CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Interim Infection Prevention and Control Recommendations for Hospitalized Patients with Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

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Background

Preventing transmission of respiratory pathogens including MERS-CoV in hospitals requires the application of infection control procedures and protocols including environmental and engineering controls, administrative controls, safer work practices, and personal protective equipment (PPE). Measures that enhance early detection and prompt triage and isolation of patients who should be evaluated for MERS-CoV (Interim Guidance for Healthcare Professionals) are critical to ensuring effective implementation of infection control measures. Successful implementation of many, if not all, of these strategies is dependent on the presence of clear administrative policies and organizational leadership that promote and facilitate adherence to these recommendations among the various people within the healthcare setting, including patients, visitors, and HCP.

Though these recommendations focus on the hospital setting (a setting where MERS-CoV transmission has been reported from some international locations), the recommendations for PPE, source control (i.e., placing a facemask on potentially infected patients when outside of an airborne infection isolation room), and environmental infection control measures are applicable to any healthcare setting. **This guidance does not apply to non-healthcare settings (e.g., schools) OR to persons outside of healthcare settings.** This guidance also does not provide recommendations for clinical management, air or ground medical transport, or laboratory settings which can both be found elsewhere on the CDC MERS website.

Definition of Healthcare Personnel (HCP) – For the purposes of this guidance, HCP refers to all persons, paid and unpaid, working in healthcare settings whose activities potentially place them at risk for exposures to a patient with MERS-CoV. Examples of such activities include those that require direct contact with patients and exposure to the patient-care environment, including being in the patient room or in a triage or examination room or other potentially contaminated areas, and handling blood, body fluids (except sweat), secretions, or excretions or soiled medical supplies, equipment or environmental surfaces.

Recommendations

1. Minimize Chance for Exposures

Ensure facility policies and practices are in place to minimize exposures to respiratory pathogens including MERS-CoV. Measures should be implemented before patient arrival, upon arrival, and throughout the duration of the affected patient's presence in the healthcare setting.

- **Before Arrival**
  - When scheduling appointments, instruct patients and persons who accompany them to call ahead or inform HCP upon arrival if they have symptoms of any respiratory infection (e.g., cough, runny nose, fever[1]) and to take appropriate preventive actions (e.g., wear a facemask upon entry to contain cough, follow triage procedure).
- **Upon Arrival and During the Visit**
  - Take steps to ensure all persons with symptoms of a respiratory infection adhere to respiratory hygiene and cough etiquette, hand hygiene, and triage procedures throughout the duration of the visit. Consider posting visual alerts (e.g., signs, posters) at the entrance and in strategic places (e.g., waiting areas, elevators, cafeterias) to provide patients and HCP with instructions (in appropriate

languages) about hand hygiene, respiratory hygiene, and cough etiquette. Instructions should include how to use facemasks (See definition of facemask in Appendix) or tissues to cover nose and mouth when coughing or sneezing, to dispose of tissues and contaminated items in waste receptacles, and how and when to perform hand hygiene.

  ◦ Provide space and encourage persons with symptoms of respiratory infections to sit as far away from others as possible. If available, facilities may wish to place these patients in a separate area while waiting for care.
  ◦ Ensure rapid triage and isolation of patients who might have MERS-CoV infection
    ▪ Identify patients at risk for having MERS-CoV infection before or immediately upon arrival to the hospital
      ▪ Implement triage procedures to detect patients at risk for having MERS-CoV infections during or before patient triage or registration (e.g., at the time of patient check-in) and ensure that all patients are asked about the presence of symptoms of a respiratory infection and history of travel to areas experiencing transmission of MERS-CoV or contact with possible MERS-CoV patients. See the Interim Guidance for Healthcare Professionals for which patients to evaluate for MERS-CoV.
    ▪ Immediately isolate those identified as at risk for having MERS-CoV infection
      ▪ Implement Respiratory Hygiene and Cough Etiquette (i.e., placing a facemask over the patient's nose and mouth) and isolate those at risk for MERS-CoV infection in an Airborne Infection Isolation Room (AIIR). See recommendations for "Patient Placement" below. Additional guidance for evaluating patients in U.S. for MERS-CoV infection can be found at the CDC Middle East Respiratory Syndrome (MERS) website.
  ◦ Provide supplies to perform hand hygiene to all patients upon arrival to facility (e.g., at entrances of facility, waiting rooms, at patient check-in) and throughout the entire duration of the visit to the healthcare setting.

