From Potter, P.A. & Perry, A.G. (2009). *Fundamentals of Nursing*. 7th Ed. St. Louis: Mosby.

* Care of Patients Requiring Oxygen Therapy or Tracheostomy

Why Do We Need Oxygen?

* Essential for life and function of cells/tissues.
* Respiratory, cardiovascular, hematologic systems work together, providing sufficient tissue perfusion to the body.
* Oxygen therapy improves oxygenation and tissue perfusion.

goal of O2 therapy; provide enough O2 in the blood while lowing stress.

Clinical Manifestations of Respiratory Distress

- Dyspnea
- Nasal flaring
- Use of accessory muscles to breathe
- Pursed-lip or diaphragmatic breathing
- Decreased endurance
- Skin, mucous membrane changes (pallor, cyanosis)

Respiratory Assessment

- Don't forget the order of assessment!
  - Nose and sinuses
  - Pharynx, trachea, larynx
  - Lungs and thorax
    - Rate/rhythm/depth of respirations
    - Movement /symmetry
    - Shape
    - Breath sounds
  - General appearance (muscle development)
  - Skin and mucous membranes

* Assessment of Oxygenation

Arterial Blood Gas (ABG) Lab Analysis

TEST	RANGE			RESULT	UNIT
ABG:	Acidosis		Alkalosis		
pH	(7.35	-	7.45)	7.38	pH
$PaCO_2$	(35.0	-	45.0)	38.0	mm/Hg
PO_2	(35.0	-	46.0)	39.0	mm/Hg
HCO_3	(22.0	-	26.0)	25.0	mmol/L

in tissues/cells.

* ABG analysis is best way to determine need for oxygen therapy

Oxygen Therapy

hypoxemia can leads to hypoxia

* Purpose—relieves hypoxemia
  * **Hypoxemia**—low levels of oxygen in the blood.
  * **Hypoxia**—decreased tissue oxygenation.
* **Goal**—use lowest fraction of inspired oxygen for acceptable blood oxygen level without causing harmful side effects.

providing enough O2 to the blood because too much oxygen can lead to toxicity effects.

Oxygen Delivery Systems

* Type used depends on:
  * Oxygen concentration required/achieved
  * Importance of accuracy and control of oxygen concentration
  * Patient comfort
  * Importance of humidity
  * Patient mobility

* Low-Flow Oxygen Delivery Systems

* Nasal cannula (1-6 L)
* Simple Facemask (5-8 L)
* Partial Rebreather Mask (6-11 L)
* Non-Rebreather Mask

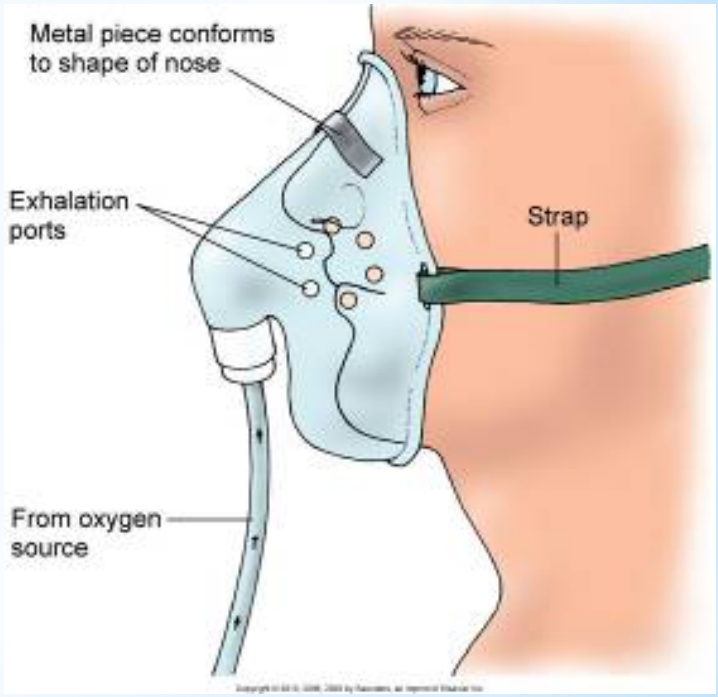
Nasal Cannula

* **Flow rates of 1-6 L/min**
* **O_2 concentration of 24%-44% (1-6 L/min)**
* Flow rate >6 L/min does not increase O_2 because anatomical dead space is full
* Assess patency of nostrils
* Assess for changes in respiratory rate and depth

- wall outlet, low flow O2 system.
- extended use will lead skin breakdown (prevent by apply water soluble gel)

Simple Facemask

* **Delivers O_2 up to 40%-60%**
* **Minimum of 5 L/min**
* Mask fits securely over nose and mouth
* Monitor closely for risk of aspiration



- low flow O2 system.
- minimum rate of 5L for CO2 flushing
- cautions with anxiety and claustrophobic patients

* Partial and Non Rebreather Mask

- low flow O2 system
- if CO2 builds up, nurse should increase liters of O2.

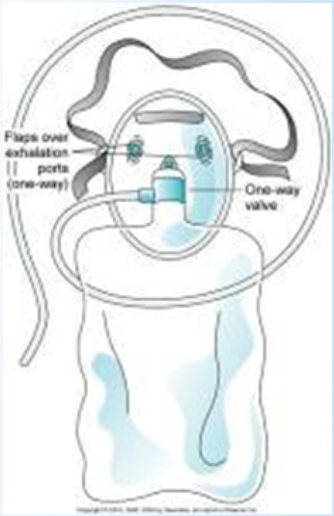
Partial

* 60-75% FiO2
* Has a reservoir bag without flaps.
* Each breath the patient Rebreaths 1/3 the tidal volume that is high in oxygen.
* Be sure the bag remains slightly inflated.

- low flow O2 system.
- deliver the highest concentration of O2 (>90%)

Non

* Up to 90% FiO2
* Use in unstable patients that may need intubation.
* Has a reservoir bag with flaps so patient gets all the oxygen and any room air that can dilute oxygen concentration.
* Ensure valves are patent and functional.



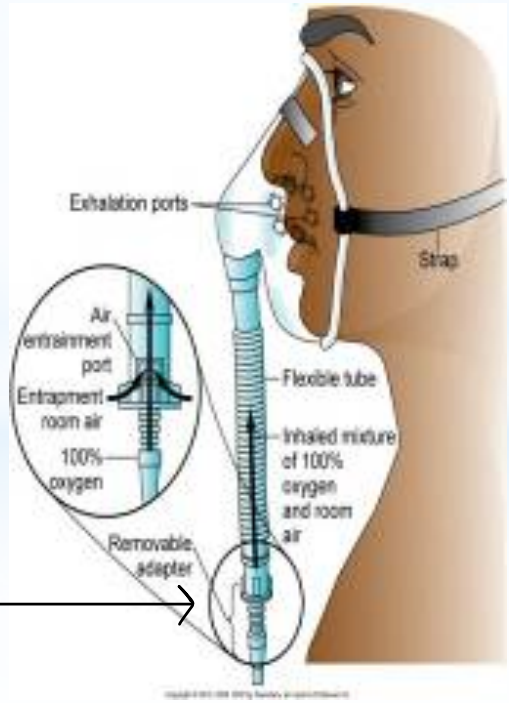
High-Flow Oxygen Delivery Systems

* Venturi mask → allow precise # of air.
  (color coded valves for corresponding O2 concentration)
* Face tent
* Aerosol mask
* Tracheostomy collar
* T-piece

Venturi Mask

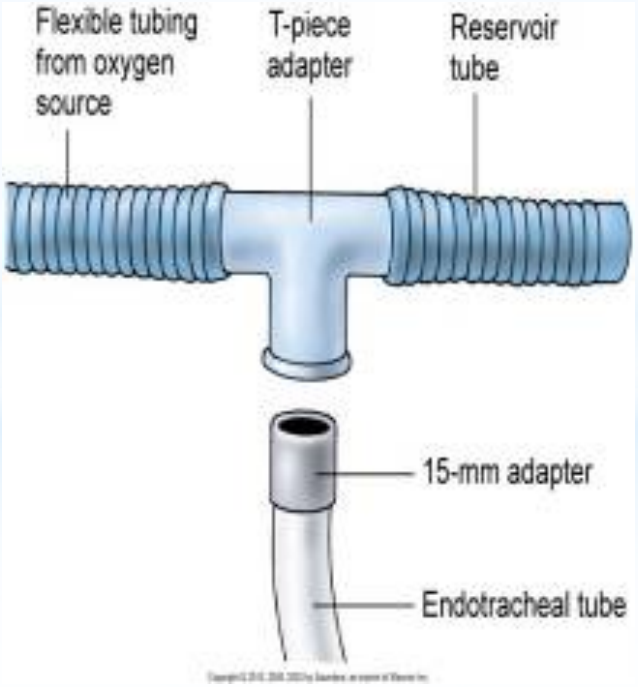
* Adaptor located between bottom of mask and O_2 sources
* Delivers precise O_2 concentration—best source for chronic lung disease
* Switch to nasal cannula during mealtimes

goal is to patient get the constant O2 supply.



T-Piece

* Delivers desired FIO_2 for tracheostomy, laryngectomy, ET tubes
* Ensures humidifier creates enough mist
* Mist should be seen during inspiration and expiration



Noninvasive Positive-Pressure Ventilation (NPPV)

* Uses positive pressure to keep alveoli open, improve gas exchange without airway intubation.
  * **BiPAP**
  * **CPAP**

* Continuous Positive Airway Pressure (CPAP)

CPAP (cont'd)

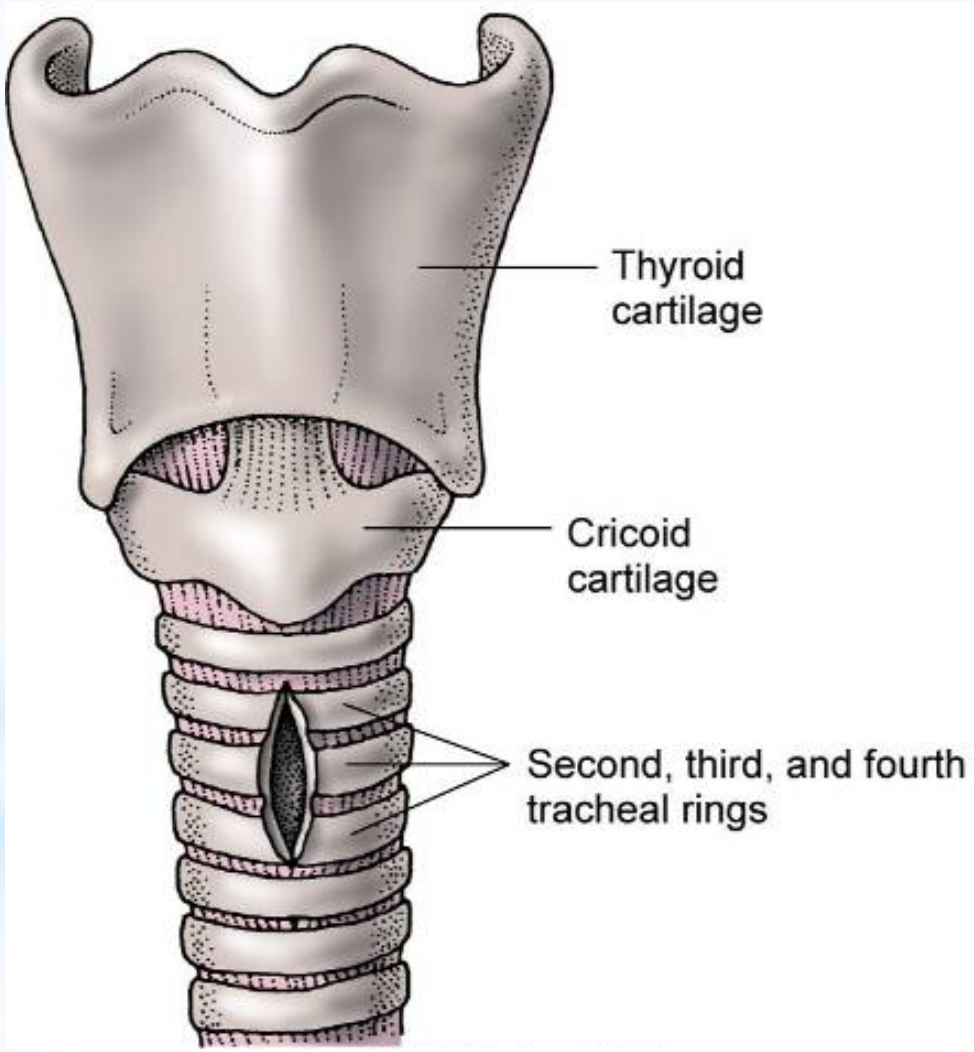
* Delivers set positive airway pressure throughout each cycle of inhalation and exhalation.
* Opens collapsed alveoli and keeps open.
* Used for atelectasis after surgery or cardiac-induced pulmonary edema; sleep apnea.
  - → obstructive sleep apnea (OSA)
* Goal: prevent the airways from collapsing.

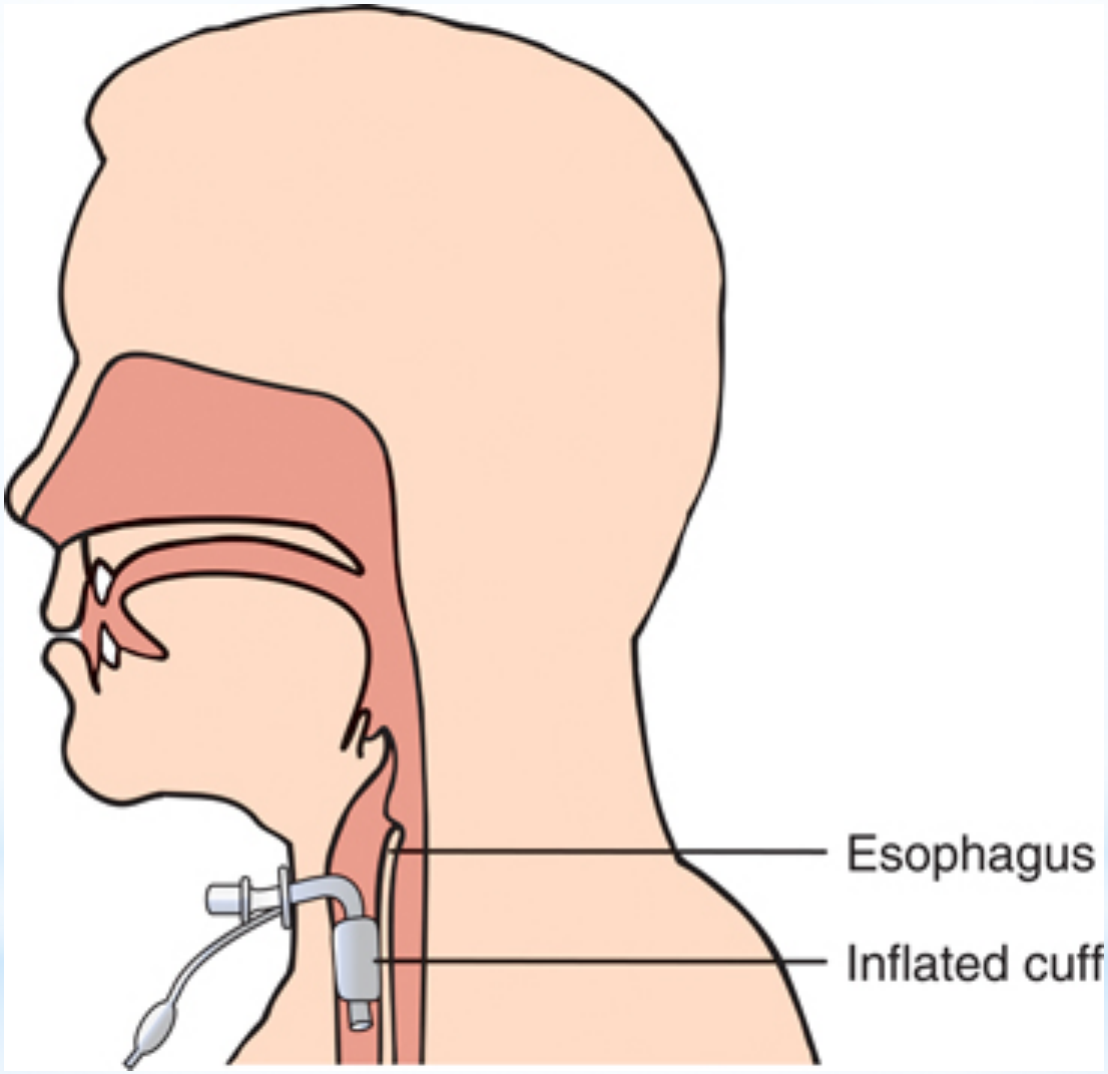
Tracheostomy

* ***Tracheotomy***—surgical incision into trachea for purpose of establishing an airway.
* ***Tracheostomy***—stoma (opening) that results from tracheotomy
  * May be temporary or permanent.
  * Permanent tracheostomy is required for certain diseases such as laryngeal cancer.

Primary nursing responsibility is to maintain a patent airway

Tracheostomy (cont'd)




Esophagus
Inflated cuff

Trach/Shiley

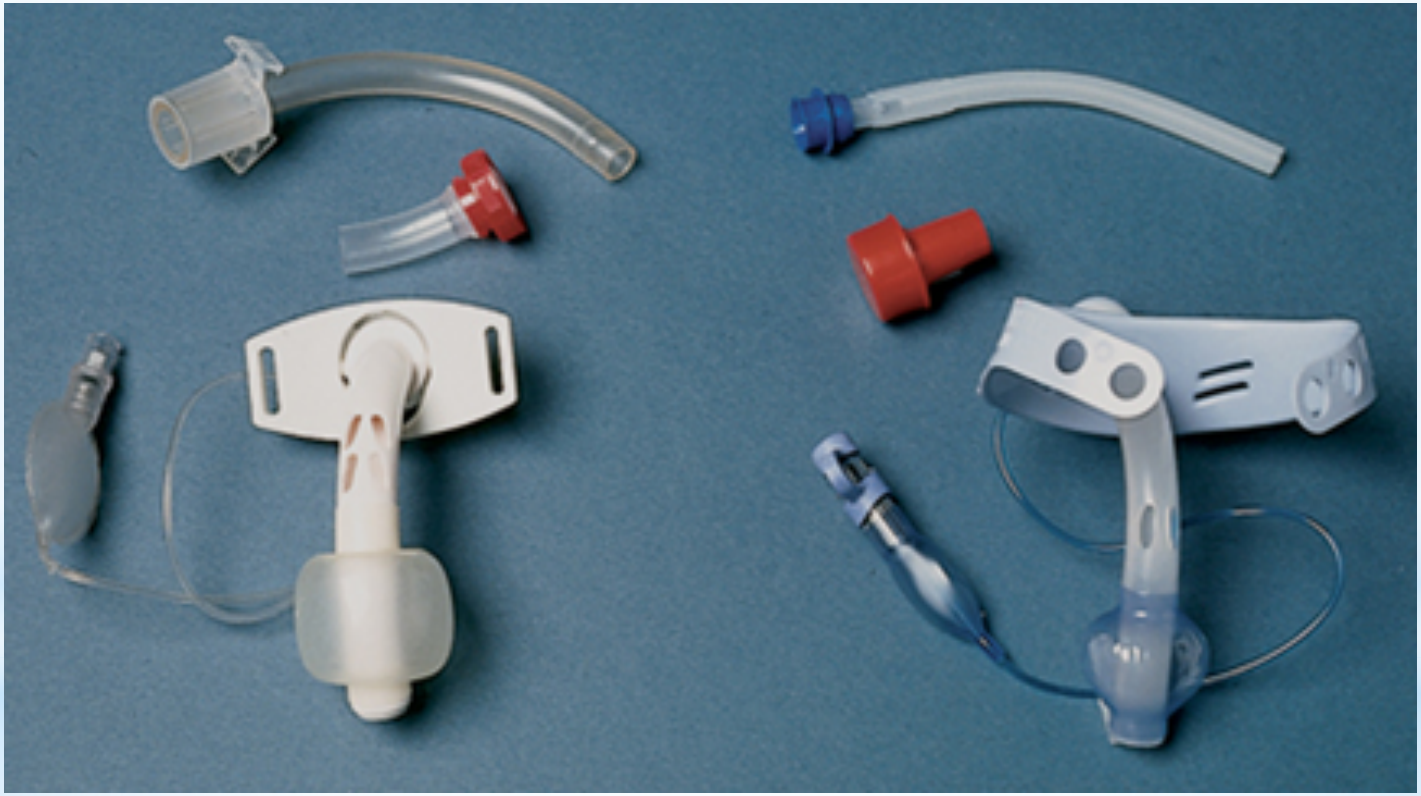
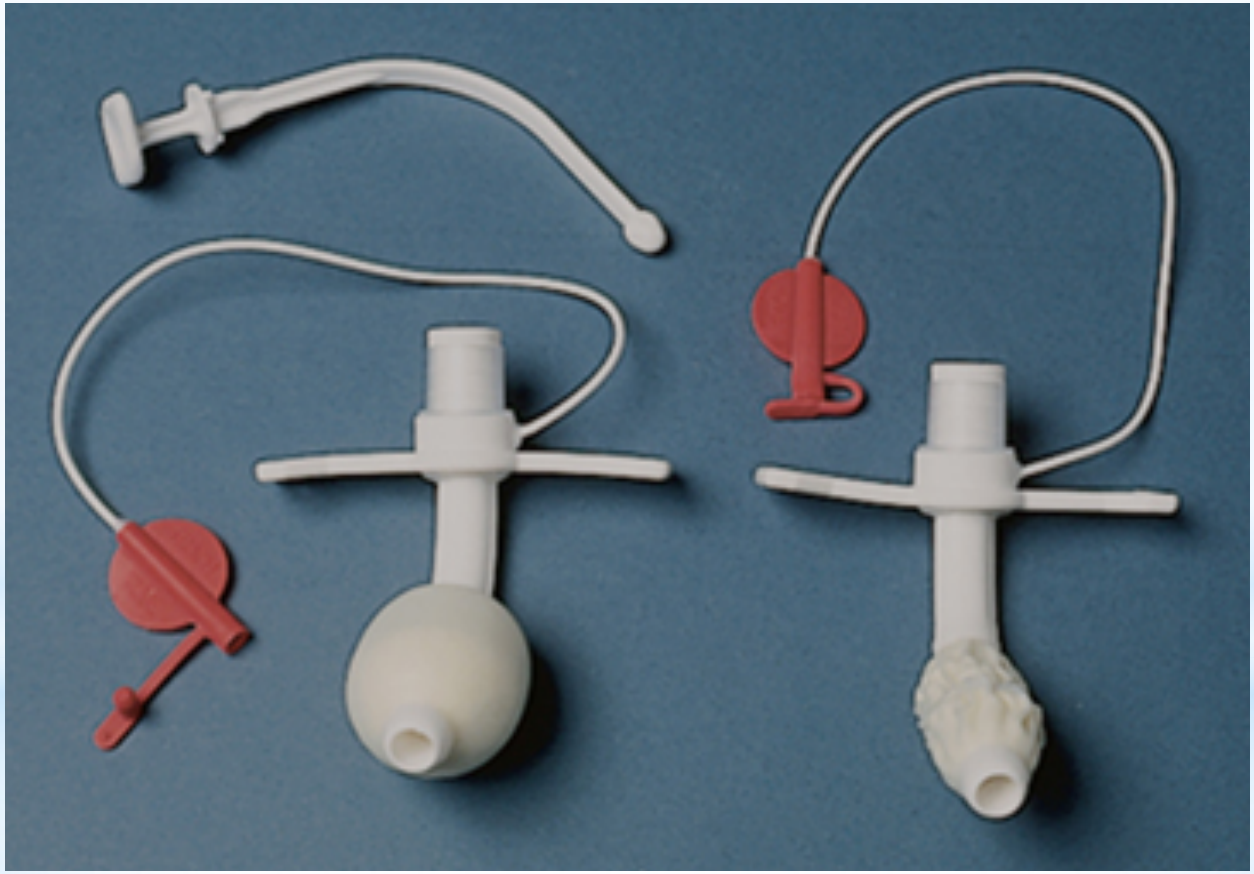


Figure 13-8, C



Cuff Pressures

David A. Muir

Passy-Muir® Valve Inventor
1962 – 1990

Priority Patient Problems

* Reduced oxygenation
* Inadequate communication
* Inadequate nutrition
* Potential for infection
* Damaged oral mucosa

Tracheostomy Tubes

* Disposable or reusable.
* Cuffed tube or tube without cuff for airway maintenance.
* Inner cannula disposable or reusable.
* Fenestrated tube.

Care Issues for the Patient with a Tracheostomy

- Prevention of tissue damage:
  - Cuff pressure can cause mucosal ischemia.
  - Use minimal leak and occlusive techniques.
  - Check cuff pressure often.
  - Prevent tube friction and movement.
  - Prevent/treat malnutrition, hemodynamic instability, hypoxia.

* Air Warming and Humidification

* Tracheostomy tube bypasses nose and mouth, which normally humidify, warm, and filter air.
* Air must be humidified
* Maintain proper temperature.
* Ensure adequate hydration.

Suctioning

* Maintains patent airway, promotes gas exchange.
* Assess the need in patients who cannot cough adequately.
* Done through nose or mouth.

Complications of Suctioning

* Hypoxia
* Tissue (mucosal) trauma
* Infection
* Vagal stimulation, bronchospasm
* Cardiac dysrhythmias from induced hypoxia

Causes of Hypoxia in the Tracheostomy

* Ineffective oxygenation before, during, after suctioning.
* Use of catheter that is too large for the artificial airway.
* Prolonged suctioning time
* Excessive suction pressure
* Too frequent suctioning

Tracheostomy Care

* Assess the patient
* Secure tracheostomy tubes in place
* Prevent accidental decannulation

Bronchial and Oral Hygiene

* Turn/reposition every 1 to 2 hours, support out-of-bed activities, encourage early ambulation.
* Coughing and deep breathing, chest percussion, vibration, and postural drainage promote pulmonary cure.
* Avoid glycerin swabs or mouthwash containing alcohol for oral care; assess for ulcers, bacterial/fungal growth, infection.

Weaning from a Tracheostomy Tube

Passy Muir Valve

* Weaning—gradual decrease in tube size; ultimate removal of tube.
* Change from cuffed to uncuffed tube.
* Size of tube decreased by capping; use smaller fenestrated tube.

* In a case of extreme medical emergency (i.e., severe oxygen desaturation, respiratory failure, or respiratory or cardiac arrest), oxygen can be delivered at full flow (> 10 L/min.) with an Ambu Bag using a face mask or fitted directly onto a tracheostomy cannula.

*

Ambu Bag

· arterial blood gas interpretation:

	acidosis	normal	alkalosis
pH	< 7.35	7.35 – 7.45	> 7.45
CO_2	> 45 mmHg	35 – 45	< 35 mmHg
HCO_3	< 22	22 – 26	> 26

ROME method

→ respiratory: ↑CO2 : ↓ pH = respiratory acidosis
opposite: ↓CO2 : ↑pH = respiratory alkalosis

metabolic: ↓HCO3 : ↓ pH = metabolic acidosis
equal: ↑HCO3 : ↑pH = metabolic alkalosis

1. pH: 7.28 CO_2: 50 HCO_3: 24
↓ acid ↑ acid

R: ↑ acid
O: good
M: normal
E: good

pH: ↓ acidic

respiratory acidosis, however its uncompensated.

2. pH: 7.30 CO_2: 40 HCO_3: 18

R: normal
O: good
M: acid
E: good

pH: ↓ acidic

metabolic acidosis. however, it's uncompensated!

3. pH: 7.42 CO_2: 26 HCO_3: 18

R: ↓ alkalosis
O:
M: ↓ acidosis
E:

pH: normal ↑ alkalotic

respiratory alkalosis, its has compensated because of the normal pH level.

4. pH: 7.37 CO_2: 32 HCO_3: 17

R: ↓ alkalosis
O:
M: ↓ acidosis
E:

pH: normal ↓ acidosis

metabolic acidosis, full compensated because of the normal pH level

5. pH: 7.51 CO2: 47 HCO3: 32

R: ↑ acidosis
O:
M: ↑ alkalosis
E:

pH: ↑ alkalosis

metabolic alkalosis, it's partial compensated!

tic tac method:

1. pH: 7.22 CO_2: 49 HCO_3: 24

acid	normal	alkal
pH CO2	HCO3	

→ respiratory acidosis

it's not compensated because the pH level is acidic and most values are in acidic sides.

2. pH: 7.22 CO2: 49 HCO3: 28

acid	normal	alkal
pH CO2		HCO3

→ respiratory acidosis

it's partial compensation because the pH level isn't normal but it's working to balance it out.

3. pH: 7.42 CO2: 32 HCO3: 18

acid	normal	alkal
HCO3	pH	CO2

respiratory alkalosis compensated because blood pH level is back to normal!

4. pH: 7.37 CO2: 33 HCO3: 17

acid	normal	alkal
HCO3	pH	CO2

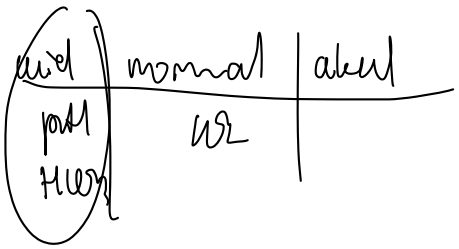
metabolic acidosis, compensated because blood pH level.

R: lateral
O:
M: acidosis
E:

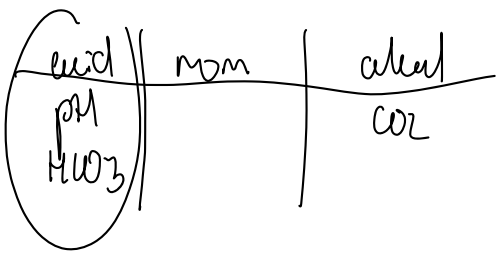
pH: 7.36
CO_2: 20
HCO_3: 20

↑alkalosis

respiratory alkalosis, partial comp.



metabolic acidosis, uncompensated



metabolic acidosis, partial compensated

R: alkal ↓
O:
M: normal
E:

pH: ↑alkalosis

respiratory alkalosis, uncompensate

R: normal
O:
M: alkal ↑
E:

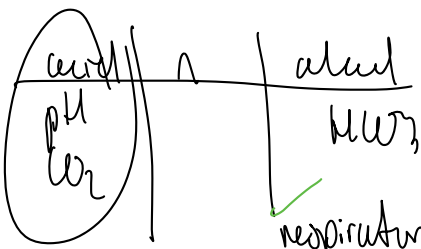
pH: alkalosis ↑

metabolic alkalosis, uncompensate

R: acid ↑
O:
M: alkal ↑
E:

pH: alkalosis ↑

metabolic alkalosis, partial compensate



respiratory acidosis, partial compensated!

R: acid ↑
O:
n: alcal ↑
G:

pH: ↑ alcal

metabolic alcalosis, partial compensated

R: acid ↑
O:
n:
G:

pH: ↓ acid

respiratory acidosis, uncompensated

acid	∩	alcal
HCO3	pH	CO2

respiratory alcalosis, compensated

R: acid ↑
O:
n:
G: alcalosis ↑

pH: normal

metabolic alcalosis, compensated!

R: ↑ acid
O:
n: normal
G:

pH: ↓ acidosis

respiratory acidosis, uncompensated

R: ↓ alcalosis
O:
n: ↓ alcalosis
G:

pH: normal

metabolic acidosis, compens.

R: ↑ acid
O:
n: ↑ alcalosis
G:

pH: ↓ acidosis

respiratory acidosis, partial compensated!

acid	∩	alcal
HCO3	pH	CO2

respiratory alcalosis, compensated