

Intra- and Post-operative Care

Concepts

Sleep

Sleep is a recurrent state of unconsciousness associated with a decreased response to external stimuli, from which a patient can readily be roused.

Unconsciousness

Unconsciousness is a state of unawareness where the patient is incapable of responding to sensory stimuli or of having subjective experiences, but somatic and autonomic reflexes to pain and noxious stimuli still occurs.

Anaesthesia

Anaesthesia is a state of drug induced hypnosis which is distinct from unconsciousness. It is accompanied by a loss of motor response to noxious stimuli; which for the inhalational agents is measured as the MAC value. There is much evidence to suggest that the state of drug induced anaesthesia is often associated with some degree of consciousness (termed *implicit awareness*) although the vast majority of patients display an inability to spontaneously recall events during the period of anaesthesia, i.e. a lack of explicit awareness

Unconsciousness has many common features with an anaesthetised patient so that the *management of the two states has many parallels*.

During the induction of anaesthesia there is a *progressive loss of protective reflexes*. The speed of induction depends upon the mode of induction; inhalational induction is slower than intravenous induction (IVI), hence patients undergoing inhalational induction may be seen to go through the phases of anaesthesia whereas with IVI there is rapid progression from awake to anaesthetised. These patients are subsequently unable to take care of themselves, to protect themselves against pressure injury, to maintain an airway, and it is the anaesthetist's responsibility to care of the patient pre-, intra- and post- operatively until the patient is able to protect his / her own airway again and move away from painful stimuli.

Depth of anaesthesia

This is assessed on clinical signs, first described by Guedel.

Stage	Description
1	Analgesia From the beginning of induction to loss of consciousness
2	Excitement From loss of consciousness to automatic breathing. There may be excitation, breath-holding, vomiting, coughing, swallowing, gagging.
3	Surgical Light From onset of automatic respiration until eyeballs become fixed. Medium Increasing intercostal paralysis. Deep Diaphragmatic respiration.
4	Overdose From onset of diaphragmatic paralysis to apnoea and death. All reflex activity is lost and pupils are widely dilated.

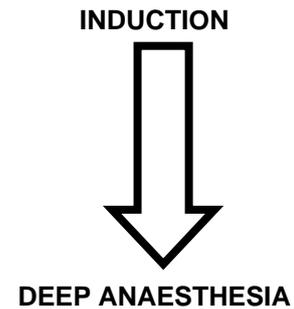
The most critical test of depth of anaesthesia is the patient's reaction to surgical stimulation.

- **Somatic response:** Frank movement of extremities or laryngospasm.
- **Subtle response:** Wrinkling of forehead, vocalisation, irregular breathing, breath-holding.
- **Sympathetic response:** Hypertension, tachycardia, sweating, lacrimation.

Both somatic and sympathetic responses to surgical stimulation should be abolished by anaesthesia in a patient who is breathing spontaneously. In a paralysed patient, sympathetic response is the only response than can be used to gauge the depth of anaesthesia.

Progressive loss of reflexes

- Voluntary control of eye movement disappears
- Loss of eyelash reflex
- Loss of eyelid reflex
- Swallowing, retching and vomiting cease
- Loss of conjunctival reflex
- Muscular tone diminishes (i.e. airway maintenance is impaired)
- Loss of corneal reflex
- Glottic reflexes diminish, then disappear
- Loss of pupillary light reflex



Most important for the anaesthetist is loss of glottic reflexes and in deep anaesthesia and coma, medullary control of respiration is progressively lost causing hypoxia and hypercarbia.

Causes of a depressed level of consciousness

- 1) Trauma
- 2) Infective / inflammatory
- 3) Neoplastic
- 4) Metabolic: Hypoxia, hypercarbia, acidosis, hyper- / hypo- glycaemia, uraemia, electrolytes.
- 5) Drugs: Anaesthesia, poisons.

Most episodes of unconsciousness are of short duration and recovery can be expected.

