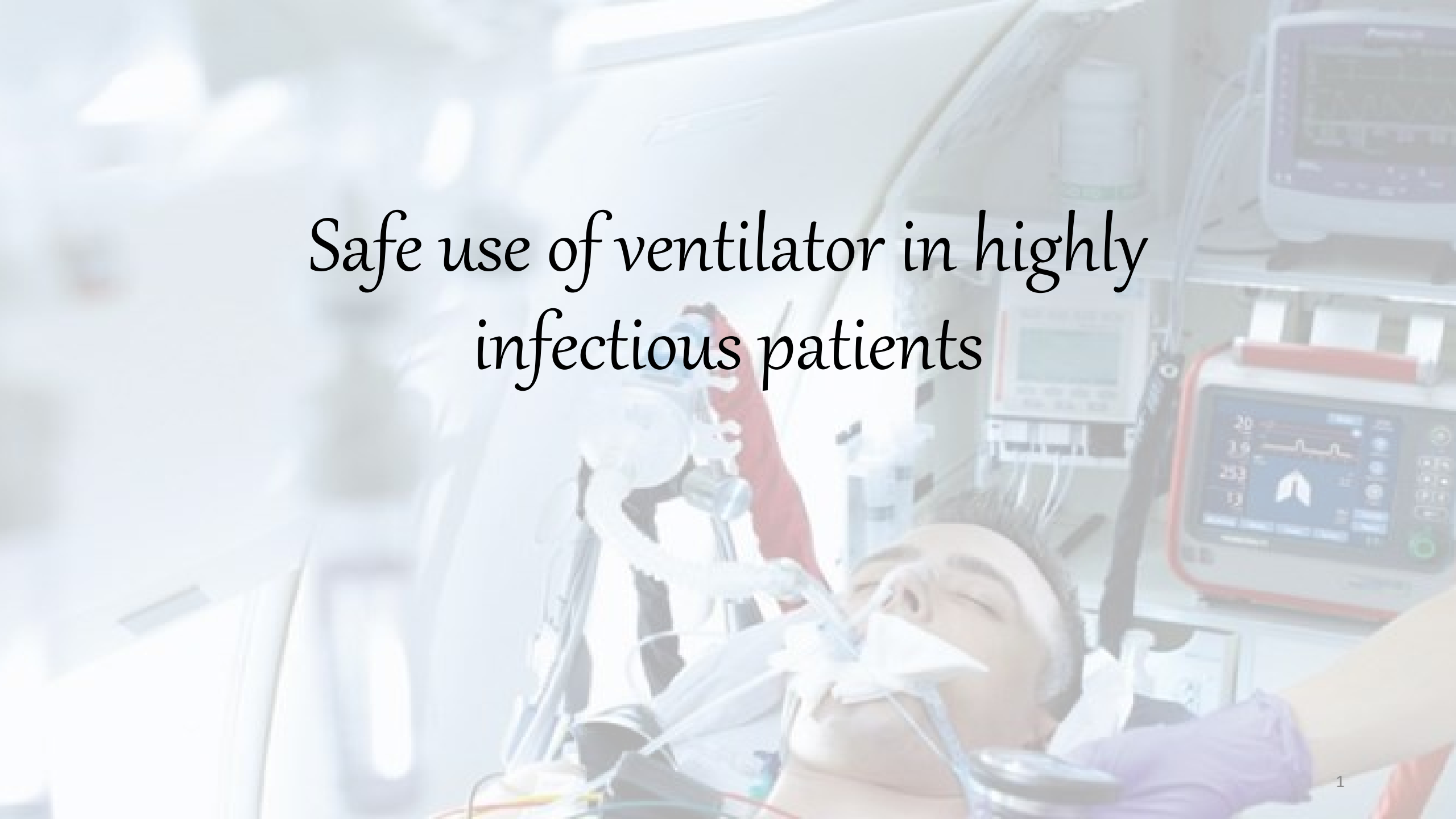
Safe use of ventilator in highly infectious patients



Objectives

- To reduce the risk of cross contamination while ventilating a COVID-19 patient.
- How to prepare a ventilator for patient use.
- To prevent the internal gas pathways of ventilator.

COVID-19

- SARS-CoV-2 is single- stranded RNA, enveloped virus that likely spread to humans from a zoonotic source.
- It is spread from person to person via respiratory droplet nuclei.

Mechanical ventilator

- A machine that helps a patient breathe(ventilate) when he or she is unable to maintain adequate minute ventilation on its own.


HAMILTON·C2
Modes
ASV
24
2.41
424
10
4
21.8
Controls
Alarms
Monitoring
Utilities
Events
System
HAMILTON MEDICAL

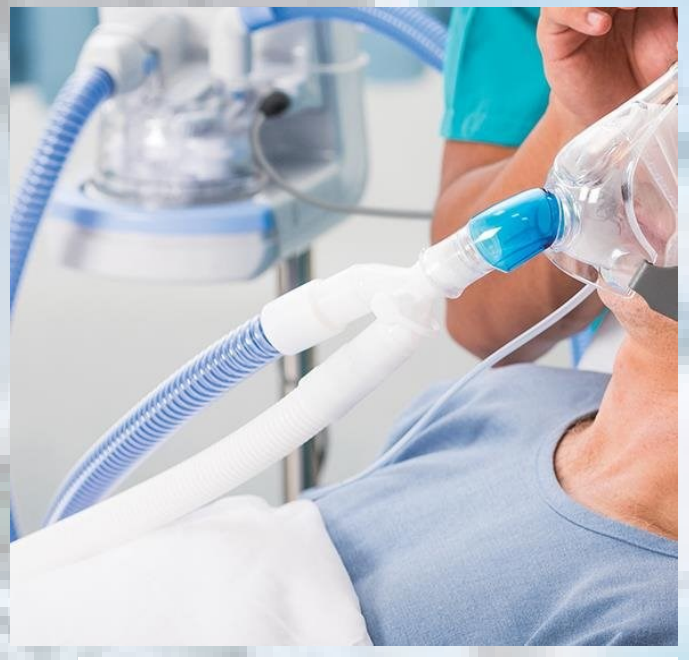

HAMILTON
MEDICAL

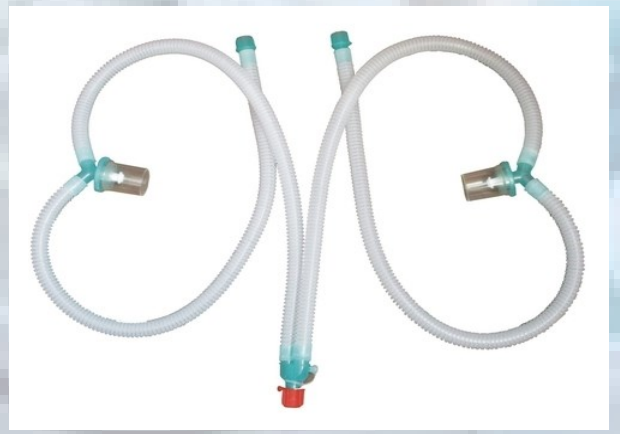
Inspiratory and expiratory filters

Efficiency of bacterial/viral filters:

- The viral efficiency of these filters are 99.9%
- The bacterial efficiency of these filters are 99.9%
- Maximum duration of bacterial/viral filter is 24 hrs.
- Maximum duration of HME filter is 48 hrs.

Types of breathing circuits





Single limb breathing circuit

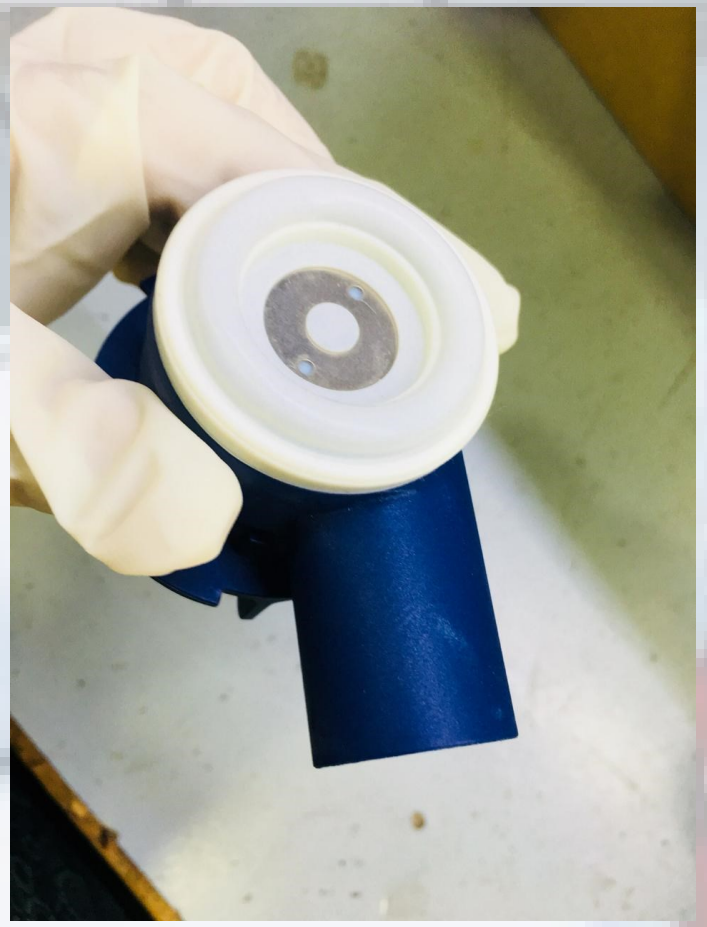
For passive humidification:
HME(HEAT AND MOISTURE EXCHANGE) filter

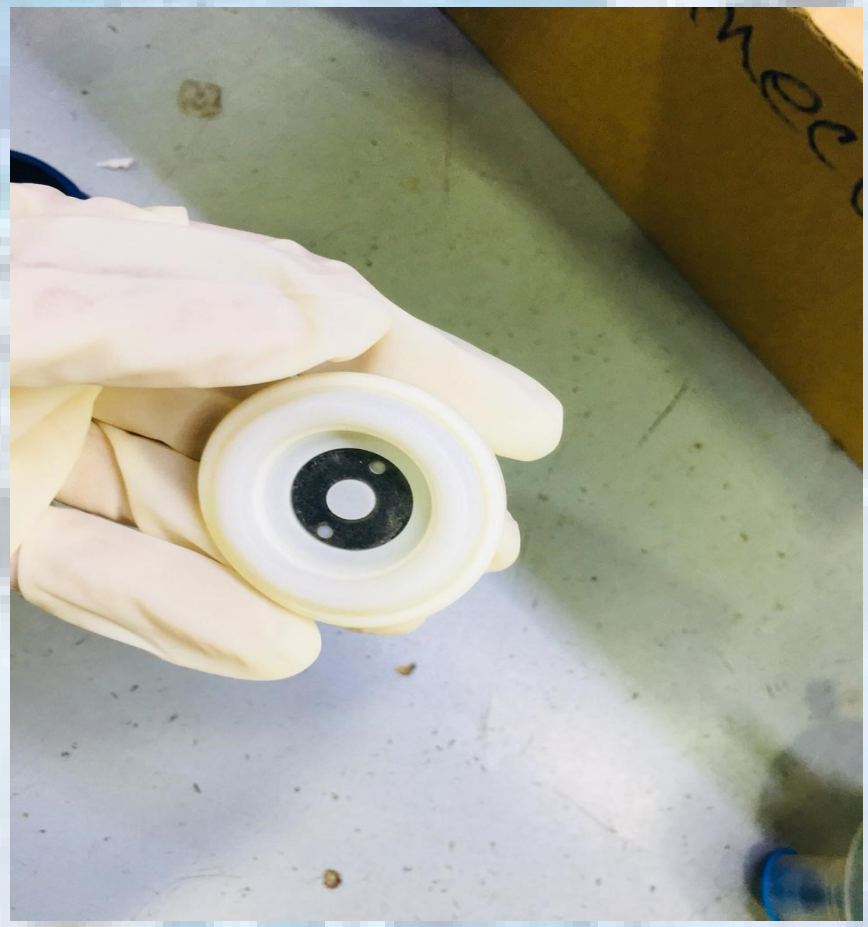
HMEs operate passively by storing heat and moisture from the patient's exhaled gas and releasing it to the inhaled gas.

For active humidification

Heated humidifiers operate actively to increase the heat and water vapor content of inspired gas.

Expiratory valve membrane





- The expiratory valve membrane can be cleaned, disinfected and autoclaved at least 40 times.
- The solution used for disinfection is sodium hypochlorite.
- Dip the membrane for atleast 30 minutes in this solution.

- The exhaled gas is released into the environment and increase the risk of cross-contamination.
- To reduce the risk of infection among HCP. we can take the following measures:
- Use isolation rooms.
- Build negative pressure rooms.
- Scavenger system.
- Hospitals should use highest filtration systems. Such as:

1. Air purifiers.
2. HEPA filters.

HEPA FILTER:

All turbine driven medical ventilators are equipped with **HEPA(**high efficiency particulate air) filter to keep the interior airway free of contamination.

HEPA filter is efficient to capture particles as small 0.1 -0.001um
The coronavirus species COVID-2019, MERS-CoV and SARS-CoV range in size from 0.06 to 0.2 µm.

Scavenger system

- A **scavenger system** is a medical device used in hospitals. It is used to gather gas or aerosolized medication after it is exhaled from the patient or left the area of the patient.

Use stand-by prior to disconnecting the patient

- Use the stand-by function prior to disconnecting the patient from the ventilator.
- To prevent the mucus dispersion from the circuit.
- Use a closed inline suction only.

How to administer aerosol therapy while decreasing the risk of cross contamination

- In line with current evidence, WHO maintains the recommendations of droplet and contact precautions for healthcare workers caring for COVID-19 patients. For those performing aerosol generating procedures, WHO recommends airborne and contact precautions. The use of medical masks, eye protection, gloves and gown are required for direct patient care; respirator masks are specifically required for aerosol generating procedures.
- According to the currently available evidence, transmission through smaller droplet nuclei (airborne transmission) that propagate through air at distances longer than 1 meter is limited to aerosol generating procedures during clinical care of COVID-19 patients.
- To limit this transmission of infection we can administer the aerosol therapy via metered dose inhaler(MDI'S).

MDI adapter

T-piece connector

Single use consumables

- Use single use consumables such as:
- Breathing circuits
- Flow sensors
- Airway adapters
- Expiratory valves and filters
- It will minimize the risk of cross contamination.

Calibration test

- After connecting the breathing circuit. You have to run following pre-op check.
- To asses the system leak
- And flow censor.
- https://www.youtube.com/watch?v=C7_p7nTKhZA&t=304s
- https://www.youtube.com/watch?v=5iP2QcNr2y8


thank
you