

# *Anesthesia and Pain Management*



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<https://is.muni.cz/auth/el/1411/zima2010/VSAL091/>

## *My goal:*

- understand basic concepts of general and regional anesthesia
  - learn basic skills of airway management
  - anatomy of regional anesthesia (SA, EPI)
  - anesthesia of children
- .. and if you would like, more ...
- 
-

# *How to get credit??*

Lectures

Literature : Larsen, Miller, Barash  
Anesthesia

Short test

Simulation (Airway management drill)

OR – voluntary intership

Oral Exam

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# *Topics for oral exam*

- Anatomy of airways + physiology of breathing
  - Physiology of circulation (cardiac output)
  - Monitoring
  - Pharmacology
  - ASA I patient and GA, premedication;
  - Airway management
    - Rapid sequence of induction = technique, indications
    - Difficult ventilation / intubation
  - Malignant hyperthermia
  - Acute, chronic pain
  - Anatomy of spinal column – SA, EPI
- 
-

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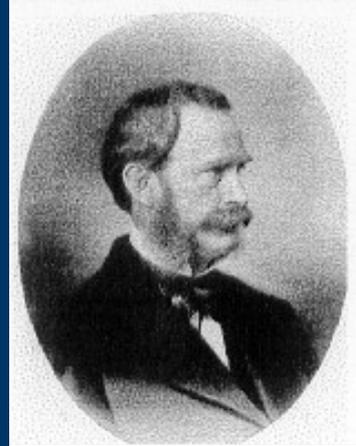
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 [The Society For Airway Management](#)

# History

- 📄 Opium (Egypt, Syria)
    - Hippokrates 400 BC ease pain
  - 📄 1555 Andreas Vesalius - arteficial ventilation through tube between vocal cords, ventricular fibrilation (animals)
  - 📄 1546 Valerius Cordus - ether – oleum vitreolum dulce
  - 📄 1547 Paracelsus - analgetic effect of ether
  - 📄 1646 Severino - cryoanaesthesia – Napoleon's wars - Larey
  - 📄 1773 N<sub>2</sub>O Joseph Priestley (1733-1804)
  - 📄 1774 oxygen
  - 📄 1779 Humphry Davy - anaesthetic effect of N<sub>2</sub>O
- 
-

# Beginning of GA



- ☞ October 16th 1846 ether general anaesthesia Boston dentist William Thomas Green Morton to Gilbert Abbott (tumor of mandibule)
- ☞ February 6th 1847 Prague - first Czech ether anaesthesia - Celestýn Opitz
- ☞ 1895 direct laryngoscopy Alfred Kirstein in Berlin.
  - 1920 direct laryngoscopy to clinical praxis Magill and Rowbotham

# Ether

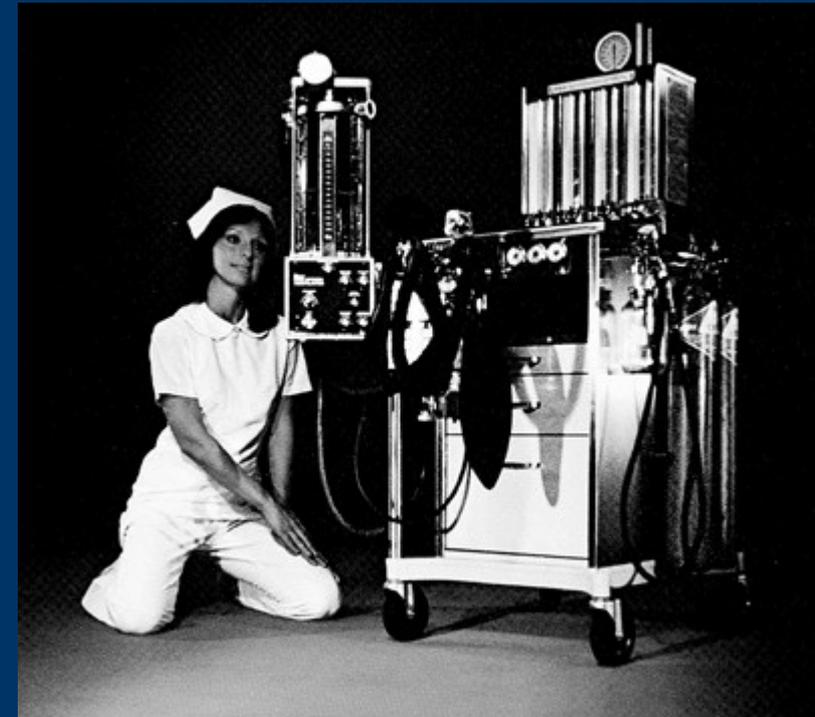


DR. H. J. BIGELOW    DR. A. A. GOULD    DR. J. C. WARREN    DR. W. T. C. MORTON    DR. SAMUEL PARKMAN    DR. GEORGE HAYWARD  
DR. J. MASON WARREN    DR. S. D. TOWNSEND

