Novel Coronavirus Causing Severe Acute Respiratory Disease rev Jan 2016

BASIC EPIDEMIOLOGY

Infectious Agent
Coronaviruses are named for the crown-like spikes on their surface. There are four main sub-groupings of coronaviruses—alpha, beta, gamma and delta. Human coronaviruses were first identified in the mid-1960s. The six coronaviruses that can infect people are alpha coronaviruses 229E and NL63, and beta coronaviruses OC43, HKU1, severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East Respiratory Syndrome coronavirus (MERS-CoV). Both SARS-CoV and MERS-CoV are considered new coronaviruses: the first known SARS-CoV illness occurred in 2002 and MERS-CoV was identified in 2012. Both novel coronaviruses cause acute severe respiratory illness. Since 2004, there have not been any known cases of SARS reported anywhere in the world.

Transmission
Studies have been conducted to determine the transmission of SARS-CoV. The studies suggest that the most likely modes of transmission for SARS-CoV are droplet and direct person-to-person contact. However, there is evidence that indirect contact and aerosol spread also exist. MERS-CoV has been spread from ill people to others through close contact, such as caring for or living with an infected person. Infected people have spread MERS-CoV to others in healthcare settings, such as hospitals. There has been limited spread of MERS-CoV from person to person.

Incubation Period
The incubation period of a novel coronavirus causing severe acute respiratory disease depends on the type of novel coronavirus. The incubation period for SARS is estimated to be 1 to 14 days with a median of 4 to 5 days. The incubation period for MERS is usually 5 or 6 days, but it can range from 2 to 14 days.

Communicability
The period of communicability for the novel coronaviruses causing severe respiratory disease, SARS-CoV and MERS-CoV, is not completely understood. For SARS-CoV, epidemiologic and virologic studies and clinical follow-up during the 2003 epidemic indicated that transmission does not occur before the onset of clinical signs and symptoms and the maximum period of communicability is less than 21 days. The period of communicability of MERS-CoV is unknown.

Clinical Illness
The two novel coronaviruses, SARS-CoV and MERS-CoV, can cause acute respiratory illness. SARS-CoV caused severe acute respiratory syndrome or SARS, a respiratory illness that mostly affected adults. Typical symptoms included fever, myalgia, headache, malaise and chills followed by a nonproductive cough and dyspnea generally 5 to 7 days later. It also caused diarrhea in approximately 10%-20% of the cases. SARS had a mortality rate of 10% with a case fatality rate approaching 50% in people who were 60 years of age and older.

MERS-CoV causes Middle East Respiratory Syndrome or MERS, a severe acute respiratory illness. Typical symptoms include fever, cough and shortness of breath. Some people may develop gastrointestinal symptoms including diarrhea or nausea/vomiting. For many people with MERS, more severe complications follow, such as pneumonia and kidney failure. About 3-4 out of every 10 people reported with MERS have died. Most MERS-related deaths have been in persons with underlying health conditions such as diabetes or cancer.

DEFINITIONS

Case definitions for novel coronaviruses evolve as clinical and epidemiologic information on these viruses changes. Please refer to the novel coronavirus information on CDC's website for the most recent definitions. The CDC MERS-CoV case definitions may be found here: http://www.cdc.gov/coronavirus/mers/case-def.html.

Clinical Case Definition

Limited data on the clinical presentation of MERS are available; most published clinical information to date is from critically ill patients. At hospital admission, common signs and symptoms include fever, chills/rigors, headache, non-productive cough, dyspnea and myalgia. Other symptoms can include sore throat, coryza, sputum production, dizziness, nausea and vomiting, diarrhea and abdominal pain. Atypical presentations including mild respiratory illness without fever and diarrheal illness preceding development of pneumonia have been reported. Clinical judgment should be used to guide testing of patients for MERS-CoV infection. Healthcare providers should maintain awareness of the need to detect patients who should be evaluated for Middle East Respiratory Syndrome Coronavirus (MERS-CoV) infection; this requires clinical judgment as information on modes of transmission of MERS-CoV, and clinical presentation of MERS, is limited and continues to evolve.

Laboratory Confirmation

- Identification of a novel coronavirus that is different from currently circulating human coronavirues as confirmed by CDC's laboratory, by public health laboratories using CDC-approved protocols for a specific novel strain or by labs using an FDA-approved test for a specific novel strain
- Confirmatory laboratory testing requires a positive PCR on at least two specific genomic targets or a single positive target with sequencing on a second.
- Other laboratory confirmation criteria may be defined by CDC for the specific novel coronavirus.

Case Classifications

- **Confirmed:** A confirmed case is a person with laboratory confirmation of MERS-CoV infection.

- **Probable:** A probable case is a Patient Under Investigation (PUI) with absent or inconclusive laboratory results for MERS-CoV infection who is a close contact[1] of a laboratory-confirmed MERS-CoV case. Examples of laboratory results that may be considered inconclusive include a positive test on a single PCR target, a positive test with an assay that has limited performance data available, or a negative test on an inadequate specimen.

- **Suspect (Patient Under Investigation [PUI]):** A person who has both clinical features and an epidemiologic risk should be considered a Patient Under Investigation based on one of the following scenarios:
    - Fever[1] AND pneumonia or acute respiratory distress syndrome (based on clinical or radiological evidence) AND EITHER:
        - A history of travel from countries in or near the Arabian Peninsula[3] within 14 days before symptom onset, OR
        - Close contact[2] with a symptomatic traveler who developed fever[1] and acute respiratory illness (not necessarily pneumonia) within 14 days after traveling from countries in or near the Arabian Peninsula[3] OR
        - A member of a cluster of patients with severe acute respiratory illness (e.g., fever[1] and pneumonia requiring hospitalization) of unknown etiology in which MERS-CoV is being evaluated, in consultation with state and local health departments.

    OR

    - Fever[1] AND symptoms of respiratory illness (not necessarily pneumonia; e.g., cough, shortness of breath) AND being in a healthcare facility (as a patient, worker or visitor) within 14 days before symptom onset in a country or territory in or near the Arabian Peninsula[3] in which recent healthcare-associated cases of MERS have been identified.

    OR

    - Fever[1] OR symptoms of respiratory illness (not necessarily pneumonia; e.g., cough, shortness of breath) AND close contact[2] with a confirmed MERS case while the case was ill.

The above criteria serve as guidance for testing; however, patients should be evaluated and discussed with public health departments on a case-by-case basis if their clinical presentation or exposure history is equivocal (e.g., uncertain history of health care exposure).

