

# **Respiratory Equipment & Procedures**

*Infection Control Guidelines for the Use of  
Respiratory Equipment or Procedures in patients  
with Probable or Suspect SARS*

## Table of Contents

<b>2</b>	<b>Forward</b>
<b>3</b>	<b>Respiratory Procedures</b>
<b>3</b>	<b>Medication Delivery Systems</b>
<b>4</b>	<b>Oxygen Delivery Systems</b>
<b>6</b>	<b>Manual Ventilation Units</b>
<b>6</b>	<b>Ventilated Patients</b>
<b>7</b>	<b>Transport of Patients</b>
<b>8</b>	<b>Pulmonary Function Testing</b>
<b>8</b>	<b>Diagnostic Procedures</b>
<b>8</b>	<b>Acknowledgements</b>

### **Forward:**

**As with any emerging disease, information and guidelines pertaining to SARS are in a constant state of evolution. Information presented here is based on evidence available at the time of publishing and is naturally subject to change. Images are for illustration purposes only Vancouver Hospital Infection Control does not endorse any specific products. Although significant effort has gone into developing clinically sound guidelines, the sole intent of this document to provide infection control guidelines. This document should not be used for clinical guidance for the management of patients with SARS.**

# Respiratory Equipment & Procedures

## Infection Control Guidelines for the Use of Respiratory Equipment or Procedures in patients with Probable or Suspect SARS

### RESPIRATORY PROCEDURES

**WARNING:** Valves may malfunction and filters may clog. Any respiratory system for an intubated patient should include an anti-suffocation valve/device. Other institutions using this document must individually confirm their respiratory systems for patient safety.

All respiratory procedures should be performed in a negative pressure room and full barriers should be used (hospital greens, fluid-resistant gown, double gloves, face shield, N95 mask, shoe covers and hair cap). Wherever possible, disposable equipment and closed systems (e.g. in-line suctioning) should be used. For full details, please see the "Acute Management of the Patient with SARS" guideline.

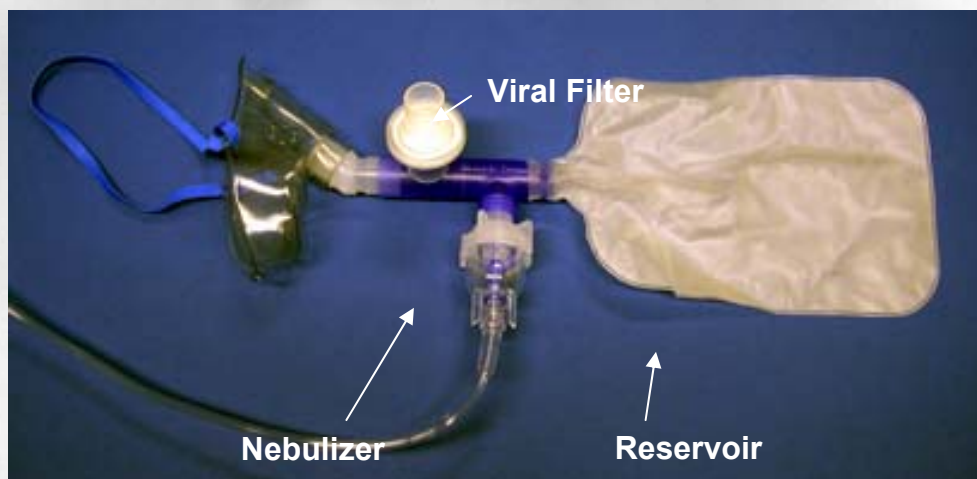
### MEDICATION DELIVERY SYSTEMS

1. Avoid the use of nebulizers wherever possible.
2. If bronchodilators are required, metered dose inhalers (MDI) are preferable and this should be specified when ordering. If this mode of delivery is not feasible and nebulization **must** be used (e.g. decreased level of consciousness), then a closed aerosol delivery system with a reservoir and viral filter should be used. Non-vented masks are preferable. Again, nebulization should be avoided if at all possible.

#### Metered-dose Inhaler



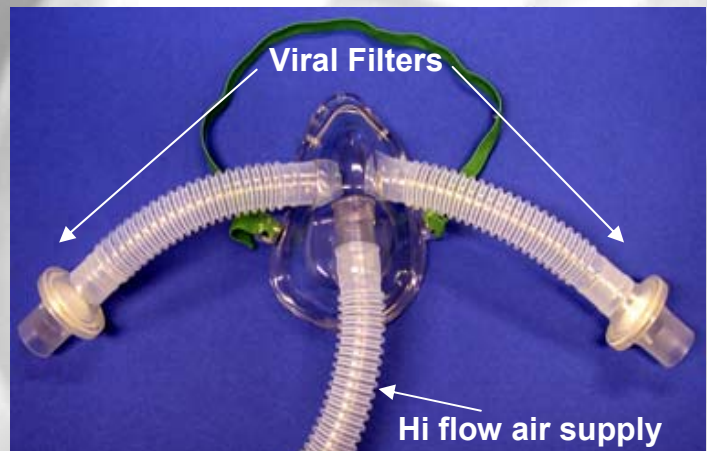
#### Closed Aerosol Delivery System



## OXYGEN DELIVERY SYSTEMS

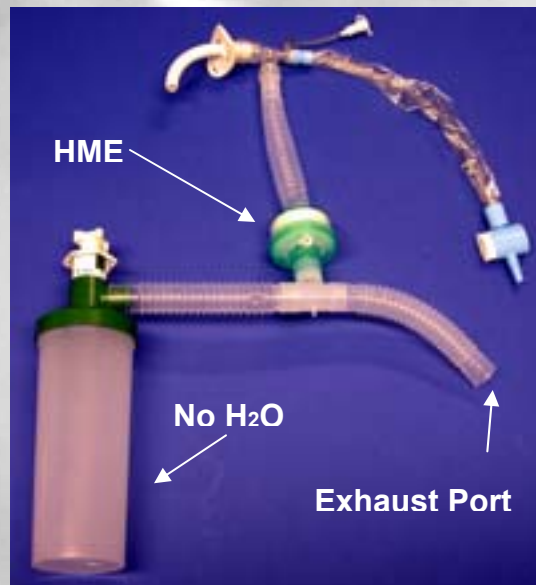
- a. CPAP and BIPAP are not recommended and early intubation is preferred, because of the lower risk of aerosolization. Oscillators (a type of ventilator used to reduce barotrauma, by pulsing air to the patient) should not be used.
- b. Large volume nebulizers are not preferred. Low flow oxygen (i.e. 5L/min or less) does not require humidification. Between 21% and 50% oxygen, humidity may not be required but a water-based lubricant may be used on the patients' nares and lips. If a high humidity system is required, a Star Wars mask should be used with a viral filter attached to the ends of the corrugated tubing reservoirs.

### Dry O<sub>2</sub> Set-up for Untrached Patients



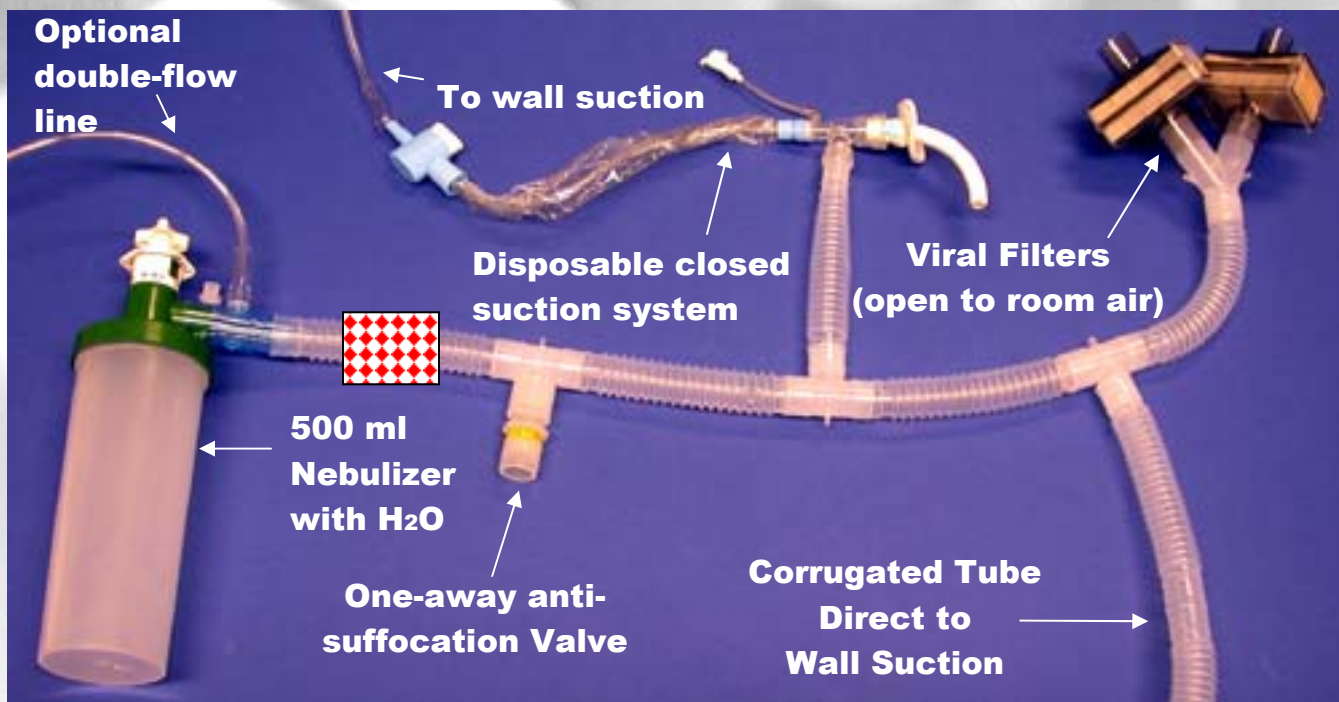
- c. Tracheostomy (trach) masks should be avoided. Instead, a heat and moisture exchanger (HME) is used to filter the expired air. By using an HME (as shown in this image), much of the patient's moisture is retained. This is not directly an infection control issue. However, for most trached patients, this will negate the need for humidified O<sub>2</sub>, and the associated risk of aerosols.


