

General anaesthesia

Dr. Sabah Altheeti

General anaesthesia or **general anesthesia** is a medically induced coma with loss of protective [reflexes](#), resulting from the administration of one or more general anaesthetic agents. It is carried out to allow medical procedures that would otherwise be intolerably painful for the patient; or where the nature of the procedure itself precludes the patient being awake. A variety of [drugs](#) may be administered, with the overall aim of ensuring [unconsciousness](#), [amnesia](#), [analgesia](#), loss of reflexes of the [autonomic nervous system](#), and in some cases [paralysis of skeletal muscles](#). The optimal combination of drugs for any given patient and procedure is typically selected by an [anaesthetist](#).

General anaesthesia has many purposes, including:

1. Analgesia (loss of response to pain)
2. Amnesia (loss of memory)
3. Immobility (loss of motor reflexes)
4. Hypnosis (unconsciousness)
5. Paralysis (skeletal muscle relaxation)

The [biochemical mechanism of action of general anaesthetics](#) is not well understood. To induce unconsciousness, anaesthetics have myriad sites of action and affect the [central nervous system](#) (CNS) at multiple levels. Common areas of the central nervous system whose functions are interrupted or changed during general anaesthesia include the [cerebral cortex](#), [thalamus](#), [reticular activating system](#), and [spinal cord](#). Potential pharmacologic targets of general anaesthetics are [GABA](#), [glutamate](#) receptors.

Stages of anaesthesia

[Guedel's classification](#), introduced by [Arthur Ernest Guedel](#) in 1937,^[13] describes four stages of anaesthesia.

Stage 1

Stage 1, also known as *induction*, is the period between the administration of induction agents and loss of consciousness. During this stage, the patient progresses from analgesia without amnesia to analgesia with amnesia. Patients can carry on a conversation at this time.

Stage 2

Stage 2, also known as the *excitement stage*, is the period following loss of consciousness and marked by excited and delirious activity. During this stage, the patient's [respiration](#) and [heart rate](#) may become irregular. In addition, there may be uncontrolled movements, vomiting, [suspension of breathing](#), and [pupillary dilation](#). Because the combination of spastic movements, vomiting, and irregular respiration may compromise the patient's airway, rapidly acting drugs are used to minimize time in this stage and reach Stage 3 as fast as possible.

Stage 3

In Stage 3, also known as *surgical anaesthesia*, the skeletal muscles relax, vomiting stops, respiratory depression occurs, and eye movements slow and then stop. The patient is unconscious and ready for surgery. This stage is divided into four planes:

1. The eyes roll, then become fixed;
2. Corneal and laryngeal reflexes are lost;
3. The pupils dilate and light reflex is lost;
4. Intercostal paralysis and shallow abdominal respiration occur.

Stage 4

Stage 4, also known as *overdose*, occurs when too much anaesthetic medication is given relative to the amount of surgical stimulation and the patient has severe [brainstem](#) or [medullary](#) depression, resulting in a cessation of respiration and potential cardiovascular collapse. This stage is lethal without cardiovascular and respiratory support.

Preanaesthetic evaluation

Prior to a planned procedure, the anesthesiologist reviews medical records and/or interviews the patient to determine the best combination of drugs and dosages and the degree to which [monitoring](#) will be required to ensure a safe and effective procedure.

The process of anesthesia

- 1- Premedication
- 2- Induction
- 3- Maintenance phase
- 4- Emergence

Premedication

Prior to administration of a general anaesthetic, the anaesthetist may administer one or more drugs that complement or improve the quality or safety of the anaesthetic. The aim of premedications which is administrated 1-2 hr prior operation are:

- Analgesia
- Anxiolysis
- Increase in gastric PH and decrease of gastric secretion
- Decrease saliva secretion

The commonly used premedication :

1-[Midazolam](#), a benzodiazepine characterized by a rapid onset and short duration, is effective in reducing [preoperative anxiety](#)

2- [Beta adrenergic antagonists](#) to reduce the incidence of postoperative [hypertension](#), [cardiac dysrhythmia](#), or [myocardial infarction](#)

3- Opioids e.g. fentanyl, pethidine as analgesics

4- Antiemetics e.g. metoclopramide, Dexamethasone

5- Medications which reduce gastric volume, increase gastric PH and decrease gastric motility (to reduce risk of aspiration):

- Antacids
- H2 receptor antagonists e.g. **Tagamet (cimetidine)** and **Zantac (ranitidine hydrochloride)**
- Proton pump inhibitors e.g. Omeprazole

Induction

General anaesthesia is usually induced in a [medical facility](#), most commonly in an [operating theatre](#). Anaesthetic agents may be administered by various routes, including [inhalation](#), [injection](#) ([intravenous](#), [intramuscular](#), [subcutaneous](#)), [oral](#), and [rectal](#).

Most general anaesthetics are induced either intravenously or by inhalation. Intravenous injection works faster than inhalation, taking about 10–20 seconds to induce total unconsciousness. This minimizes the excitatory phase (Stage 2) and thus reduces complications related to the induction of anaesthesia. Commonly used intravenous induction agents include [propofol](#), [sodium thiopental](#), [etomidate](#), [methohexital](#), and [ketamine](#).

[Inhalational anaesthesia](#) (including Sevoflurane, Desflurane, Isoflurane, Enflurane, Halothane) may be chosen when intravenous access is difficult to obtain (e.g., children), when difficulty maintaining the airway is anticipated, or when the patient prefers it. [Sevoflurane](#) is the most commonly used agent for inhalational induction, because it is less irritating to the [tracheobronchial tree](#) than other agents.

Anaesthetized patients lose protective airway reflexes (such as coughing), [airway patency](#), and sometimes a regular breathing pattern due to the effects of anaesthetics, [opioids](#), or [muscle relaxants](#). To maintain an open airway and regulate breathing, some form of [breathing tube](#) is inserted after the patient is unconscious. To enable [mechanical ventilation](#), an [endotracheal tube](#) is often used.

Other drugs used in general anaesthesia:

- Muscle relaxants: drug that affects skeletal muscle function and decreases the muscle tone. Useful for aiding insertion of Endotracheal tube and ventilation. There are two types of Neuromuscular blocking agents:
 - ❖ Depolarising muscle relaxants Suxamethonium
 - ❖ Non-depolarising muscle relaxants ex, Atracurium

- Benzodiazepines enhance the effect of the [neurotransmitter gamma-aminobutyric acid](#) (GABA) at the [GABA_A receptor](#), resulting in [sedative](#), [hypnotic \(sleep-inducing\)](#), [anxiolytic](#) (anti-anxiety), [anticonvulsant](#), and [muscle relaxant](#) properties. Ex: diazepam, midazolam, [Lorazepam](#).
- Opioids: While opioids can produce unconsciousness, they do so unreliably and with significant side effects. So, while they are rarely used to induce anesthesia, they are frequently used along with other agents such as intravenous non-opioid anesthetics or inhalational anesthetics. Furthermore, they are used to relieve pain of patients before, during, or after surgery. Ex: Alfentanil, fentanyl

Maintenance

The duration of action of intravenous induction agents is generally 5 to 10 minutes, after which spontaneous recovery of consciousness will occur. In order to prolong unconsciousness for the required duration (usually the duration of surgery), anaesthesia must be maintained. This is achieved by allowing the patient to breathe a carefully controlled mixture of oxygen, sometimes [nitrous oxide](#), and a [volatile anaesthetic](#) agent, or by administering medication (usually [propofol](#)) through an [intravenous catheter](#).

Emergence

Emergence is the return to baseline physiologic function of all organ systems after the cessation of general anaesthetics. This stage may be accompanied by temporary neurologic phenomena, such as [agitated emergence](#) (acute mental confusion), [aphasia](#) (impaired production of speech), or focal impairment in sensory or motor function. [Shivering](#) is also fairly common and can be clinically significant because it causes an increase in [oxygen](#) consumption. Reversal of anesthetics by

- ❖ Switch off Inhalational /Intravenous Anaesthetic agents
- ❖ Using Intravenous reversal agents
 - i. Flumazenil, reverses the effects of benzodiazepines
 - ii. Naloxone, reverses the effects of opioids
 - iii. Neostigmine, helps reverse the effects of non-depolarizing muscle relaxants

Complications of General Anaesthesia

- 1- Central Nervous System: e.g. Awareness, Psychological trauma
- 2- Cardiovascular System: e.g. hypotension which lead to MI, cardiac arrest, brain injury.
- 3- Respiratory system: e.g. pulmonary aspiration which lead to pneumonia

Indications of general anaesthesia in dentistry.

1. Acute infection
2. Children
3. Mentally challenged patients:
4. Dental phobia
5. Allergy to local anaesthetics

6. Extensive dentistry & facio-maxillary surgery