Centralized vacuum or suction system

- Suction devices play a crucial part in the care of patients in the operating theatre, intensive care unit and other parts of the hospital.

- Suctioning can be performed through an endotracheal tube, a tracheostomy tube, the mouth, or the nose. There are two separate suctioning techniques, namely the ***closed*** and ***open*** system.

- The suction developed by the machine will be measured as a pressure. The common units of pressure are millimeters of mercury (mm Hg) or pascals (Pa or kPa), inches or centimeters of water (inH2O), or pounds per square inch (psi).

- Suction pressure is the negative difference in pressure between two places that drags liquid or gas from a higher-pressure state to a lower pressure state.

There are four ways to suction airway:

- Nasal suction (suctioning in the nose).

- Oral suction (suctioning the mouth).
- Nasopharyngeal and oropharyngeal suction (suctioning the throat).
- Deep suctioning.

Important notes:

- Suction pressure should be kept at less than 200 mmHg in adults. It should be set at 80 mmHg to 120 mmHg in neonates.The catheter size used for suction should be less than 50% of the internal diameter of the endotracheal tube. A common conversion is that a 1 mm diameter is equal to a 3 French.

- Position patient in ***semi-Fowler's position*** with head turned to the side. This facilitates ease of suctioning. **Unconscious** patients should be in the **lateral position**.

- **Open Suction**: Suction is performed by means of disconnecting the patient ETT from the ventilation device during the procedure and then reconnecting it following the procedure.

- **closed suctioning** technique allows passage of the suction catheter into the airway without disconnection from the ventilator. Advantages of the closed suctioning technique include: Ventilator settings can be maintained, especially positive end-expiratory pressure (PEEP) Fewer episodes and severity of hypoxia.

- If both the mouth and nose need to be suctioned, suction the mouth first.

- After inserting the catheter, the measured distance initiate suctioning as you retract the catheter in a sweeping motion. Do not suction too long! The maximum suction time should only be ***15 seconds***. After suctioning, re-oxygenate the patient.

Components

1. A pump or a power source that is capable of continuously generating a negative pressure of −500 mmHg.
2. A suction controller with a filter.
3. A receiver or a collection vessel.
4. A suction tubing and suction nozzle (e.g. a Yankaeur sucker) or catheter.

To determine the efficiency of central-piped vacuum systems, we should notice the following:

- A negative pressure of at least −53 kPa (−400 mmHg) should be maintained at the outlet.
- Each central-piped vacuum outlet should be able to withstand a flow of free air of at least 40 L/min.
- A unit should take no longer than 10 seconds to generate a vacuum (500 mmHg) with a displacement of air of 25 L/min.

Mechanism of action

1. Negative pressure is generated by an electric motor and pneumatic-driven pumps using the Venturi principle.

2. The amount of vacuum generated can be manually adjusted by the suction controller.
3. The reservoir must have sufficient capacity to receive the aspirated material. Too large a capacity will make the system cumbersome and will take a long time to generate adequate negative pressure.
4. The suction tubing should be flexible and firm to prevent collapse. Also, it should be transparent so that the contents aspirated can be visualized, and of sufficient internal diameter and length for optimal suction.
5. The negative pressure (or degree of suctioning) can be adjusted to suit its use;

e.g. a lesser degree of suctioning is required to clear oral secretions in a child than in an adult.

6. Bacterial filters are used to prevent spread of infectious bacteria, with a removal of 99.999% of bacteria. Filters are also used to prevent fluids, condensate and smoke from contaminating the system.
7. It is recommended that there are at least two vacuum outlets per each operating theatre, one per anesthetic room and one per recovery or intensive care unit bed.

Problems in practice and safety features

To prevent trauma to the tissues during suction, the nozzles should taper, be smooth and have multiple holes, so that if one is blocked the others will continue suction.

Comparison between **Cleaning, Disinfection, Sterilization**

Cleaning	Disinfection	Sterilization

Cleaning is the removal of visible soil (e.g. organic and inorganic material) from objects and surfaces.	Disinfection describes a process that eliminates many or all pathogenic microorganisms on inanimate objects with the exception of bacterial spores.	Sterilization is the complete elimination or destruction of all forms of microbial life.
It is normally accomplished by manual or mechanical means using water with detergents or enzymatic products.	It is usually accomplished by the use of liquid chemical and heat (washer disinfector).	This is accomplished in healthcare facilities by either physical or chemical processes