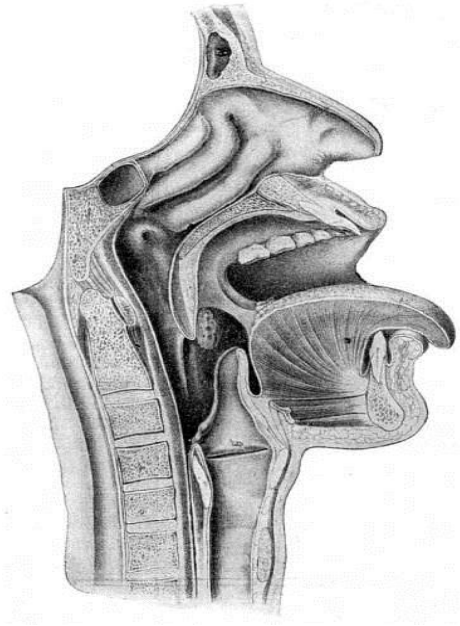
Foundation in Critical Care Nursing

NHS

Airway / Respiratory / Workbook

Airway Anatomy:



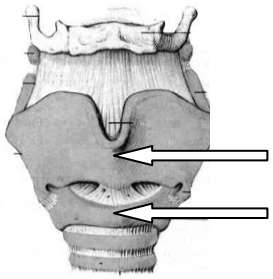
Please label the following:

Tongue Larynx
Epiglottis Pharynx
Trachea Vertebrae
Oesophagus

Where is the ET (endotracheal) tube supposed to sit? (draw it in)

Where is it likely to go if put in blindly?

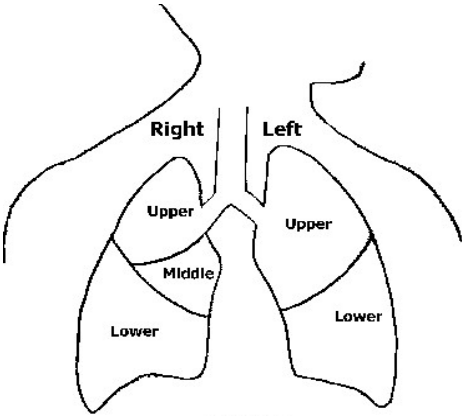
Why is muscle relaxant required for intubation?



Please label:

Thyroid cartilage
Cricoid cartilage

What is the significance of the cricoid cartilage during intubation?



Please label:

Carina Mediastinum
Right main bronchus

Draw in:
Diaphragm
Pleura

If an ET tube is inserted too far, where will it tend to go?

How can you tell where the ET tube is in relation to the carina?

Intubation:

List the equipment , personnel and safety issues to consider during preparation for intubation.

-
-
-
-
-
-
-
-
-
-

There are different categories of drugs used to facilitate intubation:

Sedative agents (administered first) for example: Propofol, Ketamine, Benzodiazipines, Etomidate

Sometimes these are administered with analgesic agents for example Fentanyl.

Muscle Relaxants: These drugs should only be given after sedation (to avoid conscious paralysis) Examples include – Rocuronium, Suxamethonium, Atracurium, and Vecuronium.

Rapid sequence intubation:

Breathe until…….

Short, fast-acting sedative e.g……..

Muscle relaxant e.g……..

Apply cricoids pressure at this point (if required), do not release until ……..

Wait until…….

DO NOTMANUALLY VENTILATE THE PATIENT because …….

Intubation attempt should not last more than …….

Following successful intubation check placement of tube by:

1.
2.
3.
4.

