

Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

CDNA NATIONAL GUIDELINES FOR PUBLIC HEALTH UNITS

Revision history			
Version	Date	Revised by	Changes
1.0	15 Oct 2014	Developed by MERS-CoV SoNG working group	Original
1.1	24 July 2015	MERS-CoV SoNG Working Group	Presenting symptoms; contact management and case definitions updated to address revised evidence following outbreak in Republic of South Korea. Further minor update approved by AHPPC Chair 7 Sept 2015 to include WHO recommendations on the testing of asymptomatic close contacts in the context of a hospital outbreak.
1.2	1 July 2016	CDNA	Minor update to probable and confirmed case definitions.

The Series of National Guidelines ('the Guidelines') have been developed by the Communicable Diseases Network Australia (CDNA) and noted by the Australian Health Protection Principal Committee (AHPPC). Their purpose is to provide nationally consistent guidance to public health units (PHUs) in responding to a notifiable disease event.

These guidelines capture the knowledge of experienced professionals, and provide guidance on best practice based upon the best available evidence at the time of completion.

Readers should not rely solely on the information contained within these guidelines. Guideline information is not intended to be a substitute for advice from other relevant sources including, but not limited to, the advice from a health professional. Clinical judgement and discretion may be required in the interpretation and application of these guidelines.

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Endorsed by CDNA: 24 July 2015

Noted by AHPPC: 14 August 2015

Released by Health: 7 September 2015

Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

CDNA NATIONAL GUIDELINES FOR PUBLIC HEALTH UNITS

1. Summary

Public health priority

Urgent.

Advice should be sought, where applicable, from the relevant state or territory central communicable diseases agency on the process for reporting of suspected, probable and confirmed MERS-CoV cases. MERS-CoV infection is a nationally notifiable disease.

Case management

Isolate suspected, probable and confirmed cases in a single room with negative pressure air-handling and an ensuite bathroom (if available) and use standard and transmission-based precautions (contact and airborne).

Contact management

Close contacts of probable and confirmed cases are subject to some work and travel restrictions and should be actively monitored for development of fever and respiratory symptoms in the 14 days following the last contact, while casual contacts are subject to self-monitoring only.

2. The disease

Infectious agents

The Middle East respiratory syndrome coronavirus (MERS-CoV).

Coronaviruses are a large and diverse family of viruses that include viruses that are known to cause illness in humans (including the common cold) and animals.

Reservoir

It is likely that the virus has come from an animal source. MERS-CoV has been detected in camels in several Middle East countries with human cases of MERS-CoV infection. Additionally, serological evidence of camel exposure to MERS-CoV or a closely related virus has been found in camels over a wide area of northern Africa and the Middle East. It is suspected, but not confirmed, that infected camels may be the source of the virus for some human cases. There are also limited reports of MERS-CoV being detected in bats.

More information is needed to identify the possible role that camels, bats, and other animals may play in the transmission of MERS-CoV. MERS-CoV is genetically distinct from SARS-CoV, and appears to behave differently, being less transmissible but with a higher mortality rate. However, the full spectrum of illness remains unclear.

Mode of transmission

The mode or modes of transmission of MERS-CoV are not fully known.

There have been some cases with a strong history of exposure to camels or camel products (e.g. milk), including at least one cluster where the camels also tested positive. However, there have been many sporadic cases with no history of prior exposure to camels or other animals.

There have been multiple clusters of cases in which human-to-human transmission has occurred. These clusters have been observed in health-care facilities, among family members and between co-workers. However, the mechanism by which transmission occurred in these instances, whether respiratory (e.g. coughing, sneezing) or direct physical contact with the patient or via fomites after contamination of the environment by the patient, is unknown.

Infection control recommendations for managing suspected, probable and confirmed cases are consistent with those recommended for SARS-CoV and pandemic influenza. As further information becomes available, these recommendations will be re-evaluated and updated as needed.

Incubation period

From 2 to 14 days; most commonly 5 days.

Infectious period

The duration of infectivity for MERS-CoV infection is unknown. Standard precautions should be applied throughout any admission; additional isolation precautions should be continued until at least 24 hours after the resolution of symptoms.

Given that little information is currently available on viral shedding and the potential for transmission of MERS-CoV, testing to detect the virus may be necessary to inform decision-making on infectiousness. Patient information (e.g. age, immune status and medication) should also be considered.

Clinical presentation and outcome

Clinical presentation ranges from asymptomatic to severe pneumonia with acute respiratory distress syndrome and multi-organ failure. Nearly all symptomatic patients have presented with fever. Respiratory symptoms are common and gastrointestinal symptoms are less commonly reported.

Typically, the disease starts with fever and cough. Other common symptoms are myalgia and chills. Sore throat, arthralgia, dyspnoea, nausea, vomiting and diarrhoea are less commonly present. In the 2015 South Korean outbreak pneumonia was present in a minority of patients at initial presentation, but it is unclear whether early testing of contacts with, at the time, milder clinical manifestations of MERS-CoV infection may have influenced the reported spectrum of illness.

Patients who develop pneumonia or pneumonitis often require mechanical ventilation and other organ support. The case fatality rate for confirmed cases is estimated at 30-40 percent, but this may decrease when the spectrum of disease is better understood, as suggested by lower case fatality observed in the South Korean outbreak.

Persons at increased risk of disease

The age distribution of reported cases is skewed heavily to the middle-aged and elderly. Cases who are elderly, immunocompromised or with co-morbidities have an increased case fatality rate[1].

Disease occurrence and public health significance

As of June 2015 there have been no confirmed MERS-CoV cases reported in Australia.

Countries that have reported cases in the Middle East include Iran, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia (KSA), United Arab Emirates (UAE) and Yemen, with Saudi Arabia and UAE being most affected.

Persons who acquired MERS-CoV in Middle Eastern countries have exported the infection to many other countries, which has resulted in health facility outbreaks in France, the United Kingdom, and most notably South Korea. For a full list of countries where MERS-CoV cases have been detected see the World Health Organization (WHO) coronavirus infection website [1].

WHO expects that additional cases of MERS-CoV infection will be reported from the Middle East, and that it is likely that cases will continue to be exported to other countries by tourists, travellers, guest workers or pilgrims who might acquire infection following exposure to human cases (possibly in a health care setting), or possibly from camels or other unknown animal sources (for example, while visiting farms or markets).

Until more is understood about the mode of transmission and risk factors for infection, it is expected that sporadic cases will continue to occur, with potential for limited transmission within households and healthcare settings.

