

# ANESTHESIA



435

## Intra & Post operative complications management

{Color index: **Important**★ | **Notes** | **Book** | **433 Notes** | Extra | [Editing File](#)}

### Objectives:

- Learn a common approach to emergency medical problems encountered in intraoperative and postoperative period.
- Study postoperative respiratory and hemodynamic problems and understand how to manage these problems.
- Learn about the predisposing factors, differential diagnosis and management of PONV (postoperative nausea and vomiting).
- Understand the causes and treatments of postoperative agitation and delirium.
- Learn about the causes of delayed emergence and know how to deal with this problem.
- Learn about different approaches of postoperative pain management.

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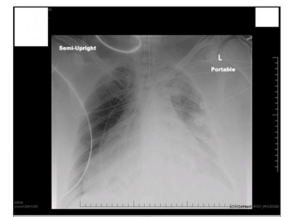


# Anaesthetic emergencies in the operating theatre:

- **Introduction.**
- Emergencies are not common but when they do occur they are often life threatening and require immediate action.
- Factors in the mnemonic **COVER ABCD** accounts for approximately 95% of critical incidents. (read it)
  - ❑ **Colour** ⇒ Saturation, central cyanosis.
  - ❑ **Oxygen** ⇒ Ensure adequate and correct delivery.
  - ❑ **Ventilation** ⇒ e.g. breathing circuit, air entry, CO<sub>2</sub> trace, vaporizer.
  - ❑ **Endotracheal tube** ⇒ Kinks, obstruction, endobronchial.
  - ❑ **Review** ⇒ monitors Correctly cited, checked, calibrated.
  - ❑ **Airway** ⇒ Failed intubation, laryngeal spasm, foreign body, aspiration.
  - ❑ **Breathing** ⇒ Difficult to ventilate, e.g. tube occlusion, bronchospasm, pneumothorax, aspiration, lack of neuromuscular blocking drug (NMBD), pulmonary oedema.
  - ❑ **Circulation** ⇒ Hypotension: excess anaesthetic agent, dysrhythmia, myocardial ischaemia/MI, hypovolaemia from any cause (e.g. dehydration, bleeding), sepsis, tension pneumothorax, sympathetic block (e.g. spinal or epidural anaesthetic).
  - ❑ **Drugs** ⇒ Anaphylaxis, wrong drug/dose/route.
  - ❑ **Embolism** ⇒ Air/fat/cement/amniotic fluid.
  - ❑ **Others** ⇒ Related to CVP line (pneumothorax [see Chapter 25]/cardiac tamponade); awareness; endocrine and metabolic (malignant hyperthermia, pheochromocytoma).

## Aspiration Most dangerous complications

<b>Definition</b>	<p>Inhalation of gastric contents can occur in patients who do not have fully functional upper airway reflexes. Impaired protective airway reflexes. (cough)</p> <p>Patient regurge – not vomit because the vomiting is an active process – because he is unconscious and he had relaxed sphincter → no control over his sphincter “ no protection to his airway → Aspiration of gastric acid → to the airway → the acidic content of the stomach will burn the lungs → pneumonitis → ARDS</p>
<b>Signs</b>	<ul style="list-style-type: none"> <li>● Gastric contents visible within breathing circuit/airway adjunct (e.g. LMA).</li> <li>● Decreased SaO<sub>2</sub>. not immediately it will takes time bc the lungs should be 1st affected by the gastric contents.</li> <li>● Wheeze/stridor. Immediately</li> <li>● Tachycardia. Sign of compensating</li> <li>● Increased airway pressure. Bc of spasm &gt; how the airway muscles are not affected by the given muscles relaxant ??           <ul style="list-style-type: none"> <li>- Muscles relaxant doesn't work on autonomic muscles bc of that also the heart doesn't stop pumping (the autonomic muscle lack the NMJ and Muscles relaxant only work through them. )</li> </ul> </li> <li>● Regurgitation of gastric contents can happen in any patient <b>who does not have fully functioning upper airway protective reflexes</b> .</li> </ul>



	<ul style="list-style-type: none"> <li>● <b>Those at risk include:</b> <ul style="list-style-type: none"> <li>○ Inadequate period of preoperative starvation (fasting).</li> <li>○ Delayed gastric emptying (e.g. opiates, pain “One of the extra reasons for delayed gastric emptying → patient is anxious”, bowel obstruction, pregnancy at term).</li> <li>○ Insufficient/lack of cricoid pressure at induction of the anaesthesia (the applied pressure will close the esophagus, used in RSI and emergencies situations).</li> <li>○ Early extubation in an at-risk patient in supine position <ul style="list-style-type: none"> <li>- <b>In emergencies situation you take the risk of doing the surgery &gt; do RSI</b></li> </ul> </li> </ul> </li> </ul>
<b>Treatment</b>	<ul style="list-style-type: none"> <li>● 100% oxygen.</li> <li>● Call for help. <b>Very important</b></li> <li>● 30% Head-down the position to prevent/limit aspiration.</li> <li>● Oropharyngeal suction.</li> <li>● Tracheal intubation if needed, including tracheal suctioning.</li> <li>● Postoperatively: physiotherapy, oxygen. &gt; if survive</li> <li>● Some advocate antibiotics (if here was infection post aspiration) and steroids</li> </ul>