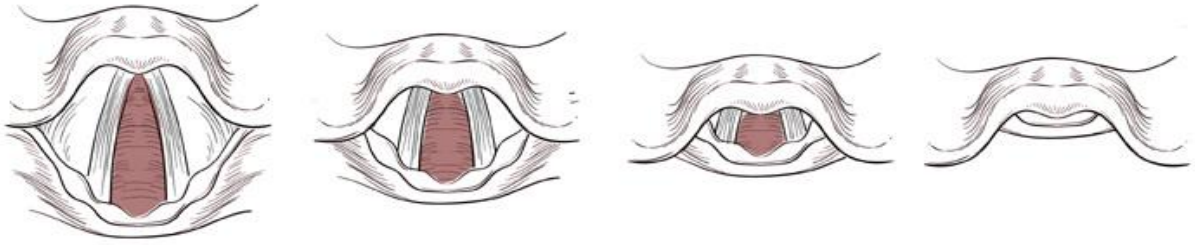
List the tasks that are required to care for the now intubated patient safely:

5.
6.
7.
8.
9.

Document:

-Position of the ET tube at the lips,
-Size of ET tube
-Intubation grade (the anesthetist will tell you this):

Intubation Grades:



What are the causes of emergency intubation or re-intubation?

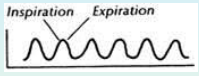
-
-
-
-
-

Respiratory Assessment:

Respiratory assessment consists of:

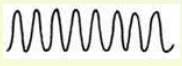
- Hands
- Face
- Colour
- Chest - shape, symmetry, scars
- Respiratory rate, rhythm, depth, pattern
- Position
- Breathlessness
- Level of consciousness
- Distress / use of accessory muscles
- Mannerisms / Posture , facial expression
- Speech / if unable to speak sounds indicating partial airway obstruction / no sound ?full obstruction
- Sputum assessment for colour, consistency, amount
- SpO2, ABG analysis, EtCO2 data

Breathing Patterns



Normal
Adults:12-20/min

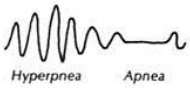
Tachypnea
Rapid, shallow breathing



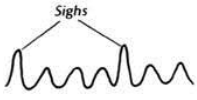
Hyperypnea
Rapid, deep breathing
Hyperventilation
Kussmaul breathing

