In L+D suite, epidural has been placed and bolus is ongoing through PCEA pump	Lateral, table	1. Nurse is monitoring blood pressure q2 minutes			
		2. Nurse is monitoring fetal tracing			
Middle of epidural bolus	Lateral, unstable, extreme anxiety (partner also displays anxiety), blood pressure is trending down and patient is complaining of weakness and significant shortness of breath	1. Alert or activate emergency protocol <ul style="list-style-type: none"> <input type="checkbox"/> Notify anesthesiology team of maternal collapse <input type="checkbox"/> Notify obstetrical team of maternal collapse <input type="checkbox"/> Allocate team member to inform partner about situation 			
		2. Monitor patient and optimize room set up <ul style="list-style-type: none"> <input type="checkbox"/> Place patient on full monitors <input type="checkbox"/> Organize room to allow for easy entry of personnel and equipment 			
		3. Treat hypotension <ul style="list-style-type: none"> <input type="checkbox"/> Turn off epidural pump <input type="checkbox"/> Open fluids wide open/vasopressors <input type="checkbox"/> Obtain additional large bore IV access 			
		4. Treat shortness of breath <ul style="list-style-type: none"> <input type="checkbox"/> Elevate head of the bed <input type="checkbox"/> Place oxygen mask on patient with high-flow (10-15 L/min) oxygen <input type="checkbox"/> Assess for weakness in the hands 			
Impending airway collapse	Patient progresses to unresponsiveness, dilated pupils	<ul style="list-style-type: none"> <input type="checkbox"/> Airway and cardiovascular intervention if necessary <input type="checkbox"/> Obtain airway box/backup airway equipment <input type="checkbox"/> Obtain code cart <input type="checkbox"/> Assist ventilation with bag-valve mask if necessary <input type="checkbox"/> Intubate with RSI when 			

		respiratory failure imminent <input type="checkbox"/> Continue to monitor for fetal distress			
Resolution	Patient stabilizes after intubation, scenario ends after discussion of next steps	<input type="checkbox"/> Aspirate from catheter for diagnosis (may still be negative) <input type="checkbox"/> Discuss patient disposition and need for cesarean delivery			

Appendix 1

Obstetrics Interdisciplinary Team Simulation

Name of simulation: _____

Date: _____

OB Nursing Anes Support Personnel

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 signs and symptoms of high neuraxial block/total spinal?

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 the location of the emergency airway box?

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 the backup airway equipment?

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 the location of the code cart?

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 and role in the management of an obstetric patient who developed high neuraxial block/total spinal?

BEFORE THE SIMULATION						END OF SIMULATION						
1	2	3	4	5	6	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 simulator	1	2	3	4	5	N/A
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PHYSICAL SPACE

Realism of the simulator 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 scenarios	1	2	3	4	5	N/A
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Ability of the scenarios to test technical skills	1	2	3	4	5	N/A
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Ability of the scenarios to test behavioral skills	1	2	3	4	5	N/A
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Overall quality of the debriefings	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

References

1. Hermanowski, Jane, and Aditi Modi. "High Regional Block (Including Total Spinal Anesthesia)." *OAA*, West Suffolk NHS Foundation Trust, Apr. 2017, www.oaa-anaes.ac.uk/High_Regional_Block.