## Air embolism

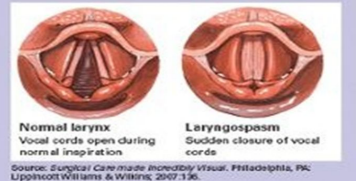
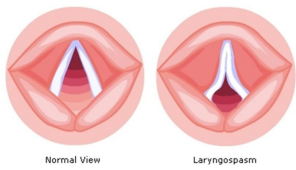
<b>Definition</b>	Air embolism results from inadvertent introduction of air into the circulation, usually via the venous system causing clots (mostly dangerous if it goes to the cerebral circulation “brain” or to the pulmonary arteries causing PE). <sup>1</sup>
<b>Causes</b>	<ul style="list-style-type: none"> <li>● Neurosurgery (dural sinuses are non-collapsible).</li> <li>● Caesarean section “both air or amniotic fluid o (e.g. if exposed veins are raised above level of heart).</li> <li>● Central line insertion/removal.</li> <li>● Epidural catheter placement (if loss of resistance to air is used). <b>very rare</b></li> <li>● Entrainment through an intravenous line (especially if pressure-assisted).</li> <li>● Situations where high pressure gas is used (laparoscopy). <b>Inflate the abdomen with CO2</b></li> </ul>
<b>Signs</b>	<ul style="list-style-type: none"> <li>● ↑ HR.</li> <li>● ↓ BP. “on proper circulation”</li> <li>● ↓ SaO2. <b>If it was in the pulmonary artery</b></li> <li>● ↓ ETCO2 (<b>end-tidal co2</b>) (acute due to ventilation–perfusion mismatch).</li> <li>● Murmur (millwheel<sup>2</sup>, due to air circulating around the cardiac chambers)</li> </ul>
<b>Treatment</b>	<ul style="list-style-type: none"> <li>● <b>stop everything even the surgical procedure and give 100% Oxygen.</b></li> <li>● Airway, breathing, circulation and call for help.</li> <li>● Flood surgical site with saline. <b>It will act as pool that prevent the air from going in.</b></li> <li>● Position patient in Trendelenburg<sup>3</sup>/left lateral decubitus position. <b>(left side down)</b></li> <li>● Consider inserting a central venous catheter to aspirate gas.</li> <li>● Consider hyperbaric (<b>high pressure chamber</b>) chamber if indicated</li> </ul>

<sup>1</sup> Bc of the gravity the venous blood will go down while standing > in case the emissary veins if they open they don't collapse they keep opened > negative pressure will aspirate the air

<sup>2</sup> A temporary loud, machinery-like, churning or splashing sound due to blood mixing with air in the right ventricle, best heard over the precordium, which is a late sign of significant—i.e., > 200 mL—venous air embolism, accompanied by increased pressure, cyanosis, tachycardia, syncope. It may be of pleural, pericardial, or cardiac origin

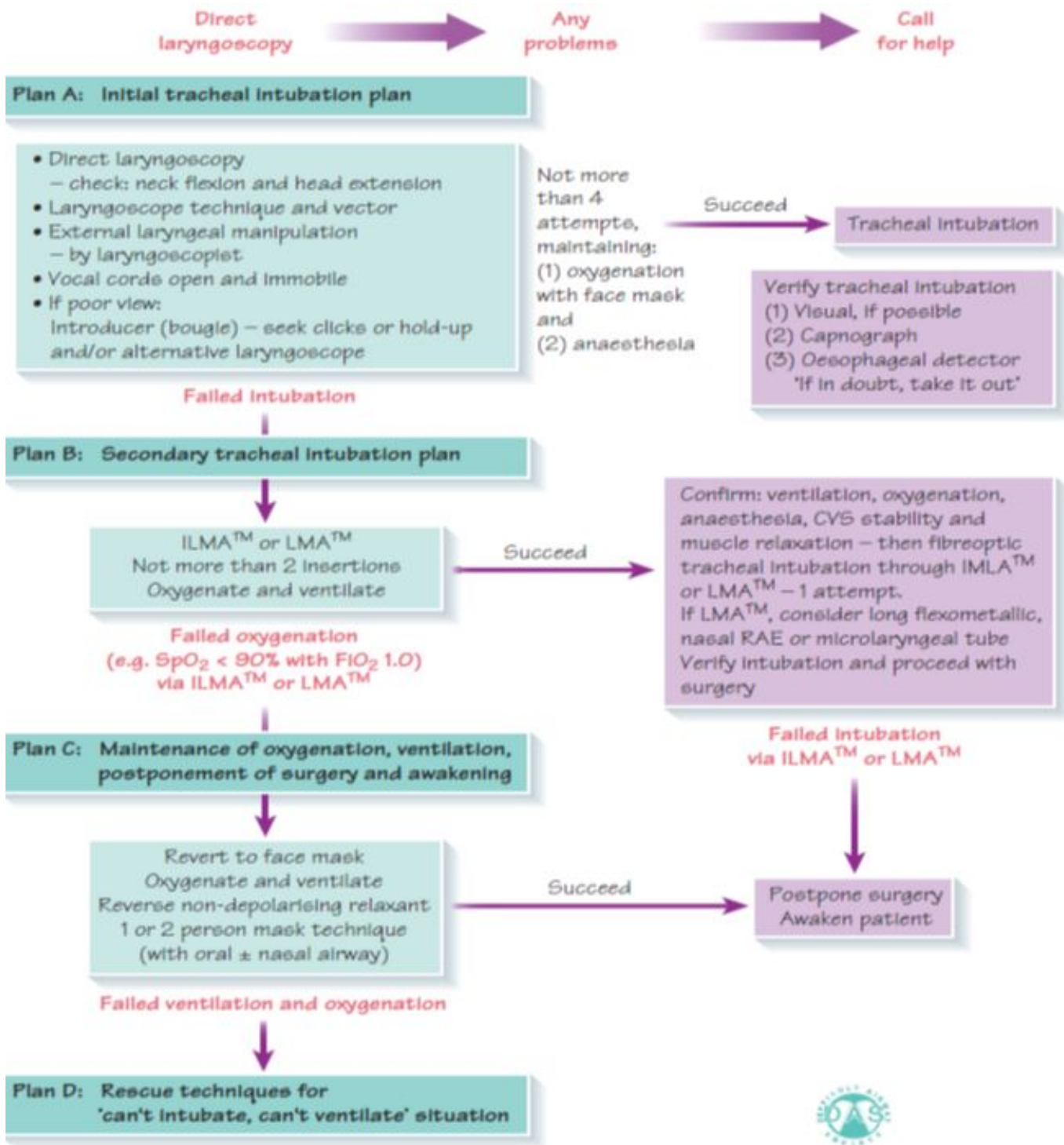
<sup>3</sup> In the **Trendelenburg position**, the body is laid supine, or flat on the back on a 15-30 degree incline with the feet elevated above the head. The reverse Trendelenburg position, similarly, places the body supine on an incline but with the head now being elevated.

