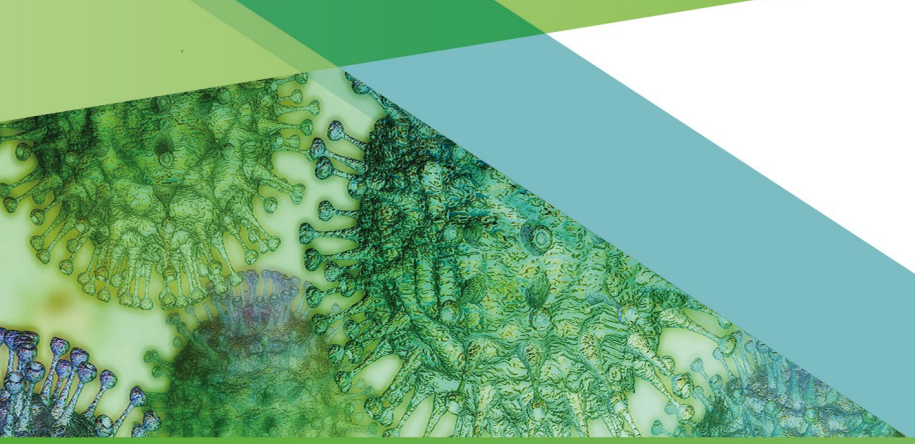

GUIDANCE

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

Sixth update – 9 February 2021

Healthcare facilities, including long-term care facilities (LTCFs), should apply several types of measures to minimise the risk of transmission of COVID-19.

The mainstays of infection prevention and control (IPC) in all healthcare facilities are administrative measures, physical distancing, hand hygiene and the appropriate use of personal protective equipment (PPE).

Administrative measures decrease the opportunities for transmission within healthcare facilities and diminish the risk of outbreaks.

In areas with community transmission of COVID-19, staff, visitors and patients should apply physical distancing, hand hygiene and respiratory hygiene, and wear face masks when physical distancing is not possible.

Healthcare facilities should ensure that PPE is available and appropriately used to safeguard those providing patient and resident care.

In areas with community transmission of COVID-19, frontline healthcare workers should strongly consider wearing medical face masks during all routine activities and in all communal areas.

Gloves and gowns are recommended when there is a risk of exposure to body fluids and in settings in which contamination is presumed to be high, such as where aerosol-generating procedures are performed. When used, gloves and gowns should always be changed after each patient contact.

COVID-19 cases can be released from isolation after consideration of the time from onset of symptoms, the severity of the disease, possible deficiencies of the immune system, and SARS-CoV-2 test results. There is currently insufficient evidence of prolonged viral shedding in COVID-19 cases with SARS-CoV-2 variants of concern (VOCs) to warrant stricter isolation criteria.

Due to the large impact of COVID-19 in LTCFs, it is essential that national measures are prioritised in these facilities to shield residents and prevent outbreaks.

In the European Union/European Economic Area (EU/EEA), LTCFs are often the responsibility of various national and sub-national competent authorities, usually dependent on the type of facility. Therefore, this guidance recommends activities for the most central competent public health authority. This authority should then provide guidance and support for all facilities that provide long-term care for the prevention, identification and management of COVID-19 outbreaks.

The competent health authorities should also, in collaboration with LTCFs, ensure continuity of care including maintained access to hospital healthcare; and address physical and mental wellbeing needs.

LTCFs should designate lead persons or teams to ensure accountability, resources and procedures to address: (1) IPC measures, supplies of PPE and training; (2) COVID-19 surveillance; (3) testing for SARS-CoV-2 for the timely identification and control of outbreaks; (4) access to medical and psychosocial care; and (5) visitors.

Vaccination against COVID-19 protects in varying degrees against symptomatic infection, and recent evidence also suggests varying efficacy of the vaccines in protecting against asymptomatic infection. Therefore, vaccination can be expected to have some effect on SARS-CoV-2 transmission. However, this protection is not absolute and more recent studies report reduced efficacy of COVID-19 vaccines in protecting against infection with SARS-CoV-2 VOCs, in particular the variant first identified in South Africa. As long as there is community transmission of COVID-19, it is prudent for the current guidance on self-isolation in the event of COVID-19 symptoms or proven COVID-19 and on quarantine in the event of contact with a COVID-19 case without recommended PPE to also apply to vaccinated healthcare workers.

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Scope of this document

This document aims to provide guidance to healthcare facilities and healthcare providers in the European Union/European Economic Area (EU/EEA) and the United Kingdom (UK) on preparedness and infection prevention and control (IPC) measures for the management of possible and confirmed cases of COVID-19 in healthcare settings, including long-term care facilities (LTCFs). In addition, this document addresses the management of clinical diagnostic specimens at laboratories in the EU/EEA.

This is the sixth update of the ECDC guidance on 'Infection prevention and control and preparedness for COVID-19 in healthcare settings', and replaces the document dated 6 October 2020 [1].

The second update included measures to be applied in healthcare settings in areas with community transmission, and addressed a growing demand for the 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 UK.

The third update included updated recommendations for healthcare staff, including LTCF staff, regarding medical face masks and filtering face piece category 2 (FFP2) respirators, and actions for staff with mild symptoms of COVID-19. It also contained additional references to the current ECDC surveillance guidance for LTCFs recommending laboratory testing of all residents and staff for SARS-CoV-2 as soon as possible after the detection of a case, to guide IPC measures.

The fourth update contained updated recommendations on occupational health and safety (OSH), physical distancing, the clinical and microbiological criteria for discharge from isolation, and microbiological testing for SARS-CoV-2 of new and returning residents of LTCFs.

The fifth update contained updated recommendations on universal masking in healthcare facilities, the use of gloves and gowns, testing during the influenza season, decontamination of re-usable medical devices, ventilation of closed spaces, preparedness and response options and IPC measures in LTCFs. It also included information on reinfection and re-exposure of previously COVID-19-positive patients and staff.

Changes to the current update

This sixth update contains the following additions/changes:

- A dedicated section on IPC related to vaccination against COVID-19.
- A dedicated section on IPC related to SARS-CoV-2 variants of concern (VOCs).

Target audience

National public health agencies, hospital administrators, LTCF administrators and healthcare workers in EU/EEA countries and the United Kingdom (UK).

Background

Epidemiology

Between 1 March 2020 and 4 February 2021, EU/EEA countries reported 19 729 006 cases and 473 206 deaths due to COVID-19 [2]. COVID-19 case notification rates have increased steadily across the EU/EEA in recent months, and more transmissible SARS-CoV-2 variants of concern (VOCs) have also emerged [3]. The current epidemiological situation in many countries is of concern, as it poses an increasing risk of infection for vulnerable individuals (individuals with risk factors for severe COVID-19 disease, such as the elderly) and healthcare workers.

More up-to-date disease background information is available online from ECDC [2], the WHO [4] and in ECDC's Rapid Risk Assessments [2] .

Risk for healthcare workers and healthcare-associated outbreaks

Healthcare workers are at high risk of COVID-19 infection because of more frequent exposure to COVID-19 cases and may contribute to the spread of COVID-19 in healthcare institutions. A study in the UK and the United States estimated that frontline healthcare workers had a 3.4-fold higher risk than people living in the general community for reporting a SARS-CoV-2-positive test, adjusting for the likelihood of getting tested [5]. Up to 10% of the reported cases in China [6] and up to 11.5% of all cases in Ireland have been among healthcare workers [7]. Multiple healthcare-associated outbreaks have been documented affecting healthcare workers, patients and residents [8]. Such outbreaks can be important amplifiers of local outbreaks, and 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 of COVID-19 in healthcare facilities are an immediate priority in order to: 1) protect patients and healthcare workers; 2) safeguard risk groups; 3) slow the demand for specialised healthcare, such as intensive care unit beds; and 4) minimise the export of cases to other healthcare facilities and the wider community.

Transmission of SARS-CoV-2 and personal protective equipment (PPE)

In most instances, coronaviruses are believed to be transmitted from person to person via respiratory droplets, either by being inhaled or deposited on mucosal surfaces, including aerosols produced when coughing and speaking. The production of aerosols is thought to be increased by aerosol-generating procedures. Transmission through contact with contaminated fomites is considered possible, although it has not yet been documented for SARS-CoV-2, and cultivable virus has not been detected in real-life situations [9,10]. SARS-CoV-2 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 [6]. Scientific groups have undertaken environmental investigations in hospital rooms in which COVID-19 patients were admitted and detected viral RNA in air samples and air outlet fans, therefore inferring the possibility of aerosols in those areas [11-15]. In two studies, low concentrations of cultivable SARS-CoV-2 were detected in air samples from a hospital room in which COVID-19 patients resided [16,17]. The relative role of large droplet, aerosol and fomite transmission for SARS-CoV-2, the protection provided by the different components of PPE, and the transmissibility of the virus at different stages of the disease remain unclear. Caution should therefore be exercised when considering these elements [18,19].

A recent systematic review and meta-analysis estimated that respirators may have a stronger protective effect than medical face masks [20]. However, this conclusion was based on a limited number of observational studies and the authors assigned low certainty to this conclusion. It is therefore unclear whether respirators provide a better protection than medical face masks against other coronaviruses and respiratory viruses such as influenza [21,22]. Consequently, in the event of widespread community transmission leading to shortages of PPE, a rational approach would necessitate prioritising the use of respirators for care activities involving a higher perceived risk of transmission, such as during aerosol-generating procedures or in intensive care units.

Gloves and gowns are used to prevent contamination of the hands, skin and clothes of healthcare workers that could lead to the transfer of infectious virus to the nose, mouth and eyes. Transmission through intact or non-intact skin is not known to occur. In several studies of SARS among healthcare workers, it was unclear whether the use of gloves or gowns was protective, after adjusting for the effect of wearing a face mask [23-28]. A meta-analysis of these studies concluded that gloves and gowns were shown to be effective in univariable analysis, but the effect was only statistically significant in multivariable analysis in one or two occasions [29]. There is no evidence to date of the protective effect of gloves and gowns for the prevention of COVID-19. The use of gloves and gowns may complicate and prolong the procedure of putting on and removing PPE and may lead to neglecting

hand hygiene, and result in contamination of the environment and transmission of other microorganisms in the event that gloves and gowns are not changed after each patient contact [30,31]. Further research is necessary to clarify the role of gloves and gowns in the prevention of COVID-19.

There is evidence that people with mild or no symptoms contribute to the spread of COVID-19 [13,18,32-34]. 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 [35].

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 LTCFs, and in laboratories in the EU/EEA.

Occupational safety and health (OSH)

The safety and health of healthcare workers and other staff working at healthcare premises is paramount, not only for their own protection but also to help prevent the spread of the virus and improve overall care. There is a comprehensive body of EU legislation to protect workers' health and safety at the workplace. Additional measures that need to be taken when COVID-19 cases are registered at healthcare premises may pose additional burdens and risks to the well-being of staff in terms of higher physical and mental workloads, longer working hours and increased administrative workloads. Workplace risk assessments should be revised and appropriate measures set by employers in accordance with the legislation governing risks from biological agents at work and the Directive 2004/54/EC on the protection of workers from exposure to biological agents (available from https://eur-lex.europa.eu/legal-content/EN/LSU/?uri=celex:32000L0054) [see Annex]. The OSH measures should be adapted in agreement with OSH services and workers, taking into account all types of risks as well as the additional physical load when wearing PPE. The safety and health committee should be consulted, where there is one in place. The risk to healthcare workers and other staff who belong to medically vulnerable groups and potential mitigation measures need to be addressed in collaboration with the occupational health services or health and safety committee.

Non-binding guidelines developed at EU level aim to help employers and workers stay safe and healthy in a working environment that has changed significantly because of the COVID-19 pandemic. They give advice on risk assessment and appropriate measures, such as minimising exposure, resuming work, coping with absences and taking care of workers that have been ill. They also contain useful links to national guidance in specific sectors, including the health and care services. More information on OSH in the context of COVID-19 is available by EU-OSHA [36].

Acute care hospitals

Due to the likelihood of SARS-CoV-2 transmission by people with few or no symptoms, healthcare facilities should ensure that physical distancing measures are applied by staff, visitors and patients, particularly in settings with community transmission.

The use of medical face masks by healthcare workers for personal protection and source control should be strongly considered during all routine activities and in communal areas as a measure for reducing transmission within healthcare settings in areas with community transmission.

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

Staff, visitors and patients should wear a face mask when physical distancing is not possible. Visitors may use non-medical face masks, if in line with local recommendations.

Staff who have contact with patients should wear scrubs for the duration of their work. Clean scrubs should be provided daily.

Administrative measures

Hospital administrations should address the following areas:

Triage, initial contact and assessment

- Emergency services and primary care staff, including physicians, nursing and administrative staff who have contact with patients, should be made aware of the current COVID-19 epidemiological situation in their region, country and globally, including:
  - the known risk factors for COVID-19 infection;
  - the clinical symptoms and signs of COVID-19;
  - the recommended IPC measures, including those in this document;
  - the procedures for reporting and transferring people under investigation and probable/confirmed COVID-19 cases;
- Assess the onsite availability of appropriate PPE for all healthcare workers at the point of care;

- Create a separate area in the emergency department for assessment and management of patients with respiratory symptoms. This should allow for the rational use of PPE and safer collection of diagnostic respiratory samples;
- 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];
- Ensure availability of testing for SARS-CoV-2 and that results are available in a timely manner;
- Map and develop policies for prioritising stocks of PPE, available equipment for the administration of oxygen, including nasal cannulas, non-invasive ventilation devices and mechanical ventilators, and necessary medication, 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 and online services to reduce the number of people with symptoms of COVID-19 who come into contact with healthcare services;
- Be aware of requirements for testing for SARS-CoV-2 and the case definitions [37] for reporting cases.

Patient transport

- It is important to ensure the availability of a preparedness plan for ambulance transfers of possible or confirmed COVID-19 cases, addressing the temporal and geographical coverage of adequately trained staff and equipment.
- For the transfers of possible or confirmed COVID-19 cases by ambulance, it is important to ensure that healthcare workers are provided with appropriate PPE, to set decontamination measures for the ambulance after the transfer of the patient in accordance with the recommendations on environmental cleaning (see below), and to practise safe waste management in accordance with local procedures.
- Appropriate PPE for healthcare workers accompanying/monitoring a patient during transport includes a respirator and eye protection (visor or goggles). Gloves and a long-sleeved gown are recommended when there is risk for contact with body fluids. A medical face mask should be provided to patients with respiratory symptoms.
- People 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 rear of the ambulance, they should be provided with appropriate PPE [16].

Inpatient care

The hospital administration should:

- Ensure appropriate training on IPC for healthcare workers and other staff, and regular updates to ensure that emerging evidence on the effectiveness of the various IPC measures and changing guidance are taken into account;
- Provide appropriate information and training to healthcare workers recruited for surge capacity (for example agency staff, student doctors/nurses, and retired health professionals);
- Consider setting 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. Establishing a 'COVID-19 preparedness and response committee' can facilitate liaising with a health and safety committee if established or with the OSH experts at enterprise level and taking into account their advice on OSH requirements, as well as participating in a local healthcare coalition, which 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 [38];
- Be aware of the minimum requirements for designated units that manage 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);
- Plan for surge capacity and 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 the workplace risk assessment is revised regularly to ensure measures are adapted to take into account changes to work procedures that may incur an additional risk to staff. This includes higher physical and mental workload;
- 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 [39,40];
- Identify and designate additional separate units for the diagnostic evaluation and treatment of COVID-19 patients;
- 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 [41]);
- Define a strategy for testing, management and follow-up of healthcare workers with respiratory symptoms in alignment to national/regional authorities. Ensure that testing for SARS-CoV-2 is available for staff and patients. Ensure notification of a staff member with COVID-19 infection as an occupational accident or disease according to national regulations, as the case may be;
- In areas with any kind of community transmission, all staff who provide care for patients or have contact with patients should consider wearing a medical face mask, in addition to practising meticulous hand hygiene;
- All staff with symptoms compatible with COVID-19 should be relieved from their duties and isolated 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 COVID-19 free in accordance with guidance for discharge and ending isolation [42]. Ill members of the staff should be replaced as much as possible for the duration of their absence to avoid excess physical and mental workload on other staff;

- Asymptomatic staff that have tested positive for SARS-CoV-2 should also be relieved from their duties and isolated.
- Ensure that visits to COVID-19 patients are limited to the absolute minimum and that visitors are aware of the need for hand hygiene and respiratory hygiene, including suitable cough etiquette. Visitors should wear a medical face mask and keep a distance of at least 1.5 metres from a patient for the duration of the visit [43];
- 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

Possible or confirmed COVID-19 cases

- Possible COVID-19 cases should be isolated, or at least separated from other patients, as much as possible. They should wear a medical face 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 possible cases and other people should be minimised. With a small number of COVID-19 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 aerosol-generating procedures.
- Appropriate response routines should be set, e.g. reporting to a designated 24/7 response service, such as the local public health authorities, arrangement of diagnostic testing and, if appropriate following initial assessment, arrangement for safe transfer to a designated acute care unit for further diagnostic evaluation.
- During the influenza season, all patients with severe acute respiratory infections should be tested for both SARS-CoV-2 and influenza (and other respiratory viruses, such as RSV, if possible) to inform clinical management and infection prevention and control measures, such as patient placement. Patients should be managed as 'possible COVID-19 case' until the test result is available.
- In the event of community transmission and large numbers of COVID-19 cases are 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 conserve PPE, since healthcare workers can wear the same respiratory protection while providing care to the cohorted patients while respecting the OSH requirements on the use of PPE.
- The use of dedicated (i.e. one for each patient) or if possible disposable medical equipment (e.g. blood pressure cuffs, stethoscopes and thermometers), is recommended.
- When there is documented community transmission, and provided testing capacity allows, all patients regardless of presentation should be tested for SARS-CoV-2 on admission to the hospital and managed as 'possible COVID-19 case' until the test result is available. Considering the incubation period of 14 days and the possibility of asymptomatic course of disease, patients admitted to the hospital should be monitored daily for COVID-19-compatible signs and symptoms, and tested again on day 3-5 after admission if no signs and symptoms have developed before that. As an alternative to universal screening of all patients upon admission to hospital, more targeted approaches can be considered for vulnerable groups, such as screening before admission to oncology and transplantation wards. Patients with planned admissions, such as admissions for elective surgery, should be tested 24-72 hours before admission and admitted only after confirmation of a negative result.

Personal protective equipment (PPE)

- During initial assessment of a patient without direct contact, the patient should wear a medical face mask and keep a distance of at least 1.5 metres. If possible, a physical barrier such as glass or a plastic panel should be used [43].
- Collecting diagnostic respiratory samples (e.g. nasopharyngeal swab) necessitates close proximity to the person tested and can provoke coughing and/or sneezing [44]. Healthcare workers collecting diagnostic respiratory samples in enclosed spaces [45] should wear a respirator and eye protection. A medical face mask can be used in place of a respirator in the event of shortage of respirators and for drive-through or outdoor testing facilities [40].
- While collecting the samples, healthcare workers can use the same respiratory protection equipment for several patients for a longer period of time without removing it, provided that it is not damaged or soiled, unless the manufacturer explicitly advises against this and in accordance with OSH regulations, codes of practice and in agreement with the occupational physician or health and safety committee [16].
- Healthcare workers in contact with a possible or confirmed COVID-19 case should wear a well-fitted respirator and eye protection (i.e. visor or goggles) [40]. In case of shortage of respirators, the use of medical face masks and options for prolonged use of respirators, decontamination and reuse of respirators can be considered in agreement with the health and safety committee or OSH experts at facility level. Gloves and a long-sleeved gown are recommended when there is risk for contact with body fluids and in settings where contamination is presumably high, such as where aerosol generating procedures are performed. Aprons can be used in place of gowns, especially when the risk of contact with body fluids is low. In case of shortages of gloves and gowns, these should be prioritised for procedures that are associated with contact of body fluids and splashes or contact with sterile sites (for sterile gloves). The gloves and the gown or apron should be changed between patient contacts.
- Healthcare workers should strictly follow the procedures for putting on and safely removing PPE in the correct sequence [40]. Hand hygiene should be performed immediately before and after removing PPE. It is essential to ensure that all healthcare workers assigned to treat COVID-19 patients are trained in the proper use of PPE. Quality assurance should be promoted before assigning healthcare workers to COVID-19 patient care.

Aerosol-generating procedures

- Several medical procedures have been linked with increased risk of transmission of infections transmitted through respiratory droplets and aerosols, presumably through increasing aerosolisation of infectious respiratory secretions and require respiratory protection measures [22]. Such procedures are known as aerosol-generating procedures. Although the evidence is often inconclusive, the following procedures have been linked with increased risk of transmission of respiratory viruses : endotracheal intubation, open suctioning, manual ventilation before intubation, non-invasive positive pressure ventilation, tracheotomy, cardiopulmonary resuscitation bronchoscopy and high-frequency oscillatory ventilation [46,47]. Among these procedures, the evidence is the most consistent for endotracheal intubation.
- High-frequency nasal oxygen (HFNO) that is often applied in the treatment of respiratory failure related to COVID-19 is also considered a potentially aerosol-generating procedure and should ideally be administered under airborne precautions [48], although currently available evidence about its role in the production of infectious aerosols is inconclusive [49].
- The infectious risk of other procedures that have been linked to the production of aerosols, such as administration of nebulised treatment, is unclear and there is not consensus on their classification as aerosol-generating procedures [50].
- Aerosol-generating procedures 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 respirator as well as visor or goggles, long-sleeved impermeable protective gown, and gloves [51]. If there is a shortage of respirators, it is recommended that respirators are prioritised for aerosol-generating procedures.

Approaches for the rational use of PPE in the event of shortages

In the event of shortages, the following approaches can be considered to reduce the consumption and maximise the use of PPE, if in accordance with OSH regulations and codes of practice, and in agreement with the occupational physician or health and safety committee.

Extended use: The same respirator may be used while caring for multiple patients with COVID-19. 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 [43].

Reuse and decontamination: Medical face 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 medical face masks entails a risk of infection when putting the device on again 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 medical face masks used during patient care may become contaminated. The risk of the surface of medical face 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/medical face mask may be considered as a last-resort option to conserve PPE. Several different procedures have been tested for the decontamination of respirators in the event of shortage [52,53]. 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 and only after other approaches for the rational use of PPE (such as extended use) have been applied.

Release from isolation

- The duration of infectivity for COVID-19 patients is not yet known with certainty. Several studies show that most transmission happens around the onset of symptoms and that SARS-CoV-2 can initially be detected in upper respiratory samples one to two days before the onset of symptoms. In studies of non-severe cases, the virus was successfully isolated for 10 days from the onset of symptoms' [54-56]. Among hospitalised/severe COVID-19 patients, virus isolation was possible until day 20 after onset of symptoms, with a median of eight days (IQR 5-11 days) [57,58]. The probability of detecting infectious virus dropped below 5% after 15.2 days post onset of symptoms (95% confidence interval (CI) 13,4 – 17,2). In this study, the risk of having a positive virus culture was three times higher in immunocompromised patients.
- Some patients with laboratory-confirmed COVID-19 infection have been identified as PCR-positive over prolonged periods of time after infection and clinical recovery. Studies of the duration of viral shedding (defined as positive RT-PCR test) in hospitalised COVID-19 cases found a duration up to six weeks from illness onset [59,60]. Some evidence is emerging that these cases are not linked with secondary transmission [61]. Prolonged viral RNA shedding has been shown even after seroconversion [62,63]. The identification of SARS-CoV-2 RNA through PCR (i.e. viral RNA shedding) does not equate to the presence of viable, infectious virus within a patient. However, the significance for transmission of prolonged shedding among immunocompromised patients remains unclear.
- Based on this evidence, non-immunocompromised patients can be discharged from isolation when the following criteria are fulfilled: 1) resolution of fever for at least three days and, 2) clinical improvement of other symptoms, and 3) after ten days from symptom onset for mild cases or at least 14 days and up to 20 days from symptom onset for severe cases [42]. WHO recommends that patients are released from isolation 10 days after symptom onset, plus at least 3 additional days without symptoms [64].
- Two consecutive negative PCR tests are recommended for discontinuation of isolation for immunocompromised COVID-19 cases and the same approach can be considered for severely ill patients, especially if they will be transferred to another unit within the hospital or discharged to a LTCF.

- When severely ill cases need to be discharged from a hospital earlier than 14 days or without fulfilling the above criteria, and no test result is available, these patients should self-isolate at home or at a safe place for up to 20 days from the onset of symptoms. Patients should seek medical advice, if they develop symptoms again.
- If the PCR test remains positive for a prolonged period, virus culture or sub-genomic RNA detection can be used to confirm viable virus positivity. If viable virus is detected, the patient will need to continue isolation at a designated facility or at home.

Health monitoring and management of exposed staff

- Healthcare workers 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 healthcare workers providing care for possible and confirmed COVID-19 cases. These healthcare workers should be trained in reporting procedures and report any symptoms, and if developing fever or any symptoms compatible with COVID-19 within 14 days of their last exposure to a confirmed case, they should be tested and be relieved of their duties if they become unwell and quarantined according to national requirements. The workload and psychological health needs of the staff should be addressed.
- Healthcare workers who have been exposed to COVID-19 cases without the recommended PPE should be allowed to stop work, self-monitor for symptoms and self-quarantine for 14 days, in accordance with national regulations. Alternatively, a RT-PCR test on day 10 after exposure can be performed and if it is negative, quarantine can be discontinued earlier.
- Due to the very limited number of reported cases of confirmed COVID-19 reinfection, the risk of reinfection among individuals who previously had COVID-19 is not known, but cannot be ruled out [65]. Although there are no documented cases of onward transmission from a re-infected case, knowledge of this topic is also still evolving. Risk assessment, including relevant laboratory investigations, may be made for re-exposed cases, taking into account the overall immune status of a re-exposed individual, the results of antibody testing, and the level of contact that the individual has with vulnerable populations in order to assess the best method of managing and following re-exposed cases for potential disease development and risk of further transmission. ECDC has published a Threat Assessment Brief 'Reinfection with SARS-CoV-2: considerations for public health response' which provides options for the investigation and management of re-infections.

Additional measures for healthcare professionals and healthcare facility staff

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:

- Healthcare workers who have contact with patients should wear scrubs for the duration of their work. Clean scrubs should be provided daily;
- When returning home, healthcare workers who have managed COVID-19 patients should practise physical distancing to minimise the risk of transmission to other household members.

Environmental cleaning, ventilation and waste management

The following measures should be considered to reduce the risk of transmission from environmental contamination:

- Cleaners should be appropriately trained in cleaning procedures and waste disposal and receive appropriate instructions;
- Staff engaged in environmental cleaning and waste management should wear a medical face mask, eye protection (visor or goggles), gloves and a gown [43];
- 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 cleaned with a neutral detergent, then decontaminated with 0.05-0.1% sodium hypochlorite (i.e. dilution 1:100 to 1:50 if household bleach at an initial concentration of 5% is used). Surfaces that do not tolerate sodium hypochlorite may be cleaned with a neutral detergent, followed by 70% ethanol [66];
- Decontamination of reusable medical devices should follow the manufacturer's instructions. Use of dedicated equipment can be considered for patients with COVID-19 when available;
- Ensure the regular cleaning and disinfecting of electronic equipment, such as mobile phones, desk phones and other communication devices, tablets, desktop screens, keyboards and printers, particularly when these are used by many people;
- Ventilation plays a key role for the prevention of respiratory infections in healthcare settings [67]. The minimum number of air exchanges per hour, in accordance with the applicable hospital regulations, should be ensured at all times. Increasing the number of air exchanges per hour will reduce the risk of transmission in closed spaces. This may be achieved by means of natural or mechanical ventilation, depending on the setting. Air recirculation without filtration should be avoided as much as possible;
- There is limited indirect evidence for the use of portable air filtration devices in healthcare settings as a preventive measure for COVID-19 [68,69];
- Due to concerns about possible aerosolisation of the virus present in faeces [70], closing the lid before flushing the toilet is recommended;

- Staff engaged in waste management should be provided with and wear appropriate PPE. Waste should be treated as infectious clinical waste Category B (UN3291) [71], and handled in accordance with healthcare facility policies and local regulations. Staff should be trained in waste management and disposal procedures.

Laboratory testing

All specimens collected for laboratory investigation should be regarded as potentially infectious, and healthcare workers or staff members who collect or transport clinical specimens should adhere rigorously to standard precautions in order to minimise the possibility of exposure to pathogens. The WHO's aide-memoire on standard precautions in healthcare is available online [41].

Laboratories should adhere to the guidance provided by The European Committee for Standardisation: CWA15793 laboratory biorisk management [72] and the WHO's Laboratory testing for coronavirus disease 2019 (COVID-19) in suspected human cases [41].

Long-term care facilities (LTCFs)

European countries, that have established surveillance systems in LTCFs, have reported deaths attributed to COVID-19 among 5–6% of all current LTCF residents, and/or reported that up to 66% of all fatal cases have been among LTCF residents [73,74]. COVID-19 outbreaks in LTCFs can have devastating effects since the residents are already vulnerable due to their age and frequent underlying health problems, meaning that there is a high likelihood of unfavourable outcomes [74,75]. In addition, COVID-19 can spread rapidly within LTCFs, which can exceed the capacity of LTCFs to implement a sufficient response [76,77]. Therefore, LTCFs should prepare to manage COVID-19 outbreaks.

Furthermore, social vulnerability in LTCF residents may be exacerbated when non-pharmaceutical interventions are in place that limit physical personal interactions or impact access to health services [78-82].

A. National or subnational level activities for LTCFs

In EU/EEA countries, long-term care is provided by a broad range of actors, including public, private for profit, private not-for-profit, and informal or unregistered providers. Additionally, while hospital care is most often the responsibility of the Ministry of Health, LTCFs are often the responsibility of different ministries, with responsibilities distributed between national and sub-national authorities, often dependent on the type of facility [83-85]. For example, in Spain and Italy the same person may receive long-term care services that are organised or funded by up to three different levels of government [85]. Therefore, the most central competent public health authority should consider implementing the following measures to enable COVID-19 preparedness and IPC in LTCFs. [85]. Therefore, the most central competent public health authority should consider implementing the following measures to enable COVID-19 preparedness and IPC in LTCFs:

Ensure accessibility of resources for COVID-19 for all facilities that provide long-term care

Competent authorities, such as the national public health institute, should ensure accessibility to COVID-19 resources for both LTCFs and LTCF-like[1] settings, e.g. competent authorities, such as the national public health institute, should ensure accessibility to COVID-19 resources, for both LTCFs and LTCF-like settings, e.g. by maintaining a comprehensive online repository of guidelines, guidance and training materials relevant to COVID-19 [86,87]. An implicit objective of such a repository is to provide all facilities, including those not yet registered with national authorities and those not yet included in current guidance [83,88], with the tools to develop their own comprehensive COVID-19 plans including IPC training activities.

This online repository should also contain guidance to help LTCFs avoid the possibility of indirect adverse effects of the inappropriate application of COVID-19 measures. These should include measures that ensure psychosocial care of residents and staff; and continuity of healthcare for COVID-19 and other diseases, including maintained access to hospital healthcare, and palliation [85]. These should include measures that ensure psychosocial care of residents and staff as well as continuity of healthcare for COVID-19 and other diseases, including maintained access to hospital healthcare, and palliation [85].

This online repository should be advertised broadly at national and sub-national level to ensure awareness in all facilities, including those not yet registered with authorities.

Ensure capacity to mobilise staff and material resources to LTCFs

Competent authorities should consider options to mobilise resources to LTCFs requiring support to their current response to a COVID-19 outbreak (e.g. healthcare workers), including, if appropriate, medical care that would have otherwise been provided in an outpatient or inpatient setting (e.g. oxygen therapy and medical staff) [85,89]. A common feature of European LTCFs is that the workforce often work in several facilities[83] , which has been

[1] LTCF-like settings include hospitals' long-term care wards, hostels (without any type of nursing care), sheltered care homes, day centres, home-based centres, and facilities for protected living. ECDC's document 'Guidance on the provision of support for medically and socially vulnerable populations in EU/EEA countries and the United Kingdom during the COVID-19 pandemic' contains considerations for institutions supporting the homeless and people with alcohol or drug dependence. It is available from: https://www.ecdc.europa.eu/en/publications-data/guidance-medically-and-socially-vulnerable-populations-covid-19

associated with outbreaks of COVID-19 in LTCFs Competent authorities should consider options to mobilise resources to LTCFs requiring support to their current response to a COVID-19 outbreak (e.g. healthcare workers), including, if appropriate, medical care that would have otherwise been provided in an outpatient or inpatient setting (e.g. oxygen therapy and medical staff) [85,89]. A common feature of European LTCFs is that the workforce often work in several facilities [83] , which has been associated with outbreaks of COVID-19 in LTCFs [90]. Therefore, COVID-19 outbreaks have the potential to affect multiple LTCFs through importation of the virus, and these LTCFs may have difficulties in operating normally because of staff absenteeism.

Competent authorities should monitor the availability of PPE, particularly equipment for respiratory protection, in LTCFs. Two ECDC guidance documents specify indicators to aid competent authorities in this monitoring. These are the 'Monitoring and evaluation framework for COVID-19 response activities in the EU/EEA and the UK' (Pillar 6) [91]; and the ECDC surveillance guidance for COVID-19 in LTCFs, which also specifies the collection of data on policy for the use of face masks for LTCF residents and staff [92].

Ensure surveillance of COVID-19 and testing for SARS-CoV-2 in LTCFs

The objectives of ECDC's guidance for COVID-19 surveillance in LTCFs [92] are to provide situational awareness to inform mitigation measures and to enable appropriate implementation of IPC measures in LTCFs. It specifies which data must be collected from LTCFs.

This guidance, and ECDC's guidance regarding COVID-19 testing strategies and objectives [93], recommend regularly testing all staff for SARS-CoV-2 at LTCFs in areas with community transmission; isolating and testing possible cases as soon as possible; and comprehensively testing all residents and staff upon identification of a confirmed case amongst residents or staff.

Ensure that each LTCF has access to external consultation services for IPC and medical care

The first step to ensure the provision of services to LTCFs is to acquire a comprehensive register of LTCFs. As of May 2020, such a register was not available in the vast majority of EU/EEA countries [94]. Information on the number and type of LTCFs is available for several EU/EEA countries from the 2016—2017, 2013 or 2010 ECDC point prevalence surveys of healthcare-associated infections (HAIs) and antimicrobial use in European LTCFs [95].

If not already established, countries may consider pairing LTCFs to a local hospital and local public health authorities, for external advice on IPC and continuity of provision of essential healthcare services. The external IPC advice should ensure that LTCF staff are aware of signs and symptoms of, and risk factors for COVID-19 and for HAIs in general [94,95]. Indeed, it is plausible that adjustment to COVID-19 of otherwise routine practices, particularly in LTCFs with reduced staff-to-resident ratios, may result in reduced compliance with measures to prevent HAIs, including those with microorganisms with antimicrobial resistance (AMR). In LTCFs, such measures include, in particular, appropriate urinary and vascular catheterisation of residents, appropriate hand hygiene practices, and antimicrobial stewardship activities by healthcare staff.

B. LTCF-level activities

Administrative measures

LTCF administrators and healthcare administrators should implement the following measures for COVID-19 preparedness and IPC in LTCFs.

Designation of COVID-19 leadership roles within each LTCF

LTCF lead for COVID-19

- 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. They should work in consultation with the local authorities, LTCF medical lead, LTCF administrative lead, Health and Safety committee and/or occupational health service, also consulting with LTCF workers.

The LTCF COVID-19 lead team or person should:

- Designate other COVID-19 leads, to include a medical lead and a lead for IPC training (see below);
- Be responsible for ensuring that the LTCF has the following in place:
  - IPC training for staff and residents and COVID-19 IPC procedures, in collaboration with the Medical Lead and the IPC Lead (see below);
  - an appropriate SARS-CoV-2 testing strategy [92,93];
  - a COVID-19 outbreak preparedness plan.
    These should be developed in collaboration with public health agencies, preferably including local public health authorities and/or hospitals;
- Establish communication channels with all authorities that provide COVID-19 guidance relevant to LTCFs. This should include local health authorities, to:
  - Acquire familiarity with national/regional advice on preparedness, including advice for the calculation of requirements for PPE and related materials and products; and specific locally recommended measures;
  - Monitor local and national public health sources to understand the level of COVID-19 transmission in their community;

  - Acquire awareness of the preferred minimum requirement for management of residents with symptoms of COVID-19 (see below);
  - Acquire awareness of the requirements for reporting of residents with symptoms compatible with COVID-19;
- Update business continuity plans, in case staff members become ill or need to self-isolate;
- Liaise with the employer to ensure that the facility has enough hand-washing facilities, alcohol-based hand rub and PPE;
- Ensure the compatibility of the plans of the LTCF for COVID-19 preparedness, IPC and business continuity, with plans of the LTCF for the psychosocial well-being of residents and staff, continuity of healthcare provision, and appropriate palliation.

Medical lead

Each LTCF should have a medical lead for COVID-19 who should:
- Review LTCF plans for COVID-19 preparedness and IPC. This should include consideration of their compatibility with LTCF plans for the psychological well-being of residents and staff, continuity of healthcare provision (e.g. referral to the hospital), and palliation for COVID-19 and other diseases;
- Establish contact with external public health teams and IPC practitioners, such as local authorities and/or hospitals, that can provide additional advice on IPC;
- Review the routines of care of LTCF residents to prevent adverse events that may occur when physical distancing measures are in place. These include reducing inappropriate urinary catheterisation, measures to prevent bedsores, and ensuring appropriate antimicrobial use.

IPC lead

- Each LTCF should have a staff member (e.g. a liaison nurse for IPC) responsible for IPC and ensuring IPC training;
- IPC training should be provided to all LTCF staff and to all residents;
- IPC training should include respiratory etiquette, standard precautions including hand hygiene, physical distancing, self-isolation for residents and staff members who have symptoms of respiratory infection, and proper use of PPE and related materials;
- All staff members should follow hand hygiene practices outlined in WHO guidance for hand hygiene in outpatient and home-based care and LTCFs [77]. In addition, the IPC lead and staff members should ensure that residents and visitors at the LTCF follow hand hygiene measures.

Considerations for LTCF workers

- In areas with community transmission of COVID-19, all LTCF workers, including LTCF staff, agency staff, volunteers and/or other informal carers, who provide care for residents or have contact with residents or communal areas of the LTCF, should consider wearing a medical face mask, in addition to practising meticulous hand hygiene;
- The administration to ensure that staff members with symptoms of respiratory infection are relieved from work, self-isolate and contact a predesignated telephone number or contact point at the LTCF to inform of their symptoms and get advice on how and where to obtain a COVID-19 test;
- The administration should ensure that business continuity plans in case of widespread community transmission are in place, in terms of availability of staff, including agency staff, and non-staff workers;
- Workers who provide services to several LTCFs should pay particular attention to IPC practices and self-monitoring of symptoms of COVID-19 [74], with business continuity consultations with local authorities paying particular attention to the possible absenteeism of such workers;
- Employers should ensure that workers in LTCFs are aware of how COVID-19 preparedness and response plans affect the baseline requirements for continuity of and access to healthcare including first aid, hospital referrals and palliative care;
- Employers should consult with occupational health and national agencies, to ensure that COVID-19 preparedness and response plans can integrate measures to ensure the psychosocial wellbeing of staff.

Personal Protective Equipment (PPE)

- For information on PPE, please consult the section above on 'Personal Protective Equipment (PPE)' for acute care hospitals and the section below on 'Management of residents with symptoms of COVID-19';
- For specific recommendations on the use medical face masks in LTCFs, please consult the section above on 'Considerations for LTCF staff' and the section below on 'External visitors, e.g. social visits';
- For options for rational use of PPE in the event of shortages, please consult the corresponding section above for acute care hospitals.

Logistic considerations

- The administration should provide signs at all entrances describing the symptoms compatible with COVID-19 (fever, cough, shortness of breath) [96], informing visitors with any of these symptoms not to enter the LTCF;
- The preferred minimum requirements for the management of residents with symptoms compatible with COVID-19 are: a single room with dedicated bathroom and toilet; staff adequately trained in hand hygiene and the use of PPE; availability of appropriate PPE; soap, paper towels and alcohol-based hand rub; and appropriate cleaning and waste management procedures;

- The administration should ensure that soap dispensers and paper towels are available for hand-washing [96]. If no paper towels are available, use clean cloth towels and replace them frequently [97];
- If possible, make alcohol-based hand rub available in every resident's room, both inside and outside the room, and in all public areas [96]. If there is a shortage of alcohol-based hand rub, prioritise availability at the point of care;
- If possible, designate areas that can be dedicated to the management of COVID-19 cases in case of an outbreak (i.e. resident cohorting). During planning, also identify surge capacity, within or outside the LTCF, for cases.

Environmental cleaning, ventilation and waste management

For information on environmental cleaning, ventilation and waste management, please consult the corresponding section for acute care hospitals.

Minimising risk of COVID-19 introduction and transmission

The mainstays of IPC in LTCFs remain ensuring physical distancing of at least 1.5 metres wherever possible, maintaining respiratory etiquette and practicing meticulous hand hygiene.

The following can be considered for specific settings within the LTCF:

Communal areas

- Ensure that the occupancy rate for communal areas permits maintenance of physical distancing;
- Endeavour to ensure appropriate ventilation, as feasible (see section 'Environmental cleaning, ventilation and waste management' for acute care hospitals);
- If possible, ensure that communal areas have direct access to hand-washing facilities, and that alcohol-based hand rub dispensers are available in communal areas (see section 'Logistic considerations').

Organised external social activities

- It is recommended that LTCF 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.;
- Organised activities within LTCFs, such as social activities and exercise, should be designed according to local risk assessment, ensuring appropriate IPC measures and including physical distancing and ventilation.

External visitors, e.g. social visits

- The decision to admit visitors should follow national guidelines. If visits are allowed, LTCFs should preferably prepare the process in collaboration with public health authorities, i.e. perform a risk assessment to designate visitor areas. These areas should have appropriate ventilation, permit appropriate physical distancing, and ideally be accessible without traversing communal areas;
- Symptomatic potential visitors should not come to LTCFs. Prior to entering the LTCF, visitors should (a) provide sufficient information for subsequent contact tracing, if required; and (b) be screened by LTCF staff for current symptoms compatible with COVID-19;
- The use of medical face masks for visitors and visited residents should be strongly considered [98].
- Ensure that residents and visitors at the LTCF practice appropriate hand hygiene, i.e. they should use soap and water or an alcohol-based hand rub;
- The risk of transmission from other visitors (such as for delivery of supplies and collection of refuse) will be minimised through maintenance of a short duration of contact with the LTCF; avoiding or minimising traversal of the LTCF premises, most particularly communal areas; and by the above mentioned other visitors not working if they have symptoms compatible with COVID-19;
- For consideration of 'social bubbles', see the ECDC guidelines for the implementation of non-pharmaceutical interventions against COVID-19 [78]. For LTCFs, social bubbles should ideally only contain people residing within the same LTCF, to minimise introduction of COVID-19 into the bubble.

Timely identification of COVID-19 cases

The administration should consider the following measures for the early identification of COVID-19 cases among residents:

- Monitoring the residents on a daily basis for symptoms (e.g. measuring body temperature);
- Regularly testing all staff at LTCFs for SARS-CoV-2 in areas with community transmission;
- Isolating and testing possible cases as soon as possible;
- Comprehensively testing all residents and staff upon identification of a confirmed case amongst residents or staff.

Admission and re-admission of LTCF residents

Staff responsible for receiving new and returning residents should do the following to minimise the risk of introduction of COVID-19:

- Assess new and returning residents for symptoms compatible with COVID-19;
- For residents without symptoms or signs of COVID-19, strongly consider requesting one negative RT-PCR test before admission or re-admission in the LTCF;
- For residents who were hospitalised for COVID-19 and clinically recovered, request two negative RT-PCR tests, at least 10 days after onset of symptoms, before admission or re-admission in the LTCF;
- In case RT-PCR tests remain positive for SARS-CoV-2 or in case of insufficient testing capacity, admission or re-admission can be considered after 20 days from onset of symptoms [57,58].

Management of residents with symptoms of COVID-19

- If a resident in a LTCF displays signs or symptoms of COVID-19, urgently contact public health authorities'/healthcare services for notification, assessment and instructions on testing and possible transfer to an acute care hospital;
- If feasible, LTCFs may consider identifying dedicated staff to care for residents with possible/confirmed COVID-19 in order to reduce the likelihood of transmission to other residents;
- Residents displaying signs or symptoms of COVID-19 that do not require hospitalisation should be isolated in single rooms with a separate bathroom and toilet. If there are more than a few cases, consider placing the residents in a separate ward or section of the facility with dedicated staff;
- The administration should ensure that all LTCF staff are aware of the residents displaying signs or 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 possible or confirmed COVID-19 cases;
- Healthcare workers and LTCF staff coming into contact with residents who have symptoms compatible with COVID-19 should wear a medical face mask or an FFP2 respirator if available, as well as eye protection (i.e. visor or goggles). Gloves and a gown or apron should be considered when there is a risk for contact with body fluids [40];
- Healthcare workers should strictly follow the procedures for safely putting on and removing PPE in the correct sequence [40];
- Hand hygiene should be performed immediately before and after removing PPE.

Infection prevention and control aspects related to vaccination against COVID-19

As of 29 January 2021, three vaccines against COVID-19 have been recommended for authorisation by the European Medicines Agency and were granted conditional marketing authorisation by the European Commission [99]: two messenger RNA (mRNA) vaccines - the BNT162b2 (Comirnaty®, Pfizer/BioNTech) on 21 December 2020 [100] and the mRNA-1273 vaccine (Covid-19 Vaccine Moderna®) on 6 January 2021 [101], and the non-replicating adenovirus vector ChAdOx1 nCoV-19 vaccine (AZD1222, Oxford/AstraZeneca) on 29 January 2021 [102]. Vaccination against COVID-19 across the EU started on 27 December 2020 according to nationally defined vaccination strategies and recommendations, primarily prioritising elderly people, healthcare workers and those with certain comorbidities [103,104]. Data monitoring the progress of COVID-19 vaccination across Europe are available from the ECDC COVID-19 Vaccine Tracker [105].

Infection prevention and control measures when delivering vaccines

On 15 January 2021, WHO published a memory aid document that summarises the key infection prevention and control (IPC) measures and the precautions to take for the safe administration of COVID-19 vaccines [106]. Readers are referred to this document for a detailed overview of the points to consider during the preparation/planning and operational phases of vaccination activities. The key standard precautions to be applied during any vaccination activity, along with key additional precautions necessary to reduce the risk of SARS-CoV-2 transmission during vaccination activity, are summarised below.

Standard precautions

- When administering vaccines, strict hand hygiene should be practised between patients, using alcohol-based hand rub and, if hands are visibly soiled, soap and water.
- Gloves are not required when administering vaccines. If gloves are used, they should be changed between patients and hand hygiene should be practised before putting on new gloves and after removing old ones.
- Ensure that an adequate number of hand hygiene stations are available in strategic areas for staff and the public.

Additional precautions

- Face masks should be worn both by staff administering vaccines and by the individuals being vaccinated. Hand hygiene should be practised before putting on face masks.
- Areas identified for vaccination activity should allow for sufficient physical distancing and screening, waiting, vaccination and post-vaccination areas should be adequately ventilated.
- One-way entry and exit areas, where possible separated, should be clearly marked.

Considerations regarding vaccination in LTCFs

Elderly residents in LTCFs are at disproportionately high risk of COVID-19 with fatal outcome [107] and have therefore been prioritised for vaccination in most EU/EEA countries. National guidelines should be followed regarding the choice of vaccine to be used for residents in LTCFs, as evidence for the efficacy of the available vaccines in older age groups varies by type of vaccine [100-102]. It should be emphasised that, in areas with community transmission, COVID-19 outbreaks in LTCFs may still occur after the vaccination campaign [108-113] and maximum protection of vaccinated residents is only achieved several weeks after completing the vaccination schedule, depending on the vaccine. In addition, recent evidence suggests a lower vaccine efficacy against some of the new SARS-CoV-2 variants of concern (VOCs), especially those harbouring the E484K mutation (see below).

- As long as there is community transmission of COVID-19, IPC measures in LTCFs should be maintained after the vaccination campaign, and at the highest possible levels [114].
- Vaccination in an LTCF should not be postponed when there are COVID-19 cases at the LTCF. Vaccination of non-cases (ring vaccination) may help contain an outbreak of COVID-19 [115,116].
- Vaccination should be offered to persons irrespective of their previous history of COVID-19 (symptomatic or asymptomatic) [117-119].
- Vaccination of those currently known to have COVID-19 should be postponed until they have recovered from the acute illness (if they had symptoms) and criteria have been met for them to discontinue isolation [118-120].
- For very frail residents with severe underlying conditions and short life expectancy, medical staff should assess the risk of severe side-effects of vaccination and consider whether their underlying conditions make them too frail to receive the vaccine [121,122].
- Consider vaccinating new residents before admission to an LTCF.
- Consider vaccinating new staff before they start working at the LTCF.

Impact of vaccination on IPC measures in healthcare, quarantine and isolation for healthcare workers

As vaccine efficacy is not 100%, some of the people vaccinated against COVID-19 may still become infected with SARS-CoV-2, asymptomatically or symptomatically. While there is evidence of protection against symptomatic infection, there is currently insufficient evidence of the effect of vaccination on asymptomatic infection, and therefore on transmission. Pre-second dose nasopharyngeal swab data from the mRNA-1273 vaccine (COVID-19 Vaccine Moderna®) study showed a significant reduction (IRR 0.37 (95% CI 0.20-0.68)) of asymptomatic infections in the vaccinated group (14/14 134, 0.10%), compared to the control group (38/14 073, 0.27%) [123]. Partial results of the ChAdOx1 nCoV-19 vaccine (AZD1222, Oxford/AstraZeneca) trials initially showed no overall significant effect on asymptomatic infections after the second dose in vaccinated persons versus controls [124]. In a recent pre-print, however, a better efficacy of the ChAdOx1 n-CoV-19 vaccine against both symptomatic and asymptomatic infection was shown in groups with longer intervals between the first and second dose [125], contrary to mRNA vaccines for which the second dose should not be administered later than six weeks after the first dose [118,119]. Similar data are not available to date for the BNT162b2 mRNA COVID-19 vaccine (Comirnaty®, Pfizer/BioNTech) trial [126]. Animal studies showed an effect on nasal replication of SARS-CoV-2 for both the BNT162b2 mRNA vaccine [127] and the mRNA-1273 vaccine [128], thus suggesting that these vaccines could stop viral shedding. This effect was not observed for the ChAdOx1 nCoV-19 vaccine [129]. Finally, neutralising activity of all current vaccines may be reduced against current emerging SARS-CoV-2 variants of concern (VOCs) (see below), and other antigenic escape VOCs are expected to emerge as natural immunity and vaccination-induced immunity increase [130]. However, it is reasonable to assume that, overall, vaccination will reduce the number of symptomatic infections and, to some extent, the number of asymptomatic infections, thereby also reducing transmission of SARS-CoV-2. However, further studies are needed (and these are being initiated) to better understand the role of vaccination in blocking transmission of SARS-CoV-2.

- Given this preliminary evidence, as long as there is community transmission of COVID-19 and a risk that currently available vaccines may be less protective against any of the emerging VOCs, vaccinated healthcare workers should still be considered as potentially able to be infected and transmit SARS-CoV-2. The related risk may depend on the type of vaccine they receive and on the circulation of new VOCs in the community. Therefore, IPC measures for healthcare workers, such as universal masking for all routine clinical activities and appropriate PPE for care of COVID-19 patients, remain unchanged in the current epidemiological context throughout the EU/EEA. Similarly, previous guidance on ending isolation of people with symptomatic or asymptomatic COVID-19 [131] continues to apply for vaccinated healthcare workers, as well as vaccinated patients, with symptomatic or asymptomatic COVID-19.
- When taking decisions on quarantine requirements for vaccinated healthcare workers having had contact with COVID-19 cases without recommended PPE, health authorities should take into account factors such as the current pressure on the healthcare system including shortages of staff, the probable protection of vaccinated staff, given the prevalence of potential escape VOCs, the type of vaccine received [132] and laboratory diagnostic resources. Allowing healthcare workers to stop working, self-monitor for symptoms and self-quarantine for 14 days should be considered as a precautionary measure, in accordance with national recommendations. This period may be shortened by evidence of SARS-CoV-2-negative RT-PCR test results. If national recommendations allow vaccinated healthcare workers to continue working after unprotected exposure [133], strict compliance with IPC measures, in particular measures aimed at source control (e.g. universal masking, meticulous hand hygiene, change of PPE between COVID-19 patients) should be emphasised.

Infection prevention and control aspects related to SARS-CoV-2 variants of concern (VOCs)

Background

While viruses constantly change through mutation, some variants are considered to be of concern because of mutations which may have led to increased transmissibility, reduced neutralisation by natural and vaccine-induced immunity and/or deteriorating epidemiological situations in the areas where they have recently become established. ECDC recently published an update of its risk assessment concerning three SARS-CoV-2 VOCs: variant B.1.1.7 (VOC 202012/01, 501Y.V1), variant B.1.351 (501Y.V2) and a variant belonging to lineage B.1.1.28, later reassigned to P.1. These variants were first described in the United Kingdom, South Africa and Brazil, respectively [3].

The transmissibility of variant B.1.1.7 was estimated to be 1.56 (credibility interval CrI 1.50-1.74) times higher than previously circulating wild-type variants [134]. Contrary to previous reports from the United Kingdom, more recent studies found that (a) the higher transmissibility of variant B.1.1.7 is not associated with a higher viral load [135], and (b) there is a realistic possibility that the B.1.1.7 variant causes more severe disease [136]. Conflicting results from previous studies that reported a higher viral load (lower Ct values) in infections with the B1.1.7 variant [137,138] could be attributed to sampling artefacts (e.g. oversampling of symptomatic severe COVID-19 patients with high viral loads.) Further studies using viral culture rather than RT-PCR Ct values as a proxy for viral shedding are urgently needed to confirm that the B1.1.7 variant is indeed not associated with higher viral load. The hypothesis which requires further investigation is that the B.1.1.7 variant is more likely to lead to infection following any given exposure, consistent with enhanced ACE2 receptor binding associated with the N501Y mutation. This mutation is also found in the B.1.351 and P.1 variants.

Similar to variant B.1.1.7, variant B.1.351 was estimated to be 1.50 (CrI 1.20-2.13) times more transmissible than previously circulating variants [139]. Estimates for increased transmissibility of variant P.1 are not yet available, but the observation of a rapid increase in COVID-19 cases in Manaus, Brazil, is consistent with what has been observed for the other two VOCs [140]. To our knowledge, viral load data on COVID-19 cases infected with the B1.351 and P.1 variants are not yet available. In addition, data on the duration of viral shedding are not available for any of the three VOCs. Further studies on viral shedding in COVID-19 patients across the disease spectrum (with patients being observed for the duration of their symptoms and for 10–20 days after onset) need to be performed to inform public health policies on ending isolation of COVID-19 patients.

Limited evidence suggests that neutralising antibodies against wild-type SARS-CoV-2 may have reduced activity against the VOCs [141]. Despite a study indicating that 76% (95% confidence interval 67-98%) of the population had been infected with SARS-CoV-2 by October 2020, the recent resurgence of cases in Manaus, Brazil suggests that the P.1 variant might evade immunity generated in response to previous infection. However, waning immunity and higher transmissibility may, at least partially, also account for the increase [140,142]. The E484K mutation such as that found in the B.1.351 and P.1 variants, which was recently reported by the United Kingdom in 11 cases of infection with the B.1.1.7 variant and 40 cases of infection with wild-type SARS-CoV-2, is of particular concern [143,144]. Data showing that antibodies against wild-type variants do not seem to protect against infection with the B1.351 variant were attributed to the E484K mutation [144,145].

Studies of the neutralising activity of the mRNA vaccine-elicited antibodies on the current VOCs reported mixed results. Some studies reported that neutralisation of the B.1.1.7 variant was unlikely to be affected [146], while other studies reported reduced neutralising activity [147,148]. One study showed that the E484K mutation substantially decreased neutralising activity by mRNA vaccine-elicited antibodies [145,149]. As for the B.1.351 variant, Moderna reported a six-fold reduced neutralising activity by mRNA-1273 vaccine-elicited antibodies [146]. AstraZeneca reported limited efficacy of the ChAdOx1 nCoV-19 vaccine against mild disease from the B.1.351 vaccine, although the vaccine could still protect against severe disease [150]. Media reported that all aforementioned vaccine manufacturers have initiated the development of updated vaccines to protect against new VOCs, in addition to testing a third dose booster with the current, or possibly updated, vaccines [144,151,152].

Impact of VOCs on IPC measures in healthcare, and on quarantine and isolation for healthcare workers

There is no evidence that the modes of transmission of COVID-19 have changed for the SARS-CoV-2 VOCs, therefore current IPC measures in healthcare facilities remain unchanged. However, the increased transmissibility of the VOCs emphasises the need for strict compliance with and possibly strengthening of these IPC measures.

- Consider universal masking for healthcare workers at all times, not only during routine clinical activities. For example, this includes wearing a medical mask in communal areas such as nurses' or doctors' rooms or any other communal room (e.g. during breaks).
- Ensure strict adherence to hand hygiene, with the availability of alcohol-based hand rub dispensers at the point of care in all areas of the healthcare facility.

- In settings and situations where gloves and gowns are used, emphasise the importance of changing gloves and gowns between patients, not only to prevent transmission of SARS-CoV-2 (potentially different VOCs). This will also prevent transmission of other healthcare-associated pathogens between patients.
- Test healthcare workers regularly. Consider using rapid antigen tests for regular self-testing to detect asymptomatic COVID-19 cases among healthcare workers [153].
- Accelerate the vaccination campaign for healthcare workers.

In the absence of data on the duration of viral shedding in COVID-19 cases due to VOCs, criteria for quarantine and isolation of healthcare workers remain unchanged. ECDC is reviewing the evidence and will update the recommendation if new evidence emerges on the duration of viral shedding for the new SARS-CoV-2 VOCs.

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Annex

Measures for the protection of workers from exposure to biological agents at the workplace are specified in the Directive 2004/54/EC (available from https://eur-lex.europa.eu/legal-content/EN/LSU/?uri=celex:32000L0054) and include:

- Keeping the number of workers exposed or likely to be exposed as low as possible.
- Designing work processes and engineering control measures so as to avoid or minimise the release of Biological agents into the place of work.
- Organisational measures to limit exposure, such as dedicated areas for the reception of infected patients.
- Technical measures such as appropriate ventilation, physical barriers and the use of appropriate work benches for laboratory work.
- Personal protective measures as a last resort where the above-mentioned measures do not ensure appropriate protection.
- Training of workers, including in the use of PPE, disinfection procedures and waste disposal.
- Provision of appropriate PPE.
- Ensuring means for the safe collection, storage and disposal of waste by workers, including the use of secure and identifiable containers, after suitable treatment.
- Ensuring that workers are provided with appropriate protective clothing or other appropriate special clothing.
- Ensuring that workers are provided with appropriate and adequate washing and toilet facilities, which may include eye washes and/or skin antiseptics.
- Removing working clothes and protective equipment, including protective clothing, which may be contaminated by biological agents, when leaving the working area and, before taking the measures referred to in the second subparagraph, and keeping them separate from other clothing. The employer must ensure that such clothing and protective equipment is decontaminated and cleaned or, if necessary, destroyed.
- Drawing up plans to deal with accidents and incidents and ensuring that staff know whom to report to.
- Appropriate measures shall be taken by the employer to ensure that workers and their representatives receive sufficient and appropriate training on: (a) potential risks to health; (b) precautions to be taken to prevent exposure; (c) hygiene requirements; (d) wearing and use of protective equipment and clothing; (e) steps to be taken by workers in the case of incidents and to prevent incidents. The training shall be: (a) given at the beginning of work involving contact with biological agents, (b) adapted to take account of new or changed risks, and (c) repeated periodically if necessary.

Appropriate measures shall be taken in health and veterinary care facilities in order to protect the health and safety of the workers concerned. The measures to be taken shall include: (a) specifying appropriate decontamination and disinfection procedures; and (b) implementing procedures enabling contaminated waste to be handled and disposed of without risk.

In isolation facilities where there are human patients or animals who are, or who are suspected of being, infected with group 3 or group 4 biological agents, containment measures shall be selected from those in Annex V of the biological agents Directive, in order to minimise the risk of infection.

Definitions

A respirator (also known as filtering face piece (FFP) mask or filtering half mask) is designed to protect the wearer from exposure to airborne contaminants (e.g. from inhaling infectious agents associated with inhaling small and large particle droplets) and is classified as personal protective equipment (PPE) [154]. FFP2 respirators have a filtering capacity of at least 94% for 0.3 µm particles. FFP3 respirators have a filtering capacity of at least 99% for 0.3 µm particles. Respirators are mainly used by healthcare workers to protect themselves, especially during aerosol-generating procedures, and require a fitting test to ensure proper protection. Some valved respirators do not prevent the release of exhaled respiratory particles from the wearer into the environment and therefore may not be appropriate for use as a means of source control in the case of respiratory infections [155]. Requirements for respirators are specified in EN 149:2001+A1:2009.

A medical face mask (also known as surgical or procedure mask) is a medical device covering the mouth, nose and chin, ensuring a barrier that limits the transition of an infective agent between hospital staff and the patient. They are used by healthcare workers to prevent large respiratory droplets and splashes reaching the mouth and nose of the wearer, and as a means of source control to stop the spread of large respiratory droplets by the person wearing them [154]. Requirements for medical face masks are defined in EN 14683:2014. Medical face masks are not defined as personal protective equipment in Regulation (EU) 2016/425 of 9 March 2016 and Directive 89/656/EEC on personal protective equipment. However, for the purpose of this document and in accordance with guidance on infection prevention and control in the context of COVID-19 by the World Health Organization (WHO) [156] and on transmission-based precautions [157], medical face masks are considered to provide protection against infections transmitted by droplets.

Non-medical face masks (also known as 'community' masks) include various forms of self-made and commercial masks, including face covers made of cloth and other materials such as paper. They are not standardised and are not intended to be used in healthcare settings or by healthcare professionals.