AIRWAY PLACEMENT

INTUBATION

- **Refers to the insertion of an artificial airway, an endotracheal tube (ETT) into the trachea through the mouth or nose**

Equipment Needed for Intubation

- Laryngoscope & blade
- Suction / suction catheters
- Syringe to inflate cuff (10 cc)
- Topical anesthetic & sedation as ordered
- Water soluble lubricant, Tape or device to secure tube
- Stethoscope, Manual Resuscitation Bag (Ambu)
- O_2 flow meter

Assisting with Intubation

- **Intubation** is performed by anesthesiologists, nurse anesthetists, some paramedics, and MDs.
- Check cuff and laryngoscope prior to insertion
- **Administer sedation/neuromuscular** blockade as ordered
- **Prepare patient:** remove dentures, and suction if indicated

- **After intubation:** Auscultate breath sounds bilaterally, inflate cuff, secure tube, connect to ventilator or oxygen source
- Order CXR to confirm placement
- Insert NGT to prevent aspiration
- Record position of tube at lips (cm)
- Change sides of mouth q 24 hours
- May need to insert oral airway to prevent biting of tube

Complications of Mechanical Ventilation

BAROTRAUMA

- Presence of extra alveolar air
- This air may escape (usually due to alveolar or bleb rupture)
- May occur when the alveoli are over distended such as with positive pressure ventilation, high tidal volumes or PEEP
- Signs & Symptoms: decreased breath sounds, tracheal shift, hypoxemia
- Could worsen to tension pneumothorax

Cardiovascular

- Decreased venous return and CO2
- May be manifested by decreased BP, decreased urinary output, weak pulses, fatigue

Gastrointestinal

- Stress ulcers and GI bleeding
- Distention
- **Malnutrition:** atrophy of respiratory muscles, ↓ protein, ? albumin, ? immunity, ? surfactant production, impaired cellular oxygenation, and central respiratory depression

Inadequate Ventilation

- Intubation of right mainstem bronchus
- ETT out of position/extubation
- Incompatible settings
- Operator error

Tracheal Damage/Necrosis

- The systolic pressure in mucosal vessels of the trachea normally **20 - 25 mmHg**

Leaks

Can cause a decrease in tidal volume
Check all ventilator tubing for disconnections or leaking
Can be leaking at cuff of airway or one - way valve of airway

RESISTANCE / OBSTRUCTION OF AIRWAY

- Usually caused by situations which ↓ compliance
- May be equipment related: ETT kinked, water in tubing, patient biting ETT
- May be patient related: secretions, bronchospasm, atelectasis, “bucking” ventilator

Acid - Base Disturbances

- Respiratory alkalosis versus respiratory acidosis
- O_2 Toxicity
- Occurs with high concentrations of oxygen (FIO_2 >60%)

Aspiration

- Gastric distention, impaired gastric emptying and esophageal reflux predispose patient to aspiration

Infection

- Patients with artificial airways are at increased risk for pulmonary infection
- ETT suctioning can also predispose the patient to infection and frequently cause nosocomial infection
- Urinary Tract Infection.
- Septicemia

Water Imbalance

- Water and salt retention.
- Reduce ionized calcium.

Immobility

- **Complications:** muscle weakness/wasting, contractures, loss of skin integrity, pneumonia, DVT , and constipation.

Psychological Complications

- Patient may experience stress/anxiety due to being on a machine to breathe
- Communication becomes challenging
- Loses autonomy/control over care
- Altered sleep pattern may occur
- Depression may occur

Ventilator Dependence/ Inability to Wean

- Patients who require long term ventilation are usually very challenging when it comes to weaning.

MONITORING THE VENTILATED PATIENT : IMPLICATION OF NURSING CARE

- **General monitoring of the patient on continues ventilatory support include:**
- **1- Patient Assessment.**
- **2- Monitoring of ventilator setting.**
- **3- ABGs**
- **4- Lab. Studies.**
- **5- Radiological studies.**

1- Patient Assessment

- **A- Neurological status:**

- **level of consciousness, anxiety, pain?**
- **Is the patient fighting the ventilator?**
- **Evaluate nonverbal communications is meeting needs**

B- RESPIRATORY STATUS:

- Evaluate airway patency, RR and pattern of breathing, Endotracheal tube for leak from the balloon .
- Assess bilateral breathing sounds & chest movement

C- CARDIOVASCULAR STATUS:

- **Assess HR and sounds, peripheral pulses , neck veins distention, arterial pressure.**

D- RENAL STATUS:

- **Assess fluid and electrolyte balances, daily weight, intake and output.**

E- GASTROINTESTINAL STATUS:

- NG tube for gastric decompression.
- Monitor gastric secretion for bleeding (stress ulcer result M.V.)
- Patient under M.V. need energy support to meet demands.

2- MONITORING OF VENTILATOR SETTING

- Minute volume (ventilation)
- RR (machine and patient)
- Oxygen concentration by ABGs monitoring
- I:E ratio usually I:E= 1:2
- Airway pressure E.x.:
- If ↑there may be secretions may be or tube kinking.
- if ↓ there may be disconnection or leak
- Alarm system (should never be turned off)
- Humidity

3- ABGS

- The pH and $PaCO_2$ are correlated with minute ventilation.
- PaO_2 and O_2 saturation correlated with FiO_2
- ABGs should be checked 30 minute after changes in ventilator setting.

4- LAB. STUDIES

- Hematological study; Hb, Hct, CBC.
- Blood chemistry ; serum electrolyte; BUN, Creatinin, Glucose.

NURSING CARE OF THE MECHANICAL VENTILATED PATIENT
MAINTAIN PATENT AIRWAY BY:

- Bronchial hygiene (suctioning ETT):
- Assess for S&S of complications
- Carry out medical management
- Document in nursing notes

1. MAINTAIN PATENT AIRWAY BY

- **Proper ETT placement, because it may slip into right main bronchus.**
- **Taping and fixation by special tape and plaster to defined level.**
- **Inflate ETT balloon (cuff), over inflation may cause tracheal tissue necrosis, or it may herniate and obstruct the tube (partially or completely)**

2. BRONCHIAL HYGIENE (SUCTIONING ETT):

- Pre-oxygenate the patient with 100% oxygen and manual hyperinflation. Continuously monitor the patient in both Pulse oxymeter and Monitor.
- Suction the trachea:
- Use careful sterile technique and a suction catheter less than or equal to one half the diameter of the tracheal tube
- Insert the catheter without suction past the tracheal tube until obstruction is met, then withdraw slightly.
- Withdraw the catheter using intermittent suction and by rotating the catheter
- Limit suction to 10 to 15 seconds and to 80 to 120 mm Hg suction pressure . Limit interruption of ventilation to 20 second
- Re-oxygenate the patient with 100% oxygen delivered by manual inflations, and wait until vital signs have returned to normal .
- Repeat steps 1 through 3 until the secretions are cleaned.
- Suction the mouth and nose, and dispose of the suction catheter .

3. ASSESS FOR SIGNS AND SYMPTOMS OF COMPLICATIONS

- **E.g. barotraumas (pnuemothorax) manifested by :**
- **Asymmetrical chest movement, diminished breath sounds on affected side, tachycarida, cyanosis, decrease CO2 and hypotention, accumulation of air under the skin, displacement of trachea.**

4. CARRY OUT MEDICAL MANAGEMENT

- Arterial lines and ABGs
- Administration of fluids
- Bronchodilators
- Sedatives
- Antibiotics and other supportive measures and drugs.

5. DOCUMENT IN NURSING NOTES

- Mode of respiration (IMV, SIMV,-----)
- Tidal volume , RR (patient and machine)
- Fio2
- O2 saturation
- Airway pressure
- Minute volume
- I: E ratio .

EXTUBATION

- **Weaning**
- **Is the cause of respiratory failure gone or getting better ?**
- **Is the patient well oxygenated and ventilated ?**
- **Can the heart tolerate the increased work of breathing ?**
- **Weaning: is the process of removing the patient from mechanical ventilation therapy**

- In truth, you are always weaning a patient in the sense that you are always trying to minimize the ventilator settings.
- “True” weaning implies a different expectation - that the patient is improving and will soon not need mechanical ventilation.
- This usually happens when the disease process is improving or resolved and the patient has acceptable parameters. It is important to assess the ability of the heart to handle the increased demands that extubation may place upon it (e.g., pneumonia/ARDS has resolved but significant septic shock with cardiovascular collapse is present).

FACTORS AFFECTING WEANING

- Length of time the patient has been on mechanical ventilation
- Physical condition
- Tone and strength of respiratory muscles
- Underlying disease status
- Psychological dependence is a significant factor

Remember

- It is recognized that , when patients have been maintained on mechanical ventilatory, a period of gradual separation is necessary before spontaneous respiration can effectively meet ventilatory needs

Criteria for successful weaning

- Subjective
- Is the patient awake , oriented, alert and cooperative?
- Can the patient cough & deep breath affectively?
- Is there broncho-spasm?
- Is there respiratory muscle disco-ordination
- What are the secretions like & can the patient handle them effectively?
- Is the patient hemodynamically stable ?

Objectives:

- Vital capacity > 12- 15 ml / kg
- Tidal volume > 5 -7 ml/kg
- Respiratory rate within normal limits
- PaO2> 60 mmHg
- Paco2<45mmHg
- pH 7.35 – 7.45
- Oxygen Saturation 99%

Criteria for successful weaning

- When is a patient ready to be extubated? First, they must be able to protect their airway.
- They should have an acceptable S_aO_2 on an FiO_2 of no more than .30-.35.
- They should be breathing at a comfortable rate with a set ventilator rate of 5-8.
- Patients may be trialed on just pressure support/CPAP to make sure they are generating an adequate spontaneous minute ventilation.
- If these are the circumstances, then the patient is ready for an attempt at extubation and their time on mechanical ventilation.