Bradypnea

Ataxic breathing
Biot's breathing
Irregularly irregular



Cheyne-Stokes breathing
Regular rate, irregular depth
MAY be normal



Sighs
Hyperventilation syndrome
1 sigh per 200 breaths

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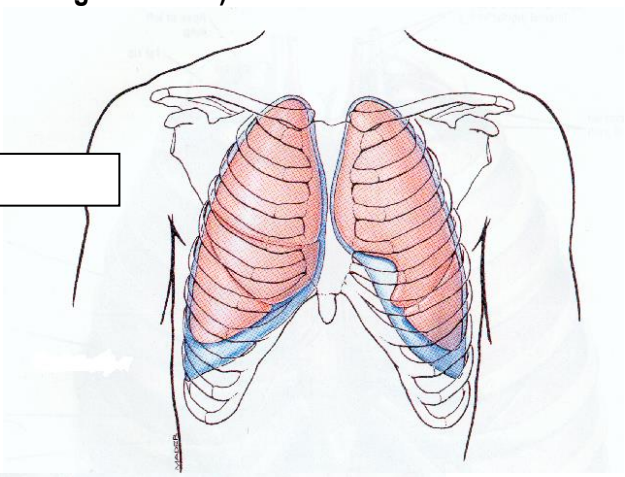
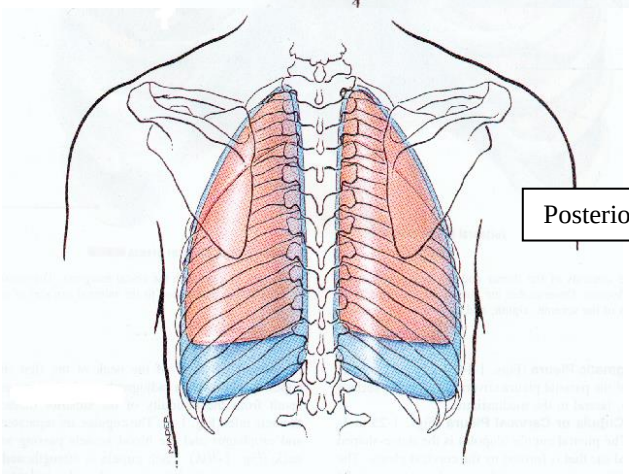
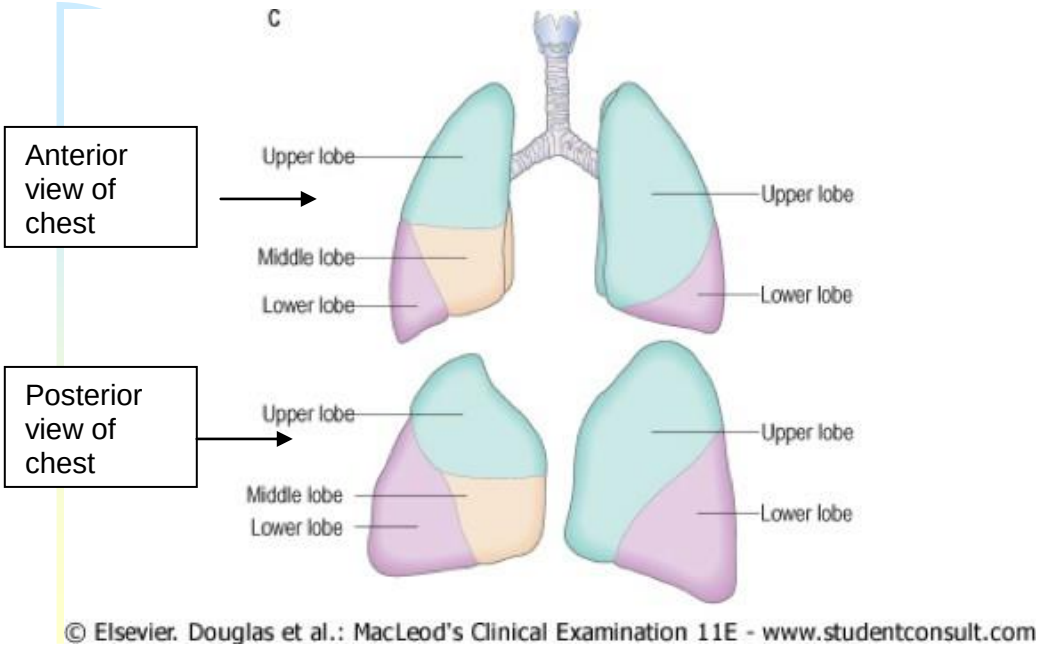
Auscultation – Please label the position of the stethoscope when you auscultate: (note lung fields diagram below)

Anterior view:





Posterior view:



Respiratory anatomy and physiology:

List the components of the respiratory system:

……
……

Define the following and give approx normal values:

Respiratory rate (RR):

Tidal volume (TV):

Minute volume (MV):

Complete the following equations:

MV = TV x …… RR = MV ÷ ……

What is the formula for calculating the average tidal volume size?.....ml/kg

Do you use actual body weight or ideal bodyweight? ……..

Internal vs External respiration and Gas Exchange:

Gas exchange in the metabolizing tissues is referred to as **…….....respiration**. Compared with external respiration, the gases now move in opposite directions. That is, oxygen diffuses out of the blood into the tissues and carbon dioxide diffuses out of the tissues into the blood.

