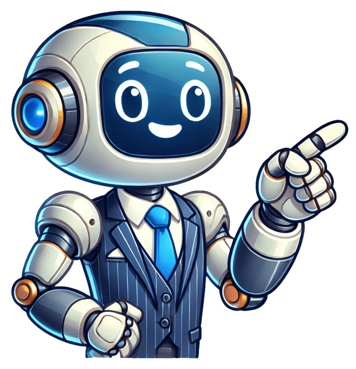

Medically induced loss of consciousness Medical intervention General anaesthesiaEquipment used for anaesthesia in the operating roomSpecialtyAnaestheticsUsesFacilitating surgery, terminal sedation[1]ComplicationsAnaesthesia awareness,[2] overdose,[3] death[4]MeSHD000768MedlinePlus007410[edit on Wikidata] General anaesthesia (UK) or general anesthesia (US) is medically induced loss of consciousness that renders a patient unarousable even by painful stimuli.[5] It is achieved through medications, which can be injected or inhaled, often with an analgesic and neuromuscular blocking agent. General anaesthesia is usually performed in an operating theatre to allow surgical procedures that would otherwise be intolerably painful for a patient, or in an intensive care unit or emergency department to facilitate endotracheal intubation and mechanical ventilation in critically ill patients. Depending on the procedure, general anaesthesia may be optional or required. No matter whether the patient prefers to be unconscious or not, certain pain stimuli can lead to involuntary responses from the patient, such as movement or muscle contractions, that make the operation extremely difficult. Thus, for many procedures, general anaesthesia is necessary from a practical point of view. The patient's natural breathing may be inadequate during the procedure and intervention is often necessary to protect the airway.[5] Various drugs are used to achieve unconsciousness, amnesia, analgesia, loss of reflexes of the autonomic nervous system, and in some cases paralysis of skeletal muscles. The best combination of anaesthetics for a given patient and procedure is chosen by an anaesthetist or other specialist in consultation with the patient and the surgeon or practitioner performing the procedure.[6] Main article: History of general anesthesia Further information: History of tracheal intubation Attempts at producing general anaesthesia can be traced throughout recorded history in the writings of the ancient Sumerians, Babylonians, Assyrians, Egyptians, Greeks, Romans, Indians, and Chinese. During the Middle Ages, scholars made advances in the Eastern world and Europe. The Renaissance saw advances in anatomy and surgical technique. However, surgery remained a treatment of last resort. Largely because of the associated pain, many patients chose certain death over surgery. Although there has been debate as to who deserves the most credit for the discovery of general anaesthesia, scientific discoveries in the late 18th and early 19th centuries were critical to the eventual introduction and development of modern anaesthetic techniques.[7] Two enormous leaps occurred in the late 19th century, which allowed the transition to modern surgery. An appreciation of the germ theory of disease led to the development of antiseptic techniques in surgery. Antisepsis, which soon gave way to asepsis, reduced the overall morbidity and mortality of surgery to a far more acceptable rate.[8] Concurrently, significant advances in pharmacology and physiology led to the development of general anaesthesia. On 14 November 1804, Hanaoka Seishū, a Japanese surgeon, became the first person on record to perform successful surgery using general anaesthesia.[9] In the 20th century, general anaesthesia's safety and efficacy improved with routine tracheal intubation and other advanced airway management techniques. Advances in monitoring and new anaesthetic agents with improved pharmacokinetic and pharmacodynamic characteristics also contributed to this trend, and standardized training programs for anaesthesiologists and nurse anaesthetists emerged. General anaesthesia has many purposes and is routinely used in many surgical procedures. An appropriate surgical anaesthesia should include the following goals: Hypnosis/Unconsciousness (loss of awareness) Analgesia (loss of response to pain) Amnesia (loss of memory) Immobility (loss of motor reflexes) Paralysis (skeletal muscle relaxation and normal muscle relaxation)[3] Instead of receiving continuous deep sedation, such as via benzodiazepines, dying patients may choose to be completely unconscious as they die.[1] The biochemical mechanism of action of general anaesthetics is not fully understood.[10] Anaesthetics have myriad sites of action and affect the central nervous system (CNS) at several levels. General anaesthesia interrupts or changes the functions of CNS components including the cerebral cortex, thalamus, reticular activating system, and spinal cord. Theories of anaesthesia identify target sites in the CNS, neural networks and arousal circuits linked with unconsciousness, and some anaesthetics can potentially activate specific sleep-active regions.[11] Two non-exclusionary mechanisms include membrane-mediated and direct protein-mediated anesthesia. Potential protein-mediated molecular targets are GABAA,and NMDA glutamate receptors. General anaesthesia was thought to enhance the inhibitory transmission or to reduce the excitatory transmission of neuro signaling.[12] Most volatile anaesthetics have been found to be a GABAA agonist, although the site of action on the receptor remains unknown.[13] Ketamine is a non-competitive NMDA receptor antagonist.[14] The chemical structure and properties of anaesthetics, as first noted by Meyer and Overton, suggest they could target the plasma membrane. A membrane-mediated mechanism that could account for the activation of an ion channel remained elusive until recently. A study from 2020 showed that inhaled anaesthetics (chloroform and isoflurane) could displace phospholipase D2 from ordered lipid domains in the plasma membrane, which led to the production of the signaling molecule phosphatidic acid (PA). The signaling molecule activated TWIK-related K+ channels (TREK-1), a channel involved in anaesthesia. PLDnull fruit flies were shown to resist anaesthesia. The results established a membrane mediated target for inhaled anaesthetics.[15] Before a procedure, the anaesthesiologist reviews medical records, interviews the patient, and examines them to determine an appropriate anaesthetic plan and decide what combination of drugs and dosages will be needed for the patient's comfort and safety during the procedure. A variety of non-invasive and invasive monitoring devices may be necessary to ensure a safe and effective procedure. Key factors in this evaluation are the patient's age, gender, body mass index, medical and surgical history, current medications, exercise capacity, and fasting time.[16][17] Thorough and accurate preoperative evaluation is crucial for the effective safety of the anaesthetic plan. For example, a patient who consumes significant quantities of alcohol or illicit drugs could be undermedicated during the procedure if they fail to disclose this fact, and this could lead to anaesthesia awareness or intraoperative hypertension.[2][18] Commonly used medications can also interact with anaesthetics, and failure to disclose such usage can increase the risk during the operation. Inaccurate timing of last meal can also increase the risk for aspiration of food, and lead to serious complications.[6] An important aspect of pre-anaesthetic evaluation is an assessment of the patient's airway, involving inspection of the mouth opening and visualisation of the soft tissues of the pharynx.[19] The condition of teeth and location of dental crowns are checked, and neck flexibility and head extension are observed.[20][21] The most commonly performed airway assessment is the Mallampati score, which evaluates the airway base on the ability to view airway structures with the mouth open and the tongue protruding. Mallampati tests alone have limited accuracy, and other evaluations are routinely performed addition to the Mallampati test including mouth opening, thyromental distance, neck range of motion, and mandibular protrusion. In a patient with suspected distorted airway anatomy, endoscopy or ultrasound is sometimes used to evaluate the airway before planning for the airway management.[22] 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 or simply provide anxiolysis. Premedication also often has mild sedative effects and may reduce the amount of anaesthetic agent required during the case.[6] One commonly used premedication is clonidine, an alpha-2 adrenergic agonist.[23][24] It reduces postoperative shivering, postoperative nausea and vomiting, and emergence delirium.[6] However, a randomized controlled trial from 2021 demonstrated that clonidine is less effective at providing anxiolysis and more sedative in children of preschool age. Oral clonidine can take up to 45 minutes to take full effect,[25] The drawbacks of clonidine include hypotension and bradycardia, but these can be advantageous in patients with hypertension and tachycardia.[26] Another commonly used alpha-2 adrenergic agonist is dexmedetomidine, which is commonly used to provide a short term sedative effect (