# Laryngospasm

<p><b>Definition</b></p>	<p>laryngospasm is the complete or partial adduction of the vocal cords, resulting in a variable degree of airway obstruction.</p> <ul style="list-style-type: none"> <li>● Out of the lecture:           <ul style="list-style-type: none"> <li>- Intubate the patient when he is unconscious</li> <li>- Extubate the patient when he is conscious → because he has to look after his airway</li> </ul> </li> </ul>	 <p>Normal larynx Vocal cords open during normal inspiration</p> <p>Laryngospasm Sudden closure of vocal cords</p> <p><small>Source: Surgical Care made Incredibly Visual, Philadelphia, PA: Lippincott Williams &amp; Wilkins, 2007:156.</small></p>
<p><b>Causes</b></p>	<ul style="list-style-type: none"> <li>● Airway manipulation &gt;puting suction and other tubes to the airway and not allowing the pt. To breath.</li> <li>● Blood/secretions in oropharynx &gt;if surgery is in the throat or nose (causes irritation to the larynx)</li> <li>● Patient movement (like coughing )</li> <li>● Surgical stimulus (No prober anesthesia)</li> <li>● Failure to deliver anaesthetic agent</li> </ul>	
<p><b>Signs</b></p>	<ul style="list-style-type: none"> <li>● Partial/complete airway obstruction.</li> <li>● Paradoxical respiratory effort (inspiration is from the mouth and expiration from the abdomen) in a spontaneously breathing patient (abdominal/ chest see saw movements as respiratory effort attempts to overcome the obstruction).</li> </ul>	
<p><b>Treatment</b></p>	<p><b>Some or all might be needed: O2 is the only Rx &gt; muscle relaxant</b></p> <ul style="list-style-type: none"> <li>● Positive pressure ventilation with high flow oxygen (e.g. CPAP<sup>4</sup> or IPPV<sup>5</sup>).</li> <li>● Deepening of anaesthesia (e.g. i.v. propofol)</li> <li>● Suxamethonium with or without tracheal intubation – causes rapid muscle relaxation and ceases vocal cord opposition. Suxamethonium Adverse effects ? 1) hyperkalemia 2)MALIGNANT HYPERTHERMIA</li> </ul>	
<p><b>Complications</b></p>	<ul style="list-style-type: none"> <li>● Decreased SaO<sub>2</sub> (so u have to oxygenate )</li> <li>● Aspiration.</li> <li>● Bradycardia (especially in children), WILL NOT RESPOND TO ATROPINE BECAUSE IT IS NOT A CARDIAC PROBLEM &gt; We have to oxygenate</li> <li>● Pulmonary oedema.</li> </ul>	 <p>Normal View      Laryngospasm</p>

<sup>4</sup> Continuous positive airway pressure (CPAP) is a form of positive airway pressure ventilator, which applies mild air pressure on a continuous basis to keep the airways continuously open in people who are not able to breathe spontaneously on their own

<sup>5</sup> Intermittent Positive Pressure Ventilation



Induction (GA) + give O<sub>2</sub> then intubate / we stop the breathing by propofol and fentanyl NOT by muscle relaxants, if you do it by muscle relaxant you'll lose the patient

# Failed intubation

**(Reproduced from the Difficult Airway Society, with permission)**

**1. Assess the likelihood and clinical impact of basic management problems (before the anaesthesia):**

**Direct laryngoscopy**  Any Problem  CALL FOR HELP  Then ventilate Pt and try to wake him up “to back to his spontaneous ventilation” !!!

**Always call for help don't try to be hero , be SAFE**

- Difficulty with patient cooperation (for awake intubation) or consent.
- Difficult mask ventilation.
- Difficult supraglottic airway placement.
- Difficult laryngoscopy.
- Difficult intubation.
- Difficult surgical airway access.

**2. Actively pursue opportunities to deliver supplemental oxygen throughout the process of difficult airway management.** (they mostly die bc of failed ventilation not intubation)

**3. Consider the relative merits and feasibility of basic management choices:**

- Awake intubation (very easy , by using fiber-optic laryngoscope) vs. intubation after induction of general anaesthesia.
- Non-invasive technique vs. invasive techniques for the initial approach to intubation.
- Video-assisted laryngoscopy as an initial approach to intubation.
- Preservation vs. ablation of spontaneous ventilation. (u want to preserve it)

<b>Failed intubation</b>	
<b>Plan A: Initial tracheal intubation plan</b>	<p><b>Direct laryngoscopy</b></p> <ul style="list-style-type: none"> <li>– check: neck flexion and head extension</li> <li>• Laryngoscope technique and vector</li> <li>• External laryngeal manipulation               <ul style="list-style-type: none"> <li>– by laryngoscopy</li> </ul> </li> <li>• Vocal cords open and immobile</li> <li>• If poor view:               <ul style="list-style-type: none"> <li>Introducer (bougie) – seek clicks or hold-up and/or alternative laryngoscope</li> </ul> </li> </ul>
<p><b>Plan B</b></p> <p>NOT breathing spontaneously</p>	<p><b>Secondary tracheal intubation plan</b></p> <ul style="list-style-type: none"> <li>• ILMA<sup>6</sup> or LMA</li> <li>-Not more than 2 insertions</li> <li>-Oxygenate and ventilate <b>Very very very important</b></li> <li>• Failed oxygenation               <ul style="list-style-type: none"> <li>-(e.g. SpO<sub>2</sub> &lt; 90% with FiO<sub>2</sub> 1.0)</li> <li>-via ILMA<sup>TM</sup> or LMA<sup>TM</sup></li> </ul> </li> </ul>

<sup>6</sup> intubating laryngeal mask airway



**Plan C**

**Maintenance of oxygenation, ventilation, postponement of surgery and awakening**

Revert to face mask  
 Oxygenate and ventilate  
 Reverse nondepolarizing relaxant  
 1 or 2 person mask technique  
 (with oral ± nasal airway)

**Failed ventilation and oxygenation after plan C → go for plan D**

**Plan D: Rescue techniques for can't intubate, can't ventilate situation**

**Malignant hyperthermia**

**Definition:-** this occurs after exposure to a triggering agent (volatile anaesthetics or suxamethonium) and results in loss of normal **calcium homeostasis** within skeletal muscle cells. > will cause severe spasm all over the body (**Usually happens during induction**) Rx dantrolene I.V

**Signs**

- Muscle rigidity — especially masseter muscles noticed on intubation
- Tachycardia
- Cardiovascular instability
- Hypercapnia (a progressively increasing CO<sub>2</sub> capnograph reading)
- Acidosis
- Hyperkalaemia
- Cyanosis
- Hyperthermia/sweating

**Treatment**

- Call for help/stop surgery if possible
- Stop trigger/change anaesthetic breathing circuit
- Give 100% oxygen
- Hyperventilate
- Active cooling
- Dantrolene I.v.
- Treat complications as they arise:
  - renal failure/hyperkalaemia
  - coagulopathy
  - cardiovascular complications

**Anaphylaxis 2nd exposure**

<b>Definition</b>	this is an acute severe <b>type 1 hypersensitivity</b> reaction when an antigen (trigger) reacts with immunoglobulin <b>IgE</b> bound to histamine rich mast cells and basophils.
<b>Symptoms</b>	<ul style="list-style-type: none"> <li>• Anxiety, feeling of impending doom</li> <li>• Rash, itch</li> <li>• Wheeze, shortness of breath</li> <li>• Abdominal pain, diarrhoea, vomiting</li> <li>• Chest pain</li> </ul>
<b>Signs</b>	<ul style="list-style-type: none"> <li>• Angioedema, e.g. skin, lips, throat</li> <li>• Rash, flushing, urticaria</li> <li>• Tachycardia, bradycardia, dysrhythmias</li> <li>• Hypotension</li> <li>• Bronchospasm</li> </ul>
<b>Treatment</b>	<ul style="list-style-type: none"> <li>• Basic resuscitation based on Airway Breathing Circulation (ABC)</li> <li>• Remove suspected cause</li> <li>• Call for help</li> <li>• Give patient 100% oxygen, tracheal intubation if necessary</li> <li>• Elevate legs if hypotension (increases venous return)</li> <li>• Start cardiopulmonary resuscitation (CPR) if needed</li> <li>• Give epinephrine 50µg in repeated doses; consider epinephrine infusion &gt; <b>Very important, use as much as you want bc. It's naturally occurring antihistamine</b></li> <li>• Give large volumes of fluid, e.g. normal saline or Hartmann's solution</li> </ul>

**Secondary Treatment**

- Chlorpheniramine 10mg (H1 antagonist)
- Hydrocortisone 200 mg
- Consider alternative vasopressor if unresponsive to epinephrine
- Consider salbutamol i.v./nebulizer, aminophylline, for persistent bronchospasm
- High dependency or intensive care transfer

**Cardiac arrest >do ABC**

**During CPR**

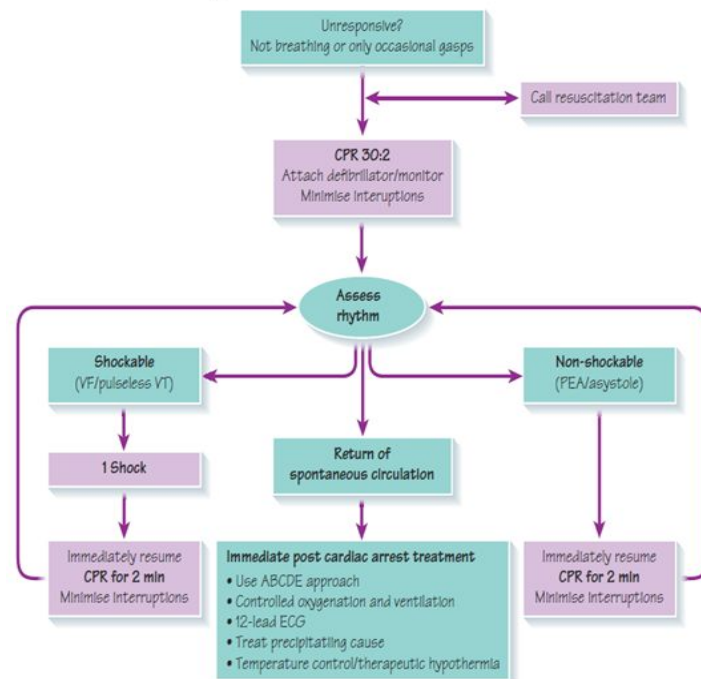
- Ensure high-quality CPR rate, depth, recoil
- Plan actions before interrupting CPR
- Give oxygen
- Consider advanced airway and capnography
- Continuous chest compressions when advanced airway in place
- Vascular access (intravenous, intraosseous)
- Give adrenaline every 3–5 min
- Correct reversible causes

**Reversible causes**

- Hypoxia
- Hypovolaemia
- Hypo-/hyperkalemia/metabolic
- Hypothermia
- Thrombosis – coronary or pulmonary
- Tamponade – cardiac
- Toxins
- Tension pneumothorax

**Advanced life support algorithm u don't have to know it**

Figure 24.2 Advanced life support algorithm



VF: ventricular fibrillation VT: ventricular tachycardia PEA: pulseless electrical activity  
Defibrillation we do it when there is no regular/clear QRS (R wave) like in ventricular fib.



## Status asthmaticus

<b>Signs</b>	<ul style="list-style-type: none"><li>• tachypnoea;</li><li>• use of accessory respiratory muscles (e.g. abdominal, sternocleidomastoid), and intercostal and subcostal recession</li><li>• wheeze might be minimal or absent</li><li>• tachycardia;</li><li>• pulsus paradoxus &gt;10 mmHg (a reduction in blood pressure on inspiration)</li><li>• sweating</li><li>• tiring</li><li>• confusion.</li></ul>
<b>Treatment</b>	<ul style="list-style-type: none"><li>• give supplemental oxygen to maintain SaO<sub>2</sub> 94–98%</li><li>• <math>\beta_2</math> agonist (either salbutamol or terbutaline) via O<sub>2</sub> driven nebulizer</li><li>• continuous nebulization can be used if there is a poor initial response</li><li>• intravenous <math>\beta_2</math> agonists should only be used when the inhaled route is unreliable</li><li>• steroids – either oral prednisolone or i.v. hydrocortisone</li><li>• nebulized ipratropium (anticholinergic)</li><li>• consider i.v. magnesium sulphate when life-threatening or poor initial response to treatment; aminophylline might also be considered in this situation.</li></ul>

**Post Anesthesia Care Unit (PACU):** monitor till he is fully awake and can take care of his own breathing

- The role of the anaesthetist is not limited to theatres. There may be a number of postoperative responsibilities to undertake, both in the recovery room and on the surgical ward.
- After receiving anesthesia for a surgery or procedure a patient is sent to the PACU to recover and wake up .
- The PACU is a critical care unit where the patient's vital signs are closely observed ,pain management begins , and fluids are given .
- The nursing staff is skilled in recognizing and managing problems in patients after receiving anesthesia .
- The PACU is under the direction of the Department of Anesthesiology.
- Design should match function
- Location: Close to the OR, quick access to x-ray, blood bank & clinical labs.
- Monitoring equipment
- Emergency equipment
- Personnel

## Admission to PACU

### Steps:

- Coordinate prior to arrival
- Assess airway
- Administer oxygen
- Apply monitors
- Obtain vital signs
- Receive report from anesthesia personnel.

## PACU - ASA Standards

<b>Standard I</b>	All patients should receive appropriate care (all pt. Who underwent different procedure should have the same care)
<b>Standard II</b>	All patients will be accompanied by one of anesthesia team
<b>Standard III</b>	The patient will be reevaluated & report given to the nurse
<b>Standard IV</b>	The patient shall be continually (every second) monitored in the PACU
<b>Standard V (At least for 45 minutes)</b>	A physician will signing for the patient out of the PACU



### Patient Care in the PACU

#### 1-Admission

- Apply oxygen and monitor
- Receive report

#### 2-Monitor & Observe & Manage

→ To Achieve

- Cardiovascular stability
- Respiratory stability
- Pain control

#### 3-Discharge from PACU

### Monitoring in the PACU

- Baseline vital signs.
- Respiration
  - RR/min, Rhythm
  - Pulse oximetry
- Circulation
  - PR/min & Blood pressure
  - ECG
- Level of consciousness
- Pain scores

# Initial Assessment

Color- Respiration- Circulation- Consciousness- Activity



## Aldrete Score “ALDRETE SCORE is for sedation , doctor said no need”

Score	Activity	Respiration	Circulation	Consciousness	Oxygen Saturation
<b>2</b>	Moves all extremities	Breathes deeply and coughs freely.	BP + 20 mm of preanesthetic level	Fully awake	SpO <sub>2</sub> > 92% on room air
<b>1</b>	Moves 2 extremities	Dyspneic, or shallow breathing	BP + 20-50 mm of preanesthetic level	Arousable on calling	Needs O <sub>2</sub> inhalation to maintain O <sub>2</sub> saturation more than 90
<b>0</b>	Unable to move	Apneic	BP + 50 mm of preanesthetic level	Not responding	Saturation less than 90 even with supplemental O <sub>2</sub>

### Discharge From the PACU

- Standard Aldrete Score:
  - Simple sum of numerical values assigned to activity, respiration, circulation, consciousness, and oxygen saturation.
  - A score of 9 out of 10 shows readiness for discharge.
- Post-anesthesia Discharge Scoring System:
  - Modification of the Aldrete score which also includes an assessment of pain, N/V, and surgical bleeding, in addition to vital signs and activity.
  - Also, a score of 9 or 10 shows readiness for discharge.

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### Discharge criteria from PACU

- Easy arousability
- Full orientation
- Ability to maintain & protect airway
- Stable vital signs for at least 15 – 30 minutes
- The ability to call for help if necessary
- No obvious surgical complication (active bleeding)

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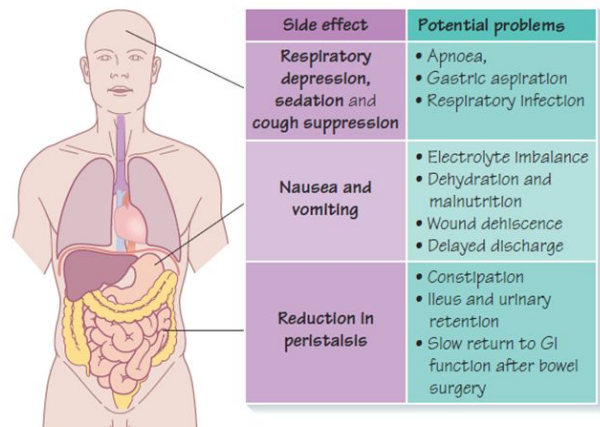


Figure 34.1 Side effects of opioids

## Postoperative management

### Common PACU Problems

**Airway obstruction - Hypoxemia- Hypoventilation- Hypotension- Hypertension- Cardiac dysrhythmias- Hypothermia- Bleeding- Agitation- Delayed recovery- PONV- Pain- Oliguria**



# 1. Airway Obstruction



<b>Airway obstruction</b>	Most common: <b>tongue fall</b> back posterior pharynx May be foreign body- Inadequate relaxant reversal- Residual anesthesia
<b>Management</b>	<ul style="list-style-type: none"> <li>•Patient's stimulation,</li> <li>•Suction,</li> <li>•Oral Airway,</li> <li>•Nasal Airway,</li> <li>•Others:             <ul style="list-style-type: none"> <li>-Tracheal intubation</li> <li>-Cricothyroidotomy</li> <li>-Tracheotomy</li> </ul> </li> </ul>

# 2. Hypoventilation

<b>Hypoventilation</b>	<ul style="list-style-type: none"> <li>•Residual anesthesia             <ul style="list-style-type: none"> <li>- Narcotics</li> <li>-Inhalation agent</li> <li>-Muscle Relaxant</li> </ul> </li> <li>•Post operative - Analgesia             <ul style="list-style-type: none"> <li>- Intravenous</li> <li>-Epidural</li> </ul> </li> </ul>
<b>Treatment</b>	<ul style="list-style-type: none"> <li>•Close observation</li> <li>•Assess the problem</li> <li>•Treatment of the cause:             <ul style="list-style-type: none"> <li>Reverse (or Antidote):                 <ul style="list-style-type: none"> <li>Muscle relaxant → Neostigmine</li> <li>Opioids → Naloxone</li> <li>Midazolam → Anexate</li> </ul> </li> </ul> </li> </ul>

Figure 34.2 Hazards of postoperative hypoxaemia

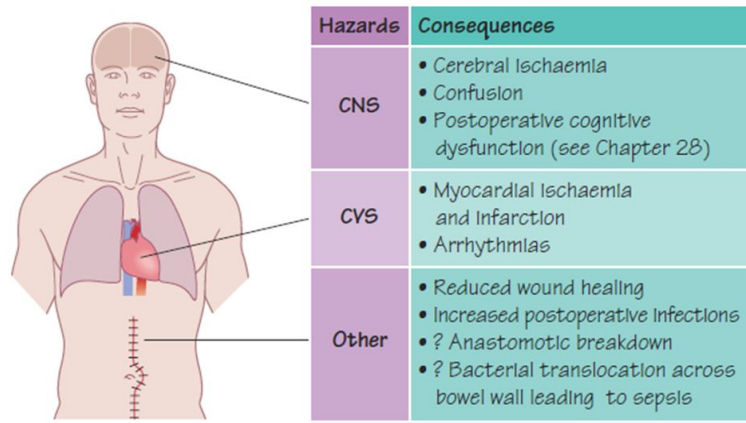
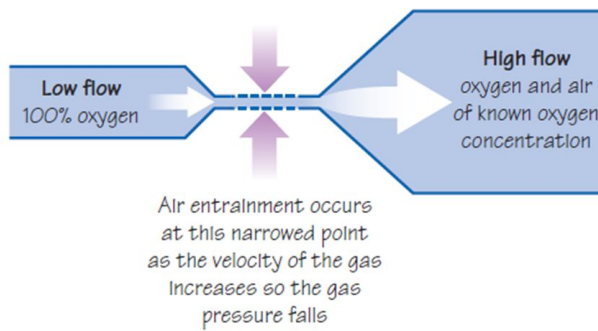


Figure 34.3 Venturi effect




### 3. Hypertension

<p><b>Hypertension</b></p>	<ul style="list-style-type: none"> <li>•Common causes: e.g. <ul style="list-style-type: none"> <li>-Pain</li> <li>-Full Bladder</li> </ul> </li> <li>•Hypertensive patients</li> <li>•Fluid overload</li> <li>•Excessive use of vasopressors</li> </ul>
<p><b>Treatment</b></p>	<ul style="list-style-type: none"> <li>•Effective pain control</li> <li>•Sedation</li> <li>•Antihypertensives: <ul style="list-style-type: none"> <li>-Beta blockers</li> <li>-Alpha blockers</li> <li>-Hydralazine (Apresoline)</li> <li>-Calcium channel blockers</li> </ul> </li> </ul>

### 4. Hypotension

<p><b>Hypotension</b></p>	<ul style="list-style-type: none"> <li>•Decreased venous return</li> <li>Hypovolemia: <ol style="list-style-type: none"> <li>1- decreased fluid intake</li> <li>2- increased losses</li> <li>3-Bleeding</li> </ol> </li> <li>•Sympathectomy</li> <li>•3rd space loss</li> <li>•Left ventricular dysfunction</li> </ul>
<p><b>Treatment</b></p>	<p><b>Fluids</b></p> <p>Patients will require i.v. fluids until they are able to drink normally</p> <ul style="list-style-type: none"> <li>• maintenance and intraoperative fluid losses</li> <li>• replacement of pre-existing losses (e.g. dehydration preoperatively)</li> <li>• replacement of postoperative losses (e.g. nasogastric losses, bleeding).</li> </ul> <p>The types of fluid are:</p> <ul style="list-style-type: none"> <li>• isotonic crystalloid (most often used)</li> <li>• colloids (for maintaining intravascular volume, early bleeding)</li> <li>• blood and blood products (for significant haemorrhage, coagulopathy).</li> </ul>

## 5. Dysrhythmias

<b>Dysrhythmias</b>	Secondary to: Hypoxemia Hypercarbia  Hypothermia Acidosis Catecholamines Electrolyte abnormalities.
<b>Treatment</b>	<ul style="list-style-type: none"><li>•Identify and treat the cause</li><li>•Assure oxygenation</li><li>•Pharmacological</li></ul>

## 6. Urine Output


<b>Oliguria</b>	<ul style="list-style-type: none"><li>•Hypovolemia</li><li>•Surgical trauma</li><li>•Impaired renal function</li><li>•Mechanical blocking of catheter.</li></ul>
<b>Treatment</b>	<ul style="list-style-type: none"><li>•Assess catheter patency</li><li>•Fluid bolus</li><li>•Diuretics e.g. Lasix</li></ul>

## 7. Post op Bleeding

<b>Causes</b>	<ul style="list-style-type: none"><li>•Usually Surgical Problem</li><li>•Coagulopathy</li><li>•Drug induced</li></ul>
<b>Treatment</b>	<ul style="list-style-type: none"><li>•Start i.v. lines → push fluids</li></ul> Blood sample: <ul style="list-style-type: none"><li>1-CBC</li><li>2-Cross matching</li><li>3-Coagulopathy</li></ul> <ul style="list-style-type: none"><li>• Notify the surgeon,</li><li>•Correction of the cause</li></ul>


## 8. Hypothermia

Most of patients will arrive cold


<b>Treatment</b>	<ul style="list-style-type: none"><li>•Get baseline temperature</li><li>•Actively rewarm</li><li>•Administer oxygen if shivering</li><li>•Take care for:<ul style="list-style-type: none"><li>Pediatric</li><li>Geriatric</li></ul></li></ul> 
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## 9. Altered Mental Status

<p><b>Causes</b></p>	<ul style="list-style-type: none"> <li>•Reaction to drugs?               <ul style="list-style-type: none"> <li>-Drugs e.g. sedatives, anticholinergics</li> <li>-Intoxication / Drug abusers</li> </ul> </li> <li>•Pain</li> <li>•Full bladder</li> <li>•Hypoventilation</li> <li>•Low COP</li> <li>•CVA </li> </ul>
<p><b>Treatment</b></p>	<ul style="list-style-type: none"> <li>•Reassurances</li> <li>•Always protect the patient</li> <li>•Evaluate the cause</li> <li>•Treatment of symptoms</li> <li>•Sedatives / Opioids if necessary.</li> </ul>

## 10. Delayed Recovery

<p><b>Delayed Recovery</b></p>	<ul style="list-style-type: none"> <li>•Systematic evaluation               <ul style="list-style-type: none"> <li>-Pre-op status</li> <li>-Intraoperative events</li> <li>-Ventilation</li> <li>-Response to Stimulation</li> <li>-Cardiovascular status</li> </ul> </li> </ul>
<p><b>Causes</b></p>	<ul style="list-style-type: none"> <li>•The most common cause:               <ul style="list-style-type: none"> <li>-Residual anesthesia → Consider reversal</li> </ul> </li> <li>•Hypothermia,</li> <li>•Metabolic e.g. diabetic coma </li> <li>•Underlying psychiatric problem</li> <li>•CVA</li> </ul>

## 11. Postoperative Nausea & Vomiting "PONV"

<p><b>Risk Factors</b></p>	<ul style="list-style-type: none"> <li>•Type &amp; duration of surgery (<b>Laparoscopic surgeries</b>) </li> <li>•Type of anesthesia</li> <li>•Drugs</li> <li>•Hormone levels</li> <li>•Medical problems</li> <li>•Autonomic involvement.</li> </ul>
<p><b>Prevention</b></p>	<ul style="list-style-type: none"> <li>•NPO status</li> <li>•Dexamethasone</li> <li>•Droperidol</li> <li>•Metoclopramide </li> <li>•H2 blockers</li> <li>•Ondansetron</li> <li>•Acupuncture</li> </ul>

## 12. Postoperative Pain

<p><b>Causes</b></p>	<ul style="list-style-type: none"> <li>•Incisional → Skin and subcutaneous tissue</li> <li>•Laparoscopy → Insufflation of Co2</li> <li>•Others: <ul style="list-style-type: none"> <li>Deep → cutting, coagulation, trauma</li> <li>Positional → nerve compression, traction &amp; bed sore.</li> <li>IV site → needle trauma, extravasation, venous irritation</li> <li>Tubes → drains, nasogastric tube, ETT</li> <li>Surgical → complication of surgery</li> <li>Others → cast, dressing too tight, urinary retention</li> </ul> </li> </ul>																				
<p><b>Treatment</b></p>	<p><b>Table 34.1 Drugs used for multimodal analgesia</b></p> <table border="1"> <thead> <tr> <th>Drug</th> <th>Side effects</th> </tr> </thead> <tbody> <tr> <td>Opioids</td> <td>See Figure 34.1</td> </tr> <tr> <td>NSAIDs</td> <td> <ul style="list-style-type: none"> <li>• Bleeding, especially gastrointestinal</li> <li>• Gastrointestinal perforation</li> <li>• Asthma, renal failure</li> <li>• Myocardial and cerebral thrombosis</li> </ul> </td> </tr> <tr> <td>Paracetamol</td> <td>• Liver dysfunction in overdose</td> </tr> <tr> <td>Local anaesthetics</td> <td>• Cardiac and CNS toxicity</td> </tr> </tbody> </table> <p><b>Table 34.2 Common methods of administering analgesics</b></p> <table border="1"> <thead> <tr> <th>Analgesic</th> <th>Method</th> </tr> </thead> <tbody> <tr> <td>Opioids</td> <td>I.m., I.v. (PCA), epidural/spinal, oral, Intra-articular</td> </tr> <tr> <td>Paracetamol</td> <td>I.v. and oral (rarely p.r.)</td> </tr> <tr> <td>NSAIDs</td> <td>Oral, p.r., I.v.</td> </tr> <tr> <td>Local anaesthetic</td> <td>Wound, epidural/spinal, various nerve blocks. Intra-articular</td> </tr> </tbody> </table>	Drug	Side effects	Opioids	See Figure 34.1	NSAIDs	<ul style="list-style-type: none"> <li>• Bleeding, especially gastrointestinal</li> <li>• Gastrointestinal perforation</li> <li>• Asthma, renal failure</li> <li>• Myocardial and cerebral thrombosis</li> </ul>	Paracetamol	• Liver dysfunction in overdose	Local anaesthetics	• Cardiac and CNS toxicity	Analgesic	Method	Opioids	I.m., I.v. (PCA), epidural/spinal, oral, Intra-articular	Paracetamol	I.v. and oral (rarely p.r.)	NSAIDs	Oral, p.r., I.v.	Local anaesthetic	Wound, epidural/spinal, various nerve blocks. Intra-articular
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### Referral to high dependency unit/intensive care unit

Table 34.3 Levels of postoperative care

Level of care	
0 (ward)	Patients needs met on normal ward
1 (HDU)	Patients at risk of their condition deteriorating, or who require advice from the ICU team
2 (ICU)	Patients with a single failing organ system or requiring detailed observation/intervention
3 (ICU)	Patients requiring ventilation (alone), advanced respiratory support alone or support of at least two organ systems