

Oxygen therapy

University of Pécs Faculty of Health Sciences

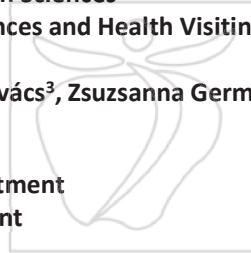
Institute of Nursing Sciences, Basic Health Sciences and Health Visiting

Dr. András Oláh¹, Noémi Fullér², Gyula Szabeni-Kovács³, Zsuzsanna Germán³,
Szilvia Szunomár³

¹ associate professor, vice dean, head of the department

² assistant professor, deputy head of the department

³ subject teacher



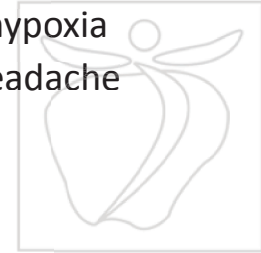
Oxygen therapy

- Anatomical and physiological basics – not in this subject

Aims of the oxygen therapy:

- Prevention and treatment of hypoxia
- for the treatment of cluster headache

- PaO₂ < 60 Hgmm
- SatO₂ < 90%



Forms of oxygen therapy

- Long-term

- During physical load

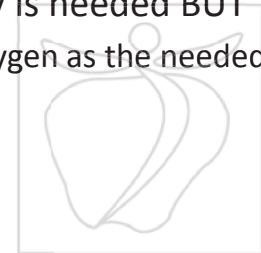
- Reducing acute dyspnoe



Special considerations regarding the home oxygen therapy

- duration of the therapy
- numbers of dependents

- in serious cases 24 hrs therapy is needed BUT
– patients do not use as much oxygen as the needed amount
 - economic reasons
 - improper patient education



Special considerations regarding the home oxygen therapy

- in Hungary 40.000 patients
- only 4500-5000 patients use the home oxygen therapy
- 19 hrs/day is needed
 - increase the survival with 6-7 yrs

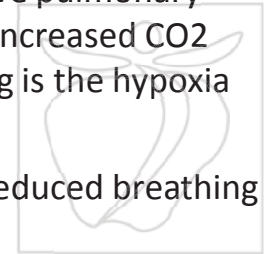


Risks of oxygen therapy

- Oxygen toxicity
- CO2 coma

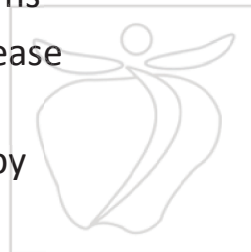
In case of COPD (chronic obstructive pulmonary disease) the body get used to the increased CO2 level so the trigger of the breathing is the hypoxia

oxygen th. -> reduced hypoxia -> reduced breathing



Contraindications of oxygen therapy

- Poisoning caused by paraquat
- Pesticide poisoning caused by diquat derivatives (except for apnea)
- Premature babies and new borns
- In chronic obstructive lung disease
 - significance of titration
- Patients with Bleomycin therapy



FiO₂

fraction of inspired oxygen



Oxygen delivery devices

Devices dispensing varied O₂ concentration

- FiO₂ depends on the breathing pattern of the patient, breathing count
- nasal cannula, low flow devices

Devices dispensing fixed O₂ concentration

- FiO₂ is independent of the patient's breathing pattern
- high flow masks

Low-flow devices

increase the dead space with 100% oxygen at the end-expiratory break

at the time of inhalation increase the inhaled gas oxygen concentration

all amount of inhaled gas is 5 l/min

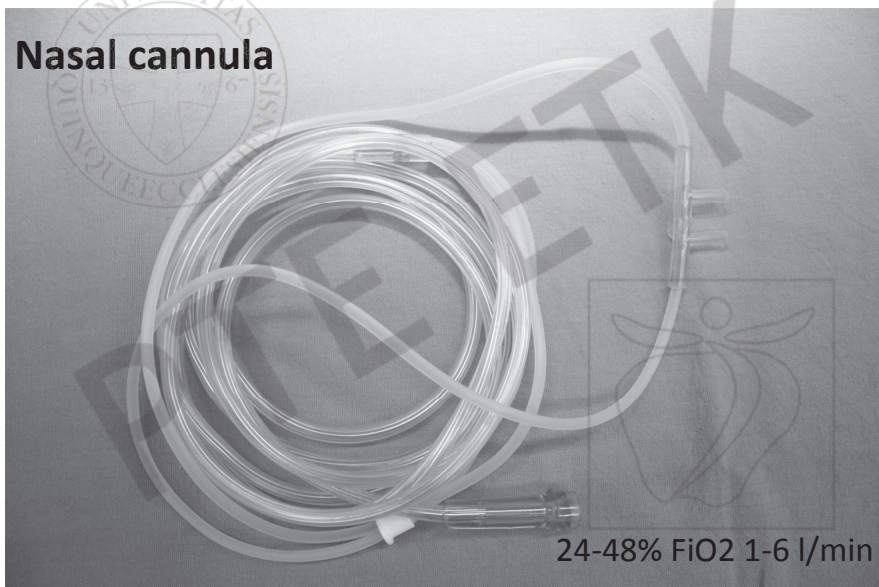
room air goes into the mask with 3 l/min

oxygen goes into the mask with 2 l/min speed

oxygen flow is 2 l/min

Low-flow devices

Nasal cannula



Low-flow devices

nasal catheter



Low-flow devices

Simple face mask

40-60% FiO₂
5-8 l/min

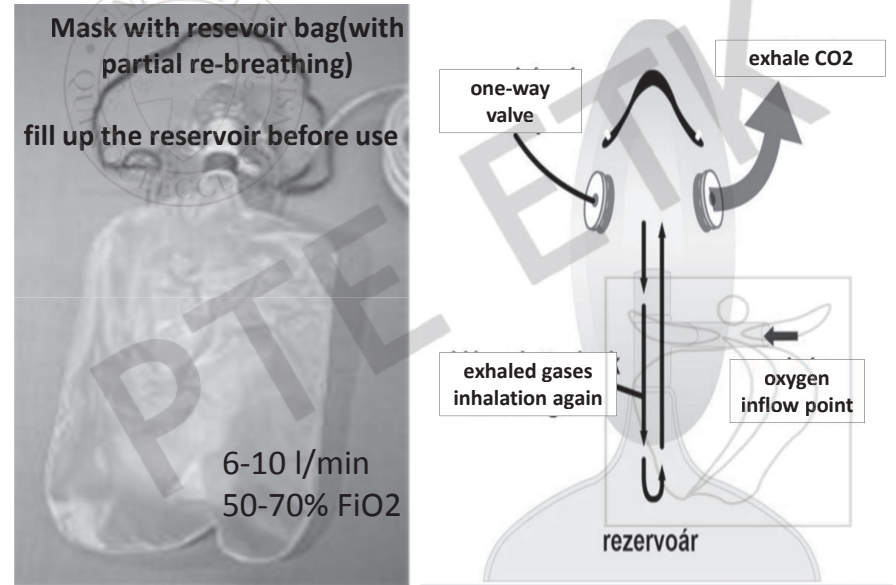


Low-flow devices

Mask with resevoir bag (with partial re-breathing)

fill up the resevoir before use

6-10 l/min
50-70% FiO₂

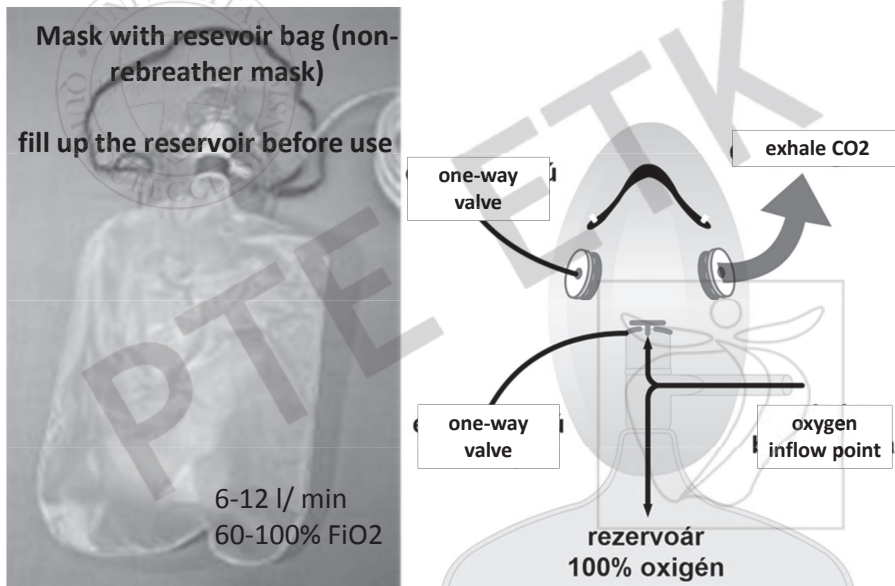


Low-flow devices

Mask with resevoir bag (non-rebreather mask)

fill up the resevoir before use

6-12 l/min
60-100% FiO₂

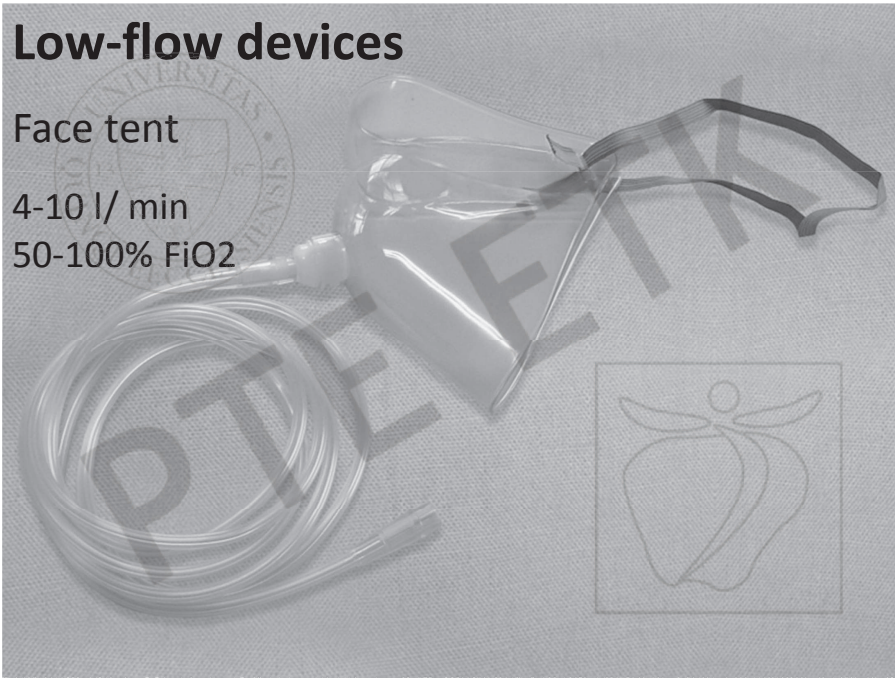


Low-flow devices

Face tent

4-10 l/ min

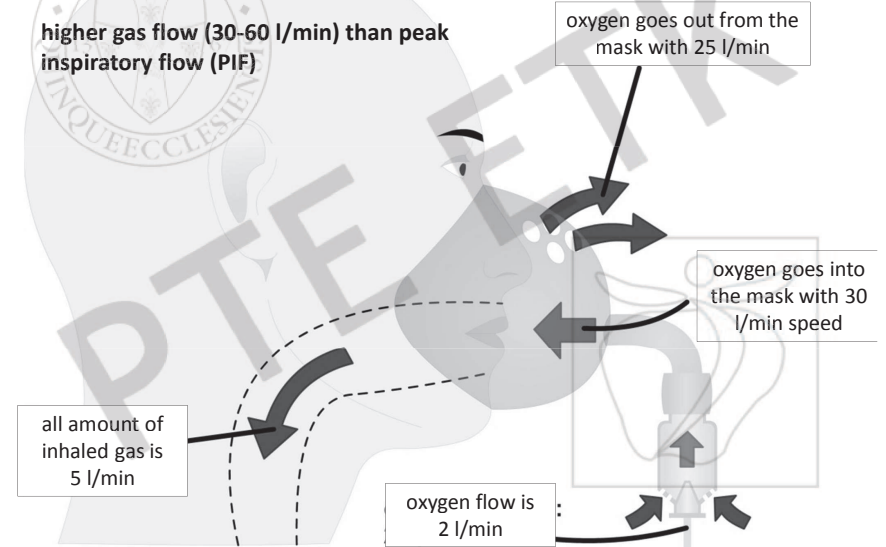
50-100% FiO₂



High-flow devices

FiO₂ is independent from the breathing pattern

higher gas flow (30-60 l/min) than peak inspiratory flow (PIF)

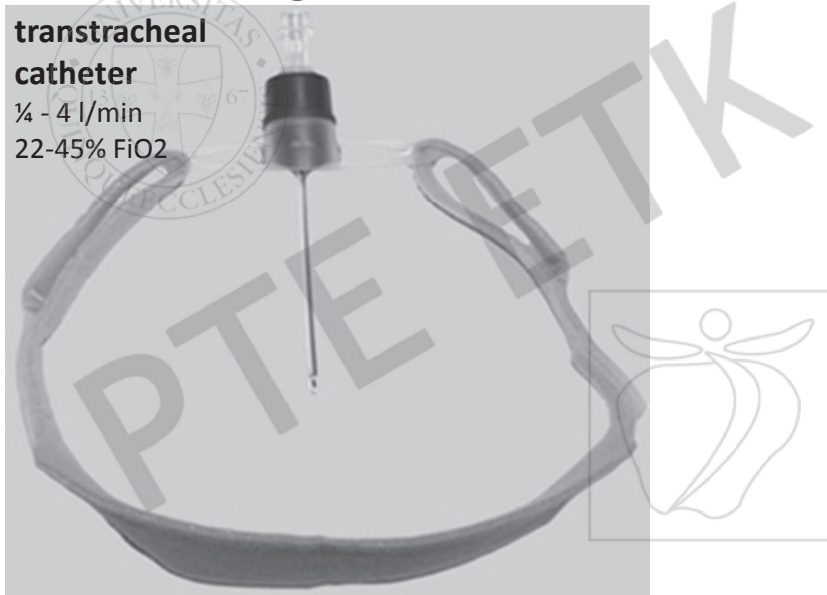


High-flow devices

transtracheal catheter

¼ - 4 l/min

22-45% FiO₂



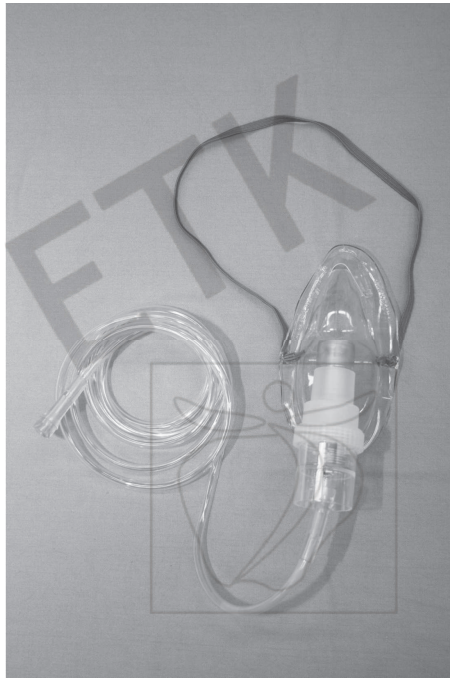
High-flow devices



High-flow devices

Aerosol mask

8-10 l/min
30-100% FiO₂



High-flow devices

Tracheostoma mask

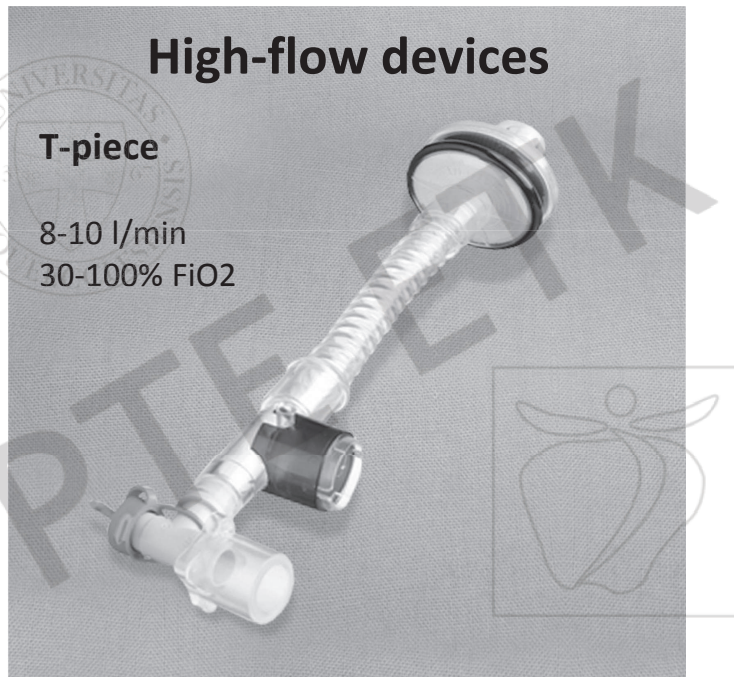
8-10 l/min
30-100% FiO₂



High-flow devices

T-piece

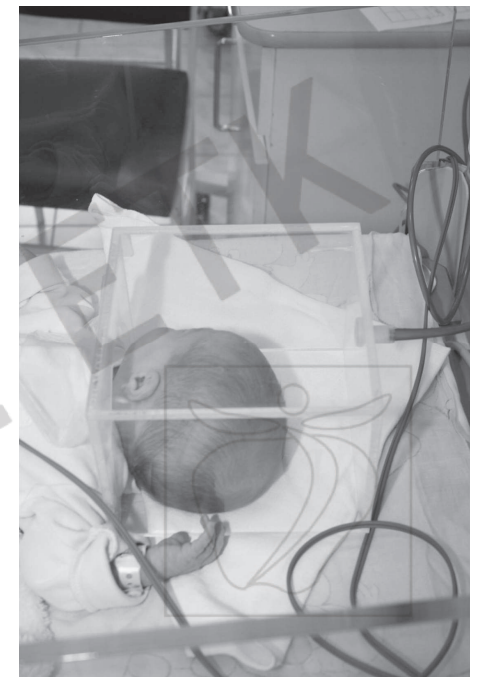
8-10 l/min
30-100% FiO₂



High-flow devices

Oxygen hood

10-15 l/min
80-90% FiO₂



High-flow devices

Oxygen tent
≥10 l/min
30-50% FiO₂



High-flow devices

CPAP-systems

0,5-10 l/min
21-57% FiO₂

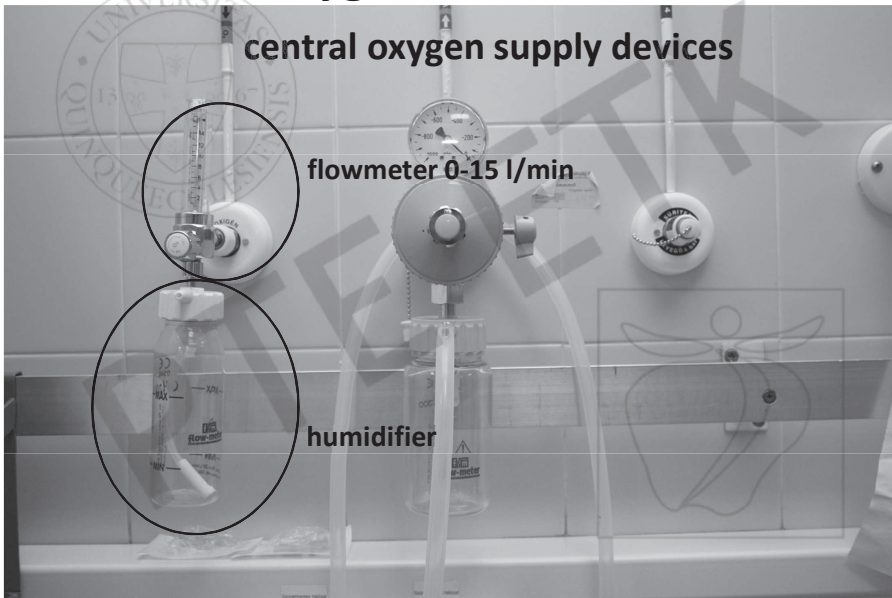


Oxygen resources

central oxygen supply devices

flowmeter 0-15 l/min

humidifier



Oxygen resources

Oxygen cylinder

pressure reductor, flowmeter,
humidifier are needed

for 3-4 days

check the colour code – should be
white

at home or institution
small one - easy to carry

time for exchange

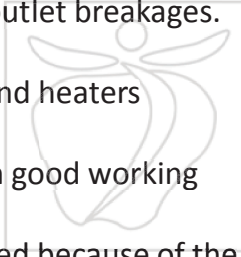
reserve cylinder



Oxygen cylinder

precautions

- no smoking and no open flames in the room
- do not touch the cylinder with oily or greasy hand
- strap them securely in wheeled transport devices or stands to prevent possible falls and outlet breakages.
- place them away from traffic areas and heaters
- make sure that electric devices are in good working
- do not put working device into the bed because of the possible danger of fire



Oxygen concentrator

cleans the air in room



Oxygen resources

- works by electricity
- easy to use
- for low-pressure systems
- noisy
- patient is tied to bed



Oxygen resources

oxygen tank

- cooled to -183°C
- in liquid form-greater amount can be stored
- tanks in different sizes
- exchange in longer periods
- easy to mobilize
- expensive



Humidifying the inhaled air

against the dehydration of airways

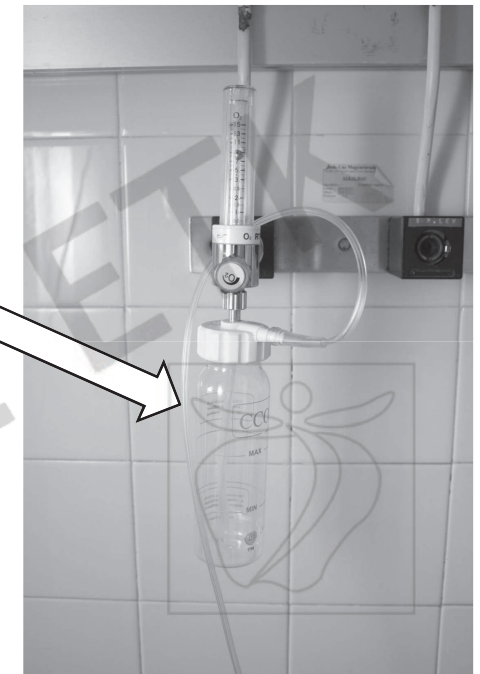
filling up with distilled water

useful?risk?

BTS 2008

- 4l/min
- therapy over 24 hours
- subjective judgement of patient

tracheostoma



Removal of respiratory secretions

Trachea sucking

- Exclusively in cases where other techniques are useless and secretion may cause physiological damage
- Alert patients can tolerate it badly

- nasotracheal sucking
- orotracheal sucking
- sucking of oral cavity and pharynx

indications/contraindications

Removal of respiratory secretions

Indications:

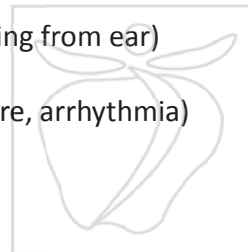
- Increased respiratory rate
- Removal of lung secretion if patient is unable to do it
- Reduced respiratory sounds
- Audible secretion
- Unproductive coughing
- Reduced O₂ saturation
- Increased breathing
- Arterial blood gas differences
- Artificial airway access
- For sampling
- Cough induction with unconscious patient
- Oral hygiene
- Removal of blood and vomit



Removal of respiratory secretions

Contraindications:

- Severe blood coagulation disorder
- Haemoptoe (respiratory bleeding, blood from GI when coughing)
- Severe laryngospasm (stridor)
- Severe bronchospasm
- Basal skull fractures (spinal fluid is leaking from ear)
- Oesophagus or trachea anastomosis
- Hemodynamic instability (blood pressure, arrhythmia)
- Obstructed nasal passages
- Nose bleeding
- Loose teeth and toothbridge

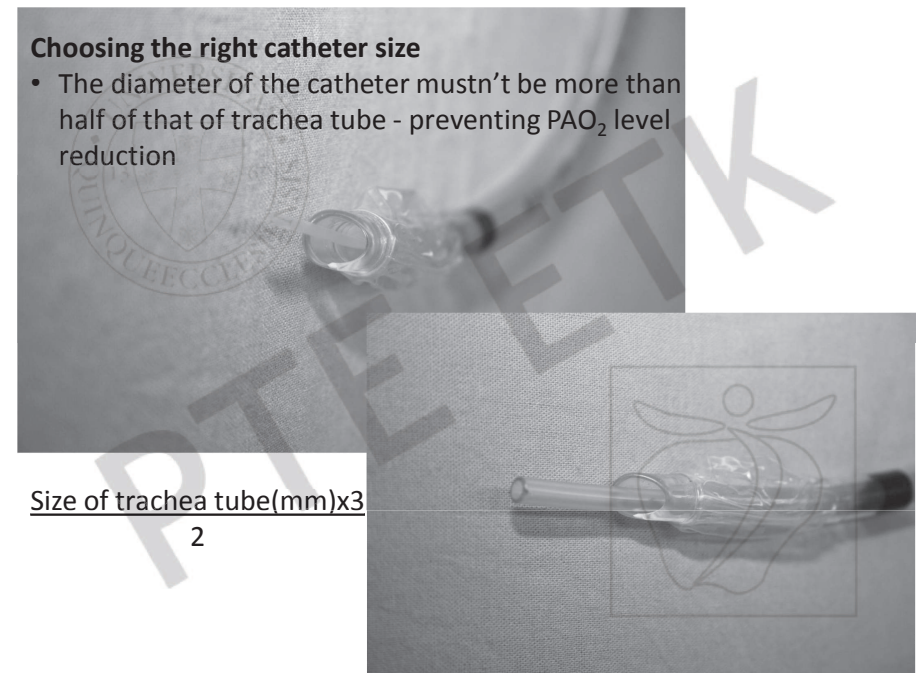


Choosing the right catheter size

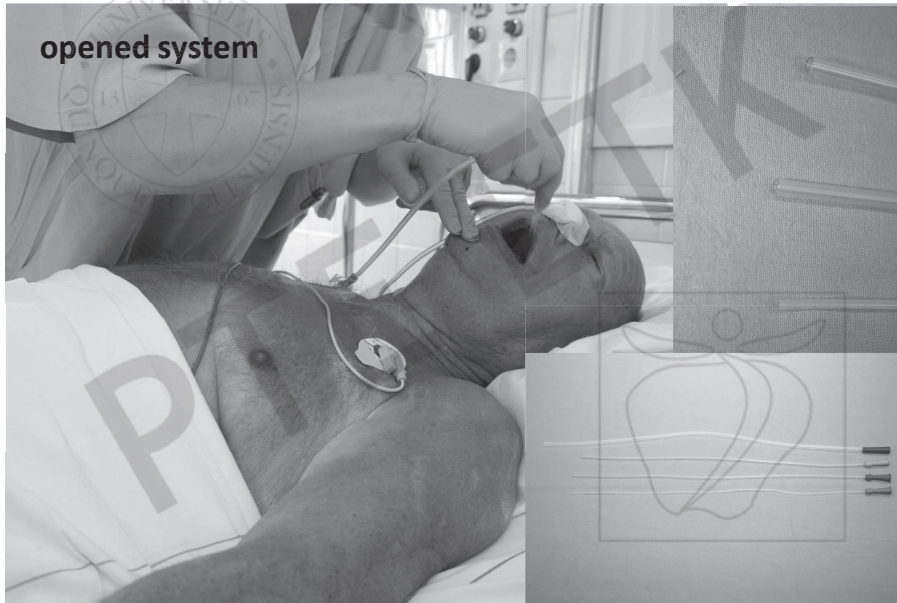
- The diameter of the catheter mustn't be more than half of that of trachea tube - preventing PAO₂ level reduction

Size of trachea tube(mm)x3

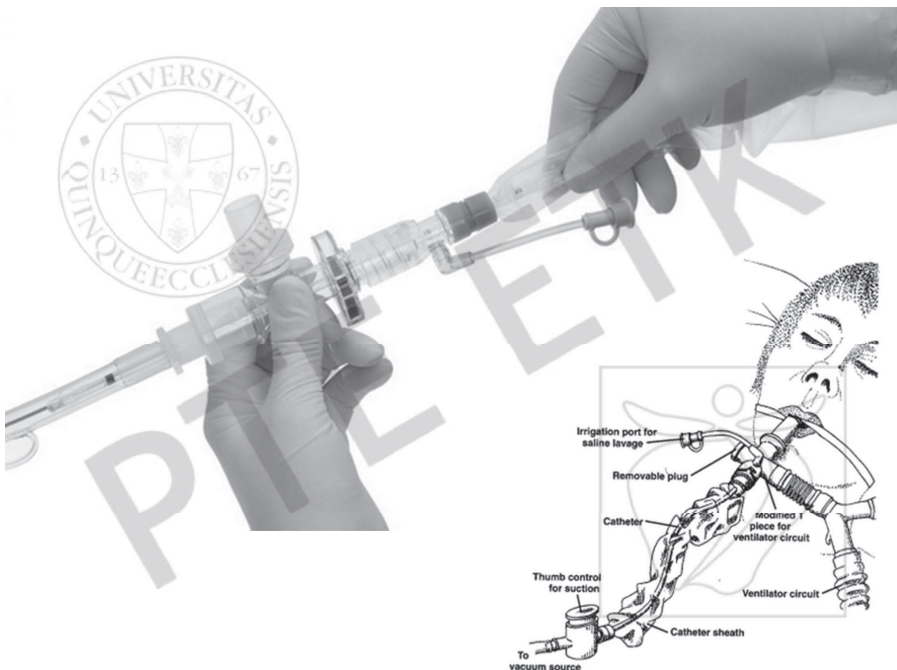
2



Types of the suction catheter

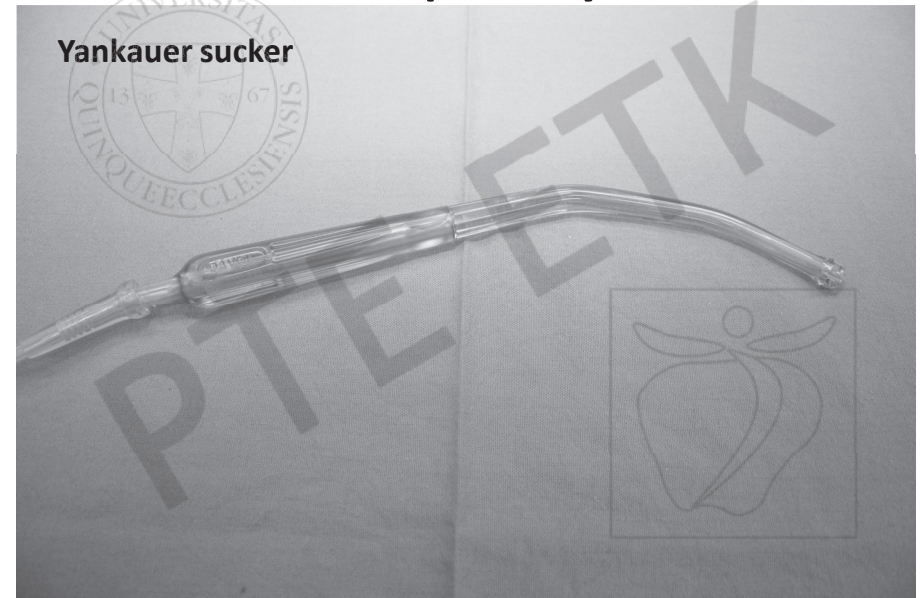


Types of the suction catheter



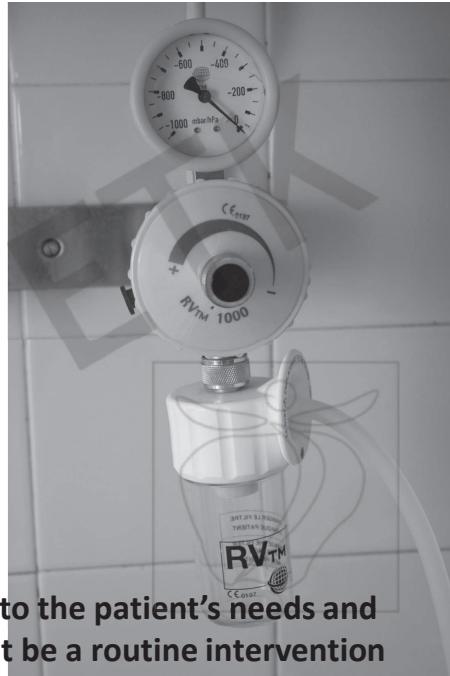
Removal of respiratory secretions

Yankauer sucker



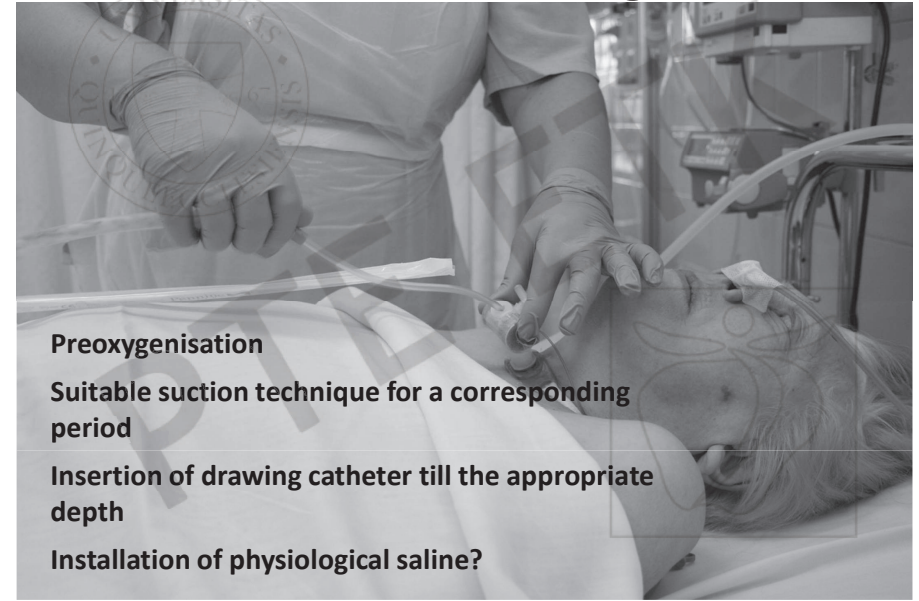
Trachea sucking

- intensity of the vacuum is 70-150 Hgmm (9,3-20 kPa)
- average of 120 Hgmm (16 kPa)



suckings should be suit to the patient's needs and condition and should not be a routine intervention

Trachea sucking



Preoxygenisation

Suitable suction technique for a corresponding period

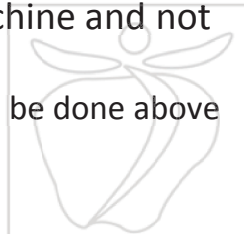
Insertion of drawing catheter till the appropriate depth

Installation of physiological saline?

Trachea sucking

Preoxygenisation:

- Hyperoxygenisation is combined with hyperinflation of the lungs (great pressure ventilation) minimizes hypoxemia
- With 100% O₂, ventilation machine and not with balloon
 - Ventilation of COPD patients can be done above 21% FiO₂ rather than 100%
- Prevalence of arrhythmia is smaller with 100%



Trachea sucking

Insertion of suction catheter till the appropriate depth:

- Till the patient starts coughing
- Bifurcation (feel resistance) - do not go on

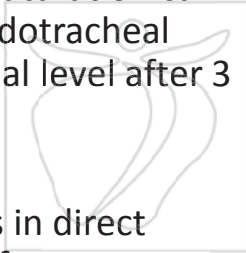


don't insert further!



Trachea sucking

- sucking for 15 sec. max
- 3 suckings for each occasion
- according to some studies O₂ saturation can be reduced by 25-30% after endotracheal sucking, which returns to normal level after 3 min.
- prevalence of trachea lesions is in direct proportion with the duration of vacuum use



Trachea sucking

Complications:

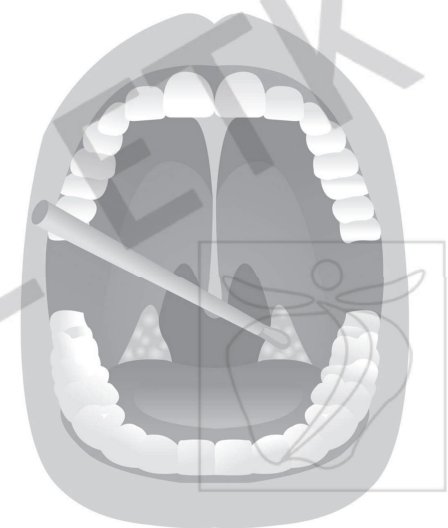
- Hypoxia
- Tissue damage/trauma
- Lung bleeding/bleeding
- Aspiration
- Laryngospasm/bronchospasm
- Apnoe
- Atelectasis
- Pneumothorax
- Pain
- Infection
- Discontinuance of mechanical ventilation
- Vomiting (in case of orotracheal drawings)
- Vague tone increase
- Arrhythmia
- Fluctuating blood pressure
- Increase of intracranial pressure
- Incorrect insertion of catheter in the oesophagus
- Anxiety, discomfort



Sampling respiratory secretions

throat secretion

sampling wand is rubbed against the pharynx or tonsils after pressing the tongue by a chap



Sampling respiratory secretions

trachea secretion:

it is feasible with intubated patients
it is equivalent with sputum sampling

sputum sampling:

sample should be taken from lower respiratory tracts, it should not be saliva
sample should be taken in the morning after rinsing the mouth with water

Sampling respiratory secretions

nasopharyngeal sampling

tampon is inserted till the nasopharyngeal wall (sampling is OK if the patient sneezes or coughs)

Inhalation therapy

- in case of acute and chronic respiratory obstructive diseases

Aim:

- Promotion of expectoration and attaining local effect
- High agent concentration can be attained with lesser amount of medicament
- fewer systemic side effects

Inhalation therapy

- form and size of aerosol particles (the most effective)
 - 2,4 – 4,7 μm the most effective
- always applied orally, appropriate concentration in the lower RT cannot be attained nasally
- technique and duration of inhalation is important
- appropriate inhalation mood

Inhalation therapy

inhalers, nebulizers functioning by propellant gas

- active compliance is needed - shooting and inhalation at the same time
- shake before use
- cold freon effect - it may lead to breathing failure and bronchospasm-it can be reduced by the use of supplement

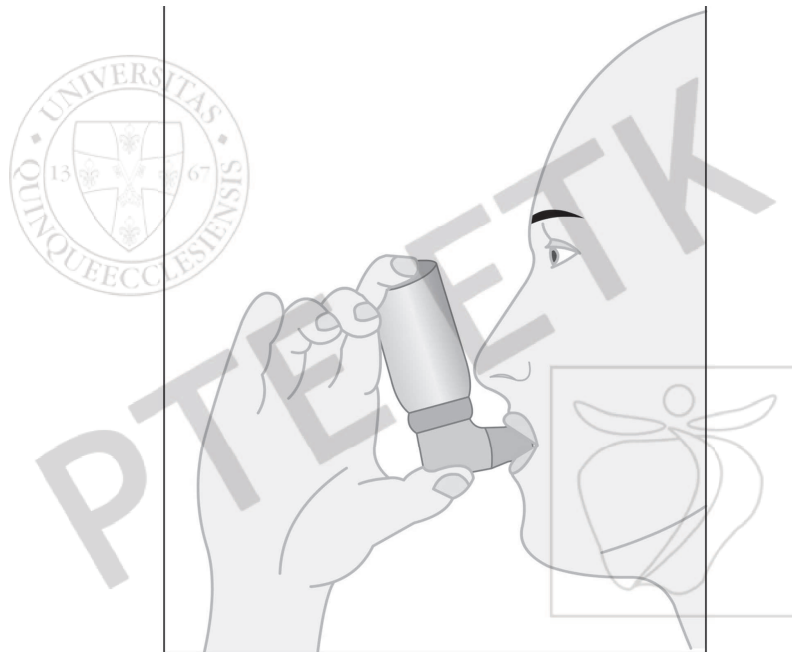
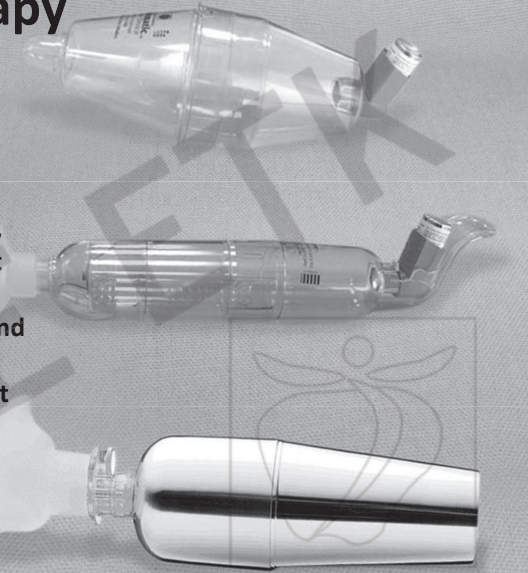
Inhalation therapy

cold freon effect can be eliminated with the use of supplements

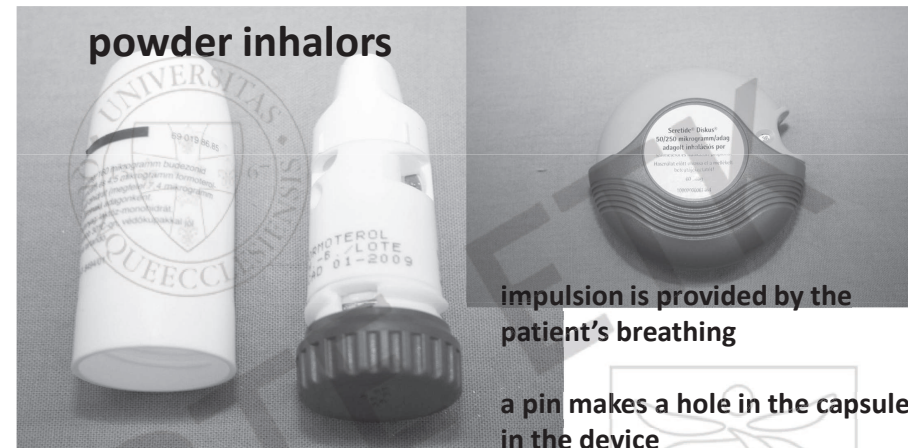
spray gets first in the container, then the patient inhales from it

most of the drug precipitates and is lost on the wall of the plastic supplement - metal supplement is better

aerosol is stable in plastic supplement for 10 sec, and in metal supplement for 30 sec.

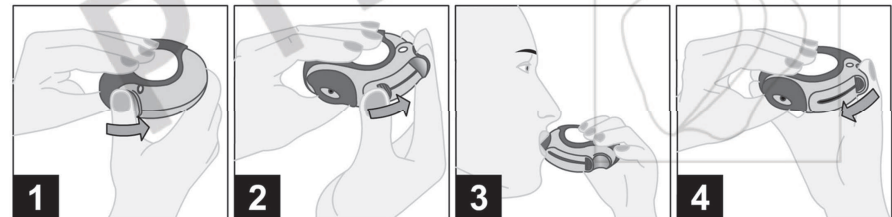


powder inhalors



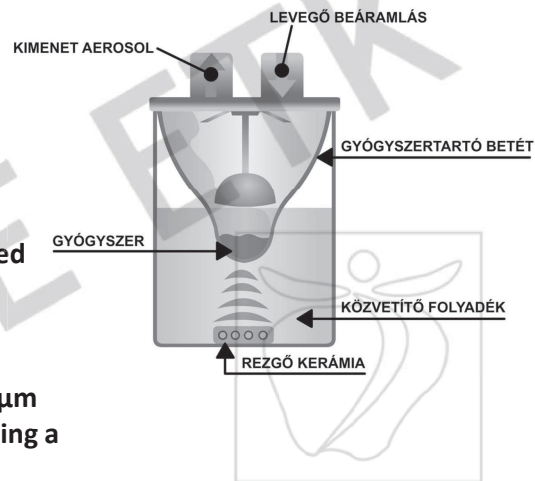
impulsion is provided by the patient's breathing

a pin makes a hole in the capsule in the device



Nebulizer machine

- compressor: compressed air transforms air into mist
- ultrasound: high-frequency sound wave triggers fluid atomization



- Various drugs can be mixed
- O₂ dosaging is possible
- Easy use
- Electricity is needed
- Particels should be 0,5-5 μm
- 4-6ml fluid is sprayed during a treatment
- A treatment lasts for 15-20 min