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Apnea in Beach-Chair Position Status Post Interscalene Block: A Simulation Case for Anesthesia Residents

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Abstract

Introduction: Regional anesthesia is commonly performed for orthopedic operations, especially in situations when general anesthesia is preferably avoided. Anesthesia residents should understand the complications of regional procedures and should know how to treat them if treatment is warranted. This simulation involves a 60-year-old man who became apneic in the beach-chair position following an interscalene block for rotator cuff repair. It presents trainees with the opportunity to further their learning with regard to perioperative management and associated complications of patients receiving brachial plexus blocks. **Methods:** This simulation is designed to be delivered in a single, 1-hour session. Materials contained within this simulation include a case template, a checklist of critical actions, a brief summary for key takeaways, and an evaluation form. At the conclusion of this simulation and debriefing session, the learner has had the opportunity to demonstrate progress in several of the anesthesiology milestones outlined by the Accreditation Council for Graduate Medical Education and the American Board of Anesthesiology in the Anesthesiology Milestone Project as they relate to this particular clinical topic. **Results:** At the time of this submission, a total of 15 junior residents had completed this simulation. Commonly missed critical actions included difficulty of management of analgesia in a block that is not complete and correlation between noninvasive blood pressure on the arm and cerebral perfusion pressure. Learners' comments were generally positive, indicating the residents felt this simulation was a worthwhile learning experience. **Discussion:** The majority of anesthesia residents who have participated in this simulation were able to properly address apnea in the beach-chair position following a brachial plexus block. It is expected that this simulation will be performed approximately 15-20 times annually.

Keywords

Anesthesia, Chronic Obstructive Pulmonary Disease, Regional Anesthesia, Intraoperative Apnea, Difficult Airway Algorithm, Cerebral Perfusion Pressure, Cerebrovascular Circulation, Regional Anesthesia Complications, Conduction

Educational Objectives

By the end of this simulation, the learner will be able to:

1. Discuss relevant risk factors of performing an interscalene block in patients with chronic obstructive pulmonary disease (Anesthesia Milestones [AM]: Patient Care [PC] 1, PC 3, PC 7, PC 10).
2. Formulate an anesthetic plan (general anesthesia vs. monitored anesthesia care; AM: PC 1, PC 2, PC 3).
3. Maintain cerebral perfusion pressure in the beach-chair position (AM: PC 4, PC 5, PC 9).
4. Manage an airway in the beach-chair position (AM: PC 4, PC 5, PC 8).

Introduction

In a patient with multiple comorbidities undergoing a surgical procedure, there are several ways anesthesia and analgesia can be provided. Anesthesia residents should be able to weigh the advantages and disadvantages of each option and construct an anesthetic plan. In this simulation, regional anesthesia

Appendices

- A. Simulation Case.docx
- B. Supplemental Materials.docx
- C. Critical Actions.docx
- D. Debriefing Materials.docx
- E. Evaluation Form.docx
- F. Resources That Informed the Submission.docx

All appendices are peer reviewed as integral parts of the Original Publication.

is preemptively chosen, but the different anesthetic plans can be discussed at the beginning of this simulation.

Regional anesthesia is commonly performed for orthopedic operations, especially in situations when general anesthesia is preferably avoided. Anesthesia residents should understand the complications of regional procedures and should know how to treat them if treatment is warranted.

All anesthesia residents should have a strong clinical working knowledge of the Difficult Airway Algorithm¹ (created by the American Society of Anesthesiologists). This simulation tests knowledge of this algorithm in an uncommonly encountered situation, increasing the level of difficulty of the simulation. There are various topics of discussion and education included in this simulation, and the simulation can be personalized for each learner depending on the learner's level of knowledge and training, as well as the instructor's areas of specialty.

Simulation objectives address several of the anesthesiology milestones outlined by the Accreditation Council for Graduate Medical Education and the American Board of Anesthesiology in the Anesthesiology Milestone Project.² Specific anesthesia milestones addressed include Patient Care 1, Patient Care 2, Patient Care 3, Patient Care 4, Patient Care 5, Patient Care 7, Patient Care 8, Patient Care 9, and Patient Care 10.

Methods

The case is fully presented for facilitators in the simulation case file (Appendix A). Optional supplemental materials (Appendix B), including laboratory values and an EKG, are available at the request of the learner during the simulation. A separate critical actions checklist (Appendix C) is also included for learners to reference while running the simulation. A list of resources that informed the creation of this simulation is also included (Appendix F).

The case begins preoperatively with the learners given the patient history. They are allowed to ask further questions. Learners should discuss the benefits and risks of performing an interscalene block in a patient with chronic obstructive pulmonary disease and poor respiratory functional status. The case then moves to the simulated operating room.

Equipment/Environment

Access to a SimMan or other medical simulator is beneficial. Other useful equipment includes simulated real-time vital signs monitoring with blood pressure cuff, capnograph, pulse oximeter, EKG, and temperature probe, and airway supplies including nasal cannula, oral/nasal airways, supraglottic airways, endotracheal tubes, and laryngoscopes. The environment is set up to mimic that of an operating room with all associated supplies to lend a degree of realism to the situation.

Personnel

In addition to the instructor facilitating the simulation, it is beneficial to have a technician for the medical simulator to provide changes in patient status and vital signs in real time. It is recommended that the facilitator and technician discuss the case in its entirety before the simulation is performed. The simulation has been run with one learner at a time; it could be possible to incorporate more learners at a single session.

Assessment

Learners are assessed on items that are critical to quality care; these items include both critical actions that need to be taken regarding diagnosis and treatment and avoidance of critical pitfalls. The critical actions checklist was created during evaluation of the step-by-step process of the simulation with the goal of providing a list of the most essential steps in caring for the stimulated patient. At times, a learner may take inappropriate steps or pursue an undesirable course of action and then follow a best-case scenario as per the technical guide, or the simulation may be modified at the discretion of the instructor.

Debriefing

Following the completion of this simulation, it is recommended that the learner first be given the opportunity for self-reflection, with questions such as “How do you think the case went?”, “What do you think you did well?”, and “What do you think is an area where you could improve?” The instructor then discusses the critical actions checklist with the learner, pausing to ask questions that encourage discussion and further learning. Desired learner actions and behavior are discussed. When the discussion is complete, the debriefing materials (Appendix D) may be discussed and then presented to the learner as a handout. Finally, the evaluation form (Appendix E) should be distributed to learners for their impressions of the session.

Results

At the time of this submission, a total of 15 junior residents have completed this simulation, with necessary modifications made based on feedback. All of the junior residents who completed this simulation were more than 3 months into their CA-1 anesthesiology residency and had not yet completed an acute pain service rotation. Commonly missed critical actions included difficulty of management of analgesia in a block that is not complete and correlation between noninvasive blood pressure on the arm and cerebral perfusion pressure. Learners felt content was worthwhile, and comments were generally positive, indicating the residents felt this simulation was a worthwhile learning experience. In our simulation center, it is expected that this simulation will be performed approximately 15-20 times annually.

Discussion

The majority of anesthesia residents who have participated in this simulation were able to properly address apnea in the beach-chair position following a brachial plexus block. Those who made mistakes left the simulation (following debriefing) feeling that they would be able to appropriately manage this (or a similar) situation should it occur.

The main challenge for this simulation, at least at our center, is not being able to position our mannequin in a beach-chair position turned 90° away from the trainee. The trainee must be informed of the patient's position, which makes the simulation not as lifelike as it could be; however, this may not pose a problem at other simulation centers.

This simulation should take approximately 1 hour, with a 5-minute orientation to the case, a 20- to 30-minute simulation, and a 20-minute debriefing.

This simulation could be adapted to include advanced learners with the inclusion of crisis resource management discussion points. Because this simulation is designed for beginner CA-1 residents, such a discussion would likely not fit into a 1-hour session.

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Ethical Approval

Reported as not applicable.

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