3. Routine prevention activities

It is recommended that people with significant medical conditions such as diabetes, renal disease and chronic lung disease who are intending to travel to the Middle East – including those undertaking the Hajj or Umrah - consult a doctor prior to travel.

People travelling in countries affected by MERS-CoV should maintain good hygiene practices, avoid contact with animals, especially camels, and refrain from consuming unpasteurised milk or undercooked meat.

Travellers to the Middle East and travel organisations should be advised of general travel health precautions which will lower the risk of infection in general, including respiratory viruses and traveller's diarrhoea. Specific emphasis should be placed on:

- hand hygiene and respiratory hygiene
- adhering to good food-safety practices,
- maintaining good personal hygiene.

Travel advice for Australians is available at the Australian Department of Health MERS-CoV web page [2]. Travellers should check if there are any travel restrictions in place prior to travel.

4. Surveillance objectives

- To rapidly identify, isolate and treat cases, and prevent transmission to their contacts
- To identify and provide information to contacts and ensure that they are isolated rapidly should symptoms occur
- To describe the epidemiology of MERS-CoV infection in Australia, including identifying risk factors for transmission.

5. Data management

Probable and confirmed cases of MERS-CoV infection should be entered onto the notifiable diseases database within one working day of notification/report. Data for suspected cases should be maintained according to jurisdictional protocols.

6. Communications

Where applicable, public health units should immediately notify the central state/territory communicable diseases agency of suspected, probable and confirmed cases once notifications/reports are received. Provide the case's age, sex, place of residence, indigenous status, date of onset, travel history, laboratory results, clinical status, likely place of acquisition, and follow-up action taken.

State/territory communicable disease agencies should immediately notify probable and confirmed MERS-CoV cases to the National Incident Room.

7. Case definition

The criteria for a suspected case of MERS-CoV are to be used to direct testing and initial infection control and public health actions. Suspected cases will ultimately be reclassified as either having a diagnosis of MERS-CoV excluded, or meeting the criteria for a probable or confirmed case. The criteria for probable and confirmed cases of MERS-CoV define those cases that are to be reported to the National Notifiable Diseases Surveillance System.

Suspected case ¹

Knowledge and understanding of MERS-CoV infection continues to expand. The following criteria are based on case series reported from recent outbreaks and represent combinations of symptoms and epidemiological criteria in which MERS-CoV testing is strongly recommended.

Atypical presentations occur, and clinical and public health judgement should also be used to determine the need for testing in patients who do not meet the criteria below.

Testing and initial infection control and public health actions for MERS-CoV should be undertaken for persons with:

- A. Fever AND pneumonia or pneumonitis or acute respiratory distress syndrome (ARDS) AND
- history of travel from or residence in affected countries in the Middle East ² within 14 days before symptom onset, OR
 - contact ³ (within the incubation period of 14 days) with a symptomatic traveller who developed fever and acute respiratory illness of unknown aetiology within 14 days after travelling from affected countries in the Middle East, OR
 - contact (within the incubation period of 14 days) with a symptomatic traveller who developed fever and acute respiratory illness of unknown aetiology within 14 days after travelling from a region with a known MERS-CoV outbreak at that time.⁴

OR

¹ Check for updates on the Australian Department of Health MERS-CoV website (<http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-mers-cov.htm>).

² Affected countries in the Middle East include Iran, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia (KSA), United Arab Emirates (UAE) and Yemen. Not including airport transit.

³ See Section 11: Definition of contact.

⁴ See the World Health Organization (WHO) coronavirus infection website - www.who.int/emergencies/mers-cov/en/ - for a list of countries with endemic MERS-CoV or currently experiencing a MERS outbreak.

- B. Fever AND symptoms of respiratory illness (e.g., cough, shortness of breath) AND
- being in a healthcare facility (as a patient, worker, or visitor) in a country or territory in which recent healthcare-associated cases of MERS have been identified⁴ within 14 days before symptom onset, OR
 - being in contact with camels or raw camel products within affected countries in the Middle East within 14 days before symptom onset.

OR

- C. Fever OR acute symptoms compatible with MERS-CoV AND onset within 14 days after contact with a probable or confirmed MERS-CoV case while the case was ill.

OR

- D. Testing and initial infection control and public health actions for MERS-CoV should also be considered, in consultation with the public health unit, where there is a cluster of patients with severe acute respiratory illness of unknown aetiology following routine microbiological investigation, particularly where the cluster includes health care workers.

Reporting

Confirmed and probable cases should be notified nationally.⁵

Confirmed case

A confirmed case requires laboratory definitive evidence of infection with MERS-CoV.

Laboratory definitive evidence

Detection of MERS coronavirus by polymerase chain reaction (PCR) in a public health reference laboratory using the testing algorithm described in [Appendix 3](#) and summarised below.⁶

Probable case

A probable case requires clinical evidence AND epidemiological evidence.

Clinical evidence

An acute respiratory infection with clinical, radiological, or histopathological evidence of pulmonary parenchymal disease (e.g. pneumonia or pneumonitis or Acute Respiratory Distress Syndrome), AND

No possibility of laboratory confirmation for MERS-CoV because the patient or samples are not available for testing.

Epidemiological evidence

Close contact with a laboratory-confirmed case.

See the [Laboratory testing](#) section and [Appendix 3](#) for additional MERS-CoV laboratory testing information.

⁵ In NSW, all suspected cases should be recorded on NCIMS and reported to CDOnCall

⁶ To consider a case as laboratory-confirmed, one of the following conditions must be met:

- A positive PCR result for at least two different specific targets on the MERS-CoV genome.
- One positive PCR result for a specific target on the MERS-CoV genome and an additional different PCR product sequenced, confirming identity to known sequences of MERS-CoV.

8. Laboratory testing

Patients to be considered for MERS-CoV testing are described under the suspected case definition (above). Where applicable, consult with your state/territory communicable diseases agency to seek advice on which laboratories can provide MERS-CoV testing; appropriate specimen type, collection and transport; and also to facilitate contact management if indicated.

Transmission-based contact and airborne precautions must be used when collecting respiratory specimens [3]. These include:

- Contact precautions, including close attention to hand hygiene
- Airborne transmission precautions, including routine use of a P2 mask/respirator, disposable gown, gloves, and eye protection
- Collection in a room with negative pressure air-handling where available.

Routine tests for acute pneumonia/pneumonitis should be performed where indicated, including bacterial cultures, acute and convalescent serology, urinary antigen testing and tests for respiratory viruses, according to local protocols.

Serology, if available, may be useful in cases where MERS-CoV is strongly suspected but non-confirmed with PCR but requires paired acute and convalescent sera – seek expert clinical microbiology advice. Serology is also useful to estimate secondary infection rates in asymptomatic cases following exposure to MERS-CoV.

See [Appendix 3](#) for additional MERS-CoV laboratory testing information.

9. Case management

Response times

On the same day as notification of a suspected, probable or confirmed case, begin follow up investigation and, where applicable, notify your central state or territory communicable diseases agency.

Response procedure

Case investigation

The response to a notification will normally be carried out in collaboration with the clinicians managing the case, and be guided by the MERS-CoV public health unit checklist ([Appendix 2](#)) and the MERS-CoV Investigation Form ([Appendix 4](#)).

Regardless of who does the follow-up, PHU staff should ensure that action has been taken to:

- Confirm the onset date and symptoms of the illness
- Confirm results of relevant pathology tests, or recommend that tests be done
- Seek the treating doctor's permission to contact the case or relevant care-giver
- Determine if the diagnosis has been discussed with the case or relevant care-giver before beginning the interview
- Review case and contact management
- Ensure appropriate infection control guidelines are followed in caring for the case
- Identify the likely source of infection.

Note: If interviews with suspected cases are conducted face-to-face, the person conducting the interview must have a thorough understanding of infection control practices and be competent in using appropriate PPE.

Wherever possible, cases should be managed in hospital. If clinically indicated, cases may be managed at home only if it can be ensured that the case and household contacts are counselled about risk and that appropriate infection control measures are in place.

Case treatment

In the absence of pathogen-specific interventions, patient management largely depends on supportive treatment, and vigilance for and treatment of complications.

Further advice on clinical management is available from WHO [4].

Education

Provide MERS-CoV Fact Sheets ([Appendix 1](#)) to cases and their close contacts. Ensure that they are aware of the signs and symptoms of MERS-CoV, the requirements of isolation, contact details of the PHU and the infection control practices that can prevent the transmission of MERS-CoV.

Isolation and restriction

Cases must be isolated in an appropriate health facility, unless alternative arrangements are recommended on expert advice. Healthcare workers and others who come into contact with suspected, probable and confirmed cases must be protected according to recommended infection control guidelines. Visitors should be restricted to close family members.

A risk assessment should be undertaken for suspected cases who initially test negative for MERS-CoV. If there is no alternative diagnosis and a high index of suspicion remains that such cases may have MERS-CoV infection, consider continued isolation and use of the recommended infection control precautions, pending further testing (see [Laboratory testing](#) section and [Appendix 3](#)) and re-assessment.

Given the severity of reported infections, the evidence of limited person-to-person transmission, and gaps in knowledge of transmission pathways, the recommendations on isolation and PPE for management of suspected, probable and confirmed cases take a deliberately cautious approach.

Infection control measures should be those applicable to control the transmission of pathogens that can be spread by the airborne route. These measures are detailed in the [*Interim infection prevention and control advice for acute care hospitals relating to suspected Middle Eastern respiratory syndrome coronavirus \(MERS-CoV\) infections*](#), (<http://www.health.gov.au/mers-coronavirus>) [3].

In summary, transmission-based precautions for suspected, probable and confirmed cases should include:

- Placement of cases in a negative pressure room with an ensuite bathroom, if available, or in a single room from which the air does not circulate to other areas
- Airborne transmission precautions, including routine use of a P2 respirator (or N95 mask), long sleeved disposable gown, gloves, and eye protection when entering a patient care area
- Contact precautions, including close attention to hand hygiene
- If transfer of the confirmed or probable case outside the negative pressure room is necessary, ask the patient to wear a single use "surgical" face mask while they are being transferred and to follow respiratory hygiene and cough etiquette.

Active case finding

Contacts (see *Contact management* section) should be identified and advised to immediately seek medical advice should they develop symptoms. Contacts or caregivers should be advised to inform the public health agency if they develop symptoms.

10. Environmental evaluation

Where local transmission of MERS-CoV is thought possible, a thorough review of contributing environmental factors should be done. This should include a review of infection control procedures, and opportunities for exposure to respiratory or faecal contamination.

If a case has had occupational exposure to animals it may be appropriate to consult with animal health authorities.

11. Contact management

As there remain gaps in the understanding of infectivity of MERS-CoV cases and transmission modes the definition of contacts is based on observations of people infected in large outbreaks, particularly the outbreak in South Korea. The definition of contacts and recommended control measures are subject to review as more information on MERS-CoV becomes available.

Identification of contacts

All persons categorised as a contact (see definitions of “close contacts” and “casual contacts” following) of probable and confirmed cases should be followed-up, and monitored for the development of symptoms for 14 days after the last exposure to the case (i.e. the maximum incubation period).

Contacts of suspected cases should also be considered for contact management if there is likely to be a delay in confirming or excluding MERS CoV infection in the suspected case, such as delayed testing.

Close Contact definition

A close contact is defined as requiring greater than 15 minutes face-to-face contact with a symptomatic probable or confirmed case in any setting, or the sharing of a closed space with a symptomatic probable or confirmed case for a prolonged period (e.g. more than 2 hours).

Hence, close contacts may include:

- A healthcare worker or family member providing direct patient care to, or who were within close vicinity of an aerosol generating procedure performed on, or a laboratory worker who performed tests on specimens from, a confirmed or probable case, without recommended infection control precautions, including not using full personal protective equipment (PPE).
- OR, a healthcare worker, patient or visitor who shared the same closed space for a prolonged time (e.g. more than 2 hours), and without recommended infection control precautions, including not using full personal protective equipment (PPE).
- OR, people who resided in the same household or household-like setting (e.g. dormitory room in a boarding school).

Contact tracing by public health units should prioritise identifying close contacts particularly healthcare workers, and other close contacts who may be at higher risk of severe disease, including the elderly and those with significant co-morbidities.

- Casual contact definition
- Casual contact is defined as any person having less than 15 minutes face-to-face contact with a symptomatic probable or confirmed case in any setting, or sharing a closed space with a symptomatic probable or confirmed case for less than 2 hours. This will include healthcare workers, other patients, or visitors who were in the same closed healthcare space as a case, but for shorter periods than those required for a close contact. Other closed settings might include schools or offices.

Note that healthcare workers and other contacts who have taken recommended infection control precautions, including the use of full PPE, while caring for a symptomatic probable or confirmed MERS-CoV case are not considered to be close contacts. However, these people should be advised to self-monitor and if they develop symptoms consistent with MERS-CoV infection they should isolate themselves and notify their public health unit or staff health unit so they can be tested and managed as a suspected MERS-CoV case (see recommendations below under *Management of symptomatic contacts*).

Other casual contacts may include:

- Extended family groups e.g. in an Aboriginal community.
- Aircraft passengers who were seated in the same row as the case, or in the two rows in front or two rows behind a symptomatic probable or confirmed MERS-CoV case. It is noted that to date no instances of transmission on airlines have been identified. Contact tracing of people who may have had close contact on long bus or train trips should also be attempted where possible, using similar seating/proximity criteria.
- All crew-members on an aircraft who worked in the same cabin area as a symptomatic probable or confirmed case of MERS-CoV. If a crew member is the symptomatic MERS-CoV case, contact tracing efforts should concentrate on passengers seated in the area where the crew member was working during the flight and all of the other members of the crew.

Where resources permit, more active contact tracing may be extended to other persons who have had casual contact (as defined above), particularly in school, office, or other closed settings. In these circumstances, the size of the room/space and degree of separation of the case from others should be considered in identifying contacts.

Contact assessment

All persons identified as having had contact with a symptomatic probable or confirmed case should be assessed to see if they should be classified as a close or casual contact and have demographic and epidemiological data collected. Information on contacts should be managed according to jurisdictional requirements.

Identification and assessment of the contacts of suspected cases may be deferred pending the results of initial laboratory testing. However, contact tracing should be considered if MERS-CoV infection remains high on the list of differential diagnoses, even if initial laboratory results are negative or are pending.

Contact testing

Routine laboratory screening for MERS-CoV infection is not recommended for asymptomatic contacts. One exception is in the setting of a hospital outbreak, where WHO recommends RT-

PCR testing of nose/throat swabs of asymptomatic close contacts be considered, if feasible. RT-PCR-positive asymptomatic close contacts in this setting should be isolated, monitored closely for symptoms and only released from isolation following two negative RT-PCR tests separated by 24 hours.⁷

Serological testing of contacts may be useful if available, in order to help determine the secondary infection-attack rate and the proportion of infections that are asymptomatic. Contacts who agree to be tested should be advised that serological testing will not be done immediately and is not being conducted for contact management purposes.

Consent should be sought from household and healthcare worker close contacts for the collection of the following samples:

- A baseline serum sample, ideally within 7 days of exposure, to be stored and tested in parallel with a convalescent sample.
- A convalescent serum sample at least 21 days after the baseline sample was collected. If more than 21 days have passed since the last exposure, only a single serum sample is required.

The collection of nasopharyngeal (NP) swabs from asymptomatic contacts for MERS-CoV PCR is not recommended. There is little information available currently to reliably inform the timing of testing or the interpretation of negative test results in this setting.

Serial PCR testing of NP swabs from asymptomatic close contacts to detect MERS-CoV viral shedding may be conducted as part of ethics-approved research studies.

Prophylaxis

No specific chemoprophylaxis is available for contacts.

Education

Contacts should be counselled about their risk and the symptoms of MERS-CoV and provided with a MERS-CoV Fact Sheet ([Appendix 1](#)). They should be advised to self-isolate if they develop symptoms, and to immediately notify their public health unit and, if appropriate, their facility infection control unit (i.e. for healthcare workers).

Quarantine and restriction

Close contacts

Home quarantine of asymptomatic close contacts is not routinely recommended, but people identified as close contacts are advised to monitor their health for 14 days after the last possible contact with a symptomatic probable or confirmed MERS-CoV case.

Public health units should conduct active daily monitoring of close contacts for symptoms for 14 days after the last possible contact with a symptomatic probable or confirmed MERS-CoV case.

Close contacts should also be advised to immediately telephone the public health unit to arrange medical assessment if they develop symptoms such as fever, respiratory symptoms (including coughing and shortness of breath), headache, muscle pain or diarrhoea.

⁷ WHO recommends that if feasible, and in the context of a hospital outbreak, all close contacts of a confirmed case of MERS should be tested for the presence of the virus. See: http://apps.who.int/iris/bitstream/10665/180973/1/WHO_MERS_IPC_15.2_eng.pdf?ua=1 .

Less frequent active follow-up together with passive surveillance may be necessary if there are large numbers of close contacts to monitor.

Close contacts should also be advised to not travel internationally for 14 days after the last close contact with a probable or confirmed case of MERS-CoV, and any travel within Australia during this period should be subject to discussion with public health authorities.

Close contacts should be excluded from schools and sensitive occupations or settings such as health care, aged care, or child care during the 14 days after last unprotected contact with a case.

Casual contacts

Casual contacts should monitor their health for 14 days and report any symptoms immediately to the local public health unit. There are no restrictions on movements; however casual contacts should be advised to contact the public health unit if they develop symptoms.

Healthcare worker close contacts

Healthcare worker close contacts (i.e. persons exposed while unprotected, as described in the Contact definition section) should not undertake work in a healthcare setting for 14 days following the last possible contact with the case. Home quarantine is not routinely recommended during this period if these individuals remain asymptomatic, but some restrictions may be recommended based on a risk assessment of the particular circumstances.

Depending on arrangements in the jurisdiction, public health units may assist infection control units of health facilities to identify and monitor healthcare worker close contacts.

It is recognised that clinical work restrictions on healthcare worker close contacts may place strain on individuals and on health services. This underlines the importance of ensuring healthcare workers implement appropriate infection control precautions when assessing and managing suspected, probable and confirmed MERS-CoV cases.

These recommendations are based on reports from large health facility-based MERS-CoV outbreaks in the Middle East and South Korea which have involved nosocomial transmission of MERS-CoV to both patients and healthcare workers. CDNA will continue to monitor the emerging evidence around MERS-CoV transmission risks in healthcare settings and revise these recommendations as needed.

Management of symptomatic contacts

If fever, respiratory symptoms, or other symptoms consistent with MERS-CoV infection develop within the first 14 days following the last contact, the individual should be immediately isolated and managed as per the current recommendations for suspected MERS-CoV cases, with urgent testing for MERS-CoV infection undertaken in an environment which minimises the risk of exposure to others.

Ill contacts who are being evaluated for MERS-CoV infection can be appropriately isolated and managed at home, unless their condition is severe enough to require hospitalisation.

Symptomatic contacts who test negative for MERS-CoV by PCR will still need to be monitored for 14 days after their last contact with a probable or confirmed MERS-CoV case and may require re-testing. There have been a number of reports of MERS-CoV cases who initially tested negative for MERS-CoV by PCR.

12. Special situations

Outbreaks in healthcare facilities

If one or more probable or confirmed MERS-CoV cases are identified in a healthcare facility, an outbreak management team should be convened, including a senior facility manager, an infection control practitioner and appropriate clinical staff, in consultation with PHU staff as required.

Control measures may include:

- active case finding, assessment and care
- isolation and/or cohorting
- work restriction for healthcare workers who have had close contact (i.e. unprotected exposure) with a confirmed or probable case
- distribution of fact sheets and other information
- epidemiological studies to determine risks for infection.

Outbreaks in residential care facilities or other residential institutions (e.g. prisons or boarding schools)

There have been few if any reports of MERS-CoV outbreaks in institutions other than in healthcare facilities, and transmission within households appears to be uncommon. Nevertheless, it is assumed that fellow residents in an institution will be at greater risk of infection if there has been a confirmed case living at the institution while infectious.

If one or more probable or confirmed MERS-CoV cases are identified in a residential care facility or institution, an outbreak management team should be convened, in consultation with PHU staff.

13. References and additional sources of information

References:

- [1] [World Health Organization \(WHO\). Coronavirus infections. \(http://www.who.int/csr/disease/coronavirus_infections/en/\)](http://www.who.int/csr/disease/coronavirus_infections/en/)
- [2] Australian Department of Health. [MERS coronavirus web page. \(http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-mers-cov.htm\).](http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-mers-cov.htm)
- [3] [Interim infection prevention and control advice for acute care hospitals relating to suspected Middle Eastern respiratory syndrome coronavirus \(MERS-CoV\) infections \(http://www.health.gov.au/internet/main/publishing.nsf/Content/18EA5D58FA62A556CA257BF0001A8E1F/\\$File/interim-infection-prevention.pdf\)](http://www.health.gov.au/internet/main/publishing.nsf/Content/18EA5D58FA62A556CA257BF0001A8E1F/$File/interim-infection-prevention.pdf)
- [4] World Health Organization (WHO). [Interim Guidance Document - Clinical management of severe acute respiratory infections when novel coronavirus is suspected. \(http://www.who.int/csr/disease/coronavirus_infections/InterimGuidance_ClinicalManagement_NovelCoronavirus_11Feb13u.pdf\).](http://www.who.int/csr/disease/coronavirus_infections/InterimGuidance_ClinicalManagement_NovelCoronavirus_11Feb13u.pdf)

Additional resources:

[WHO FAQs on MERS-CoV](http://www.who.int/csr/disease/coronavirus_infections/faq/en/): (http://www.who.int/csr/disease/coronavirus_infections/faq/en/)

[WHO MERS-CoV summary and literature updates](http://www.who.int/csr/disease/coronavirus_infections/archive_updates/en/):

(http://www.who.int/csr/disease/coronavirus_infections/archive_updates/en/)

[WHO Update on MERS-CoV transmission from animals to humans, and interim recommendations for at-risk groups \(13 June 2014\)](http://www.who.int/csr/disease/coronavirus_infections/MERS_CoV_RA_20140613.pdf):

(http://www.who.int/csr/disease/coronavirus_infections/MERS_CoV_RA_20140613.pdf)

[WHO updated travel advice on MERS-CoV for Pilgrimages \(3 June 2014\)](http://www.who.int/ith/updates/20140603/en/):

(http://www.who.int/ith/updates/20140603/en/)

[US CDC Middle East respiratory syndrome website](http://www.cdc.gov/coronavirus/mers/index.html):

(http://www.cdc.gov/coronavirus/mers/index.html)

[ECDC Coronavirus website](http://ecdc.europa.eu/en/healthtopics/coronavirus-infections/Pages/index.aspx) (http://ecdc.europa.eu/en/healthtopics/coronavirus-infections/Pages/index.aspx)

[Public Health England Middle East respiratory syndrome coronavirus website](http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/MERSCoV/):

(http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/MERSCoV/)

14. Appendices

Appendix 1. [MERS-CoV Factsheet](#)

Appendix 2. [MERS-CoV PHU checklist](#)

Appendix 3. [MERS-CoV laboratory testing information](#)

Appendix 4. [MERS-CoV case investigation form](#)

15. Jurisdiction specific issues

Links to Australian state and territory public health legislation, and the Commonwealth Quarantine Act and amendments are available at:

<http://www.health.gov.au/internet/main/publishing.nsf/Content/cda-state-legislation-links.htm>

Appendix 1: Middle East Respiratory Syndrome (MERS) Factsheet

What is Middle East Respiratory Syndrome (MERS)?

Middle East Respiratory Syndrome (MERS) is a viral illness caused by a novel coronavirus, Middle East respiratory Syndrome Coronavirus (MERS-CoV) that was first identified in Saudi Arabia in 2012. Coronaviruses are a large family of viruses that cause diseases ranging from the common cold to Severe Acute Respiratory Syndrome (SARS).

All recognised cases of MERS-CoV infection (people who have the disease) have to date lived in or travelled to countries in the Middle East, or have had close contact, such as caring for or living with, people who acquired the infection in the Middle East. However, there is no evidence of sustained spread of the disease within the community.

There is a risk of MERS-CoV in the following Middle Eastern countries:

- Jordan, Kuwait, Oman, Qatar, Saudi Arabia, the United Arab Emirates (UAE), Yemen, Lebanon and Iran.

People who caught the infection in the Middle East have travelled to a number of countries outside the Middle East and subsequently developed the disease. There have been no cases identified in Australia to date.

It is a very serious disease, and about 30% of people with MERS-CoV infection have died from the infection or related complications.

What are the symptoms?

- Most confirmed cases have had a rapid onset of serious respiratory illness, with fever, cough, and shortness of breath, leading to pneumonia.
- A variety of other symptoms have been reported in some cases, including muscle pain, diarrhoea, vomiting and nausea.
- An increasing number of infections are being identified in people with only mild symptoms or no symptoms (asymptomatic) who were tested because they were close contacts of seriously-ill cases.

How is it spread?

It is not yet understood exactly how people are becoming infected. In some cases there appears to have been spread from an infected person to another person in close contact. This has been seen among family members, and other patients and health care workers in hospitals caring for people with MERS-CoV infection. However, the virus does not seem to spread easily from person-to-person.

The original source of the virus is likely to be animals and MERS-CoV has been found in camels in some Middle Eastern countries where cases are occurring. Similar viruses have also been reported in bats. However, contact with camels and other animals does not appear to explain most of the human cases that are occurring. More information is needed to determine the roles that camels, bats and other animals may play in the spread of MERS-CoV.

Who is at risk?

People who are living in or travelling to affected areas of the Middle East or who have had contact with other cases may be at risk of catching the disease. People with underlying illnesses that make them more vulnerable to respiratory disease, including those with diabetes, chronic lung disease, pre-existing kidney disease, or those who have suppressed immune systems, may be at a higher risk.

How is it prevented?

There is no vaccine to prevent MERS-CoV infection. People who are travelling to affected countries should practice normal hygiene measures. Wash your hands often, and use a hand sanitiser if soap and water is not available.

It is currently recommended to minimise contact with animals in affected countries. When visiting a farm good hygiene measures should be practised, such as regular hand washing before and after touching animals, avoiding contact with sick animals, and following good food hygiene practices, including avoiding drinking raw milk, camel urine or eating food that may be contaminated with animal products unless the food is properly washed, peeled, or cooked.

People at high risk of severe disease due to MERS-CoV should consider taking additional precautions while travelling in the Middle East, such as avoiding visiting farms or market environments where camels are present.

What should I do if I become unwell after travel in the Middle East?

If you become ill or feel unwell while travelling in the Middle East, you should not wait until you arrive back in Australia to seek medical assistance. Instead you should see a doctor or go to the local emergency department.

If you have returned from travel to the Middle East within the last fourteen days and develop a fever, cough and other symptoms, you should see your doctor or go to the emergency department to work out why you are ill. It is important that you mention your symptoms and which countries you have visited in the Middle East when you first arrive at the medical practice or hospital emergency department.

You may be asked or required to wear a mask and be separated from others to prevent further spread of infection.

How is it diagnosed?

MERS-CoV is diagnosed by finding genetic material from the virus in respiratory samples such as swabs from the back of the throat and fluid from the lungs. Testing for MERS-CoV is done in public health laboratories.

How is it treated?

There is currently no specific treatment for people who are sick with MERS, but general supportive medical care can be life-saving.

What is the public health response?

The World Health Organization (WHO) is working with affected countries to minimise the risk of spread and find out more about the disease.

There have been no confirmed cases in Australia, but special procedures to prevent the spread of MERS-CoV would be put in place in the event of any suspected or confirmed cases. These would include:

- Asking the sick person to wear a surgical mask
- Health-care workers seeing patients and laboratory staff handling specimens would follow special safety guidelines, including wearing protective equipment.
- Doctors and laboratories would inform state/ territory health departments of suspected cases.
- Public Health authorities would follow up any case to identify their contacts so as to help prevent spread of the disease. Close contacts of people diagnosed or suspected of having

MERS-CoV infection would be given information about the risk of infection, and would be tested for the disease if necessary.

Public health unit staff will investigate all cases to find out how the infection occurred, identify other people at risk of infection, implement control measures and provide other advice.

Further information

- [World Health Organization \(WHO\) MERS-CoV updates \(www.who.int/csr/disease/coronavirus_infections/en/\)](http://www.who.int/csr/disease/coronavirus_infections/en/)
- [Australian Department of Health – MERS coronavirus website \(http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-mers-cov.htm\)](http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-mers-cov.htm)
- [Centers for Disease Control and Prevention \(USA\) \(http://www.cdc.gov/coronavirus/mers/\)](http://www.cdc.gov/coronavirus/mers/)
- Australian Department of Foreign Affairs and Trade provides information for travellers on the [Smartraveller website \(www.smartraveller.gov.au/\)](http://www.smartraveller.gov.au/)

Appendix 2: PHU MERS-CoV checklist

Using the MERS-CoV Investigation form, contact the patient's doctor to:

- Confirm the onset date and symptoms of the illness
- Confirm results of relevant pathology tests, or recommend that tests be done
- Find out if the case or relevant care-giver has been told what the diagnosis is before beginning the interview
- Seek the doctor's permission to contact the case or relevant care-giver
- Review case management including infection control measures being used in caring for the case

Interview the case or care-giver to complete exposure and contact history and other details

- Complete the exposure history and other sections of the MERS-CoV Investigation Form.
- Identify close contacts according to the contact definition.

Follow-up patient's contacts to:

- Assess risk of MERS-CoV transmission and classify as close or casual contacts
- Determine current symptoms, if any, and advise on active daily monitoring of symptoms by public health unit (close contacts) or passive surveillance (casual contacts)
- Explain symptoms and need to immediately report any new symptoms
- Explain to healthcare, aged care, and childcare worker close contacts the need for work restrictions during the potential incubation period after exposure
- Explain to school student close contacts (or their carers) the need for exclusion during the potential incubation period after exposure
- Provide a MERS-CoV Disease Factsheet
- Arrange serological testing if available and appropriate.

Notify central jurisdictional communicable disease control agency

Central communicable disease control agency to notify Commonwealth Department of Health, Office of Health Protection

Consider need for media release and designate a media spokesperson.

Appendix 3: MERS-CoV Laboratory testing information

Samples suitable for testing

Respiratory samples - Upper respiratory tract

1. Nasopharyngeal swab and/or oropharyngeal swab
 - nasopharyngeal: insert a swab into each nostril parallel to the palate, leave the swab in place for a few seconds to absorb secretions
 - oropharyngeal: swab the tonsillar beds, avoiding the tongue
 - place swabs back into the accompanying transport media
2. Nasal wash/aspirates
 - collect 2-3 mL into a sterile, leak-proof, screw-top dry sterile container

Respiratory samples – Lower respiratory tract

1. Bronchoalveolar lavage, tracheal aspirate, pleural fluid
 - collect 2-3 mL into a sterile, leak-proof, screw-top sputum collection cup or dry sterile container
2. Sputum
 - patient should rinse his/her mouth with water before collection
 - expectorate deep cough sputum directly into a sterile, leak-proof, screw-top dry sterile container

There is now increasing evidence that lower respiratory tract specimens contain the highest viral loads, therefore, lower respiratory tract specimens should be collected where possible. Repeat testing (especially of lower respiratory tract specimens) in compatible cases should be performed if initial results are negative.

Serology

Serum should be collected during the acute phase of the illness (preferably within the first 7 days of symptom onset), stored, and tested in parallel with a convalescent serum collected 3 or more weeks after acute sample collection. If no acute sample was collected, a single serum sample collected 14 or more days after symptom onset may be tested.

Immunofluorescence and neutralization serology tests are used. Similar to NAT, a two stage approach using a screening followed by a confirmatory test can be employed. For screening purposes, an enzyme-immunosorbent assay (ELISA) against recombinant N protein can be used, followed by confirmatory testing using a whole virus indirect fluorescent antibody (IFA) test or microneutralization. Given that all serological tests developed so far have only been validated against a small number of convalescent sera from MERS-CoV cases, positive serological test results in the absence of nucleic acid testing (NAT) or sequencing are considered probable cases only.

Stool

2 – 5 grams of stool (formed or liquid) is collected in a sterile, leak-proof, screw-top dry sterile container.

Handling of specimens in the laboratory

Laboratory staff should handle specimens under PC2 conditions in accordance with AS/NZS 2243.3:2010 Safety in Laboratories Part 3: Microbiological Safety and Containment. Specimens should be transported in accordance with current regulatory requirements.

MERS-CoV testing

NAT using reverse-transcriptase polymerase chain reaction (RT-PCR) is the method of choice for detection of MERS-CoV. Currently, four targets are used for testing:-

- upstream region of the E protein (upE) gene
- open reading frames (ORF) 1a (ORF1a)
- ORF1b
- MERS-CoV specific nucleocapsid (N) protein gene

An algorithm using a screening assay, followed by confirmatory testing is recommended. For screening purposes, assays targeting the upE gene are appropriate. Confirmatory testing can be performed using an assay targeting the ORF1a (comparable sensitivity to upE gene), ORF1b (which is less sensitive than ORF1a or upE) or N gene. It is recommended that positive screening tests be reported to communicable diseases agencies whilst awaiting confirmatory testing.

Where available, RdRp gene (for the broad detection of β -coronavirus clade C) and/or N gene sequencing may also be considered for MERS-CoV confirmation. As the primers for the RdRp sequencing assay is highly conserved, it is not recommended that this assay be used alone for MERS-CoV confirmation, as false positive results may occur from cross-reactions with other β -coronaviruses. Further information about laboratory testing is available at:

- [Institute of Virology, Bonn](http://www.virology-bonn.de/index.php?id=40) (<http://www.virology-bonn.de/index.php?id=40>)
- [The US Food and Drug Administration](http://www.fda.gov/downloads/MedicalDevices/Safety/EmergencySituations/UCM355572.pdf) (<http://www.fda.gov/downloads/MedicalDevices/Safety/EmergencySituations/UCM355572.pdf>).

Testing algorithms may also need to be revised pending further information about the virus, and the number of specimens received in the laboratory for testing.

Viral culture is generally not performed for routine diagnosis, and should only be attempted in laboratories with appropriate experience and containment facilities. MERS-CoV replication has been previously observed on Vero and LLC-MK2 cells within 5 days of inoculation

Appendix 4: MERS-CoV Case Investigation Form

Note: This is an example form incorporating most of the fields contained in the NetEpi (database) form that has been prepared for national reporting. Central disease control agencies in individual jurisdictions should be consulted regarding their specific data collection requirements.

1	Interview	Was the person interviewed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable <hr/> - If Yes, date of interview: / / (dd/mm/yyyy) <hr/> - If No, specify reason not interviewed (and if someone else was interviewed):
2	Case status	<input type="checkbox"/> Confirmed <input type="checkbox"/> Probable <input type="checkbox"/> Suspected <input type="checkbox"/> Excluded <hr/> Notification date: / / <hr/> Received date: / / <hr/> Notifier:
3	Patient contact details	Family name: <hr/> Given names: <hr/> Residential address: <hr/> <hr/> Phone number (home): <hr/> Phone number (work): <hr/> Phone number (mobile): <hr/>
4	Address type	<input type="checkbox"/> Household <input type="checkbox"/> Aged-care facility <input type="checkbox"/> Educational Institution <input type="checkbox"/> Assisted <input type="checkbox"/> Military Barracks <input type="checkbox"/> Prison <input type="checkbox"/> Other <input type="checkbox"/> Unknown <hr/> If Other, please specify:
5	Gender	<input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Unknown
6	Date of birth	Date of birth: / / (dd/mm/yyyy)
7	Country of birth	Country of birth: <hr/> If not born in Australia, date of first arrival in Australia: / / (dd/mm/yyyy) <i>Note: if only year known, enter 01/01/[year]</i>
8	Indigenous Status	<input type="radio"/> Aboriginal origin <hr/> <input type="radio"/> Torres Strait Islander origin <hr/> <input type="radio"/> Both Aboriginal and Torres Strait Islander origin <hr/> <input type="radio"/> Not Aboriginal and Torres Strait Islander origin <hr/> <input type="radio"/> Not Stated / Unknown
9	Onset date of first symptoms	Did the person have symptoms? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <hr/> - If Yes, onset date: / / (dd/mm/yyyy)

		- Duration of symptoms:	(days)
10	Symptoms and clinical notes	Acute respiratory distress syndrome	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Arthralgia	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Conjunctivitis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Cough	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Diarrhoea	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Fatigue	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Fever	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		- Highest temperature:	(°Celsius)
		- Fever onset date:	/ / (dd/mm/yyyy)
		- Feverish by self-report?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Chills or rigors	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Headache	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Malaise	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Myalgia	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Nausea	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Pneumonia	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Pneumonitis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Rhinorrhoea	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Shortness of breath	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Sore throat	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Vomiting	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Other symptoms	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
			- If Yes, specify symptoms:
	Clinical notes:		
11	Hospitalisation and treatment details	Was the person hospitalised?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		- Name of hospital:	
		- Hospital phone number:	
		- Date admitted:	/ / (dd/mm/yyyy)
		- Date discharged:	/ / (dd/mm/yyyy)
		Admitted to ICU/HDU?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		- Number of days in ICU/HDU:	(days)
		Oxygen therapy required?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Intubation required?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
		Mechanical ventilation required?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown

Hospital medical record/chart number:		
12	Admitting doctor details	Is admitting doctor same as treating doctor? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown - If Yes, enter details in the Treating Doctor section below. - If No, record Admitting Doctor's name: - Phone number / pager
13	Outcome of illness	What was the outcome of the case? <input type="checkbox"/> Alive <input type="checkbox"/> Died - If Died, date of death: / / (dd/mm/yyyy) - Cause of death due to MERS-CoV infection? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown - If death due to other cause, specify:
14	Occupation (during period of interest)	During the period of interest, did the person work in any of the following high risk occupations (settings)? <input type="checkbox"/> Healthcare <input type="checkbox"/> Aged-care facility <input type="checkbox"/> Educational facility <input type="checkbox"/> Assisted Living <input type="checkbox"/> Military institution <input type="checkbox"/> Correctional facility <input type="checkbox"/> No high risk occupation <input type="checkbox"/> Other <input type="checkbox"/> Unknown - If Other, specify: - If No high risk occupation – Skip to next question Date last attended this work: / / (dd/mm/yyyy) Was the infection acquired in the workplace? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown Description of occupation: Employer/facility name Employer/facility street address Employer/facility suburb/ town Employer/facility state Employer/facility postcode Employer/facility phone number Employer/facility fax number Contact name Contact email address
15	Contact with a known or possible case (during period of interest)	Did the case have contact with a known or possible MERS-CoV case? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown - If Yes, specify: Date of last contact: / / (dd/mm/yyyy)
16	Treating Doctor details	Enter the Treating Doctor's details. Name: _____ Practice name (if any): _____ Street address: _____ Suburb / town: _____ State: _____ Postcode: _____ Phone number: _____ Fax number: _____ Email address: _____

		Case's medical record/chart number:				
17	Pre-existing conditions and medical history	Cardiac disease (not simple hypertension)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		Chronic lung disease	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		Diabetes	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		Haemoglobinopathy	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		Immunosuppressive condition	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		Liver disease	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		Metabolic disease	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		Neurological disorder	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		Obesity	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		Renal disease	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		- If Yes, are they on dialysis?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		Other medical condition?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown	
		- If Yes, specify:				
				Is the person currently pregnant or was she pregnant during the illness?		
				<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown		
				If Yes, number of weeks gestation at onset of symptoms: (weeks)		
				- Pre-existing medications and conditions notes:		
		Are they a current smoker? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown				
		If Yes, number of pack years: (pack/yr.)				
		- Do they drink alcohol? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown				
		If Yes, average number of standard drinks per week: (SD/week)				
18	Travel in the Middle East and contact with other cases * Check the current case definition for a list of affected countries.	During the period of interest, did the case travel to the Middle East? *				
		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown				
		<i>Note: Transiting through an international airport (<24 hours stay, remaining within the Airport) in the Middle East is not considered to be risk factor for infection.</i>				
		If NO → Proceed directly to Question 22: Human Exposures				
		Did they participate in any Pilgrimages or festivals whilst in the Middle East during the 14 days prior to onset? (e.g. the Hajj or Umrah)				
		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown				
		- If Yes, give details of what, when and where:				
19	Locations visited during incubation period (during period of interest)	During the period of interest, did they visit any of the following venues or locations in the Middle East*?				
		<input type="checkbox"/> Hospital	<input type="checkbox"/> Other health facility			
		<input type="checkbox"/> Farm	<input type="checkbox"/> Swamp marsh			
		<input type="checkbox"/> Zoo/petting zoo	<input type="checkbox"/> Camping			
		<input type="checkbox"/> Abattoir	<input type="checkbox"/> Hunting			

		<input type="checkbox"/> Animal market <input type="checkbox"/> River/lake	<input type="checkbox"/> Stockyards <input type="checkbox"/> Agricultural show
20	Animal exposures (during period of interest)	<p><i>Consider any contact with live or dead animals that they have had including visiting places where animals are kept, even if they didn't have direct contact with them.</i></p> <hr/> <p>Did they have contact with camels? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, specify:</p> <p>Did they have contact with domestic (including household pets) or wild animals? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, were any of these animals sick or dead? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>o If Yes, specify:</p> <hr/> <p>Were they aware of any other animal/excreta (e.g. bats, rodents, stray cats/dog, foxes, reptiles, etc.) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, specify:</p> <hr/> <p>Did they visit a market selling live animals? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, specify:</p> <hr/> <p>Did they visit any other venue at which live animals were present (e.g. farm, race course, zoo or falconry events)? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, specify:</p>	
21	Food exposures (during period of interest)	<p>During the period of interest, where did they normally get their food? (Specify kinds of food and locations)</p> <hr/> <p>Did they get their food from any other locations, or did they eat any new types of food? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, describe:</p> <hr/> <p>Have they eaten any foods or drunk any beverages that they think could have been unsafe or caused them to become ill? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, describe:</p> <hr/> <p>Did they eat any of the following:</p> <p>Camel meat, camel milk or camel urine? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>Raw fruits or vegetables? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>Uncooked meat or eggs <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>Raw/unpasteurised milk or milk products? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>Dried fruits or nuts <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <hr/> <p>Did they slaughter an animal or handle raw meat (e.g. in preparation for a meal or religious offering)? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, describe:</p> <hr/> <p>Did they take any traditional medicines or use any home remedies?</p> <p style="text-align: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p>	

		- If Yes, give details:
22	Human exposures <i>Contact with people who were ill during the period of interest</i> Note: not restricted to Middle East contacts	<p>During the period of interest, did they have contact with anyone who might have had a contagious illness while they were still sick? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, give details:</p> <hr/> <p>Have they had contact with persons who are in close contact with animals because of their work? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, give details:</p> <hr/> <p>Have they had contact with a person who had a respiratory illness/diarrhoea/vomiting? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, give details:</p> <hr/> <p>Did they visit or care for any sick person? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, give details:</p> <p>- If Yes, did they have any contact with the sick person's bodily fluids, such as urine, blood, sputum or faeces? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>o If Yes, give details:</p>
23	Healthcare and hospital presentation <i>These questions should be answered about healthcare and hospital presentation in the 14 days prior to onset</i> <i>Includes Australian and overseas presentations</i>	<p>Did the case present to hospital? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, date of presentation to hospital: / / (dd/mm/yyyy)</p> <p>- Was the hospital presentation for MERS related symptoms? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>o If No, give details of what, when and where:</p> <hr/> <p>Did the case visit any other healthcare facilities during the period of interest? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If Yes, give date of presentation: / / (dd/mm/yyyy)</p> <hr/> <p>Was the healthcare visit for MERS-CoV symptoms? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> <p>- If No, give details of what, when and where:</p>
24	Case Found by	<input type="checkbox"/> Clinical Presentation <input type="checkbox"/> Contact tracing/epidemiological investigation <input type="checkbox"/> Screening <input type="checkbox"/> Clinical and epidemiology <input type="checkbox"/> Other: Specify: