Ontario

Ministry of Health and Long-Term Care

Ministère de la Santé et des Soins de longue durée

S· A· R· S·

Directive HR04-13
April 15, 2004

DIRECTIVE TO ALL ONTARIO HEALTH CARE FACILITIES/SETTINGS FOR HIGH-RISK AEROSOL-GENERATING PROCEDURES UNDER OUTBREAK CONDITIONS

In order to prevent the transmission of respiratory and other pathogens to workers in health care facilities/settings during respiratory procedures that generate droplets and aerosols, the Ontario Ministry of Health and Long-Term Care directs all health care facilities/settings to undertake the procedures described in this directive.

REPLACES:	**OUTBREAK SECTIONS OF:** *Directive to All Ontario Acute Care Facilities For High-Risk Respiratory Procedures (includes both Non-outbreak and outbreak conditions), October 22, 2003.*
APPLIES TO:	➢ **All acute and non-acute facilities and health care settings with ventilated patients or that perform high-risk procedures** ➢ In this document "High-risk procedures" refers to High-risk aerosol-generating procedures: any procedure with the potential to generate aerosolized droplets, including, but not limited to, nebulized therapy, endotracheal intubation, bronchoscopy, bag-valve mask ventilation, non-invasive ventilation (CPAP, BiPAP) and ventilation using high frequency oscillation. ➢ **OUTBREAK SITUATIONS ONLY. Notification about SARS outbreaks will originate from the local Medical Officer of Health.**

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1 GENERAL CONSIDERATIONS

1.1 Principles

Procedures that generate droplets and aerosols can expose staff to respiratory pathogens and should be conducted using infection control practices designed to reduce exposure to respiratory secretions. During outbreak conditions the risks of exposure are especially high.

In these circumstances protection must be undertaken for all procedures that have the potential to generate droplets or aerosols, such as:

- nebulized therapies,
- aerosol humidification,
- non-invasive ventilation (CPAP, BiPAP),
- use of bag-valve mask to ventilate a patient,
- endotracheal intubation,
- airway suctioning,
- tube or needle thoracostomy,
- bronchoscopy or other upper airway endoscopy, tracheostomy, and open thoracotomy.

A summary of the personal protective equipment required to care for different types of patients is provided in Appendix 2.

While there is some evidence to suggest that droplet precautions are sufficient to prevent transmission of SARS, a conservative approach is recommended in Ontario, particularly with respect to the use of N95 respirator or equivalent masks[1] for aerosol-generating high-risk procedures during outbreak conditions. As more evidence emerges regarding SARS transmission in these circumstances, these directives may be updated.

1.2 Equipment

All crash carts must have personal protective equipment available including N95 respirators or equivalent masks, eye protection, gloves, gowns, head covering and face shields, available for use during high-risk procedures

Each unit or crash cart must also have, in addition to resuscitation equipment:

- a manual resuscitation bag with hydrophobic submicron filter,
- in-line suction catheters[2], and
    - non-rebreather mask that allows filtration of exhaled gases (ideally a low flow high oxygen concentration mask[3] with hydrophobic submicron filter).

During outbreak conditions, acute care hospitals must maintain a group of highly trained healthcare workers to function as an intubation team for high risk patients with highly

[1] While the term “N95 respirator” is more accurate, the term “N95 mask” has been used in other Directives
[2] Note: if the patient is a small child then suctioning may be performed in the normal fashion.
[3] This refers to a special mask which concentrates oxygen using low flows, e.g. Hi-Ox®

communicable diseases. This should include expertise in the use and maintenance of Personal Protective Systems (PPS). PPS must be readily available (either on the ward crash cart or on a specialized SARS crash cart) in the Emergency Department, Critical Care and SARS units.

1.3 Personal Protection

All personnel not essential to the procedure must remain outside of the room; if attendance is necessary for non-medical reasons (e.g., presence of family members on compassionate grounds), persons must use at minimum N95 respirator or equivalent masks, gloves, and eye protection.

Protective equipment must be removed in such a way as to not contaminate the health care worker or others.

The following process is recommended (the process is dependent on level of precautions in use) to remove Personal Protective Equipment:
• Remove gloves and discard using a glove-to-glove/skin-to-skin technique. • Use alcohol hand rinse or, if available, a hand sink; **do not use** patient bathroom to wash hands. • Remove gown (discard in linen hamper in a manner that minimizes air disturbance).
Just prior to leaving or immediately after leaving the room:
• Use alcohol hand rinse. • Remove face shield/fluid shield and eye protection and discard or place in clear plastic bag and send for decontamination. • Remove hair cover and discard. • Use alcohol hand rinse again. • Remove N95 respirator or equivalent mask and discard. • Use alcohol hand rinse again.

1.4 Personnel

Personal protective equipment must be properly used, fit and maintained in a manner consistent with *Regulation for Health Care and Residential Facilities* (Reg. 67/93 s.10) under the Occupational Health and Safety Act. Staff who require N95 respirator or equivalent masks must be fit-tested to ensure maximum mask effectiveness. (See NIOSH website at www.cdc.gov/niosh -Publication No.99-143, and Canadian Standards Association *Z94.4-02* Selection, Use, and Care of Respirators, October 2002). Measures and procedures for worker protection and training must be developed in consultation with the facility's Joint Health and Safety Committee/Health and Safety Representatives.

