MERS Co-V

Middle East Respiratory Syndrome Coronavirus

Surveillance Protocol

Provider Responsibilities

1. Providers should maintain a high index of suspicion for MERS-CoV and report immediately by phone to their local health department any person who meets the following criteria:
    a. Fever (≥38°C, 100.4°F) and pneumonia or acute respiratory distress syndrome (based on clinical or radiological evidence) AND EITHER:
        i. a history of travel from countries in or near the Arabian Peninsula (Bahrain, Gaza Strip, Iraq, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, the United Arab Emirates (UAE), the West Bank, and Yemen) within 14 days before symptom onset, OR
        ii. close contact 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 OR
        iii. close contact with a confirmed or probable case of MERS within 14 days prior to symptom onset.
2. Suspect or confirmed cases of MERS-CoV should be immediately placed in contact and respiratory isolation and the infection preventionist should be immediately notified for hospitalized patients. Physicians referring a patient to a healthcare facility for evaluation should notify the receiving facility that MERS-CoV is suspected so that facility can take appropriate precautions to prevent spread.
3. Collaborate with the local health department to obtain appropriate diagnostic recommendations. Testing is available ONLY at the state laboratory, Office of Laboratory Services (OLS) and must be coordinated with your local health department.
4. Collaborate with the local health department to institute appropriate control measures.
5. Collaborate with the local health department on the investigation. Local health departments may request, as needed:
    a. A line listing of healthcare workers who provided care for the patient.
    b. Names and contact information for other close contacts of the patient.
    c. Clinical and laboratory information.
    d. Other epidemiologically necessary information for the investigation.

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Phone: 304-558-5358 Fax: 304-558-8736 www.dide.wv.gov

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Surveillance Protocol

Laboratory Responsibilities

2. Testing for MERS Co-V is available ONLY at OLS and must be coordinated with your local health department. CDC guidelines for specimen collection and laboratory safety are found at: http://www.cdc.gov/coronavirus/mers/laboratories.html. IF testing for Other Respiratory Pathogens:
    a. Testing for common respiratory pathogens by molecular or antigen detection methods **(not by viral culture)** is **strongly recommended**. Common respiratory pathogens include 1) influenza A, influenza B, respiratory syncytial virus, human metapneumovirus, human parainfluenza viruses, adenovirus, human rhinovirus and other respiratory viruses; 2) Streptococcus pneumoniae, Chlamydia pneumophila, and other pathogens that cause severe lower respiratory infections.
    b. Clinical presentation, epidemiologic and surveillance information, and season should be considered when selecting which pathogens to test for. A few MERS-CoV cases have had other respiratory pathogens detected, so identification of a respiratory pathogen prior to MERS-CoV testing should not preclude testing for MERS-CoV, especially if MERS is strongly suspected.

Local Health Responsibilities

1. Take steps to protect employee health and safety. Employees who might interview a case of MERS-CoV should:
    a. Be educated on signs and symptoms of MERS-CoV and agree to monitor themselves for development of symptoms;
    b. Be trained to use standard, contact and airborne precautions when working with a suspect or confirmed MERS-CoV case;
    c. Be fit-tested with an N-95 mask and have a supply of N-95 masks readily available; and
    d. have access to an adequate supply of gloves and gowns and goggles if going into the same room with a person confirmed or suspected to have MERS-CoV.
2. Report suspect or confirmed cases immediately to the Bureau for Public Health Division of Infectious Disease Epidemiology (DIDE).
3. Testing for MERS Co-V is available ONLY at OLS and must be coordinated with the DIDE. Local health departments should familiarize themselves with specimen

collection guidelines available at http://www.cdc.gov/coronavirus/mers/laboratories.html

4. Conduct an appropriate case investigation for each individual who meets the criteria for PUIs by completing the MERS PUI short form: http://www.cdc.gov/coronavirus/mers/downloads/mers-investigation-short-form.pdf.
5. Fax MERS PUI short form to DIDE at 304-558-8736.
6. Identify close contacts. Close contacts are defined as:
    a. any person who provided care for the patient, including a healthcare worker or family member, or had a similarly close physical contact; or
    b. any person who stayed at the same place (e.g. lived with, visited) as the patient while the patient was ill.
7. Line list all close contacts. Indicate type of contact (healthcare, household, other). Include information on type of exposure, date and duration of exposure, date(s) and location of isolation, date of release from isolation and status on release from isolation. For healthcare contacts, note extent of precautions in use at the time of exposure. Share the line list with DIDE. Evaluation and management of close contacts of a PUI should be discussed with DIDE. Close contacts of a PUI should monitor themselves for fever and respiratory illness and seek medical attention if they become ill within 14 days after contact. Exposed healthcare providers can be monitored by their place of employment, if applicable. However, the local health department should keep in touch with a health facility that is monitoring exposed healthcare workers.
8. Phone DIDE immediately if a contact develops symptoms. Refer to medical evaluation and arrange testing, if appropriate. Complete a new investigation form and FAX to (304)-558-8736.
9. Other contacts of the ill person, such as community contacts or contacts on conveyances (e.g., airplane, bus), should also be evaluated in consultation with DIDE.
10. Call contacts 14 days after last exposure to MERS-CoV to ascertain health status and record on the line list.
11. Collaborate with DIDE on an outbreak report to document the investigation at closure.

MERS Co-V

Middle East Respiratory Syndrome Coronavirus

Surveillance Protocol

Bureau for Public Health Responsibilities

1. Take steps to protect employee health. Employees who might interview a case of MERS-CoV should:
    a. Be educated on signs and symptoms of MERS-CoV and agree to monitor themselves for development of symptoms;
    b. Be trained to use standard, contact and airborne precautions when working with a suspect or confirmed MERS-CoV case;
    c. Be fit-tested with an N-95 mask and have a supply of N-95 masks readily available; and
    d. have access to an adequate supply of gloves and gowns and goggles if going into the same room with a person confirmed or suspected to have MERS-CoV.
2. Report PUIs using the MERS PUI short form immediately to CDC.

Fax completed investigation short forms by FAX to CDC at 770-488-7107 or attach the short form to an e-mail to eocreport@cdc.gov (subject line: MERS Patient Form). Consult with CDC on diagnostic testing and other aspects of epidemiological investigation and case management.

3. Notify OLS immediately of PUIs and coordinate collection and transportation of specimens to OLS.
4. In a PUI, CDC strongly recommends testing a lower respiratory specimen (e.g., sputum), a nasopharygeal/oropharygeal swab, and serum, via the CDC MERS-CoV rRT-PCR assay. If symptom onset was more than 14 days prior, CDC also strongly recommends additional testing of a serum specimen via the CDC MERS-CoV serologic assay. At this point, testing of asymptomatic or mildly symptomatic contacts may be considered, in part to add to the knowledge base regarding MERS-CoV transmission and clinical characteristics. DIDE should consult with CDC colleagues to develop and implement appropriate contact tracing and evaluation strategies.
5. Report travel associated with confirmed MERS-CoV to the CDC within 7 days of confirmation or as soon as known.
6. Provide technical assistance and consultation regarding surveillance, investigation, control measures and prevention of MERS-CoV.
7. DIDE ordinarily takes a major leadership role in the investigation of emerging diseases, including assistance with field investigation.

Division of Infectious Disease Epidemiology
350 Capitol Street, Room 125, Charleston, WV 25301-3715
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8. If needed, develop questionnaires to trace case activities and possible exposures during the incubation period (to investigate possible sources of infection). If needed, develop questionnaires to trace case activities during the infectious period (to investigate possible avenues for transmission).
9. Develop line lists to standardize data collection for contact tracing. Separate line lists for healthcare and non-healthcare contacts may be needed. Record the name and date of birth of the index case and dates of symptom onset and date well and details about index case isolation (location and dates) on the header. Suggested data elements may include:
    a. Name of contact
    b. Phone, address
    c. Age, date of birth, sex, race, ethnicity
    d. First date of exposure
    e. Last date of exposure
    f. duration of exposure
    g. type of exposure
    h. for healthcare worker, type of PPE
    i. Symptomatic? (yes/no) and date
    j. Case status, if symptomatic
    k. Quarantined? (yes/no)
    l. Date of quarantine
    m. Location of quarantine
    n. For healthcare workers, furlough and dates
    o. Date of release from quarantine / furlough
    p. Final health status and date documented
10. Assist the local health department in documenting investigation activities in an outbreak report within 30 days of completion of the investigation.

Disease Control Objectives

Prevent spread of respiratory illness through early recognition and institution of effective infection control measures.

Disease Prevention Objectives

Prevent spread of respiratory illness through early recognition and institution of effective infection control measures.

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Middle East Respiratory Syndrome Coronavirus

Surveillance Protocol

Disease Surveillance Objectives

1. Promptly detect a case of MERS-CoV if it occurs in West Virginia.
2. Immediately report a suspect or confirmed case to the local health department, DIDE and CDC.

Public Health Significance

Four types of coronaviruses are among the many viruses that cause the 'common cold,' typically in the fall and winter: alpha coronaviruses 229E and NL63; and beta coronaviruses OC43, HKU1. These viruses have a benign clinical presentation and are considered an inconvenience. They are spread by coughing and sneezing, shaking hands and other close contact[1]. Two additional members of the coronavirus family with a much more severe clinical course have recently been identified: severe acute respiratory syndrome coronavirus (SARS Co-V) was first identified in 2002[2]; and Middle Eastern Respiratory Syndrome coronavirus (MERS Co-V) was identified ten years later[3].

In the fall of 2002, cases of SARS began to emerge in China. Before SARS disappeared, almost one year later, 8000 persons had acquired the infection and 774 had died[2]. SARS is the iconic emerging infection with a novel animal reservoir (Himalayan palm civets); transmission to close contacts including healthcare workers; and global spread by persons travelling on airplanes during the incubation period. The public health strategies used to control SARS included:

- Cough etiquette in healthcare facilities;
- Active case finding;
- Immediate isolation of suspect and confirmed cases;
- Development and deployment of new methods for rapid confirmation of cases by PCR;
- Strict infection control in healthcare facilities;
- Provider and public health education and awareness; and
- Outbreak and other epidemiological investigations to identify the sources of transmission and the ecologic reservoir.

The story of MERS Co-V is strikingly similar. First identified in 2012, 536 laboratory-confirmed cases of human infection including 145 deaths have been reported to the World Health Organization (WHO) as of May 9[2]. To date, all primary cases have

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occurred on the Arabian Peninsula: Jordan, Kuwait, Oman, Qatar, Saudi Arabia (KSA), United Arab Emirates (UAE). Travel-associated cases have occurred elsewhere in Africa, Europe and the United States. To date, limited or no secondary spread has been identified in association with travel-associated cases.

Multiple healthcare associated outbreaks have been reported. MERS Co-V has spread from infected patients to other patients and healthcare workers. In a recent outbreak in Jeddah, Saudi Arabia 60% of 128 patients with MERS Co-V were "presumed to have acquired infection in a hospital setting, including 39 health care workers." Healthcare workers were more likely to be younger, female and have mild disease. However, some healthcare workers had severe disease and some died[4]. In a previous hospital outbreak, 9 of 23 cases were associated with transmission in a single hospital dialysis unit. The dialysis unit was an 'open unit' with 16 beds spaced 1.3-1.5 meters (4-4.5 feet) apart[5].

The search for an animal reservoir is ongoing. Dromedary camels PCR-positive for MERS-CoV have been associated with human MERS-CoV cases[6,7]; however, more information is needed to fully understand the ecology of this virus.

At this time, recommended public health strategies for MERS-CoV are similar to those implemented for SARS[3]:

- Heightened physician and public health awareness;
- Provision of PCR test methods to public health laboratories so that confirmation can be performed rapidly;
- Rigorous infection control measures (including airborne and contact precautions, including a negative pressure room, fit-tested N-95 mask, gown, gloves and goggles) should be implemented at the earliest time that a MERS-CoV case is suspected;
- Contact tracing and surveillance. Close contacts are defined by CDC as 'any person who provided care for the patient, including a healthcare worker or family member, or had similarly close physical contact; or any person who stayed at the same place (e.g. lived with, visited) as the patient while the patient was ill.'

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Clinical Description[2,8]

Like many emerging infectious diseases, the clinical picture of MERS-CoV is currently incomplete. Initially recognized cases have been severe with a mortality rate approaching 30%. Most patients present with fever, cough, chills, sore throat, myalgias and arthralgias, and subsequently develop shortness of breath and signs of lower respiratory tract involvement. While asymptomatic or mildly symptomatic cases occur, patients may also develop severe pneumonia or acute respiratory distress syndrome (ARDS) and multi-organ failure. Some patients also present with nausea, vomiting or diarrhea. Most patients have at least one comorbid condition. Fatal cases are more likely to occur in persons with comorbid conditions, such as diabetes or end-stage renal disease.

Laboratory findings include: include leucopenia, particularly lymphopenia. Laboratory evidence of renal or hepatic compromise may be evident in patients with organ failure. Chest radiographs vary, but generally are consistent with viral pneumonitis or ARDS.

Co-infections may occur with other respiratory viruses or patients may develop secondary bacterial pneumonia or sepsis. Duration of illness until hospital admission is about 4 days; duration of hospitalization to discharge is about 7 days; and duration of hospitalization to death is about 9 days.

Etiologic Agent

MERS-CoV is a beta coronavirus. It was first reported in 2012 in Saudi Arabia. MERS-CoV used to be called “novel coronavirus,” or “nCoV”. It is different from other coronaviruses previously identified in people.[9]

Reservoir

In addition to humans, MERS-CoV has been found in camels in Qatar, Egypt and Saudi Arabia, and a bat in Saudi Arabia. Camels in a few other countries have also tested positive for antibodies to MERS-CoV, indicating they were previously infected with MERS-CoV or a closely related virus. However, more information is needed to identify the possible role that camels, bats, and other animals may play in the transmission of MERS-CoV.[9]

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Surveillance Protocol

Mode of Transmission

MERS-CoV has been shown to spread between people who are in close contact. Transmission from infected patients to healthcare personnel has also been observed. Clusters of cases in several countries are being investigated. [9]

Incubation Period

2-14 days[10]

Period of Communicability

The infectious period for MERS-CoV is not clearly established but is likely to extend from the onset of fever until 10 days after fever resolves. [11]

Outbreak Recognition

A single case is considered an outbreak.

Case Definition

Patient Under Investigation (PUI):

A person who has both clinical features and an epidemiologic risk should be considered a patient under investigation (PUI) based on one of the following scenarios:

A PUI is a person with the following characteristics:

Clinical Features		**Epidemiologic Risk**
Severe illness Fever and pneumonia or acute respiratory distress syndrome (based on clinical or radiological evidence)	And	A history of travel from countries in or near the Arabian Peninsula within 14 days before symptom onset, or close contact 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. -or- A history of being in a healthcare facility (as a patient, worker, or visitor) in the Republic of Korea within 14 days before symptom onset. -or- A member of a cluster of patients with severe acute

Division of Infectious Disease Epidemiology
350 Capitol Street, Room 125, Charleston, WV 25301-3715
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		respiratory illness (e.g., fever and pneumonia requiring hospitalization) of unknown etiology in which MERS-CoV is being evaluated, in consultation with state health department
Milder illness Fever and symptoms of respiratory illness (not necessarily pneumonia; e.g., cough, shortness of breath)	And	A history of 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.
Fever and symptoms of respiratory illness (not necessarily pneumonia; e.g., cough, shortness of breath)	And	Close contact with a confirmed MERS case while the case was ill.

Confirmed Case:
A confirmed case is a person with laboratory confirmation of MERS-CoV infection. Confirmatory laboratory testing requires a positive PCR on at least two specific genomic targets or a single positive target with sequencing on a second.

Probable Case:
A probable case is a PUI with absent or inconclusive laboratory results for MERS-CoV infection who is a close contact 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.

Definitions:

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

Preventive Interventions

Standard, contact, and airborne precautions are recommended for management of hospitalized patients with known or suspected MERS-CoV infection, based on CDC's case definition (above).

Recommended PPE for healthcare workers should include:

- Gloves
- Gowns
- Eye protection (goggles or face shield)
- Respiratory protection that is at least as protective as a fit-tested NIOSH-certified disposable N95 filtering facepiece respirator.

Persons who are mildly ill can be isolated at home. Home isolation guidelines can be found at: http://www.cdc.gov/coronavirus/MERS/hcp/home-care.html. These recommendations are consistent with those recommended for the coronavirus that caused severe acute respiratory syndrome (SARS). As more information becomes available, these recommendations will be re-evaluated and updated as needed.

These recommendations are based upon available information (as of May 2014) and the following considerations:

- Suspected high rate of morbidity and mortality among infected patients
- Evidence of limited human-to-human transmission
- Poorly characterized clinical signs and symptoms
- Unknown modes of transmission of MERS-CoV
- Lack of a vaccine and chemoprophylaxis

For current guidance on infection control measures for MERS-CoV, see:
http://www.cdc.gov/coronavirus/mers/infection-prevention-control.html

MERS Co-V

Middle East Respiratory Syndrome Coronavirus

Surveillance Protocol

Treatment

There are no specific treatments recommended for illnesses caused by MERS-CoV. Medical care is supportive and to help relieve symptoms.[9]

Surveillance Indicators

Since a single case is defined as an outbreak, please see the outbreak and healthcare associated outbreak protocols for appropriate surveillance indicators.

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