



SEVERE ACUTE RESPIRATORY SYNDROME

GUIDELINES AND RECOMMENDATIONS

Guidance on Air Medical Transport for SARS Patients

This updated guidance is intended to assist air medical transport (AMT) service providers in using specialized and/or specially equipped aircraft to transport SARS patients while ensuring the safety of patients and transport personnel. It should not be generalized to commercial passenger aircraft. The recommendations are based on standard infection control practices, AMT standards, and epidemiologic information from investigations of SARS, including experience from air transport of patients during the 2003 outbreak.

Currently recommended infection control measures for hospitalized patients with SARS <http://www.cdc.gov/ncidod/sars/guidance/I/index.htm> include Standard Precautions (with eye protection to prevent droplet exposure) plus Contact and Airborne Isolation Precautions. Respiratory protection using respirators providing at least 95% filtering efficiency (e.g., NIOSH-certified N-95 or higher-level filtering facepiece respirator) with appropriate fit-testing (www.osha.gov/SLTC/etools/respiratory/oshfiles/fittesting1.html) is recommended.

A. Air Transport of SARS Patients: General Considerations

- SARS patients should be transported on a dedicated AMT mission with the minimum number of crew members. **Whenever possible, no passengers or patients who do not have SARS should be on board.** If a parent is accompanying a sick child, the parent should use personal protective equipment (PPE) during transport as described in "Infection Control," below.
- If possible, a primary caregiver should be assigned to the SARS patient.
- The number of caregivers should be limited to those required to provide essential care during the trip.
- Infection control measures should focus on:
 - Source control (i.e., confining the spread of respiratory secretions at the patient level)
 - Engineering controls to limit airborne dissemination of the virus
 - Containment of the area of contamination (i.e., designating "clean" and "dirty" areas on the aircraft)
 - Use of PPE
 - Use of safe work practices to prevent exposure

The size and type of aircraft will influence the extent to which these measures can be implemented. When available, use of a portable isolation unit may be considered.

- Consideration must be given to the need for "PPE breaks" during long trips. Personnel will need to use the lavatory and have meals; removal of respiratory protection is unavoidable. An area at the front of the plane (or "upwind" from the patient, depending on cabin air flow), as far as possible from the patient, should be designated for this purpose.

Guidance on Air Medical Transport for SARS Patients

(continued from previous page)

- All SARS patient transport involving U.S. citizens should be coordinated with CDC Quarantine Station staff http://www.cdc.gov/ncidod/dq/quarantine_stations.htm and other appropriate state and federal health authorities, including CDC (24-hour response number: 770-488-7100) and the Department of State <http://contact-us.state.gov/> before movement begins. International movement of SARS patients might require special approvals by aircraft-servicing locations, patient rest-stop hospitals, countries that will be over-flown, and/or final destinations.

B. Airframe Selection and Cabin Airflow

Cabin airflow characteristics may reduce exposure of occupants to airborne infectious particles. Whenever possible, aircraft used to medically evacuate patients with SARS should have separate air-handling systems for the cockpit and cabin, with cockpit air at positive pressure relative to the cabin.

1. Fixed-wing pressurized aircraft

- AMT service providers should consult the manufacturer(s) of their aircraft to identify cabin airflow characteristics, including: HEPA filtration and directional airflow capabilities, air outlet location, presence or absence of air mixing between cockpit and patient-care cabin during flight, and time and aircraft configuration required to perform a post-mission airing-out of the aircraft.
- Aircraft with forward-to-aft cabin air flow and a separate cockpit cabin are strongly preferred for transport of SARS patients. Aft-to-forward cabin air flow may increase the risk of airborne exposure of cabin and flight deck personnel. Aircraft that re-circulate cabin and flight-deck air without HEPA filtration should not be selected for SARS patient transport.
- Aircraft ventilation should remain on at all times during transport of SARS patients, including during ground delays.
- Aircraft that provide space for crew members to perform necessary personal activities (e.g., eating, drinking) in an area that does not share air with the patient-care cabin should be selected for flights likely to exceed 4 hours.