All staff working with SARS patients or in SARS patient care areas must follow the Directive Regarding the Application of Respiratory and Contact Precautions (Enhanced) with Patients with Febrile Respiratory Illness and SARS Contact History; Persons Under Investigation; SARS Patients; and SARS Units, (Directive RCPE03-01), October 22, 2003.

2. PERFORMING HIGH-RISK PROCEDURES FOR PATIENTS WITHOUT FEBRILE RESPIRATORY ILLNESS (FRI).

NOTE: during a SARS outbreak FRI refers to fever OR respiratory symptoms (see Appendix 1, Glossary of Terms)

This also includes:

- Patients with sudden cardio respiratory arrest or compromise that is not related to FRI

2.1 Principles

- High-risk procedures performed on patients during a SARS outbreak may expose unprotected staff to respiratory pathogens.
- If FRI is suspected, and for all confirmed, probable or suspect SARS patients, refer to Section 3.
- Patients who present to Emergency Departments, during a declared outbreak of SARS, with sudden cardio-respiratory arrest should be managed, at minimum, with N95 respirator or equivalent masks, gowns, gloves and eye protection. If FRI is suspected in these patients, refer to Appendix 3, Protected Code Blue.
- If first responders to a patient with sudden cardio-respiratory arrest are not wearing appropriate protection, they should avoid high-risk procedures if at all possible. Patients should be managed with chest compressions and defibrillation if indicated until the arrival of responders using N95 respirator or equivalent masks, gloves and eye protection. If bag-valve-mask ventilation is deemed to be absolutely necessary, it must be performed with extreme caution, wearing at minimum a surgical mask and eye protection.
- All areas in which high-risk procedures are generally performed must have access to infection control advice and consultation to assist with the review of practices.

2.2 Personal Protection

Due to the nature of high-risk procedures, health care workers must wear, at minimum, gloves, N95 respirators or equivalent mask, and eye protection. Gowns should be worn if contamination of uniform or clothing is anticipated. Careful hand hygiene must be practiced.

2.3 Procedures

2.3.1 Nebulized therapies should be avoided if possible. Salbutamol Sulphate (Ventolin®) or Ipratropium Bromide (Atrovent®) or Salbutamol/ Ipratropium Bromide (Combivent®) can be delivered using a metered dose inhaler (MDI) and a spacer device (for example, Aerochamber®)[4] or via a dry powder inhaler

[4] Children and patients who are unable to be instructed in the use of MDI may receive nebulized therapy if MDI is not deemed to be appropriate. This should occur in a private room, and respiratory contact precautions (enhanced) must be followed by all persons in the room.

2.3.2 The need for chest physiotherapy and other cough-inducing procedures must be carefully assessed recognizing that these may increase the risk of transmission.

2.3.3 The need for high frequency oscillation (HFO) and non-invasive ventilation (CPAP/BiPAP) should be carefully considered. If non-invasive ventilation is essential for the patient, the patient must be screened for SARS contact history, and respiratory and contact precautions (enhanced) be followed, including the use of a private room (negative pressure preferred).[5] Infection control should be notified about these patients.

2.3.4 Intubation and bronchoscopy

*Note: For **controlled intubation** of patients **without FRI or a SARS contact history** in an operating room setting, this section does not apply. Droplet precautions may be used, with the use of N95 respirators or equivalent rather than surgical masks.*

Personal Protection:

- Those on the intubation team and all staff in the room must use respiratory and contact precautions.

Personnel:

- The number of persons in the room during the procedure should be kept to a maximum of 4 persons.

Procedure:

- The procedure should be done in a negative pressure room if possible. If not available, the procedure may be performed in a private room with the door closed. If performed in an area where patients cannot be isolated, such as a resuscitation area, curtains must be drawn and all non-essential persons must be at least 2 metres from the patient. An adjacent area should be used for decontamination.
- The intubation should be done while the patient is sedated and paralysed if medical condition permits.
- The ventilator and in-line suction device shall be in the patient room in advance of intubation if at all possible to reduce time needed for manual ventilation and disconnecting bag from the endotracheal tube suctioning.
- Minimize staff exposure by limiting staff re-entry to the room until the room has been cleaned. Critical care areas should preassemble medication/equipment for intubations performed on patients requiring these precautions. The preassembled kit must be in a disposable or easily cleaned container.

Cleaning:

- Excess medications must be discarded at the end of the procedure.
- Immediate clean up of room and equipment must be done in such a way as to reduce the re-release of droplets. For example, cleaning solutions and materials should be handled carefully and not shaken. Staff performing the clean up must use respiratory and contact precautions.

[5] In the pediatric population, the need for HFO should be carefully considered, and may be used if no other treatment is appropriate. Gases should be effectively scavenged and filtered to the greatest extent possible.

- Staff performing the procedure must ensure that contaminated equipment and surfaces are discarded/disinfected and cleaned before leaving the room.
- Potentially contaminated surfaces in the room must be wiped with a hospital-approved disinfectant.

2.3.5 Mechanical Ventilation

Ventilators:

- All filters and ventilator circuits must be **single use** and disposed of after use.
- To minimize contamination of the environment and protect HCWs, ventilator expiratory gases must be filtered and ventilator circuit disconnects minimized. Utilize ventilators with built in expiratory filters. If this is not possible, a disposable hydrophobic submicron filter must be placed in the expiratory circuit of the ventilator. Filters must be changed when fluid build-up impedes ventilation.
- Disposal of filters is a high-risk exposure and staff must protect themselves using respiratory and contact precautions.
- Disposable filters and disposable ventilator circuits must be bagged, sealed, and then placed in a biohazardous bag for disposal.
- Heated wire circuits should be used on both the inspiratory and expiratory limbs of the ventilator circuit. In some cases, the use of heated dual wire circuits will not reduce the amount of condensation within the circuit (therefore necessitating more circuit disconnects). In this situation the use of a Heat Moisture Exchanger (HME) or HME/filter may be preferable.
- A water trap/filter combination should be placed at the end of the expiratory circuit in an effort to decrease the frequency of filter changes.
- Utilize in-line suction catheters

Manual Resuscitation Bags:

- A hydrophobic submicron filter must be placed between the endotracheal tube and the bag or on the expiratory exhaust component of the bag.
- Equipment used for manual ventilation must be disposed of after use, not cleaned.
- Disposal of bags and filters is a high-risk exposure and staff must protect themselves using respiratory and contact precautions.
- Equipment must be bagged, sealed, and then placed in a biohazardous bag for disposal. Under no circumstances should the equipment be re-sterilized for re-use.

3 PERFORMING HIGH-RISK PROCEDURES IN PATIENTS WITH FRI OR IN PATIENTS WITH CONFIRMED, PROBABLE OR SUSPECT SARS

This includes:

- Patients with sudden cardio respiratory arrest or compromise related to febrile respiratory illness (FRI).
- Patients with pre-existing fever or respiratory symptoms, who have a SARS contact history, or who are confirmed, probable or suspect SARS cases.

- In non-outbreak conditions, patients who are confirmed, probable or suspect SARS cases.

3.1 Principles:

- All high-risk procedures, but in particular bronchoscopy, should be avoided if possible.
- If deemed necessary for life-saving reasons, these procedures should only be performed as outlined below:
    - in a private room with negative pressure if possible,
    - by the most experienced staff,
    - with minimum numbers of staff, and
    - using respiratory and contact precautions (enhanced) **or** personal protective systems (PPS). **In confirmed, probable or suspect SARS patients, individuals performing the procedure must wear PPS (refer to section 3.3.5).** Careful hand hygiene must be practiced.
- For patients in this category with sudden cardio respiratory arrest refer to Appendix 3, Protected Code Blue.
- All areas in which high-risk procedures are generally performed must have access to infection control advice and consultation to assist with review of practices.

3.2 Personal Protection

Health care workers must use respiratory and contact precautions. At minimum, this means that gloves, gown, N95 respirator or equivalent mask**,** eye protection, face shield and head covering must be worn. **In confirmed, probable or suspect SARS patients, individuals performing the procedure must wear PPS (refer to section 3.3.5).** Careful hand hygiene must be practised.

3.3 Procedures

3.3.1 Nebulized therapies must be avoided. Salbutamol Sulphate (Ventolin®) or Ipratropium Bromide (Atrovent®) or Salbutamol/Ipratropium Bromide (Combivent®) can be delivered using a metered dose inhaler (MDI) and a spacer device (for example, Aerochamber®)[6], or via a dry powder inhaler.

3.3.2 The need for chest physiotherapy and other cough-inducing procedures must be carefully assessed recognizing that these may increase the risk of transmission.

3.3.3 Patients on oxygen therapy by mask or nasal prongs must receive it dry, with the exception of tracheostomy patients. Maximum flow rate for nasal prongs should be 6 litres per minute.[7]

[6] Children and patients who are unable to be instructed in the use of MDI may receive nebulized therapy if MDI is not deemed to be appropriate. This should occur in a private room, and respiratory contact precautions must be followed by all persons in the room.

[7] For children, oxygen should be humidified as usual.

- If a patient requires up to 50% oxygen by mask use a venti-mask. If a patient requires more than 50% oxygen then the respiratory therapist (RT) must be notified. The nebulizer system must be emptied of the water from the prefilled water bottle. The water bottle should remain DRY. The RT will monitor the patient and wean to nasal prongs as soon as the patient can tolerate.
- Patients must receive frequent mouth, care and tracheostomy (if applicable) care.
- Patients with tracheostomies must be provided with humidity.
- Patients who require oxygen greater than 50% shall be referred to RT for set up and ongoing monitoring.

3.3.4 High frequency oscillation (HFO) and non-invasive ventilation (CPAP/BiPAP) should be avoided. If non-invasive ventilation is essential for the patient, the patient must be screened for SARS contact history and evaluated carefully for respiratory infection, and respiratory and contact (enhanced) precautions be followed, including the use of a private room (negative pressure preferred).[8] Infection control should be notified.

3.3.5 Intubation and bronchoscopy

Personal Protection:

- Those on the intubation team must wear full head and face protection. This consists of at minimum, N95 respirator, eye protection, face shield, hair cover, gown and gloves. For confirmed, probable or suspect SARS cases or when airborne respiratory infection is suspected, Powered Air-Purifying Respirator (PAPR) or another type of PPS (see Appendix 4 - Parameters to Guide the Selection of Personal Protective Systems) must be worn.
- The system chosen must allow for safe performance of the procedure and not fog when in use.
- Staff must be trained and be proficient in the use of the specific type of PPS chosen.

Use of Personal Protection Systems (PPS):

- A clean N95 respirator mask or equivalent and eye protection must be worn underneath the PPS hood and be left in place once the PPS is removed until health care worker has left the room.
- Staff using this equipment must receive proper instruction and be proficient in its application and removal to avoid contamination.
- A practice session shall be carried out prior to use and written instructions must be given to staff. Staff training sessions must be documented. The hospital Infection Control Practitioner must review the written procedure/ instructions.
- Ensure that all disposable components of the equipment are carefully removed and disposed of at the end of the procedure and reusable items are thoroughly cleaned using hospital disinfectant or disinfectant wipes.
- The application and removal of PAPR/PPS equipment **requires the assistance of another person and must not be done alone**. For information on the application

[8] In the pediatric population, high-frequency oscillation (HFO) should be avoided if possible, but may be used if no other treatment is appropriate. Gases should be effectively scavenged and filtered to the greatest extent possible.

and removal of this equipment, refer to www.SARS.medtau.org or manufacturer's instructions.

Personnel:

- The procedure shall be performed by the most experienced staff members available. The number of persons in the room should be kept to a maximum of 4 persons (Note: hospitals should maintain an intubation team for high risk procedures in these patients).

Procedure:

- The procedure should be done in a negative pressure room. If none is available, the procedure must be done in a private room with the door closed.
- After hand-washing and prior to entering the room, the procedure team must apply the personal protective equipment as per *Directive Regarding the Application of Respiratory and Contact Precautions (Enhanced) with Patients with Febrile Respiratory Illness and SARS Contact History; Persons Under Investigation; SARS Patients; and SARS Units, (Directive RCPE03-01), October 22, 2003* and manufacturer's instructions.
- Staff in the room during the intubation must wear appropriate personal protection as outlined.
- The intubation should be done while the patient is sedated and paralysed if medical condition permits.
- The ventilator and in-line suction device shall be in the patient room in advance of intubation to reduce time needed for bag ventilation and disconnecting bag from the endotracheal tube suctioning.
- Minimize staff exposure by limiting staff re-entry to the room until the room has been cleaned. If re-entry is necessary within two hours of the procedure, use PPS.
- Critical care areas shall preassemble medication/equipment for intubations performed on patients requiring these precautions. The preassembled kit must be in a disposable or easily cleaned container.

Cleaning:

- Excess medications must be discarded at the end of the procedure.
- Immediate clean up of room and equipment must be done in such a way as to reduce the re-release of droplets. Staff performing the clean up must use respiratory and contact precautions (enhanced).
- Staff performing the cleaning procedures must ensure that contaminated equipment and surfaces are discarded/disinfected and cleaned before leaving the room.
- Potentially contaminated surfaces in the room must be wiped with a hospital-approved disinfectant.

3.3.6 Mechanical Ventilation

Note: Infectious respiratory secretions from these patients may contaminate respiratory equipment and be expelled into the surrounding environment

Ventilators:

- All filters and ventilator circuits must be **single use** and disposed of after use.
- To minimize contamination of the environment and protect HCWs, ventilator expiratory gases must be filtered and ventilator circuit disconnects minimized. Utilize ventilators with built in expiratory filters. If this is not possible, a disposable hydrophobic submicron filter must be placed in the expiratory circuit of the ventilator. Filters must be changed when fluid build-up impedes ventilation.
- Disposal of filters is a high-risk exposure and staff must protect themselves using respiratory and contact precautions.
- Disposable filters and disposable ventilator circuits must be bagged, sealed, and then placed in a biohazardous bag for disposal.
- Heated wire circuits should be used on both the inspiratory and expiratory limbs of the ventilator circuit. In some cases, the use of heated dual wire circuits will not reduce the amount of condensation within the circuit (therefore necessitating more circuit disconnects). In this situation the use of a Heat Moisture Exchanger (HME) or HME/filter may be preferable.
- A water trap/filter combination should be placed at the end of the expiratory circuit in an effort to decrease the frequency of filter changes.
- Utilize in-line suction catheters

Manual Resuscitation Bags:

- A hydrophobic submicron filter must be placed between the endotracheal tube and the bag or on the expiratory exhaust component of the bag.
- Equipment used for manual ventilation must be disposed of after use, not cleaned.
- Disposal of bags and filters is a high-risk exposure and staff must protect themselves using respiratory and contact precautions.
- Equipment must be bagged, sealed, and then placed in a biohazardous bag for disposal. Under no circumstances should the equipment be re-sterilized for re-use.

4 RESOURCES

SARS Information

- Ontario – www.health.gov.on.ca
- Health Canada – www.sars.gc.ca
- U.S. Centers for Disease Control - www.cdc.gov/
- World Health Organization - **www.who.int/csr/sars/en/**

Infection Control

- Health Canada – Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Health Care; Recommendations for Ambulatory Care – www.hc-sc.gc.ca/pphb-dgspsp/publicat/ccdr-rmtc/99vol25/25s4/index.html
- College of Physicians and Surgeons of Ontario – Infection Control in the Physician's Office – www.cpso.on.ca/publications/infect.htm.

Situation Reports

A list of areas with recent local transmission of SARS is available from:

- World Health Organization at www.who.int/csr/sarsareas
- Health Canada at www.sars.gc.ca
- Ontario Ministry of Health and Long-Term Care at: www.health.gov.on.ca/english/providers/program/pubhealth/sars/sars_mn.html

5 LIST OF APPENDICES

Appendix 1: Glossary of Terms
Appendix 2: High Risk Respiratory Procedures Personal Protective Equipment
Appendix 3: Protected Code Blue
Appendix 4: Parameters to Guide the Selection of Personal Protective Systems

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APPENDIX 1 - GLOSSARY OF TERMS

Aerosolization: The process of creating very small droplets (droplet nuclei) of moisture that may carry microorganisms. The aerosolized droplets can be light enough to remain suspended in the air for short periods of time and facilitate inhalation of the microorganisms.

Cluster: A grouping of cases of a disease (e.g. respiratory illness indicative of SARS) within a specific time frame and geographic location suggesting a possible association between the cases with respect to transmission.

Droplet Precautions: (see also Routine Practices) The use of surgical or procedure masks and eye protection or face shields for patients who have respiratory infections especially if associated with coughing, sneezing, felt to be transmissible principally by large respiratory droplets particularly when within 1 meter of such a patient. Also used where appropriate to protect the mucous membranes of the eyes, nose and mouth during procedures and patient care activities likely to generate splashes or sprays of blood, body fluids, secretions or excretions (e.g., air way suctioning).

Febrile Respiratory Illness (FRI): temperature greater than 38^0 C and new or worsening cough or shortness of breath. During non-outbreak conditions this includes a fever of greater than38^0C **and** new or worsening cough or shortness of breath to increase the specificity of this designation. During outbreak conditions, to maximize the sensitivity to potential SARS infection, this includes a fever of greater than38^0C **or** new or worsening cough or shortness of breath. The context in which FRI is determined must take the outbreak vs. non-outbreak conditions into account.

Health Care Facility/Setting: a location where ill people are examined and assessed by health care workers and/or provided with direct health care services. Locations may range from private physician offices, ambulatory clinics or diagnostic facilities, to hospitals, long-term care facilities, and peoples' homes.

Health Care Facilities SARS Categories: a categorization system established by the Ministry of Health and Long-Term Care to determine precautionary measures to be taken during a SARS outbreak. The levels are as follows:

> **SARS Category 0**: Health care facility has no known cases of SARS (suspect or probable).
>
> **SARS Category 1**: No unprotected SARS exposure – staff and/or patients. Health care facility has one or more cases of SARS (suspect or probable).
>
> **SARS Category 2**: Any unprotected SARS exposure within the last 10 days but without transmission to staff or patients. The health care facility may or may not currently have one or more cases of SARS (suspect or probable).
>
> **SARS Category 3**: Unprotected SARS exposure with transmission to health care workers and/or patients. The health care facility may or may not currently have one or more case of SARS (suspect or probable).

High-Risk Respiratory Procedure: any procedure with the potential to generate aerosolized droplets, including, but not limited to nebulized therapy, endotracheal intubation, bronchoscopy, bag-valve mask ventilation, non-invasive ventilation (CPAP, BiPAP), and ventilation using high frequency oscillation.

Non-Outbreak: *Non-outbreak* refers to the conditions once a SARS Outbreak is declared over by the local Medical Officer of Health (MOH) or in a region where no SARS outbreak has occurred. Facilities within the region may have one or more SARS patient(s), either local cases or those imported through travel activity, provided there has been no transmission within the hospital population. This represents Levels 0-3 of the Regional Response Levels Outbreak definition which describes seven levels of outbreak.

Reference: Regional SARS Response Levels and Paradigm appended to Infection Control Guidelines

Outbreak: For the purposes of SARS activity, an *outbreak* is defined as local transmission of SARS. This represents Level IV of the Regional Response Levels Outbreak definition which describes seven levels of outbreak. The local Medical Officer of Health is responsible for declaring a SARS outbreak. An outbreak may be setting-specific (e.g., a hospital with transmission) or health unit wide (e.g. transmission in more than one setting or significant community exposure). In declaring an outbreak the local Medical Officer of Health takes into account global and neighbouring jurisdiction conditions and the potential impact of those conditions.

Reference: Regional SARS Response Levels and Paradigm appended to Infection Control Guidelines.

Personal Protective Equipment (PPE): includes N95 respirator or equivalent mask, eye protection, gloves and gowns if contamination of clothing could be anticipated.

Personal Protective System (PPS): a full body suit or equivalent protective apparatus consisting of head, face and neck protection worn with appropriate respiratory protection, with or without enclosed body protection; or a powered air purifying respirator (PAPR).

Respiratory and Contact Precautions (RCP): infection control procedures for institutional and community-based settings with the intent of protecting the health care worker from SARS.

1. Common Elements for both institutional and community-based settings:

    A. Personal protective equipment, (PPE):

    - Staff to use an N95 respirator or equivalent mask, eye protection, gown, and gloves.
    - Remove PPE after there is no further contact with the patient/client in the following order: Remove gloves, clean hands, remove gown, clean hands, remove eye protection and finally the N95 respirator or equivalent mask. Wash hands carefully after removing the final PPE. Avoid touching other objects or people until after removing PPE and washing hands.
    - Disinfect non-disposable equipment (e.g.: stethoscope, testing items) and anything the client used or touched before it is used for others.

- When the patient leaves the examining room it should be cleaned with a hospital grade disinfectant.

B. Patient Management:

- Isolate the patient/client immediately from other patients/clients and staff.
- Whenever the patient/client is in a public setting (e.g., in the hallway, or waiting room), in the same room with others, and during transport, the patient/client must wear a surgical mask, unless medically contraindicated.
- Limit visitation to the symptomatic patient/client except for essential or compassionate reasons. Visitors should wear PPE.

2. For Institutional Settings:

Patient Accommodation for Hospitals: Patients are to be placed as follows (in order of decreasing preference):

1. Single room with negative pressure ventilation, with at least 6 air exchanges per hour or 12 air exchanges if the building is a new facility, as per Canadian Standards Association, Sept 2001 (highest preference)
2. single room with HEPA filtration unit which achieves at least 9 air exchanges per hour
3. single room, with no special air handling
4. semi-private room, cohorted with patients with similar SARS risk factors and/or symptoms or diagnosis

3. For Community-Based Settings:

Includes physician's offices, community health practice settings, non-acute care facilities, and home and community care:

- Physician, or nurse/nurse practitioner, if present, to assess the patient
- If SARS is possible, or if hospitalization is required, arrange for the patient/client to be taken to an Emergency Department for evaluation (call ahead)
- Transportation for medical examination must be by private vehicle or medical transport with the patient/client wearing a surgical mask during transport.
- Contact the local public health unit, as appropriate

Respiratory and Contact Precautions (Enhanced) (RCP[E]): an enhanced form of infection control procedures, which require the following in addition to procedures under Respiratory and Contact Precautions:

A. Personal Protective Equipment: also includes a full face shield and hair covering

B. Patient accommodation in hospitals: patients assessed to be at risk for having SARS, based on the SARS Risk Management Algorithms, have priority for the highest level of accommodation

Respiratory Symptoms: new or worse cough (onset within 7 days) OR new or worse shortness of breath (worse than what is normal for the patient).

Routine Practices (See also "Droplet precautions"): The Health Canada term to describe the system of infection prevention recommended in Canada to prevent transmission of infections in health care settings. These practices describe prevention strategies to be used with all patients during all patient care, and include:

- Hand washing or cleansing with an alcohol-based sanitizer before and after any direct contact with a patient.
- The use of additional barrier precautions to prevent health care worker contact with a patient's blood and body fluids, non intact skin or mucous membranes.

    - Gloves are to be worn when there is a risk of body fluid contact with hands; gloves should be used as an additional measure, not as a substitute for hand washing.
    - Gowns are to be worn if contamination of uniform or clothing is anticipated.
    - The wearing of masks and eye protection or face shields where appropriate to protect the mucous membranes of the eyes, nose and mouth during procedures and patient care activities likely to generate splashes or sprays of blood, body fluids, secretions or excretions.

The full description of routine practices to prevent transmission of nosocomial pathogens can be found on the Health Canada website (http://www.hc-sc.gc.ca/pphb-dgspsp/dpg_e.html#infection).

SARS Contact History: SARS contact history in a patient with febrile and/or respiratory illness is defined as any one of:

- Unprotected contact with a person with SARS in the last 10 days prior to the onset of this illness
- Were present in a health care facility closed due to SARS before the onset of symptoms, 10 days prior to the onset of this illness
- Instructed by the local public health unit to be in quarantine or isolation.
- Travel to a SARS affected area in the 10 days prior to the onset of illness

SARS Risk Management Algorithm: a tool to be used by health care workers to assist in the management of a patient based on information derived from the SARS Risk Factor Screening Tool. There are various algorithms to reflect patient care in different settings.

SARS Risk Factor Screening Tool: a tool to be used by health care workers during triage, admitting, and outpatient /ambulatory settings. This tool gathers information from the patient regarding temperature, respiratory illness, contact history and SARS risk factors.

SARS Risk Factors: SARS risk factors in a patient with febrile and/or respiratory illness are defined as:

- Travel (patient or household/close family) to a former or current SARS affected area in the last 30 days.
- Admission to a hospital* or long-term care facility* in the 10 days prior to the onset of this illness.
- Household members or other close contacts with fever or pneumonia.
- Health care worker with direct patient contact in a healthcare facility.

(*Only facilities in Toronto, York, Durham Regions of Ontario or Taiwan, China, Singapore or Hong Kong are considered as positive risk factors.)

Working Quarantine: To prevent the potential transmission of SARS virus by persons who have been in contact with a known probable or suspected case of SARS and may be in the incubation period of illness and those who work in an area where exposures to SARS may have occurred. The precautionary measures are to be applied to those who meet the above criteria and whose work has been identified as essential (e.g., health care workers during a SARS outbreak).

Measures include but are not limited to the following:

1) Arrive at the workplace wearing a mask

2) Go directly to the quarantine workplace area

3) Take breaks and meals in the designated quarantine area

4) Use Respiratory and Contact Precautions, which include gown, gloves, N95 mask or equivalent, and eye protection, while working in the quarantined area

5) Leave work wearing a clean procedure mask

6) Avoid public transit

7) For persons who were exposed to SARS virus and considered contacts, follow home quarantine measures

APPENDIX 2 - HIGH RISK PROCEDURES PERSONAL PROTECTIVE EQUIPMENT

	PPE (outbreak)	**Code Blue (outbreak)**	**Comments**
Patients without febrile respiratory illness (FRI)	N95 respirator or equivalent mask, eye protection, gloves ± gown	N95 respirator or equivalent mask, eye protection, gloves ± gown	Gowns to be worn if contamination of uniform or clothing is anticipated.
Patients with FRI, but without SARS Contact History	Respiratory and Contact Precautions (use enhanced for intubation/ bronchoscopy)	Protected Code Blue with RCP (enhanced)*	In outbreak, febrile respiratory illness (FRI) refers to fever ***or*** respiratory symptoms.
Patients with FRI and with SARS Contact History	Respiratory and Contact Precautions (enhanced) or Personal Protective System*	Protected Code Blue with PPS*	In outbreak, FRI refers to fever ***or*** respiratory symptoms. Requires negative pressure room, or, if in resuscitation area, no non protected people within two (2) metres, and area set aside for donning and removing PPS.
Confirmed probable or suspect SARS patients (outbreak or non-outbreak conditions)	Respiratory and Contact precautions (enhanced) or Personal Protective System*	Protected Code Blue with PPS*	Requires negative pressure room, or if in resuscitation area, no non protected people within two (2) metres, and area set aside for donning and removing PPS.

*** refer to Glossary of Terms, Appendix 1**

APPENDIX 3 - PROTECTED CODE BLUE

To prevent the spread of communicable respiratory diseases to a health care worker, respiratory and contact precautions are essential. However, during an outbreak and/or in certain high-risk settings, such as cardio-respiratory failure in a patient with SARS who requires airway management, these may not be sufficient and a Protected Code Blue Team should be called.

The Protected Code Blue (PCB) Team is an in-hospital team which consists of four individuals, at least one of whom (Staff Emergentologist, Intensivist, Anaesthetist, etc.) is highly skilled in intubation and resuscitation measures. The persons involved in the intubation must wear, at minimum, N95 respirator or equivalent masks, gloves, gown, eye protection, face shield and hair cover. **In persons with confirmed, probable or suspect SARS, Personal Protection Systems must be used.** Regardless of the level of PPE used the provider must be fully trained in its use, including safe application and removal procedures.

In teaching hospitals, only attending staff, fellows or senior house staff with considerable experience in rapid sequence intubation should be allowed to perform intubations in patients with SARS. Junior house staff may be members of the team but must not do the highest risk procedure—intubation. In the event of a delayed response by the airway expert physician, intubation may be attempted by other PCB team physicians or respiratory therapists if the patient is unconscious (i.e., does not require sedation and paralysis) and the team member is competent in airway management. Other team members may be nurses, respiratory therapists, or paramedics.

A cadre of teams must be specially trained, with consistent adherence to skills and opportunities to maintain skills..

A team must be available in hospital 24/7 during times of regional outbreaks as defined by the local Medical Officer of Health, or if a patient is admitted with a known high-risk communicable respiratory disease such as SARS.

During outbreaks with potential for large numbers of patients, the core PCB Teams shall train staff in high risk areas such as emergency, affected medical units, critical care units and operating room staff to either assist in the PCB or to run them independently as the demand may overwhelm the team's capacity.

Ideally these patients should be in hospital isolation rooms with negative pressure, but may arrive unexpectedly in the Emergency Department (ED) in need of life saving care after being transported by family or paramedics. Each of these steps poses significant risk to all involved and has the potential to rapidly spread the disease.

1. Equipment:

- EDs, Critical Care and SARS units must have crash carts which include:
  i. Manual resuscitation bag with bacterial/viral filter,
  ii. In-line suction catheters,

iii. Personal protective equipment including N95 respirator or equivalent masks, eye protection, gloves, gowns, head covering and face shields, and
iv. Personal Protective Systems (PPS).

2. Preparation:

- Consider early critical care unit transfer when deteriorating (50% 0_2 necessary).
- Consider early controlled intubation when patient's respiratory status deteriorates.
- Keep all non-essential staff outside room.
- Ensure fit testing of N95 respirator or equivalent masks or equivalent for all staff on the unit.
- Ensure training in PPE application for all staff involved in intubation.
- Develop protocols for Protected Code Blue activation.

