

# Infection prevention and control during health care for probable or confirmed cases of Middle East respiratory syndrome coronavirus (MERS-CoV) infection

## Interim guidance

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## Background

WHO has updated the interim guidance that was published on 6 May 2013 to meet the urgent need for up-to-date information and evidence-based recommendations for the safe care of patients with probable or confirmed Middle East respiratory syndrome coronavirus (MERS-CoV) infection. The interim recommendations are informed by evidence-based guidelines WHO has published, including the *Infection prevention and control of epidemic- and pandemic-prone acute respiratory infections in health care. WHO Guidelines*<sup>1</sup> and review of current evidence on MERS-CoV infection. The recommendations have been reviewed by experts in infection prevention and control (IPC) and other technical areas (see Acknowledgements for names and affiliations).

This guidance reflects current understanding of MERS-CoV<sup>2</sup> related to IPC and uses revised case definitions<sup>3</sup>. The guidance is intended for health-care workers (HCWs), health-care managers, and IPC teams. Specific WHO guidance on clinical management has also been published<sup>4</sup>. WHO continues to monitor the situation closely for any changes that may affect the this interim guidance. Should any factors change, WHO will issue a further update. Otherwise, this interim guidance document will expire 12 months after the date of publication. Links are given here to additional sources and evidence. If you have further questions, send an e-mail message to: [outbreak@who.int](mailto:outbreak@who.int) with "MERS IPC question" in the subject line.

MERS-CoV is a zoonotic virus, with evidence to date indicating that camels are the source of infection to humans. Human-to-human transmission occurs mostly in health-care settings and, to a much limited extent, within communities, mainly within households. There is no clear evidence of sustained, human-to-human transmission. Close contact is needed for transmission and different modes such as droplet and contact transmission are possible. Further studies are required to better understand the risk factors for animal-to-human and human-to-human transmissions.

The successful prevention of amplification of MERS-CoV infections associated with health care depends on the full implementation of the core components of IPC programmes<sup>5</sup>. Most transmissions occur in the absence of basic IPC precautions and before a specific case is suspected or confirmed; hence, the routine application of measures to prevent spread of acute respiratory infections (ARI)<sup>1</sup> when caring for symptomatic patients is essential to reduce spread of any ARI in health-care settings. Additional precautions when caring for patients with probable or confirmed infection with MERS-CoV (see section 2.4 in this publication) should be applied to further reduce the risk of

transmission. Health-care institutions are advised to consider reinforcing a service for the oversight of HCWs' health to ensure a safe environment for patients and HCWs. It is crucial that HCWs are provided with the best locally available protection for caring for MERS-CoV-infected patients and are followed up if exposure has occurred.

This guidance summarizes:

- Principles of IPC strategies associated with health care
- IPC precautions:
  - for providing care to all patients
  - for providing care to ARI patients, and
  - for providing care to patients with probable or confirmed MERS-CoV infection.

## 1. Principles of infection prevention and control strategies associated with health care

Preventing or limiting infection transmission in health-care settings requires the application of procedures and protocols referred to as "controls". These have been organized hierarchically in accordance with their IPC effectiveness, and include the following: administrative controls, environmental and engineering controls, and personal protective equipment (PPE).

**Administrative controls.** These are the first priority of IPC strategies. They provide the infrastructure of policies and procedures to prevent, detect early, and control transmission of infections during health care. To be effective, IPC measures must anticipate the flow of patients (and thus the potential risks) from the first point of encounter until discharge from the facility.

Clinical triage is an important such measure and is used for rapid identification and appropriate care of patients with ARI including those with suspected MERS-CoV infection. Identified ARI patients should be placed in an area separate from other patients, and additional IPC precautions promptly implemented (see section 2.2). Clinical and epidemiological aspects of the cases should be evaluated as soon as possible (see WHO recommendations<sup>6</sup>) and should be complemented by laboratory evaluation.

Other administrative controls and policies that apply to ARI include establishment of sustainable IPC infrastructures and activities; education of HCWs; prevention of overcrowding in waiting areas; providing dedicated waiting areas for the ill and placement of hospitalized patients; organization of health-care services for adequate provision and use of supplies; policies and procedures for all facets of occupational health, with emphasis on surveillance of ARIs among HCWs and the importance of seeking medical care;

and monitoring of HCW compliance, along with mechanisms for improvement as needed.

**Environmental and engineering controls.** These include basic health-care facility infrastructures<sup>7</sup>. These controls address ensuring adequate environmental ventilation<sup>8</sup> in all areas within a health-care facility, as well as adequate environmental cleaning. Spatial separation of at least 1m should be maintained between each ARI patient and others, including HCWs (when not using PPE). Both controls can help reduce the spread of many pathogens during health care<sup>9</sup>.

**Personal protective equipment.** Rational and consistent use of available PPE and appropriate hand hygiene<sup>10</sup> also help reduce the spread of infection. Although use of PPE is the most visible control used to prevent transmission, it is the last and weakest in the hierarchy of IPC measures and should not be relied upon as a primary prevention strategy. In the absence of effective administrative and engineering controls, PPE has limited benefit.

## 2. Infection prevention and control precautions

### 2.1 Standard Precautions

Standard Precautions<sup>11</sup>, a cornerstone for providing safe health care, reducing the risk of further infection and protecting HCWs, should always be applied in all health-care settings for all patients. Standard Precautions include hand hygiene and use of relevant PPE depending on risk of direct contact with patients' blood, body fluids, secretions (including respiratory secretions) and non-intact skin. Standard Precautions also include: prevention of needle-stick or sharps injury; safe waste management; cleaning, disinfection and, where applicable, sterilization of patient-care equipment and linen, and cleaning and disinfection of the environment. Use of respiratory hygiene in anyone with respiratory symptoms should be encouraged.

HCWs should apply "My 5 moments for hand hygiene": before touching a patient; before any clean or aseptic procedure; after body fluid exposure risk; after touching a patient; and after touching a patient's surroundings, including contaminated items or surfaces.

- Hand hygiene includes either washing hands with soap and water or the use of an alcohol-based hand rub.
- Wash hands with soap and water when they are visibly soiled.
- The use of PPE does not eliminate the need for hand hygiene. Hand hygiene is also necessary while putting on and especially when taking off PPE.<sup>12</sup>

The use of PPE should be guided by a risk assessment concerning anticipated contact with blood, body fluids, secretions and non-intact skin for routine patient care. When there is a risk of contamination of the face and/or body, PPE should include the use of:

- facial protection by means of either a medical mask<sup>13</sup> and eye-visor or goggles; or a face shield;
- a gown; and
- clean gloves.

HCWs should refrain from touching their eyes, nose or mouth with potentially contaminated gloved or ungloved hands.

Ensure that cleaning and disinfection procedures are followed consistently and correctly. Cleaning environmental surfaces with water and detergent and applying commonly used disinfectants (such as hypochlorite) is an effective and sufficient procedure. Manage laundry, food service utensils and medical waste in accordance with safe routine procedures.

### 2.2. Additional infection prevention and control precautions when caring for patients with acute respiratory infection (ARI)

In addition to Standard Precautions, all individuals, including visitors and HCWs, in contact with patients with ARI should:

- use a medical mask when in close contact (i.e. within approximately 1m) and upon entering the room or cubicle of the patient;
- perform hand hygiene before and after touching the patient and his or her surroundings and immediately after removal of a medical mask.

The detailed precautions are described in published WHO guidelines<sup>1</sup> and should be applied when providing care to patients with ARI.

### 2.3. Infection prevention and control precautions for aerosol-generating procedures

An aerosol-generating procedure is defined as any medical procedure that can induce the production of aerosols of various sizes, including small (< 5 µm) particles. Current evidence, the best of which comes from studies of the severe acute respiratory syndrome coronavirus (SARS-CoV), suggests a consistent association between pathogen transmission and tracheal intubation.<sup>14</sup> In addition, a few studies have reported an increased risk of SARS-CoV infection associated with tracheotomy, non-invasive ventilation and manual ventilation before intubation. However, because these findings were identified from only a few studies of very low quality, interpretation and practical application are difficult. No other procedures were found to be significantly associated with any increased risk of ARI transmission.

Additional precautions should be observed when performing aerosol-generating procedures, which may be associated with an increased risk of infection transmission, in particular tracheal intubation.

Additional precautions when performing aerosol-generating procedures include:

- using a particulate respirator<sup>15</sup>; when putting on a disposable particulate respirator, always check the seal<sup>16</sup>;
- using eye protection (i.e. goggles or a face shield);
- using a clean, non-sterile, long-sleeved gown and gloves (some of these procedures require sterile gloves);
- using a fluid resistant apron for some procedures with expected high fluid volumes that might penetrate the gown;
- performing procedures in an adequately ventilated room; i.e. at least 6 to 12 air changes per hour in facilities with a mechanically ventilated room and at least 60 litres/second per patient in facilities with natural ventilation<sup>8</sup>;

- limiting the number of persons present in the room to the absolute minimum required for the patient's care and support; and
- performing hand hygiene before and after contact with the patient and his or her surroundings and after PPE removal.

#### 2.4. Infection prevention and control precautions when caring for patients with probable or confirmed MERS-CoV infection

Place patients with probable or confirmed MERS-CoV infection in adequately ventilated single rooms or 'Airborne Precaution' rooms; if possible, situate the single rooms used for barrier nursing in an area that is clearly segregated from other patient-care areas. When single rooms are not available, place confirmed patients together and separate them from probable patients. If this is not possible, place patient beds at least 1 m apart.

Limit the number of HCWs, family members and visitors in contact with a patient with probable or confirmed MERS-CoV infection.

- To the extent possible, assign probable or confirmed cases to be cared for exclusively by a specified group of skilled HCWs both for continuity of care and to reduce opportunities for inadvertent infection control breaches that could result in unprotected exposure.
- Family members and visitors who may come into contact with a patient should be limited to those essential for patient support and should be trained on the risk of transmission and on the use of the same infection control precautions as HCWs who are providing routine care. This is especially important in settings where hospitalized patients are often cared for by family members.

In addition to Standard Precautions, all individuals, including visitors and HCWs, when in close contact (within 1 m) or upon entering the room or cubicle of patients with probable or confirmed MERS-CoV infection should always:

- use a medical mask<sup>14</sup>;
- use eye protection (i.e. goggles or a face shield);
- use a clean, non-sterile, long-sleeved gown;
- use gloves (some procedures may require sterile gloves);
- perform hand hygiene before and after contact with the patient and his or her surroundings and immediately after removal of PPE.

If possible, use either disposable equipment or dedicated equipment (e.g. stethoscopes, blood pressure cuffs and thermometers). If equipment needs to be shared among patients, clean and disinfect it after each patient use. HCWs should refrain from touching their eyes, nose or mouth with potentially contaminated gloved or ungloved hands.

In addition, for patients with probable or confirmed MERS-CoV infection:

- Avoid the movement and transport of patients out of the barrier nursing room or area unless medically necessary. The use of designated portable X-ray equipment and other important diagnostic equipment may make this easier. If transport is required, use routes of transport that minimize exposures of staff, other patients and visitors.

- Notify the receiving area of the patient's diagnosis and necessary precautions as soon as possible before the patient's arrival.
- Clean and disinfect patient-contact surfaces (e.g. bed) after use<sup>17</sup>.
- Ensure that HCWs who are transporting patients wear appropriate PPE and perform hand hygiene afterwards.

#### 2.5. Duration of barrier nursing precautions for MERS-CoV infection

The duration of infectivity for MERS-CoV infection is unknown. While Standard Precautions should always be applied, additional barrier nursing precautions should be used for the duration of symptomatic illness<sup>21</sup> and continued for 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 for viral shedding should assist decision-making when readily available. Patient information (e.g. age, immune status and medication) should also be considered in situations where there is concern that a patient may be shedding the virus for a prolonged period.

#### 2.6. Collection and handling of laboratory specimens from patients with ARIs of potential concern

All specimens collected for laboratory investigations should be regarded as potentially infectious, and HCWs who collect or transport clinical specimens should adhere rigorously to Standard Precautions to minimize the possibility of exposure to pathogens.

- Ensure that HCWs who collect specimens use appropriate PPE.
- Ensure that personnel who transport specimens are trained in safe handling practices and spill decontamination procedures.
- Place specimens for transport in leak-proof specimen bags (secondary container) that have a separate sealable pocket for the specimen (i.e. a plastic biohazard specimen bag), with the patient's label on the specimen container (primary container), and a clearly written request form.
- Ensure that health-care facility laboratories adhere to appropriate biosafety practices and transport requirements according to the type of organism being handled.
- Deliver all specimens by hand whenever possible. Do not use pneumatic-tube systems to transport specimens.
- State the name of the (suspected) ARI of potential concern clearly on the accompanying request form. Notify the laboratory as soon as possible that the specimen is being transported.

For further information on specimen handling in the laboratory and laboratory testing for novel coronavirus, see *Laboratory biorisk management for laboratories handling human specimens suspected or confirmed to contain novel coronavirus: Interim recommendations*<sup>22</sup> and the *Laboratory testing for Middle East respiratory syndrome coronavirus - Interim recommendations (revised)*<sup>23</sup>. For further information on laboratory biosafety guidelines, see the *WHO Laboratory Biosafety Manual, 3rd edition*.<sup>24</sup>

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## References

1. *Infection prevention and control of epidemic- and pandemic-prone acute respiratory infections in health care - WHO Guidelines*. Geneva, World Health Organization, 2014. Available at [http://apps.who.int/iris/bitstream/10665/112656/1/9789241507134\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/112656/1/9789241507134_eng.pdf)
2. For the latest information, please consult the WHO coronavirus web page at [http://www.who.int/csr/disease/coronavirus\\_infections/en/](http://www.who.int/csr/disease/coronavirus_infections/en/).
3. The WHO case definitions for reporting are available at [http://www.who.int/csr/disease/coronavirus\\_infections/case\\_definition/en/](http://www.who.int/csr/disease/coronavirus_infections/case_definition/en/).
4. *Clinical management of severe acute respiratory infections when novel coronavirus is suspected: What to do and what not to do*. Geneva, World Health Organization, 2013. Available at [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).
5. *Core components of infection prevention and control programmes in health care. Aide-memoire*. Geneva, World Health Organization, 2011. Available at [http://www.who.int/csr/resources/publications/AM\\_core\\_components\\_IPC/en/](http://www.who.int/csr/resources/publications/AM_core_components_IPC/en/).
6. *Interim surveillance recommendations for human infection with Middle East respiratory syndrome coronavirus*. Geneva, World Health Organization, 2014. Available at [http://www.who.int/csr/disease/coronavirus\\_infections/InterimRevisedSurveillanceRecommendations\\_nCoVInfection\\_14July2014.pdf](http://www.who.int/csr/disease/coronavirus_infections/InterimRevisedSurveillanceRecommendations_nCoVInfection_14July2014.pdf)
7. *Essential environmental health standards in health care*. Geneva, World Health Organization, 2008. Available at [http://www.who.int/water\\_sanitation\\_health/hygiene/settings/ehs\\_hc/en/index.html](http://www.who.int/water_sanitation_health/hygiene/settings/ehs_hc/en/index.html).
8. *Natural ventilation for infection control in health-care settings*. Geneva, World Health Organization, 2009. Available at [http://www.who.int/water\\_sanitation\\_health/publications/natural\\_ventilation/en/index.html](http://www.who.int/water_sanitation_health/publications/natural_ventilation/en/index.html).
9. Jefferson T, Del Mar CB, Dooley L et al. Physical interventions to interrupt or reduce the spread of respiratory viruses. *Cochrane Database of Systematic Reviews*, 2011, 7:CD006207. Available at <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD006207.pub4/abstract.jsessionid=074644E776469A4CFB54F28D01B82835.d03t02>.
10. *WHO Guidelines on hand hygiene in health care*. Geneva, World Health Organization, 2009. Available at [http://whqlibdoc.who.int/publications/2009/9789241597906\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf).

11. Standard Precautions are basic precautions designed to minimize direct, unprotected exposure to potentially infected blood, body fluids or secretions applicable to all patients. See also *Standard precautions in health care*. Geneva, World Health Organization, 2007. Available at [http://www.who.int/csr/resources/publications/EPR\\_AM2\\_E7.pdf](http://www.who.int/csr/resources/publications/EPR_AM2_E7.pdf).
12. A visual aid on how to put on and take off PPE is available at <http://www.who.int/csr/resources/publications/putontakeoffPPE/en/>.
13. In this document, the term "medical mask" refers to disposable surgical or procedure masks.
14. Tran K, Cimon K, Severn M, Pessoa-Silva CL, Conly J. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. *PloS One* 2012;7:e35797. Available at <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0035797>.
15. Examples of acceptable, disposable particulate respirators in use in various parts of the world include: Australia/New Zealand: P2 (94%), P3 (99.95%); China: II (95%), I (99%); European Union: CE-certified filtering face-piece class 2 (FFP2) (95%), class 3 (FFP3) (99.7%); Japan: 2nd class (95%), 3rd class (99.9%); Republic of Korea: 1st class (94%), special (99.95%); United States: NIOSH-certified N95 (95%), N99 (99%), N100 (99.7%).
16. A visual aid on how to perform a particulate respirator seal check is available at <http://www.who.int/csr/resources/publications/respiratorsealcheck/en/>.
17. Lai MY, Cheng PK, Lim WW. Survival of severe acute respiratory syndrome coronavirus. *Clinical Infectious Diseases*, 2005, 41(7):67–71.
18. *Community case management during an influenza outbreak. A training package for community health workers*. Geneva, World Health Organization, 2011. Available at [http://www.who.int/influenza/resources/documents/community\\_case\\_management\\_flipbook/en/index.html](http://www.who.int/influenza/resources/documents/community_case_management_flipbook/en/index.html).
19. *Infection-control measures for health care of patients with acute respiratory diseases in community settings. Trainer's Guide*. Geneva, World Health Organization, 2009. Available at [http://www.who.int/csr/resources/publications/WHO\\_HSE\\_GAR\\_BDP\\_2009\\_1/en/index.html](http://www.who.int/csr/resources/publications/WHO_HSE_GAR_BDP_2009_1/en/index.html).
20. *Infection-control measures for health care of patients with acute respiratory diseases in community settings. Trainee's Guide*. Geneva, World Health Organization, 2009. Available at [http://www.who.int/csr/resources/publications/WHO\\_HSE\\_GAR\\_BDP\\_2009\\_1a/en/index.html](http://www.who.int/csr/resources/publications/WHO_HSE_GAR_BDP_2009_1a/en/index.html).
21. In studies conducted in Hong Kong SAR, China, no SARS-CoV was cultured from the clinical specimens from infected patients once they were asymptomatic (see Chan KH, Poon LL, Cheng VC et al. Detection of SARS coronavirus in patients with suspected SARS. *Emerging Infectious Diseases*, 2004, 10(2):294–299).
22. *Laboratory biorisk management for laboratories handling human specimens suspected or confirmed to contain novel coronavirus: Interim recommendations*. Geneva, World Health Organization, 2013. Available at [http://www.who.int/csr/disease/coronavirus\\_infections/NovelCoronavirusInterimRecommendationsLaboratoryBiorisk\\_190213/en/index.html](http://www.who.int/csr/disease/coronavirus_infections/NovelCoronavirusInterimRecommendationsLaboratoryBiorisk_190213/en/index.html).
23. *Laboratory testing for Middle East respiratory syndrome coronavirus - Interim recommendations*, Geneva, World Health Organization, 2014. Available at [http://www.who.int/csr/disease/coronavirus\\_infections/WHO\\_interim\\_recommendations\\_lab\\_detection\\_MERSCoV\\_092014.pdf?ua=1](http://www.who.int/csr/disease/coronavirus_infections/WHO_interim_recommendations_lab_detection_MERSCoV_092014.pdf?ua=1).
24. *WHO laboratory biosafety manual, third edition*. Geneva, World Health Organization, 2004. Available at [http://www.who.int/csr/resources/publications/biosafety/WHO\\_CDS\\_CSR\\_LYO\\_2004\\_11/en/](http://www.who.int/csr/resources/publications/biosafety/WHO_CDS_CSR_LYO_2004_11/en/).

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