2. Rotor-wing and non-pressurized aircraft

- In aircraft with uncontrolled interior air flow, such as rotor-wing and small, non-pressurized fixed-wing aircraft, all personnel should wear disposable N-95 or higher-level respirators during transport of SARS patients. For cockpit crews, aircraft aviator tight-fitting face pieces capable of delivering oxygen that has not mixed with cabin air may be used in lieu of a disposable N-95 respirator.

C. Patient Placement

The airflow of each aircraft should form the basis for litter and seat assignments. In general:

- SARS patients should be positioned as far downwind with regard to cabin air flow as possible.
- A bathroom for use by the patient(s) with SARS should be close by.
- In AMT aircraft with vertical litter tiers and top-to-bottom air flow, SARS litter patients should be placed in the lowest position in the tier.
- Ambulatory SARS patients should be seated next to the cabin sidewall.
- Patients should wear a surgical mask, if tolerated, to reduce droplet production.

Guidance on Air Medical Transport for SARS Patients

(continued from previous page)

- If transport of a non-SARS patient simultaneously with SARS patient(s) cannot be avoided, the non-SARS patient should wear an N-95 or higher-level respirator during transport and should be positioned upwind and as far as possible from the SARS patient.
- If several SARS patients are transported, they may be moved as a group (cohorted) in an aircraft that provides appropriate airflow characteristics as described above.

D. Infection Control

1. Designation of an "isolation area"

- Where space permits, a perimeter should be established for designating "clean" and "dirty" areas for the purpose of defining where gowns and gloves must be donned and removed. The distance will depend on the area required for patient care support; a minimum distance of 6 feet from the patient is recommended. A bathroom for use by the patient should be within the isolation area.
- Materials required for patient care, including PPE, should be organized outside the isolation area. Receptacles for soiled linen, waste, and reusable equipment should be placed inside the isolation area.
- Patient movement should be restricted to the designated isolation area.
- Personnel who are within the isolation area must wear full PPE.

2. Source control

- If the patient is able, s/he should be instructed to wear a surgical mask

3. Personal protective equipment and procedures

- The following PPE should be available for use by direct care providers:
 - Non-sterile patient-care gloves
 - Disposable isolation gowns
 - Goggles or face shield (Corrective eyeglasses alone are not appropriate protection.)
 - Fit-tested, disposable respirators (Disposable N-95 respirators are approved for in-flight use.)
 - Hand hygiene product (e.g., alcohol-based hand rub)
- Disposable non-sterile gloves, gown, and eye and respiratory protection must be worn for all patient contact.
- Eye protection, gown, and gloves should be removed and discarded in designated receptacles after patient care is completed (e.g., between patients) or when soiled or damaged. The respirator should remain on until the wearer is in the area designated as safe for respirator removal.
- Hands must be washed with soap and water or a waterless, alcohol-based hand rub immediately after removal of PPE.
- Oxygen delivery with simple and non-rebreather face masks may be used for patient oxygen support during flight.
- Manually assisted ventilation should be performed using a resuscitation bag-valve mask. If available, units equipped for HEPA or equivalent filtration of expired air should be used.
- Cough-generating procedures (e.g., nebulizer treatments) should be avoided during transport.

Guidance on Air Medical Transport for SARS Patients

(continued from previous page)

E. Patients Requiring Mechanical Ventilation

- Mechanical ventilators for SARS patients should provide HEPA or equivalent filtration of airflow exhaust.
- AMT services should consult their ventilator equipment manufacturer to confirm appropriate filtration capability and the effect of filtration on positive-pressure ventilation.

F. Management of Clinical Specimens

- Standard Precautions should be used when collecting and transporting clinical specimens.
- Specimens should be stored only in designated coolers or refrigerators.
- Clinical specimens should be labeled with appropriate patient information and placed in a clean, self-sealing bag for storage and transport.