Care of the unconscious patient

The management and care of the anaesthetised or unconscious patient can be divided into three categories:

- 1) **Immediate care** of an unconscious patient: e.g. in the emergency situation.
- 2) Monitoring the **anaesthetised patient**: Intra-operatively and in recovery.
- 3) **Long-term care** of the unconscious patient: e.g. intensive care unit (ICU).

1) **IMMEDIATE CARE** *The ABCD of resuscitation*

- A** for **Airway**: Maintain a clear airway. Clear any fluid (vomit, blood, secretions) from airway with suction. A Guedel airway (oropharyngeal airway) may be useful, but protect the airway with a cuffed endotracheal tube if necessary.
Place patient on his / her side if no contra-indication to being moved (e.g. fractured neck) or if no further CPR necessary.
- B** for **Breathing**: Ensure adequate ventilation. Assist if necessary and ensure adequate inspired oxygen to avoid hypoxia. Observe depth and rate of respiratory excursions.
Monitor tidal volume and rate. Respiratory support via mouth-to-mouth, Ambu bag or mechanical ventilation may be necessary.
- C** for **Circulation**: Monitor and control BP, HR, ECG, CVP, urine output, blood chemistry and gases, fluids.
- D** for **Drugs**: Sedatives and analgesics are dangerous in an unconscious patient because airway, respiratory and cardiovascular impairment occur.
These drugs may be necessary for proper nursing and monitoring in which case they should be used appropriately in a situation of close supervision (e.g. ICU), and respiratory support be available if necessary.

DEFG – *Don't Ever Forget Glucose in the Unconscious Patient!*

2) MONITORING THE ANAESTHETISED PATIENT

a) Intra-operatively

i) Circulatory function

Pulse, Oxygen saturation monitor
 Non-invasive and/or invasive blood pressure monitoring
 ECG: Rate, rhythm, ischaemia
 Invasive monitoring CVP
 Arterial line
 Urinary catheter
 Swan Ganz catheter (for cardiac output assessment)
 Measurement of blood loss

ii) Respiratory function

Clinical signs: Respiratory rate, movement of chest wall and diaphragm, excursion of bag, irregular breathing or breath-holding, tracheal tug, stridor, unequal chest movement.
 Colour: Cyanosis.
 Ventilatory volumes: Spontaneous (Wright's or digital spirometer)
 IPPV (Spirometer – integral to ventilator or separate)
 Airway pressure: Pressure gauge in the circuit: seldom exceeds 25 hPa (cm²H₂O) in IPPV and fluctuates around zero for spontaneous ventilation. Important for reflecting circuit leaks or increased ventilatory pressures, e.g. pneumothorax.
 O₂ concentration of inspired gas mixture is mandatory, especially when using low flows.
 Arterial blood gas analysis for pH, P_aO₂, P_aCO₂ and blood buffering capacity.
 Non-invasive methods of monitoring blood gases include:
 a) Capnography: measures end-tidal CO₂.
 b) Oximetry: measures O₂ saturation.

iii) Renal function

Urine output: Ideal hourly output of 1 ml kg⁻¹
 Opiates and stress stimulate secretion of ADH which decreases urine output so that urine output is not an accurate monitor of renal function
 Use in context with other parameters - pulse, BP, CVP, blood loss.
 Many anaesthetic drugs are excreted renally so be cautious about administering any drug in patients with abnormal renal function.

iv) Neuromuscular function

Monitor neuromuscular function using the nerve stimulator when using muscle relaxants.

v) Body temperature

Hypothermia or hyperthermia.
 Thermometry to detect changes in body temperature during anaesthesia should be used routinely, especially in paediatrics and the critically ill.
Hypothermia is a common complication of anaesthesia and surgery, particularly in children, critically ill patients and when large volumes of fluid are lost and given.
Hyperthermia is much less common but can be an important indication of e.g. malignant hyperthermia, and is, like hypothermia, more common in children.
 Usually oesophageal or nasopharyngeal probes in adults and rectal probes in children.

vi) Other variables requiring monitoring

- 1) **Pressure points:** Especially for prolonged surgery.
- 2) **Blood sugar and electrolytes:** NB diabetics.
- 3) **Electrolytes and acid-base:** NB low K⁺.
- 4) **Haemoglobin:** Especially when losing blood, or giving large volumes of fluid. You may need coagulation screens.
- 5) **Eyes:** Protect from pressure injuries or corneal lacerations and dryness.
- 6) **Thrombosis:** Increased incidence with stasis, poor perfusion, low BP or local pressure. Stop surgeon/assistants leaning on patient. Use calf compressors. Pulmonary embolus resulting from DVT is a preventable cause of peri-operative death.
 Patients at risk include:
 Orthopaedic, pelvic and oncological surgery
 History of previous DVTs and/or pulmonary embolus
 Prolonged immobility

b) **Recovery room** (Post-anaesthesia care unit - PACU)

As anaesthesia lightens there is a return of muscle tone and of reflex responses, although the latter may remain sluggish until consciousness has almost returned. "Emergence delirium" may occur as the patient ascends through the second stage.

The responsibility of the anaesthetist to the patient extends beyond the phase of emergence. Many surgical and anaesthetic complications may occur during the early post-operative period. The patient should be admitted to a post-anaesthetic recovery area for close monitoring and care by experienced personell until recovery from anaesthesia is complete and the possibility of complications ruled out.

Transfer of the patient from the theatre should not be made unless it is absolutely certain that:

- a) A patent airway can be maintained.
- b) Ventilation is adequate.
- c) Cardiovascular function is stable.

The patient should be in the lateral decubitus position on the trolley and the anaesthetist should be looking after the airway. Any doubt as to the adequacy of airway should be corrected before transportation and, if necessary, an endotracheal tube left in situ. If gravely ill, portable oxygen equipment and an ECG with defibrillator for monitoring should be available.

On arrival in the recovery room, full responsibility is transferred to the sister as regards:

- Identification of patient.
- Brief summary of patient's history and surgery performed.
- Anaesthetic given and any complications.
- Present condition and physiological parameters.
- Instructions for monitoring and any investigations required.
- Instructions for management of pain, fluid therapy, O₂ supplementation.

Unless contra-indicated, the patient should remain on his side until fully conscious.

Routine monitoring in the recovery room

- Pulse oximeter:
Routine O₂ supplementation is unnecessary if the S_pO₂ is > 95 %, and may be dangerous as it masks hypoventilation and potentially fatal hypercarbia.
If the S_pO₂ is consistently < 90 %, then O₂ (F_iO₂ 0,4) should be given via facemask, nasal specs or resuscitator. However, the **CAUSE** for this **must** be sought and corrected and this patient needs extra vigilance. If in doubt, assist ventilation with a resuscitator and mask, and if necessary; sedate, intubate and ventilate.

OXYGEN is a holding strategy, not a treatment!

- Blood pressure
- Clinical assessment of level of consciousness, breathing, pain, bleeding etc.

Common post-operative anaesthetic problems

a) **Airway obstruction**

Tongue obstructs upper airway of unconscious patient in supine position. Turn patient on his side, support the jaw (jaw thrust) and insert an oral airway.

Laryngospasm – uncommon at this stage although may occur with insertion of airway.

Look in mouth, clear mouth and pharynx of any secretions or debris. Give supplemental O₂ and positive pressure ventilation. Intubate if necessary.

b) **Hypoventilation**

Pain

Neuromuscular paralysis – residual neuromuscular blockade

Drug overdose, e.g. narcotics and anaesthetic agents.

c) **Hypoxaemia**

Cyanosis is a **late** sign of hypoxaemia, hypoventilation, airway obstruction, pulmonary oedema, ventilation : perfusion abnormalities or gastric acid aspiration.

Give O₂ by face mask and prepare to intubate and ventilate.

d) **Hypotension**

Hypovolaemia – most common cause

Drugs, e.g. opiates

Cardiac origin – failure, MI, PE

Give O₂. Eliminate underlying cause.

- e) **Hypertension:**
 Pre-existing disease
 Pain
 Other: Distension of bladder (common), ↓ P_aO₂, ↑ P_aCO₂.
 Fluid overload.
 Beware of CVA and myocardial infarct sequelae.
- f) **Shivering:**
 Varies from fine tremors to convulsion-like clonic contractions. High incidence with Halothane anaesthesia, but also due to loss of cortical inhibition of spinal reflexes during recovery.
 Increases O₂ consumption by 200 %! Give supplemental O₂.
- g) **Somnolence:**
 Residual effects of anaesthetic
 Drug idiosyncrasy e.g. to opiates
 Pre-existing diseases: CVA, head injury, myxoedema, hypothermia, hypoglycaemia (DEFG!).
- h) **Delirium:**
 A very disconcerting problem! Patient may become violent and hurt himself and his attendant.
 Causes: Hypoxia, pain, full bladder, drugs - Ketamine, phenothiazines, alcohol withdrawal, acute intoxication in an unsuspected addict.
- i) **Nausea and vomiting**
- j) **Pain**
- k) **Problems after regional anaesthesia:**
- Sedation: From which patient must recover before going back to the ward.
 - Hypotension: Especially with postural changes. Nurse supine.
 - Patients still under effects of regional anaesthetic may injure the affected part of his body without feeling pain.
 - Prolonged delay in recovery of sensory and motor function after spinal or epidural is serious and requires attention. (This may be due to an epidural haematoma compressing the spinal cord – this must be investigated promptly and may require *urgent* surgical intervention)

Fitness for discharge from recovery room

The Aldrete score is a popular method for assessing a patient's physical and mental status and progress in recovery. A score of 0, 1 or 2 is assigned to objective signs and recorded every 15 minutes. The patient should only be allowed to leave recovery once a score of 10 has been achieved. An anaesthetist should check and sign the patient out once satisfied the patient has recovered fully from the anaesthetic.

SIGN	CRITERIA	SCORE
ACTIVITY	Able to move 4 limbs voluntarily or on command	2
	Able to move 2 limbs voluntarily or on command	1
	Able to move 0 limbs voluntarily or on command	0
RESPIRATION	Able to deep-breathe & cough adequately	2
	Dyspnoeic or with limited breathing	1
	Apnoeic	0
CIRCULATION	BP < 20 % change from pre-anaesthetic level	2
	BP 20 – 50 % change " "	1
	BP > 50 % change " "	0
CONSCIOUSNESS	Fully awake	2
	Arousable on calling	1
	Not responding	0
COLOUR	Pink	2
	Pale, dusky, blotchy, jaundiced.	1
	Cyanosed	0

3) LONG-TERM CARE

Prolonged unconsciousness (days → weeks) brings considerations over and above those of immediate care or anaesthesia.

1. **Respiratory problems due to:**
 - Failure to cough (causing atelectasis, infection)
 - Hypostatic pneumonia due to lying in same position
 - Hypoventilation because of central respiratory depression and partial obstruction
 - Inhalation of foreign material - gastric contents, mucous plugs.
 - These may necessitate respiratory support and airway monitoring. Tracheostomy may be necessary if prolonged ventilation is necessary.
2. **Circulation:**
 - Fluids and electrolytes
 - Thrombosis
 - Shock and need for inotropes
 - Monitor pulse, ECG, urine output, Hb (and CVP or Swan Ganz catheterisation if indicated)
3. **Nutrition:**
 - Enteral or total parenteral nutrition (TPN) when patient unable to absorb adequately via GIT.
 - Bowel dysfunction - usually constipation.
4. **CNS:**
 - Neuro observations.
 - Eye care.
5. **Musculo-skeletal:**
 - Joint and muscle damage. Physio and pressure care.
6. **Renal:**
 - Urinary tract infection is common.
 - Avoid catheterisation if possible but may be unavoidable.
7. **Metabolic control:**
 - Blood glucose, electrolytes, acid-base should be appropriately monitored.
8. **Physiotherapy and general care:**
 - Chest physio and prevention of contractures
 - Care of teeth, mouth, tracheostomy
 - Eye care: Lubrication and closing of eyes
 - Pressure points - Massage
 - Careful positioning of limbs
 - Regular turning
 - Pain relief
 - Sedation