



Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

National Institute for Communicable Diseases (NICD) guidelines for Case-finding, diagnosis, management and public health response in South Africa

Compiled by the Centre for the Respiratory Diseases and Meningitis and Outbreak Response, Division of Public Health Surveillance and Response, National Institute for Communicable Diseases (NICD) of the National Health Laboratory Services (NHLS)

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Disclaimer: (wording to be finalised)

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Quick Reference Guide – MERS-CoV

Clinical and epidemiological criteria for Person Under Investigation (PUI) (Page 8):

Severe illness

Fever ($\geq 38^{\circ}\text{C}$) and cough with pneumonia or Acute Respiratory Distress Syndrome (ARDS) (based on clinical/radiological) **AND**

1. History of travel within 14 days before onset of illness to Arabian Peninsula or in countries where MERS-CoV is known to be circulating or where human infections have recently occurred OR
2. Close contact with a symptomatic traveller who developed fever and acute respiratory illness within 14 days after travelling from countries in or near the Arabian peninsula OR
3. A history of being in a healthcare facility, within 14 days before onset of illness, in the country where hospital-associated-MERS-CoV infections have been reported OR
4. The disease is in a cluster² of patients with severe acute respiratory illness of unknown aetiology that occurs within a 14-day period, without regard to place of residence or history of travel

Illness of any severity

A person with acute respiratory illness of any degree of severity **AND** within 14 days before onset of illness had any of the following exposure:

1. Close physical contact with a confirmed or probable case of MERS-CoV infection, while that patient was ill OR
2. Healthcare facility in a country where hospital-associated MERS-CoV infections have been reported

¹ Arabian Peninsula and neighbouring countries include: Iraq, Iran, Bahrain, Israel, the West Bank, and Gaza; Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, The United Arab Emirates (UAE) and Yemen. ² A “cluster” is defined as two or more persons with onset of symptoms within the same 14-day period, and who are associated with a specific setting, such as a classroom, workplace, household, extended family, hospital, other residential institution, or recreational camp

MERS-CoV case definitions: Page 8

A confirmed case of MERS-CoV: person with a laboratory confirmation of infection with the MERS-CoV

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

Infection control: Page 8-9

1. Early detection and triage is key
2. Isolate PUI
3. Use appropriate infection control
 - a. Add droplet precautions when providing care to patients with symptoms of acute respiratory infection;
 - b. Add airborne protection and eye protection when caring for probable or confirmed cases of MERS-CoV infection

Laboratory diagnosis and specimen collection for MERS-CoV – Page 10-12

- Collect appropriate samples- **collect all 3 specimen types** (lower respiratory, upper respiratory samples and serum) if possible
 - **Preferred:** Lower respiratory tract samples (sputum, bronchoalveolar lavage, bronchial aspirates)—have better yield
 - **Strongly recommended:** combined nasopharyngeal and oropharyngeal swab, nasopharyngeal aspirates, clotted blood/serum sample
- Use universal transport medium for swabs and aspirates; sterile container for sputum and aspirates; clotted blood container for serum
- Transport samples at 4°C
- Alert NICD Hotline +27 82 883 9920

Close contacts Page 7

1. Being within 2 meters/within the room or care area for a prolonged period of time (e.g., health personnel, household members) while not wearing recommended personal protective equipment (gloves, gowns, N95 mask, eye protection); or
2. Having direct contact with infectious secretions (e.g., exposure to respiratory droplets through coughing while not wearing recommended personal protective equipment)

Notification of cases and additional support: Page 18

Laboratory support: National Institute for Communicable Disease, Centre for Respiratory Diseases and Meningitis: **011 386 6390/ 011 386 6392**

- **NICD Hot line: +27 82 883 9920**

Public Health support and notification of cases: Notify the Provincial Communicable Diseases Control Officer, or the NICD Outbreak Response unit (**011-555-0542**) or outbreak@nicd.ac.za

Management of close contacts of PUI-Page 19

1. Identify close contacts as soon as possible
2. Monitor close contacts of a probable or confirmed case at home, for development of respiratory symptoms
3. Manage and investigate close contacts who develop respiratory symptoms within 14 days of contact as PUI.

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2 Introduction

This document outlines the procedure for identifying cases that should be considered for laboratory investigation for Middle East Respiratory Syndrome Coronavirus (MERS-CoV).

Middle East respiratory syndrome (MERS) is an emerging infectious disease caused by a recently identified respiratory virus, MERS coronavirus (MERS-CoV) which causes severe respiratory illness. It was first identified in September 2012 in a 60-year-old patient from Jeddah, Kingdom of Saudi Arabia who died from a severe respiratory infection in June 2012. It is important to consider this virus in the differential diagnosis of patients with pneumonia in order to identify possible cases early and to allow for implementation of appropriate infection control procedures and public health response. Healthcare providers should maintain awareness of the need to detect patients who should be evaluated for MERS.

3 Microbiology and epidemiology

This is a new strain of coronavirus that has not been previously identified in humans. Coronaviruses are a large family of viruses, some of which may cause respiratory infections in humans and animals. Such respiratory infections may range from mild upper respiratory tract illness to severe lower respiratory disease. Since September 2012, the World Health Organization (WHO) has been notified of a total of 1733 laboratory-confirmed cases of human infection with MERS-CoV, including 628 related deaths. To date all the cases reported from outside the Middle East have either had a recent travel history to the Middle East or could be linked to a chain of transmission originating from a case with a travel history to the Middle East. Of the countries that have reported cases, Saudi Arabia has reported the highest number of cases to date.

Although there is growing evidence that the dromedary camel is a host species for the MERS-CoV and that camels likely play an important role in the transmission to humans, the routes of direct and indirect transmission remain unknown. The majority of human cases reported to date have resulted from human-to-human transmission in health-care settings (health workers, close contacts of the cases who were visiting the health centres where cases were being cared for, and a number of patients in hospital). However, to date, there is no evidence of sustained human-to-human transmission.

4 Clinical presentation and management

The majority of cases of MERS-CoV have had acute, serious respiratory illness with fever, cough, shortness of breath, and breathing difficulties. A small number of cases were mild. There is no specific treatment for disease caused by MERS-CoV. However, many of the symptoms caused by this virus can be treated and therefore treatment should be based on the symptoms of the patient. Moreover, supportive care for infected persons can be highly effective.

5 Case definitions for MERS-CoV

5.1 Patients to be investigated for MERS-CoV

The diagnosis of MERS-CoV should be considered in certain circumstances, as risk factors are quite specific, testing for MERS-CoV is expensive, and the implications for infection control and occupational safety of health care workers are vast. Table 1 describes criteria for investigation of persons for MERS-CoV. A person who meets the criteria listed in Table 1, with both clinical features AND epidemiologic risk should be considered a Patient Under Investigation (PUI). Infection control measures described below should be implemented for all PUIs. Case definitions are a guide to whom should be tested. Where there is doubt about clinical presentation or history, cases should be discussed with the Centre for Respiratory Diseases and Meningitis, National Institute for Communicable Diseases (NICD) of the National Health Laboratory Service (NHLS), through the NICD Hot Line number **082 883 9920**. Clinicians should be alert to the possibility of atypical presentations in patients who are immunocompromised.

Close contacts:

- i. Being within 2 meters/within the room or care area for a prolonged period of time (e.g., health personnel, household members) while not wearing recommended personal protective equipment (gloves, gowns, N95 mask, eye protection); or
- ii. Having direct contact with infectious secretions (e.g., exposure to respiratory droplets through coughing) while not wearing recommended personal protective equipment (gown, gloves, eye protection, N95 mask). Data on close contacts is limited, currently brief interactions (walking by a person, are considered low risk and do not constitute close contact).

Table 1. Clinical and epidemiological risk criteria for investigation of persons for MERS-CoV (PUI)

Clinical features		Epidemiologic risk
<p>Severe illness Fever ($\geq 38^{\circ}\text{C}$) and cough with pneumonia or acute respiratory distress syndrome (ARDS) (based on clinical or radiologic evidence)</p>	AND	<ol style="list-style-type: none"> 1. History of travel within 14 days before onset of illness from Arabian Peninsula¹ or in countries where MERS-CoV is known to be circulating or where human infections have recently occurred OR 2. Close contact with a symptomatic traveller who developed fever and acute respiratory illness within 14 days after travelling from countries in or near the Arabian peninsula OR 3. A history of being in a healthcare facility, within 14 days before onset of illness, in the country where recent healthcare -associated-MERS-CoV infections have been reported OR 4. The disease is in a cluster² of patients with severe acute respiratory illness of unknown aetiology that occurs within a 14 day period, without regard to place of residence or history of travel.
<p>Illness of any severity A person with acute respiratory illness of any degree of severity</p>	AND	<p>within 14 days before onset of illness, had any of the following exposure:</p> <ol style="list-style-type: none"> 1. Close physical contact with a confirmed or probable case of MERS-CoV infection, while that patient was ill OR 2. A healthcare facility in a country where hospital-associated MERS-CoV infections have been reported e.g. Saudi Arabia.

¹Arabian Peninsula and neighbouring countries include: Iraq, Iran, Bahrain, Israel, the West Bank, and Gaza; Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, The United Arab Emirates (UAE) and Yemen.

²A "cluster" is defined as two or more persons with onset of symptoms within the same 14 day 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.

A confirmed case: is a person with a laboratory confirmation (see laboratory diagnosis, section 7 below) of infection with the MERS-CoV.

A probable case: is a PUI with absent or inconclusive results for MERS-CoV infection who is a close contact of a laboratory-confirmed case. Examples of inconclusive laboratory results are a negative test on an inadequate specimen (e.g., a nasopharyngeal without an accompanying lower respiratory sample or sample taken too late in the course of illness) or a positive test on a single PCR target or a positive test with an assay that has limited performance data available.

6 Infection control

Nosocomial transmission has been a hallmark of MERS. Early detection and prompt triage and isolation of patients who should be evaluated for MERS-CoV are essential to ensuring effective implementation of infection control measures. Health care providers are advised that appropriate infection-control measures should be used while managing all patients with symptoms of acute respiratory infection and whenever specimens are collected from patients under investigation, the appropriate infection control guidelines should be followed.

- Droplet precautions should be added to the standard precautions when providing care to patients with symptoms of acute respiratory infection;
- Airborne protections and eye protection should be added when caring for probable or confirmed cases of MERS-CoV infection.
- All healthcare workers who collect specimens from patients suspected or confirmed to be infected with MERS-CoV must wear protective equipment (PPE)

The WHO Infection prevention and control during health care for probable or confirmed cases of Middle East respiratory syndrome coronavirus (MERS-CoV) infection (2015) document can be accessed for additional information.

http://apps.who.int/iris/bitstream/10665/174652/1/WHO_MERS_IPC_15.1_eng.pdf?ua=1

Additional precautions to be used during aerosol-generating procedures include:

- minimising respirator face-seal leakage to fully protect the worker from exposure to aerosolized infectious droplets when using particulate respirators e.g. N95 mask
- eye protection (goggles) to protect the eyes from respiratory splash or spray
- contact protection (non-sterile, long-sleeved gown and gloves).

Minimize chance for exposures in health care facilities

- 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
- Ensure rapid triage and isolation of patients who might have MERS-CoV infection.
- Immediately isolate those identified as at risk for having MERS-CoV infection,
 - Implement respiratory hygiene and cough etiquette by placing a facemask over the patient's nose and mouth especially those who are coughing and sneezing
 - If possible, isolate those at risk for MERS-CoV infection in an Airborne Infection Isolation Room (AIIR). If an AIIR is not available, consider transferring the patient 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. Only essential personnel should enter the isolation room.
- Persons who are under investigation for MERS-CoV should have chest radiography performed at the bedside, and SHOULD NOT go to the radiology department for diagnostic procedures.

6.1 Management of Patients Under Investigation (PUI)

6.1.1 Diagnostic work-up

- From the moment that MERS-CoV is considered as a diagnostic possibility, patients under investigation should be isolated, and infection control measures as described above should be implemented.
- Patients under investigation should undergo routinely available laboratory tests as clinically indicated according to local management guidelines for community-acquired pneumonia to determine the presence of other potential primary aetiologies of pneumonia (e.g *Streptococcus pneumoniae*, *Haemophilus influenzae* serotype b, *Mycoplasma pneumoniae*, *Legionella pneumophila*, *Mycobacterium tuberculosis* and respiratory viruses including influenza, and respiratory syncytial virus (RSV)). These investigations include at least the following
 - Full blood count
 - Blood cultures
 - Lower respiratory specimens, nasopharyngeal swabs or aspirates and oropharyngeal swabs for detection of viral and atypical pathogens
 - Chest radiography
 - Sputum for *Mycobacterium tuberculosis* microscopy, and/or molecular detection
- Before collecting and handling specimens for MERS CoV testing, confirm whether patient meets case definition for PUI described in section 5.1 above Testing for other respiratory pathogens should not delay MERS testing. Clinicians do not have to wait for all test results for other pathogens to be available before testing for MERS- CoV.
- In addition, patients with a clear history and clinical presentation consistent with chemical pneumonitis or smoke inhalation should not be considered as a patient under investigation.

6.2 Type of samples to be submitted and specimen transport

Collection of all three specimen types (lower respiratory, upper respiratory and serum) for testing for MERS CoV is recommended depending on timing of specimen collection (length of time from onset of symptoms to specimen collection). Different types of respiratory samples (sputum (expectorated/induced), nasopharyngeal aspirate, combined nasopharyngeal (NP) and oropharyngeal (OP) swabs, bronchoalveolar lavage) and blood may be collected for MERS-CoV testing (see table 2), however lower respiratory tract samples (sputum (induced or non-induced), endotracheal aspirates and bronchoalveolar lavage) are preferred because they contain the highest viral loads [1-4] and therefore have a better yield. Dipeptidyl peptidase 4 (DPP4), which is expressed on non-ciliated bronchial epithelial cells has been identified as the cellular receptor for MERS- CoV [5].

Nasopharyngeal and oropharyngeal swabs are also useful in detecting MERS-CoV, however a nasopharyngeal (NP) swab has to be collected from the nasopharynx and not from the nostril (See appendix on how to collect NPS sample). MERS-CoV nucleic acid has also been detected by real time reverse-transcription polymerase chain reaction (RT-PCR) in serum [6]. Mers CoV has also been detected in urine and faeces, but levels are lower than those found in lower respiratory tract[1].

Table 2 lists the type of specimens that can be collected for testing for MERS CoV in symptomatic cases and asymptomatic contacts.

Timing of specimen collection

Respiratory specimens should be collected as soon as possible after onset of symptoms, ideally within 7 days. If a patient presents > 7 days from symptom onset and is still symptomatic, respiratory samples, especially lower respiratory samples, should still be collected. For an example if symptoms onset for PUI with respiratory symptoms was within 14 days, a single serum/ clotted blood specimen, a combined OP and NP and a lower respiratory specimen should be collected for PCR testing. In RT-PCR MERS-CoV negative cases with high index of suspicion, repeat sequential sampling for RT-PCR testing is encouraged. It is also important to collect sequential samples from confirmed MERS-CoV positive cases. This will guide decision making about infection control and prevention of nosocomial transmission. In order to confirm clearance of the virus, respiratory samples should be collected until there are two consecutive negative results in clinically recovered persons. The frequency of specimen collection should be at least every 2-4 days. Serum samples (sequential, paired or single) for serological testing will contribute to understanding the natural history of the disease however this test is only done by reference laboratories in Europe and thus not available for disease diagnosis at NICD.

Patients should be managed as potentially infected when the clinical and epidemiological clues strongly suggest MERS-CoV, even if an initial test is negative.

Table 2. Type of specimens that can be collected for MERS-CoV diagnostics and the transport requirements of these specimens

Patient	Timing	Specimen type and test	Collection conditions	Storage and transportation	Dangerous goods shipping category	Comment
Symptomatic	On presentation	Naturally produced sputum* RT-PCR	Deep cough sputum in sterile leak proof container	Refrigerate at 2-8 °C up to 72 hrs., if >72hrs freeze at -70°C and ship on dry ice	Biological substance, Category B	The preferred sample but need to ensure the material is from the lower respiratory tract
		Bronchoalveolar lavage, RT-PCR	2-3 mls in sterile leak proof container	Refrigerate at 2-8 °C up to 72 hrs., if >72hrs freeze at -70°C and ship on dry ice	As above	There may be some dilution of virus but still a worthwhile specimen
		Tracheal aspirate, RT-PCR	2-3 mls in sterile leak proof container	Refrigerate at 2-8 °C up to 72 hrs., if >72hrs freeze at -70°C and ship on dry ice	As above	
		Pleural fluid, RT-PCR	2-3 mls in sterile leak proof container	Refrigerate at 2-8 °C up to 72 hrs., if >72hrs freeze at -70°C and ship on dry ice	As above	
		Nasopharyngeal aspirate, RT-PCR	Sterile leak proof container/ Universal Transport Medium	Refrigerate at 2-8 °C up to 72 hrs., if >72hrs freeze at -70°C and ship on dry ice	As above	
		Combined nasopharyngeal and oropharyngeal swab, RT-PCR	Universal Transport Medium	Refrigerate at 2-8 °C up to 72 hrs., if >72hrs freeze at -70°C and ship on dry ice	As above	Virus has been detected in this type of specimen but false negatives can occur
		Clotted blood or serum, RT-PCR	5-10mlsml** serum/ clotted	Store upright for 30 minutes Refrigerate	As above	A single serum/ clotted blood specimen collected during the

			tube	clotted blood/serum at 2-8 °C and ship on ice pack. Can freeze and ship on dry ice		1 st 10-12 days after symptom onset is recommended for PCR testing
Asymptomatic contact (particularly in health care associated outbreaks or other situations of high intensity contact)	Within 14 days of last documented contact	Nasopharyngeal and oropharyngeal swabs, sputum if possible, RT-PCR	Universal Transport Medium	Refrigerate at 2-8 °C up to 72 hrs., if >72hrs freeze at -70°C and ship on dry ice		

* The collection of induced sputum samples may pose an additional infection risk for health care workers. ** Children and adults: collect 1 tube (5-10mL) of clotted blood. Infant: a minimum of 1mL in a clotted tube. RT-PCR= Reverse transcription polymerase chain reaction

6.2.1 Procedures for submission of specimens for investigation

Step 1: Report the suspected case to the NICD to allow a risk assessment to be carried out and guide laboratory testing

- Contact the NICD Hotline +27 82 883 9920
- The test will be free of charge for patients meeting the case definitions above

Step 2: Complete the case investigation form

Fully complete the case investigation form [MERS-CoV investigation form June2016](#)

Step 3: Submit specimens for specialized laboratory investigation

- The specimens should be stored and shipped at temperatures indicated above. Specimens should be packaged in accordance with the guidelines for the transport of dangerous biological goods (triple packaging using absorbent material and transported directly and urgently to:
Oriënka Hellferscee/ Florette Treurnicht
National Institute for Communicable Diseases (NICD)
Centre for Respiratory Diseases and Meningitis (Virology Laboratory)
SAVP Building – North Block Upper Level
1 Modderfontein Rd
Sandringham, 2131
- See next section for transport requirements
- Ensure that the completed case investigation form accompanies the specimens
- Avoid repeated freezing and thawing of specimens

Packaging of specimens for transfer to NICD

The principle of triple layer packaging should be followed.

UN/WHO approved shipping containers for hazardous specimens are commercially available, e.g. SAF-T-PAK® (www.saftpak.com) or PATHOPAK® (www.intelsius.com).

It is required that designated staff members per site are trained by approved provider in the packaging and transport of dangerous goods. The International Air Transport Association (IATA) or WHO websites may be consulted for international regulations and guidelines in this regard.

Primary specimen containers (properly labelled) should be wrapped in sufficient absorbent material (paper towels or tissues) to absorb the entire contents in the event of leakage.

The wrapped primary containers must be placed in durable, leak-proof **secondary containers** such as several layers of sealed plastic bags or, preferably, rigid screw-cap metal, plastic or similar containers (suitable containers are usually available from hospital dispensaries). The secondary container should be taped closed to prevent leakage.

The secondary containers and data forms, sealed separately in plastic, must then be placed in a **rigid outer (tertiary) container** such as a fibre carton or polystyrene cold box with cold packs.

The outer wrapping should be addressed to the above mentioned address at the NICD
The parcel should bear appropriate outer warning that it contains biohazardous material.

If transported by air, IATA regulations must be followed and appropriate labelling applied (refer to www.iata.org). In addition to completing an ordinary air waybill for parcels sent by air, it is necessary to complete a shipper's declaration for dangerous goods (refer to www.iata.org or your courier company).

Transporting samples to NICD

- Private pathology laboratories:
 - As per internal institutional arrangement
- National Health Laboratory Service (NHLS)- follow procedures below:

NHLS: PROTOCOL TRANSPORTING SPECIMENS VIA COURIER

STEP 1: CONTACT THE COURIER COMPANY

- Contact World Couriers at: jnbops@worldcourier.co.za or +27 11 394 3880 / 083 700 4511 (after hours) and arrange the pickup.
- If sending request via email, use "Transport of **Mers-CoV** Category A consignment to NICD" in the subject line and copy florettet@nicd.ac.za / orienkah@nicd.ac.za.
- State the following account number when arranging for the pickup: **10468**

STEP 2: RECEIVE CATEGORY B PACKAGING MATERIAL

- World Couriers will supply the appropriate Category B packaging material when picking up the consignment (the packaging material needn't be pre-delivered)

STEP 3: PACK THE CONSIGNMENT

- See section on packaging

STEP 4: COURIER TAKES CUSTODY OF THE CONSIGNMENT AND DELIVER TO NICD

- Specimens are delivered to the NICD Specimen Reception Office during office hours. **For after-hours** deliveries the specimens are deposited in a designated facility at the NICD Specimen Reception Office as directed by security staff at the main gate of the NICD Campus. It is recommended that the laboratory is forewarned of such deliveries by calling **011 386 6390/ 011 386 6392 or 27 82 883 9920**.

7 Laboratory diagnosis

Routine confirmation of cases of MERS-CoV infection is based on detection of unique sequences of virus RNA by real-time reverse-transcription polymerase chain reaction (rRT-PCR) with confirmation by using alternate gene segments for confirmatory testing by rRT-PCR [7]

The National Institute for Communicable Diseases offers testing for MERS using the recommended WHO rRT-PCR assay. The protocol for testing is based on a method described by Drosten et al., 2013 (1). The assay for the UpE target (E protein gene) is considered highly sensitive, and is used as a screening PCR [1].

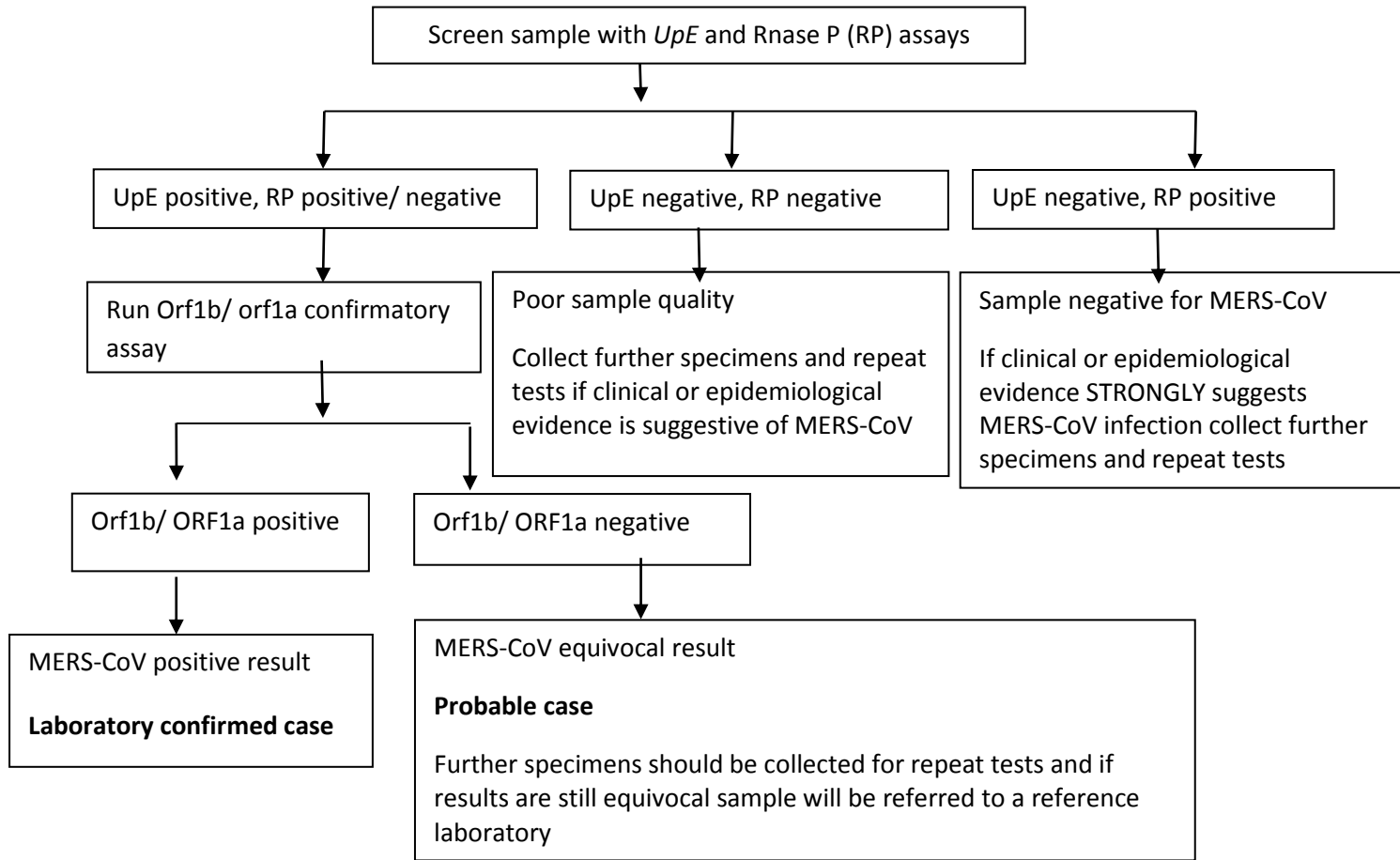
If a sample tests positive for Mers-CoV for the UpE target PCR assay, repeat testing will be done on the same extracted material using Orfb1 primers and probes if the sample is positive using these primer/probe sets, it confirms it is a true positive sample. Follow-up specimens for testing may be requested for further confirmation of positive results. A series of negative results does not absolutely rule out the possibility of a MERS-CoV infection. A number of factors could lead to a false negative result including:

- Poor specimen quality
- The specimen was collected late or very early in the illness
- The specimen was not handled and shipped appropriately, e.g., the cold chain of specimens was not properly maintained throughout the process i.e. from the point of collection up until receipt and processing
- Technical reasons inherent in the test, e.g., virus mutation or PCR inhibition.

If negative results are obtained from patients with a high index of suspicion for MERS-CoV infection, especially when only upper respiratory tract samples were collected, additional specimens, including lower respiratory samples should be collected and tested.

For a case to be positive, one of the following should apply:

- A positive RT-PCR result for MERS-CoV UpE and Orf1b or Orf1a gene targets using a validated assay, OR
- A positive RT-PCR result for ONLY one MERS-CoV gene target and MERS-CoV sequence confirmation from another viral gene target [8].



Rnase P gene target is used as human “housekeeping gene” to determine sample integrity or quality

Figure1: Algorithm for screening samples for MERS CoV by real-time reverse transcriptase PCR

8 Public health response

The detection of a case of MERS-CoV constitutes a public health emergency and a risk to the safety of the patient, their contacts including health care workers, and more broadly, the wellbeing of the broader South African community. Even at the time the decision is made to test a patient for MERS-CoV, consideration must be made of the public health response.

8.1 Notification of infection control staff and public health authorities

At the point of consideration of the diagnosis of MERS-CoV:

- The infection control team of the hospital/facility should be notified, and requested to assist with appropriate isolation of the patient considering possible airborne transmission of MERS-Cov
- The NICD Hotline should be called, and arrangements made to submit a specimen for MERS-CoV testing
- A full travel history including date of onset of symptoms, travel itinerary, movement within South Africa, and nature of exposures to persons should be established, in the event of the test being positive.

8.2 Management of case contacts

- Any person who has had close contact with a probable or confirmed case while the probable or confirmed case was ill should be carefully monitored (at home) for the appearance of respiratory symptoms.
- If symptoms develop within the first 14 days following the contact, the individual should be considered a “Patient Under Investigation” regardless of the severity of illness and investigated accordingly.
- Close contacts who are ill and do not require hospitalization for medical reasons may be cared for and isolated in their home while being evaluated for MERS-CoV infection. (Isolation is defined as the separation or restriction of activities of an ill person with a contagious disease from those who are well).

8.3 Steps to take when close contacts or cases (PUI) die

- All attempts should be made to confirm the diagnosis in persons who are close contacts who die. Post mortem nasopharyngeal swabs, and if possible, bronchial washings may be taken.
- If laboratory data, including histopathological examination of fatal cases, cannot be obtained because the patient has died before specimens are taken, clinical specimens cannot otherwise be obtained, or appropriate laboratory testing for other pathogens is not available, then the patient may meet criteria for “Probable Case” as defined above.

9 Additional Resources

Additional information on MERS-CoV can be accessed at the following websites:

1. WHO website: http://www.who.int/csr/disease/coronavirus_infections/en/

2. NICD website: <http://www.nicd.ac.za>
3. WHO website: http://www.who.int/csr/resources/publications/WHO_CDS_EPR_2007_6c.pdf
4. http://apps.who.int/iris/bitstream/10665/174652/1/WHO_MERS_IPC_15.1_eng.pdf?ua=1
5. DROSTEN, C., SEILMAIER, M., CORMAN, V. M., HARTMANN, W., SCHEIBLE, G., SACK, S., GUGGEMOS, W., KALLIES, R., MUTH, D., JUNGLEN, S., MULLER, M. A., HAAS, W., GUBERINA, H., ROHNISCH, T., SCHMID-WENDTNER, M., ALDABBAGH, S., DITTMER, U., GOLD, H., GRAF, P., BONIN, F., RAMBAUT, A. & WENDTNER, C. M. 2013. Clinical features and virological analysis of a case of Middle East respiratory syndrome coronavirus infection. *Lancet Infect Dis*, 13, 745-51.
6. The IATA of WHO websites may be consulted for international regulations and guidelines in this regard. International Air Transport Association. Dangerous Goods Regulations. <http://www.iata.org/publications/dgr/Pages/index.aspx>, Accessed on 8 August 2014.
7. World Health Organization. Guidance on the regulations for the transportation of dangerous goods, 2013-2014. WHO/HSE/GCR/2012.12, Geneva, Switzerland. http://www.who.int/ihr/publications/who_hse_ihr_2012.12/en/, Accessed on 8 August 2014.

10 Appendix 1: Collection of nasopharyngeal swab and aspirate

Type of swabs

Flocked nasopharyngeal and oropharyngeal swabs with perforated, flexible plastic shafts (Figure 2) should be used (if available) for collection of nasopharyngeal specimens. There is evidence to suggest some benefit to using flocked swabs for recovery of pathogens over other types. An appropriate size of the nasopharyngeal swab should be used, paediatric swab for children and adult swab for older children and adults. Swabs with wooden shafts should preferably not be used as absorbency make it difficult to retrieve all the sample.

Collecting nasopharyngeal swab

- Gently insert nasal flocked swab into the nostril aiming backwards, along the floor of the nasal cavity, until the nasopharynx is reached. Be careful not to insert swab upwards. If resistance is encountered during insertion of the swab, remove it and try the other nostril. The distance from the nose to the ear gives an estimate of the distance the swab should be inserted
- Gently rotate the swab and hold in place for a few seconds
- Slowly withdraw swab
- Unscrew and remove the cap from the tube with transport medium.
- Insert the swab directly into a vial containing transport medium
- Break plastic shaft at the break point so that it can fit in the universal transport medium tube
- Close the tube with the lid
- Refrigerate at 2-8 °C

Nasopharyngeal aspirates

- Fill syringe with 2-3mls saline; attach catheter tubing to syringe tip
- Slowly insert the catheter into one nostril until the pharyngeal wall is reached.
- Quickly inject saline into nostril and then aspirate the recoverable nasopharyngeal specimen.
- Withdraw the catheter under suction, being careful not to touch the tip.
- Inject the aspirated fluid into a labelled sterile specimen container/ universal transport medium.
- Refrigerate at 2-8 °C



Figure 2 : Flocked swab and Universal Transport Medium

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