G. Waste Disposal

- Dry solid waste (e.g., used gloves, dressings), should be collected in biohazard bags for disposal as regulated medical waste in accordance with local requirements at the destination medical facility.
- Waste that is saturated with blood or body fluids should be collected in leak-proof biohazard bags or containers for disposal as regulated medical waste in accordance with local requirements at the destination medical facility.
- Sharp items such as used needles or scalpel blades should be collected in puncture-resistant sharps containers for disposal as regulated medical waste in accordance with local requirements at the destination medical facility.
- Suctioned fluids and secretions should be stored in sealed containers for disposal as regulated medical waste in accordance with local requirements at the destination medical facility. Handling that might create splashes or aerosols during flight should be avoided.
- Suction device exhaust should not be vented into the cabin without HEPA or equivalent filtration. Portable suction devices should be fitted with in-line HEPA or equivalent filters. Externally vented suction should not be used during ground operation.
- Excretions (feces, urine) may be carefully poured down the aircraft toilet.

H. Cleaning and Disinfection

- After transporting a SARS patient, exits and doors should be closed and aircraft air conditioning turned on at maximum capacity for several minutes in accordance with the airing time specified by aircraft manufacturers to provide at least one complete air exchange. Non-pressurized aircraft should be aired out, with exits and doors open long enough to ensure a complete air exchange. Blowers and high-powered fans that might re-aerosolize infectious material should not be used for airing out aircraft.
- Cleaning should be postponed until airing out is complete.
- Compressed air that might re-aerosolize infectious material should not be used for cleaning the aircraft.
- Non-patient-care areas of the aircraft should be cleaned and maintained according to manufacturers' recommendations.
- Cleaning personnel should wear non-sterile gloves and disposable isolation gown or coveralls over their usual cleaning uniform. Eye protection to prevent contact with germicides should be worn according to existing organization procedures for environmental cleaning and disinfection while cleaning patient-care areas.

Guidance on Air Medical Transport for SARS Patients

(continued from previous page)

- Patient-care areas (including stretchers, railings, medical equipment control panels, and adjacent flooring, walls and work surfaces likely to be directly contaminated during care) should be cleaned and disinfected in accordance with manufacturer's recommendations.
- Spills of body fluids during transport should be cleaned by placing absorbent material over the spill and collecting the used cleaning material in a biohazard bag. The area of the spill should be cleaned using an EPA-registered hospital disinfectant. Ground service personnel should be notified of the spill location and initial clean-up performed.
- Contaminated web seats or seat cushions should be placed in a biohazard bag and labeled with the location and type of contamination for later disposal or cleaning.
- Contaminated reusable patient care equipment should be placed in biohazard bags and labeled for cleaning and disinfection at the AMT service medical equipment section.
- Reusable equipment should be cleaned and disinfected according to manufacturer's instructions.
- Following completion of cleaning tasks, including cleaning and disinfection of reusable equipment, cleaning personnel should carefully remove and dispose of personal protective gear and wash hands thoroughly with soap and water or an alcohol-based hand rub <http://www.cdc.gov/handhygiene/>.

I. Logistical Planning and Post-Mission Follow-Up

- Sufficient infection control supplies should be on board to support the expected duration of the mission plus additional time in the event that the aircraft experiences maintenance delays or weather diversions.
- Flight planning should identify emergency or unexpected diversion airfields and coordinate with authorities in advance.
- Upon termination of the mission, the AMT team should provide the following information to their medical director: mission number/date; address of the team/aircraft basing; duration of patient transport; names, contact information, and crew positions (including estimated duration of direct patient care provided) of mission personnel; and description of any recognized breach(es) in infection control precautions.
- AMT services should designate persons responsible for performing post-mission monitoring of mission personnel and reporting results to the AMT service medical director.
- Mission personnel should be monitored (directly or by telephone) at least once daily for 10 days for evidence of fever or respiratory symptoms that would require evaluation and follow-up (www.cdc.gov/ncidod/sars/exposuremanagement.htm).

J. Ground/In-Flight Emergency Procedures

AMT service providers should have a written plan addressing patient handling during in-flight and/or ground emergency situations. Activities such as donning life vests and litter-patient emergency egress may create special exposure risks. Use of respirators must be weighed against time constraints and on-board emergency conditions (e.g., smoke in the cabin, sudden cabin decompression). Gowns and latex gloves represent a fire/flash hazard and should not be worn during ground or in-flight emergency situations.

For more information, visit www.cdc.gov/sars or call the CDC public response hotline at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY)