

# Infection prevention and control and preparedness for COVID-19 in healthcare settings

Third update – 31 March 2020

## Scope of this document

This document aims to provide guidance to EU/EEA healthcare facilities and healthcare providers on infection prevention and control (IPC) measures for the management of suspected and confirmed cases of COVID-19 infection in healthcare settings, including long-term care facilities. It also offers guidance on the management of specimens at laboratories in the EU/EEA.

This is an update of the ECDC guidance dated 12 March 2020 'Infection prevention and control for COVID-19 in healthcare settings' [1]. This update focuses on measures to be applied in settings with increasing community transmission, a growing demand for care of COVID-19 patients and ensuing staff issues in the event of shortages of personal protective equipment (PPE) for healthcare facilities in EU/EEA countries and the United Kingdom.

## Target audience

Hospital administrators, long-term care facility administrators and healthcare practitioners in EU/EEA countries and the United Kingdom.

## Background

As of 26 March 2020, more than 500 000 cases of COVID-19 had been reported worldwide by more than 150 countries. The number of reported COVID-19 cases is rapidly rising in all EU/EEA countries and the UK, accounting for an increasing proportion of the cases worldwide.

More up-to-date disease background information is available online from [ECDC](#) [2], [WHO](#) [3]) and in ECDC's Rapid Risk Assessment [4].

Up to 10% of the reported cases in China [5] and up to 9% of all cases in Italy have been among healthcare workers [6]. It is probable that nosocomial outbreaks are important amplifiers of the local outbreaks which disproportionately affect the elderly and vulnerable populations. IPC practices are of critical importance in protecting the functioning of healthcare services and mitigating the impact on vulnerable populations.

Measures to prevent transmission in healthcare facilities are an immediate priority in order to 1) slow the demand for specialised healthcare, such as intensive care unit (ICU) beds; 2) safeguard risk groups; 3) protect healthcare workers and 4) minimise the export of cases to other healthcare facilities and the wider community.

In most instances, coronaviruses are believed to be transmitted from person to person via large respiratory droplets, either being inhaled or deposited on mucosal surfaces. Other routes implicated in transmission of coronaviruses include contact with contaminated fomites and inhalation of aerosols produced during aerosol-generating procedures (AGPs). SARS-CoV-2 virus has been detected in respiratory and faecal specimens. Viral RNA has also been detected on rare occasions in blood specimens but there is no evidence of transmission through

contact with blood [5]. The relative role of droplet, fomite and aerosol transmission for SARS-CoV-2, the protection provided by the different components of personal protective equipment (PPE) and the transmissibility of the virus at different stages of the disease remain unclear. Caution should therefore be exercised when considering these elements [7,8]. With the exception of AGPs, it is unclear whether facial filtering piece (FFP) respirators (class 2 or 3) provide better protection than surgical masks against other coronaviruses and respiratory viruses such as influenza [9,10]. Therefore, in the event of widespread community transmission leading to shortages of PPE, a rational approach would necessitate prioritising use of FFP2/3 respirators for care activities involving a higher perceived risk of transmission, such as during AGPs or in intensive care.

There is increasing evidence that persons with mild or no symptoms can contribute to the spread of COVID-19 [7,11]. Although uncertainties remain about the relative role of transmission by symptomatic versus asymptomatic or pauci-symptomatic persons, the implications of this observation for the prevention of COVID-19 among healthcare workers and vulnerable patient populations in healthcare are significant.

## Healthcare settings

The following sections provide an outline of technical measures and resources that can be used to reduce the risk of COVID-19 transmission in healthcare settings (including long-term care facilities) and laboratories in the EU/EEA. It draws on interim advice produced by WHO and national agencies, and also expert opinion [10,12-14]

### General infection prevention and control measures

Due to the likelihood of virus transmission by persons with few or no symptoms, healthcare facilities should ensure that physical distancing measures are implemented by staff, visitors and patients, particularly in settings with widespread community transmission. The use of surgical masks by healthcare workers for personal protection and source control can be considered as a measure for reducing transmission within healthcare settings. Optimal strategies have not been defined but any strategy needs to take into account the availability of surgical masks, the extent of community transmission and other measures in place. Some healthcare facilities require that all healthcare providers wear a surgical mask while at work.

Standard precautions, and in particular meticulous hand hygiene, should be emphasised.

### Triage, initial contact and assessment (primary and emergency care)

Emergency services and primary care staff, including physicians, nursing and administrative staff having contact with patients, should:

- Be made aware of the current COVID-19 epidemiological situation in their country and globally, including:
  - known risk factors for infection;
  - clinical symptoms and signs of COVID-19;
  - recommended IPC measures, including those in this document;
  - procedures for reporting and transferring people under investigation and probable/confirmed cases.
- Assess the onsite availability of appropriate PPE for all personnel at the point-of-care.
- Create a separate area in the emergency department for the assessment and management of patients with respiratory symptoms in order to spare PPE.
- Perform a point-of-care risk assessment to assess the likelihood of COVID-19 infection, including the clinical presentation of the patient and a review of clinical and epidemiological information. The assessment should be based on the latest case definitions [15].
- Create a separate area in the emergency department/hospital for swabbing suspect cases in accordance with the existing protocol. This should allow rational use of PPE and safer sampling.
- Map and develop policies for prioritising stocks of available equipment for the administration of oxygen, including nasal cannulas, non-invasive ventilation devices, and mechanical ventilators, given that COVID-19 patients may present with significant hypoxemia and need oxygen support.
- For patients requiring intubation for mechanical ventilation, plan ahead and avoid emergency intubations as much as possible. Consider performing all the necessary procedures such as central venous catheter and arterial line insertions during one session, in order to conserve PPE.
- If possible, provide for triage by telephone or telemedicine/online to reduce the number of people with symptoms of COVID-19 who come into contact with healthcare services.
- Be aware of requirements for testing and the case definitions [15] for reporting cases.

## Personal protective equipment for assessment and collection of diagnostic respiratory samples

The recommended PPE for the clinical assessment of suspected COVID-19 cases can be adapted as follows:

- Healthcare workers performing the first assessment without direct contact: the patient should wear a surgical mask if available and keep a distance of at least one metre.
- If possible, a physical barrier such as glass or a plastic teller window can be used to avoid direct contact and keep a distance. In this case no PPE is necessary [16].
- Collecting diagnostic respiratory samples (e.g. nasopharyngeal swab) can provoke coughing and/or sneezing and therefore lead to the production of aerosols [17]. Healthcare workers collecting diagnostic respiratory samples in enclosed spaces [18] should wear gloves, eye protection, a gown and a surgical mask or, if available, an FFP [19].
- For drive-through or outdoor testing facilities, the use of a surgical mask should be sufficient.

In order to optimise the use of PPE, staff should be assigned to carry out procedures in designated areas. For example, a dedicated area for collecting diagnostic respiratory samples can be set up. While collecting the sample, healthcare personnel can use the same respiratory protection equipment (surgical mask or respirator) for several patients for a longer period of time (up to 4-6 hours for respirators) without removing it, provided that it is not damaged or soiled, unless the manufacturer explicitly advises against this [16].

## Management of suspected cases

Suspected cases of COVID-19 should be isolated, or at least separated from other patients as far as possible. They should wear a surgical mask, if available, or at least cover their mouth with a tissue when coughing and practise appropriate hand hygiene. If possible, dedicated toilet facilities should be made available. Non-essential contacts between suspected cases and other persons should be minimised.

Staff should contact a designated 24/7 response service, such as the local public health authorities, to report the case, arrange diagnostic testing and, if appropriate following initial assessment, arrange safe transfer to a designated acute care unit for further diagnostic evaluation.

## Patient transport

It is important to ensure the availability of a preparedness plan for ambulance transfers of suspected or confirmed COVID-19 cases, addressing the temporal and geographical coverage of adequately trained staff and equipment.

For ambulance transfers of suspected or confirmed COVID-19 cases, it is important to ensure that healthcare staff wear PPE, decontaminate the ambulance after the transfer of the patient in accordance with the recommendations on environmental cleaning (see below), and practise safe waste management in accordance with local procedures. If decontamination of the ambulance is not practical due to the high demand of ambulance services, consider using dedicated ambulances for COVID-19 suspected patients.

Appropriate PPE for healthcare workers accompanying/monitoring a patient during transport includes a surgical mask or, if available, an FFP in addition to gloves, eye protection (visor or goggles) and gown. If available, a surgical mask should be provided for patients with respiratory symptoms.

Persons sitting in the front of the ambulance, including the driver, should not come into contact with the patient. If there is no physical separation between the front and the back of the ambulance, they should consider wearing a surgical mask [16].

## Hospitals

The following measures should be considered to reduce the risk of COVID-19 transmission among patients, healthcare workers, and other staff in hospitals.

### Administrative measures

- Ensure appropriate training on IPC for healthcare workers and other staff.
- If possible, also provide training to those who may be requested to work at a later stage to provide for surge capacity (for example agency staff, student doctors/nurses, and retired health professionals).
- Consider restricting non-essential visits and ensure that everyone, including patients and visitors, at the healthcare facility are aware of the need for hand and respiratory hygiene, including suitable cough etiquette.
- Set up a hospital 'COVID-19 preparedness and response committee' (or adapt an existing emergency management committee) with representatives from all the main clinical and support departments as well as senior administrators. Participate in a local healthcare coalition; this should include neighbouring hospitals, local public health agencies, and emergency healthcare services. Members of multi-hospital health systems should integrate system-wide planning and local planning with that of other local hospitals [20].
- To ensure preparedness for a surge in critically ill patients, identify rooms for these patients. In addition, identify non-urgent outpatient visits for re-scheduling or cancellation, and elective in-patient diagnostic and surgical procedures that can be moved to an outpatient setting, re-scheduled or cancelled [21,22].

- Identify and designate additional separate units that can be used for diagnostic evaluation and treatment of COVID-19 patients.
- Plan for surge capacity, estimate the needs in terms of patient beds, respiratory support, PPE, staff and diagnostics. Laboratory capacity and therapeutics should also be included in these estimates.
- Ensure that virological investigations can be arranged in a timely manner in accordance with the algorithm for laboratory diagnosis of COVID-19 (see [Laboratory testing for coronavirus disease 2019 \(COVID-19\) in suspected human cases](#) [23]).
- Define a strategy for testing, management and follow-up of healthcare workers with respiratory symptoms. Ensure that testing for COVID-19 is available for healthcare workers and patients.
- All staff with symptoms compatible with COVID-19 should stop working and self-isolate while symptomatic, and they should be prioritised in the national testing policy in order to be able to return to work as soon as possible once they are SARS-CoV-2 free<sup>1</sup>.
- Be aware of the minimum requirements for designated units managing confirmed COVID-19 patients: staff adequately trained in the safe diagnostic evaluation and management of COVID-19 patients; availability of appropriate PPE and hand hygiene products; adequate laboratory support, appropriate cleaning, and appropriate waste management procedures (see section 'Environmental cleaning and waste management' below).
- Where possible, use negative pressure isolation rooms for AGPs (see 'Patient management').
- Ensure that visits to COVID-19 patients are limited to the absolute minimum. Visitors should wear a surgical mask, gloves, a visor or goggles and a gown. If PPE availability is limited, it is sufficient for visitors to wear a surgical mask, provided that they keep a distance of at least one metre from a patient for the duration of the visit [16].
- If feasible, maintain a register of visitors for the purposes of contact tracing. Visitors to a confirmed COVID-19 case should self-monitor for symptoms of COVID-19 for 14 days after the visit, if periodic active monitoring (e.g. by telephone every few days) is not possible.

## Patient management

With a small number of cases, patients should preferably be admitted to an isolation room with a dedicated toilet if available. If possible, patients should be placed in single, airborne-precaution rooms with negative pressure and anteroom, especially those patients requiring AGPs.

In the event of widespread community transmission and large numbers of COVID-19 cases requiring hospitalisation, hospitals should consider placing confirmed COVID-19 patients in a separate ward or section of the hospital with dedicated staff (cohorting). This makes it possible to economise on the use of PPE, since healthcare workers can wear the same respiratory protection while providing care to the cohorted patients, and reduce healthcare-associated transmission.

The use of dedicated or, if possible, disposable medical equipment (e.g. blood pressure cuffs, stethoscopes and thermometers) is recommended.

### Personal protective equipment

Healthcare workers in contact with a suspected or confirmed COVID-19 case should wear a surgical mask or, if available an FFP2 respirator tested for fitting, eye protection (i.e. visor or goggles), a long-sleeved gown or apron, and gloves [19].

Healthcare workers should strictly follow the procedures for putting on (donning) and safely removing (doffing) PPE in the correct sequence [19]. Active assistance during donning and doffing will help to minimise the risk of accidental contamination. Hands should be washed immediately after the removal of PPE. It is essential to ensure that all staff assigned to treat COVID-19 patients are trained in the proper use of PPE. Quality assurance should be promoted before assigning staff to COVID-19 patient care. For example, to ensure a staff member's competency hospitals could require staff members to produce documented evidence of having participated in a training course in the correct use of PPE.

### Aerosol generated procedures

These procedures include: endotracheal intubation, bronchoscopy, open suctioning, administration of nebulised treatment, manual ventilation before intubation, physical prone positioning of the patient, disconnecting the patient from the ventilator, non-invasive positive pressure ventilation, tracheostomy, and cardiopulmonary resuscitation [24]. These procedures have been linked with an increased transmission risk of coronaviruses and require respiratory protection measures [25]. If there is a shortage of respirators it is recommended that they are prioritised for AGPs. AGPs should ideally be performed in a negative pressure isolation room. The number of people in the room should be limited to a minimum during such procedures. All those present should wear a well-fitted FFP3 respirator, visor or goggles, long-sleeved impermeable protective gown, and gloves [26].

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<sup>1</sup> For more information on contact tracing, see 'Resource estimation for contact tracing, quarantine and monitoring activities for COVID-19 cases in the EU/EEA'. 2 March 2020. ECDC: Stockholm; 2020. Available at: <https://www.ecdc.europa.eu/en/publications-data/resource-estimation-contact-tracing-quarantine-and-monitoring-activities-covid-19>

### **Approaches for economising on the use of PPE in the event of shortages**

In the event of shortages, to reduce consumption and maximise the use of PPE it is acceptable for staff to wear the same respirator while caring for multiple patients with COVID-19 for up to 4–6 hours. This is on the condition that the respirator is not removed between patients and is not damaged, soiled or contaminated, or unless specifically contraindicated by the manufacturer [16].

Surgical masks are designed for single-use. Respirators are usually also discarded after use, but in the event of a shortage, they can be reused a limited number of times unless there is a risk of contamination through the deposition of infectious particles on the surface. Contamination of the surface of respirators and surgical masks entails a risk of infection when putting the device on again (donning) for reuse. Since SARS-CoV-2 survives in the environment, including on the surfaces of various materials such as tissue, there is a risk that the outer surface of respirators and surgical masks used during patient care may become contaminated. The risk of the surface of surgical masks and respirators becoming contaminated by respiratory droplets is considered to be lower when they are covered with a visor. In such cases, reuse of the respirator/surgical mask may be considered as a last-resort option to economise on use of PPE. Research groups and healthcare facilities are currently looking into possible methods for decontaminating and sterilising masks (and other equipment) for re-use. Steam, hydrogen peroxide vapour, ultraviolet germicidal irradiation and gamma irradiation are being studied but so far none of these methods have been standardised. Such options are only to be considered as an extraordinary last resort in the event of imminent shortages of PPE, depending on availability and feasibility after other approaches for the rational use of PPE (such as extended use) have been applied. Any countries and groups studying such methods are encouraged to share results as soon as they are available.

### **Health monitoring and management of exposed staff'**

- Staff providing care to COVID-19 patients need to be actively followed-up for development of symptoms and provided with occupational health support. Hospitals should maintain a record of all staff providing care for confirmed COVID-19 cases. These staff should remain vigilant, and if developing a fever or any respiratory symptoms within 14 days of their last exposure to a confirmed case, they should seek testing and self-isolate if they become unwell.
- Healthcare workers exposed to COVID-19 cases without the recommended PPE should, if possible, stop work, self-monitor for symptoms and self-quarantine for 14 days. Testing of exposed healthcare workers for COVID-19 is an alternative strategy that may be applied in the event of a critical shortage of staff. An optimal testing strategy has not yet been defined for this scenario.

### **Discharge**

The duration of infectivity for COVID-19 patients is not yet known for sure. SARS-CoV-2 can be initially detected in upper respiratory samples one to two days before the onset of symptoms and persist for seven to 12 days in moderate cases, and up to two weeks in severe cases. In faeces, viral RNA has been detected in up to 30% of patients from day 5 after onset for up to four to five weeks [27]. COVID-19 cases should therefore not be discharged until recovery from clinical symptoms of COVID-19. If there are sufficient resources, it is useful to test asymptomatic patients before they are released from isolation. If resources are limited, the testing of symptomatic patients should take priority over the testing of asymptomatic patients before release from isolation [28].

### **Instructions for healthcare professionals and healthcare facility staff**

This advice is for all staff working in healthcare facilities. Some hospitals will be designated exclusively for the management of COVID-19 patients, however the probability of exposure to the virus should be considered high at all healthcare facilities. The following precautionary measures are recommended:

- Staff who have contact with patients should wear scrubs for the duration of their work. Clean scrubs should be provided daily.
- Staff should also wear special shoes at work that can be left at the hospital.
- At the end of the shift and after appropriate doffing (removal) of PPE, staff should wash their hands meticulously. If possible, shower facilities should be available for staff to take a shower before leaving work.
- Staff should consider regularly cleaning and disinfecting electronic equipment such as mobile and desk phones and other communication devices, tablets, desktop screens, keyboards and printers, particularly when these are used by many people.
- Staff managing COVID-19 patients should consider the following measures when returning home in order to minimise the risk of transmission to other household members:
  - practise physical distancing;
  - wash hands frequently;
  - clean the frequently touched surfaces in their car (e.g. steering wheel, knobs, screens, etc.)
- Family members of health professionals currently involved in the management of COVID-19 patients should:
  - practise physical distancing;
  - consider sleeping in a separate room and using a separate bathroom if they belong to a high-risk group;
  - wash hands meticulously.

## Environmental cleaning and waste management

The following measures may be considered for staff working in the area of environmental cleaning and waste management.

- Staff engaged in environmental cleaning and waste management should wear a surgical mask, gloves, eye protection (visor or goggles) and a gown [16].
- Regular cleaning followed by disinfection is recommended, using hospital disinfectants active against viruses; cleaning in patient rooms is particularly important for frequently touched surfaces. If there is a shortage of hospital disinfectants, surfaces may be decontaminated with 0.05% sodium hypochlorite (dilution 1:100 if household bleach at an initial concentration of 5% is used) after cleaning with a neutral detergent. Surfaces that do not tolerate sodium hypochlorite may be cleaned with a neutral detergent, followed by 70% ethanol [29].
- Staff engaged in waste management should wear PPE. Waste should be treated as infectious clinical waste Category B (UN3291) [30] and handled in accordance with healthcare facility policies and local regulations.

## Laboratory testing

All specimens collected for laboratory investigation should be regarded as potentially infectious, and healthcare workers who collect or transport clinical specimens should adhere rigorously to standard precautions in order to minimise the possibility of exposure to pathogens. [WHO's aide-memoire on standard precautions in healthcare](#) is available online [23].

Laboratories should adhere to the guidance provided by [The European Committee for Standardisation: CWA15793 laboratory biorisk management](#) [31] and WHO [Laboratory testing for coronavirus disease 2019 \(COVID-19\) in suspected human cases](#) [23].

## Long-term care facilities

COVID-19 outbreaks in long-term care facilities can have devastating effect since the residents are already vulnerable due to their age and possible underlying health problems, meaning that there is a high likelihood of unfavourable outcomes [32,33].

Long-term care facility administrators and healthcare administrators should implement the following measures for COVID-19 preparedness and infection prevention and control in long-term care facilities.

### *Administrative measures*

- Consult with local health authorities regarding specific locally recommended measures.
- Designate a team or at least one full-time staff member in each facility to be the lead for COVID-19 preparedness and response at that facility. This person should:
  - be familiar with national/regional advice on preparedness and requirements for reporting of residents with symptoms compatible with COVID-19;
  - be aware of the preferred minimum requirements for the management of residents with symptoms compatible with COVID-19: a single room with dedicated bathroom; staff adequately trained in hand hygiene and the use of PPE; availability of appropriate PPE and hand hygiene products, and appropriate cleaning and waste management procedures;
  - be responsible for ensuring that all staff are trained in IPC, including hand hygiene;
  - ensure that the facility has a sufficient number of hand washing facilities;
  - update business continuity plans, if staff members become ill or have to self-isolate;
  - monitor local and national public health sources to understand COVID-19 activity in their community.
- Designate a contact point (e.g. a liaison nurse for IPC) responsible for IPC training (including hand hygiene and standard precautions) of all those who work in the long-term care facility, including staff.
- Provide signs at all entrances describing the symptoms compatible with COVID-19 (fever, cough, shortness of breath) [34], informing visitors with any of these symptoms not to enter the long-term care facility.
- Ensure that all people at the long-term care facility and all those who enter the facility practice appropriate hand hygiene measures – i.e. they should use soap and water, or alcohol-based hand rub.
- Assess new and returning residents for symptoms compatible with COVID-19; implement IPC practices for symptomatic residents (see 'Management of residents' below). Consider monitoring all residents on a daily basis for symptoms (e.g. measure body temperature).
- Ensure that staff who have symptoms compatible with COVID-19 do not come to work and contact a pre-designated telephone number or contact point at the long-term care facility to inform of their symptoms.
- Recommend that long-term care facility residents consider, if applicable, reducing their use of transportation methods with potentially large numbers of close contacts and consider minimising attendance at non-essential public events.
- Consider restricting non-essential visits and implementing physical distancing measures, whilst balancing the need of the residents for care and social contact.
- Ensure that staff with symptoms of respiratory infection stop work and self-isolate.
- If feasible, long-term care facilities should consider identifying dedicated staff to care for residents with suspected/confirmed COVID-19 in order to reduce the likelihood of transmission to other residents.

- Establish contact with external public health teams and IPC practitioners (such as local authorities and/or hospitals) that can provide additional advice on IPC. The long-term care facility should seek their advice to calculate its need for PPE and related materials and products.
- Provide IPC training to all staff. All long-term care facility staff should follow rigorous hand hygiene practices, as outlined in WHO guidance for hand hygiene in outpatient and home-based care and long-term care facilities [35].
- Ensure that all people at the long-term care facility are aware of hand and respiratory hygiene, including cough etiquette [34].
- If possible, make alcohol-based hand rub available in every resident's room, both inside and outside the room, and in all public areas [34]. If there is a shortage of alcohol-based hand rub, prioritise availability at the point-of-care.
- Ensure that soap dispensers and paper towels are available for hand washing [34]. If no paper towels are available, use clean cloth towels and replace them frequently [36].

### **Management of residents with symptoms of COVID-19**

- If a resident in a long-term care facility displays clinical signs or symptoms of COVID-19, contact public health authorities/healthcare services for notification, assessment and instructions on testing and possible transfer to an acute care hospital.
- Residents displaying signs or symptoms of COVID-19 that do not require hospitalisation should be isolated in single rooms with a separate bathroom. If there are more than a few cases, consider placing the residents in a separate ward or section of the facility with dedicated staff.
- Ensure that all long-term care facility staff are aware of the residents displaying symptoms compatible with COVID-19 or having tested positive for the disease.
- If appropriate, consider posting information detailing IPC precautions on the doors of all residents' rooms, especially in those areas that have suspected or confirmed COVID-19 cases.
- Healthcare and other workers coming into contact with residents who have respiratory infections should wear a surgical mask or an FFP2 respirator if available, eye protection (i.e. visor or goggles), a gown and gloves [19].
- Healthcare workers should strictly follow the procedures for putting on (donning) and safely removing (doffing) PPE in the correct sequence [19].
- Hands should be washed immediately after removing PPE.

