

## Different Emergencies in the Operation Room (OR)

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**Emergencies in the operation room (OR) are uncommon. However, if and when they occur, prompt diagnosis and immediate management are necessary to prevent morbidity and mortality. Most emergencies occur unexpectedly, while some are missed in the initial period due to human error and poor communication etc. Different emergencies encountered in the operating room are discussed in this article.**



## Classification of Emergencies in the Operation Room

An anesthesia provider requires a combination of skills, such as anatomical knowledge of the airway, knowledge of the varied pharmacologic agents used, along with their effects and interactions, drug titrations, ability to manage stress and provide relief to an anxious, often critically ill patient. There can be several anesthesia-related emergencies in the operating room and they can be classified as follows:

## Drug induced

- [Malignant hyperthermia](#)
- [Anaphylaxis](#)
- Hyperkalemic arrest

## Patient related

- Difficult airway
- Aspiration
- Laryngospasm
- Massive hemorrhage
- Brain swelling - increased intracranial pressure
- Ischemic cardiac disease

## Iatrogenic (doctor induced)

- Incorrect drug administration
- Incorrect dose administration
- Incorrect site of surgery
- Incorrect surgery
- Hemorrhage

# Drug-Induced Emergencies

**Anesthesia agents** (e.g. muscle relaxants) and **medications** (e.g. [antibiotics](#)) can lead to anaphylaxis, malignant hyperthermia and hyperkalemic cardiac arrest in the operation room.

It is imperative for the anesthesia provider to **promptly identify the condition** and start treatment. For example, if muscle rigidity is noticed during intubation accompanied by tachycardia, cyanosis, and hyperthermia, then malignant hyperthermia should be suspected and immediate management instituted with **hyperventilation, active cooling, dantrolene** etc.

**Anaphylaxis** to a drug can manifest as **skin rash** and **bronchospasm**. It should be managed with the administration of subcutaneous epinephrine, corticosteroids and adequate oxygenation while monitoring the airway.

## Drug Induced

Malignant Hyperthermia – Diagnosis and treatment



< 1: 1,000,000

**Autosomal dominant genetic disorder** – extremely rare



80-90%

**Very dangerous** when it occurs – **80-90% mortality without proper treatment**



90%

**When treated appropriately** – **90% cure rate** so the anesthesiologist must recognize it

## Patient Related Emergencies

### Difficult airway

A difficult airway should be anticipated in patients who are **obese**, have a **short, broad neck, medical co-morbidities** or **upper airway tumors** or **maxillofacial fractures/deforities**.

In all such cases, a **preoperative plan for alternative airway** in an emergency like tracheal intubation/cricothyrotomy/tracheotomy should be in place. Flexible laryngoscopes, airway bougies, and equipment for emergency airway intubation should be kept ready.

### Aspiration

A patient without adequately functioning airway reflexes due to a **recent meal** (inadequate starvation period), **delayed gastric emptying** (bowel obstruction, pregnancy, pain or opiates) can regurgitate gastric contents into the airway and **lungs** during induction of anesthesia.

It is imperative for the anesthesia provider to place a **nasogastric tube** to remove gastric contents prior to induction, apply adequate cricoids pressure during intubation and extubation to prevent aspiration.

### Laryngospasm

Patients, especially **children**, are very sensitive to airway manipulation which can lead to laryngospasm. Other causes of laryngospasm are **blood**, or secretions on the vocal cords, surgical stimulation or failure to provide an anesthetic agent.

## Massive hemorrhage

This can occur unexpectedly during a surgical procedure if a blood vessel is accidentally severed or in cases of trauma wherein the patient is brought to the operating room with blunt trauma to the abdomen.

In all cases of hemorrhage, whether anticipated or unanticipated, anesthesia providers should anticipate and request for **crossmatched blood and blood products**, as well as **colloidal fluids**, and ensure that the correct product is used in the patient to prevent **anaphylaxis**.

## Pulmonary edema

**Pulmonary edema** can develop if **excessive fluids/blood products** are administered to a hemorrhaging patient or if the patient has other medical co-morbidities at the onset of surgery.

Anesthesia providers should monitor the amount of fluids being administered, as well as the airway secretions (frothy pink secretions in pulmonary edema) being suctioned through the **endotracheal tube**.

## Brain swelling – increased intracranial pressure

Although the exact etiology of cerebral edema during surgery is not known, it is encountered commonly during **neurosurgical procedures**. The etiology is believed to be multifactorial with **subarachnoid hemorrhage** or **intraventricular hemorrhage** leading to **acute intracranial hyperemia** and **cerebral edema**.

The anesthesia provider should anticipate this event in all surgeries, but especially during neurosurgical/head trauma surgeries and plan for the management of such events.

## Ischemic cardiac disease

The stress of a surgical procedure can trigger **myocardial ischemia** in susceptible high-risk patients. **Intraoperative cardiac monitoring** helps to detect signs of ischemia and appropriate oxygenation and measures can be instituted to prevent disasters.

## Iatrogenic Emergencies

### Incorrect drug administration

Before and during the surgical procedure, drugs may be administered accidentally due to **wrong labeling, human fatigue/inattention**. This can be avoided by repeated checking and confirming the medication labels, avoiding too many unnecessary medications on the anesthesia machine, adequate rest for the providers and watching for miscommunication during hand-offs.

### Incorrect dose administration

This can be a disastrous complication, especially in the case of drugs whose doses are weight dependent or in pediatric/elderly patients or patients with renal or hepatic disease.

## Incorrect site of surgery/incorrect surgery

This is a sentinel event and its incidence has increased in recent years. To prevent this from occurring, the following measures have been recommended:

- Accurately identify patient prior to surgery with two patient identifiers and a “time-out” procedure.
- Pre-operatively verify the correct patient, surgical procedure and site of surgery from patient documents and implement the process of marking the surgical site with the involvement of the patient and their relatives/family.

## Hemorrhage

This can occur due to **inadvertent severance of a blood vessel** during the surgical procedure. This can only be prevented by **preoperative surgical planning**, knowledge of the **relevant anatomy**, identification of **anatomical structures during surgery** methodically and **requesting for help** as needed in an emergency before disaster strikes.

A surgeon can communicate their concern to the anesthesia provider and ensure that adequate fluids and blood products are transfused to **maintain blood/plasma volume**.

## Checklist to Minimize Different Emergencies in the OR

Although certain emergencies are sudden and without apparent cause, the anesthesia provider can **pro-actively** do the following to minimize nasty operating room surprises:

Evaluate the patient pre-operatively with a **thorough history and physical examination**. A detailed history will provide information about **medications** taken by the patient currently, **current medical conditions**, **previous history of allergies**, and **response to anesthesia** for surgical procedures, as well as a **family history of medical conditions/response to anesthesia** (e.g. delayed recovery from anesthesia).

A physical examination will exclude **difficult airway** and **comorbid medical conditions**. If either of these situations is present, then the provider can plan for the anesthesia beforehand.

### Maintain a checklist in the operating theater:

- Confirm the patient’s name.
- Confirm the patient is adequately fasting.
- Confirm the site and side of surgery.
- Ensure that the patient’s intravenous line is functional and correctly positioned.
- Check the functionality of the anesthesia machine and the adequacy of gasses.
- Check the availability of the anesthesia agents, intravenous fluids, and cross-matched blood/plasma.
- Confirm that adequately functioning resuscitation equipment, laryngoscopes and vacuum suction are available in the OR.
- Confirm that emergency drugs are readily available, if required.
- Ensure that the correct position of the patient is maintained during anesthesia, as well as during the surgery and that the endotracheal tube is not displaced

with any change of the patient's position.

## References

[Anaesthetic emergencies in the operating theatre](#) via pocketdentistry.com

[Anesthesia Safety Checklist](#) via who.int

[Anesthesiologist: The silent force behind the scene](#) via nih.gov

[Wrong-Site Surgery: A Preventable Medical Error](#) via nih.gov

[Acute Open Brain Herniation During Elective Tumor Resection](#) via ispub.com

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