*The First Public Demonstration of Surgical Anaesthesia  
Boston, October 16, 1846*

# *After ether*

- 1847 – chloroform – porodnická anestezie
- 1884 – cocaine – eye, .. mucosa
- 1885-99 – cocaine “spinaly”
  
- 1950's – halothan
- 1960's – enflurane, isoflurane
- 1994 – sevoflurane



# *Ideal anesthetic*

- temporary disable function of neurons
- no influence on breathing, circulation
- safe, cheap, non-toxic,...
  
- Does not exist.



# *Anesthesiology*

is a young discipline (160y) dealing with

- The preoperative, **intraoperative** and **postoperative** evaluation and treatment of patients who are rendered unconscious and/or insensible to pain and emotional stress during surgical, obstetrical, therapeutic and diagnostic medical procedures;
  - The protection of life functions and vital organs (brain, heart, lungs, kidneys, liver, endocrine, skin integrity, nerve) under the stress of surgical and other medical procedures;
- 
-

# *Anesthesiology*

- Monitoring and maintenance of normal physiology during the perioperative period;
- Diagnosis and treatment of acute, chronic and cancer-related pain;
- Clinical management of CPR;
- Evaluation of respiratory function and application of respiratory therapy;
- Management of critically ill patients;
- Conduct of clinical research;
- Teaching personnel involved in perioperative care

# *General Anesthesia - Definition*

☞ artificial intoxication, controlled coma

☞ reversible

☞ drug-induced loss of consciousness, feeling, pain.  
„No reaction“ to stimuli

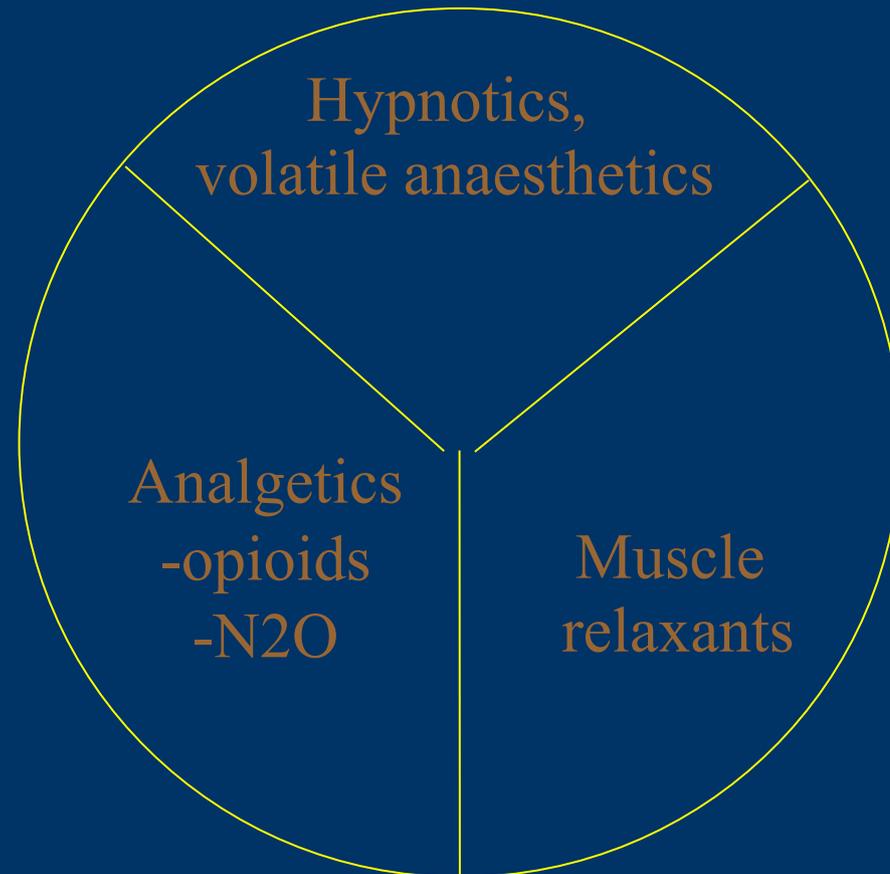
☞ allow therapy (surgery, electroshock)

☞ allow diagnostic method (CT, MRI)

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# *General anaesthesia*



# Patient + GA

preoperative anaest. visit, **informed consent**

premedication

venous line

monitoring

induction

(airway protection)

maintenance

(extubation)

treatment of postoperative pain

record of GA

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# ASA Physical Status = risk

I <b>Healthy patient</b>	0,06%
II <b>Mild systemic disease, no functional limitations</b> hypertension, smoker, mild asthma	0,47%
III <b>Severe systemic disease- definite functional limitation</b> coronary disease, COPD, DM, CHF, renal failure	4,39%
IV <b>Severe systemic disease that is a constant threat to life</b> unstable angina, burn with septic shock 23,48%	
V <b>Moribund patient not expected to survive 24 hours with or without operation</b> patient with extensive bowel infarction, polytrauma	50,8%

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# *Preoperative tests*

as a component of the preanesthesia evaluation, may be indicated to:

- 1) discovery a disease or disorder which may affect perioperative anesthetic care,
- 2) verification of an already known disease, disorder, medical or alternative therapy which may affect perioperative anesthetic care,
- 3) formulation of specific anesthes. plans

Will I change something if the result is ...?

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# *Preoperative examination*

- ☞ history (GA, RA, complications)
  - ☞ physical examination (neck, back)
  - ☞ laboratory: blood cells, ions, urea, creatinin, glucose, AST, ALT, GMT, bilirubin, AB0.
  - ☞ ECG (older 45).
  - ☞ Xray of chest (older 60 let).
  - ☞ function exam
    - cardiological, lung, nephro, hemato
- 
-

# *Why to do PreOP exam?*

- decrease RISKS
  - what is the benefit of surgery
  - Airway exam
  - GA // regional?
  - premedication
- 
-

# *History of Airway Management*

- History

- any difficulty, teeth?

- TS scar [narrower trachea]?

!!! Tell the truth about troubles in anesthesia !!!

- Examination:

- Mouth Opening(3 fingers)

- free teeth

- gothic palatum

- big tongue, small mouth

- hypoplastic mandibula

- anteposition of larynx = mandibula-os hyoideum <3 fing.

- flection, extension of head

- Mallanpati

- ***Mouth opening***

Should be adequate (3 cm or more) to easily

- allow a laryngoscope plus endotracheal tube (ETT).
- Patients with temporomandibular joint (TMJ) disease or trismus may not be able to open widely, and may require fiberoptic intubation by the nasal route





# Teeth

Edentulous patients are always easier to intubate, but are often more difficult to ventilate with a face mask.

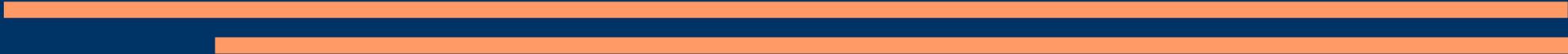
Patients with teeth in poor condition or with very prominent teeth may be more difficult to intubate.



# *Thyromental distance*

Distance from the mentum of the **mandible to the thyroid**, with neck fully extended.

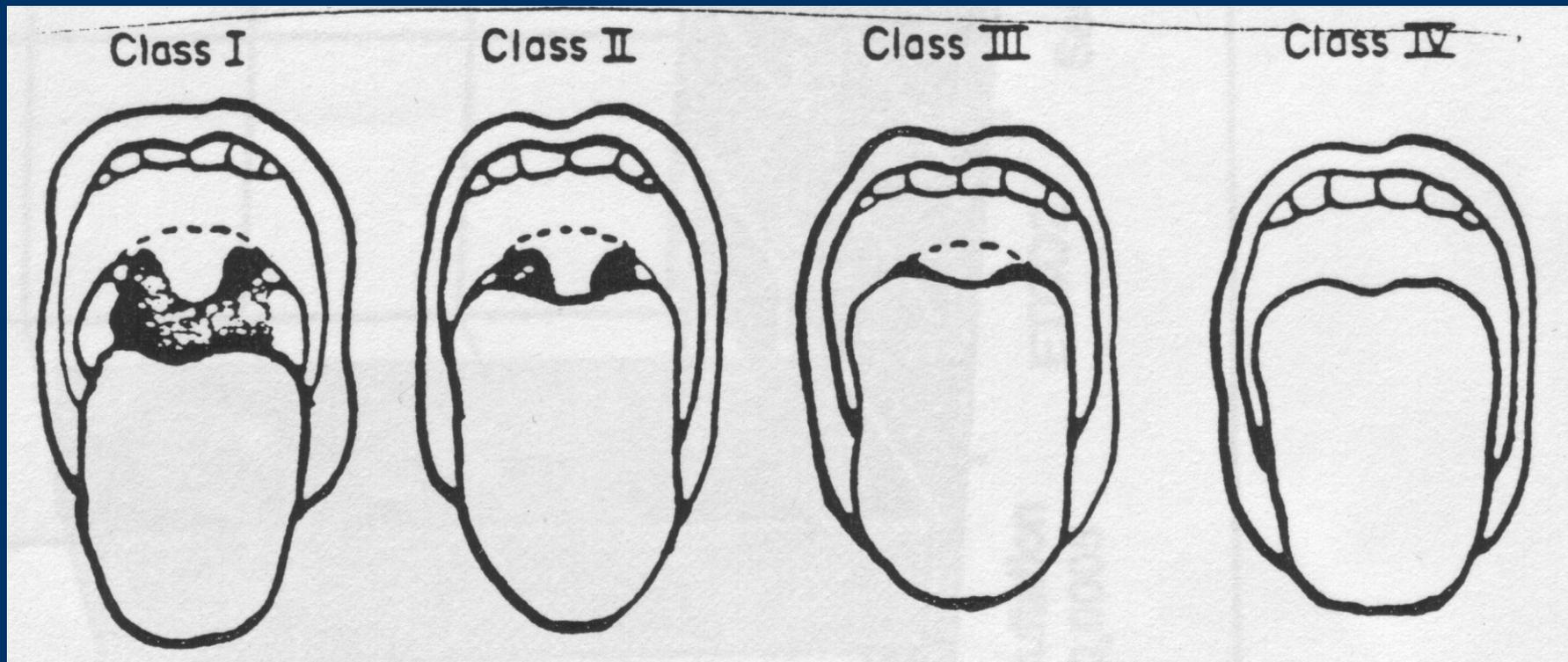
If distance is less than 6 cm there is less space for the tongue to be displaced with laryngoscopy



# *Mallanpati*

OTI easy 95%

OTI difficult 50%



# *Your easy patient?*



<http://starwars.wikia.com>

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# *Predicted difficult airway*

- epiglottitis
  - abscesus (submandibular, retropharyngeal)
  - tetanus
  - trauma of the neck, mouth
  - tumor of the larynx, faryngx
  - temporomandibular joint disease
  - obezity
- 
-

# *Respiratory risk*

- spirometry, Blood gases
- COPD
- Astma
- chronic bronchitis



# *Cardiovaskular risks*

- ECG (load)
  - ECHO, (coronarography)
  
  - hypertension ( cardiac work, failure)
  - ischemia (AP, IM, rhythm)
  - Cor pulmonale
  - Valvular abnormalities (Ao stenosis)
- Prophylaxis:
- Beta blockers, ? antihypertenzive drugs
- 
-

## *... other risks*

- Diabetes mellitus
- Hepatic
  - porfyrie
  - failure
- Renal
- CNS
  - epilepsy
  - mm. (Myastenia gr., )



# *Conversation before GA or RA*

☞ empty stomach - last food, fluid

☞ tooth (artificial, free)

☞ weight

☞ allergy

☞ complication of CA in his/family history

☞ check-up questionnaire

☞ agreement with anaesthesia

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# *PreOP starving*

- 24 h no smoking
- 6-8 h no eating  
4h breast milk
- 2 h last clear liquid



# *Premedication*

**usually p.os - evening + morning**

☰ sedation/anxiolysis (Benzodiazepines)

☰ analgesia only if pain (opioids)

☰ reduce airway secretions + heart rate control + hemodynamic stability

☰ prevent bronchospasm

☰ prevent and/or minimize the impact of **aspiration**

☰ decrease post-op nausea/vomiting

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# *Premedication*

goal: cooperating patient

anxiolysis

- easier induction of A.
- lower consumption of drugs



# *Risk of Aspiration*

- Severe obesity
  - Symptoms of gastroesophageal reflux
  - Advanced pregnancy
  - Severe ascites
  - Opioid administration or other condition resulting in delayed gastric emptying
  - History of gastroparesis or other motility disorder
  - Bowel ileus or bowel obstruction
- ((Metoclopramid, sodium citrate with citric acid))  
→ RSI Rapid Sequence of Induction
- 
-

# *Induction of Anesthesia*

1 – 3 drugs i.v. =

- lethal dose
- the most effective way

=> no self-control, unable call for help, suppress of vital autoregulating mechanisms

- unmask compensated disturbances (hypovolemia, relative respiratory insuf, ...)



# *Induction*

- 30 - 60s from fully conscious to vitally dependent on anaesthetist
- Moment with big influence on the rest of the life.

P.S. Did you ever sign “Informed Consent”

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# Airways

Indication for intubation:

- ☞ need of relaxation or artificial ventilation
- ☞ full stomach (Rapid Sequence of Induction)

- ☞ Laryngeal mask
  - ☞ Face mask
  - ☞ Orotracheal intubation, nasotracheal intubation with direct laryngoscopy
  - ☞ Tracheotomy
  - ☞ Cricothyrotomy
- 
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# *In the End of Anesthesia*

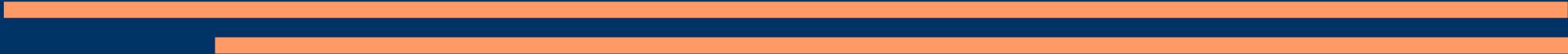
☞ Stable ABCD: extubation, pain, temperature control, PostAnest.CareUnit

☞ Unstable: analgosedation + arteficial ventilation  
- transport to ICU



# *Extubation*

- pay now or pay later - if in doubt, leave it in.
- always awake if - difficult mask airway or intubation, full stomach, surgical considerations, sux contraindicated
- awake means awake - if in doubt, leave it in



# *Postoperative care*

- ☞ ICU or standard department
  - ☞ monitoring according to the type of OP + health
  - ☞ control laboratory
  - ☞ treatment of acute pain
  - ☞ infusion therapy, blood loss
- 
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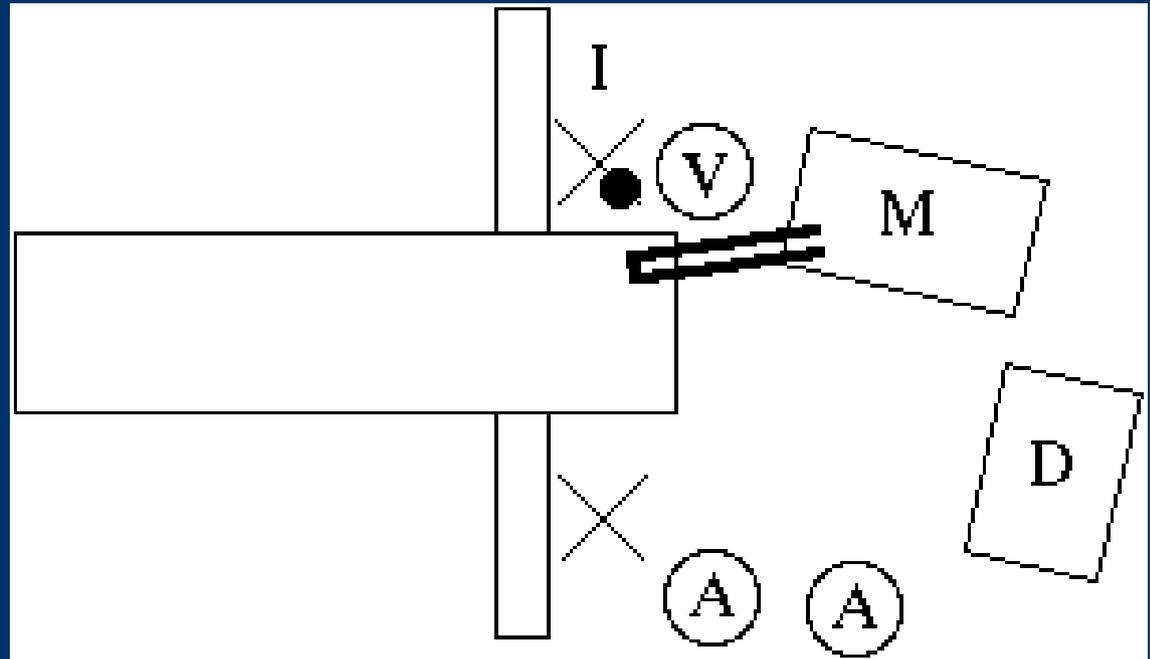
# *OR checklist*

- Test A.Machine = does it inflate O2  
[before anesthesia]
  - Identity
  - Procedure, side
  - Allergy
  - Documentation (fill in, Informed Consent)
  - i.v. access
  - Monitoring
- 
-

# *Optimal anesthesia – cardiovascular stability*

- $f$  50..90/min
  - STK max 115% of starting
  - DTK  $> 60$  mmHg
  - PAOP  $< 12$  mmHg
  - correct anemia
- 
-

# ORoom



- „Dobry den“
  - fellowship anesthetist ~ A.nurse
- confidence, respect
- hygiene – wash your hands before every case, use gloves
- 
-

# *Mortality of anaesthesia (ASA I)*

☞ 0,008-0,009% primary connected with A

☞ 0,01-0,02% partially connected with A

☞ 0,6% 6 day mortality after operation

☞ 3 times danger than flying [1: 775 000]

# *Complications of GA*

!!! No risk = no anaesthesia !!!

☞ difficult intubation, ventilation ... asfyxia

☞ aspiration of stomach fluid ... pneumonia

☞ overdose anaesthetic ... cardiovascular, respiratory colaps

☞ malfunction of monitor, machines

☞ organ failure (AIM, dekomensation COPD, hepatitis, ...)

☞ malignant hyperthermia

☞ anaphylactic reaction / shock

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# *Risk of anesthesia - mortality*

- Trend to improve safety => low tolerance to complications of anesthesia

## Mortality and Anesthesia:

- 1952 1 : 2 000 (Beecher, 1954)
  - 1982 1 : 10 000 (NCEPOD 1987)
  - 2001 1 : 50 000 – 220 000 (Brown, 2002)
- 
- Risk of death in aviation 1: 755 000 (1997)
- 
-

# ☰ *Death and Anesthesia*

- hypoxemia / UPV /  
intubation of oesophagus
- aspiration / regurgitation of gastric fluid to lung
- circulatory instability (ischaemia)
- over dose
- anaphylaxis, interaction of drugs

!!! Death was preventable (60%) !!!

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# Phraseology

- analgesia = elimination of pain
  - sedation = elimination of stress, impatience, fear
    - Minimal Sedation (Anxiolysis) is a drug-induced state during which patients respond normally to verbal commands. Although cognitive function and physical coordination may be impaired, airway reflexes, and ventilatory and cardiovascular functions are unaffected.
    - Moderate Sedation/Analgesia (“Conscious Sedation”) is a drug-induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation.
- 
-

# Phraseology

- Deep Sedation/Analgesia is a drug-induced depression of consciousness during which patients cannot be easily aroused but respond following repeated or painful stimulation. The ability to independently maintain ventilatory function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate.
- General Anesthesia is ... loss of consciousness during which patients are not arousable, even by painful stimulation.
  - inability to maintain ventilatory function = often require assistance in maintaining a patent airway, and positive pressure ventilation may be required.

# Continuum of depth of sedation

	<i>Minimal Sedation/Anxiolysis</i>	<i>Moderate Sedation/Analgesia</i> <i>("Conscious Sedation")</i>	<i>Deep Sedation/Analgesia</i>	<i>General Anesthesia</i>
<i>Responsiveness</i>	Normal response to verbal stimulation	Purposeful** response to verbal or tactile stimulation	Purposeful** response following repeated or painful stimulation	Unarousable even with painful stimulus
<i>Airway</i>	Unaffected	No intervention required	Intervention may be required	Intervention often required
<i>Spontaneous Ventilation</i>	Unaffected	Adequate	May be inadequate	Frequently inadequate
<i>Cardiovascular Function</i>	Unaffected	Usually maintained	Usually maintained	May be impaired

ASA 2004/2009

# Anesthesia

- General
  - inhal.,
  - TIVA
- Regional
  - central block (SA, EPI)
  - periferal blocks (brachial, nervous)
  - local anesthesia (eye – cornea + conjunctiva, infiltration)

Combined = GA + EPI-line

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# Useful web

<http://www.virtual-anaesthesia-textbook.com/>

[www.asahq.org](http://www.asahq.org)

[www.akutne.cz](http://www.akutne.cz)

[www.cobatrice.org](http://www.cobatrice.org)

<http://airwaymicrotext.homestead.com>

## Virtual Anesthesia Machine:

- <http://www.anest.ufl.edu/vam/>
  - [www.simanest.org](http://www.simanest.org)
- 
-



# *Preoperative evaluation and premedication*

- Risk of A
- PreOp evaluation
- Premedication
- Safety in OR

Next week:

- Anesthesia Machine
  - Monitoring
- 
-