### **Environmental cleaning and waste management**

- Regular cleaning followed by disinfection is recommended. Cleaning personnel should use hospital disinfectants active against viruses for all common care facility areas and residents' rooms (furniture and frequently touched surfaces). If there is a shortage of hospital disinfectants, surfaces may be decontaminated with 0.05% sodium hypochlorite (dilution 1:100 if household bleach at an initial concentration of 5% is used) after cleaning with a neutral detergent. However, it should be noted that no data are available on the effectiveness of this approach against SARS-CoV-2. Surfaces that do not tolerate sodium hypochlorite may be cleaned with a neutral detergent, followed by a 70% concentration of ethanol [29].
- Staff engaged in waste management should wear PPE. Waste should be treated as infectious clinical waste Category B (UN3291) [30] and handled in accordance with healthcare facility policies and local regulations.

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## Rational use of PPE and hand hygiene materials for the care and management of COVID-19 patients

As of March 2020, countries worldwide affected by COVID-19 have been experiencing difficulties in accessing personal protective equipment (PPE) and hand hygiene materials [37]. This has been identified as an immediate priority at EU level, and a joint procurement process has been launched by the European Commission for interested EU Member States to ensure adequate production and supply of PPE for healthcare workers and patients. Coordinated supply chains for PPE should ensure distribution of such materials to healthcare systems in order to reduce the potential of healthcare-associated transmission to vulnerable groups and healthcare workers [16]. Cross-border shipments of supplies and donations to highly affected areas should continue in order to reduce the overall risk of infection in EU/EEA countries.

This document highlights best practices for PPE usage and options for hospitals and long-term care facilities with limited access to PPE materials. The main priorities for rational use identified in this document are aligned with detailed guidance published by WHO in February 2020 [16].

In order to maximise the use of available PPE in the event of insufficient stocks, staff should be allocated to perform a procedure, or set of procedures, in designated areas. For example, respiratory tract diagnostic sample collection should be carried out in a dedicated area by one staff member who could then use the same PPE for several hours. Placing of COVID-19 cases in separate designated areas of a hospital, or even in dedicated hospitals, should be considered, to minimise PPE stock requirements [26].

### Priorities for use of respirators (FFP2/3)

- The highest priority is for healthcare workers, most particularly those performing AGP, including tracheal intubation, bronchial suctioning, bronchoscopy, and sputum induction.
- Respirators can be used for 4–6 hours for multiple patients without removing them [16], unless the respirator is damaged, soiled or contaminated (for example, a symptomatic suspected case coughing directly onto a respirator).
- In the absence of FFP2/3 respirators, healthcare workers should use masks with the highest available filter level.

### Priorities for use of surgical masks

- If no respirators are available, the highest priority for the use of surgical masks is those caring for COVID-19 patients.
- The next highest priority is for symptomatic confirmed cases of COVID-19, followed by suspected cases.

### Priorities for use of alcohol-based hand rub

- Prioritise rigorous hand-washing practices using water and soap and ensure access to hand-washing facilities.
- If alcohol-based hand rub is not available, the highest priority is at the point-of-care, prioritising confirmed cases. If sufficient stocks of alcohol-based hand rub are available, place the rub in communal areas with high footfall outside of designated COVID-19 areas.

### Priorities for use of other PPE and hand hygiene products

- If insufficient quantities of gowns are available, use aprons.
- If insufficient quantities of goggles and/or visors are available for the recommended use described, use products that can be decontaminated, if available. Otherwise, consider decontamination and reuse, consulting the guidelines of the manufacturer.
- Regular cleaning is recommended followed by disinfection, using hospital disinfectants active against viruses, for rooms accessed by patients/residents, furniture and frequently touched surfaces. In the event of shortages of hospital disinfectants, surfaces may be decontaminated using 0.05% sodium hypochlorite (dilution 1:100 if household bleach at an initial concentration of 5% is used) after cleaning with a neutral detergent, although no data are available on the effectiveness of this approach against COVID-19 [22]. Surfaces that may become damaged by sodium hypochlorite can be cleaned with a neutral detergent followed by a 70% concentration of ethanol [29].
- In long-term care facilities with insufficient quantities of paper towels, use clean cloth towels and replace them frequently, washing them with a detergent such as household washing powder [36].