2. Ensure Adherence to Standard, Contact and Airborne Precautions

Standard precautions assume that every person is potentially infected or colonized with a pathogen that could be transmitted in the healthcare setting. Elements of standard precautions that apply to patients with respiratory infections, including those caused by MERS-CoV, are summarized below. Attention should be paid to training and proper donning, doffing and disposal of any personal protective equipment. All aspects of standard precautions (e.g., injection safety) are not emphasized in this document but can be found in the guideline titled Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. All HCP (see section 7 for measures for non-HCP visitors) who enter the room of a patient with suspected or confirmed MERS-CoV should adhere to Standard, Contact, and Airborne precautions, including the following:

- **Hand Hygiene**
  ◦ HCP should perform hand hygiene before and after all patient contact, contact with potentially infectious material, and before putting on and upon removal of PPE, including gloves. Hand hygiene in healthcare settings can be performed by washing with soap and water or using alcohol-based hand rubs. If hands are visibly soiled, use soap and water, not alcohol-based hand rubs.
  ◦ Healthcare facilities should ensure that facilities and supplies for performing hand hygiene are readily available to all personnel.
- **Personal Protective Equipment**
  Employers should select appropriate PPE and provide it to workers in accordance with OSHA's PPE standards (29 CFR 1910 Subpart I). Workers must receive training on and demonstrate an understanding of when to use PPE; what PPE is necessary; how to properly don (put on), use, doff (take off) PPE; how to properly dispose of or disinfect and maintain PPE; and the limitations of PPE. Any reusable PPE must be properly cleaned, decontaminated, and maintained after and between uses.
  ◦ **Gloves**
    ▪ Put on clean, non-sterile gloves upon entry into the patient room or care area. Change gloves if they become torn or heavily contaminated.

- Remove and discard gloves immediately upon leaving the patient room or care area. Please see section below on "Using More than one Kind of Personal Protective Equipment (PPE)" for recommended sequence of PPE removal.

◦ **Gowns**
  - Put on a clean disposable gown upon entry into the patient room or area. Change the gown if it becomes soiled. Remove and discard the gown immediately upon leaving the patient room or care area.

◦ **Respiratory Protection**
  - Use respiratory protection (i.e., a respirator) that is at least as protective as a fit-tested NIOSH-certified disposable N95 filtering facepiece respirator upon entry to the patient room or care area. See appendix for respirator definition.
  - The respirator should be the last part of the PPE ensemble to be removed. If reusable respirators are used, they must be cleaned and disinfected according to manufacturer's reprocessing instructions prior to re-use. If disposable respirators are used, they should be removed and discarded after leaving the patient room or care area and closing the door.
  - Respirator use must be in the context of a complete respiratory protection program in accordance with Occupational Safety and Health Administration (OSHA) Respiratory Protection standard (29 CFR 1910.134 (http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=12716)   ). Staff should be medically cleared and fit-tested if using respirators with tight-fitting facepieces (e.g., a NIOSH-certified disposable N95) and trained in the proper use of respirators, safe removal and disposal, and medical contraindications to respirator use.

◦ **Eye Protection**
  - Put on eye protection (e.g., a disposable face shield) upon entry to the patient room or care area. Remove and discard eye protection immediately upon leaving the patient room or care area. Reusable eye protection (e.g., goggles) must be cleaned and disinfected according to manufacturer's reprocessing instructions prior to re-use.

  - **Using More than one Kind of Personal Protective Equipment (PPE)**
    - Different types of PPE are used together to prevent multiple routes of transmission.
    - The following sequence is a general approach to putting on this PPE combination for respiratory pathogens: first gown; then respirator; then goggles or face shield; then gloves.
    - The following sequence is a general approach to removing PPE for respiratory pathogens: first gloves; then goggles or face shield; then gown; then respirator.
    - Except for respirator, remove PPE at doorway or in anteroom. Remove respirator after leaving patient room and closing door.
    - Careful attention should be given to prevent contamination of clothing and skin during the process of removing PPE.
    - Perform hand hygiene as described above immediately before putting on and after removing all PPE.

- **Patient Placement**
  ◦ Place a patient who might be infected with MERS-CoV in an Airborne Infection Isolation Room (AIIR) that has been constructed and maintained in accordance with current guidelines.
    - AIIRs are single patient rooms at negative pressure relative to the surrounding areas, and with a minimum of 6 air changes per hour (12 air changes per hour are recommended for new construction or renovation). Air from these rooms should be exhausted directly to the outside or be filtered through a high-efficiency particulate air (HEPA) filter before recirculation. Room doors should be kept closed except when entering or leaving the room, and entry and exit should be minimized. Facilities should monitor and document the proper negative-pressure function of these rooms.
    - If an AIIR is not available, the patient should be transferred as soon as is feasible to a facility where an AIIR is available. Pending transfer, place a facemask on the patient and isolate him/her in an examination room with the door closed. The patient should not be placed in any room where room exhaust is recirculated without high-efficiency particulate air (HEPA) filtration.

- Once in an AIIR, the patient's facemask may be removed; the facemask should remain on if the patient is not in an AIIR. Limit transport and movement of the patient outside of the AIIR to medically-essential purposes. When outside of the AIIR, patients should wear a facemask to contain secretions.
- Only essential personnel should enter the AIIR. Implement staffing policies to minimize the number of HCP who enter the room.
  - Facilities should consider caring for these patients with dedicated HCP to minimize risk of transmission and exposure to other patients and other HCP.
- Facilities should keep a log of all persons who care for OR enter the rooms or care area of these patients.
- Once the patient vacates a room, unprotected individuals, including HCP, should not be allowed in that room until sufficient time has elapsed for enough air changes to remove potentially infectious particles. More information on clearance rates under differing ventilation conditions is available. In addition, the room should undergo appropriate cleaning and surface disinfection before unprotected individuals are allowed to reenter it.

- **Use Caution When Performing Aerosol-Generating Procedures**
  - Some procedures performed on MERS-CoV patients may be more likely to generate higher concentrations of infectious respiratory aerosols than coughing, sneezing, talking, or breathing. These procedures potentially put HCP and others at an increased risk for MERS-CoV exposure. Although not quantified, procedures that might post such a risk include: cough-generating procedures, bronchoscopy, sputum induction, intubation and extubation cardiopulmonary resuscitation, and open suctioning of airways.
  - Ideally, a combination of measures should be used to reduce exposures from these aerosol-generating procedures when performed on patients with suspected or confirmed MERS-CoV. Precautions for aerosol-generating procedures include:
    - Only performing these procedures if they are medically necessary and cannot be postponed.
    - Limiting the number of HCP present during the procedure to only those essential for patient care and support.
    - Conducting the procedures in an AIIR when feasible. Such rooms are designed to reduce the concentration of infectious aerosols and prevent their escape into adjacent areas using controlled air exchanges and directional airflow.
    - HCP should wear gloves, a gown, either a face shield that fully covers the front and sides of the face or goggles, and respiratory protection at least as protective as an N95 filtering facepiece respirator during aerosol-generating procedures.
    - Unprotected HCP should not be allowed in a room where an aerosol-generating procedure has been conducted until sufficient time has elapsed to remove potentially infectious particles. More information on clearance rates under differing ventilation conditions is available.
    - Conduct environmental surface cleaning following procedures described in the section on environmental infection control below.

- **Duration of Infection Control Precautions**
  - At this time, information is lacking to definitively determine a recommended duration for keeping patients in isolation precautions.
  - Duration of precautions should be determined on a case-by-case basis, in conjunction with local, state, and federal health authorities.
  - Factors that should be considered include: presence of symptoms related to MERS-CoV, date symptoms resolved, other conditions that would require specific precautions (e.g., tuberculosis, *Clostridium difficile*) and available laboratory information.

3. Manage Visitor Access and Movement Within the Facility

- Establish procedures for monitoring, managing and training visitors.
- All visitors should follow respiratory hygiene and cough etiquette precautions while in the common areas of the facility.
- Restrict visitors from entering the MERS-CoV patient's room. Facilities can consider exceptions based on end-of-life situations or when a visitor is essential for the patient's emotional well-being and care.

- Visitors who have been in contact with the patient before and during hospitalization are a possible source of MERS-CoV for other patients, visitors, and staff.
- Visitors to MERS-CoV patients should be scheduled and controlled to allow for:
  - Screening visitors for symptoms of acute respiratory illness before entering the hospital.
  - Facilities should evaluate risk to the health of the visitor (e.g., visitor might have underlying illness putting them at higher risk for MERS-CoV) and ability to comply with precautions.
  - Facilities should provide instruction, before visitors enter patients' rooms, on hand hygiene, limiting surfaces touched, and use of PPE according to current facility policy while in the patient's room.
  - Facilities should maintain a record (e.g., log book) of all visitors who enter patient rooms.
  - Visitors should not be present during aerosol-generating procedures.
  - Visitors should be instructed to limit their movement within the facility.
  - Exposed visitors (e.g., contact with symptomatic MERS-CoV patient prior to admission) should be advised to report any signs and symptoms of acute illness to their health care provider for a period of at least 14 days after the last known exposure to the sick patient.

4. Implement Engineering Controls

- Consider designing and installing engineering controls to reduce or eliminate exposures by shielding HCP and other patients from infected individuals. Examples of engineering controls include physical barriers or partitions to guide patients through triage areas, curtains between patients in shared areas, closed suctioning systems for airway suctioning for intubated patients, as well as appropriate air-handling systems (with appropriate directionality, filtration, exchange rate, etc.) that are installed and properly maintained.

5. Monitor and Manage Ill and Exposed Healthcare Personnel

- HCP who care for patients with MERS-CoV should be monitored. They should immediately report any signs (e.g., fever[1]) or symptoms (e.g., cough, shortness of breath) of acute illness to their supervisor or a facility designated person (e.g., occupational health services) for a period of 14 days after the last known contact with a MERS CoV patient, regardless of their use of PPE.
- HCP who develop any respiratory symptoms after an unprotected exposure (i.e., not wearing recommended PPE at the time of contact) to a patient with MERS-CoV should not report for work or should immediately stop working. These HCP should notify their supervisor, implement respiratory hygiene and cough etiquette, seek prompt medical evaluation, and comply with work exclusion until they are no longer deemed infectious to others.
- For asymptomatic HCP who have had an unprotected exposure (i.e., not wearing recommended PPE at the time of contact) to a patient with MERS-CoV, exclude from work for 14 days to monitor for signs and symptoms of respiratory illness and fever[1].
  - If necessary to ensure adequate staffing of the facility, the asymptomatic provider could be considered for continuing patient care duties after discussion with local, state, and federal public health authorities.
- Facilities and organizations providing healthcare should:
  - Implement sick leave policies for HCP, including contract staff and part-time personnel, that are non-punitive, flexible and consistent with public health guidance (e.g., policies should ensure ill HCP who may have MERS-CoV infection stay home, unless hospital admission for isolation and treatment is recommended).
  - Ensure that all HCP are aware of the sick leave policies.
- Provide employee health services that:
  - Ensure that HCP have ready access, including via telephone, to medical consultation and, if needed, prompt treatment.

6. Train and Educate Healthcare Personnel

- Provide all HCP with job- or task-specific education and training on preventing transmission of infectious agents, including refresher training.
- HCP must be medically cleared, trained, and fit tested for respiratory protection device use (e.g., N95 filtering facepiece respirators), or medically cleared and trained in the use of an alternative respiratory protection device (e.g., Powered Air-Purifying Respirator, PAPR) whenever respirators are required.

OSHA has a number of respiratory training videos
(http://www.osha.gov/SLTC/respiratoryprotection/training_videos.html) .

- Ensure that HCP are educated, trained, and have practiced the appropriate use of PPE prior to caring for a patient, including attention to correct use of PPE and prevention of contamination of clothing, skin, and environment during the process of removing such equipment.

7. Implement Environmental Infection Control

- Ensure that cleaning and disinfection procedures are followed consistently and correctly.
- Standard cleaning and disinfection procedures (e.g., using cleaners and water to pre-clean surfaces prior to applying an EPA-registered disinfectant to frequently touched surfaces or objects for appropriate contact times as indicated on the product's label) are appropriate for MERS-CoV in healthcare settings, including those patient-care areas in which aerosol-generating procedures are performed. If there are no available EPA-registered products that have a label claim for MERS-CoV, products with label claims against human coronaviruses should be used according to label instructions. Management of laundry, food service utensils, and medical waste should also be performed in accordance with routine procedures.
  - Detailed information on environmental infection control in healthcare settings can be found in CDC's Guidelines for Environmental Infection Control in Health-Care Facilities and Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings [section IV.F. Care of the environment].

8. Establish Reporting within Hospitals and to Public Health Authorities

- Implement mechanisms and policies that promptly alert key facility staff including infection control, healthcare epidemiology, hospital leadership, occupational health, clinical laboratory, and frontline staff about suspected or known MERS-CoV patients.
- Communicate and collaborate with public health authorities.
  - Promptly notify public health authorities of suspected or known patients with MERS-CoV.
  - Facilities should designate specific persons within the healthcare facility who are responsible for communication with public health officials and dissemination of information to HCP.

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Appendix: Additional Information about Respirators and Facemasks

Information about Respirators:

**N95 respirators, FDA
(http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/GeneralHospitalDevicesandSupplies/PersonalProtectiveEquipment/ucm055977.htm)**

- A respirator is a personal protective device that is worn on the face, covers at least the nose and mouth, and is used to reduce the wearer's risk of inhaling hazardous airborne particles (including dust particles and infectious agents), gases, or vapors. Respirators are certified by the NIOSH, CDC, and N95 respirators may also be cleared by FDA as medical devices, depending on the intended use. A commonly used respirator is a filtering facepiece respirator (commonly referred to as an N95).
- To work properly, respirators must be specially fitted for each person who wears one (this is called "fit-testing" and is usually done in a workplace where respirators are used).
- Respirator use must be in the context of a complete respiratory protection program in accordance with Occupational Safety and Health Administration (OSHA) Respiratory Protection standard (29 CFR 1910.134 (https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=12716)). Staff should be medically cleared and fit-tested if using respirators with tight-fitting facepieces (e.g., a NIOSH-certified disposable N95) and trained in the proper use of respirators, safe removal and disposal, and medical contraindications to respirator use.
- NIOSH information about respirators
- OSHA Respiratory Protection eTool (https://www.osha.gov/SLTC/etools/respiratory/index.html)

Information about Facemasks:

Facemasks, FDA (http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/GeneralHospitalDevicesandSupplies/PersonalProtectiveEquipment/ucm055977.htm)

- A facemask is a loose-fitting, disposable device that creates a physical barrier between the mouth and nose of the wearer and potential contaminants in the immediate environment. Facemasks may be labeled as surgical, laser, isolation, dental or medical procedure masks. They may come with or without a face shield. If worn properly, a facemask is meant to help block large-particle droplets, splashes, sprays or splatter that may contain germs (viruses and bacteria) from reaching your mouth and nose. Facemasks are also used to contain respiratory secretions when worn by a person with respiratory symptoms. While a facemask may be effective in blocking splashes and large-particle droplets, a facemask, by design, does not filter or block very small particles in the air that may be transmitted by coughs, sneezes or certain medical procedures.
- Facemasks are cleared by the U.S. Food and Drug Administration (FDA) for use as medical devices. Facemasks should be used once and then thrown away in the trash.

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Preparedness

To aid providers and facilities, CDC has developed two checklists that identify key actions that can be taken now to enhance preparedness for MERS-CoV infection control.

- Healthcare Providers Preparedness Checklist
- Healthcare Facility Preparedness Checklist

Interim Home Care and Isolation or Quarantine Guidance

CDC has developed interim guidance for local and state health departments, infection prevention and control professionals, healthcare providers, and healthcare workers who are coordinating the home care and isolation or quarantine of people who are confirmed to have, or are being evaluated for, MERS-CoV infection.

- Home Care and Isolation or Quarantine Guidance for MERS-CoV

Important Links

- Respirator Trusted-Source Information
- Respirator Fact Sheet

Footnote

1. Fever may not be present in some patients, such as those who are very young, elderly, immunosuppressed, or taking certain medications. Clinical judgement should be used to guide testing of patients in such situations.

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Related Page
CDC Case Definitions