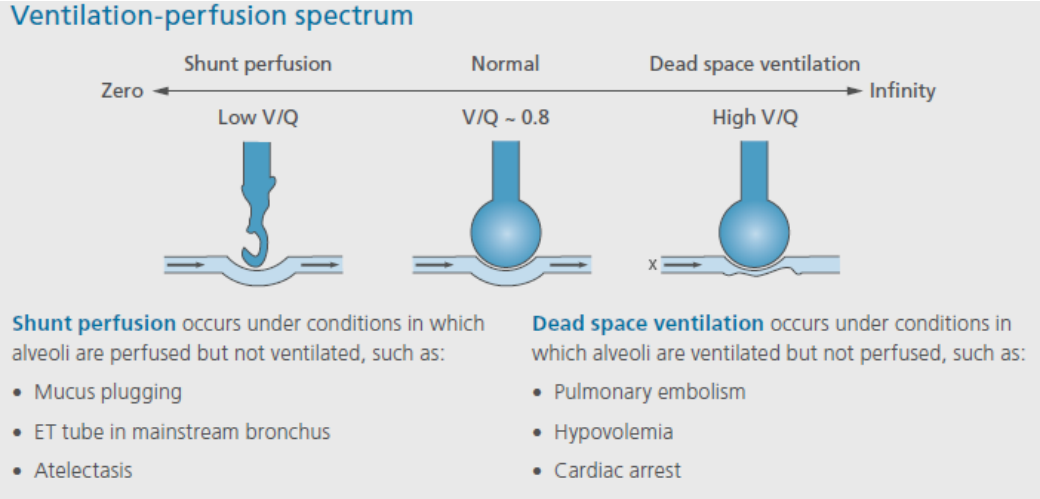
Gas exchange in the lungs is referred to as **……..respiration** as one side of the respiratory membrane - that is, the alveolar air - is actually outside of the body. As blood flows through the pulmonary **capillaries**, oxygen diffuses into the blood and carbon dioxide diffuses into the alveolar gas. Each gas diffuses down its own partial pressure gradient - that is, from a high to low partial pressure. The partial pressure of oxygen is 100 mmHg in alveolar air compared to only 40 mmHg in the blood entering the lungs. The partial pressure of carbon dioxide is 40 mmHg in the alveolar air and 45 mmHg in the blood entering the lungs.

V/Q mismatch:

- At times, there is a mismatch between the amount of air (ventilation, V) and the amount of blood (perfusion, Q) in the lungs, referred to as ventilation/perfusion (V/Q) mismatch.
- The two major types of V/Q mismatch that result in **dead space** include: anatomical dead space (caused by an anatomical issue) and physiological dead space (caused by a functional issue with the lung or **arteries**).

- Anatomical dead space can occur due to changes in gravity (i.e. posture positions: sitting, standing, lying); it will affect both ventilation (V) and perfusion (Q).

- Physiological dead space can occur due to changes in function. Ventilation will be affected if the patient has an the infection is in the lung or collapse, consolidation or pneumothorax for example. Perfusion will affect perfusion if the functional impairment is in the arteries (for eg PE).



Which patients are at risk:

……
……
……
……

Respiratory muscles are dependent on three key factors to function adequately:

1. Load
2. CNS Drive
3. Capacity

If any imbalance occurs the patient is at risk of respiratory failure:

Load:

Load against which the respiratory muscle pump works (& not a constant)

Excessive load due to:

- Reduced compliance of chest wall (e.g. scoliosis)
- Reduced compliance of lungs (e.g. atelectasis, obstructive airways disease)

Changes to load due to:

- Sputum
- Fluid retention
- Increased airflow obstruction
- Normal circadian physiological changes (loss of upper airway muscle tone during sleep leads to increased upper airway resistance)

Neural drive reduced by:

- Structural & Metabolic abnormalities of respiratory control center in brain stem
- Loss of wakefulness drive
- Chronic nocturnal hypoventilation
- Sedative drugs

Capacity:

Intrinsic weakness of respiratory muscles = reduce **capacity**

- Weakness may be **irreversible** if due to Neuromuscular disease (NMD)
- Weakness may be **reversible i**f due to:

  Electrolyte disturbance **(& malnutrition)**
  Hypoxia
  Hypercapnia
  Acidosis

List strategies to improve your patients

1. Load

……
……
……

2. Neural drive (if reversible cause)

……
……
……

3. Capacity (If reversible cause)

.....
.....
.....

The terms "type 1 and type 2" can be used to describe respiratory failure:

Type 1 respiratory failure patients have a ……PaO2 and a …….PaCO2

Type 2 respiratory failure patients have a …..PaO2 and a ……..PaCO2

List the signs and symptoms of respiratory failure:

-
-
-
-
-
-

Review Key knowledge of the following conditions:

- COPD……
  ……
  ……

……
……

- Asthma……
  ……
  ……
  ……
  …….
- ARDS/ALI……
  ……
  ……
  ……
  ……..
- Pneumonia / ventilator associated pneumonia……
  ……
  ……
  ……
  ……
- Pulmonary embolism……
  ……
  ……
  ……
  ……

Terminology:

- If air enters the pleural space, it's called:
- If pus collects in the lung, it's known as:
- If serous fluid collects in the pleural space, it's called:
- If blood collects in the pleural space, it's known as:
- If air escapes past the pleura into the skin, it's called:
- If lymph collects in the pleural space, it's known as:
- If air escapes past the pleura, trachea or bronchi into the mediastinum, it's called:

Chest drains:

Please list the observation you would document for a patient with a chest drain:

- .....
- .....
- .....
- .....

List the potential complications with chest drains:

1. .....
2. .....
3. .....
4. .....

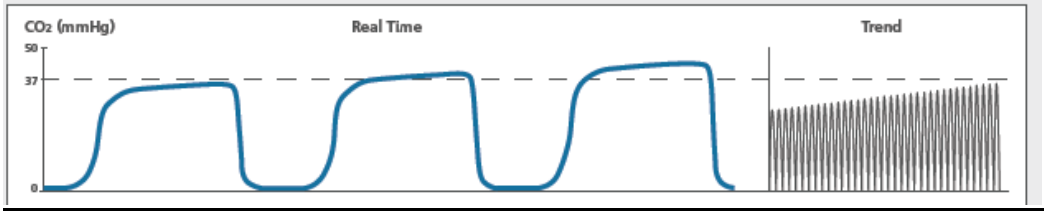
Capnography:

Capnography must be used for intubation and for the duration of any episode of mechanical ventilation. Please familiarize yourself with the following waveforms:

Physiologic factors affecting $EtCO_2$ levels

Increase in $EtCO_2$

- Increased muscular activity (shivering)
- Malignant hyperthermia
- Increased cardiac output (during resuscitation)
- Bicarbonate infusion
- Tourniquet release
- Effective drug therapy for bronchospasm
- Decreased minute ventilation

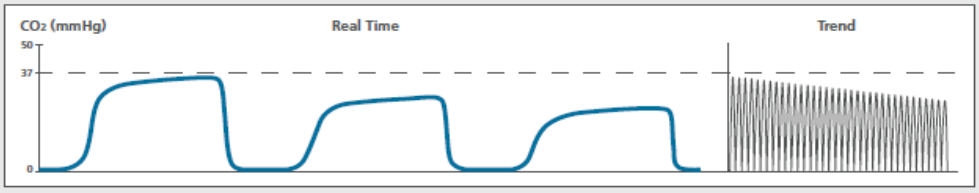


Factors affecting capnographic readings *(continued)*

Physiologic factors affecting $EtCO_2$ levels (continued)

Decrease in $EtCO_2$

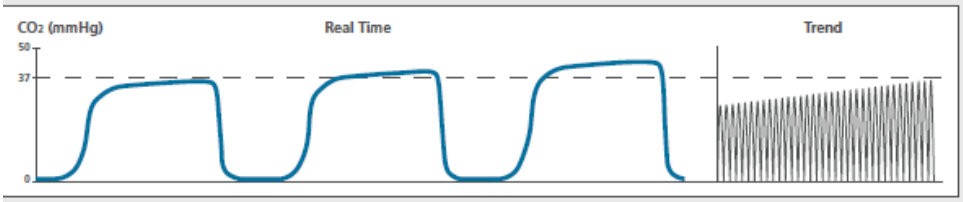
- Decreased muscular activity (muscle relaxants)
- Hypothermia
- Decreased cardiac output
- Pulmonary embolism
- Bronchospasm
- Increased minute ventilation



Equipment related factors affecting $EtCO_2$ levels

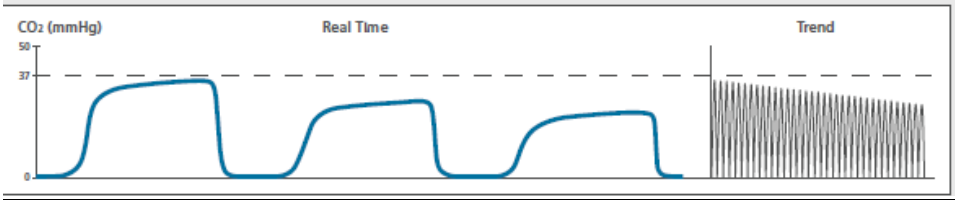
Increase in $EtCO_2$

- Malfunctioning exhalation valve
- Decreased minute ventilation settings

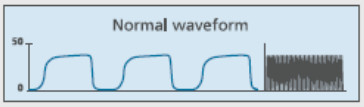


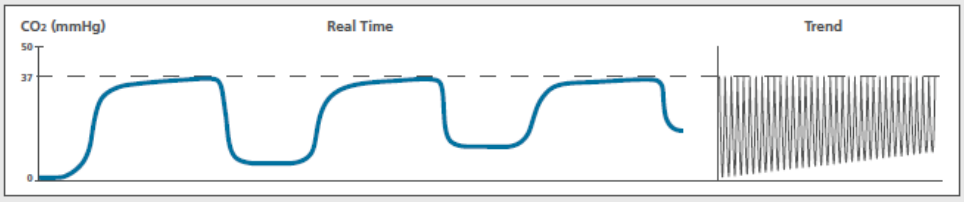
Decrease in $EtCO_2$

- Circuit leak or partial obstruction
- Increased minute ventilation settings
- Poor sampling technique



Rebreathing



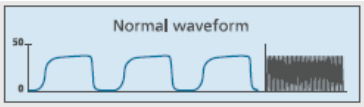


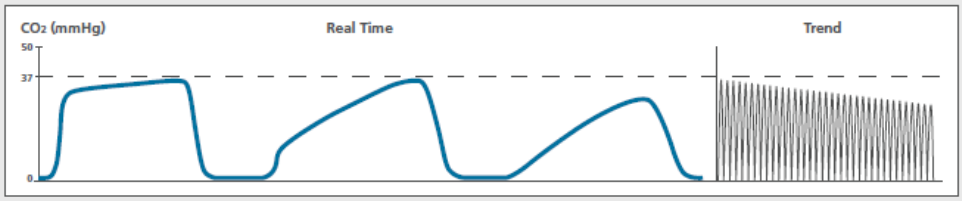
Elevation of the baseline indicates rebreathing (may also show a corresponding increase in $EtCO_2$).

Possible causes:

- Faulty expiratory valve
- Inadequate inspiratory flow
- Malfunction of a CO_2 absorber system
- Partial rebreathing circuits
- Insufficient expiratory time

Obstruction in breathing circuit or airway





Obstructed expiratory gas flow is noted as a change in the slope of the ascending limb of the capnogram (the expiratory plateau may be absent).

Possible causes:

- Obstruction in the expiratory limb of the breathing circuit
- Presence of a foreign body in the upper airway
- Partially kinked or occluded artificial airway
- Bronchospasm

Pharmacology:

Describe the action of common medications used in respiratory care, and provide examples of drugs you have seen in practice:

1. Bronchodilators / other nebulisers
   ……
   ……
   ……
   ……
2. Steroids
   ……
   ……
   ……
   ……
3. Antibiotics
   ……
   ……
   ……
   ……
4. Analgesia
   ……
   ……
   ……
   ……