## References

1. European Centre for Disease Prevention and Control (ECDC). Infection prevention and control for COVID-19 in healthcare settings 2020 [updated 12 March 2020; cited 26 March 2020]. Available from: <https://www.ecdc.europa.eu/sites/default/files/documents/COVID-19-infection-prevention-and-control-healthcare-settings-march-2020.pdf>.
2. European Centre for Disease Prevention and Control (ECDC). COVID-19 [cited 8 March 2020]. Available from: <https://www.ecdc.europa.eu/en/novel-coronavirus-china>.
3. World Health Organization (WHO). Coronavirus disease (COVID-19) outbreak 2020. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>
4. European Centre for Disease Prevention and Control (ECDC). Coronavirus disease 2019 (COVID-19) pandemic: increased transmission in the EU/EEA and the UK – seventh update 2020 [updated 25 March 2020; cited 26 March 2020]. Available from: <https://www.ecdc.europa.eu/sites/default/files/documents/RRA-seventh-update-Outbreak-of-coronavirus-disease-COVID-19.pdf>
5. World Health Organization (WHO). Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19) 2020 [cited 1 March 2020]. Available from: <https://www.who.int/docs/default-source/coronavirus/who-china-joint-mission-on-covid-19-final-report.pdf>
6. Istituto Superiore di Sanita' (ISS). Sorveglianza Integrata COVID-19 in Italia 2020 [updated 26 March 2020; cited 26 March 2020]. Available from: [https://www.epicentro.iss.it/coronavirus/bollettino/Infografica\\_26marzo%20ITA.pdf](https://www.epicentro.iss.it/coronavirus/bollettino/Infografica_26marzo%20ITA.pdf)
7. Rothe C, Schunk M, Sothmann P, Bretzel G, Froeschl G, Wallrauch C, et al. Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. *New England Journal of Medicine*. 2020.
8. Ong SWX, Tan YK, Chia PY, Lee TH, Ng OT, Wong MSY, et al. Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient. *JAMA*. 2020.
9. Smith JD, MacDougall CC, Johnstone, Copes RA, Schwartz B, Garber GE. Effectiveness of N95 respirators versus surgical masks in protecting healthcare workers from acute respiratory infection: a systematic review and meta-analysis. *Cmaj*. 2016;188(8):567-74.
10. 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(4):e35797.
11. Li R, Pei S, Chen B, Song Y, Zhang T, Yang W, et al. Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV2). *Science*. 2020:eabb3221.
12. World Health Organization (WHO). Infection prevention and control during healthcare when novel coronavirus (nCoV) infection is suspected. Interim Guidance Geneva2020 [cited 8 March 2020]. WHO/2019-nCoV/IPC/v2020.1. Available from: [https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-\(ncov\)-infection-is-suspected](https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-(ncov)-infection-is-suspected)
13. US Centers for Disease Control and Prevention (CDC). Interim Infection Prevention and Control Recommendations for Patients with Confirmed Coronavirus Disease 2019 (COVID-19) or Persons Under Investigation for COVID-19 in Healthcare Settings 2020 [updated 21 February 2020; cited 8 March 2020]. Available from: [https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html?CDC\\_AA\\_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp%2Finfection-control.html](https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp%2Finfection-control.html)
14. Public Health England (PHE). COVID-19: infection prevention and control guidance 2020 [updated 6 March 2020; cited 8 March 2020]. Available from: <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/wuhan-novel-coronavirus-wn-cov-infection-prevention-and-control-guidance>
15. European Centre for Disease Prevention and Control. Case definition and European surveillance for COVID-19, as of 2 March 2020 Stockholm: ECDC; 2020. Available from: <https://www.ecdc.europa.eu/en/case-definition-and-european-surveillance-human-infection-novel-coronavirus-2019-ncov>
16. World Health Organization (WHO). Rational use of personal protective equipment for coronavirus disease 2019 (COVID-19) 2020 [updated 27 February 2020; cited 8 March 2020]. Available from: [https://apps.who.int/iris/bitstream/handle/10665/331215/WHO-2019-nCov-IPCPPE\\_use-2020.1-eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/331215/WHO-2019-nCov-IPCPPE_use-2020.1-eng.pdf)
17. US Centers for Disease Control and Prevention (CDC). Interim Guidance for Public Health Personnel Evaluating Persons Under Investigation (PUIs) and Asymptomatic Close Contacts of Confirmed Cases at Their Home or Non-Home Residential Settings 2020. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/php/guidance-evaluating-pui.html>
18. World Health Organization (WHO). Infection prevention and control of epidemic and pandemic prone acute respiratory infections in health care. WHO guidelines 2014 [17 January 2020]. Available from: [https://www.who.int/csr/bioriskreduction/infection\\_control/publication/en/](https://www.who.int/csr/bioriskreduction/infection_control/publication/en/)
19. European Centre for Disease Prevention and Control (ECDC). Guidance for wearing and removing personal protective equipment in healthcare settings for the care of patients with suspected or confirmed COVID-19 2020 [cited 8 March 2020]. Available from: <https://www.ecdc.europa.eu/en/publications-data/guidance-wearing-and-removing-personal-protective-equipment-healthcare-settings>

20. Toner E, Waldhorn R. What US Hospitals Should Do Now to Prepare for a COVID-19 Pandemic: Clinicians' Biosecurity News; 2020 [cited 10 March 2020]. Available from: <http://www.centerforhealthsecurity.org/cbn/2020/cbnreport-02272020.html>
21. US Centers for Disease Control and Prevention (CDC). Interim Guidance for Healthcare Facilities: Preparing for Community Transmission of COVID-19 in the United States [cited 11 March 2020]. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/healthcare-facilities/guidance-hcf.html>
22. European Centre for Disease Prevention and Control (ECDC). Checklist for hospitals preparing for the reception and care of coronavirus 2019 (COVID-19) patients 2020 [cited 11 March 2020]. Available from: <https://www.ecdc.europa.eu/sites/default/files/documents/covid-19-checklist-hospitals-preparing-reception-care-coronavirus-patients.pdf>
23. World Health Organization (WHO). Laboratory testing for coronavirus disease 2019 (COVID-19) in suspected human cases 2020 [updated 2 March 2020; cited 8 March 2020]. Available from: <https://www.who.int/publications-detail/laboratory-testing-for-2019-novel-coronavirus-in-suspected-human-cases-20200117>
24. Surviving Sepsis Campaign: Guidelines on the Management of Critically Ill Adults with Coronavirus Disease 2019 (COVID-19). Intensive Care Med. 2020. [publication pending]
25. 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(4):e35797-e.
26. European Centre for Disease Prevention and Control (ECDC). Personal protective equipment (PPE) needs in healthcare settings for the care of patients with suspected or confirmed novel coronavirus (2019-nCoV) 2020 [cited 11 March 2020]. Available from: <https://www.ecdc.europa.eu/sites/default/files/documents/novel-coronavirus-personal-protective-equipment-needs-healthcare-settings.pdf>
27. World Health Organization (WHO). Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19) 2020 [cited 11 March 2020]. Available from: <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf>
28. European Centre for Disease Prevention and Control (ECDC). Novel coronavirus (SARS-CoV-2) - Discharge criteria for confirmed COVID-19 cases – When is it safe to discharge COVID-19 cases from the hospital or end home isolation? [cited 11 March 2020]. Available from: <https://www.ecdc.europa.eu/sites/default/files/documents/COVID-19-Discharge-criteria.pdf>
29. European Centre for Disease Prevention and Control. Disinfection of environments in healthcare and non healthcare settings potentially contaminated with SARS-CoV-2 Stockholm: ECDC; 2020. Available from: [https://www.ecdc.europa.eu/sites/default/files/documents/Environmental-persistence-of-SARS-CoV-2-virus-Options-for-cleaning2020-03-26\\_0.pdf](https://www.ecdc.europa.eu/sites/default/files/documents/Environmental-persistence-of-SARS-CoV-2-virus-Options-for-cleaning2020-03-26_0.pdf)
30. World Health Organization (WHO). Guidance on regulations for the Transport of Infectious Substances 2013–2014. Available from: [https://apps.who.int/iris/bitstream/handle/10665/78075/WHO\\_HSE\\_GCR\\_2012.12\\_eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/78075/WHO_HSE_GCR_2012.12_eng.pdf)
31. CEN Workshop agreement. CWA 15793 - Laboratory biorisk management 2011 [cited 8 March 2020]. Available from: [https://www.uab.cat/doc/CWA15793\\_2011](https://www.uab.cat/doc/CWA15793_2011)
32. Symptomatic and Presymptomatic SARS-CoV-2 Infections in Residents of a Long-Term Care Skilled Nursing Facility — King County, Washington, March 2020. MMWR Morb Mortal Wkly. 2020.
33. World Health Organization (WHO). Infection Prevention and Control guidance for Long-Term Care Facilities in the context of COVID-19, Interim Guidance: WHO; 2020. Available from: [https://apps.who.int/iris/bitstream/handle/10665/331508/WHO-2019-nCoV-IPC\\_long\\_term\\_care-2020.1-eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/331508/WHO-2019-nCoV-IPC_long_term_care-2020.1-eng.pdf)
34. US Centers for Disease Control and Prevention (CDC). Strategies to Prevent the Spread of COVID-19 in Long-Term Care Facilities (LTCF) 2020 [updated 1 March 2020; cited 8 March 2020]. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/healthcare-facilities/prevent-spread-in-long-term-care-facilities.html>
35. World Health Organization (WHO). Hand Hygiene in Outpatient and Home-based Care and Long-term Care Facilities 2012 [cited 8 March 2020]. Available from: [https://apps.who.int/iris/bitstream/handle/10665/78060/9789241503372\\_eng.pdf?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/78060/9789241503372_eng.pdf?sequence=1)
36. World Health Organization (WHO). Home care for patients with suspected novel coronavirus (nCoV) infection presenting with mild symptoms and management of contacts 2020 [updated 4 February 2020; cited 8 March 2020]. Available from: [https://www.who.int/publications-detail/home-care-for-patients-with-suspected-novel-coronavirus-\(ncov\)-infection-presenting-with-mild-symptoms-and-management-of-contacts](https://www.who.int/publications-detail/home-care-for-patients-with-suspected-novel-coronavirus-(ncov)-infection-presenting-with-mild-symptoms-and-management-of-contacts)
37. World Health Organization (WHO). Shortage of personal protective equipment endangering health workers worldwide 2020 [updated 3 March 2020; cited 11 March 2020]. Available from: <https://www.who.int/news-room/detail/03-03-2020-shortage-of-personal-protective-equipment-endangering-health-workers-worldwide>