Footnotes:

[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.

[2] Close contact is defined as: a) being within approximately 6 feet (2 meters) or within the room or care area for a prolonged period of time (e.g., healthcare personnel, household members) while not wearing recommended personal protective equipment (i.e., gowns, gloves, respirator, eye protection); or b) having direct contact with infectious secretions (e.g., being coughed on) while not wearing recommended personal protective equipment (i.e., gowns, gloves, respirator, eye protection). Data to inform the definition of close contact are limited. At this time, brief interactions, such as walking by a person, are considered low risk and do not constitute close contact. For guidance on recommended PPE please see Interim Infection Prevention and Control Recommendations for Hospitalized Patients with Middle East Respiratory Syndrome Coronavirus (MERS-CoV).

[3] Countries considered in the Arabian Peninsula and neighboring include: Bahrain; Iraq; Iran; Israel, the West Bank, and Gaza; Jordan; Kuwait; Lebanon; Oman; Qatar; Saudi Arabia; Syria; the United Arab Emirates (UAE); and Yemen.

Note: CDC may require that patients undergo testing for alternate causes of infection including all clinically indicated tests for community acquired pneumonia, before being considered a probable or suspect case.

SURVEILLANCE AND CASE INVESTIGATION

Case Investigation

Local and regional health departments should investigate all reports of novel coronavirus causing severe acute respiratory disease including SARS and MERS. Investigations should include an interview of the case or surrogate to obtain a detailed exposure history. The current investigation form is the Middle East Respiratory Syndrome (MERS) Patient Under Investigation (PUI) Short Form available at http://www.dshs.state.tx.us/idcu/investigation/. Completion of a more detailed investigation form may be required for probable or confirmed cases or in the event of an outbreak or other special situation. This more detailed investigation form will be provided by DSHS, if needed.

Suspect (Patient Under Investigation [PUI]) Case Investigation Checklist

- ☐ Any suspected novel coronavirus case should be investigated immediately.
- ☐ Ensure that appropriate control measures have been implemented (see Prevention and Control Measures, below). If the patient is under evaluation for MERS-CoV (e.g., differential diagnosis includes MERS-CoV, healthcare provider is requesting testing for MERS-CoV, etc.), then MERS-CoV control measures should be implemented.
- ☐ Determine whether the patient meets the case definition.
    - Obtain medical records, interview the suspected case-patient or surrogate and interview the patient's healthcare provider.
- ☐ Notify DSHS immediately of suspect (PUI) cases of novel coronavirus causing severe acute respiratory disease.
- ☐ Collect and ship specimens to the DSHS laboratory or another public health laboratory qualified to perform novel coronavirus testing using CDC-approved protocols for a specific novel strain.
    - Inform the testing laboratory (i.e., DSHS or a qualified Laboratory Response Network [LRN] lab) when specimens have been shipped and provide a shipment tracking number.
    - Note: Only persons who meet case definition or have been approved by the local health department epidemiologist or DSHS EAIDB will be tested for novel coronavirus.
    - If novel coronavirus testing is performed at a laboratory other than DSHS Austin, inform the Regional Health Department and DSHS EAIDB within 24 hours of initiating testing.
- ☐ For any patient who is tested for MERS-CoV, complete the novel coronavirus-specific PUI Short Form.
- ☐ Fax the completed PUI form to DSHS within 48 hours of testing.
- ☐ Suspect case investigations may be entered in the NEDSS Base System (NBS).

Confirmed/Probable Case Investigation Checklist

- ☐ Any confirmed or probable novel coronavirus cases should be investigated immediately.
- ☐ Ensure that appropriate control measures have been implemented (see Prevention and Control Measures, below).

- Confirm that laboratory results (if available) meet the case definition.
    - For confirmed cases, verify that the laboratory that performed the confirmatory testing is a public health laboratory using CDC-approved protocols for a specific novel strain.
- For probable cases, verify that epidemiologic linkages meet the case definition.
- Notify DSHS immediately of probable or confirmed cases of novel coronavirus causing a severe acute respiratory disease.
- For probable cases, collect and ship specimens to the DSHS laboratory or another public health laboratory qualified to perform novel coronavirus testing using CDC-approved protocols for a specific novel strain.
    - Inform the testing laboratory (i.e., DSHS or a qualified LRN lab) when specimens have been shipped and provide a shipment tracking number.
    - Note: Only persons who meet case definition or have been approved by the local health department epidemiologist or DSHS EAIDB will be tested for novel coronavirus.
    - If novel coronavirus testing is performed at a laboratory other than DSHS Austin, inform the Regional Health Department and DSHS EAIDB within 24 hours of initiating testing.
- Complete the novel coronavirus-specific PUI Form using medical records and by interviewing the case-patient or surrogate to identify close contacts, risk factors, and other pertinent information.
    - Completion of a more detailed investigation form may be required and will be provided by DSHS, if needed.
- Identify close contacts and determine if secondary cases have occurred.
    - See the Contact Tracing section below.
    - Inform DSHS EAIDB immediately if the case-patient used public transportation (bus, train, airplane, ship, etc.) while symptomatic.
- Be prepared to enhance surveillance in the local area for respiratory illnesses and respiratory viruses, if requested by DSHS.
    - Refer to the *Public Health Preparedness, Surveillance, and Response Plan for Texas: Respiratory Viruses Having Pandemic Potential* for a list of responsibilities by department and program area, and for action triggers.
- If applicable, complete the steps in the Managing Special Situations section.
- Fax the novel coronavirus-specific PUI Form and other investigation forms (if provided) to DSHS. The PUI form must be faxed to DSHS within 48 hours of testing.
- Confirmed and probable case investigations must be entered in the NEDSS Base System (NBS).

Prevention and Control Measures
Prevention and control guidelines for MERS are subject to change as disease knowledge evolves. Please refer to the CDC websites provided below for the most recent recommendations.

Healthcare Facilities and Healthcare Personnel
Please see "Interim Infection Prevention and Control Recommendations for Hospitalized Patients with Middle East Respiratory Syndrome Coronavirus (MERS-CoV)" available at http://www.cdc.gov/coronavirus/mers/infection-prevention-control.html. These recommendations are intended for healthcare settings (excluding air or ground medical transport, and laboratory settings) and for healthcare personnel (HCP) who may come into contact with people confirmed to have, or being evaluated for, a novel coronavirus causing severe respiratory illness such as MERS. 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.

To complement the guidance below, CDC has developed two checklists that identify key actions that can be taken to enhance preparedness for MERS-CoV infection control:

- Healthcare Providers Preparedness Checklist: http://www.cdc.gov/coronavirus/mers/preparedness/checklist-provider-preparedness.html
- Healthcare Facility Preparedness Checklist: http://www.cdc.gov/coronavirus/mers/preparedness/checklist-facility-preparedness.html

Infection Control 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" (http://www.cdc.gov/coronavirus/mers/interim-guidance.html) 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). 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.
    - More information on respirators and facemasks is available in Appendix A of CDC's Interim Infection Prevention guidance for MERS-CoV: http://www.cdc.gov/coronavirus/mers/infection-prevention-control.html
  - 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 here: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5417a1.htm?s_cid=rr5417a1_e%20-%20tab1. 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 (https://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" (http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5210a1.htm) and "Guideline for Isolation Precautions: Preventing Transmission of Infectious

Agents in Healthcare Settings" [section IV.F. Care of the environment] (http://www.cdc.gov/hicpac/2007IP/2007ip_part4.html).

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.

Laboratory Settings

Laboratory workers should follow the guidelines in the CDC's "Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Middle East Respiratory Syndrome Coronavirus (MERS-CoV) – Version 2", available at http://www.cdc.gov/coronavirus/mers/guidelines-lab-biosafety.html.

General Guidelines (for working with potentially infectious materials)

- Laboratory workers should wear personal protective equipment (PPE) which includes disposable gloves, laboratory coat/gown, respirator, and eye protection when handling potentially infectious specimens.
- Acceptable respiratory protection devices include: a properly fit-tested, NIOSH-approved filtering facepiece respirator (N-95 or higher level) or a powered air-purifying respirator (PAPR) equipped with high-efficiency particulate air (HEPA) filters. Accurate fit-testing is a key component of a respiratory protection program (RPP) and will assist with effective respirator use. An RPP includes medical clearance, training, fit-testing, and fit-checking to ensure appropriate respiratory selection and use. To be effective, respirators must provide a proper sealing surface on the wearer's face. Personnel who cannot wear fitted respirators because of facial hair or other fit limitations should wear loose-fitting hooded or helmeted PAPRs. See detailed information on a respiratory protection program here https://www.osha.gov/SLTC/etools/respiratory/.
- Any procedure with the potential to generate fine-particulate aerosols (e.g., vortexing or sonication of specimens in an open tube) should be performed in a Class II Biological Safety Cabinet (BSC). Appropriate physical containment devices (e.g., centrifuge safety buckets; sealed rotors) should be used for centrifugation. Ideally, rotors and buckets should be loaded and unloaded in a BSC. Perform any procedures outside a BSC in a manner that minimizes the risk of exposure to an inadvertent sample release.
- After specimens are processed, decontaminate work surfaces and equipment with appropriate disinfectants. Use any EPA-registered hospital disinfectant. Follow manufacturer's recommendations for use-dilution (i.e., concentration), contact time, and care in handling.
- Autoclave all disposable waste.

Specific Guidelines

- The following activities may be performed in BSL-2 facilities using standard BSL-2 work practices:
    - Pathologic examination and processing of formalin-fixed or otherwise inactivated tissues
    - Molecular analysis of extracted nucleic acid preparations
    - Electron microscopic studies with glutaraldehyde-fixed grids
    - Routine examination of bacterial and mycotic cultures
    - Routine staining and microscopic analysis of fixed smears
    - Final packaging of specimens for transport to diagnostic laboratories for additional testing. Specimens should already be in a sealed, decontaminated primary container.
    - Inactivated specimens (e.g., specimens in nucleic acid extraction buffer)
- The following activities involving manipulation of potentially infected specimens should be performed as above and in a Class II BSC:
    - Aliquoting and/or diluting specimens
    - Inoculating bacterial or mycological culture media
    - Performing diagnostic tests that do not involve propagation of viral agents in vitro or in vivo
    - Nucleic acid extraction procedures involving potentially infected specimens
    - Preparation and chemical- or heat-fixing of smears for microscopic analysis
- The following activities must be performed in a BSL-3 facility using BSL-3 work practices:
    - MERS-CoV propagation in cell culture
    - Initial characterization of viral agents recovered in cultures of MERS-CoV specimens
- The following activities must be performed in Animal BSL-3 facilities using Animal BSL-3 work practices:
    - Inoculation of animals for potential recovery of virus from MERS-CoV samples
    - Protocols involving animal inoculation for characterization of putative MERS-CoV agents

Clinical Laboratory Testing

- Clinical laboratories performing routine hematology, urinalysis, and clinical chemistry studies, and microbiology laboratories performing diagnostic tests on serum, blood, or urine specimens should follow standard laboratory practices, including Standard Precautions,when handling potential MERS-CoV specimens. For additional information, see Biosafety in Microbiological and Biomedical Laboratories (BMBL) - Fifth Edition (page 225).

Packing, Shipping and Transport

- Follow IATA Dangerous Goods Regulations for packaging, shipping and transport of specimens from suspect cases of MERS-CoV infection.
- Follow shipping regulations for UN 3373 Biological Substance, Category B when sending potential MERS-CoV specimens.
- More packaging resources (checklist, packing instructions, labels, packaging schematic) can be found at http://www.cdc.gov/coronavirus/mers/guidelines-lab-biosafety.html.

Air or Ground Medical Transport
Air medical transport (AMT) service providers transporting MERS patients should follow the guidance at http://www.cdc.gov/coronavirus/mers/hcp/air-transport.html.

CDC has not written emergency medical services (EMS) or first responder ground transport guidelines specifically for MERS; however, the guidance in CDC's "Infection Control for Prehospital Emergency Medical Services (EMS)" guidance for Severe Acute Respiratory Syndrome (SARS) (http://www.cdc.gov/sars/guidance/I-infection/prehospital.html) is also applicable to ground transport of MERS patients.

Confirmed, Probable or Suspected (PUI) Case-Patients
People who are confirmed to have, or being evaluated for, MERS-CoV infection and do not require hospitalization for medical reasons may be cared for and isolated in a residential setting after a healthcare professional determines that the setting is suitable.

- To assess the suitability of the home setting, see http://www.cdc.gov/coronavirus/mers/hcp/home-care.html.
- Providers should contact their state or local health department to discuss home isolation, home quarantine, or other measures for close contacts, especially for patients who test positive for MERS-CoV, and to discuss criteria for discontinuing any such measures.
- See Interim Guidance for Health Professionals for more information.
- Provide guidance below on "Preventing MERS-CoV from Spreading to Others in Homes and Communities" (http://www.cdc.gov/coronavirus/mers/hcp/home-care-patient.html) to anyone confirmed to have, or being evaluated for, MERS-CoV infection who will be cared for and isolated in a residential setting, http://www.cdc.gov/coronavirus/mers/hcp/home-care-patient.html

The following prevention steps are recommended for people confirmed to have MERS-CoV infection who can receive care at home and do not need to be hospitalized for medical reasons; people being evaluated by a healthcare provider for MERS-CoV infection[2]; caregivers and household members of a person confirmed to have, or being evaluated for, MERS-CoV infection; and other people who have had close contact[3] with a person confirmed to have, or being evaluated for, MERS-CoV infection:

Note: If you are confirmed to have, or being evaluated for, MERS-CoV infection you should follow the prevention steps below until a healthcare provider or local or state health department says you can return to your normal activities.

- Stay home
  - You should restrict activities outside your home, except for getting medical care. Do not go to work, school, or public areas, and do not use public transportation or taxis.
- Separate yourself from other people in your home
  - As much as possible, you should stay in a different room from other people in your home. Also, you should use a separate bathroom, if available.
- Call ahead before visiting your doctor
  - Before your medical appointment, call the healthcare provider and tell him or her that you have, or are being evaluated for, MERS-CoV infection. This will help the healthcare provider's office take steps to keep other people from getting infected.

- Wear a facemask
    - You should wear a facemask when you are in the same room with other people and when you visit a healthcare provider. If you cannot wear a facemask, the people who live with you should wear one while they are in the same room with you.
- Cover your coughs and sneezes
    - Cover your mouth and nose with a tissue when you cough or sneeze, or you can cough or sneeze into your sleeve. Throw used tissues in a lined trash can, and immediately wash your hands with soap and water.
- Wash your hands
    - Wash your hands often and thoroughly with soap and water. You can use an alcohol-based hand sanitizer if soap and water are not available and if your hands are not visibly dirty. Avoid touching your eyes, nose, and mouth with unwashed hands.
- Avoid sharing household items
    - You should not share dishes, drinking glasses, cups, eating utensils, towels, bedding, or other items with other people in your home. After using these items, you should wash them thoroughly with soap and water.
- Monitor your symptoms
    - Seek prompt medical attention if your illness is worsening (e.g., difficulty breathing). Before going to your medical appointment, call the healthcare provider and tell him or her that you have, or are being evaluated for, MERS-CoV infection. This will help the healthcare provider's office take steps to keep other people from getting infected. Ask your healthcare provider to call the local or state health department.

Caregivers and Household Members
http://www.cdc.gov/coronavirus/mers/hcp/home-care-patient.html
The following prevention steps are recommended for anyone who lives with or provides care at home for a person confirmed to have, or being evaluated for, a novel coronavirus causing severe acute respiratory disease:

- Make sure that you understand and can help the person follow the healthcare provider's instructions for medication and care. You should help the person with basic needs in the home and provide support for getting groceries, prescriptions, and other personal needs.
- Allow only people in the home who are essential for providing care for the person.
    - Other household members should stay in another home or place of residence. If this is not possible, they should stay in another room or be separated from the person as much as possible. Use a separate bathroom, if available.
    - Restrict visitors who do not have an essential need to be in the home.
    - Keep elderly people and those who have compromised immune systems or certain health conditions away from the person. This includes people with chronic heart, lung or kidney conditions and diabetes.
- Make sure that shared spaces in the home have good air flow, such as by an air conditioner or an opened window, weather permitting.
- Wash hands often and thoroughly with soap and water, or with an alcohol-based hand sanitizer if hands are not visibly dirty. Avoid touching your eyes, nose, and mouth with unwashed hands.

- Wear a disposable facemask, gown, and gloves when you touch or have contact with the person's blood, body fluids and/or secretions, such as sweat, saliva, sputum, nasal mucus, vomit, urine or diarrhea.
    - Throw out disposable facemasks, gowns, and gloves after using them. Do not reuse them.
    - Wash your hands immediately after removing your facemask, gown and gloves.
- Avoid sharing household items.
    - Do not share dishes, drinking glasses, cups, eating utensils, towels, bedding, or other items with a person who is confirmed to have, or being evaluated for, novel coronavirus causing severe respiratory disease infection. After the person uses these items, he or she should be wash them thoroughly (see below "Wash laundry thoroughly").
- Clean all "high-touch" surfaces, such as counters, tabletops, doorknobs, bathroom fixtures, toilets, phones, keyboards, tablets and bedside tables, every day. Also, clean any surfaces that may have blood, body fluids and/or secretions or excretions on them.
    - Read label of cleaning products and follow recommendations provided on product labels.
        - Labels contain instructions for safe and effective use of the cleaning product including precautions you should take when applying the product, such as wearing gloves or aprons and making sure you have good ventilation during use of the product.
    - Use a diluted bleach solution or a household disinfectant with a label that says "EPA-approved."
        - To make a bleach solution at home, add 1 tablespoon of bleach to 1 quart (4 cups) of water. For a larger supply, add ¼ cup of bleach to 1 gallon (16 cups) of water.
- Wash laundry thoroughly.
    - Immediately remove and wash clothes or bedding that have blood, body fluids and/or secretions or excretions on them.
    - Wear disposable gloves while handling soiled items. Wash hands immediately after removing your gloves.
    - Read and follow directions on labels of laundry or clothing items and detergent. In general, wash and dry with the warmest temperatures recommended on the clothing label.
- Place all used gloves, gowns, facemasks, and other contaminated items in a lined container before disposing them with other household waste. Wash hands immediately after handling these items.
- Monitor the person's symptoms. If he or she is getting sicker, call his or her medical provider and tell him or her that the person has, or is being evaluated for a novel coronavirus infection. This will help the healthcare provider's office take steps to keep other people from getting infected. Ask the healthcare provider to call the local or state health department.
- Caregivers and household members who do not follow precautions when in close contact[3] with a person who is confirmed to have, or being evaluated for, novel coronavirus causing severe acute respiratory disease, are considered "close contacts" and should monitor their health. Follow the prevention steps for close contacts below.

Close Contacts
http://www.cdc.gov/coronavirus/mers/hcp/home-care-patient.html
The following prevention steps are recommended for anyone who has had close contact[3] with someone who is confirmed to have, or being evaluated for, novel coronavirus causing severe acute respiratory disease:

- Monitor your health starting from the day you were first exposed to the person and continue for 14 days after you were last exposed to the person. Watch for these signs and symptoms:
    - Fever[1]. Take your temperature twice a day.
    - Coughing.
    - Shortness of breath.
    - Other early symptoms to watch for are chills, body aches, sore throat, headache, diarrhea, nausea/vomiting, and runny nose.
- If you develop symptoms, follow the prevention steps described above for Confirmed, Probable or Suspected (PUI) Case-Patients, and call your healthcare provider as soon as possible.
    - Before going to your medical appointment, call the healthcare provider and tell him or her about your possible exposure to MERS-CoV. This will help the healthcare provider's office take steps to keep other people from getting infected.
    - Ask your healthcare provider to call the local or state health department.
- If you do not have any symptoms, you can continue with your daily activities, such as going to work, school, or other public areas.

Travelers to the Arabian Peninsula[4] and Airline Crew
http://wwwnc.cdc.gov/travel/notices/alert/coronavirus-saudi-arabia-qatar

- General prevention measures for all travelers:
    - Wash your hands often with soap and water. If soap and water are not available, use an alcohol-based hand sanitizer.
    - Avoid touching your eyes, nose, and mouth. Germs spread this way.
    - Avoid close contact with sick people.
    - Be sure you are up-to-date with all of your shots, and if possible, see your health care provider at least 4–6 weeks before travel to get any additional shots.
    - Visit CDC's Travelers' Health website (http://wwwnc.cdc.gov/travel/) for more information on healthy travel.
    - CDC does not recommend that travelers change their plans because of MERS. Most instances of person-to-person spread have occurred in health care workers and other close contacts (such as family members and caregivers) of people sick with MERS. If you are concerned about MERS, you should discuss your travel plans with your doctor.
- Travelers who are ill:
    - Cover your mouth with a tissue when you cough or sneeze, and throw the tissue in the trash.
    - Avoid contact with other people to keep from infecting them. This might mean delaying your travel until you are well.
    - Call a doctor if you develop a fever and symptoms of lower respiratory illness, such as cough or shortness of breath, within 14 days after traveling from countries in or near the Arabian Peninsula[4]. You should tell the doctor about your recent travel before you go in for an appointment.

- Tell people who have been in close contact with you to monitor their health for 14 days after the last time they were around you.
    - They should call a doctor and tell them about your illness and travel history and their current symptoms.
- If you get sick while you are traveling, see "Getting Health Care Abroad" (http://wwwnc.cdc.gov/travel/page/getting-health-care-abroad) for information about how to locate medical services overseas.

- Persons considering exposure or exposed to camels during travel:
    - The MERS virus has been found in some camels, and some MERS patients have reported contact with camels. However, we do not know exactly how people become infected with the virus—many people with MERS have had close contact with a person sick with MERS.
    - The World Health Organization (WHO) has posted a general precaution for anyone visiting farms, markets, barns, or other places where animals are present. Travelers should practice general hygiene measures, including regular hand washing before and after touching animals, and avoid contact with sick animals. Travelers should also avoid consumption of raw or undercooked animal products. For more information, see http://www.who.int/csr/disease/coronavirus_infections/faq/en/.
    - The WHO considers certain groups to be at high risk for severe MERS; these groups include people with diabetes, kidney failure, or chronic lung disease and people who have weakened immune systems. The WHO recommends that these groups take additional precautions (for more information see http://www.who.int/csr/disease/coronavirus_infections/MERS_CoV_RA_20140613.pdf?ua=1):
        - Avoid contact with camels.
        - Do not drink raw camel milk or raw camel urine.
        - Do not eat undercooked meat, particularly camel meat.
- Healthcare workers
    - People who are traveling to provide health care services in the Arabian Peninsula[4] should review CDC's recommendations for infection control of confirmed or suspected MERS cases.
- Airline crew (http://www.cdc.gov/quarantine/air/managing-sick-travelers/mers-airline-crew.html)
    - Please follow your company's policy for personal protection.
    - Please report to CDC ill travelers (with symptoms below) arriving from the Republic of Korea or countries in and near the Arabian Peninsula[4].
        - Report to CDC if the ill person:
            - feels warm to the touch, gives a history of feeling feverish, or has an actual measured temperature of 100° F (37.8° C) or higher, PLUS
            - has a cough or difficulty breathing.
        - Please report as soon as possible—before arrival—by one of the methods described in the "Guidance for Airlines on Reporting Onboard Deaths or Illnesses to CDC" (http://www.cdc.gov/quarantine/air/reporting-deaths-illness/guidance-reporting-onboard-deaths-illnesses.html).
    - CDC will update the airline about the results of the testing and any need for follow-up or treatment of exposed crew members or passengers.

General Population

- CDC advises that people follow prevention steps to help reduce their risk of getting infected with respiratory viruses, like MERS-CoV:
    - Wash your hands often with soap and water for 20 seconds, and help young children do the same. If soap and water are not available, use an alcohol-based hand sanitizer.
    - Cover your nose and mouth with a tissue when you cough or sneeze, then throw the tissue in the trash.
    - Avoid touching your eyes, nose and mouth with unwashed hands.
    - Avoid personal contact, such as kissing, or sharing cups or eating utensils, with sick people.
    - Clean and disinfect frequently touched surfaces such as toys and doorknobs.
- You are not considered to be at risk for MERS-CoV infection if you have not had close contact with someone who is confirmed to have, or being evaluated for, MERS-CoV infection.
- If you are caring for or living with a person confirmed to have, or being evaluated for, MERS-CoV infection, see "Interim Guidance for Preventing MERS-CoV from Spreading in Homes and Communities" at http://www.cdc.gov/coronavirus/mers/hcp/home-care-patient.html.
- Currently, there is no vaccine to prevent MERS-CoV infection. The U.S. National Institutes of Health is exploring the possibility of developing one.

Footnotes

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.

2. For this guidance, a person being evaluated for MERS (considered a patient under investigation) is someone with the following characteristics:

A.Fever[1] AND pneumonia or acute respiratory distress syndrome (based on clinical or radiologic evidence) AND EITHER:

- history of travel from countries in or near the Arabian Peninsula[4] within 14 days before symptom onset, OR
- close contact[3] with a symptomatic traveler who developed fever and acute respiratory illness (not necessarily pneumonia) within 14 days after traveling from countries in or near the Arabian Peninsula[4], OR
- a member of a cluster of patients with severe acute respiratory illness (e.g., fever[1] and pneumonia requiring hospitalization) of unknown etiology in which MERS-CoV is being evaluated, in consultation with state and local health departments,

OR

B.Fever[1] AND symptoms of respiratory illness (not necessarily pneumonia; e.g., cough, shortness of breath) AND being in a healthcare facility (as a patient, worker, or visitor) within 14 days before symptom onset in a country or territory in or near the Arabian Peninsula in which recent healthcare-associated cases of MERS have been identified.

OR

C.Fever[1] OR symptoms of respiratory illness (not necessarily pneumonia; e.g. cough, shortness of breath) AND close contact[3] with a confirmed MERS case while the case was ill.

3. Close contact is defined as: a) being within approximately 6 feet (2 meters) or within the room or care area for a prolonged period of time (e.g., healthcare personnel, household members) while not wearing recommended personal protective equipment (i.e., gowns, gloves, respirator, eye protection– see Infection Prevention and Control Recommendations); or b) having direct contact with infectious secretions of a

confirmed or probable case (e.g., being coughed on) while not wearing recommended personal protective equipment (i.e., gowns, gloves, respirator, eye protection – see Infection Prevention and Control Recommendations). Data to inform the definition of close contact are limited. At this time, brief interactions, such as walking by a person, are considered low risk and do not constitute close contact.

4. Countries considered in the Arabian Peninsula and neighboring include: Bahrain; Iraq; Iran; Israel, the West Bank and Gaza; Jordan; Kuwait; Lebanon; Oman; Qatar; Saudi Arabia; Syria; the United Arab Emirates (UAE); and Yemen.

School/Daycare Exclusion Criteria

Children with a fever from any infectious disease cause should be excluded from school and daycare for at least 24 hours after fever subsides without the use of fever-suppressing medications. It is recommended that adults not return to work for at least 24 hours after fever has subsided without the use of fever suppressing medications. Do not exclude close contacts from daily activities such as work or school as long as they have no other reasons for exclusion. In the event of a pandemic the exclusion period may be extended.

CONTACT TRACING

For all confirmed and probable cases of novel coronavirus infection, contact tracing for close contacts (see CDC's close contact definition below) is required. In addition, because MERS-CoV and other novel coronaviruses are not fully understood, DSHS Austin may request that contact tracing activities for confirmed and probable cases include healthcare workers who were wearing recommended PPE but otherwise meet the definition of close contact.

The extent of follow-up required for close contacts of confirmed or probable cases may depend on the number of cases identified, the severity of illness or interest from public health leaders or media. Contract tracing requirements may cease in specific situations (e.g., in the case of an ongoing pandemic), as specified by DSHS Austin.

Contact tracing

- Contact tracing should be done for all probable and confirmed cases.
- Complete the Respiratory Disease Contact Tracking Form found at http://www.dshs.state.tx.us/idcu/investigation/ and provide a copy to DSHS.
- Advise contacts of signs and symptoms of illness, and refer them to their healthcare providers if they experience any symptoms compatible with novel coronavirus infection within 14 days of their last contact with the confirmed or probable case.
    - Advise ill close contacts to call ahead prior to visiting their healthcare provider and inform their healthcare provider about recent contact with a confirmed or probable case.
    - Close contacts with respiratory or other compatible symptoms should be tested for novel coronavirus.
- Close contacts should be actively monitored for symptoms of novel coronavirus infection for a minimum of 14 days after last contact with the confirmed/probable case (i.e., follow-up should be performed at regular intervals).
- Collect serum specimens or other laboratory specimens on asymptomatic close contacts, when requested (See Laboratory Procedures section)
- Provide close contacts with a disease fact sheet, if available.

Close contacts definition for MERS: Close contact is defined as a) being within approximately 6 feet (2 meters) or within the room or care area for a prolonged period of time (e.g., healthcare personnel, household members) while not wearing recommended personal protective equipment (PPE) (i.e., gowns, gloves, respirator, eye protection); or b) having direct contact with infectious secretions (e.g., being coughed on) while not wearing recommended personal protective equipment (i.e., gowns, gloves, respirator, eye protection.

Data to inform the definition of close contact are limited. At this time, brief interactions, such as walking by a person, are considered low risk and do not constitute close contact. For guidance on appropriate PPE please see Interim Infection Prevention and Control Recommendations for Hospitalized Patients with Middle East Respiratory Syndrome Coronavirus (MERS-CoV).

MANAGING SPECIAL SITUATIONS

Clusters of Patients with Severe Acute Respiratory Illness

- Clusters of patients with severe acute respiratory illness (e.g., fever[1] and pneumonia requiring hospitalization) without recognized links to a case of MERS-CoV infection or to travelers from countries in or near the Arabian Peninsula should be evaluated for common respiratory pathogens.
- If the illnesses remain unexplained, providers should consider testing for MERS-CoV, in consultation with state and local health departments.
- In accordance with the World Health Organization's guidance for MERS-CoV, a cluster is defined as two or more persons with onset of symptoms within the same 14 days period, and who are associated with a specific setting such as a classroom, workplace, household, extended family, hospital, other residential institution, military barracks or recreational camp.
- If a cluster of patients with severe acute respiratory illness is identified, notify EAIDB **immediately** at **(800) 252-8239 or (512) 776-7676**.

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.

Multiple Cases/Outbreaks of Novel Coronavirus Causing Severe Acute Respiratory Disease
If there is more than one case of novel coronavirus in a jurisdiction, local area or facility, or an outbreak is suspected, notify EAIDB **immediately** at **(800) 252-8239 or (512) 776-7676**.

The local/regional health department should:

- Investigate common exposures among the cases and work with any identified facilities or entities.
    - Recommend appropriate control measures for the specific entity or setting.
- Perform contact tracing and monitoring for close contacts of confirmed/probable cases.
    - Collect specimens from close contacts, if requested.
- Encourage persons with compatible symptoms to be evaluated by a healthcare provider.
- Alert all healthcare providers in the area to be cognizant of possible cases and encourage immediate reporting of suspected cases.

- Collect and ship specimens on all suspected or probable cases to the DSHS laboratory or another public health laboratory qualified to perform novel coronavirus testing using CDC-approved protocols for a specific novel strain.
- Enhance respiratory virus surveillance (e.g., case reporting and laboratory testing) in the facility or in a defined geographic area (depending on the specific outbreak situation)
- Refer to the *Public Health Preparedness, Surveillance, and Response Plan for Texas: Respiratory Viruses Having Pandemic Potential* for a list of responsibilities by department and program area.

REPORTING AND DATA ENTRY REQUIREMENTS

Provider, School, Child-Care Facility, and General Public Reporting Requirements
Confirmed, probable and clinically suspected cases of novel coronavirus infection are required to be reported immediately to the local or regional health department or the Texas Department of State Health Services (DSHS), Emerging and Acute Infectious Disease Branch (EAIDB) at (800) 252-8239 or (512) 776-7676.

Local and Regional Reporting and Follow-up Responsibilities
Local and regional health departments should:

- Enter the case into NBS and submit an NBS notification on all **confirmed** and **probable** cases to DSHS within 30 days of receiving a report of such a case.
    - Please refer to the *NBS Data Entry Guidelines* for disease-specific entry rules.
    - A notification can be sent as soon as the case criteria have been met. Additional information from the investigation may be entered upon completing the investigation.
- **Investigation forms should be faxed as soon as an investigation has been completed**.
    - Investigation forms may be faxed to DSHS EAIDB at **512-776-7616**.

When an outbreak is investigated, local and regional health departments should:

- Report outbreaks immediately to the regional DSHS office or to DSHS EAIDB at **512-776-7676**
- Submit a completed **Respiratory Disease Outbreak Summary Form** at the conclusion of the outbreak investigation.
    - Fax a copy to the DSHS regional office and/or to EAIDB at 512-776-7676.
    - The Respiratory Disease Outbreak Summary Form is available at http://www.dshs.state.tx.us/idcu/investigation/.

LABORATORY PROCEDURES

Identification of a novel coronavirus causing severe acute respiratory disease such as MERS-CoV is available in Texas through the DSHS Austin Laboratory. Additionally, some Texas Laboratory Response Network (LRN) laboratories are able to test for novel coronavirus. For a list of laboratories in Texas currently qualified to perform novel coronavirus testing, please contact DSHS EAIDB at 512-776-7676.

Specimens should be sent on all cases that meet the current definitions of suspected (PUI), probable or confirmed cases.

Specimen Collection
Please see http://www.cdc.gov/coronavirus/mers/guidelines-clinical-specimens.html for the most up-to-date guidelines.

Specimen Type and Priority
To date, little is known about pathogenic potential and transmission dynamics of MERS-CoV. To increase the likelihood of detecting infection, CDC recommends collecting multiple specimens from different sites at different times after symptom onset, if possible.

Points to consider when determining which specimen types to collect from a patient under investigation for MERS include:

- The number of days between specimen collection and symptom onset
- Symptoms at the time of specimen collection

Additional points to consider:

- Maintain proper infection control when collecting specimens
- Use approved collection methods and equipment when collecting specimens
- Handle, store, and ship specimens following appropriate protocols

Collection of all three specimen types (not just one or two of the three)—lower respiratory, upper respiratory and serum specimens—for testing using the CDC MERS rRT-PCR assay is recommended. Lower respiratory specimens are preferred, but collecting nasopharyngeal and oropharyngeal (NP/OP) specimens, and serum, is strongly recommended depending upon the length of time between symptom onset and specimen collection. Respiratory specimens should be collected as soon as possible after symptoms begin – ideally within 7 days. However, if more than a week has passed since symptom onset and the patient is still symptomatic, respiratory samples should still be collected, especially lower respiratory specimens since respiratory viruses can still be detected by rRT-PCR. For example,

1. If symptom onset for a PUI with respiratory symptoms was less than 14 days ago, a single serum specimen (see Serum section, below), an NP/OP specimen, and a lower respiratory specimen (see Respiratory Specimens section, below) should be collected for CDC MERS **rRT-PCR testing at an authorized state or local public health laboratory**.
2. If symptom onset for a PUI with an ongoing respiratory tract infection (especially a lower respiratory tract infection) was 14 or more days ago, a single serum specimen for **serologic testing at CDC** (see Serum section, below) in addition to a lower respiratory specimen and an NP/OP specimen (see Respiratory Specimens section, below) are recommended.

General Guidelines
For short periods (≤ 72 hours), most specimens should be held at 2-8°C rather than frozen. For delays exceeding 72 hours, freeze specimens at -70°C as soon as possible after collection (with exceptions noted below). Label each specimen container with the patient's ID number, specimen type and the date the sample was collected.

Respiratory Specimens
A. Lower respiratory tract

1. Bronchoalveolar lavage, tracheal aspirate, or pleural fluid
   - Collect 2-3 mL into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container.

- Refrigerate specimen at 2-8°C if the specimen will arrive at the testing laboratory within 72 hours of collection; if exceeding 72 hours, freeze at -70°C and ship on dry ice.

2. Sputum
   - Have the patient rinse his mouth with water and then expectorate (deep cough) sputum directly into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container.
   - Refrigerate specimen at 2-8°C if the specimen will arrive at the testing laboratory within 72 hours of collection; if exceeding 72 hours, freeze at -70°C and ship on dry ice.

B. Upper respiratory tract

1. Nasopharyngeal AND oropharyngeal swabs (NP/OP swabs)
   - Collection of both nasopharyngeal and oropharyngeal swabs, or a combined NP/OP specimen, is recommended.
   - Use only synthetic fiber swabs with plastic shafts. Do not use calcium alginate swabs or swabs with wooden shafts, as they may contain substances that inactivate some viruses and inhibit PCR testing.
   - Collection technique
     - Nasopharyngeal swabs: Insert a swab into the nostril parallel to the palate. Leave the swab in place for a few seconds to absorb secretions. Swab both nasopharyngeal areas.
     - Oropharyngeal swabs: Swab the posterior pharynx, avoiding the tongue.
   - Place swabs immediately into sterile tubes containing 2-3 ml of viral transport media. NP/OP specimens can be combined, placing both swabs in the same vial.
   - Refrigerate specimen at 2-8°C if the specimen will arrive at the testing laboratory within 72 hours of collection; if exceeding 72 hours, freeze at -70°C and ship on dry ice.

2. Nasopharyngeal wash/aspirate or nasal aspirates
   - Collect 2-3 mL into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container.
   - Refrigerate specimen at 2-8°C if the specimen will arrive at the testing laboratory within 72 hours of collection; if exceeding 72 hours, freeze at -70°C and ship on dry ice.

Serum

1. Serum (for serologic testing at CDC) [Note: Use this serum guidance if the only serum specimen available would be collected 14 or more days after illness onset]
   - Because we do not want to delay detection of MERS infection and since the prevalence of MERS in the US is low, serologic testing on a single serum sample collected 14 or more days after symptom onset may still be beneficial. This is in contrast to serologic testing for many other respiratory pathogens which require collection and testing of acute and convalescent serum specimens. Serologic testing is currently available at CDC upon request and approval. Please be aware that the MERS-CoV serologic test is for research/surveillance purposes and not for diagnostic purposes - it is a tool developed in response to the MERS-CoV outbreak. Contact CDC's Emergency Operations Center (EOC) (770-488-7100) for consultation and approval if serologic testing is being considered.

2. Serum (for rRT-PCR testing at authorized state or local public health lab) [Note: Use this serum guidance for specimens collected during the first two weeks of the patient's illness onset]
   - For rRT-PCR testing (i.e., detection of the virus and not antibodies), a single serum specimen collected optimally during the first 10-12 days after symptom onset is recommended. Note: The kinetics of MERS-CoV are not well understood. Once additional data become available, these recommendations will be updated as needed.
   - The minimum amount of serum required for MERS-CoV testing (either serologic or rRT-PCR) is 200 µL. If both MERS-CoV serology and rRT-PCR tests are planned, the minimum amount of serum required is 400 µL (200 µL for each test). Serum separator tubes should be stored upright for at least 30 minutes, and then centrifuged at 1000–1300 relative centrifugal force (RCF) for 10 minutes before removing the serum and placing it in a separate sterile tube for shipping (such as a cryovial). Refrigerate the serum specimen at 2-8°C and ship on ice-pack; freezing and shipment of serum on dry ice is permissible.
     - Children and adults
       - Collect 1 tube (5-10 mL) of whole blood in a serum separator tube.
     - Infants
       - A minimum of 1 mL of whole blood is needed for testing pediatric patients.
       - If possible, collect 1 mL in a serum separator tube.

Submission Form

- Use DSHS Laboratory G-2V Specimen Submission Form for specimen submission. On the form, under the Virology section, check the box "MERS Coronavirus (Novel coronavirus)".

Section 4. VIROLOGY

☐ Electron Microscopy

☐ Culture: Reference {Virus ID}
Virus suspected: _____
Submitted on (cell type): _____

☐ Chikungunya, real time RT-PCR
Date of onset: _____
Travel history: _____
**** Information required prior to testing. ****
Performed only if specimen is collected within 5 days or less of symptom onset.

☐ Dengue, real time RT-PCR
Date of onset: _____
Travel history: _____
**** Information required prior to testing. ****
Performed only if specimen is collected within 5 days or less of symptom onset.

☐ Influenza surveillance {Influenza real-time RT-PCR}
Vaccine received: ☐ Yes ☐ No
Date vaccine received: _____
Travel history (if known): _____
Animal contact (if known): _____

☐ Measles, real-time RT-PCR

☐ Mumps, real-time RT-PCR

☒ MERS Coronavirus (Novel coronavirus)
++++ Prior authorization required. ++++
Call Infectious Disease (512) 776-7676 for authorization

☐ Viral isolation, clinical {Comprehensive cell culture}
Virus suspected: _____

☐ Other: _____

- Make sure the patient's name and date of birth match exactly what is written on the transport tubes or specimen cups.
- Fill in the patient's first name, last name, address, city, state, zip code, sex, date of birth, date <u>and time</u> of collection, date of onset and diagnosis/symptoms.
- The submitter will not incur a cost for novel coronavirus testing when patients meet testing criteria as long as the appropriate payor source is selected on the submission form. Contact DSHS EAIDB at 512-776-7676 for instructions on filling out the Payor Source section of the G-2V Specimen Submission Form.

Specimen Shipping

- **Notify the testing laboratory that you will be shipping the specimen and provide the shipment date and tracking number.**
- Transport temperature: Store the specimen at 2-8°C if the specimen will be received at the laboratory within 72 hours of collection; ship the specimen on cold or freezer packs. Otherwise, the specimen must be frozen at -70°C and shipped on dry ice.
- Ship specimens via overnight delivery.
- DO NOT mail on a Friday or the day before a holiday unless special arrangements have been made in advance with the DSHS Laboratory.
- Ship specimens to:

  Laboratory Services Section, MC-1947
  Texas Department of State Health Services
  Attn. Walter Douglass (512) 776-7569
  1100 West 49th Street
  Austin, TX 78756-3199

Causes for Rejection:

- Incorrect source of specimen
- The specimen is received at an incorrect temperature
- The specimen is received more than 72 hours after collection (if refrigerated)
- Missing or discrepant information on form/specimen
- Patient does not meet testing criteria or has not been approved for testing by epidemiology

UPDATES

- Basic Epidemiology: changes to SARS incubation period and percentage of cases with diarrhea
- Definitions: updated suspect/Patient Under Investigation definition to incorporate CDC changes in fever requirement and to remove references to the Republic of Korea
- Surveillance and Case Investigation:
    - Case Investigation Checklist: slight changes to specify when to complete the PUI form and how quickly to send the completed form to DSHS
    - Prevention and Control Measures:
        - Healthcare Facilities and Healthcare Personnel: change to heading name; added detailed CDC guidance
        - Laboratory settings: extensive updates to incorporate CDC's changes
        - Air or Ground Medical Transport: NEW
        - Confirmed, Probable or Suspected (PUI) Case-Patients: added detailed recommendations including assessment of suitability of home isolation/care and reformatting of guidance per CDC's updates
        - Caregivers and Household Members: added detailed recommendations
        - Close Contacts: added detailed recommendations
        - Travelers to Arabian Peninsula and Airline Crew: added detailed CDC guidance
        - Footnotes: NEW
- Contact Tracing: added a statement to clarify that DSHS Austin may request that healthcare workers who are close contacts to a confirmed or probable case be included in contact tracing activities regardless of PPE usage
- Managing Special Situations: added footnote on fever
- Laboratory Procedures: updated DSHS lab submission form picture; attempted to clarify when serum should be collected for rRT-PCR testing at a state or local PHL (more common) vs. PCR testing at CDC (less common)