



Anesthesia
MED441



11- Patient safety

Objectives

- Risk and complication of anesthesia.
- How to implement anesthesia safety in operation rooms.
- Error related to complication.
- Factors threatening patient safety in the operation rooms.
- General safety strategies.
- Quality assurance.
- Crucial errors to know and avoid.
- Postoperative pain management.
- Hypothermia sequences.

Color Index:

- Main Text
- 41 Doctor's notes
- 39 Doctor's notes
- Reference
- Important
- Golden notes
- Extra

Editing file

Case discussion

Anesthesia

is a high-risk specialty as compared with other specialties in medicine, so you should always be prepared for complications and have plan A, plan B, and plan C ready.

Risk of anesthesia

- Anesthesia may contribute to death in about 1 per 10,000, to 1 per 200,000 anesthetics
- Some patients suffer serious and costly nonfatal injuries such as permanent neurologic damage (paraplegia and vegetative state)

Complications of anesthesia

Major complications	Minor complications
<ul style="list-style-type: none">- Cardiac arrest if the patient has bradycardia don't induce anesthesia before you make sure you got everything covered.<ul style="list-style-type: none">• You have to be very careful esp with chronic patients who have multiple comorbidities because they can't compensate and may develop cardiac arrest.• Tachycardia is the compensating mechanism for hypotension, so if the patient is volume depletic, dilatic, have electrolytes abnormalities or on beta blockers they may develop cardiac arrest if you induced anaesthesia without stabilizing the patient before and monitoring them.- Perioperative MI take very careful preoperative assessment when hx of MI- Aspiration patients fasting 6-8 hours before anesthesia. Do rapid sequence induction in patients with full abdomen (preoxygenate for 3 mins > IV anesthesia > cricoid pressure > muscle relaxant > wait 15 seconds > insert ETT > inflate cuff)- Anaphylaxis perioperatively: check for drug allergies. Intraoperative: stop any medication given if there is bradycardia or hypertension (sometimes hypotension) give epinephrine and antihistamine.- Drug overdose.- Convulsion happens in induction & recovery. So u have to expect it in pt with epilepsy & give them midazolam & mild analgesic agent before they're shifting to recovery room.<ul style="list-style-type: none">- Nerve palsy during positioning of the patient.- Organ injury. Avoid hypotension and hypoxia. Any patient with tendency of bleeding have to be checked- Malignant hyperthermia.	<ul style="list-style-type: none">- Post-operative nausea, vomiting (most common) fasting & give always multimodal antiemetic medication. In the preop assessment we ask the pt if he had problems with N/V in prev surgeries and if yes we should give multimodal antiemetic + hydrate pt + and avoid medications causing N/V like morphine.<ul style="list-style-type: none">• Don't bag (ventilate) the patient aggressively because if you distend the stomach, the patient will vomit post-operatively.- Sore throat with multiple attempts of endotracheal intubation, in this case you have to give multimodal analgesic medication such as NSAIDS.<ul style="list-style-type: none">• Pain of sore throat is more difficult than pain of the incision site.- Hemodynamic instability in patients with comorbidities we have to titrate medications and keep vasopressors ready. Also if you keep your patient fasting for >6 hrs you have to start IV fluid for him.<ul style="list-style-type: none">- Pneumonia. Due to aspiration- Delirium in case of elderly advice regional than general anesthesia- Shivering warm the pt properly using fluid warmers, blankets, etc.<ul style="list-style-type: none">• The main cause of shivering is the vasodilation and hypothermia in operation room.• The first complication with urology surgery is hypothermia.- Cognitive Defect happen with elderly and patients with severe hypotension or hypoxia



10 common causes of cardiac arrest under anaesthesia:

- Drug overdose/ adverse reaction.
- Rhythm disturbances.¹
- Perioperative MI ²
- Airway obstruction.
- High spinal ³
- Lack of vigilance
- **Massive Bleeding** ⁴
- Aspiration

¹ Causes of arrhythmia : Hypoxia, hypovolemia, electrolytes imbalance.

² Specially if the Pt has perioperative hypotension, hypovolemia, anemia, tachycardia, hypoxia and previous history of MI.

³ Effect cardiac and respiratory centres > causing bradycardia or respiratory arrest, especially with obstetric & cesarean section.

⁴ Esp. Bleeding from trauma or obstetric.

Patient Safety

How to implement anesthesia safety in OR ?

Standardization: drug dosage, dosing units, concentration, drugs preparation methods workplace .

Technology¹: drug identification and delivery system, utilization automated information system

Pharmacy: dedicate pharmacy resource to the OR.²

Cultures: speak out! recognize and report the errors, learn from adverse events

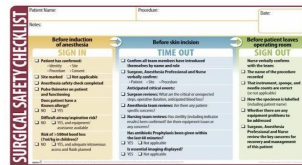
Factors threatening patient safety in the operation rooms



Equipment causes:

- Design flaw
- User error
- Malfunction

strategies:
Pre-use checkout



Patient underlying disease causes:

- Hyperthyroidism-thyroid storm³, diabetes-ketoacidosis, hyperosmolar coma⁴
- Allergic reaction to some drugs

strategies:
Preoperative evaluation

Pre anesthesia check

Check patient risk factor: ASA 1,2,3,4,5, e in case of emergency.

01 Airway assessment.⁵

05 Comorbidity.

02 Aspiration risk.

06 Medication.

03 Allergies.

07 Formulate anesthesia plan If there's no contraindications to regional anaesthesia, neuraxial and regional anaesthesia is better than general anaesthesia.

04 Abnormal investigation.

1 Check machine safety features

2 Specially for routine medications

3 You should update yourself with signs, symptoms and management of thyroid storm

4 We have to optimize patients situation before they get in.

5- Predict anticipated Difficult intubation and aspiration risk

Anesthesia accidents

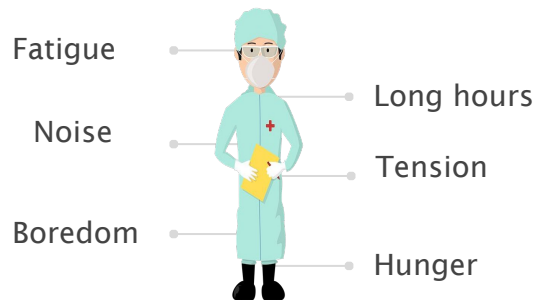
Causes of Accidents

There is rarely a single cause for an accident

System error ¹	Human error ²
<ul style="list-style-type: none">• System failures are the main reason for accidents:<ul style="list-style-type: none">○ check anesthetic machine○ oxygen supply○ A backup O2 tank mandatory.○ Never shut down audible alarms (Very important)• Emergency ventilation equipment “Ambu Bag”<ul style="list-style-type: none">○ Equipment failure○ Limitation of therapeutic standard○ Limitation of available resources	<ul style="list-style-type: none">• Human error contributes to 70– 80% of anesthetic incidents• Human error may involve:<ul style="list-style-type: none">○ Misjudgments○ Failure to check equipment's○ Fault with technique ³○ Communication problem ⁴○ Limitation of supervision○ Communication error○ Technical accident ⁶

Human error (anesthesia and surgeon)

- Human error is a strong contributor
 - Deviations from accepted anesthesia practices.
 - A lapse in vigilance and no attention to details.
 - Vigilance lets anesthetists find abnormal signs as early as possible.
 - **Vigilance allows the anesthetist to remain aware of surrounding events and signals while performing other tasks.**⁵
 - Vigilance lets anesthetist find abnormal sign as early as possible.
- Anesthetist and Surgeon Human factors affecting performance such as:



1- Related to the hospital. We have to improve the system

2- We have to improve the training and education


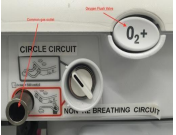
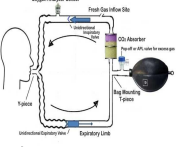

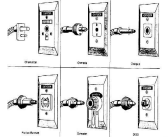
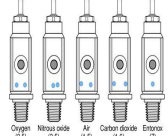
3- For example if the patient has full stomach you have to use rapid sequence induction technique

4- Most common human cause

5- You administer anesthetics and hear changes in the sounds and monitor the Pt at the same time. You shouldn't stay away from the anesthesia machine or the Pt. Also, you should have direct communication with the surgeon

6- Ex: Doctor not familiar to certain procedure such as epidural anaesthesia.

Safety features in an anesthesia machine

<p>Flowmeters V.imp</p>	<ul style="list-style-type: none"> → Flow delivered through the anesthetic machine is displayed by a bobbin within a rotameter to allow accurate gas delivery Hypoxic guard Bobbin is a small ball that move and rotate when you turn on the gasse. e.g. if you turn on nitrous oxide, oxygen will turn on automatically with it so that we don't deliver hypoxic flow → Hypoxic guard the O2 and N2O control knobs are linked, preventing <25% O2 being delivered when N2O is used. → Oxygen is delivered distal to N2O within the rotameter, preventing hypoxic gas delivery if the O2 rotameter is faulty or cracked. 																			
<p>Emergency oxygen flush</p>	<ul style="list-style-type: none"> → when pressed, oxygen bypasses the back bar and is delivered to the CGO (common gas outlet) at >35 L/min → Give a high flow of O2, use it when Pt is hypoxic 																			
<p>Scavenging system</p>	<ul style="list-style-type: none"> → Scavenging of vented anaesthetic gases is active, passive or a combination. → Scavenged gases are usually vented to the atmosphere. → Scavenging tubing has a wider bore (30mm), preventing accidental connection to breathing circuits 																			
<p>Suction</p>	<ul style="list-style-type: none"> → Suction: adjustable negative-pressure- generated suction is used to clear airway secretions/vomit and must be available for all cases. 																			
<p>Diameter index safety system</p>	<ul style="list-style-type: none"> → Connecting the role gases into the anesthesia machine (central line) → DISS is used for Central pipeline supply 																			
<p>Pin index safety system</p>	<ul style="list-style-type: none"> → Connecting role gases to the cylinder. Each gas has a unique inlet so you can't miss and connect a different gas. → PISS is used to prevent incorrect cylinders connection 																			
<p>Ventilator alarms</p>	<table border="1"> <thead> <tr> <th data-bbox="258 1462 456 1541">Alarm</th> <th data-bbox="456 1462 956 1541">Definition</th> <th data-bbox="956 1462 1560 1541">Potential cause</th> </tr> </thead> <tbody> <tr> <td data-bbox="258 1541 456 1653">High pressure</td> <td data-bbox="456 1541 956 1653">Pressure required to ventilate exceeds preset pressure</td> <td data-bbox="956 1541 1560 1653">Pneumothorax, excessive secretions, decreased lung compliance and kinking of endotracheal tube</td> </tr> <tr> <td data-bbox="258 1653 456 1798">Low pressure</td> <td data-bbox="456 1653 956 1798">Resistance to inspiratory flow is less than preset pressure</td> <td data-bbox="956 1653 1560 1798">Disconnected from ventilator, break in circuit It's important because the Pt is paralyzed, if it's disconnected the Pt will not be breathing</td> </tr> <tr> <td data-bbox="258 1798 456 1933">Low exhaled pressure</td> <td data-bbox="456 1798 956 1933">Exhaled tidal volume drops below preset amount</td> <td data-bbox="956 1798 1560 1933">Leak in system, increased airway resistance, decreased lung compliance or ETT cuff is not inflated</td> </tr> <tr> <td data-bbox="258 1933 456 2078">Rate / apnea</td> <td data-bbox="456 1933 956 2078">Respiratory rate drops below preset pressure level. Apnea period exceed set time</td> <td data-bbox="956 1933 1560 2078">Client fatigue, decreased RR due to medication</td> </tr> <tr> <td data-bbox="258 2078 456 2190">FIO2</td> <td data-bbox="456 2078 956 2190">Indicate FIO2 drift from prest range</td> <td data-bbox="956 2078 1560 2190">Change in level of consciousness, disconnected from O2 source, break in circuit</td> </tr> </tbody> </table>		Alarm	Definition	Potential cause	High pressure	Pressure required to ventilate exceeds preset pressure	Pneumothorax, excessive secretions, decreased lung compliance and kinking of endotracheal tube	Low pressure	Resistance to inspiratory flow is less than preset pressure	Disconnected from ventilator, break in circuit It's important because the Pt is paralyzed, if it's disconnected the Pt will not be breathing	Low exhaled pressure	Exhaled tidal volume drops below preset amount	Leak in system, increased airway resistance, decreased lung compliance or ETT cuff is not inflated	Rate / apnea	Respiratory rate drops below preset pressure level. Apnea period exceed set time	Client fatigue, decreased RR due to medication	FIO2	Indicate FIO2 drift from prest range	Change in level of consciousness, disconnected from O2 source, break in circuit
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General safety strategies

01 Prepare a preoperative plan

- Preoperative visit to the patient to let us know the patient's condition in detail
- Make an anesthesia plan to perform the anesthesia and how to deal with possible crisis

02 Develop situational awareness

Use a systematic approach to scanning the machine, monitors, patient, surgical field, and surroundings.

→ If One Vital Sign Is Anomalous, quickly assess the others ¹ (urine output, heart rate) while repeating the measurement and observing what is happening on the surgical field.²

03 Verify observations, Cross-check observations, Assess co varying variables

Review it with a second person.

04 Implement compensatory responses If something wrong happens urgently,

first implementing time-buying measures then look for cause. e.g., (increase the fraction of inspired oxygen when oxygen saturation falls; administer intravenous fluids or vasopressors when hypotension occurs).

→ Then search out any correctable primary cause and treat it appropriately.

05 Prepare for crisis

In case any critical events happened (cardiac arrest, malignant hyperthermia or difficult intubation), **call for help early.**

→ then use accepted protocols for emergencies and resuscitation (e.g., advanced cardiac life support, malignant hyperthermia protocols).

06 Enhance teamwork:

- Enhance teamwork communication, address surgeons and nurses early in the case by names.
- Make requests and delegate tasks clearly and specifically by name (e.g., "Jack, do task X and tell me when task X is completed.").

07 Compensate for stressors (Anesthesia is a stressful job).

If you feel very tired, ask for a relief. Reduce various stressors: noise, fatigue, interpersonal tension, etc. optimize the work environment

08 Learn from close calls Every mistake is an opportunity to learn and Improve.

Analysis and feedback of adverse events to identify and assess system problems.

1 Tachycardia + Hypotension = Bleeding, Tachycardia + Hypertension = Pain

2 If you have bradycardia, check for BP, check the surgeon if he/she is putting a pressure on the Pt or stretching the Pt's viscera

3 Don't be ashamed of your mistakes, but learn from them. Ask why it happened? How to avoid it? What to do if it happened the next time?

Quality assurance

The aim is to improve the quality of care and minimizing the risk of injury from anesthesia.

Documentation

Any adverse events should be reported truthfully, discussed, analyzed to identify causes and assess system problems. So we can learn and develop patterns to prevent recurrence.

Standards & guidelines

Anesthetists should be aware of their institution's safety policies and procedures. These should include those for monitoring, response to an adverse event, handoff checklist, resuscitation protocols, perioperative testing, and any special procedures or practices for the use of drugs, equipment, and supplies.

Safety training anesthesia providers

- Should obtain training in safety to learn and maintain basic skills.
- Simulation based training techniques.

Crucial errors to know and avoid

1. Airway errors
2. Procedure error.
3. Medication error

Airway errors

Patients receiving general anesthesia have no spontaneous respiration due to use of muscle relaxants, their respiration is controlled by machine via endotracheal tube.

- So we must ensure oxygen supply and avoid accidental extubation during surgeries (prone surgery) and transport.
- Once it happens, It can cause severe hypoxia and directly threaten the patient's life.

How to avoid it:

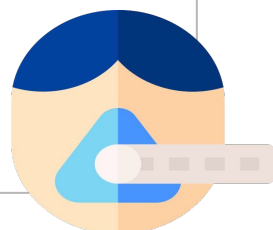
- Check the system and guarantee it to function well
- Verify the position of endotracheal tube by auscultation for breath sounds bilaterally and detecting ETCO₂ with proper fixation
- Closely observe the vital signs
- Be careful when position the patient in prone position

Suppose you are doing general anaesthesia for a patient who is in prone position, and the patient is accidentally extubated.

- what are you going to do? -Maintain with the position, ambu bag and intubate.

Suppose that at the middle of the procedure and the back is open, the patient accidentally extubated in prone position.

- what are you going to do? -Fiberoptic intubation through LMA.



Quality assurance

Crucial errors to know and avoid

1. Airway errors
2. Procedure error.
3. Medication error

Procedure error

- Inadvertent intravascular injection of **local anesthetics** during a nerve block can cause neurologic and **cardiac toxicity**.
- Avoid epidural hematoma (Hx of coagulopathy)
- Air embolism: with insertion or removal of central line. **Apply pressure to prevent it.**

How to avoid it:

- Adequate preoperative evaluation
- Follow standards guidelines
- Vigilance



Medication error ¹

Examples:

- Administration of undiluted potassium by rapid intravenous infusion can cause ventricular fibrillation and cardiac arrest.
- Neostigmine given without an antimuscarinic drug can cause asystole, severe bradycardia and atrioventricular block and can be fatal.²
- Succinylcholine can cause severe hyperkalemia and dysrhythmias, may trigger malignant hyperthermia.
- Medications to which a patient is allergic can cause anaphylaxis.
- Administering the wrong blood can cause an incompatibility reaction that can be fatal.

How to avoid it: **v.imp for OSCE (439)**

- **Be Familiar with the medication you use**
- **Know clearly its indications and contraindications.**
- **Administer the medication strictly according to instructions.**
- **Know the patient's history of allergy ,Cross-check blood type.**
- **All electrolyte concentrate should stored out OR**
- **Label high alert medication and keep it isolated from routinely used medication**

Basic medication safety **Dr: Very imp. for exam Qs**

- Label all syringes
- Eliminate look like ampoules
- Read label before administration
- Distinctive drug labels
- Color coding
- Barcoding



Human error: most common / All drugs should be clearly labeled; cross check before administration

1A) Prepare only the medications that you are going to use. B) Read what's written (the name of drug), it's not enough to depend only on the color.

2 We have to administer glycopyrrolate with neostigmine to reduce side effects.

Standards and protocols

Standards for basic anesthetic monitoring:

1. Qualified anesthesia personnel should be present in the room throughout the course of all general anesthetics, regional anesthetics, and monitored anesthesia care
2. Continually evaluate the patient's respiration, circulation and temperature.

5 things to monitor: heart rate, BP, temperature, etCO₂, SpO₂

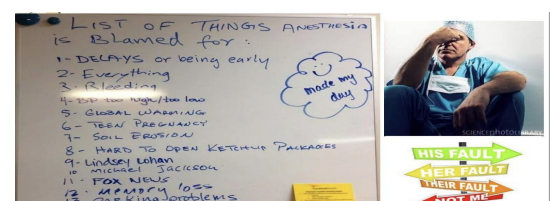


ASA standard monitor

Guidelines for action after an adverse anesthesia event

The anesthesiologist involved in an adverse event should do the following:

- 01 Provide for continuing care of the patient.
- 02 Notify the consultant anesthesia in charge .
- 03 Not discard supplies or tamper with equipment
Don't throw any drug you used, so if anything happens we will still have samples to detect the reason.
- 04 Document events in the patient record (including the serial number of the anesthesia machine).
- 05 Stay involved with the follow-up care.
- 06 Submit a follow-up report to the department quality assurance committee.
- 07 Document continuing care in the patient's record.



Avoid blame culture - develop help centre

Post operative pain

Post operative pain

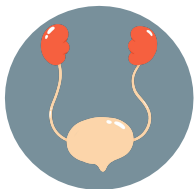
- **Multimodal analgesia** First start with paracetamol and NSAIDs then go for opioids
- **Preemptive preventive analgesia** Intravenous drugs, peripheral nerve block, or fascia block
- **Regular analgesia technique not PRN** PRN=per request
- **Identify problematic patients** like sickler patients and formulate management plan
- **Greater use of regional anesthesia technique**

Why opioid free analgesia?

Because opioids lead to:



PONV → delay of start feeding



Bladder bowel function



Sedation delay
mobilization & patient discharge & pulmonary complication PE



Immunosuppressive effects
infection cancer recurrent /mets



Inadequate analgesia persistence
post-op pain into chronic pain.

Postoperative morbidity/mortality

Hypothermia: <35 c

Factors predisposing to postoperative hypothermia

- Age ● Duration of the surgery ● Cool operating room

Consequence of hypothermia

- Shivering/oxygen requirement → increased myocardial oxygen supply demand
- Infection → Directly depress immune function, Vasoconstriction → reduced tissue oxygen-predispose to infection
- Delay wound healing and induce bleeding due to platelets dysfunction.
- Depressed Cardiac function and risk for arrhythmias esp with neonates and geriatric population.
- Delay recovery from anesthesia

Postoperative infection-anesthetic role

- Antibiotic prophylaxis 60 mins before skin incision, and you have to confirm it during time out in surgical safety checklist
- Hand hygiene
- Aseptic precautions for invasive procedures
- Fluid balance and blood transfusion
- Oxygen -avoiding hypoxia/hyperoxia
- Avoid hypothermia



WFSA

The goal is to provide highest standard of care and safety any setting International Task Force on Anaesthesia Safety Approved by: In World Federation of Societies of Anaesthesiologists (WFSA)

- Sign in: before induction of Anesthesia
- Time out: before skin incision
- Sign out: before patient leaving theater

SURGICAL SAFETY CHECKLIST	Patient Name: _____	Procedure: _____	Date: _____
	Notes: _____		
	Before induction of anesthesia SIGN IN <ul style="list-style-type: none"><input type="checkbox"/> Patient has confirmed:<ul style="list-style-type: none">• Identity• Site• Procedure• Consent<input type="checkbox"/> Site marked <input type="checkbox"/> Not applicable<input type="checkbox"/> Anesthesia safety check completed<input type="checkbox"/> Pulse Oximeter on patient and functioningDoes patient have a Known allergy? <input type="checkbox"/> NO <input type="checkbox"/> YESDifficult airway/aspiration risk? <input type="checkbox"/> NO <input type="checkbox"/> YES, and equipment/assistance availableRisk of >500ml blood loss (7ml/kg in children)? <input type="checkbox"/> NO <input type="checkbox"/> YES, and adequate intravenous access and fluids planned	Before skin incision TIME OUT <ul style="list-style-type: none"><input type="checkbox"/> Confirm all team members have introduced themselves by name and role<input type="checkbox"/> Surgeon, Anesthesia Professional and Nurse verbally confirm:<ul style="list-style-type: none">• Patient• Site• ProcedureAnticipated critical events:<input type="checkbox"/> Surgeon reviews: What are the critical or unexpected steps, operative duration, anticipated blood loss?<input type="checkbox"/> Anesthesia team reviews: Are there any patient-specific concerns?<input type="checkbox"/> Nursing team reviews: Has sterility (including indicator results) been confirmed? Are there equipment issues or any concerns?Has antibiotic Prophylaxis been given within the last 60 minutes? <input type="checkbox"/> YES <input type="checkbox"/> Not applicableIs essential imaging displayed? <input type="checkbox"/> YES <input type="checkbox"/> Not applicable	Before patient leaves operating room SIGN OUT <ul style="list-style-type: none">Nurse verbally confirms with the team:<input type="checkbox"/> The name of the procedure recorded<input type="checkbox"/> That instrument, sponge, and needle counts are correct (or not applicable)<input type="checkbox"/> How the specimen is labelled (including patient name)<input type="checkbox"/> Whether there are any equipment problems to be addressed<input type="checkbox"/> Surgeon, Anesthesia Professional and Nurse review the key concerns for recovery and management of this patient

Anesthesia considerations for COVID-19

- Protection which should be worn whenever patient is in the operating or procedure room for care of patients with suspected or positive COVID-19 receiving anesthesia in perioperative locations.
- Hand hygiene and personal protective equipment, eye protection which should be worn whenever patient is in the operating or procedure room.

Lower



Lower threshold for planning elective or semi-elective intubations in relevant cases *Postpone any covid positive patient procedures*

Wear



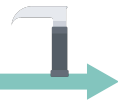
If general anesthesia is not required, the patient should continue to wear a surgical mask throughout the procedure.

Designate



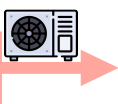
Designate the most experienced anesthesia professional available to perform intubation to minimize the number of attempts as is appropriate for the clinical situation.

Use



Use disposable equipment (laryngoscope handles and blades)..

Ensure



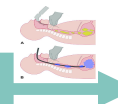
Ensure a high quality HMEF (Heat and Moisture Exchanging Filter) rated to remove at least 99.97% of airborne particles 0.3 microns or greater is placed between the endotracheal tube and reservoir bag during transfers to avoid contaminating the atmosphere.

Avoid



- Avoid awake fiberoptic intubation unless specifically indicated.
- Atomized local anesthetic will aerosolize the virus.
- Consider using a video-laryngoscope to improve intubation success when the intubation appears challenging

Perform



Perform rapid sequence induction (RSI) or a modified RSI as clinically indicated to avoid spread of airway Droplets

Apply



- Apply the double glove technique during airway management. Re-sheath the laryngoscope immediately post intubation (double glove technique)
- Seal ALL used airway equipment in a double zip-locked plastic bag. It must then be removed for decontamination and disinfection

Lecture Quiz

Question 1: A 25 year old patient, intraoperatively, the patient became tachycardic, decreased O₂, temperature increased to 113F. The anesthesiologist identified it as Malignant Hyperthermia. Which of the following was given to the pt to trigger it?

- A. Sevoflurane.
- B. Amiodarone.
- C. Dantrolene.
- D. Lidocaine.

Question 2: Which is the most common human/personal error that causes accidents in anesthesia?

- A. Technical accident.
- B. Communication error.
- C. Limitation of supervision.
- D. Equipment failure.

Question 3: You're operating on a trauma patient, once you intubated him the high pressure alarm goes off, which is the most likely cause in this case?

- A. The preset pressure is too low.
- B. Pneumothorax.
- C. Ventilator malfunction.
- D. Circuit problems.

Question 4: In safety features of anesthesia machine, the pin index system is used to prevent which of the following?

- A. Incorrect connection of gas pipeline to the machine inlet.
- B. The incorrect gas cylinder connection.
- C. Barotrauma.
- D. Mixing of two inhalational anesthesia agents.

Question 5: in a paediatric case of orchiopexy, the nurse asked the anaesthetist when to administer an antibiotic before the start of surgery?

- A. One day before
- B. 2 hours before
- C. During the last hour
- D. No need



Team leader: Rand Aldajani



**Team member:
Lubna Altamimi**



**Note Taker:
Shaima Alqoud**