

Bradycardia Simulation Scenario

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Scenario Overview

Name of Scenario: A five-year-old patient with Down syndrome experiencing hemodynamically significant bradycardia during an inhalation induction.

Learning Objectives of Scenario:

Cognitive:

1. Describe the differential diagnosis of bradycardia during an anesthesia induction
2. Recognize that hemodynamically significant bradycardia needs immediate chest compressions/pharmacologic intervention
3. Describe management of hemodynamically significant bradycardia with/without IV access
4. Evaluate the need for further management/case cancellation in a patient who has been successfully treated for bradycardia

Technical:

1. Demonstrate effective task prioritization in a bradycardic patient without IV access or a secure airway
2. Demonstrate effective use of pharmacologic therapy for management of bradycardia
3. Demonstrate the effective use of PALS guidelines for resuscitation
4. Demonstrate effective administration of chest compressions
5. Demonstrate effective crisis management in a simulated setting

Behavioral:

1. Demonstrates effective communication with OR team throughout case
2. Recognizes when and whom to call for help

Patient Description:

History

A 6 year old 20 kg female with Down syndrome and OSA presents for T & A. No cardiac history. No atlantoaxial instability. Prior duodenoduodenostomy as an infant without complication.

Medications – none

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SH – duodenoduodenostomy

Baseline vital signs – prior to induction: 36.7 C, HR 95, BP 95/43 RR 19 SpO₂ 100% 19kg

Baseline lab values: None

Target Learners – Pediatric Anesthesia Providers

Anticipated Duration: 8-10 minutes

Debriefing Time (30 minutes)

Scenario Set-up

Room configuration – OR set-up

Equipment Needed: Anesthesia machine with pediatric circuit, pediatric drug cart, pediatric airway equipment, IV setup and equipment, drugs in syringes (atropine, epinephrine, glycopyrrolate, propofol, rocuronium, fentanyl)

Mannequins/task trainer/standardized patient needed – child sized mannequin

Expected Scenario Flow

The scenario begins in the OR with the patient (who has been premedicated with oral midazolam 9 mg). All monitors are in place, and the patient is about to undergo an inhalation induction. You are taking over the room for your post-call colleague who was up all night taking care of a patient undergoing a craniotomy.

Learner anesthesiologist now enters the room, just after the resident begins the induction with an inhaled mixture of 8% sevoflurane and 60% nitrous oxide. Colleague (confederate anesthesiologist) thanks the learner anesthesiologist as he/she exits the OR to go home. Within 10 seconds of the confederate anesthesiologist leaving the room, the patient's HR decreases audibly from 95-50. Initial vital signs are otherwise stable. The learner can see adequate chest rise and the child already has an oral airway in place.

The patient is currently without an IV or a secure airway. Over the next minute the HR continues to decrease to the 30s and the BP falls. EtCO₂ decreases and the SpO₂ tracing is lost. The scenario progresses to asystole and PEA.

The surgeon asks, "What's going on? Why does the patient look like that (grey)?" The Learner/hot seat anesthesiologist must assess the situation, formulate a differential diagnosis, assure themselves the patient is ventilating adequately and rule out hypoxia, IV medication effects, or a vagal response. IM atropine can be given at any point prior to IV access (learner should state the doses out loud, epinephrine should be given if the patient is unstable). The surgeon continues to ask what's going on and to ask the anesthesiology team to "put the tube in so he can get started." The anesthesiologist must obtain IV access and assure him/herself of continued adequacy of ventilation (she can continue to

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have the resident mask ventilate or intubate after IV access is acquired) and turn off the inhalational agent as well as place the patient on 100% FiO₂.

Depending upon the timing of interventions, the scenario may continue to PEA or asystole. Prompt intervention can stabilize the patient prior to cardiac arrest. If available, the learner should set the AED to the correct setting as well.

For either outcome further discussion with the surgeon can focus on whether or not to proceed with the case.

Expected Interventions of Learner

The Learner recognizes the bradycardia

Situation is evaluated effectively – i.e. hemodynamic significance of bradycardia is sought (BP, notes etCO₂ tracing, notes SpO₂ tracing)

Cause of bradycardia is identified (hypoxia and vagal response ruled out)

Sevoflurane turned off and 100% FiO₂ provided.

The Learner calls for help

Chest compressions are initiated appropriately

If no IV access, IM medications are given. IO access may be considered as well.

The Learner obtains IV access and secures the airway.

Epinephrine is given

Pacing may or may not be mentioned

Interventions of Advanced Learner

Prompt recognition and treatment of bradycardia without patient deterioration

The surgeon's interference is dealt with effectively and professionally

Discussion with surgeon about proceeding with case VERSUS cancelling case

Expected Endpoint of Scenario

Recognition and treatment of bradycardia, recognition and treatment of deterioration/PEA/asystole

Scenario Distractors

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The surgeon is actively distracting the anesthesiologist throughout the scenario.

Scenario Debrief

How was this similar to/different than cases of bradycardia that you have experienced in real life, in simulation, or heard or read about?

How readily evident was it that the bradycardia was NOT due to hypoxia?

If applicable - do you feel comfortable initiating chest compressions?

Did this simulation provide you with any new information?

Did this simulation identify a gap in your knowledge base or skill set? If yes would you please provide an example?

References:

Mason KP & Lonnqvist PA. Bradycardia in perspective – not all reductions in heart rate need immediate intervention. *Pediatr Anesth* 2015, 25: 44-51.

Kraemer FW, Stricker PA, Gurnaney HG, McClung H, Meador MR, Sussman E et al. Bradycardia during induction of anesthesia with sevoflurane in Children with Down Syndrome. *Anest Analg* 2010; 111: 1259-1263.

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