3. Personnel: (Protected Code Blue Team)

NOTE: All staff in vicinity of the patient's room must wear full protective apparel.

- "Airway expert" physician (such as Staff Emergentologist, Intensivist or Anaesthetist) or respiratory therapist
- Appropriately trained nurse
- Respiratory therapist for managing ventilation
- 4th person capable of performing ACLS Procedures
- "Coach" individual who is trained to assist with donning and removal of adjunct equipment and room entry/exit procedures (this may be the First Responder).This person must use checklist to ensure all steps followed. For information on the application and removal of this equipment, refer to www.SARS.medtau.org or manufacturer's instructions.

4. Procedure:

a) First Responder (First person to recognize non-responsiveness or cardio respiratory arrest)
   i. Likely wearing respiratory and contact precautions protection.
   ii. Must not perform high-risk procedures (such as bag valve mask ventilation/intubation) or be present in the room when these take place if no RCP(E) protection or PPS.
   iii. Calls Protected Code Blue.
   i. If wearing appropriate protection, begins BVM. If not, places low flow high concentration O_2 mask with hydrophobic submicron filter on patient – if not available use regular O_2 mask @ 6 litres per minute.
   iv. Attaches cardiac monitor, if available; defibrillates if indicated.
   v. Performs chest compressions, if the patient has no pulse.
   vi. Must leave room when persons with RCP(E) protection or PPS arrive.
   vii. Gives report on leaving room.
   viii. May assist dressing team in appropriate PPS. Removes contaminated PPE in the appropriate manner and re-dons PPE.
   ix. Prepares any drugs or equipment requested.

b) PCB responder #1 (wears RCP(E) protection or PPS)
   i. Takes report and assumes responsibility.
   ii. Attaches cardiac monitor if not already done; defibrillates, if indicated.
   iii. Continues compressions, if indicated.

c) PCB #2 (wears RCP(E) protection or PPS)
   i. Prepares BVM with exhalation filter and intubation equipment.
   ii. Prepares for intubation.

d) PCB #3 (wears RCP(E) protection or PPS)
   i. Prepares appropriate drugs.
   ii. Performs (or assists with) intubation, if "airway expert" is present.
   iii. If "airway expert" is not present, proceeds with two-person BVM Ventilation.

e) PCB #4 (Wears RCP(E) protection or PPS)
   i. If designated intubator, performs intubation.
   ii. Provides ACLS assistance as directed by Team leader.

5. Termination

- If resuscitation is successful, a member of the PCB Team must remain with the patient until transfer to another area in the hospital or to another hospital is possible. If there is a prolonged delay in moving the patient, this team member must have back-up. Precautions for patient movement such as plastic tent over stretcher, etc. will be at the discretion of the PCB Team.
- Consideration should be given to termination of resuscitative attempts at the time survival is deemed to be futile (e.g., unwitnessed arrest, asystole) as the outcome of resuscitation is inversely proportional to the length of time of resuscitation, and the risk to the providers increases.
- Personal protection systems must be removed in the approved manner prior to exiting room to avoid contamination of hospital environment.

For further information and education on Protected Code Blue, please go to website:
www.sars.medtau.org

APPENDIX 4 - PARAMETERS TO GUIDE THE SELECTION OF PERSONAL PROTECTIVE SYSTEMS

1. Provides barrier precautions for droplets/splashing and completely covers all of the face and head, or can be easily combined with other protective apparel to provide full coverage.
2. Provides filtration at <0.3 micron with 95% filter efficiency. For hooded devices, the circulating air within the hood should not affect the wearing of an N95 respirator or equivalent mask nor impede its effectiveness.
3. Hooded devices should be able to create positive pressure.
4. Consideration should be given to the extent of CO_2 build up within hood or respirator. Current guidelines recommend that CO_2 should not exceed 5000 ppm as a time weighted average (TWA).
5. The equipment should be able to be assembled with little chance of error, and disassembled easily.
6. Ability to clean the surface of the equipment with hospital grade disinfectants. Single use of high-risk components is preferred, or the product is easily disassembled and cleaned and tolerates high-level disinfection or sterilization.
7. The filter for any system should be easy to remove and dispose.
8. Demonstrable ease of donning with minimal amount of time.
9. Ability to remove equipment with minimal contamination of the wearer and the equipment.
10. The device provides a good field of vision and a clear view with no distortion in order to perform procedures such as intubation and bronchoscopy.
11. The device should not interfere with communications between team members and allow for clinical assessments of patients such as auscultation.
12. Wearer is able to easily perform procedures using ergonomic techniques.
13. The system or device should be comfortable to wear for at least a continuous 2-hour period.
14. The equipment should be easily worn and managed by staff of varying sizes.
15. The equipment or device should allow for the wearer to remain cool and comfortable.

Personal Protective Systems

A listing of powered air-purifying respirators can be found by doing the following:

- Log on to http://www2.cdc.gov/drds/cel/cel/_form.asp
- Highlight “HEPA (PAPR only)” in the section headed “For Protection Against”
- Click on “View Results” at the bottom of the screen.