PBLD Table 1

Title: Straightening out your life can be difficult: incision and drainage after a VEPTR placement.

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Goals:

1. Differentiate how complex patients may require increased preoperative preparation and optimization even for outpatient procedures when compared to their simpler counterparts.

2. Discuss how simulation training can reduce stress and anxiety surrounding code scenarios and deteriorating clinical situations.

3. Discuss how having checklists for the most common emergencies may help during emergency.

Case: 8 year old, 25 kg boy with muscular dystrophy returns to the operating room after VEPTR (vertical expandable prosthetic titanium rod) placement for incision and drainage of an abscess and possible hardware removal. The case is an add-on (after scheduled cases) to begin approximately at 5:30 PM when only three anesthesia attendings are present. A CA2 in his first pediatric anesthesia rotation is assigned that room.

The patient arrives with stable vital signs with BP 100/60 mmHg, HR 87 bpm, RR 18 breaths/minutes, and oxygen saturation of 100% on room air. A tracheostomy is in place and a Broviac catheter is accessed.

Following intravenous induction with propofol, the circuit is attached and sevoflurane started at 2%. The patient is positioned prone and all pressure points padded. The surgeon begins the procedure. The attending anesthesiologist leaves the room to start another case.

After a few minutes, the surgeon shouts"oops!" The pulse oximeter starts plummeting downward. The nurse pushes the code blue button. The patient is turned supine. The attending rushes into the room at this point.

The end tidal CO2 tracing disappears. It is suddenly realized the Broviac has been pulled out during the turn. The attending positioned at the head of the bed places a 14 gauge angiocatheter into the second intercostal space on the left side as a chest radiograph is ordered stat. The other 2 anesthesia attendings rush into the room. IV access is attempted without success. An intraosseous device is called for. Epinephrine is given via IO. Pulse is lost and the HR drops to the 30 beats/minute. Oxygen saturation is 20%. CPR is started. Chest compressions result in a small return of CO2 tracing.

The pediatric general surgeon comes in and places bilateral chest tubes. Blood pressure and heart rate return to normal. A 5 french double lumen central line is placed in the left femoral line and a 22 gauge left radial arterial cannula placed. The patient is turned prone. The orthopedic surgeon resumes surgery. The rest of the case continues without incident. The patient is transported on monitors to the pediatric intensive care unit (PICU).

Key Questions

1. Does timing of case impact preoperative preparation?
2. Does the semi-urgent nature of case preclude a proper assessment?
3. Is the Broviac and standard ASA monitors adequate for the case?
4. How do you handle the tracheostomy in prone case?
5. How do you handle acute decompensation in prone situation?
6. Is simulation training with common emergencies helpful with regards to real case scenarios?
7. Is simulation training common in your hospital?
8. What is the role of checklists?
9. Does your OR have ready access to IO devices?

- Does timing of case impact preoperative preparation?

  Timing and emergent nature of surgery makes a difference in patient outcomes. Poor surgical outcomes have been attributed to multi-factorial human as well as organizational factors.[1] The time of day also plays a role.[2] 25% of errors happened in the preoperative phase and 66% occurred in the intra-operative phase.[1] 40% happened between 5 PM and 7 AM. Interestingly most errors happened during non-emergent care (77%). Also, it was found that emergency care accounted for more system failures.

- Does the semi-urgent nature of the case preclude a proper assessment?

  It has been found that almost 25% of errors during surgeries occurred preoperatively[1] A concise preoperative assessment is important. Obviously patient factors that can impact the case should be addressed. Allergies,

medications, underlying co-morbidities, and weight should be the bare minimum information obtained.

- Are the broviac and standard ASA monitors adequate for the case?

  If patient starts off as a difficult access, the patient will always remain a difficult access. Most pediatric anesthesiologists will attempt to place another peripheral access given patient positioning and the magnitude of the case involved. If standard peripheral access fails, ultrasound guided placement of a peripheral cannula may be helpful and is becoming more common in our practice.
  Standard ASA monitors are probably adequate as long as the blood pressure is able to be obtained.

  The patient position also impacts adequacy of monitoring and the choice for intravenous access.

- How do you handle the tracheostomy in prone case?

  It has been shown that prone positioning should not affect the ventilation of critically ill children for long periods of time.[3] However, careful attention should be placed on pressure points and to ensure adequate seal of the airway. There should not be a profound leak affecting oxygenation and ventilation. A cuffed tracheostomy tube is generally suggested. Alternatively, the tracheostomy can be removed and a cuffed, wire-reinforced tube placed through the stoma.

- How do you handle acute decompensation in the prone position?

  Unfortunately, the prone position is common in various neurosurgical and orthopedic cases for surgical access and proper exposure. Although uncommon, severe hypotension and cardiac arrest can occur and re-positioning the patient into supine position may not be an option.

  An alternative is to consider the "reverse pericardial compression".[4] The palms should be placed on each side of the spine at the scapular level. It is felt blood flow is provided due to thoracic pump mechanism.[5]
  Although it is still felt that CPR should be optimally performed in the supine position. Prone position CPR is a reasonable alternative if turning patient and timing a concern. CPR should be initiated immediately in the prone position, while consideration is given to turning the patient supine.

- Is simulation training with common emergencies helpful with regards to real case scenarios?

  The American Society of Anesthesiologists supports national centers for simulation to help the practicing anesthesiologist take advantage of simulation training.[6] Simulation training is also a mandatory component of the ABA MOCA (maintenance of certification in anesthesiology) program. [7] Simulation training has also been proven superior to problem based learning discussion (PBLD).[8]

- Is simulation training common in your hospital?

  There are eight factors important in the success of any simulation program. These are science, staff, supplies, space, support, systems, success, and sustainability.[9]

- What is the role of checklists?

  Levels of cognitive function are at risk with increasing stress and fatigue. Many high intensity fields such as aviation, aeronautics, and product manufacturing heavily rely on checklists to reduce error.[10] Check lists can serve multifunctional roles: memory recall, standardization of processes, providing a framework for evaluations, or as a diagnostic tool. The main reason for checklists remain to reduce error and adhere to best practice.[10]

  These medical errors are costly and not small. 44,000-98,000 deaths annually have been attributed to medical error costing about $17-29 billion.[11]

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