### Dry O<sub>2</sub> Set-up for Trachs



d. The humidified O<sub>2</sub> set-up for trached patients is currently under investigation. Added humidity in a respiratory system significantly increases filters' resistance to air flow, thus possibly modifying air pressure to clinically unsafe levels. To balance pressure with ambient room air, a port must be open to room air. However, this poses the infection control risk of aerosols. In response to this, Vancouver Hospital is currently considering solutions, which exhaust expired air out through the wall suction system, consequently minimizing the possibility of such aerosols. Ideally, the vacuum pressure would be sufficient that the room air port only draws in air, and no air from the system escapes to room air. If this can be ensured, the port to room air does not require a viral filter. However, such assurance may not be a realistic expectation, and from an infection control perspective, the port to room air should have a viral filter. Theoretically this filter would not be exposed to moistened air and resistance to air flow would not be significant. Furthermore, by using a Y-connector, the port room air may be divided between two filters, thus significantly reducing the resistance to air flow. If filters are used on this port, it may be prudent to place an alarmed pressure monitor to the system.

**Trach Set-up for Humidified Air** (safety of this system is under investigation)



 Block indicates possible location for alarmed pressure monitor

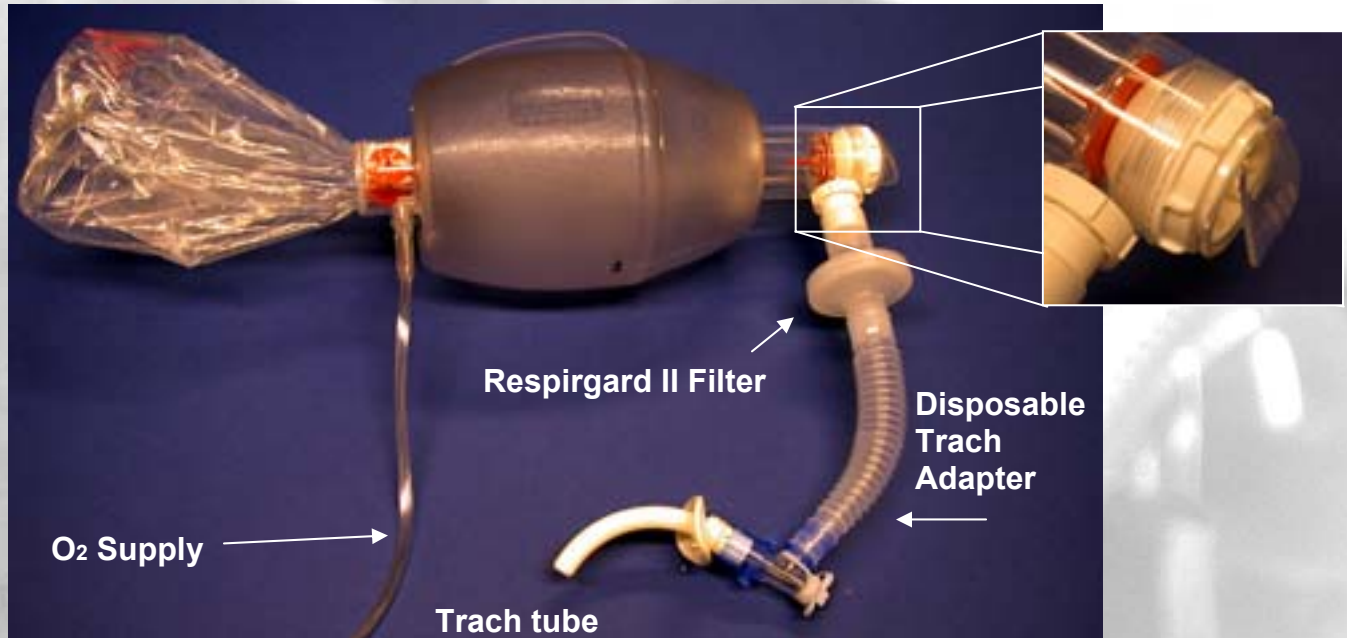
**MANUAL VENTILATION UNITS**

Manual Ventilation Units (MVUs)—often referred to as “ambubags”—must be disposable and have an inspiratory/expiratory viral filter attached. An

added feature of the MVU shown is the multi-directional exhaust port, which may be adjusted to direct exhaust away from the care provider.

### **Disposable MVU with Viral Filter**

### **Multi-directional Exhaust Port**



## **VENTILATED PATIENTS**

- Require an exhalation filter with 99.97% viral efficiency. Please note that not all ventilators are capable of accepting an exhalation filter and care must be taken to ensure that a machine capable of permitting use of an exhalation filter is selected.
- When a ventilator is no longer required, it must be disassembled in the patient's negative pressure room and all tubing (ie. ventilator circuit) and filters discarded in the garbage. The ventilator should be wiped down with the appropriate disinfectant in the room and then transported to the ventilator holding area. Please note that staff must wear full protective gear (hospital greens, fluid-resistant gown, double gloves, face shield, N95 mask, shoe covers and hair cap) when disassembling and cleaning the ventilator.
- Circuit changes are not to be performed. This includes changing of the closed suction system.

### **Exhalation Filter**

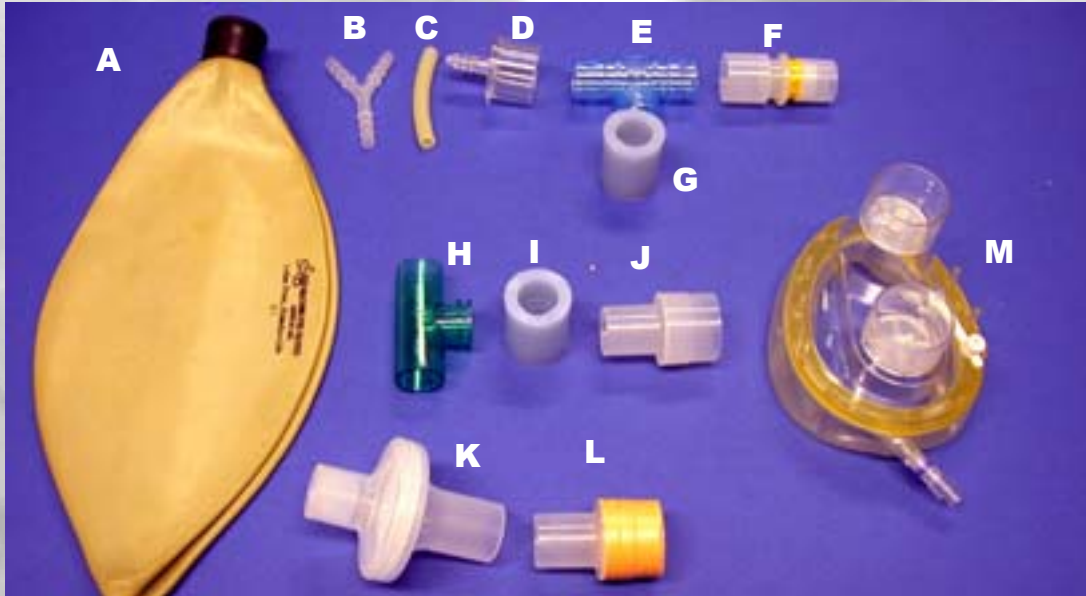


## **TRANSPORT OF PATIENTS**

- May require use of the ventilators in the diagnostic areas. Please ensure that these ventilators use a viral exhalation filter.

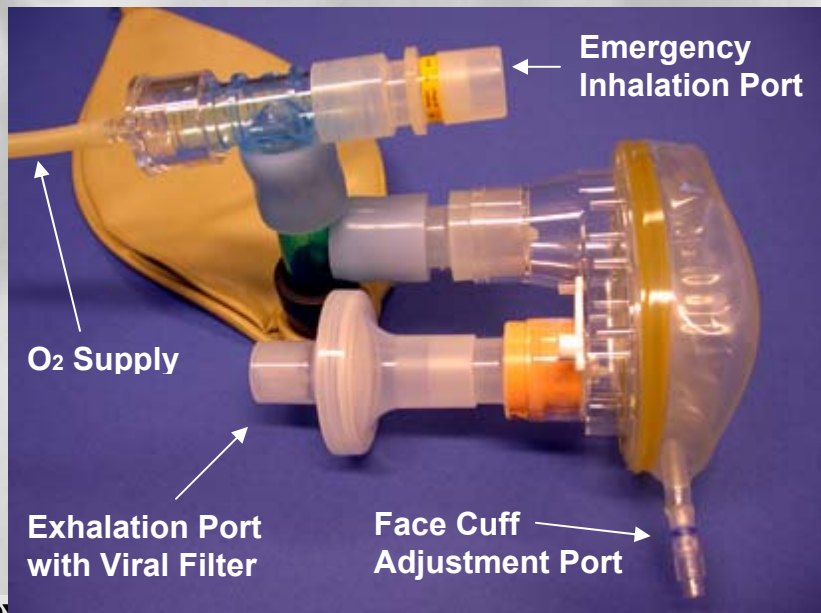
b. Patients with nasal cannulas may simply wear a surgical mask. Patients requiring an oxygen mask should use a Star Wars mask (with viral filters) or a “Neumann” mask developed by and available from Respiratory Therapy. The Neumann mask is preferable as it has an adjustable face cuff and thus provides a better seal on the patient’s face.

**Neumann Mask Parts**



- A**— Reservoir Bag
- B**— Y-connector (optional)
- C**— Latex Flex Tube
- D**— Adapter
- E**— T-piece
- F**— One-way Flow Valve
- G**— Silicone Connector
- H**— T-piece
- I**— Silicone Connector
- J**— Adapter
- K**— Respigard II Filter
- L**— Adapter w/ tape
- M**— CPAP Mask

**Neumann Mask Assembled**

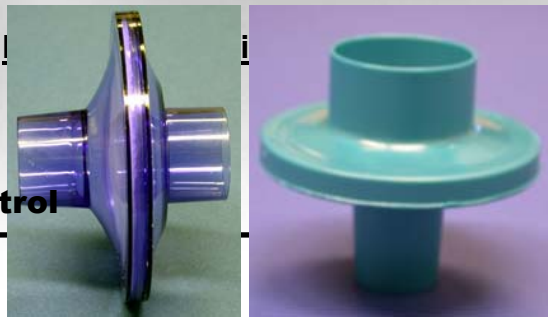


**PULMONARY FUNCTION TESTING**

Pulmonary function testing must not be performed on patients with



**Infection Control**



SARS. However, routine spirometry may be performed in pulmonary function clinics using an appropriate filter.

## DIAGNOSTIC PROCEDURES

- a. Sputum induction should be avoided as a means of obtaining respiratory samples.
- b. The outside of the specimen containers should be wiped with alcohol or buffered bleach prior to transport.
- c. Bronchoscopy must be performed in a negative pressure room using full protective barriers. If bronchoscopy is performed away from the bedside (e.g. procedure room), adequate time for air recirculation must occur prior to the start of the next case (9 air exchanges/hr – wait 30 minutes; 12-15 air exchanges/hour – wait 20 minutes) as per Health Canada Tuberculosis Guidelines.

## ACKNOWLEDGEMENTS

We would like to acknowledge the following for their great support in the development of this document:

Elizabeth Goodfellow RT  
Judy Mack RT  
Ron Thiessen RT  
Vancouver Hospital Respiratory Therapy Team

## Vancouver Hospital Infection Control Team

Dr. E.A. Bryce	Dr. M.A. Noble
N. Cole RN	Dr. D.L. Roscoe
Dr. P.W. Doyle	S. Scharf RN
L. Harris RN	M. Walker RN

## NOTES:

