Infection prevention and control in the context of COVID-19: a guideline

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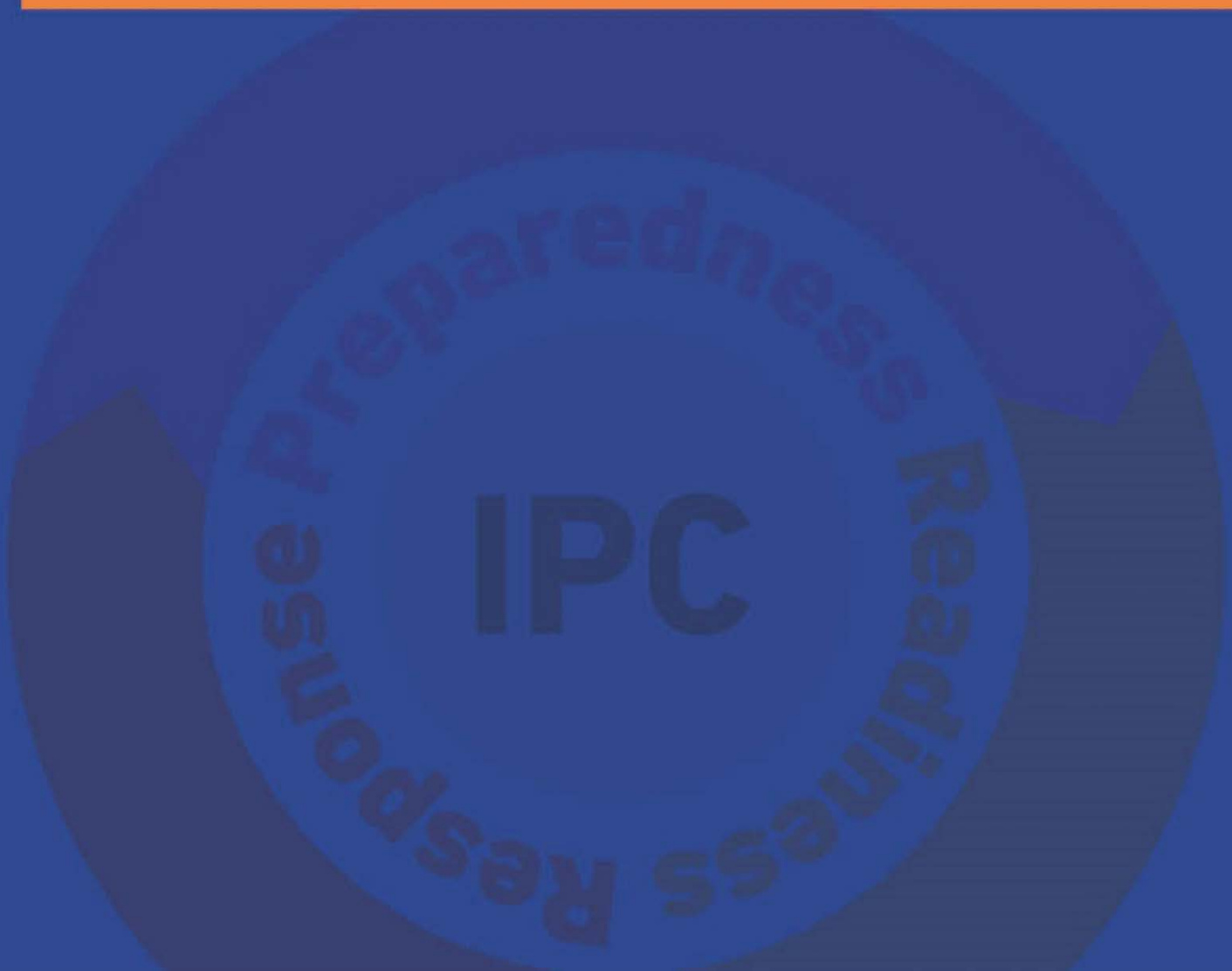

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1. Executive summary

The ***Infection prevention and control guideline for coronavirus disease 2019 (COVID-19)*** consolidates IPC technical guidance developed and published during the COVID-19 pandemic, with evidence-informed recommendations for health-care and community settings.

COVID-19 is the disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Health-care facilities remain high-risk settings for SARS-CoV-2 transmission as they admit and care for patients with a risk of Consistent application of IPC measures is essential to preventing transmission of SARS-CoV-2 in health-care settings.

This update (version 7) considers the current context of COVID-19, epidemiological trends, the emergence of variants of concern and factors including specific considerations for populations at-risk of severe disease outcomes, availability and uptake of vaccines, immunity levels and indoor environmental conditions.

The target audience for this guideline comprises policy-makers and decision-makers; public health professionals; IPC professionals and focal points for IPC and occupational health and safety of health workers at national, subnational and facility levels; health-care facility administrators and managers; and other health and care workers.

The guideline incudes two sections: Part 1 provides an overview of IPC principles and practices, and IPC measures in health-care facilities for patients with suspected or confirmed COVID-19. Part 2 pertains to mitigation measures for COVID-19 in community settings.

The methodology section describes the methodological approach used to develop technical guidance for COVID-19 based on ongoing assessment of evidence. The guideline development process followed WHO methodology, including use of Grading of Recommendations, Assessment, Development and Evaluation (GRADE) to determine the certainty of the evidence and the strength of the recommendations.

Several updates to the IPC COVID-19 guidelines were completed during the period of the pandemic response that were informed by emerging evidence and consultation with the Guideline Development Group (GDG). The current context considers the transition from critical emergency-response activities to longer-term, sustained COVID-19 disease prevention, control and management, and a shift towards integration of IPC activities into routine systems and practices (i.e. a return to standard and transmission-based precautions in health-care settings, and public health practices for community settings) *[1][2]*.

Recommendations in this guideline should be viewed in their entirety to understand the evidence-to-decision processes, nuances and contextual factors that have been considered to ensure the guideline can apply to different countries and settings where health care is delivered.

The guideline is written, disseminated and updated on an online platform (MAGICapp) and can be found on the WHO website.

1.1 Definitions

A child	Any person under the age of 18 years *[3]*.
Active screening	Actively looking for signs or symptoms either by asking the health and care worker questions regarding their symptoms through a questionnaire, electronic format or verbally. It involves actively asking about or assessing health workers' health status (through temperature checks, testing) to identify signs and symptoms of infection. This mode of screening could be considered, if human resources and logistics permit, when the health-care facility finds itself in an active outbreak or when there is heightened transmission in the health-care facility or in the community where the health facility is located. Health workers should be screened after any potential exposure risk before or on arrival for their shift – either through questionnaires (online or in-person) or through testing (antigen detection rapid diagnostic tests (Ag-RDT) or real-time reverse-transcription polymerase chain reaction (rt-PCR)) tests *[4]*. The signs or symptoms to be monitored should include fever, cough, general weakness, fatigue, headache, myalgia, sore throat, coryza, dyspnoea, nausea, diarrhoea and anorexia) *[5]*.

Adequately ventilated patient room or area	Adequate ventilation in health facilities can be assessed where a natural or mechanical ventilation system is available *[6][7]*. The ventilation rate should be 6-12 air changes per hour (e.g. equivalent to 40-80 L/s/patient for a 4x2x3 m3 room) and ideally 12 air changes per hour for new constructions, with a recommended negative pressure differential of ≥2.5Pa (0.01-inch water gauge) to ensure that air flows from the corridor into patient rooms *[7]*.
Aerosol generating procedures (AGP)	Aerosol-generating procedures (AGPs) are defined as any medical procedures that can induce the production of aerosols of various sizes (e.g. tracheal intubation, non-invasive ventilation [e.g. bilevel positive airway pressure, continuous positive airway pressure], tracheostomy, cardiopulmonary resuscitation, manual ventilation before intubation, bronchoscopy, dental procedures, tracheotomy, cardiopulmonary resuscitation, manual ventilation before intubation, sputum induction by using nebulized hypertonic saline, dentistry and autopsy procedures. In oral health care, the following are considered AGPs: all clinical procedures that use spray-generating equipment such as three-way air/water spray, dental cleaning with ultrasonic scaler and polishing; periodontal treatment with ultrasonic scaler; any kind of dental preparation with high- or low-speed hand pieces; direct and indirect restoration and polishing; definitive cementation of crown or bridge; mechanical endodontic treatment; surgical tooth extraction and implant placement *[8]*.
Airborne transmission[1]	Airborne transmission refers to the spread of an infectious agent caused by the dissemination of droplet *nuclei* that remain infectious when suspended in air over long distances and long periods of time. Airborne transmission can be further categorized into obligate or preferential airborne transmission *[8]*. • Obligate airborne transmission refers to pathogens that are transmitted only by deposition of droplet *nuclei* under natural conditions (e.g. pulmonary tuberculosis) *[8]*. • Preferential airborne transmission refers to pathogens that can initiate infection by multiple routes but are predominantly transmitted by droplet *nuclei* (e.g. measles and chickenpox) *[8]*. • Opportunistic airborne transmission refers to agents that naturally cause disease through other routes, but under special circumstances may be transmitted via fine-particle aerosols *[8]*.
Airborne precautions	Airborne precautions prevent the spread of an infectious agent caused by the dissemination of droplet nuclei that remain infectious when suspended in air over long distances and long periods of time. Health workers should wear a respirator (e.g. N95, FFP2, etc.) before entering the patient's room and remove it after exiting the room. The patient should be placed in an airborne-infection isolation room (AIIR) *[9]*.
Caregivers	Caregivers refers to parents, spouses and other family members or friends providing informal care as opposed to the care provided by health-care providers *[10]*.
Cleaning	Cleaning is the physical removal of foreign material, including dust, soil and organic material such as blood, secretions, excretions and microorganisms. It physically removes rather than kills microorganisms with water, detergents and mechanical action. Cleaning is always essential prior to disinfection or sterilization. A surface that has not been cleaned effectively cannot be properly disinfected or sterilized. Organic material left on a surface or medical device can protect microorganisms or neutralize the action of disinfectants *[11][12]*.
Clinical triage	Clinical triage is a system by which patients are screened for specific signs, symptoms and epidemiological clues upon initial contact with the health-care system for the purpose of determining further diagnostic tests, isolation precautions, treatment and reporting *[8]*.
Cohorting	Cohorting is the act of grouping patients who are colonized or infected with the same organism with the aim to confine their care to one area and prevent them from coming into contact with other susceptible patients. Cohorts are created based on clinical diagnosis, microbiological confirmation with available epidemiology and the mode of transmission of the infectious agent. Cohorting is reserved for situations where there are insufficient single rooms or where patients colonized or infected with the same pathogen can be grouped together – and away from other patients. Dedicated equipment, toilets and staff should be used for patients within the cohorted area for the

	required time *[13]*.
Contact transmission	Contact transmission is the spread of an infectious agent caused by physical contact of a susceptible host with people or objects *[8]*. • Direct contact transmission involves both a direct body-surface-to-body-surface contact and physical transfer of microorganisms between an infected or colonized person and a susceptible host *[8]*. • Indirect contact transmission involves contact of a susceptible host with a contaminated intermediate object (e.g. contaminated hands) that carries and transfers the microorganisms *[8]*.
Contact precautions	Contact precautions prevent the spread of an infectious agent caused by physical contact of a susceptible host with people or objects. Health workers should wear a gown and put on gloves before entering a patient's room and remove them prior to exit. The patient should be placed in a single room; if a single room is not available, cohort patients with similar symptoms and diagnosis. Avoid having patients share a toilet if they are in a shared room *[9]*.
Community	A community is a group of people who may or may not be geographically connected but who share common interests, concerns or identities. These communities could be local, national or international, with shared interests of a specific or broad nature *[10]*.
Disinfection	Disinfection is a thermal or chemical process for inactivating microorganisms on inanimate objects *[11][12]*.
Droplet transmission	Droplet transmission is the spread of an infectious agent caused by the dissemination of droplets. Droplets are primarily generated from an infected (source) person during coughing, sneezing and talking. Transmission occurs when these droplets that contain microorganisms are propelled (usually < 1 metre) through the air and deposited on the conjunctivae, mouth, nasal, throat or pharynx mucosa of another person. Most of the volume (>99%) comprises large droplets that travel short distances (< 1 metre) and do not remain suspended in the air. Thus, special air handling and ventilation are not required to prevent droplet transmission *[8]*.
Droplet precautions	Droplet precautions prevent the spread of infectious agents caused by the dissemination of droplets. Health workers should put on a medical mask and wear additional personal protective equipment (PPE) if indicated (based on a risk assessment) before entering the patient's room. The patient should be placed in a single room. Consider the following when single-patient rooms are not available: 1) prioritize any single-patient rooms for patients with excessive cough and sputum production; 2) cohort patients with the same symptoms; 3) physically separate patients by at least 1 metre and draw privacy curtains *[9]*.
Filtering facepiece respirators (FFR or respirators)	Filtering facepiece respirators (FFRs or respirators) offer a balance of filtration, breathability and fit. Whereas medical masks filter 3-micrometre droplets, N95-rated and FFP2-rated FFRs must filter more challenging 0.075-micrometre particles or particulates and must do so across the entire surface of the respirator as a result of the fitted design. European FFP2 FFRs, according to the EN 149 standard, filter at least 94% sodium chloride (NaCl) salt particles and paraffin oil droplets. The United States of America's N95 FFRs, according to the National Institute for Occupational Safety and Health (NIOSH) NIOSH 42 CFR Part 84, filter at least 95% NaCl salt particles. Certified FFRs must ensure unhindered breathing by meeting inhalation and exhalation breathing resistance standards below the maximum thresholds. Another important difference between FFRs and other masks lies in the way filtration is tested. Medical-mask filtration is assessed by testing filtration over a cross-section of the masks. In contrast, FFRs are tested for filtration across the entire surface. Most importantly, FFP2 FFRs are fit-tested on a sample of human participants and the FFRs are measured for leaks as part of product certification. Similarly, for N95 FFRs, individual workers are typically fit tested each year for specific FFRs at the workplace. Therefore, in both cases, by ensuring the outer edges of the FFR seal around the wearer’s face, the FFRs' filtration is closer to

	the actual filtration of inhaled air. Other FFR performance requirements include being within specified parameters for maximum CO_2 build-up *[14]*.
Grading of Recommendations Assessment, Development and Evaluation (GRADE)	GRADE is an approach used to assess the quality of a body of evidence and to develop and report recommendations.
Hand hygiene	Hand hygiene is a general term referring to any action of hand cleansing. **Antiseptic hand rubbing** refers to applying an antiseptic hand rub to reduce or inhibit the growth of microorganisms without the need for an exogenous source of water and requiring no rinsing or drying with towels or other devices. **Handwashing** refers to washing hands with plain or antimicrobial soap and water *[15]*.
Health-care facility	Health-care facilities include primary-, secondary-, tertiary-care levels, outpatient care and long-term care facilities.
Hazardous waste	Hazardous waste can harm people and the environment. The types of hazardous waste in a facility vary according to the size of the facility and the services offered. Examples of hazardous waste are listed below *[16]*. **Examples of infectious waste:** • Sharps waste is any used or unused sharp item that could cause a cut or puncture wound that could lead to infection. Examples include instruments (such as scalpels and blades), needles, syringes and broken glass or ampoules. • Pathological waste (anatomical waste). Examples include human tissues or fluids (such as blood and body fluids), organs (body parts), placentas and fetuses and unused blood products. • Other infectious waste. Examples include soiled gloves, gauze or bandages contaminated with blood, body fluids, viruses or parasites *[16]*. **Examples of other hazardous waste:** • Pharmaceutical waste is used, expired or no-longer-needed pharmaceutical products (such as vaccines and drugs). • Chemical waste. Examples include chemical substances (such as laboratory reagents or film developer), disinfectants, solvents, and waste with high heavy-metal content (such as batteries, broken thermometers, and blood pressure gauges). • Genotoxic (harmful to human genes) and cytotoxic (harmful to human cells) waste isn't common unless the facility treats cancer patients. It includes some drugs used in cancer treatment, body fluids from patients exposed to chemotherapy or cytotoxic drugs and other material contaminated by these agents. • Radioactive waste: radioactive substances (such as unused liquids from radiotherapy or laboratory research), glassware, packages, or absorbent paper contaminated with radioactive substance, urine and excreta from patients treated or tested with radionuclides and sealed sources (containers in which radioactive substances are stored and sealed) *[16]*.
Health workers/health and care workers	Health and care workers are all people from in the community to hospitals who are primarily engaged in actions with the primary intent of enhancing health. This group includes health-service providers, such as doctors, nursing and midwifery professionals, public health professionals, technicians (laboratory, health, medical and non-medical), personal care workers, healers and practitioners of traditional medicine. It also includes health management and support workers, such as cleaners, drivers, hospital administrators, district health managers, social workers, and other occupational groups in health-related activities. This group also includes those who work in acute-

	care facilities and long-term care, public health, community-based care and other occupations in the health and social care sectors. Health and care workers may provide direct personal care services in the home, in health-care and residential settings, while assisting with routine tasks of daily life and while performing a variety of other tasks of a simple and routine nature *[17]*.
High-risk exposures	High-risk exposures in the health-care facility occur when a health and care worker without any PPE or with inappropriate PPE provides direct care to a patient with an infectious disease. They also occur when a health and care worker experiences a breach in PPE integrity or a lapse in IPC measures (i.e. hand hygiene not performed as per the WHO 5 moments, lack of cleaning and disinfection of surface/environment); or when a health and care worker present during an AGP is wearing inappropriate PPE, when there is a breach in PPE integrity, when other IPC measures are not followed, or when an exposure occurs due to a splash or spray of body fluids/blood and/or a puncture/sharp injury *[18]*.
Hierarchy of controls	A hierarchy of controls provides a means of determining ways to implement systems or controls (from most effective to least effective) that protect workers from injuries, illnesses and fatalities *[19]*.
High-risk exposures	High-risk exposures in the health-care facility occur when health and care workers provide direct care to a patient with an infectious disease without any PPE, or with inappropriate PPE, or experience a breach in PPE integrity or a lapse in IPC measures (i.e. hand hygiene not performed as per the WHO 5 moments, lack of cleaning and disinfection of surface/environment); or when a health and care worker present during an AGP is wearing inappropriate PPE or when there is a breach in PPE integrity or other IPC measures are not followed; or when an exposure occurs due to a splash or spray of body fluids/blood and/or a puncture/sharp injury *[20]*.
Infection prevention and control	Infection prevention and control (IPC) is a unique field of patient safety and quality of care, a practical, evidence-based approach to preventing patients and health workers from being harmed by avoidable infections. IPC affects all aspects of health care, including the way hospitals operate during and outside of emergencies *[21]*.
Isolation	Isolation is the separation of those infected with a contagious disease from those who are not infected.
Medical masks	Medical masks are surgical or procedure masks that are flat or pleated and are affixed to the head with straps around the ears, the head or both. Their performance standards are tested according to a set of standardized test methods (American Society for Testing Materials (ASTM) F2100, EN 14683, or equivalent) that aim to balance high filtration, adequate breathability and, optionally, fluid-penetration resistance *[14]*.
Non-hazardous waste	Non-hazardous waste does not pose biological, chemical, radioactive or physical risk to people or the environment, and can be disposed of as municipal waste*. Examples include paper, boxes, bottles, plastic containers and PPE that have not been contaminated with body fluids or used in an isolation area *[12]*. **Municipal waste is general waste generated mainly by households and commercial activities, and ideally collected by municipalities (e.g. local villages or cities) for disposal. Municipal waste should not contain untreated health-care waste [12]*.
Non-medical masks	Non-medical masks are a type of facial covering of the mouth and nose of the wearer that are used to mitigate the spread of respiratory infections but do not meet the performance standards of medical or surgical masks. Their primary purpose is for source control and to provide a degree of particulate filtration to reduce the amount of inhaled particulate matter. Essential parameters for the performance and safety of non-medical masks have been advocated

	during the COVID-19 public health emergency of international concern (PHEIC) through several existing international guidelines and one international standard for non-medical masks (ASTM F3502-21) *[14][22][23][24]*. Non-medical masks that are self-made or commercially produced and do not meet guideline-supported essential parameters are permitted in areas that have not mandated minimum performance requirements for non-medical masks prior to sale and for use by the general public.
Occupational health and safety	Occupational health and safety is a multidisciplinary area of work aiming at the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention among workers of effects on health from their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; and the placement and maintenance of the workers in an occupational environment adapted to their physiological and psychological capabilities *[18]*.
Passive screening (self-reporting)	In contrast to active surveillance, passive screening (self-reporting) entails the self-reporting by health and care workers of symptoms of illness to an appropriate occupational health and safety or other designated officer in the facility before, during or after their shift. This may be the most suitable option in countries where human, financial and technical resources are limited. It is the most common type of surveillance in humanitarian emergencies *[25][26][27]*.
Preparedness	The stage that includes the development of public health emergency response plans for relevant hazards: the mapping of potential hazards and hazard sites, the identification of available resources, the development of appropriate national stockpiles of resources, and the capacity to support operations at the intermediate and community and/or primary response levels during a public health emergency. These activities may take 6 months to 2 years in order to be fully prepared for an emerging infectious disease or public health threat *[129]*.
Readiness	The stage that links effective preparedness to efficient response, a statement of the capacity and capability of a relief agency or service. These activities may take up to 6 months in order to ensure readiness for a specific defined threat *[129]*.
Response	The stage in which emergency actions exceed the usual level of activities, in response to a defined public health threat *[129]*.
Recovery	The stage after the public heatlh threat has been mitigated or protected. This phase ensure that health systems continue to function, but also to identify and digest the lessons learnt through After Action Reviews (AAR) and ultimately to “build back better” *[129]*.
Standard precautions	Standard precautions aim to protect health and care workers and patients by reducing the risk of transmission of microorganisms from both recognized and unrecognized sources. They are the minimum standard of IPC practices that should be used by all health and care workers during the care of all patients, at all times, in all settings. When applied consistently, standard precautions can prevent the transmission of microorganisms among patients, health and care workers and the environment. Key elements of standard precautions include: 1) risk assessment, 2) hand hygiene, 3) respiratory hygiene and cough etiquette, 4) patient placement, 5) personal protective equipment, 6) aseptic technique, 7) safe injections and sharps-injury prevention, 8) environmental cleaning, 9) handling of laundry and linen, 10) waste management, and 11) decontamination and reprocessing of reusable patient-care items and equipment *[11]*.
Syndromic screening	Syndromic screening is the near real-time collection, analysis, interpretation and dissemination of health-related data to enable the early identification of the impact (or absence of impact) of potential health threats that may require public health action *[25][26][27]*.
Spray	Spray is the projection of product onto or into a surface, item, or a device (such as an atomizer or sprayer) by which a spray is dispersed or applied.
Targeted continuous medical mask use	Targeted continuous medical mask use is the practice of wearing a medical mask by all health workers and caregivers working in clinical areas during all routine activities throughout the entire

	shift.
Transmission based precautions	Transmission-based precautions are used in addition to standard precautions for patients with known or suspected infection or colonization with transmissible and/or epidemiologically significant pathogens. The type of transmission-based precautions assigned to a patient depends on the transmission route of the microorganism: contact, droplet or airborne. Transmission-based precautions must be started as soon as a patient presents with symptoms (e.g. fever, new cough, vomiting, diarrhoea). There is no need to wait for test results *[9]*.
Wipe	To wipe is to clean or dry by rubbing with a cloth/paper towel. In health-care facilities, surfaces are wiped with cloths soaked with water/detergent, then rinsed and wiped again in a systematic manner with an approved disinfectant.
Universal masking	Universal masking is the requirement for all persons (staff, patients, visitors, service providers and others) in health facilities to wear a mask at all times except when eating or drinking.
Ventilation	Ventilation is the process of supplying outdoor air to and removing indoor air from a space, for the purpose of controlling air contaminant levels, potentially accompanied by humidity and/or temperature, by natural or mechanical means *[7]*.

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[1] *Definition from the WHO Guidelines on "Infection prevention and control of epidemic-and pandemic-prone acute respiratory infections in health care" (2014) [8]. WHO has hosted expert global consultations in 2022 and in 2023 to further review and plans to update the definition of airborne transmission. For the latest information on how COVID-19 is transmitted, please see "Coronavirus disease (COVID-19): How is it transmitted?".*

1.2 Abbreviations

ARO	Antibiotic-resistant organism
AIIR	Airborne infection isolation room
AGP	Aerosol generating procedure
Ag-RDT	Antigen-detection rapid diagnostic test
ASTM	American Society for Testing Materials
aOR	Adjusted odds ratio
CASP	Critical appraisal skills programme
COVID-19	Coronavirus disease 2019
CI	Confidence interval
CT	Community transmission
DOI	Declaration of interest
EtD	Evidence to decision
FFR	Filtering facepiece respirator
GDG	Guideline Development Group
GPS	Good practice statement
GRADE	Grading of recommendations, assessment, development and evaluation
GRADE-CERQual	Confidence in the evidence from reviews of qualitative research
HAI	Health-care-associated infection
HEPA	High-efficiency particulate air (filter)
HR	Hazards ratio
HVAC	Heating, ventilation and air conditioning
ICU	Intensive care unit
ILI	Influenza-like illness

IPA	International Pediatric Association
IPC	Infection prevention and control
NAAT	Nucleic acid amplification test
NIOSH	National Institute for Occupational Safety and Health
NPI	Non-pharmaceutical intervention
MDRO	Multidrug-resistant organism
MMAT	Mixed-methods appraisal tool
OHS	Occupational health and safety
OR	Odds ratio
PICO	Population, Intervention, Comparator, Outcome
PHEIC	Public health emergency of international concern
PHSM	Public health and social measure
PPE	Personal protective equipment
ROBINS-I	Risk of bias in non-randomized studies - of interventions
RCT	Randomized controlled trial
rRT-PCR	Real-time reverse-transcription polymerase chain reaction
SARS-CoV-1	Severe acute respiratory syndrome coronavirus
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
SPICE	Setting, Perspective, Intervention, Comparison, Evaluation
UNICEF	United Nations Children's Fund
US CDC	United States Centers for Disease Control and Prevention
UVGI	Ultraviolet germicidal irradiation
WHO	World Health Organization
VE	Vaccine effectiveness
VoC	Variant of concern

1.3 Background

The *Infection prevention and control in the context of coronavirus disease 2019 (COVID-19) guideline* consolidates infection prevention and control (IPC) technical guidance developed and published during the COVID-19 pandemic into evidence-informed recommendations for IPC. Consistent application of IPC measures is essential to preventing transmission of SARS-CoV-2 in health-care settings, and to establishing relevant mitigation measures in community settings.

The objective of this technical guideline is to provide the most up-to-date recommendations for IPC measures to be implemented when caring for people with or managing outbreaks of COVID-19. The focus of the guideline is infection prevention and control principles and practices, with reference to other relevant WHO COVID-19 guidance and resources. In the context of health-care and community settings, there are areas of overlap with recommendations from other WHO guidelines relevant to IPC measures and implementation considerations (e.g. clinical management, surveillance, contact tracing and quarantine, laboratory and diagnostic testing, risk communications and community engagement, public health and social measures, preparedness, readiness and response actions for COVID-19).

Intended audiences
The target audiences of these guidelines are policy-makers and decision-makers, public health professionals, response incident managers, IPC professionals, IPC focal points, occupational health and safety for health and care workers at the national, subnational and facility levels, health-care facility administrators, managers and other health and care workers.

Current context of COVID-19
Health-care facilities remain high-risk settings for SARS-CoV-2 transmission and amplification of healthcare associated infections. They are locations where patients at risk of severe COVID-19 are admitted and cared for. Maintaining and improving IPC measures remain critical to ensuring the well-being of patients, staff and visitors.

As the pandemic is in its fourth year, COVID-19 is now an established and ongoing health issue, and is no longer considered a public health emergency of international concern (PHEIC) *[28]*.

The updated recommendations consider the current context of COVID-19, including the 2023-2025 COVID-19 Strategic Preparedness and Response Plan (SPRP) From emergency response to long-term COVID-19 disease management: sustaining gains made during the COVID-19 pandemic *[1][2]*, which assists countries as they are working to transition their critical emergency response activities to longer-term, sustained COVID-19 disease prevention, control and management practices. Strategic priorities include strengthening integrated surveillance and achieving vaccination targets for at-risk groups; continuing to develop strategies to increase access to affordable therapeutics; and strengthening pandemic preparedness planning while continuing to protect vulnerable groups. To support emerging needs, especially in fragile, conflict-affected, and vulnerable contexts, countries need to align coordination, planning, financing and monitoring for the COVID-19 response with broader emergency coordination mechanisms *[2]*.

The primary objective is to ensure the long-term management and sustainability of COVID-19 response efforts in the context of other concurrent health crises, and integration into broader prevention and control programmes, as well as respiratory disease management. It remains critical to address the key factors that drive the transmission and impact of SARS-CoV-2, thereby reducing the risk of emerging SARS-CoV-2 variants of concern and mitigating the direct and indirect consequences of COVID-19 disease. This approach is vital for strengthening the public health foundation for future epidemic and pandemic responses.

At the time of writing this version of the guideline, although weekly reported cases and deaths are at lower levels, millions continue to be infected or re-infected with SARS-CoV-2 and thousands of people are dying each week *[1]*. The global public health risk associated with COVID-19 remains high. There is evidence of reducing risks to human health driven mainly by high population-level immunity from infection, vaccination, or both; same levels of virulence of currently circulating SARS-CoV-2 Omicron sublineages compared to previously circulating Omicron sublineages; implementing public health and social measures; and improving clinical case management. These factors have contributed to a progressive global decline in the weekly number of COVID-19-related deaths, hospitalizations, and admissions to intensive care units (ICU). However, available information on hospitalizations and ICU admissions is provided from a limited number of countries, most of which are high-income countries (HICs). The decline in COVID-19-related hospitalizations and ICU admissions are expected to increase the capacity of health systems to cope with potential COVID-19 resurgences and the burden of cases of post-COVID-19 condition (PCC), however, uncertainty remains. While the risk of SARS-CoV-2 variants is certain and the risk of more virulent variants emerging exists, the currently circulating variants do not appear to be associated with increased severity.

COVID-19 transmission remains varied, with evidence suggesting a reduced risk to human health driven mainly by the following factors: high population-level immunity from infection, vaccination and/or hybrid immunity; variants with consistently lower virulence; increased availability of countermeasures; and improved clinical care. While SARS-CoV-2 continues to evolve, WHO monitors variants for severity and impact on health systems *[28]*.

The updated IPC recommendations consider the current context of COVID-19, evolving epidemiological trends, the emergence of new variants of concern (VoCs), and other factors such as populations and settings at risk, immunity, availability and uptake of vaccines, and other contextual factors.

Guideline development

This guideline was developed using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) process and the Evidence to Decision framework and in accordance with WHO norms and standards for guideline development *[29][30]*.

To develop the guideline, WHO convened a Guideline Development Group (GDG) to consider current scientific evidence while assessing factors such as the relative benefits and harms, values and preferences, resource implications, availability and feasibility issues. The GDG members had expertise in IPC, epidemiology, infectious diseases, microbiology, pediatrics, water, sanitation and hygiene (WASH), engineering and aerobiology. Balance was sought on the GDG with regard to geographical and gender representation.

WHO convened the GDG to address specific settings and populations. A methodologist with expertise in guideline development assisted the GDG in formulating the recommendations. While the GDG takes into account the individual patient perspective when making recommendations, it also considers resource implications, acceptability, feasibility, equity and human rights. Although systematic reviews were conducted, there were limited studies to address the questions related to human rights and the overall quality of evidence was low. The GDG carefully considered the available evidence, contextual factors, and implementation considerations in its deliberations.

The WHO Quality Assurance for Norms and Standards Department helped to identify rapid reviews of the evidence. Where required, WHO staff or commissioned external review teams conducted systematic reviews to address specific questions to inform recommendations. Additional details are described in the methodology section.

Updates and access
Several updates to the IPC COVID-19 guidelines were completed during the period of the pandemic response, informed by emerging evidence and consultation with the GDG. This update (version 7) considers the context of the transition from critical emergency-response activities to longer-term, sustained COVID-19 disease prevention, control and management, and a shift towards integration of IPC activities into routine systems and practices (i.e. a return to standard and transmission-based precautions in health-care settings, and public health and social measures for community settings) *[1][2]*.

The first version was published 22 December 2021 using a living guideline format, driven by what was then the urgent need for global collaboration to provide trustworthy and evolving COVID-19 guidance informing policy and practice worldwide. This update (version 7) is considered a standard guideline, subject to review in accordance with WHO methodology for guideline development, and depending on how fast the evidence in a topic area is expected to change.

The guideline is written, disseminated and updated on an online platform (MAGICapp) and can be found on the WHO website.

1.3.1 Summary of recommendations and good practice statements for the health-care settings

Table 1. Summary of recommendations and good practice states in the health-care setting.

	Recommendation or good practice statement	Strength/type	Date Published
Ventilation			
1.	WHO recommends adhering to the ventilation rate requirements for health-care facilities in the context of COVID-19: 160 l/s/patient for airborne precaution rooms 60 l/s/patient for general wards and outpatient departments	Strong recommendation for, very low certainty of evidence	09 October 2023
Physical barriers			
2.	WHO suggests considering the use of physical barriers such as glass or plastic windows for areas where patients first present, such as screening and triage areas, the registration desk at the emergency department and the pharmacy window.	Conditional recommendation for, very low certainty of evidence	09 October 2023
Physical distancing			
3.	Maintain a physical distance of at least 1 metre between and among patients, staff and all other persons in health-care settings, when feasible. When possible, increase this distance.	Good Practice Statement	09 October 2023
Mask use for source control			
4.	WHO suggests targeted continuous medical mask use in health-care facilities in situations with minimum to moderate impact of COVID-19 on the health system. Remarks: • Targeted continuous masking is the practice of wearing a well-fitting medical mask by all health and care workers and caregivers in clinical areas during all routine activities throughout the entire shift. • In non-patient areas, staff who have no patient contact are not required to wear a medical mask during routine activities.	Conditional recommendation for, very low certainty of evidence	09 October 2023

	• If caring for a suspected or confirmed COVID-19 patient, please see the recommendation on mask type for health and care workers.		
5.	WHO recommends universal masking in health-care facilities when there is a significant impact of COVID-19 on the health system. Remarks: • Universal masking is the practice of all health and care workers and other staff, caregivers, visitors, outpatients and service providers wearing a well-fitting medical mask at all times within the health facility and in any common area (e.g. cafeteria, staff rooms). • Inpatients are not required to wear a medical mask unless physical distancing of at least 1 metre cannot be maintained (e.g. during examinations or bedside visits) or when outside of their care area (e.g. when being transported), provided the patient is able to tolerate the mask and there are no other contraindications. • If caring for suspected or confirmed COVID-19 patients, please see the recommendation on mask type for health and care workers.	Strong recommendation for, very low certainty of evidence	09 October 2023
PPE section and use			
6.	Appropriate mask fitting should always be ensured (for respirators, through fit testing and a user seal check when a filtering facepiece respirator is put on; and for medical masks, through methods to reduce air leakage around the mask) as well as compliance with appropriate use of PPE and other standard and transmission-based precautions.	Good Practice Statement	09 October 2023
7.	A respirator or a medical mask should be worn along with other PPE – a gown, gloves and eye protection – by health and care workers providing care to a patient with suspected or confirmed COVID-19.	Strong recommendation, low certainty of evidence	09 October 2023
8.	Suggested factors for informing the choice of the type of mask include a risk assessment and health and care workers' values and preferences. WHO suggests respirators be used in care settings where ventilation is known to be poor or cannot be assessed, or the ventilation system is not properly maintained.	Conditional recommendation, low certainty of evidence	09 October 2023
Aerosol-generating procedures			
9.	WHO suggests using airborne precautions while performing aerosol-generating procedures (AGPs) and, based on a risk assessment, when caring for patients with suspected or confirmed COVID-19.	Conditional recommendation for, very low certainty of evidence	09 October 2023
10.	A respirator should always be worn along with other PPE by health and care workers performing aerosol-generating procedures (AGPs) and by health and care workers on duty in settings where AGPs are regularly performed on patients with suspected or confirmed COVID-19, such as intensive care units (ICU), semi-intensive care units or emergency departments.	Strong recommendation for, very low certainty of evidence	09 October 2023

Environmental cleaning			
11.	For COVID-19, health-care settings should use standard precautions for the cleaning and disinfection of the environment and other frequently touched surfaces.	Good Practice Statement	21 December 2023
Waste management			
12.	Health-care waste generated from care provided to suspected or confirmed COVID-19 patients should be segregated according to existing guidelines (e.g. non-infectious, infectious) for disposal and, where necessary, treated per national/subnational/local regulations and policies.	Good Practice Statement	21 December 2023
Handling linens and laundry			
13.	Health-care facilities should follow standard processes for handling, transporting, sorting and laundering of linens for patients with suspected or confirmed COVID-19. Remark: This process should adhere to national/subnational/ local policies as well as ensure the implementation of standard precautions.	Good Practice Statement	21 December 2023
Safe dead body management			
14.	Health and care workers and other persons involved in handling the deceased should follow standard precautions according to risk-assessment and existing national/ subnational/local protocols for managing and handling the bodies of deceased persons infected with COVID-19.	Good Practice Statement	21 December 2023
Operating theatres			
15.	WHO suggests that the designation of a specific operating theatre for patients with suspected or confirmed COVID-19 infection is not needed.	Conditional recommendation against, very low certainty of evidence	21 December 2023
16.	Terminal cleaning of operating theatre after surgical intervention/procedures for patients with suspected or confirmed COVID-19 should be performed according to national/subnational and local policies for transmission-based precautions.	Good Practice Statement	21 December 2023
Identification of health and care workers infections in the health care setting			
17.	Countries should have national and subnational testing strategies for the detection of SARS-CoV-2 infections in health and care workers.	Good Practice Statement	10 August 2023
18.	Passive screening of symptoms for SARS-CoV-2 and other respiratory infections should be performed based on self-monitoring and reporting of symptoms by health and care workers.	Good Practice Statement	10 August 2023
19.	Health and care workers should be prioritized for SARS-CoV-2 testing in the context of COVID-19 testing policies for both the community and health-care facilities.	Good Practice Statement	10 August 2023
20.	Health-care facilities should have protocols for reporting and managing health and care workers' occupational and non-occupational high-risk exposures to COVID-19.	Good Practice Statement	10 August 2023

21.	Any health and care worker who has signs or symptoms of SARS-CoV-2 infection should be excluded from their activities at work that require providing in-person care to patients or other activities in the health-care facility where they are in contact with other health and care personnel. They should furthermore consult with their occupational health and safety department and plan for isolation in a designated setting for the duration of the required period of isolation outlined by their local policy.	Good Practice Statement	10 August 2023
Duration of isolation for COVID-19 cases in health and care workers			
22.	We suggest 10 days of isolation for individuals who are symptomatic due to SARS-CoV-2 infection (very low certainty of evidence).	Conditional recommendation for, very low certainty of evidence	Published in IPC guidelines: 10 August 2023 Published in Clinical Management guidelines: 13 January 2023
23.	We suggest 5 days of isolation for individuals who are asymptomatic with SARS-CoV-2 infection (very low certainty of evidence).	Conditional recommendation for, very low certainty of evidence	Published in IPC guidelines: 10 August 2023 Published in Clinical Management guidelines: 13 January 2023
24.	We suggest the use of rapid antigen testing to reduce the period of isolation (very low certainty of evidence).	Conditional recommendation for, very low certainty of evidence	Published in IPC guidelines: 10 August 2023 Published in Clinical Management guidelines: 13 January 2023

1.3.2 Summary of recommendations and good practice statements for mitigation measures in the community

Table 2. Summary of recommendations and good practice statements for mitigation measures in the community.

Recommendation or good practice statement		Strength/type	Date published
Mask use in the community			
1.	WHO recommends the use of a mask for the	Strong recommendation for, low-	13 January 2023

	prevention of SARS-CoV-2 transmission in the community in the following situations: • when in crowded, enclosed, or poorly ventilated spaces; • following recent exposure to COVID-19 (according to the WHO definition) when sharing a space with others; • when sharing a space with a person who displays signs or symptoms of COVID-19 or is COVID-19-positive; • for individuals at high risk of severe complications from COVID-19.	to-moderate certainty of evidence	
2.	In situations not addressed by the strong recommendation, WHO suggests a risk-based approach to inform the decision to use a mask for the prevention of SARS-CoV-2 transmission in the community. Factors that favour mask use: • COVID-19 epidemiological trends at the community level indicating high or rising transmission or hospitalizations; • low coverage of COVID-19 vaccination; • low levels of population immunity to SARS-CoV-2; • a greater degree of crowding, poorer indoor ventilation, and/or the presence of individual risk factors.	Conditional recommendation for, low-to-moderate certainty of evidence	13 January 2023
3.	Individuals with any signs or symptoms suggestive of COVID-19 or who test positive for COVID-19 should wear a medical mask when sharing a space with others until they are resolved or the isolation period is complete.	Good Practice Statement	13 January 2023
4.	Policies aimed at reducing the transmission of SARS-CoV-2 in the community should be revisited, strengthened and updated according to the most recent scientific evidence.	Good Practice Statement	13 January 2023
5.	When wearing a mask in community settings, individuals should use a well-fitting mask with full coverage of the nose and mouth. • Ensure a snug fit at the nose bridge, cheeks, chin and lateral sides of the face • The “knot-and-tuck” and “linking-ear-loops-behind-the-head” techniques improve medical mask fit by reducing gaps on the sides of medical masks with ear loops	Good Practice Statement	10 October 2023
Mask use during physical activity			
6.	WHO suggests that people do not wear masks during vigorous-intensity physical activity.	Conditional recommendation against, low certainty evidence	21 December 2023
Mask use by children			

7.	Masks are not required for children 5 years of age and under.	Conditional recommendation against, very low certainty of evidence	07 March 2022
8.	In areas where there is known or suspected community transmission of SARS-CoV-2, masks are recommended for use in children ages 6-11 years in the following settings: • in indoor settings where ventilation is known to be poor or cannot be assessed, or the ventilation system is not properly maintained, regardless of whether physical distancing of at least 1 metre can be maintained; • in indoor settings that have adequate ventilation if physical distancing of at least 1 metre cannot be maintained.	Conditional recommendation for, low certainty of evidence	07 March 2022
9.	Adolescents 12 years or older should follow the same WHO recommendations for mask use as adults.	Strong recommendation for, low certainty of evidence	07 March 2022
10.	Children with cognitive or respiratory impairments, developmental disorders, disabilities or other specific health conditions who experience difficulties wearing a mask or have health conditions that interfere with mask-wearing should not be required to wear a mask.	Good Practice Statement	07 March 2022
11.	The use of a medical mask is recommended for children with a higher risk of severe complications from COVID-19 but should be assessed in consultation with the child's medical provider.	Good Practice Statement	07 March 2022
Glove use			
12.	WHO suggests that the general public not wear gloves for routine activities in community settings in the context of COVID-19. Remarks: Hand hygiene should be performed frequently.	Conditional recommendation against, very low certainty of evidence	21 December 2023
Environmental cleaning			
13.	In the context of COVID-19, households and community settings should follow routine environmental cleaning and disinfection practices.	Good Practice Statement	21 December 2023
Waste management			
14.	Waste generated in the community from persons with suspected or confirmed COVID-19 should be handled and disposed of according to national/subnational/local regulations for waste management.	Good Practice Statement	21 December 2023
Handling of linens and laundry			
15.	Regular household processes should be used for laundering items for persons with suspected or confirmed COVID-19.	Good Practice Statement	21 December 2023

2. Methodology

Guideline Development Groups (GDGs) and External Review Groups
The IPC recommendations, good practice statements (GPSs) and implementation considerations included in this document were developed in accordance with WHO methodology, including a review of available evidence by the Guideline Development Group (GDG). The establishment of the GDG considered representation of members with a broad expertise spanning multiple specialties, across all WHO regions, and was gender-balanced. A consensus was sought for recommendations and GPSs. When consensus was not achieved, approval of a recommendation or GPS required a supermajority (≥ 70%) of the GDG voting members.

The technical officer responsible for the collection and review of the required declaration of interest (DOI) from GDG members assessed the DOIs for any potential conflicts. If a conflict of interest was identified, appropriate management actions were taken in accordance with the WHO Handbook for guideline development and WHO Guidelines for DOI (for WHO Experts) *[29][31]*.

External review group members were also identified for specific technical areas and provided additional review of the guidelines. External review groups do not change the recommendations made by the GDG; however, any major concerns are brought back to the GDG for additional discussion. For more information on authorship, contributions and DOI, please refer to the acknowledgement section.

Evidence synthesis and assessment
As noted in the Executive Summary, with support from the WHO Quality Assurance for Norms and Standards Department, rapid systematic reviews of published literature were commissioned. The literature for each identified topic was assessed using Grading of Recommendations, Assessment, Development and Evaluation (GRADE) to determine the certainty of the evidence (Table 1) based on the presence of risk of bias/study limitations, inconsistency, imprecision, indirectness and publication/reporting biases.

Table 3. Determining the Quality of Evidence in Grading of Recommendations, Assessment, Development and Evaluation (GRADE)

Quality level	Definition
High	The Group is very confident in the estimate of effect and considers that further research is very unlikely to change this confidence.
Moderate	The Group has moderate confidence in the estimate of effect and considers that further research is likely to have an important impact on that confidence and may change the estimate.
Low	The Group has low confidence in the estimate of effect and considers that further research is very likely to have an important impact on that confidence and is likely to change the estimate.
Very low	The Group is very uncertain about the estimate of the effect.

Rapid reviews
To provide timely, evidence-informed recommendations, the GDG needed to review multiple questions within a limited time frame. Rapid reviews of the evidence were commissioned to external groups (e.g. clinical effectiveness of mask use in health care and use of airborne precautions in the context of COVID-19) or conducted by WHO staff (e.g. ecological studies on mask effectiveness). Reviews were conducted using standardized methods for systematic reviews, which included searches of multiple electronic databases, use of pre-defined inclusion/exclusion criteria, risk-of-bias assessments and syntheses (using GRADE); noting that some used rapid-review methods and some were living reviews. Furthermore, non-commissioned and previously published reviews supplemented the decision-making process. Some of the reviews have been published and updated to identify emerging evidence that informed deliberations by the GDG *[32][33]*. Some of the rapid reviews have been published to identify any emerging evidence that may inform deliberations by the GDG *[32][33]*; details about search strategies can be found within these reviews. Evidence from randomized, controlled trials (RCTs) has been limited; therefore, the reviews included non-randomized studies, cohort, case-control and ecological studies.

Airborne precautions, ventilation, dead body management, waste management, physical barriers, laundry, operating rooms and glove use in the community rapid review
The rapid reviews of airborne precautions, physical barriers, ventilation, dead body management, waste management, physical barriers, laundry, operating rooms and glove use in the community were informed by the approach for rapid reviews developed by Tricco et al.,*[34]*. Search strategies were tested and designed in conjunction with the WHO Secretariat. Final searches were conducted in Medline, Elsevier

Embase, medRxiv preprint server, and Google Scholar. Documents were selected through pre-set inclusion and exclusion criteria. The study design, population, setting and methodology were extracted from the included articles for synthesis. All data were analysed using framework analysis *[35]* and assessed for quality using the Mixed Methods Appraisal Tool (MMAT). When the search yielded studies answering the PICO (**P**opulation, **I**ntervention, **C**omparator, **O**utcome) question, a summary of findings or GRADE tables was presented to the GDG.

Universal masking and targeted continuous masking rapid review

The rapid review for universal masking was conducted through a rapid, living review approach. A medical librarian searched PubMed, MEDLINE, and Elsevier Embase, WHO COVID-19 database and the medRxiv preprint server. Studies were selected by using predefined criteria. One investigator extracted study data (e.g. study author, year, population characteristics and results) and a second investigator verified data; odds ratios were calculated as needed. A formal risk-of-bias assessment was not done, though key limitations were narratively noted. Results were synthesized, though quantitative synthesis was not possible due to methodological limitations; study design variability; and heterogeneity in populations, comparisons, and analytic methods. The results and the certainty of evidence were presented to the GDG using GRADE, including GRADE Evidence Profiles and Summary of Findings tables. Contextual data on cost-effectiveness, equity, acceptability, resources required and feasibility were captured and summarized narratively. Since the completion of the published rapid review *[36][37]*, the WHO Secretariat has been receiving quarterly updates from the author group on the topic to inform evidence-based recommendations.

Mask type rapid review

Evidence for mask effectiveness and type is continuously reviewed through a rapid, living review approach *[32][33]*. A medical librarian searched PubMed, MEDLINE, and Elsevier Embase, WHO COVID-19 database and the medRxiv preprint server. Studies were selected by using predefined criteria. The population was health and care workers with interventions of disposable N95 filtering facepiece respirators, surgical masks and cloth masks. One investigator extracted study data (e.g. study author, year, setting, population characteristics, mask intervention, and results) into standardized tables, and a second investigator verified data. Relative risks were calculated for randomized trials and odds ratios were calculated for observational studies. For observational studies, key limitations of each study, such as potential recall, selection, or participation bias, were noted and results were synthesized narratively. Unadjusted and adjusted risk estimates were presented for observational studies. For cluster randomized trials, risk estimates adjusted for cluster effects were utilized. The results and the certainty of evidence were presented using GRADE, including GRADE Evidence Profiles and Summary of Findings tables. Contextual data on cost-effectiveness, equity, acceptability, resources required, and feasibility were captured and summarized narratively. Additional details on the study methodology can be found in the published article or its frequent updates *[32][33]*.

Cleaning and disinfection, spraying versus wiping, physical distance, and mask use during physical activity rapid review

The rapid reviews on cleaning and disinfection, spraying versus wiping, physical distance and mask use during physical activity were performed by an external team. Search strategies were tested and designed in conjunction with the WHO Secretariat. Final searches were conducted in Cochrane Library, Cochrane Database for Systematic Reviews, Central, Elsevier Embase, and PubMed. Documents were selected through pre-set inclusion and exclusion criteria. The study design, population, setting and methodology were extracted from the included articles for synthesis. Three authors independently screened the search output (for both title and abstract and full-text eligibility screening) using Distiller SR and MS Excel. Any discrepancies were resolved by discussion within the review team. Assessment of the risk of bias in included studies was with ROBINS-I (Risk of bias in non-randomized studies - of interventions). GRADE profile was prepared by one author and cross-checked by other members of the review team, and a summary of findings or GRADE tables was presented to the GDG.

Evidence review for the chapter on management, identification and prevention of infections in health and care workers

The WHO Quality Assurance for Norms and Standards Department conducted a systematic review to assess the latest evidence on the prevention, identification, testing and management of infected health and care workers. The librarian and members of the IPC team designed the search strategy. The PICOs were developed in conjunction with the GDG chairs, methodologists and Secretariat to examine research that had not previously been evaluated to provide the basis for an evidence-based decision. The WHO COVID-19 Research Database, which includes results from several other databases, was searched from January 2020 to June 2022. Full details can be found in Annex 3.

Evidence from RCTs has been limited during the pandemic. Therefore, the reviews included mostly non-randomized studies, cohort, case-control and ecological studies. The systematic reviews were presented in GDG meetings and were supplemented by other (non-systematically reviewed) data presented by WHO staff. Such presentations informed considerations regarding contextual factors on testing health and care workers; their recommended isolation period; when to return to work after an infection; and under what conditions. The GDG also received regular updates on SARS-CoV-2 epidemiology and transmission from the WHO epidemiology team. In addition, the WHO clinical management team for COVID-19 presented a systematic review on the period of infectiousness, which influenced the GDG's recommendations on the duration of isolation needed for a positive COVID-19 case. Some members of the IPC GDG participated in the

development of this recommendation by the Clinical Management GDG, and the recommendation was also adopted for health and care workers.

Qualitative reviews and grey literature searches
In addition to the rapid reviews, other data were presented by WHO staff, Member States and partner organizations. Such presentations were used to inform considerations regarding contextual factors on mask use, physical barriers and distancing, and cleaning and disinfection. These presentations included desk reviews of other prominent guidelines, information on mask filtration properties, technical specifications on ventilation and periodic updates on the ever-changing epidemiology of COVID-19.

WHO also commissioned a qualitative review of the literature (reports, qualitative studies and related systematic reviews) to understand the perceptions of health and care workers on mask use and other PPE and to better inform the GDG in the evidence-to-decision-making process. The review question was articulated using the SPICE (**S**etting, **P**erspective, **I**ntervention, **C**omparison, **E**valuation) framework and the protocol was registered on PROSPERO, an international prospective register of systematic reviews. The review utilized a structured database search on MEDLINE (Ovid) and study selection and data extraction were conducted using pre-piloted tools. Methodological quality was assessed using the modified CASP (Critical appraisal skills programme) tool and data were synthesized using the thematic synthesis approach. Such an approach generated descriptive and analytical themes, using the GRADE-CERQual (Confidence in the evidence from reviews of qualitative research) tool to assess confidence in the review finding. Findings were presented to the GDG to help inform the evidence-to-decision framework.

Rapid reviews of the evidence for mask use in the community
Systematic reviews were commissioned to external groups *[32][33]* or conducted by WHO staff *[38]*.

The evidence review for mask use in the community was continuously reviewed through a rapid, living review approach. A medical librarian searched PubMed, MEDLINE, and Elsevier Embase, the WHO COVID-19 Research Database and the medRxiv preprint server. Studies were selected by using predefined criteria. One investigator extracted study data (e.g. study author, year, population characteristics, setting) into standardized tables, and a second investigator verified data (study author, year, setting, mask interventions and results). Relative risks were calculated for randomized trials and odds ratios for observational studies. Available data on RCTs were assessed by using criteria adapted from the U.S. Preventive Services Task Force. For observational studies, key limitations of each study, such as potential recall, selection or participation bias were noted and results were synthesized narratively. Risk estimates adjusted for cluster effects and unadjusted and adjusted risk estimates were presented for RCTs and observational studies, respectively. The results and the certainty of evidence were presented using GRADE, including GRADE Evidence Profiles and Summary of Findings tables. Contextual data on cost-effectiveness, equity, acceptability, resources required and feasibility were captured and summarized narratively. This review has been published and is regularly updated to include any emerging evidence that may inform deliberations by the GDG.

The systematic review on mask fit was informed by guidance for rapid evidence reviews developed by Tricco et al. *[34]*. Search strategies were tested and designed in conjunction with the WHO Secretariat. Final searches were conducted in Medline, Elsevier Embase, medRxiv preprint server, and Google Scholar. Documents were selected through pre-set inclusion and exclusion criteria. The study design, study population, study setting and study methodology were extracted from the included articles for synthesis. All data were analysed using framework analyses *[35]* and assessed for quality using the MMAT. The results and the certainty of evidence were presented using GRADE, including GRADE Evidence Profiles and Summary of Findings tables. Due to a lack of data that would enable pooling, a descriptive summary of the patient characteristics, study characteristics, and risk of bias/methodological quality results was presented.

Process for developing recommendations
Once the balance of benefits to harms and certainty of the evidence was determined (based on the systematic reviews described above), the GDG, with the guidance of the methodologist, determined if a recommendation (strong or conditional) or a GPS was warranted. GRADE evidence profiles describe the GDG's assessment of the balance of benefits to harms, the certainty of the evidence, and a summary of findings for each critical outcome and each key question. The GDG used these summaries as the basis for discussions and formulation of recommendations.

The evidence-to-decision (EtD) framework was used by the GDG to support the formulation of the recommendation or GPS. In addition to the magnitude of benefits relative to harms and the certainty of the evidence, the strength of recommendations (strong or conditional) was informed by values and preferences, resource allocation (costs), equity, feasibility and acceptability (Table 2).

Table 4. Evidence-to-decision-making domains

Domain	Favours strong recommendations	Favours conditional

		recommendations
Balance of benefits and harms	Benefits highly outweigh harms	Benefits and harms more closely balanced
Quality of evidence	Higher certainty	Lower certainty
Values/preferences regarding outcomes	Benefits-to-harms assessment not afected by variability in values/ preferences	Variability in values/preferences would affect benefits to harms assessment
Acceptability	Highly acceptable	Low or variable acceptability
Costs/resources	Cost saving/cost effective	Costly/cost ineffective
Feasibility	Feasible in intended settings	Unfeasible or feasibility varies in intended settings
Equity	Increased equity	Decreased equity or effect on equity variable

For mask use in children, these additional EtD domains were informed by five consultation sessions conducted by the United Nations Children's Fund (UNICEF) with members of the International Pediatric Association (IPA), and members from different geographical regions, in multiple languages, regarding paediatric health professionals' children's field experiences (including acceptability and feasibility) with the implementation of previous WHO guidance on masks.

For recommendations on mask use in health and care workers, the EtD domains were informed by presentations from stakeholders from individual countries regarding acceptability and feasibility, mask availability and costs globally. The GDG also received regular updates on SARS-CoV-2 epidemiology and transmission from the WHO epidemiology team. Otherwise, the EtD domain assessments (including values/preferences and equity) were based on the collective input and experience of the GDG, which comprised members (including persons in the community, clinicians and policymakers) who represented all WHO regions and ranged from low- to very high-income countries, supplemented by key studies suggested by GDG members when available. Results from the qualitative review on PPE and masks were also used to inform the evidence to decision tables for mask use by health and care workers.

The GDG graded recommendations as strong or conditional. Strong recommendations are supported when benefits clearly outweigh harms with at least moderate certainty; other factors that support strong recommendations are non-sensitivity to variability in preferences/ values regarding outcomes, wide feasibility and acceptability, cost savings or cost-effectiveness, and likely positive impacts on improving equity. When certainty is low or very low, strong recommendations require a strong rationale for potential net benefits despite important uncertainty and strong support from the other EtD domains. Alternatively, a GPS may be considered if the certainty of benefits is high based on indirect evidence, despite no direct evidence or low/very low certainty based on direct evidence (see the section on GPS). In some cases, after determining that the benefits of intervention do not outweigh the harms and considering EtD domains (Table 2), the GDG may make a recommendation against an intervention. The GRADE tables used in this guideline can be found in the evidence section.

Good practice statements and implementation considerations

GPSs are most suitable when direct evidence is lacking, but benefits are determined to be large and harms very small; the certainty of benefits and harms is great; the decision to use the recommended intervention is not sensitive to values/preferences regarding outcomes; the intervention is cost saving; and the intervention is clearly acceptable, feasible and promotes equity *[39][40][41][42]*. GPSs characteristically represent situations in which a large and compelling body of indirect evidence, made up of linked evidence including several indirect comparisons, strongly supports the net benefit of the recommended action *[39][40][41][42]*. GPSs generally indicate interventions that would be considered the standard practice that obviously would result in net benefit. GPSs are not GRADEd statements *[39][40][41][42]*.

On multiple occasions, the GDG elected for a GPS instead of a strong or conditional recommendation. These GPSs are part of an overall evidence-based process, and often a systematic review was commissioned to determine whether direct evidence was available. The GDG issued a GPS if it judged that an assessment of the use of indirect evidence provided high certainty of benefit despite the fact that the evidence was either insufficient or of such low quality that it did not qualify as a recommendation.

Implementation considerations are critical elements that facilitate the appropriate use of recommendations and GPSs. When applying IPC measures, it is important to consider factors that can affect successful implementation, potential barriers and strategies to adapt to the specific setting and situational needs.

Implementation considerations refer to the factors that need to be taken into account when putting guidelines or recommendations into practice. These include practical, logistical and organizational aspects that can affect the application of measures to be followed by health-care providers and organizations. Examples include factors such as resource allocation, training and education, the physical environment and layout of the health-care facility, integration into existing systems, application at the point of care, cultural and contextual considerations.

Implementation considerations are not assessed using the GRADE methodology. However, considerations for application of recommendations into practice are guided by existing WHO guidelines and established IPC practices (standard and transmission-based precautions). They may be actionable and relevant to implementing one of the intervention options and may include information to enhance implementation *[39][40][41][42]*.

Readership cues for statements

Table 3 presents the readership cues used for the statements in this guideline, which is subject to review as a normative product. The green checkmarks and red X symbols reflect statements that are developed using the GRADE evidence-assessment methodology and the evidence-to-decision framework to inform a recommendation or a GPS. The grey bar refers to implementation considerations that support statements through practical advice and are the product of expert consensus.

Table 5. Readership cues used for statements in the guideline

	The GREEN checkmark symbol denotes a recommendation or a good practice statement in favour of an intervention.
	The RED X denotes a recommendation or good practice statement against an intervention.
	The GREY bar denotes an implementation consideration supporting the practical implementation of the statement.

Periodicity of the guideline revision and updates

In accordance with WHO methodology, several updates to the IPC COVID guideline were completed during the period of the pandemic response, informed by emerging evidence and consultation with the GDG. Considering the current context of COVID-19, with the transition from emergency status (PHEIC) with a return to normative IPC practices, this update (version 7) transitions the format from a living guideline to a guideline.

3. Part 1: Health-care settings

This section provides an overview of infection prevention and control (IPC) principles and practices, and IPC measures for patients with suspected or confirmed COVID-19 in health-care settings.

3.1 Background

Infection prevention and control (IPC) is a practical, evidence-informed approach to preventing patients and health and care workers from being harmed by avoidable infections *[43]*. Implementation of IPC measures is based on a risk-assessment approach and established practices (i.e. standard and transmission-based precautions). This section provides an overview of IPC programmes, principles and precautions.

3.1.1 What is an IPC programme?

What is an infection prevention and control programme?
IPC is a practical, evidence-informed approach to preventing patients and health and care workers from being harmed by avoidable infections. Health-care-associated infections (HAIs) are among the most common adverse events in care delivery and a major public health problem affecting morbidity, mortality and quality of life. On average, 7% of patients in developed countries and 15% of patients in developing countries will acquire at least one HAI *[44]*. These infections also impose a significant economic burden on society. A large proportion of them are preventable through effective IPC measures.

Establishing an infection prevention and control programme at national and acute health-care facility levels
The *WHO Guidelines on core components of infection prevention and control programmes at national and acute health-care facility levels [43]* include strategies to prevent current and future threats from infectious agents and antimicrobial resistance in health-care.

The core components constitute a framework of recommendations and good practice statements distributed into eight areas: 1) infection prevention and control programmes, 2) national and facility-level infection prevention and control guidelines, 3) IPC education and training, 4) health-care-associated infections surveillance, 5) multimodal strategies for implementing infection prevention and control activities, 6) monitoring and evaluation and feedback, 7) workload, staffing and bed occupancy at the facility level and 8) built environment, materials and equipment for IPC at the facility level. Ensuring adequate clinical staffing levels is recommended as a core component to prevent the transmission of HAIs and multidrug-resistant organisms (MDROs); limit human-to-human transmission; reduce secondary infections; and prevent transmission through amplification and super-spreading events.

Implementation of an IPC programme requires a stepwise approach to achieve its full potential *[43]*. Minimum requirements as identified by WHO support the strengthening of IPC in countries where IPC is limited or nonexistent *[45][46]*. In this regard, a facility-level IPC programme with a dedicated and trained IPC team, or at minimum, an IPC focal point, should be in place and supported by national-level and facility-level senior management. Achieving the IPC minimum requirements (and more robust and comprehensive IPC programmes in all countries) is essential to being able to control the COVID-19 pandemic, other emerging and re-emerging pathogens and MDROs. Finally, WHO has also developed guidance on the core competencies *[47]* required for infection prevention and control professional staff, which can be used to develop curricula for IPC specialists.

3.1.2 IPC principles

The following section outlines the core elements of IPC principles and practices for implementation in health-care facilities, including 1) the chain of transmission, 2) the hierarchy of control measures and 3) the implementation of standard and transmission-based precautions.

Standard precautions are the core practices that are to be applied in all health-care settings, for all patients, at all times *[11]*. Transmission-based precautions are additional measures implemented according to a risk assessment, where standard precautions are not sufficient *[9]*. For COVID-19, this includes the rapid identification and implementation of control measures, such as isolation of suspect or confirmed cases. See the respective subsections on standard and transmission-based precautions for more information.

Understanding the chain of infection

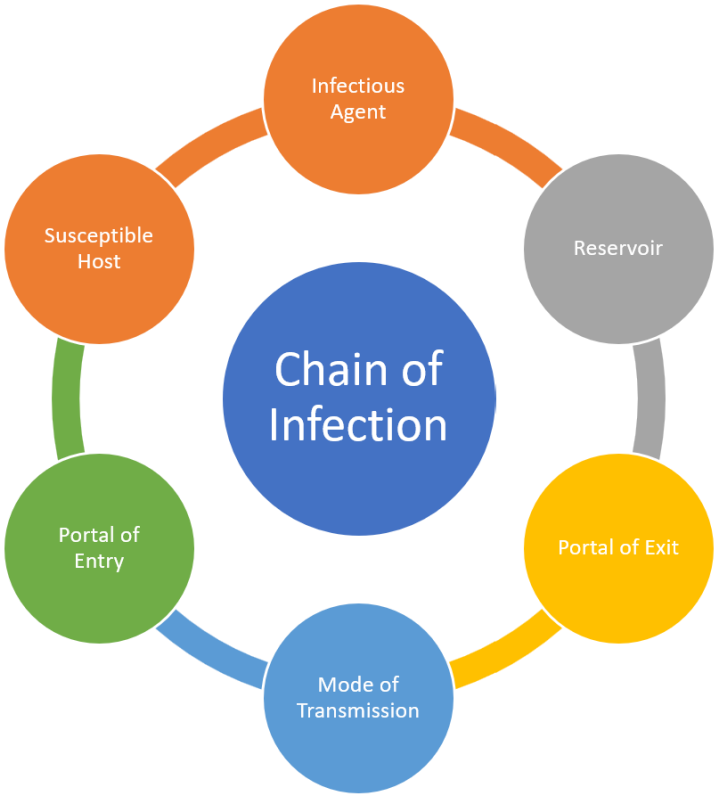
Epidemiology aids in the understanding of infectious diseases; the distribution of illness; and the identification of modifiable factors that affect occurrence and outcomes. The spread of microorganisms occurs within a community or health-care setting through a sequence of events described as a chain of infection *[48]*.

Transmission of microorganisms may result in a transient carriage or long-term colonization, asymptomatic infection or clinical disease. The presence of microorganisms in or on a host, with growth and multiplication but without tissue invasion or cellular injury, is referred to as colonization *[9]*. Infection is the condition in which microorganisms multiply within the body and respond to the host's immune defenses. Infection may or may not lead to clinical disease (symptomatic infection) *[9]*.

Certain conditions must be met for an infectious agent to be spread from person to person. The establishment of infection involves a set of complex interrelationships among the source of the infectious agent, the susceptible host and the environment, and requires the transmission of infectious agents from the source to a susceptible host *[49]*.

The chain of infection includes six links: the infectious agent, reservoir, portal of exit, mode of transmission, portal of entry and susceptible host. If this chain is broken at any of the links, the process is interrupted and the infection is prevented from occurring *[48]*. IPC measures can interrupt each link of this chain, and thus can control the spread of infectious disease. For example, by properly applying cleaning and disinfection practices, one may disrupt the reservoir (i.e. contaminated surfaces) and thereby reduce or limit the spread of disease.

Figure 1. Chain of infection



Infection prevention and control practices are informed by a risk-assessment approach that assesses and analyses the potential for exposure to infectious agents. When applied consistently, IPC precautions (i.e. standard and transmission-based precautions) can prevent or reduce the risk of exposure and transmission of health-care-associated and occupational infections *[48]*.

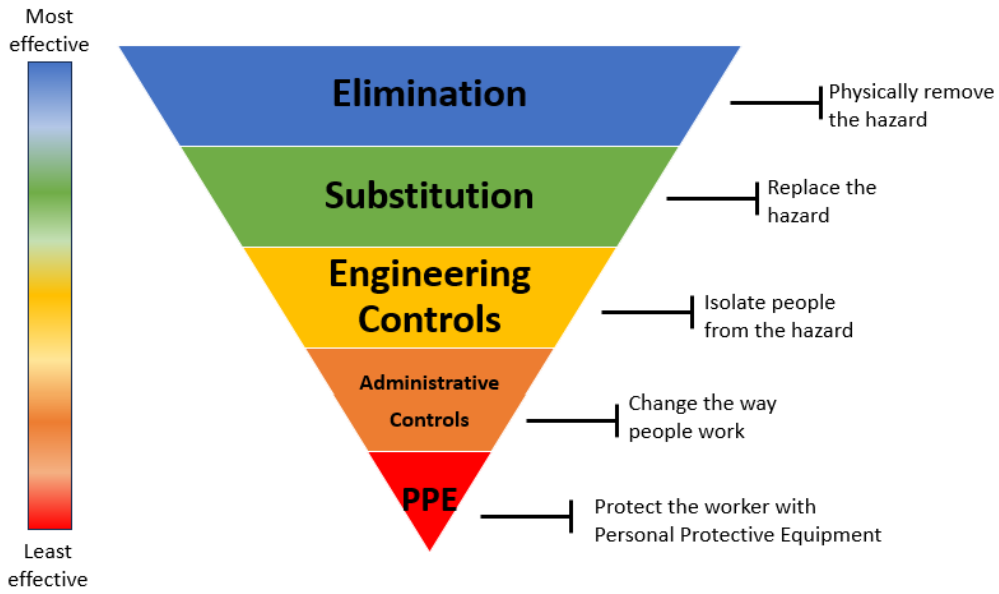
Hierarchy of occupational safety and health-control measures

The hierarchy of controls describes measures that can be taken to minimize exposure and subsequent transmission of infectious diseases *[19]*. These principles can be applied in health-care settings to reduce or mitigate the hazard, a key component of IPC efforts.

The hierarchy of occupational safety and health control framework includes five levels of actions to reduce or remove hazards:

- Elimination
- Substitution
- Engineering controls
- Administrative controls
- Personal protective equipment (PPE)

Figure 2. Hierarchy of occupational safety and health controls *[50]*



Principles can be applied in health-care settings to reduce or mitigate the hazard. Control measures listed at the top of the hierarchy are more protective than those at the bottom. If a combination of measures is implemented at each level, the risk of transmission is reduced. The hierarchy applies to a broad range of work environments and potential hazards, including pathogens, other particles and chemicals *[19][50]*.

In the framework above, the two first tiers, elimination and substitution, are more challenging actions to reduce or remove hazards in health-care settings, as it may not be feasible to eliminate or substitute the hazard. Infection prevention and control measures focus on three of these tiers: engineering controls, administrative controls, and the selection and use of personal protective equipment (PPE) for health and care workers to mitigate the risk of potential infectious hazards in the workplace *[19][50]*.

Engineering controls

Engineering controls are measures taken to reduce the risk of transmission of infections to health and care workers and patients through health-care-facility design. These measures can include modifying the ventilation, the equipment or the workspace; making available an airborne infection isolation room (AIIR) or other designated isolation room; installing protective and physical barriers; designating handwashing sinks for use by health and care workers; and creating signage to direct patients.

Engineering controls do not depend on an individual's compliance with exposure-prevention strategies. These controls are usually established and controlled within the building structure, thereby eliminating choice about their application and reducing the opportunity for individual error. As such, they provide more effective protection *[19][50]*.

Administrative controls

Administrative controls are measures taken to reduce the risk of transmission of infections to health and care workers and patients through the implementation of policies, procedures, training, monitoring and support of IPC practices. Examples include support for effective IPC programmes, IPC policies, procedures and resources (i.e. patient placement, symptom screening, visitor management, sick-leave policies); occupational health and safety policies, including preplacement assessment, work restrictions,

respiratory protection programmes, sharps safety and other practices that prevent exposure to bloodborne pathogens; vaccination programs; training and education of workers; monitoring of IPC practices, HAIs and occupational infections *[19][50]*.

To be effective in preventing the transmission of microorganisms and/or detecting cases of infection, administrative controls are best implemented at the point of first encounter with an infected source and are continued until the infected source leaves the health-care setting or is no longer infectious. Inherent in the development of administrative controls to prevent transmission of infection is the commitment by the health-care organization to provide the resources needed to implement the controls *[19][50]*.

Personal protective equipment

PPE controls are considered the lowest level of the control measures and should not be relied on as the primary or stand-alone prevention intervention. A singular focus on the availability and use of various PPE to the exclusion of other tiers in the hierarchy of controls will result in suboptimal protection of all people in the health-care setting. The effective and appropriate use of PPE is the measure that is most reliant on the user's adherence and competence and, therefore, the control level most easily compromised (resulting in ineffective protection from an infectious agent/infected source) *[19][50]*.

The PPE tier refers to the availability and appropriate use of equipment that provides a barrier to protect from an infectious agent/infected source. This includes the use of gloves, gowns, masks, facial protection, eye protection (face shields or goggles) and FFP/respirators, when indicated. The health-care organization plays a critical role in ensuring the availability of appropriate PPE for use by health and care workers to prevent exposure to an infectious agent/infected source. Staff should perform proper fit testing and receive PPE training on use. Selection of PPE is based on the route of transmission of the pathogen, the level of exposure anticipated, the appropriateness for the task, and fit *[19][50]*.

3.1.3 Standard precautions

Standard precautions aim to reduce the risk of transmission of pathogens in the health-care setting from recognized and unrecognized sources and are the basic level of IPC precautions that should always be followed in the care of all patients *[11]*.

- **Standard precautions include, but are not limited to:**
  - risk assessment
  - hand hygiene
  - respiratory hygiene and cough etiquette
  - patient placement
  - personal protective equipment
  - aseptic technique
  - safe injections and sharps injury prevention
  - environmental cleaning
  - handling of laundry and linen
  - waste management
  - decontamination and reprocessing of reusable patient-care items and equipment *[11]*.

For additional information on standard precautions see Standard precautions for the prevention and control of infections: aide-memoire *[11]*.

3.1.4 Transmission-based precautions

Transmission-based precautions are used in addition to standard precautions for patients with known or suspected infection or colonization with transmissible and/or epidemiologically significant pathogens. The type of transmission-based precautions assigned to a patient depends on the transmission route of the microorganism: contact, droplet or airborne.

Screening and application of transmission-based precautions are to be started as soon as a patient presents at a health facilty with symptoms (e.g. fever, new cough, vomiting, diarrhoea). For additional information on transmission precautions see Transmission-based precautions for the prevention and control of infections: aide-memoire *[9]*.

3.2 IPC measures for patients with suspected or confirmed COVID-19

Early recognition of SARS-CoV-2 infections and timely application of IPC measures reduce the risk of transmission of COVID-19 for patients and for health and care workers. The following section outlines well-established infection prevention and control practices that are to be implemented at the point of care, based on a risk assessment, for patients with suspected or confirmed COVID-19 *[51][52]*. Basic IPC principles and practices provide the foundation for health-care facilities to prevent and manage outbreaks.

3.2.1 Screening and patient placement

The following section describes IPC measures that should be implemented in the health-care facility for patients presenting with suspected or confirmed COVID-19.

Identify and manage individuals with suspected or confirmed COVID-19

Prompt identification of patients with signs and symptoms of acute respiratory infections reduces transmission in health-care facilities. This section provides an overview of IPC measures for individuals presenting with suspected or confirmed COVID-19. These practices are consistent with precautions for ARIs, such as respiratory and hand-hygiene best practices; isolation of patients where applicable; appropriate selection and use of PPE; environmental cleaning and disinfection; and, where possible, maintaining a physical distance of at least 1 metre. Additional measures (transmission-based precautions) are applied when standard precautions alone are insufficient.

For patients with suspected or confirmed COVID-19, the following IPC practices mitigate the risk of transmission in healthcare facilities:

1. Apply standard precautions for all patients at all times *[11]*

- Apply standard precautions for all patients when providing diagnostic and care services.

2. Screen for early recognition of suspected or confirmed COVID-19 patients and rapid implementation of source control measures

- Use clinical triage[1] to assess patients for signs and symptoms[2,3] of acute respiratory infections, including COVID-19, to prevent transmission to health and care workers *[8]*.
- Promptly isolate/separate patients when appropriate *[52]*.
- Use source-control measures, which prevent infections from spreading by stopping them at the source, to reduce the transmission of COVID-19 and other respiratory infections.
- Note that, after being screened, a person enters the COVID-19 care pathway[4], which includes an assessment of symptoms that meet the standardized case definition *[5]*. WHO recommends that COVID-19 care pathways be established at local, subnational and national levels. COVID-19 care pathways are for persons with suspected or confirmed COVID-19 and are a tool to support health and care workers in visualizing the current clinical and therapeutic recommendations to be considered in the care plan for patients with COVID-19.

3. Apply transmission-based precautions *[9]*

Additional measures are focused on the mode of transmission of the microorganism and are always used in addition to standard precautions, grouped into categories according to the route of transmission of the infectious agent (i.e. contact, droplet and/or airborne precautions). Transmission-based precautions are applied when caring for patients with known infection, patients who are colonized with an infectious organism, and asymptomatic patients who are suspected of or are under investigation for colonization or infection with an infectious microorganism. In addition to standard precautions, additional measures are applied according to risk assessment, including the appropriate selection and use of PPE, when providing direct care for patients with suspected or confirmed COVID-19 *[9][53]*.

4. Patient placement for those with suspected or confirmed COVID-19

- Isolation is used to separate people with confirmed or suspected COVID-19 from those without COVID-19.
  - A patient with suspected or confirmed COVID-19 should be cared for in a separate, well-ventilated area, preferably in an isolation room or single-patient room, if available.
  - WHO recommendations for the duration of isolation can be found here *[52]*.
- Maintain a physical distance of at least 1 metre between patients, increasing that distance where possible.
- When making decisions about patient placement, health and care workers may consider factors such as the availability of single rooms, and anticipated requirements for procedures or situations that may increase the risk and/or likelihood of transmission.
- Cohorting patients confirmed to have COVID-19 in the same room is a consideration when other options are not available. Patients should stay in their rooms, with restrictions to movement or transport to essential activities.
- Use source-control measures, such as mask use for patients with COVID-19 who require (and are able to tolerate) transport, when the patient leaves the room and when is it not possible to maintain a distance of 1 metre.
- In areas with increased community transmission of COVID-19, consider limiting visitors to those who are essential and instruct them to wear a mask (as per facility policy).

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[1] Clinical triage is a system by which patients are screened for specific signs, symptoms and epidemiological clues upon initial contact with the health-care system for the purpose of determining further diagnostic tests, isolation precautions, treatment and reporting

[2] Signs or symptoms: fever, cough, general weakness/fatigue, headache, myalgia, sore throat, coryza, dyspnoea, nausea/diarrhoea/anorexia *[18]*

[3] For information on laboratory diagnosis of SARS-CoV-2, see clinical management of COVID-19: living guideline *[52]*, *Antigen-detection in the diagnosis of SARS-CoV-2 infection [54]*, *Use of SARS-CoV-2 antigen-detection rapid diagnostic tests for COVID-19 self-testing [17]* and *Diagnostic testing for SARS-CoV-2 interim guidance [55]* regarding specimen collection, processing and laboratory testing and the diagnostic algorithm

[4] For more information on COVID-19 care pathways, refer to https://www.who.int/tools/covid-19-clinical-care-pathway *[51]*

3.2.2 Ventilation

Background
The risk of getting COVID-19 is higher in crowded and inadequately ventilated spaces where infected people are in close proximity to one another. Understanding and controlling building ventilation can improve the quality of the air we breathe and reduce indoor health risks by preventing the indoor spread of the virus that causes COVID-19 *[7]*.

Ventilation is the process of supplying outdoor air to and removing indoor air from a space, for the purpose of controlling air contaminant levels, potentially accompanied by humidity and/or temperature, by natural or mechanical means *[7]*. The purpose of ventilation in buildings is to ensure that the air is healthy for breathing. At present, this is achieved mainly by diluting pollutants originating in the building with clean air, and by changing this air (at a specified rate) with the goal of removing any pollutants. Ventilation can also be a control measure used for odour control and containment of infectious agents; it is often combined with climatic control (temperature and relative humidity).

There are three methods that may be used to ventilate a building: natural, mechanical and hybrid (mixed-mode) ventilation. Adequate ventilation in all patient-care areas plays a key role in helping prevent infections and in reducing their incidence. For additional ventilation requirements and strategies, see WHO Roadmap to improve and ensure good indoor ventilation in the context of COVID-19 *[7]*.

Strong recommendation for , Very low certainty evidence

WHO recommends adhering to the ventilation rate requirements for health-care facilities in the context of COVID-19:

- 160 l/s/patient for airborne precaution rooms
- 60 l/s/patient for general wards and outpatient departments

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Practical info

Implementation considerations

To provide maximum utility of a ventilation system and greater general dilution of air contaminants throughout any given space, mechanical and natural systems can be used independent of the settings. However, each setting has specific ventilation requirements, defined by national and international regulatory bodies, which differ according to the ventilation objectives. For instance, ventilation systems in health-care facilities are in place as an environmental and engineering control for infection prevention while, in residential buildings, they are mainly intended to create a thermally comfortable indoor environment with acceptable indoor air quality *[7]*.

Adequate ventilation in all patient-care areas plays a key role in helping to prevent and reduce infections.

Ventilation has three basic elements: ventilation rate (m^3/hr, l/s or air changes per hour [ACH]), which is the volume of outdoor air that is provided into the space; airflow direction, which is the overall airflow direction in a building and spaces; and air distribution or airflow pattern, which is where the external air should be delivered to each part of the space in an effective and efficient manner.

There are three methods that may be used to ventilate a building: natural, mechanical and hybrid (mixed-mode) ventilation.

- The ventilation rate minimum requirements are 160 L/s/patient or 12 air changes per hour (ACH) where aerosol-generating procedures (AGPs) are performed;
- The ventilation rate minimum requirement is 60 L/s/patient or 6 ACH for other patient-care areas;
- The airflow direction should be from clean zones to dirty zones;
- Air should be exhausted directly to the outside, away from air-intake vents, people and animals;
- Heating, Ventilation and Air Conditioning (HVAC) systems should be operated continuously when people are in the building and should be regularly inspected, maintained and cleaned;
- AGPs should be performed in rooms equipped with negative-pressure ventilation systems, in keeping with airborne precautions;
- If no other strategy can be adopted to meet the ventilation rate minimum requirements, consider using a stand-alone air cleaner equipped with a high-efficiency particulate air (HEPA) filter;
- For additional information on implementing ventilation standards and strategies to improve a health-care facility's ventilation, see Roadmap to improve and ensure good indoor ventilation in the context of COVID-19 *[7]*.

Evidence to decision

Benefits and harms

Small net benefit, or little difference between alternatives

No studies investigated ventilation standards versus suboptimal compliance with existing standards. Although there was no direct evidence on the harms of adherence to ventilation standards, the GDG judged any harms to be trivial or none.

Certainty of the Evidence

Very low

The quality of evidence is indirect and *very low*.

Values and preferences

Substantial variability is expected or uncertain

It was not possible to assess values and preferences as there was a lack of evidence on the effects that adherence to ventilation standards may have on SARS-CoV-2 infection.

Resources

Important issues, or potential issues not investigated

Current ventilation standards are the standard of care, though not all facilities comply with ventilation standards and costs to implement likely vary.

Equity

Important issues, or potential issues not investigated

Given the lack of evidence on benefits and harms, the GDG judged no negative impacts on equity if ventilatory standards are adhered to.

Acceptability

No important issues with the recommended alternative

Ventilation standards already exist and are widely accepted.

Feasibility

No important issues with the recommended alternative

GDG members noted that existing ventilation standards have been enforced for many years without issue. However, GDG members also noted that harm may occur when ventilation systems are not up to standard, as there is a correlation between non-compliance and HAIs other than SARS-CoV-2.

The feasibility of implementing airborne current ventilation standards likely varies in different countries and settings and is dependent on whether standards are being followed properly.

Justification

No studies compared the effects of non-compliance with existing ventilation standards to compliance with ventilation standards and risk of SARS-CoV-2 infection. However, health-care facilities are subject to national, subnational and local regulations for ventilation requirements; ventilation standards are necessary for control of infections other than SARS-CoV-2, and laboratory and epidemiological studies demonstrate the association between inadequate ventilation and increased risk of respiratory infections. The above-mentioned standards are pre-existing WHO recommendations for ventilation requirements *[7][8]*. Therefore, the GDG members agreed that these existing standards should also be utilized in the context of COVID-19.

Clinical question/ PICO

Population: Health care settings

Intervention: Ventilation standards for health care (all health care spaces have variations of their own ventilation standards, but specifically ANSI/ASHRAE/ASHE Standard 170-2017 Ventilation of Health Care Facilities - Addendum, vol. 2017)

Comparator: Ventilation standards for healthcare settings are not met (non-compliance with all requirements)

Summary

No studies evaluated impacts on risk of SARS-CoV-2 infection.

Outcome Timeframe	**Study results and measurements**	**Comparator** Ventilation standards for healthcare settings are not met (non-	**Intervention** Ventilation standards for health care (all health care spaces h	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 Infection				Very low	No studies were found that looked at SARS-CoV-2 infection

3.2.3 Physical barriers

Background

Transmission of SARS-CoV-2 can occur when one or more individuals is in close contact with an infected person. Health-care facilities may consider installing physical barriers in places where patients first present as an additional mitigation measure to protect health and care workers as well as patients. Consider consulting with a heating, ventilation, and air-conditioning (HVAC) professional to ensure the use of barriers is protective and does not adversely affect the ventilation patterns.

Conditional recommendation for , Very low certainty evidence

WHO suggests considering the use of physical barriers such as glass or plastic windows for areas where patients first present, such as screening and triage areas, the registration desk at the emergency department and the pharmacy window.

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Practical info

Implementation considerations

- Physical barriers are thought to provide some level of protection for individuals sharing a space, first by preventing people from getting too close, and as a partition to potentially prevent or decrease respiratory particle movements.
- Physical barriers are used with other infection prevention and control measures, including environmental cleaning, hand hygiene, respiratory hygiene, and mask use (source control).
- Physical barriers in health-care settings should be installed according to facility requirements and as part of engineering control measures, including ventilation standards.
- Those installing and using partitions should consider best practices in the design, installation and maintenance of physical barriers, in consultation with public health and industry standards, to ensure they are most protective.

- Consider the dimensions of the physical space, the intended use of barriers, types of activities, occupancy and ventilation.
- The dimensions should not exceed the breathing zone of users; the height should consider the tallest user and the breathing zone of a seated person.
- Transparent barriers often need openings; these slots should be as small as possible, depending on the activity. There should be adequate space to pass any required documents, cash, etc., without touching the barrier; otherwise, cross-contamination can occur through the barrier. A sliding door or flap is considered a high-touch surface for cleaning and disinfection purposes.
- With regard to safety, a surface-mounted barrier or free-standing partition is preferable to a hanging partition.
- It is unknown what material (e.g. plexiglass) and what design (i.e. shape, size) are best suited for the construction of physical barriers *[57]*.

Evidence to decision

Benefits and harms

Important harms

One before-after study found the implementation of universal masking and physical barriers was associated with decreased SARS-CoV-2 infection incidence in most facilities *[56]*. GDG members noted potential harms associated with barriers and their effect on ventilation systems.

Certainty of the Evidence

Very low

As the evidence base is a single before-after study in which it is impossible to separate the effects of universal masking and physical barriers, the certainty of evidence has been assessed as *very low.*

Values and preferences

No substantial variability expected

Physical barriers are probably not associated with significant individual harms; therefore, the decision to use physical barriers is probably not preference-sensitive.

Resources

Important issues, or potential issues not investigated

Research evidence

The cost and resource considerations likely vary depending on the setting, type of barrier, existing infrastructure and other factors.

Equity

No important issues with the recommended alternative

The GDG did not identify negative impacts on equity, assuming that implementation is consistent across different settings.

Acceptability

Important issues, or potential issues not investigated

The acceptability of physical barriers may vary depending on costs and other factors (e.g. convenience, etc.) as well as the size, layout and type of barrier.

Feasibility

Important issues, or potential issues not investigated

The feasibility of implementing physical barriers likely varies in different settings. GDG members noted the importance of

consulting with HVAC professionals and/or engineers prior to installation. There may be factors affecting feasibility, such as size, layout, design and type of barrier.

Justification

The evidence is very low since it was only one study; it used a before-after design; and it wasn't possible to separate the effects of barriers from those of masking. Despite the limitations in the evidence, the GDG judged that physical barriers could potentially reduce risk of infection in high-traffic areas with trivial or no harms, without specifying optimal barrier type and design (i.e. materials, shape, dimensions).

After reviewing the evidence, GDG members elected a conditional recommendation on physical barriers. GDG members noted that the location of these barriers was imperative, as improperly placed glass or plastic screens can disrupt the flow of air and reduce the effectiveness of the ventilation system.

GDG members felt these barriers would be most useful in triage and reception areas, pharmacies, and other locations that have patient contact but that are not considered clinical areas. GDG members also noted that physical barriers are not a substitute for public health and social measures (PHSMs) or IPC practices.

Clinical question/ PICO

Population: Health-care
Intervention: Physical barriers
Comparator: No physical barriers

Summary

One study compared the use of physical barriers to no use of physical barriers; however, this study was an observational study out of a meat-processing facility in the United States of America *[56]*. The purpose of this study was to detail the demographics and outcomes of SARS-CoV-2 infections among workers in Nebraska meat processing facilities and determine the effects of initiating universal mask policies and installing physical barriers at thirteen meat-processing facilities. This was a pre-post comparative study, dating from April to July 2020 with 2600 participants. Results showed that ten days after interventions, eight of the thirteen facilities saw a statistically significant reduction in cases *[56]***.** Three of the thirteen facilities saw a nonsignificant reduction; however, one facility saw a statistically significant increase and another one saw a nonsignificant increase. The use of physical barriers can reduce SARS-CoV-2 transmission, but this study did not separate the effect from other interventions *[56]*.

Outcome Timeframe	**Study results and measurements**	**Comparator** No physical barriers	**Intervention** Physical barriers	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection				Very low	There were too few who experienced the SARS-CoV-2 infection, to determine whether physical barriers made a difference

3.2.4 Physical distancing

Background
Transmission of SARS-CoV-2 can occur when one or more individuals is in close contact with an infected person. Health facilities should adhere to recommended IPC measures, particularly to respiratory etiquette and hand hygiene best practices; with application of standard precautions and transmission-based precautions (as per risk assessment); adequate environmental cleaning and disinfection; ensuring adequate ventilation; and use of isolation facilities for COVID-19 patients. In addition, where possible, a physical distance of at least 1 metre (and more, whenever feasible) should be maintained between any two individuals in health facilities, especially in indoor settings.

Good practice statement

Maintain a physical distance of at least 1 metre between and among patients[1], staff and all other persons in health-care settings, when feasible. When possible, increase this distance.

[1]Health and care workers providing direct patient care should wear appropriate PPE.

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Justification

WHO previously advised to maintain a physical distance of at least 1 metre in health-care settings. This recommendation was based on a review that primarily included studies of other infections and that had methodological limitations. For this update, the GDG commissioned a review to determine whether there was evidence to support increasing physical distance to >1 metre. Only one study compared distances (1 metre vs 2 metres) and reported similar rates *[58]*. Therefore, the GDG found insufficient evidence to support increasing the recommended minimum physical distance.

The GDG elected to keep the minimum distance of 1 metre based on indirect evidence showing high certainty of benefit and trivial harms. However, based on data indicating that transmission can occur at distances of 1 metre or greater, the GDG suggested increasing the minimum physical distance, when possible, to potentially reduce risk.

After extensive deliberation, the GDG decided to maintain its previous guidance on physical distancing. As only one study addressed the PICO question *[58]*, the GDG elected for a good practice statement. The lone study had few events and estimates were imprecise.

The WHO commissioned a qualitative review of the literature (reports, qualitative studies, and related systematic reviews) to better understand the perceptions of health and care workers on physical distance and to better inform the GDG in the evidence to the decision-making process, which highlighted compliance and feasibility issues.

Many GDG members noted that maintaining a physical distance of 1 metre or more is not feasible for health and care workers when they are providing direct care to patients with suspected or confirmed COVID-19. When unable to maintain a distance of at least 1 metre, health and care workers should ensure the proper use of PPE (a mask, gown, gloves, and eye protection) considering the risk when in close proximity. This good practice statement is informed by established IPC principles and practices.

Clinical question/ PICO

Population: Health and care workers
Intervention: 1 metre of physical distance
Comparator: More than 1 metre of physical distance; less than 1 metre

Summary

One study addressed the PICO question, in which SARS-CoV-2 cases were similar irrespective of the physical distance (1 metre vs 2 metres) between participants *[58]*. Importantly, this study had estimates that were very imprecise due to very few events. The environment in which this study was performed had concurrent policies for universal masking and influenza vaccination, thus potentially affecting the outcome *[58]*. Further studies are required to increase the certainty of the evidence around the effectiveness of a physical distance of 1 metre compared to distances greater or less than 1 metre, in reducing and mitigating the transmission of SARS-CoV-2.

A qualitative synthesis was also performed on this topic; for results, see the Annex.

Outcome Timeframe	**Study results and measurements**	**Comparator** More than 1 metre of physical distance; less than 1 metre	**Intervention** 1 metre of physical distance	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection					There were too few who experienced SARS-CoV-2 infection to determine whether 1 metre of physical distance made a difference

3.2.5 Mask use for source control

Background

Source-control measures prevent infections from spreading by stopping them at the source; they are important tools to reduce the transmission of COVID-19 and other respiratory infections *[59]*.

Source control refers to engineering, environmental and administrative-control measures such as screening for early identification of COVID-19; use of protective barriers; and placement of patients, aimed at reducing and preventing the dissemination of infectious agents. In health-care settings, this protects those in the facility, including the health and care worker and those at increased risk of becoming severely ill.

Source control also includes wearing well-fitting medical masks to cover a person's nose and mouth to prevent respiratory secretions from spreading when breathing, talking, singing, sneezing or coughing.

Targeted continuous masking

Conditional recommendation for , Very low certainty evidence

WHO suggests targeted continuous medical masking in health-care facilities when there is a minimum to moderate impact of COVID-19[1] on the health system.

Remarks:

- Targeted continuous masking is the practice of wearing a medical mask by all health and care workers and caregivers in clinical areas during all routine activities throughout the entire shift[2].
- In non-patient areas, staff who have no patient contact are not required to wear a medical mask during routine activities.
- If caring for a suspected or confirmed COVID-19 patient, please see the recommendation on mask type for health and care workers.

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[1] Situational level up to 2 (as defined in the latest PHSM document *[60]*):

- Situational Level 0 corresponds to a situation with no known transmission of SARS-CoV-2 in the preceding 28 days. The health system and public health authorities are ready to respond, but there are no restrictions needed on daily activities, and only core PHSMs (e.g. respiratory etiquette) are needed.
- Situational Level 1 is a situation with minimal transmission, morbidity, and health system impact of SARS-CoV-2, with only basic ongoing PHSMs needed.
- Situational Level 2 represents a situation where there is moderate impact of COVID-19, although there may be higher impact in specific sub-populations. Additional measures may be required to reduce transmission; however, disruptions to social and economic activities can still be limited, particularly if PHSMs can be targeted strategically to more affected settings.

[2] unless otherwise specified (e.g. when performing AGP).

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Practical info

Implementation considerations

Targeted continuous masking is the practice of wearing a medical mask by all health and care workers and caregivers in clinical areas during all routine activities throughout the entire shift.

When adopting targeted, continuous masking within a health facility, it is essential for health and care workers to follow proper mask-wearing procedures and practices. For additional information, review the implementation considerations on mask management for health and care workers.

The WHO recommendation on mask fitting should be followed, including the related considerations on this critical aspect.

Evidence to decision

Benefits and harms

Substantial net benefits of the recommended alternative

No studies were identified on targeted, continuous mask use/universal masking compared to no mask use in low- to moderate-impact settings. However, several studies found that implementation of universal masking is associated with decreased risk of acquiring SARS-CoV-2 infection among health and care workers. Although studies suggest benefits of universal masking, they were all conducted in settings experiencing significant impact of COVID-19 *[61][62][63][64][65]*.

Studies of universal masking in settings experiencing mild to moderate impact of COVID-19 were not available. However, the GDG determined that the benefits of universal masking did not support universal masking in these mild- to moderate-impact settings; rather, targeted continuous masking was suggested *[62][63][64][65]*.

If caring for COVID-19 patients, please see the recommendation on mask type for health and care workers caring for a patient with suspected or confirmed COVID-19.

Certainty of the Evidence

Very low

No studies compared targeted continuous masking/universal masking in settings with mild or moderate impact of SARS-CoV-2. The evidence is indirect and based on evidence on universal masking in settings experiencing high impact of SARS-CoV-2; therefore, the certainty of the evidence is rated as *very low*.

Other indirect evidence on medical mask use in the community supports benefits of mask use in preventing SARS-CoV-2 infection but is also indirect *[32][33]*.

Values and preferences

No substantial variability expected

Given the protective effects of mask use, health and care workers, including community health and care workers and caregivers, would likely favour targeted continuous masking in health facilities. The qualitative review suggests health and care workers value the protection PPE provides to them and to their patients. Furthermore, health and care workers were reported to be anxious about the level of risk associated with COVID-19; the review noted that PPE associated with higher levels of protection relieved anxiety and insecurities, in particular when health and care workers were providing patient care *[67][68][69][70][71][73]*.

Resources

No important issues with the recommended alternative

The GDG considered the potential issues with supply availability, particularly medical masks for both low-resource and higher-resource areas. The GDG noted that supply chains have improved since the beginning of the COVID-19 pandemic, and therefore judged that implementation of targeted, continuous masking is likely to have a low-to-moderate impact on resources.

Equity

No important issues with the recommended alternative

The GDG judged that implementing targeted continuous masking will likely have no adverse impact on equity, as long as masks are provided in health-care settings and are readily available to those for whom they are indicated.

Acceptability

No important issues with the recommended alternative

Targeted, continuous masking is less burdensome than universal masking and was judged by the GDG to be generally acceptable.

Some health and care workers expressed concerns about the quality of the PPE, including masks, provided throughout the COVID-19 pandemic *[67][70][71]*.

Feasibility No important issues with the recommended alternative

Many health-care facilities have transitioned from universal masking to targeted, continuous mask use, indicating general feasibility, though the GDG noted that clear policies and training may be required.

Justification

In response to the shift in epidemiology and WHO terminology classifying community transmission levels, the GDG re-assessed the recommendation within the current context of COVID-19, previously published in April 2022.

No studies were identified on targeted, continuous mask use/universal masking compared to no mask use in low- to moderate-impact settings. Studies of universal masking were conducted only in settings experiencing significant COVID-19 impact. The GDG judged that, in settings experiencing mild or moderate COVID-19 impact, the benefits of universal masking were unclear, but likely smaller than in settings experiencing significant COVID-19 impact.

Given the potential discomfort and other harms of universal masking, such as impact on communication and resource costs, the GDG judged that evidence was insufficient to support universal masking in this setting. However, the GDG felt that targeted, continuous mask based on the degree of exposure to SARS-CoV-2 was warranted to reduce the risk of infection.

The GDG judged that targeted, continuous mask use would be feasible and more acceptable than universal masking and would require fewer resources. The recommendation is conditional because of very limited evidence with high uncertainty.

Clinical question/ PICO

Population: Health and care workers
Intervention: Targeted continuous masking/universal masking
Comparator: No mask use

Summary

No studies have been conducted of targeted continuous mask use vs other strategies, or universal mask use in settings experiencing low or moderate COVID-19 impact (see universal masking PICO question for with summary of evidence on universal masking in high COVID-19 impact settings.) The universal use of masks probably decreases the risk of SARS-CoV-2 infection slightly.

A qualitative synthesis was also performed on this topic; for results, see the Annex.

Outcome Timeframe	**Study results and measurements**	**Comparator** No mask use	**Intervention** Targeted continuous masking/ universal masking	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection				Very low	There were too few who experienced the SARS-CoV-2 infection, to

Outcome Timeframe	**Study results and measurements**	**Comparator** No mask use	**Intervention** Targeted continuous masking/ universal masking	**Certainty of the Evidence** (Quality of evidence)	**Summary**
					determine whether targeted continuous masking/universal masking in low-impact settings made a difference.

Universal masking

Strong recommendation for , Very low certainty evidence

WHO recommends universal masking in health-care facilities when there is a significant impact of COVID-19 on the health system[1].

Remarks:

- Universal masking is the practice of all health and care workers and other staff, caregivers, visitors, outpatients and service providers wearing a well-fitting medical mask[2] at all times within the health facility and in any common area (e.g. cafeteria, staff rooms).
- Inpatients are not required to wear a medical mask unless physical distancing of at least 1 metre cannot be maintained (e.g. during examinations or bedside visits) or when outside of their care area (e.g. when being transported), provided the patient is able to tolerate the mask and there are no other contraindications.
- If caring for suspected or confirmed COVID-19 patients, please see the recommendation on mask type for health and care workers.

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[1]Situational levels 3 and 4 (as defined in the latest PHSM document *[60]*):

- Situational Level 3 is a situation with significant impact on the health system and a risk of health services becoming overwhelmed, or resulting in unacceptably high morbidity and mortality, even in cases where the health system capacity is sufficient. In these situations, a larger combination of PHSMs may need to be put in place to limit transmission, manage morbidity and avoid overwhelming the health system.
- Situational Level 4 corresponds to an uncontrolled epidemic with very high morbidity/mortality and limited or no additional health system response capacity available, thus requiring extensive PHSMs to avoid overwhelming health services and to limit substantial excess morbidity and mortality.

[2] Unless otherwise specified, (e.g. when performing AGPs).

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Practical info

Implementation considerations

When implementing universal masking, health facilities should:

- Ensure well-fitting medical masks are available for all health and care workers, caregivers, visitors, service providers, outpatients and inpatients.
  - See the WHO recommendation on mask fitting, including the related considerations on this critical aspect.
- Ensure there are areas equipped with waste bins for disposal of medical masks after use, including at the entrances/exits to the facility.
- Ensure sufficient hand-hygiene stations are located where masks are provided for use and where masks are removed (e.g. entrance and exit areas).
- Health and care workers, patients, family and visitors should follow proper mask-wearing procedures and practices as per facility policy. For additional information, review the implementation considerations on mask management for health and care workers.
- As the use of PPE, in particular the use of masks, during care activities increased throughout the COVID-19 pandemic, awareness of unintended consequences, such as increases in health-care waste and impact on the environment,had to be taken into consideration. For additional information on the environmental impact of the use of masks (and other PPE), please see WHO's Global analysis of health care waste in the context of COVID-19 *[74]*.

Evidence to decision

Benefits and harms

Substantial net benefits of the recommended alternative

Implementation of universal masking is associated with decreased risk of acquiring SARS-CoV-2 infection among health and care workers in several studies conducted in settings significantly affected by SARS-CoV-2. However, these studies had methodological limitations, including utilization of before-after study design and lacking or limited controls for confounders such as the use of other personal protective equipment and exposures; in addition, most studies were conducted in the United States of America *[61][62][63][64][65]*, a fact that could reduce their applicability to other countries/ settings.

In areas where there is community transmission of COVID-19, universal masking reduces the risk of transmission among health and care workers and other staff, patients and visitors to the facility. Literature provides limited insight into the harms of universal masking; however, evidence on mask use, in general, indicates bothersome but non-serious harms *[32][33]*.

A qualitative review suggests that mask use may be associated with constraints on communication (both verbal and facial communication), as the mask covers the face. Health and care workers also report issues related to hearing, such as muffled words and the inability to read others' lips. This potentially affects communication, and groups such as the elderly – who are at higher risk of experiencing hearing problems -- may be more affected.

Despite the limitations in the evidence, the GDG judged that the available evidence suggests that the benefits of implementing universal mask use in health-care facilities outweigh the potential harm in settings experiencing a significant impact of COVID-19.

If caring for COVID-19 patients, please see the recommendation on mask type for health and care workers when caring for a patient with suspected or confirmed COVID-19.

Certainty of the Evidence

Very low

Given the limited number and type of evidence available (i.e. before-after studies) investigating the implementation of universal masking to prevent transmission or infection, the certainty of the evidence is rated as *very low*.

Values and preferences

No substantial variability expected

In the context of universal masking, some health and care workers may prefer to wear a respirator instead of a medical mask, based on their perception of what offers the better protection against COVID-19.

A qualitative review of the literature reports that health and care workers often feel that masks and other PPE provide them with peace of mind and thereby create a climate of safety *[66][67]*. Furthermore, health and care workers were reported to be anxious about the level of risk associated with COVID-19 and to feel that PPE that they believed offered higher levels of protection relieved their anxiety and insecurity *[68]*. In many settings with low impact of COVID-19, in contrast, PPE has been shown to make health and care workers feel uncomfortable and to add to their feelings of stress and discomfort, especially if worn for prolonged periods *[69][70][71][72][73]*.

Resources

Important issues, or potential issues not investigated

The COVID-19 pandemic increased the need for PPE, which led toPPE shortages and use of optimization strategies when supplies were low. These strategies included measures that were used temporarily during periods of anticipated PPE shortages. While current supply may be adequate, there may be uncertainty about the adequacy of future supplies, which may pose clinical and operational challenges, particularly in low- and middle-income countries. The use of PPE requires an additional investment of financial and logistical resources to provide the best protection possible to health and care workers.

As supply chains have improved in the current context of COVID-19, the GDG has judged that implementing universal masking is likely to have a low-to-moderate impact on resources, assuming facilities use medical masks. This does not take into consideration the availability of respirators, when indicated, and resources required for fit testing.

Equity

No important issues with the recommended alternative

The GDG determined no adverse impacts on equity when universal masking is implemented in both low- and higher-resource settings, and where there is availability of medical masks for all heath and care workers, staff, visitors and patients.

Acceptability

No important issues with the recommended alternative

The qualitative review found that some health and care workers indicated that the use of masks gave them peace of mind and created a safe climate in which to deliver optimal care *[66][67]*.

But the qualitative review of the evidence also noted some health and care workers reporting drawbacks that they asssociated with mask use, such as headaches, feelings of being hot or overheating, and excessive sweat *[67][68][70][71][73]*.

In the context of universal masking, some health and care workers may prefer to wear a respirator instead of a medical mask, based on their perception of which intervention offers better protection against SARS-CoV-2 infection.

Overall, the GDG judged that universal masking was probably acceptable in health-care facilities, given the protective effects for health and care workers, other staff, visitors and patients.

Feasibility

No important issues with the recommended alternative

The universal use of masks in health-care facilities as an intervention was widely implemented in many high-resource settings throughout the COVID-19 pandemic, indicating that it is feasible in those settings.

Many reports suggest that universal masking is likely feasible in health-care facilities, as long as PPE is available and

health and care workers have proper institutional support and training *[66]*. Therefore, the GDG judged that universal masking was probably feasible.

Supply chain and availability of PPE such as masks may also be an issue *[72]*.

Justification

In response to the shift in epidemiology and WHO terminology classifying community transmission, the GDG re-examined this recommendation, which was first published in April 2022. Since that time, WHO commissioned a qualitative review of the literature (reports, qualitative studies and related systematic reviews) to examine the perceptions of health and care workers on mask use and other PPE use in health-care settings. The GDG agreed that the wording of this recommendation would be amended to reflect the institutional change in terminology and classification of situational levels; the GDG did not make other changes to the content of this recommendation.

Despite the very low certainty of the evidence for the implementation of universal masking, the GDG judged that the evidence indicates benefits without significant harm in settings experiencing significant impact from COVID-19; in addition, the GDG members judged that universal masking could prevent health and care worker infections and further transmission within the health-care setting. Members also felt that, based on their own professional experience or that of colleagues, universal masking in health-care settings was routinely implemented in most countries; therefore, the acceptability and feasibility favoured a strong recommendation, as well.

Additionally, the GDG reviewed the mask type to be used universally in health-care facilities; considering variants of interest and variants of concern and the subsequent need to protect health and care workers and their patients, GDG members felt the use of medical masks was justified. If caring for suspected or confirmed COVID-19 patients, please see the recommendation on mask type for health and care workers.

Given the available evidence on the effectiveness of medical masks and established industry standards for production, a majority of GDG members felt the universal use of medical masks in the health-care setting would provide better protection for staff, caregivers, patients and visitors.

Clinical question/ PICO

Population: Health and care workers
Intervention: Universal masking
Comparator: No universal masking

Summary

A systematic review included four studies on the effects of hospital universal masking policies on risk of SARS-CoV-2 infections in HCWs. The studies were conducted in the United States, used a before-after design and had other methodological limitations, including failure to control for other factors (e.g. other PPE use or infection-control measures or exposures) that could result in changes in SARS-CoV-2 infection, and failure to measure mask use or adherence *[61][62][63][65]*.

Studies found a decline in health-care-acquired SARS-CoV-2 infections during and after the intervention. Hospitals continued to see a decrease in SARS-CoV-2 infections within the hospital when there was an increased rate of infection within the community. While universal masking was the main intervention, hospitals also implemented other IPC measures such as physical distancing, increased access to hand-hygiene stations and strict adherence to a quarantine regime for those health and care workers who were exposed. All of the studies were conducted in settings experiencing significant SARS-CoV-2 impact.

A qualitative synthesis was also performed on this topic; for results, see the Annex.

Outcome Timeframe	**Study results and measurements**	**Comparator** No universal masking	**Intervention** Universal masking	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection		4 before-after studies		Very low All studies used before-after design and had serious methodological limitations.	There were too few who experienced the SARS-CoV-2 infection to determine whether universal masking made a difference

Good practice statement

Appropriate mask fitting should always be ensured (for respirators, through fit testing and a user seal check when a filtering facepiece respirator is put on; and for medical masks, through methods to reduce air leakage around the mask) as well as compliance with appropriate use of PPE and other standard and transmission-based precautions.

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Practical info

Implementation considerations

- When adopting a mask policy, it is essential that health and care workers follow proper mask-wearing procedures and practices.
- Health and care workers should also comply with appropriate use of PPE and other standard and transmission-based precautions.
- For additional information, review the implementation considerations on mask management for health and care workers.

Methods to improve the fit of respirators or medical masks

Respirators

- Filtering facepiece respirators (FFRs) vary for their measurement of fit, either through maximum allowable leak tightness or minimum fit factor. For European certified FFRs, the maximum leakage varies:
  - FFP1 (maximum 22% leakage)
  - FFP2 (maximum 8% leakage)
  - FFP3 (maximum 2% leakage)
- FFRs (EN 149) are subject to testing for leakage with human participants as part of the product's certification (Europe)
- For NIOSH, N-type FFRs (minimum fit factor of 100) are certified according to OSHA 29 CFR 1910.134 for each wearer prior to use *[75]*.
- At a minimum, FFRs that meet FFP2 and N95 performance levels are recommended to be worn by health workers in areas where AGPs are performed *[25]*.

- Ensure a range of FFR sizes are available to accommodate different face shapes and sizes, especially for those with small faces.
- Qualitative or quantitative fit testing should be performed annually and for new staff at the employer's expense to ensure that the respirator model fits each health worker's unique facial features and provides a consistent seal *[76]*.
- A seal check should be performed on an FFR whenever a health worker puts it on to determine if it fits adequately. See WHO guidance on how to perform a particulate respirator seal check for additional details.

Two methods can be used for fit testing FFRs

1) qualitative fit test (health worker reports taste of an ambient aerosol) and 2) quantitative fit test *[76]*

Table 6. FFRs fit testing parameters

	Qualitative Fit Testing	Quantitative Fit Testing
Standard test methods	OSHA 29 CFR 1910.134 Appendix A (for N95)	EN 149, Clause 7.9.1 (EN-type, e.g. FFP2) OSHA 29 CFR 1910.134 Appendix A (e.g. N95)
Equipment	Hood and sweet/bitter aerosol	Ambient aerosol condensation nuclei counter
Pass/Fail Criteria	Wearer reports tasting aerosol	>8% leakage (for FFP2) <100 fit factor (for N95)

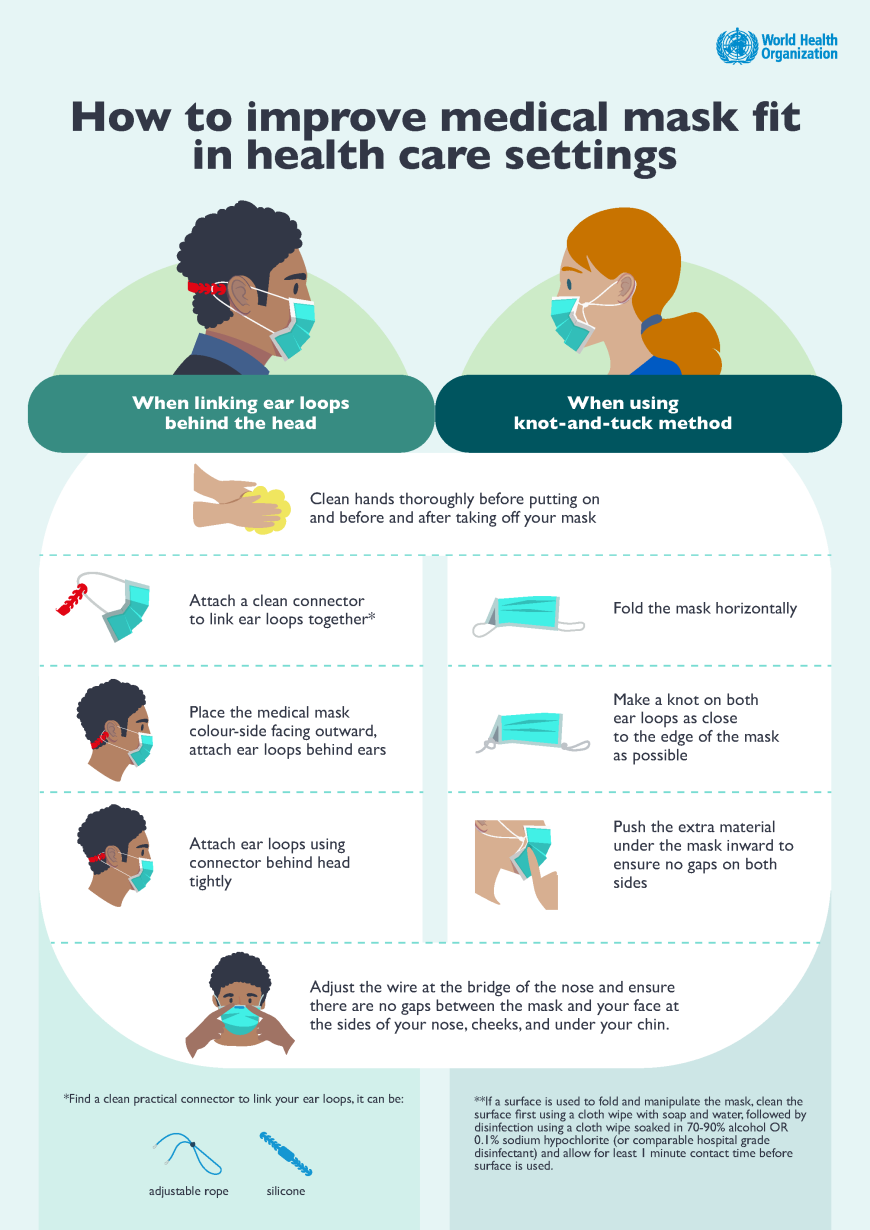
Medical masks

Improving the fit of medical masks with techniques such as the “knot-and-tuck” and “linking-ear-loops-behind-the-head” uses ear loops to reduce gaps on the sides of medical masks. Such gaps allow air leakage (potentially containing infectious particles) to bypass the filtration layers of the medical mask when the wearer inhales or exhales.

Considerations on the use of linking-ear-loops-behind-the-head techniques to improve medical mask fit

- Always use a clean, unused, rectangular, pleated medical mask meeting the minimum performance standards (or equivalent) *[25]*.
- Always clean hands thoroughly (per WHO guidance) prior to putting on, taking off and/or manipulating a mask *[15]*.
- Where connectors are used to link ear loops behind the head, ensure that these connectors are clean for use upon putting them on (either new, cleaned and disinfected or laundered, depending on the connector and local implementation strategy). When connectors are removed, they should be treated as potentially contaminated. A local strategy should be in place to manage used connectors through cleaning and disinfection processes, laundering or discarding used connectors through standard waste management.

Figure 3. How to improve medical mask fit in health-care settings



Justification

GDG members agreed that having practical advice on improving medical mask fit would be useful. After reviewing many methods to improve mask fit, the GDG decided to retain the use of the ear loops-linked-behind-the-head method and the tie-and-tuck method as advisable methods to improve the fit of masks; additional details can be found in the practical information section.

GDG members reported that the evidence available on improving the fit of medical masks to reduce the transmission risk of SARS-CoV-2 is in the form of laboratory-based studies with limited field and clinical investigations *[77][78][79][80]*

Clinical question/ PICO

Population: Health and care workers
Intervention: Methods to improve mask fitting
Comparator: An ill-fitting mask (does not fit snugly, has gaps)

Summary

The research of the included studies had been conducted over a large range of countries, with the most frequent research coming from the USA *[77][78][79][80]*.

Studies aimed to evaluate:

- modifications to improve the mask fit to reduce the number of expelled particles
- amount of leakage associated with double masking
- fitted filtration efficiency of consumer-grade masks
- aerosol particle leaking/leakage and standard surgical mask fitting with three elastomeric harness designs.

Studies found that crossing ear loops or using mask brackets made no significant improvement. However, modifications such as knot-and-tuck methods did improve the fit, blocking particles from the wearer and reducing exposure. Furthermore, increasing the tension through a brace, connector, “ear-guards”, etc., did improve fit and protection. Lastly, an elastomeric harness may improve the fit and protection of a standard surgical mask.

Outcome Timeframe	**Study results and measurements**	**Comparator** An ill-fitting mask (does not fit snugly, has gaps)	**Intervention** Methods to improve mask fitting	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection				Evidence was not GRADE’d as all studies were performed in the laboratory setting	There were too few who experienced SARS-CoV-2 infection to determine whether methods to improve mask fitting made a difference.

Implementation considerations

Health and care workers should comply with the following procedures and practices when wearing a mask for an extended period in health-care settings:

- Medical masks should be combined with other measures, including frequent hand hygiene and physical distancing of at least 1 metre among health workers in shared and crowded places such as cafeterias, break rooms and dressing rooms.
- Medical masks must be changed when wet, soiled or damaged or if the health worker or caregiver removes the mask for any reason (e.g. for eating or drinking or caring for a patient who requires droplet/contact precautions for reasons other than COVID-19).
- Used medical masks should be disposed of properly.
- The medical mask should not be touched to adjust it or if it is displaced from the face for any reason. If this happens, the mask should be safely removed and replaced and hand hygiene performed.
- The medical mask (as well as other PPE) should be discarded and replaced after caring for any patient who requires contact/droplet precautions for other pathogens, followed by hand hygiene.
- Under no circumstances should a medical mask be shared.
- During extended use, medical masks can become displaced from their optimal placement, over the mouth and nose, which creates gaps for respiratory particles to bypass the filtration layers on inhalation and exhalation. The WHO recommendation on mask fitting should be followed, including the related considerations on this critical aspect.

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3.2.6 PPE selection and use

Background
Personal protective equipment (PPE) is one component of the hierarchy-of-control measures and should always be used in conjunction with engineering and administrative controls. For information on the types of PPE, technical specifications and certification, see Section 3.2.6.1

PPE worn by health and care workers should fit properly, be worn appropriately and provide adequate coverage. Staff should be trained and monitored for compliance with procedures for selecting, putting on and removing PPE *[53]*. This includes performing hand hygiene with PPE use and between patient encounters *[15]*.

Strong recommendation for , Low certainty evidence

A respirator or a medical mask should be worn along with other PPE – a gown, gloves and eye protection – by health and care workers providing care to a patient with suspected or confirmed COVID-19.

Note: This recommendation applies to any setting where regular care is provided to patients with suspected or confirmed COVID-19, including home care, long-term care facilities and community care settings. For settings where AGPs are performed on patients with suspected or confirmed COVID-19, see the AGP recommendation.

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Practical info

Implementation considerations

Within any health facility, health and care workers must follow appropriate mask-wearing procedures and practices. For additional information, review the implementation considerations on mask management for health and care workers.

Health and care workers should follow the WHO recommendation on mask fitting, including the related considerations, such as the type of FFR that they should use.

Implementation considerations and contextual factors that may influence the overall risk of transmission, including general PPE use, PPE training, fit testing, ventilation and behavioural factors (including compliance) and transmission of SARS-CoV-2 among health and care workers, appear to occur mostly in community settings *[32][33]*.

Evidence to decision

Benefits and harms

Substantial net benefits of the recommended alternative

Evidence comparing the effectiveness of respirators versus medical masks for SARS-CoV-2 in health-care settings is limited to five observational studies *[81][82][83][84][85]*, and one randomized controlled trial *[86]*. The five observational studies were conducted prior to the emergence of the Delta, Omicron and other variants and before widespread vaccination in health-care settings. These five observational studies reported inconsistent findings regarding the risk of SARS-CoV-2 infection between the use of respirators versus medical masks and had methodological limitations (for example, recall bias, low participation, and limited measurement of exposures). One study showed a reduction of risk with respirator use *[83]*, while two other studies found no significant risk reduction *[82][85]*. One study showed no association *[85]*, and another found respirators were associated with increased risk (OR 7.1), likely related to confounding factors *[82]*. In the intention-to-treat analysis, the randomized controlled trial found that RT-PCR-confirmed COVID-19 occurred in 52 of 497 (10.46%) participants in the medical mask group versus 47 of 507 (9.27%) in the N95 respirator group (hazard ratio [HR], 1.14 [95% CI, 0.77 to 1.69]) *[86]*. Results were within the pre-specified, non-inferiority threshold (HR <2.00), but do not rule out a protective effect of N95 respirators. Furthermore, the length of the RCT transcended across various VoCs (Delta and Omicron).

The following side effects have been reported with respirators: discomfort, headaches, possible development of facial skin lesions and irritant dermatitis or worsening acne when used frequently for long hours *[32][33]*.

Medical masks are typically associated with fewer discomforts and side effects than respirators, given their reduced seal, although this has not been quantified. Undesirable outcomes from the prolonged use of respirators were noted, including general discomfort, headaches and the development of facial skin lesions, irritant dermatitis, and worsening acne *[32][33]*. The fitting process for respirators is burdensome, and issues with achieving it have been well described.

Certainty of the Evidence

Low

The certainty of the evidence is low, primarily based on a single RCT with some imprecision and methodological limitations. The observational studies were inconsistent and had important methodological limitations. Most studies were conducted before the emergence of the Delta variant and few were conducted in the Omicron era; studies included other respiratory infections but were not specific to the outcome for SARS-CoV-2 transmission *[32][33]* and the certainty of the evidence for particulate respirators compared to medical masks was rated as low.

Given similar effects of respirators vs medical masks when providing routine patient care, decisions about whether to use a respirator or medical mask could be sensitive to variability in preferences regarding perceptions of the potential increased prevention of SARS-CoV-2 infection with respirators versus increased discomfort or other harms.

Values and preferences — Substantial variability is expected or uncertain

Given similar effects of respirators vs medical masks when providing routine patient care, decisions about whether to use a respirator or medical mask could be sensitive to variability in preferences regarding potential increased prevention of SARS-CoV-2 infection with respirators vs increased bothersome and other harms.

Resources — Important issues, or potential issues not investigated

The use of respirators for the care of all patients with suspected or confirmed COVID-19 in health-care facilities requires additional investment of financial and logistical resources (including fit testing), particularly in low- and middle-income countries. However, scaling up the market for respirators could lead to cost reduction.

Equity — Important issues, or potential issues not investigated

Given the limited global supply of respirators and their higher cost compared to medical masks, recommending the use of respirators for all COVID-19 cases in health-care settings could result in inequity in resource-limited settings. However, it is also expected that the widespread use of respirators (if available) would reduce inequities related to COVID-19 exposure risk. There is an additional equity issue around medical masks, which may not be available in sufficient quantities and of adequate quality in low-resource settings.

Acceptability — No important issues with the recommended alternative

The current recommendation provides the option of using either respirators or medical masks, except for specific circumstances when a respirator is required. Those specific circumstances are covered by other recommendations. Given this flexibility, the GDG judged that the recommendation would be acceptable to stakeholders and policymakers.

Feasibility — No important issues with the recommended alternative

The current recommendation provides the option of using either respirators or medical masks, except for specific circumstances when a respirator is required. Those specific circumstances are covered by other recommendations. Given this flexibility and, based on current availability of respirators and medical masks, the GDG judged that the recommendation would be feasible for implementation in various settings.

Justification

The GDG considered the evidence for particulate respirators versus medical masks and agreed that the strength of this evidence was insufficient to recommend one type of mask over another, except in some specific conditions (see conditional recommendation).

The only RCT of medical masks vs respirators indicated similar effects with regard to the risk of SARS-CoV-2 infection when providing routine care. Therefore, the GDG recommended use of either respirators or medical masks when providing routine care.

Decisions to use respirators or masks may be based in part on one's values and preferences, especially in regard to the weight placed on the potential benefits of respirators in preventing SARS-CoV-2 infection. Furthermore, GDG members noted that the perceived discomfort caused by respirators may also play a critical role in a health and care worker's choice to wear a medical mask or a respirator.

Given the potential protective effects of respirators, some GDG members felt that respirators may be superior to medical masks in preventing SARS-CoV-2 infection and their use should be encouraged when the health-care worker delivers care while in close contact with the patient and/or when ventilation is inadequate. If respirators are used, there needs to be appropriate fit testing and training on use.

The GDG members advised that, irrespective of the mask type (medical mask or respirator), health and care workers should wear a mask along with other PPE when caring for those with suspected or confirmed COVID-19 infection. The GDG noted that the core elements of IPC include the implementation of standard and transmission-based precautions.

The GDG considered serious concerns about the limited availability of respirators in low-resource settings and the resource implications associated with more widespread use of respirators.

Clinical question/ PICO

Population: Health and care workers
Intervention: disposable filtering facepiece respirators
Comparator: surgical masks, and cloth masks

Summary

Evidence comparing the effectiveness of respirators versus medical masks for SARS-CoV-2 in health-care settings is limited to five observational studies *[81][82][83][84][85]* and one randomized controlled trial *[86]*. The five observational studies were conducted prior to the emergence of the Delta, Omicron and other variants and before widespread vaccination in health-care settings. These five observational studies reported inconsistent findings regarding the risk of SARS-CoV-2 infection between the use of respirators versus medical masks and had methodological limitations (for example, recall bias, low participation, and limited measurement of exposures). One study showed a reduction of risk with respirator use *[83]*, while in two other studies the use of respirators was not significantly associated with risk reduction *[82][85]*. One study showed no association *[85]* and another found respirators were associated with increased risk (OR 7.1), likely related to confounding factors *[82]*. In the intention-to-treat analysis, the randomized controlled trial found that RT-PCR-confirmed COVID-19 occurred in 52 of 497 (10.46%) participants in the medical-mask group versus 47 of 507 (9.27%) in the N95 respirator group (hazard ratio [HR], 1.14 [95% CI, 0.77 to 1.69]) *[86]*. Results were within the pre-specified, non-inferiority threshold (HR <2.00), but do not rule out a protective effect of N95 respirators. Furthermore, the length of RCT transcends across various VoCs (Delta and Omicron). Overall, the findings for N95 vs surgical masks and risk of SARS-CoV-2 infection in health and care workers were inconsistent.

A qualitative synthesis was also performed on this topic; for results, see the Annex.

Outcome Timeframe	**Study results and measurements**	**Comparator** surgical masks and cloth masks	**Intervention** disposable filtering facepiece respirators	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection				Low	Inconsistent findings for N95 vs surgical masks and risk of SARS-CoV-2 infection in health and care workers.

Conditional recommendation for , Low certainty evidence

Suggested factors for informing the choice of the type of mask include a risk assessment[1] and health and care workers' values and preferences.

WHO suggests respirators be used in care settings where ventilation is known to be poor[2] or cannot be assessed, or where the ventilation system is not properly maintained.

[1] The risk assessment should consider the following factors: the activity (procedure), the setting (patient care environment) and the patient.

[2] Ventilation in a health-care setting is considered to be poor when the requirements established for these settings are not in place (see "Definitions" section).

Note: This recommendation applies to any setting where regular care is provided to patients with suspected or confirmed COVID-19, including home care, long-term care facilities and community care settings. For settings where AGPs are regularly performed on patients with suspected or confirmed COVID-19, see the AGP recommendation.

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Practical info

Implementation considerations

When adopting a mask policy within a health facility, it is essential that health and care workers follow proper mask-wearing procedures and practices. For additional information, review the implementation considerations on mask management for health and care workers.

The WHO recommendation on mask fitting should be followed, as should the related considerations on this critical aspect, such as the type of FFR that health and care workers should use.

Evidence to decision

Benefits and harms

Small net benefit, or little difference between alternatives

Evidence comparing the effectiveness of respirators versus medical masks for SARS-CoV-2 in health-care settings is limited to five observational studies *[81][82][83][84][85]*, and one randomized controlled trial *[86]*. The five observational studies were conducted prior to the emergence of the Delta, Omicron and other variants and before widespread vaccination in health-care settings. These five observational studies reported inconsistent findings regarding the risk of SARS-CoV-2 infection between the use of respirators versus medical masks and had methodological limitations (for example, recall bias, low participation, limited measurement of exposures). One study showed a reduction of risk with respirator use *[83]*, while in another two studies the use of respirators was not significantly associated with risk reduction *[82][85]*. One study showed no association *[85]*, and another found respirators were associated with increased risk (OR 7.1), likely related to confounding factors *[82]*. In the intention-to-treat analysis, the randomized controlled trial found that RT-PCR-confirmed COVID-19 occurred in 52 of 497 (10.46%) participants in the medical mask group versus 47 of 507 (9.27%) in the N95 respirator group (hazard ratio [HR], 1.14 [95% CI, 0.77 to 1.69]) *[86]*. Results were within the pre-specified, non-inferiority threshold (HR <2.00), but do not rule out a protective effect of N95 respirators. Furthermore, the length of RCT transcends across various VoCs (Delta and Omicron). The following side effects have been reported with respirators: discomfort, headaches, possible development of facial skin lesions, irritant dermatitis and worsening acne

when used frequently for long hours *[32][33]*.

Medical masks are typically associated with fewer discomforts and side effects than respirators, given the medical masks' decreased thickness and reduced seal, although this has not been quantified. Undesirable outcomes from the prolonged use of respirators included general discomfort, headaches and the development of facial skin lesions, irritant dermatitis, and worsening acne *[32][33]*. The fitting process for respirators is burdensome, and issues with achieving it have been well described.

Certainty of the Evidence

Low

Given the methodological limitations of the evidence, notably inconsistency and indirectness (e.g. most studies were conducted before the emergence of the Delta variant and few in the Omicron era), evaluation of non-SARS-CoV-2 infections or assessment of non-clinical outcomes *[32][33]*, the certainty of the evidence for particulate respirators versus medical masks was rated as low.

Values and preferences

Substantial variability is expected or uncertain

There is substantial variability in preferences related to the use of respirators in preventing HAIs. In the context of the increased transmissibility of variants of concern, some health and care workers may value the wider use of respirators to potentially reduce their risk, despite the limited evidence. Others may prefer not to wear a respirator for the duration of their shift because of discomfort or potential side effects.

Local values, preferences and practicalities should play an important role in directing choices on respirators. Furthermore, other factors may influence the overall risk of transmission, including general PPE use, PPE training, fit testing, ventilation and behavioural factors (including compliance) as well as the fact that transmission of SARS-CoV-2 among health and care workers appears to occur primarily in community settings.

Resources

Important issues, or potential issues not investigated

The use of respirators for the care of all patients with suspected or confirmed COVID-19 in health-care facilities requires an additional investment of financial and logistical resources, which could be challenging, particularly in low-resource settings. There is also the need for fit testing for all staff, requiring additional investments and expertise; however, scaling up the market for respirators could lead to cost reduction.

Equity

Important issues, or potential issues not investigated

Given the limited global supply of respirators and their higher cost compared to medical masks, a recommendation to use respirators for all COVID-19 cases in health-care settings could result in inequity in resource-limited settings. There is an additional equity issue around medical masks, which may not be available in sufficient quantities and of adequate quality in low-resource settings.

Acceptability

No important issues with the recommended alternative

Discussion with the GDG suggests that this recommendation is likely acceptable for health and care workers, policymakers and hospital administrators.

Feasibility

Important issues, or potential issues not investigated

Although WHO unpublished modelling data indicated an inadequate supply of respirators to replace medical masks in all COVID-19 health-care settings, policies advising respirators in all COVID-19 settings would likely lead to increased investments and production. Furthermore, a strong supply distribution and logistics system is needed to ensure efficient procurement and reach across the whole health system. However, inefficiencies in the distribution of supplies and supply chain problems have been reported. The adequate fit of the device is correlated with the effectiveness of the respirators, but fit testing may not be feasible in all regions.

Justification

The GDG considered the evidence for particulate respirators versus medical masks and agreed that the strength of this evidence was insufficient to recommend one type of mask versus the other, except in some specific conditions.

Given the protective effects of respirators, several GDG members felt that respirators may be superior to medical masks in preventing SARS-CoV-2 infection and their use should be encouraged when the health and care worker delivers care in close contact with the patient and when ventilation is inadequate.

The previous recommendation considered serious concerns about the limited availability of respirators in low-resource settings and the resource implications of more widespread use of respirators. The GDG voting on this recommendation considering Omicron was based on the very low certainty of the evidence for particulate respirators versus medical masks, given the methodological limitations of the evidence, as well as the previously noted concerns about respirators' availability.

Given the limitations described, the deliberations of the GDG and its decision-making process were also informed by the perspectives and experiences of experts who were on the panel.

Research needs

More research is needed to investigate the risks associated with medical masks and respirators and adverse events (including self-contamination) during extended and repeated use. Other gaps include studies on simpler, faster and less costly methods, or alternative methods, to determine respirator fit and seal. Further data are needed regarding compliance with appropriate use of PPE, including masks, and appropriate techniques for putting on and taking off PPE in COVID-19 and non-COVID-19 units.

Clinical question/ PICO

Population: Health and care workers
Intervention: disposable filtering facepiece respirators
Comparator: surgical masks, and cloth masks

Summary

Evidence comparing the effectiveness of respirators versus medical masks for SARS-CoV-2 in health-care settings is limited to five observational studies *[81][82][83][84][85]* and one randomized controlled trial *[86]*. The five observational studies were conducted prior to the emergence of the Delta, Omicron and other variants and before widespread vaccination in health-care settings. These five observational studies reported inconsistent findings regarding the risk of SARS-CoV-2 infection between the use of respirators versus medical masks and had methodological limitations (for example, recall bias, low participation, and limited measurement of exposures). One study showed a reduction of risk with respirator use *[83]*, while in two other studies the use of respirators was not significantly associated with risk reduction *[82][85]*. One study showed no association *[85]* and another found respirators were associated with increased risk (OR 7.1), likely related to confounding factors *[82]*. In the intention-to-treat analysis, the randomized controlled trial found that RT-PCR-confirmed COVID-19 occurred in 52 of 497 (10.46%) participants in the medical-mask group versus 47 of 507 (9.27%) in the N95 respirator group (hazard ratio [HR], 1.14 [95% CI, 0.77 to 1.69]) *[86]*. Results were within the pre-specified, non-inferiority threshold (HR <2.00), but do not rule out a protective effect of N95 respirators. Furthermore, the length of RCT transcends across various VoCs (Delta and Omicron). Overall, the findings for N95 vs surgical masks and risk of SARS-CoV-2 infection in health and care workers were inconsistent.

A qualitative synthesis was also performed on this topic; for results, see the Annex.

Outcome Timeframe	**Study results and measurements**	**Comparator** surgical masks and cloth masks	**Intervention** disposable filtering facepiece respirators	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection				Low	Inconsistent findings for N95 vs surgical masks and risk of SARS-CoV-2 infection in health and care workers.

3.2.6.1 PPE technical specifications

Background
Personal protective equipment (PPE) is considered a medical device for COVID-19 *[87]*. **Regulatory agencies require** technical specifications for types of PPE that define the minimum requirements for the product to ensure that they are of good quality, safety and efficacy.

The methods used to develop the following technical specifications involved a review of infection prevention and control (IPC) COVID-19 guidelines; a review of PPE products available in the market and PPE products approved by stringent regulatory agencies; and an analysis of international, regional and country standards on PPE. The specifications were reviewed by members of the Technical Advisory Group of Experts on Personal Protective Equipment (TAG PPE), who also provided technical input; and by WHO staff and consultants from WHO regional offices. All experts and consultants provided conflict-of-interest declarations and no conflicts were found.

This section includes information published in "Technical specifications of personal protective equipment for COVID-19" *[14]*. This section also includes basic technical characteristics of PPE that have been considered and incorporated into this guideline. The decisions as to the appropriate clinical use of each of these devices were made in accordance with recommended IPC practices, national and subnational policies and regulations, and considerations for procurement and intended use.

Regulatory approvals and certification
For PPE and related IPC supplies, the following regulatory approvals and certifications apply. It should be noted that, in some economic regions, some PPE is considered a medical device and therefore the relevant regulations are to be followed. In other regions, some PPE may be considered an industrial protection garment and not tagged for medical use.

During COVID-19, some regions experienced limited manufacturing capacity, where some products from other economic regions might have been granted "emergency use authorizations" from regulatory agencies. Therefore, the requirements listed below for PPE use apply to the COVID-19 period, subject to review and updating by regulatory agencies.

Table 7. PPE regulatory requirements.

Requirements	**Names, synonyms**
General technical requirement	See technical specifications for PPE specific for COVID-19 (below).
Packaging	Labeling on the primary packaging needs to include: • Name and/or trademark of the manufacturer. • Model or product reference.

	• Information for storage conditions (temperature, pressure, light, humidity).
Quality management system from the manufacturer, for the PPE types	Certified quality management system for medical devices (e.g. ISO 13485) and application of risk management to medical devices (e.g. ISO 14971), if applicable. General quality management (e.g. ISO 9001) (for non-medical devices). European Union (EU) Module C2 or D conformity to type certificate (Category III CE certified PPE only).
Regulatory approval / Certification	Free sales certificate (FSC) of medical device and related IPC products. Certificate for exportation of medical device and related IPC products, provided by the authority in the country of manufacture (in the case of imported goods). National local regulatory approval (of recipient country, as applicable). Proof of regulatory compliance, as appropriate, per the product's risk classification. For example: • Europe: Conformité Européenne [CE] certification and declaration of conformity and/or EU type examination certificate as applicable, e.g. PPE cat. III for respirators; • USA: Food and Drug Administration [FDA] approval or emergency use authorization; • China: National Medical Products Administration [NMPA] listed. Ability for purchaser to check authenticity directly with the issuing regulatory authority (e.g. online database of active licences). Category I PPE, may accept self-declaration with declaration of conformity (COVID-19 context). Authorized representative must be identified and document expiration date supplied (valid until).
Test reports	Official test reports (all pages, in English) must either originate from accredited test labs, whereby the accreditation authority is preferably a member of International Laboratory Accreditation Cooperation (ILAC), or from an EU-notified body. Accredited facilities should be ISO 17025-certified. Test reports should clearly indicate the accredited laboratory name and accreditation (for regulator or procurer, to be able to check authenticity of test reports). Test standard must be within the scope of the accreditation of the laboratory. CE certificates (EU type examination certificates) for category III PPE should mention the notified body name/number. Instructions for authentication of test report(s) and certificates should be provided. Ability for purchaser to check authenticity directly with the accredited test laboratory (e.g. online uploading of test report and automatic version check, or emailing test facility).

Table 8. Technical specifications for Personal Protective Equipment (PPE) *[14]*

Item	Characteristics*	Performance standards (or alternative equivalent)
Medical mask for a health and care worker	Medical mask, good breathability, internal and external faces should be clearly identified, 98% droplet filtration, preferably fluid-resistant.	Always use a clean, unused, rectangular, pleated medical mask meeting the following minimum performance standards (or equivalent): • EN 14683 (Type II or Type IIR); • ASTM F2100 (Level 1, 2 or 3); or • YY 0469 OR YY/T 0969 (with at least 98% bacterial filtration efficiency).
Medical mask for patient	Medical mask, good breathability, internal and external faces should be clearly identified.	EN 14683 Type I YY 0469 or YY/T 0969, if bacterial droplet filtration is below 98% or alternative equivalent standard.
Fit test kit	To evaluate effectiveness of seal for tight-fitting respiratory protection devices.	To evaluate effectiveness of seal for tight-fitting respiratory protection devices.
Particulate respirator	Good particle filtration (minimum 94% or 95%), good breathability with design that does not collapse against the mouth (e.g. duckbill, cup-shaped). May be tested for fluid resistance (NIOSH/FDA surgical N95, EN 149 FFP2+Type IIR, GB 19083 Grade/ Level 1).	Fluid-resistant respirator: • Minimum NIOSH-approved (42 CFR Part 84) and FDA-cleared “surgical N95” • EN 149, minimum “FFP2“ and EN 14683 Type IIR • GB 19083, minimum “Grade/ Level 1” • Or alternative equivalent standard Non-fluid resistant respirator: • Minimum NIOSH-approved N95 according to 42 CFR Part 84 • EN 149, minimum FFP2 • GB 2626, minimum KN95 • Or alternative equivalent standard
Gloves, medical examination (nonsterile)	Gloves, examination, nitrile (preferable), latex, polychloroprene or PVC, powder-free, non-sterile (e.g. minimum 230 mm total length). Minimum thickness 0.05 mm. Sizes S, M, L.	EN 455 ASTM D6319, D3578, D5250, or D6977 EN 374, optional additional. Or alternative equivalent set of standards
Gloves, surgical (sterile)	Gloves, surgical, nitrile (preferable), latex,	Gloves, surgical, nitrile

	polyisoprene or polychloroprene, sterile, powder-free, single-use. Gloves should have long cuffs, reaching well above the wrist, ideally to mid-forearm. Minimum thickness 0.10 mm. Sizes ranging 5.0–9.0.	(preferable), latex, polyisoprene or polychloroprene, sterile, powder-free, single-use. Gloves should have long cuffs, reaching well above the wrist, ideally to mid-forearm. Minimum thickness 0.10 mm. Sizes ranging 5.0–9.0.
Goggles, glasses protective	Good seal with the skin of the face, flexible PVC frame to easily fit with all face contours with even pressure; enclose eyes and the surrounding areas; accommodate wearers with prescription glasses, clear plastic lenses with fog- and scratch-resistant treatments. Adjustable band to secure firmly so as not to become loose during clinical activity. Indirect venting to avoid fogging. May be reusable (provided appropriate arrangements for decontamination are in place) or disposable.	EN 166 ANSI/ISEA Z87.1. Or alternative equivalent set of standards
Face shield	Made of clear plastic and providing good visibility to both the wearer and the patient. Adjustable band to attach firmly around the head and fit snugly against the forehead, fog-resistant (preferable). Completely cover the sides and length of the face. May be reusable (made of robust material, which can be cleaned and disinfected) or disposable.	EN 166 (if reusable) ANSI/ISEA Z87.1 (if reusable) Or alternative equivalent set of standards
**Characteristics / Performance standards (or alternative equivalent standard)*		

Extracted from "Technical specifications of personal protective equipment for COVID-19" [14]

3.2.7 Aerosol-generating procedures (AGPs)

Background

An aerosol-generating procedure is defined as any medical procedure that can induce the production of aerosols of various sizes, including droplet nuclei *[8]*. Evidence suggests that proximity to AGPs increases a person's risk of SARS-CoV-2 infection *[8][36][37]*; therefore, WHO recommends adhering to the below IPC practices in the context of AGPs and COVID-19.

Airborne precautions during AGPs

Conditional recommendation for , Very low certainty evidence

WHO suggests using airborne precautions while performing aerosol-generating procedures (AGPs) and, based on a risk assessment[1], when caring for patients with suspected or confirmed COVID-19.

[1] The risk assessment should consider the following factors: the activity (procedure), the setting (patient care environment) and the patient.

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Practical info

Implementation considerations

- **When caring for someone on airborne precautions, health and care workers should:**
  - Place the patient in an AIIR;
  - Wear a respirator (e.g. N95, FFP2, etc.) before entering the patient's room and remove it after exiting the room;
    - Perform a respirator seal-check;
    - Perform hand hygiene before and after the use of respirators;
  - Use disposable or dedicated patient-care equipment (e.g. stethoscopes) and clean and disinfect equipment before use on other patients;
  - Instruct the patient to wear a medical mask and follow respiratory hygiene and cough etiquette when transport is necessary.
- **For airborne precautions, place the patient in an AIIR.**
  - An AIIR includes a ventilation rate of 6-12 air changes/hour (i.e. equivalent to 40-80 L/second/patient for a 4x2x3 m^3 room) and ideally 12 air changes per hour for new constructions, with a recommended negative pressure differential of ≥2.5Pa (0.01-inch water gauge);
  - Direct exhaust of air to the outside, away from places where people walk or congregate, and away from any air intake openings;
  - Keep door shut when it is not being used for entry or exit;
  - If an AIIR is not available, use a well-ventilated, single-patient room with doors closed.
- **The following actions may be taken to optimize natural ventilation when an AIIR is not available:**
  - Use a room that has good cross-ventilation (two or more windows that open to the outdoors);
  - Use an exhaust fan in one window to assist in moving room air to the outdoors, making sure the exhaust window is away from people and any air intake opening;
  - Turn off air conditioning and open windows to enhance ventilation if an independent air supply is not available;
  - Keep the door to the hallway closed, except when health and care workers enter or exit the room.

For additional information on transmission-based precautions, including airborne precautions, see Transmission-based precautions for the prevention and control of infections: aide-memoire *[9]*.

Evidence to decision

Benefits and harms

Substantial net benefits of the recommended alternative

No studies evaluated the effects of airborne precautions compared to droplet or contact precautions. However, the

evidence does suggest that health and care workers are at higher risk of SARS-CoV-2 exposure when performing intubations or other AGPs *[36][37]*.

No evidence was found on harms related to the use of airborne precautions vs droplet or contact precautions.

Given the evidence on the increased risk of SARS-CoV-2 infection when performing intubations or other AGPs, the GDG judged that airborne precautions may reduce the risk of SARS-CoV-2 infection in these situations.

Certainty of the Evidence

Very low

The certainty of evidence was rated as *very low* given the absence of direct evidence on airborne versus droplet or contact precautions.

Values and preferences

Substantial variability is expected or uncertain

The GDG was unable to determine whether decisions to utilize airborne precautions would be preference-sensitive, due to the lack of evidence on the benefits and harms of airborne precautions versus droplet or contact precautions.

Resources

Important issues, or potential issues not investigated

GDG members judged that implementing airborne precautions is associated with significant cost and resource implications that are warranted when risk of acquiring airborne infection is increased.

Equity

Important issues, or potential issues not investigated

Many GDG members noted that AIIRs (which are preferable for the implementation of airborne precautions) may not be available in low- and middle-income countries and some facilities may face challenges in trying to accommodate patients when such rooms are limited or not available. There are, however, strategies available for improving natural ventilation that countries may be able to implement (see implementation considerations).

The GDG judged that the impact on equity was uncertain, given the lack of evidence.

Acceptability

Important issues, or potential issues not investigated

Acceptability of intervention likely varies.

Feasibility

Important issues, or potential issues not investigated

Given resource limitations, implementation likely varies.

Justification

Airborne precautions are a bundle of measures (see practical info for full details) *[9]*. No studies were found that investigated the risk of SARS-CoV-2 infections when implementing airborne precautions compared to droplet and contact precautions. However, other evidence does suggest that health and care workers are at higher risk of SARS-CoV-2 exposure when performing intubations or other AGPs *[36][37]*. Therefore, the GDG judged that implementing airborne precautions in these situations has potential benefits in reducing the risk of SARS-CoV-2 infection that likely outweigh the harm.

The GDG discussed the use of airborne precautions within the context of the care environment and resources. For example, there are practical considerations regarding the availability of airborne infection isolation rooms (AIIRs), which are also referred to as negative-pressure rooms. It was noted that improving ventilation may be a challenge in some low- and middle-income countries. There is guidance for health facilities on the use of natural ventilation, although achieving negative pressure may not be reasonable, or may not meet the definition of an AIIR *[6]*.

WHO published a list of AGPs in 2014, prior to the onset of the COVID-19 pandemic *[8]*. However, the GDG members noted that an important challenge in implementing airborne precautions when performing AGPs for patients with suspected or confirmed COVID-19 is a continued lack of consensus and available evidence for defining AGPs.

Within the context of COVID-19, the GDG considered that some procedures have been found to be associated with an increased risk of aerosol generation and transmission of respiratory particles, but also noted that these particles can be produced during other activities such as talking, coughing, sneezing and singing.

Clinical question/ PICO

Population: Health and Care Workers
Intervention: Airborne Precautions
Comparator: Droplet/Contact precautions

Summary

A systematic review found no studies comparing the use of airborne precautions versus droplet and contact precautions when conducting intubations or other AGPs.

Outcome Timeframe	**Study results and measurements**	**Comparator** Droplet/Contact precautions	**Intervention** Airborne Precautions	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection					No studies were found that looked at SARS-CoV-2 infection.

PPE use during AGPs

Strong recommendation for , Very low certainty evidence

A respirator should always be worn along with other PPE[1] by health and care workers performing aerosol-generating procedures (AGPs) and by health and care workers on duty in settings where AGPs are regularly performed on patients with suspected or confirmed COVID-19, such as intensive care units (ICU), semi-intensive care units or emergency departments.

[1]PPE includes gown, gloves, eye protection.

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Practical info

When adopting a mask policy within a health facility, health and care workers must follow proper mask-wearing procedures and practices. For additional information, review the section on mask management for health workers.

The WHO recommendation on mask fitting should be followed, including the related considerations on this critical aspect.

Evidence to decision

Benefits and harms

Small net benefit, or little difference between alternatives

No studies have compared respirators vs other masks in health and care workers when performing AGPs or in settings in which AGPs are regularly performed. However, exposure to an AGP such as tracheal intubation was associated with a higher risk of infection with SARS-CoV-1, the human coronavirus most closely related to SARS-CoV-2 *[88]*. Furthermore, a living rapid review showed that certain exposures, such as involvement in intubations, are significantly associated with SARS-CoV-2 infections *[36][37]*.

If respirators are appropriately fit tested and worn, they have higher filtration efficiency standards and demonstrate better fit with fewer air gaps allowing bypass of the filter media than medical masks. The living review on masks found bothersome but no serious harms of respirators. Therefore, the GDG judged that respirators may be superior in preventing transmission of SARS-CoV-2 during AGPs *[36][37]*.

Certainty of the Evidence

Very low

Given the absence of direct evidence on the effect of respirators versus medical masks in preventing SARS-CoV-2 infection when performing AGPs or in settings in which AGPs are frequently performed, the certainty of the evidence was rated as very low.

Values and preferences

No substantial variability expected

Given increased risk of SARS-CoV-2 infection when conducting AGPs or in settings in which AGPs are frequently performed, potential moderate or large benefits of respirators in preventing SARS-CoV-2 infection, and small and trivial harms, the GDG judged that decisions regarding use of respirators to prevent SARS-CoV-2 would not be preference-sensitive.

Resources

Important issues, or potential issues not investigated

Research evidence

The use of respirators requires an additional investment of financial and logistical resources, including the need for fit testing for all staff, requiring additional investments and expertise *[76]*. Some clinical and operational challenges may be experienced, particularly in low- and middle-income countries, and investments are needed to provide the best protection possible during AGPs.

Summary

The use of respirators requires an additional investment of financial and logistical resources, including the need for fit testing for all staff, requiring additional investments and expertise *[76]*. Some clinical and operational challenges may be experienced, particularly in low- and middle-income countries, and investments are needed to provide the best protection possible during AGPs.

Equity

Important issues, or potential issues not investigated

The GDG judged that the recommendation could have negative impacts on equity if the global supply of respirators is limited and availability is restricted/limited in resource-poor settings.

Acceptability

No important issues with the recommended alternative

Stakeholders and policy-makers will likely accept the recommended use of respirators during procedures that produce aerosols as this is the policy currently in place in most countries and is one that is historically integrated into a conditional recommendation by the WHO for acute (non-SARS-CoV-2) respiratory infections *[8]*.

Feasibility

No important issues with the recommended alternative

The use of respirators during the performance of an AGP is feasible and has been standard practice.

Justification

No trials of respirators vs medical masks have been conducted in this setting. A majority of GDG members noted that, despite the very low certainty of evidence, a strong recommendation to use respirators when conducting AGPs or in settings in which AGPs are frequently performed was justified based on increased risk of exposure and acquiring infection; importance of preventing iatrogenic infections; superior filtration properties of respirators; small or trivial potential harms relative to benefits; and high acceptability and feasibility of implementation. Other factors informing the strong recommendation were the increased, widespread transmission of Omicron, its immune escape, and still limited vaccination coverage in health and care workers worldwide.

Based on these factors, the GDG upgraded this from a conditional recommendation to a strong recommendation *[8]*. The GDG acknowledged costs associated with utilizing respirators but judged the costs as being justified and noted the importance of ensuring an adequate supply of respirators to meet needs globally.

3.3 Water, sanitation, hygiene, and waste management

Background

Fully functioning water, sanitation, hygiene (WASH) and health-care waste management services are critical aspects of infection prevention and control (IPC) practices and ensuring patient safety and quality of care. WASH is a critical foundation for improving quality across the health system.

In the context of COVID-19, special WASH precautions. However, health facilities must strengthen, monitor and assess their WASH

programmes. For information on improving WASH systems in a health-care facility, please see the WASH FIT practical guidance *[89]*.

Like other coronaviruses, SARS-CoV-2 is an enveloped virus with a fragile outer lipid envelope that makes it more susceptible to disinfectants compared to non-enveloped viruses such as rotavirus, norovirus and poliovirus *[90][91]*.

Following existing recommendations for WASH and waste measures in health-care settings is important for providing adequate care to patients and protecting patients, staff and caregivers from infection risks. Additional measures are not required to prevent SARS-CoV-2 transmission, but taking the following standard WASH-related actions is particularly important:

- engaging in frequent hand hygiene using appropriate techniques;
- implementing regular environmental cleaning and disinfection practices;
- managing excreta (faeces and urine) safely;
- safely managing health-care waste produced by COVID-19 cases; and
- safely managing dead bodies.

Many other infectious diseases can be prevented and health co-benefits realized by safely managing water and sanitation services, and by applying good hygiene and waste-management practices.

3.3.1 Environmental cleaning

Background
Cleaning and disinfection of the physical environment in health-care settings is important as it reduces the number of microorganisms that may potentially be transmitted to other individuals. The determination of environmental cleaning procedures for patient-care areas, including frequency, method and process, should be based on the risk of pathogen transmission *[11]*.

The immediate environment of an infected individual can serve as a source of transmission, as infectious SARS-CoV-2 has been found on environmental surfaces *[90][91]*. The survival time of the virus depends on several factors, including the initial virus concentration, type and smoothness of the surface, temperature and relative humidity *[90][91]*. This includes the patient-care environment, which can be contaminated with SARS-CoV-2 virus in health-care facilities and is where certain medical procedures are performed. Therefore, areas where patients with COVID-19 are being cared for and items in those areas must be properly cleaned and disinfected to prevent further transmission. Examples include furniture and other fixed items inside and outside of patient rooms and bathrooms, such as tables, chairs, walls, light switches and computer peripherals, electronic equipment, sinks, toilets as well as the surfaces of non-critical medical equipment, such as blood pressure cuffs, stethoscopes, wheelchairs and incubators.

While the terms “cleaning” and “disinfection” are sometimes used interchangeably, they are not the same.

Cleaning is the physical removal of soil and debris through the mechanical action of wiping with a clean wet cloth or mop to remove pathogens or significantly reduce their load on contaminated surfaces *[11][12][92][93]*. Cleaning with water, soap (or a neutral detergent) and some form of mechanical action (brushing or scrubbing) removes and reduces dirt, debris and other organic matter such as blood, secretions and excretions, but does not kill microorganisms. Organic matter can impede direct contact of a disinfectant to a surface and inactivate the germicidal properties or mode of action of several disinfectants.

Disinfection is a thermal, chemical or physical process for inactivating microorganisms on inanimate objects *[11][12]*. Disinfection is the inactivation of disease-producing microorganisms through wetting of a surface with a ready-to-use disinfectant wipe or cloth saturated with a disinfectant solution prepared according to the manufacturer’s instructions for use. To achieve disinfection, the surface must stay wet for the manufacturer’s recommended contact time.

Surfaces must be cleaned of visible soil before they can be disinfected, as dust, dirt and organic matter interfere with the effectiveness of the disinfectant. A chemical disinfectant, such as chlorine or alcohol, should be applied after cleaning with soap and water to kill any remaining microorganisms. Disinfectant solutions must be prepared and used according to the manufacturer’s recommendations for volume and contact time. Improperly prepared disinfectants (either too dilute or too concentrated) may not be fully effective. Enough disinfectant solution should be applied to allow surfaces to remain wet and untouched long enough for the disinfectant to inactivate pathogens, as recommended by the manufacturer. All staff performing cleaning and disinfecting tasks should be knowledgeable about standard precautions, environmental cleaning principles, cleaning and disinfection products,

cleaning frequencies and methods so that their cleaning is safe and effective.

Existing recommended cleaning and disinfection procedures for health-care facilities should be followed consistently and correctly *[89]*. At a minimum, all patient-care areas should be routinely cleaned once a day, and more often when contamination is visible. For patients who require additional IPC measures (transmission-based precautions), more frequent cleaning may be required, especially in multi-bedrooms *[92][93]*.

Many disinfectants – including commonly used hospital disinfectants – are active against enveloped viruses, such as SARS-CoV-2. The selection of chemical disinfectants should meet local authorities' requirements for market approval *[94]*.

Routine environmental cleaning processes in health-care settings include (Figure 4):

- daily cleaning of all patient-care areas;
- more frequent cleaning for common areas and high-touch surfaces, and for patients on transmission-based precautions, especially in shared living spaces and bedrooms;
- terminal cleaning[1] (Figure 5) whenever a patient is discharged or transferred, when precautions have been discontinued.

Figure 4. Routine Cleaning *[12]*

Figure 5. Terminal cleaning process *[12]*

[1]Terminal or discharge cleaning aims to remove organic material and significantly reduce or eliminate microbial contamination to ensure that there is no transfer of microorganisms to the next patient *[12]*. It uses the same best practices as routine cleaning, but is more detailed.

Good practice statement

For COVID-19, health-care settings should follow standard precautions for the cleaning and disinfection of the environment and other frequently touched surfaces.

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Practical info

Implementation considerations

- Provide a clean and hygienic environment, including water, sanitation and hygiene infrastructure and adequate ventilation (natural or mechanical).
- Train cleaning staff on the principles and practices of environmental cleaning, including how to prepare and use cleaning and disinfection products.
  - All staff performing cleaning and disinfecting tasks should be knowledgeable about standard precautions, environmental cleaning principles, cleaning and disinfection products, cleaning frequencies and methods so that their cleaning is safe and effective.
- Frequency of cleaning and disinfection procedures should follow existing processes for patient-care rooms and shared areas, for example, at least once a day, paying particular attention to high-touch surfaces. If there is a spill or when surfaces are contaminated with blood, body fluids or other substances, attend to them promptly, in accordance with local protocols.
- Use products approved for health-care settings and apply them according to the manufacturer's instructions.
  - While wearing the appropriate personal protective equipment (PPE) to avoid chemical exposure, follow the manufacturer's instructions to ensure that disinfectants are prepared and handled safely.
    - In selecting a disinfectant, cleaners should consider the microorganisms targeted, as well as the recommended concentration and contact time, the compatibility of the chemical disinfectants with surfaces, toxicity, ease of use, and stability of the product. The selection of chemical disinfectants should meet local authorities' requirements for market approval, including any regulations applicable to specific sectors, for example, health-care and food industries *[94]*.
    - Provide efficient environmental cleaning and disinfectant products.
- Cleaning (with soap and water or one-step cleaner/disinfection) should be performed first, followed by disinfection.
  - Cleaning should progress from the least-soiled (cleanest) to the most-soiled (dirtiest) areas, and from the higher to lower levels so that debris may fall to the floor and be cleaned last in a systematic manner to avoid missing any areas. When cleaning and disinfecting, concentrate on frequently touched surfaces.
  - Emphasis for cleaning and disinfection should be placed on surfaces that are most likely to become contaminated with pathogens, including clinical-contact surfaces and frequently touched surfaces (such as light switches, bracket trays, switches on dental units, computer equipment) in the patient-care environment.
  - Surfaces must first be cleaned of visible soil before disinfection, as dust, dirt and organic matter interfere with the effectiveness of the disinfectant. In addition to the method of application, the disinfectant concentration (or dose) and contact time are also critical for effective surface disinfection.
- After proper cleaning, disinfection may occur.
  - Refer to the manufacturer's instructions for the preparation and use of chemical disinfectant solutions.
  - A chemical disinfectant, such as chlorine or alcohol, should be applied after cleaning with soap and water to kill any remaining microorganisms.
  - Wiping is the preferred method for the application of a product. Ensure that the disinfectant is applied liberally so that the surface is wet.
  - Spraying may be considered as an alternative but may be associated with potential harm. Appropriate PPE should be worn. If utilizing a spraying method, ensure it is done away from other persons.

    - To achieve chemical disinfection, cleaners must ensure that the surface stays wet for the recommended contact time. Concentrations with improper dilution during preparation may reduce their effectiveness. The surface must remain wet and untouched long enough for the disinfectant to inactivate pathogens, as recommended by the manufacturer.

- If considering the use of ultraviolet germicidal irradiation (UVGI) as a supplemental technology, carefully assess benefits versus harms and ensure that the product is used according to the manufacturer's instructions.

Justification

Rapid reviews exploring cleaning and disinfection found no evidence of impacts on SARS-CoV-2 infection. This included no difference when comparing wiping vs spraying in the application of products. Therefore, the GDG determined that there was insufficient evidence to suggest additional precautions are needed for environmental cleaning in the context of COVID-19.

As no data were found on the efficacy of cleaning methods, the GDG based its decision upon accepted standard environmental cleaning and disinfection practices.

The GDG agreed that health-care facilities should follow existing procedures for cleaning and disinfection and emphasize the need to follow standard precautions for environmental cleaning. WHO commissioned a qualitative review of the literature (reports, qualitative studies and related systematic reviews) to further understand the perceptions of health and care workers on cleaning and disinfection and to better inform the GDG about the evidence to decision-making process. The GDG members reviewed the outcomes and discussed the need for human resources and clear and consistent guidelines for cleaning and disinfection in implementing a proper cleaning and disinfection regime. GDG members noted that, in indoor spaces, wiping is the preferred method; routine application of disinfectants to environmental surfaces by spraying or fogging (also known as fumigation or misting) is not advised for COVID-19, particularly in situations where people are present.

Clinical question/ PICO

Population: Health-care settings
Intervention: Differential cleaning measures beyond standard environmental cleaning
Comparator: Standard precautions for environmental cleaning

Summary

No studies compared more intensive cleaning measures vs standard measures and risk of SARS-CoV-2 infection.

Three studies were found and included in the narrative syntheses that compared standard cleaning to differential cleaning. The evidence was inconclusive, as surface contamination varied greatly by the health-care facility, the disinfectant used and the cleaning regime.

A qualitative synthesis was also performed on this topic; for results, see the Annex.

Outcome Timeframe	**Study results and measurements**	**Comparator** Standard precautions for environmental cleaning	**Intervention** Differential cleaning measures beyond standard environmental cl	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection				Very low	There were no studies looking at impact on SARS-CoV-2 infection, Evidence was insufficient to determine impacts on risk of infection.

Clinical question/ PICO

Population: Health-care settings
Intervention: Spraying
Comparator: Mechanical cleaning (wiping, brushing, scrubbing)

Summary

No studies evaluated the effects of SARS-CoV-2 infection. Three studies were found and included in the narrative syntheses that compared spraying versus wiping. The evidence was inconclusive as surface contamination varied greatly by the health-care facility, the disinfectant used and the cleaning regime.

A qualitative synthesis was also performed on this topic; for results, see the Annex.

Outcome Timeframe	**Study results and measurements**	**Comparator** Mechanical cleaning (wiping, brushing, scrubbing)	**Intervention** Spraying	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection					Few studies looked at the outcome of SARS-CoV-2 infection. Evidence was inconclusive.

3.3.2 Waste management

Background

Health-care waste is divided into two main categories: hazardous and non-hazardous waste. Hazardous waste can be broken down into two subcategories: infectious and hazardous *[16]*. If waste is not segregated correctly, hazardous waste can contaminate non-hazardous waste, which can complicate its collection, transport, treatment and disposal. Furthermore, treating non-hazardous waste as though it is hazardous results in wasted resources and effort *[16]*.

The WHO description of hazardous waste in health care is as follows: Hazardous waste can harm people and the environment. The types of hazardous waste in a facility vary according to the size of the facility and the services offered *[16]*. Examples of hazardous waste are listed below.

Examples of infectious waste:

- **Sharps waste** is used or unused sharp items that could cause cuts or puncture wounds that can lead to infection. Examples include instruments (such as scalpels and blades), needles, syringes and broken glass or ampoules.
- **Pathological waste** (anatomical waste) includes human tissues or fluids (such as blood and body fluids), organs (body parts), placentas and fetuses and unused blood products.
- **Other infectious waste** includes soiled gloves, gauze or bandages contaminated with blood, body fluids, viruses or parasites.
- **Other hazardous waste** includes pharmaceutical waste, chemical waste, genotoxic and radioactive waste.

Examples of hazardous waste:

- **Pharmaceutical waste** is used, expired or no-longer-needed pharmaceutical products (such as vaccines and drugs);
- **Chemical waste** includes chemical substances (such as laboratory reagents or film developers), disinfectants, solvents and

waste with high heavy-metal content (such as batteries, broken thermometers and blood pressure gauges);

- **Genotoxic** (harmful to human genes) and **cytotoxic** (harmful to human cells) waste isn't common unless the facility treats cancer patients. They include drugs used in cancer treatment, body fluids from patients exposed to chemotherapy or cytotoxic drugs and other material contaminated by these agents.
- **Radioactive waste includes** radioactive substances (such as unused liquids from radiotherapy or laboratory research), glassware, packages, or absorbent paper contaminated with a radioactive substance, urine or excreta from patients treated or tested with radionuclides and sealed sources (containers in which radioactive substances are stored and sealed).

Figure 6. Waste processing *[16]*

- Where feasible, minimizing waste produced by a health-care facility is a good waste management practice, which includes the proper and rational use of PPE and reducing unnecessary glove use and improving hand hygiene practices.
  - Waste minimization is most commonly applied at the point of generation, but it can also happen before items even enter the health-care facility *[92]*.
- Waste segregation can substantially reduce the quantity of health-care waste that requires specialized treatment. Health-care facilities should segregate waste when and where it is generated, such as before leaving a patient's room, examination room, operating theatre or laboratory.
  - Staff should discard waste in the appropriate containers, based on the potential hazard posed by the waste and the treatment and final disposal methods.
  - Color-coded or labeled waste containers with clear signs and symbols should be strategically placed for convenient use.
- After waste is segregated, staff should be designated for each ward or unit to collect and transport it for treatment/disposal or to a dedicated storage area to await treatment/disposal.
  - Each category of waste is treated onsite or offsite and disposed of using the safest available methods.
- While general, non-hazardous health-care waste (municipal general waste) can be disposed of without treatment, hazardous waste should be treated prior to final disposal.
  - Refer to WHO safe management of wastes from health-care activities *[95]* for more information.
- Health-care facilities should conduct a risk assessment based on the type and quantity of waste and access to resources and choose the disposal methods that will pose the least risk to the community and the environment.

For additional details on how to properly handle health-care waste, please review the course on WHO entitled: *Standard Precautions: Waste Management [16]*

Good practice statement

Health-care waste generated from care provided to suspected or confirmed COVID-19 patients should be segregated according to existing guidelines (e.g. non-infectious, infectious) for disposal and, where necessary, treated per national/subnational/local regulations and policies.

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Practical info

Implementation considerations

For proper handling and disposal of waste:

- assign responsibility and adequate human and material resources for the collection, segregation and disposal of waste;
- minimize the amount of waste produced by the health-care facility;
- treat waste, preferably on-site, and then safely dispose of it;
- understand where and how waste moved off-site will be treated and disposed of to ensure that it is handled safely and that it is properly decontaminated and disposed of;
- prepare for the management of additional waste during an outbreak of SARS-CoV-2 or an increase in cases associated with the use of PPE and in the context of COVID-19 vaccination delivery;
- ensure that staff use appropriate PPE (boots, long-sleeved gown, heavy-duty gloves, mask and goggles or a face shield) while managing infectious waste and that they perform hand hygiene during and after the removal of PPE;
- treat waste contaminated with blood, body fluids, secretions and excreta as hazardous infectious waste, in accordance with local regulations;
- consider environmentally friendly treatment methodologies and solutions to minimize both general and medical waste at points of use, segregation, disposal and collection; and
- treat human tissue and laboratory waste that is directly associated with specimen processing as hazardous infectious waste.

As the use of PPE, in particular the use of masks, during care activities increased throughout the COVID-19 pandemic, awareness of unintended consequences, such as increases in health-care waste and the impact on the environment, had to be taken into consideration. For additional information on the environmental impact of masks and other PPE, see the WHO global analysis of health-care waste in the context of COVID-19 *[74]*.

For additional information on waste management, see the OpenWHO course Standard Precautions: Waste management *[16]*.

Justification

A systematic review found no study comparing the handling of COVID-19-related waste as infectious versus non-infectious and the GDG found no evidence to support handling COVID-19-related waste differently from other health-care-related waste. Upon review of the evidence, the GDG determined waste produced from SARS-CoV-2 did not require special handling beyond what was the standard advised through national, subnational or local policies for handling health-care waste. As no data were found on the differences among various waste-disposal methods, the GDG based its decision on accepted standard waste-management practices as highlighted in standard precautions. Some GDG members noted varying regional definitions for infectious waste, which underscores the importance of following one's local, national or subnational policy. Members noted that there is nothing particularly different about SARS-CoV-2, when compared to other respiratory pathogens, that would require policies above and beyond standard precautions.

Clinical question/ PICO

Population: Personnel handling waste in health-care facilities
Intervention: Infectious waste
Comparator: Noninfectious waste

Summary

No studies evaluated impacts on risk of SARS-CoV-2 infection.

Outcome Timeframe	**Study results and measurements**	**Comparator** Noninfectious waste	**Intervention** Infectious waste	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection					No studies were found that looked at SARS-CoV-2 infection.

3.3.3 Handling of linens and laundry

Background

Management of linens in health-care settings includes the collection, transport, handling, washing and drying of soiled linen, including protection of staff and hand hygiene *[11][93]*. Laundry in health-care settings may include bed-sheets and blankets, towels, personal clothing, gowns, uniforms, laundry bags and drapes for surgical procedures. Although contaminated textiles and fabrics in health-care facilities can be a source of microorganisms, the overall risk of disease transmission during the laundering process is negligible with control measures and based on principles of hygiene *[15]*. Staff should be trained in procedures for safe handling and laundering practices to protect themselves from potential cross-contamination from soiled linen by wearing appropriate PPE and should have access to hand-hygiene stations.

Good practice statement

Health-care facilities should follow standard processes for handling, transporting, sorting and laundering of linens for patients with suspected or confirmed COVID-19.

Remark: This process should adhere to national/subnational/local policies as well as ensure the implementation of standard precautions.

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Practical info

Implementation considerations

Regular laundering of bed linen and patients' clothing includes the following:

- Handle soiled linen and waste carefully (with minimal manipulation or agitation) to prevent personal contamination and transfer of any microorganisms.
- After carefully removing any solid excrement and putting it in a covered bucket to be disposed of in either a flush or dry toilet, place soiled linen in bags or containers.
- While wearing appropriate PPE, remove heavily soiled material (e.g. faeces) from linen before placing the linen in a laundry bag. PPE selection and use are determined by a risk assessment.
- Machine washing with warm water at 60−90°C and laundry detergent are recommended. The laundry can then be dried according to routine procedures.
  - For manual cleaning, items such as cloths and linen should be immersed in a detergent solution and scrubbed to remove any soiled material anywhere laundry facilities are not available. This should be performed safely, for example, using PPE. Items should be disinfected by immersing them in boiling water or in a disinfectant solution for the required contact time, then rinsing them with clean water and (ideally) hanging them out in the sun to dry *[96]*.
- Staff involved in environmental cleaning, laundering and dealing with soiled bedding, towels and clothes from patients with SARS-CoV-2 infection should wear appropriate PPE during that process and then, after exposure to blood or body fluids and after removing their PPE, they should perform hand hygiene.
  - Perform hand hygiene frequently and at critical access points *[15]* during and after removal of PPE, or after exposure to blood or body fluids and after removing PPE.
- Store clean linen in a clean area to minimize the chance that they will come into contact with environmental contaminants *[11]*.

For additional details see Environmental cleaning and infection prevention and control in health care facilities in low- and middle-income countries *[92]*.

Justification

The GDG found insufficient evidence to support additional measures and precautions in the context of COVID-19 in regard to handling, transporting, sorting and laundering of linens. The evidence on the effects of SARS-CoV-2 infection was limited to one study *[97]*.

The GDG advised that health-care facilities follow their existing procedures when partaking in these duties. The GDG members emphasized the importance of adhering to standard precautions when handling linens and laundry. The GDG elected for a G

Clinical question/ PICO

Population: Personnel handling linens in health-care facilities
Intervention: Above standard
Comparator: Standard precautions for routine handling of linens and laundry

Summary

One study addressed the PICO question, reporting that SARS-CoV-2 RNA was not detected in rinse water after washing with tap-water, disinfecting with sodium hypochlorite, or disinfecting with 80 °C water *[97]*. However, SARS-CoV-2 was detected in one of five samples after washing with laundry detergent and in one of six samples after washing with fabric softener *[97]*.

Outcome Timeframe	**Study results and measurements**	**Comparator** Standard precautions for routine handling of linens and laundry	**Intervention** Above standard	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection					There were too few who experienced the SARS-CoV-2 infection to determine a difference between standard versus above-standard cleaning.

3.4 Safe dead body management

Background

Deaths from COVID-19 may occur in health-care facilities, at home or in other locations. The safe management of dead bodies ensures proper dignity for those who have died of COVID-19, and protects their families, health and care workers and funeral home workers. For safe handling of bodies in the community, recommended practices would follow the same measures as those followed in cases of death due to other respiratory illnesses (e.g. influenza). The dignity of the dead, their cultural and religious traditions and their families should be respected and protected throughout, balancing the rights of the family, the need to investigate the cause of death, and the risks of exposure to infection.

In the health setting, apply standard precautions and follow any additional regulatory requirements for the safe management of dead bodies in accordance with local, subnational and national guidance for patients who had COVID-19.

Good practice statement

Updated

Health and care workers and other persons involved in handling the deceased should follow standard precautions according to risk-assessment[1] and existing national/subnational/local protocols for managing and handling the bodies of deceased persons infected with COVID-19.

[1] The risk assessment should consider the following factors: the activity (procedure), the setting (patient care environment) and the patient.

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Practical info

Implementation considerations

Health-care facility

Health and care workers who handle the dead body should follow standard precautions, including hand hygiene, environmental cleaning and appropriate selection and use of PPE.

- In the context of COVID-19 and the safe management of dead bodies, SARS-CoV-2 does not pose a substantial infectious risk *[98]*. Therefore, IPC measures for managing the bodies of deceased persons infected with SARS-CoV-2 should be consistent with those applied to patients who have died of an infectious disease and in accordance with national, subnational and local public health guidance. If a risk assessment determines the need for additional measures, apply transmission-based precautions accordingly.
- The dignity of the dead, their cultural and religious traditions and their families should be respected and protected throughout, balancing the rights of the family, the need to investigate the cause of death and the risks of exposure to infection.
- Before attending to a dead body, health and care workers should ensure that necessary hand-hygiene supplies, PPE and cleaning and disinfection supplies are readily available.
- When preparing and packing the body for transfer from a patient room in a health facility to an autopsy unit, mortuary, crematorium, or burial site, ensure that staff who interact with the body (health-care or mortuary staff, or the team preparing the body for burial or cremation) apply standard precautions, including hand hygiene, before and after interaction with the body and the patient environment; and use of the appropriate PPE, based on a risk assessment and considering the level of interaction.
- Preparing the body for transfer may include removing all lines, catheters and other tubes and ensuring that any body fluids leaking from orifices are contained and keeping movement and handling of the body to a minimum. Wrap the body in cloth or a plastic shroud, if culturally appropriate.
- Surfaces used during the care of the dead body should be cleaned and disinfected. Management of waste should be carried out in accordance with local standards.
- If the body of a person with suspected or confirmed COVID-19 is selected for autopsy, health-care facilities must ensure that those performing the autopsy are protected by safety measures, including appropriate supplies of PPE, a scrub suit, a long-sleeved, fluid-resistant gown, gloves (either two pairs or one pair of autopsy gloves), a particulate respirator (N95 or FFP2 or its equivalent), eye protection (face shield or goggles), and boots/footwear protection.
- Autopsies must be performed in adequately ventilated rooms and in accordance with regulations.

Mortuary staff/Funeral home workers

Mortuary staff or funeral home workers preparing the body (i.e. washing the body, tidying/shaving hair, or trimming nails) should wear appropriate PPE according to standard IPC precautions and risk assessment, including gloves, impermeable gown or gown with impermeable apron, medical mask, eye protection (face shield or goggles) and closed footwear or footwear protection.

- To avoid excessive manipulation of the body, embalming is not recommended. However, if embalming is done, it should be performed by trained, experienced staff following standard IPC precautions.
- If family members wish to view the body, allow them to do so, but instruct them not to touch or kiss the body; to maintain at least a 1-metre distance from one another and any staff during the viewing; and to perform hand hygiene after the viewing.
- Identify local alternatives to kissing and touching the dead body in settings where such contact is traditionally part of funeral procedures.

Justification

There was no evidence to support additional precautions; therefore, the GDG unanimously agreed that the use of standard precautions with a risk assessment and following national, subnational and local protocols is a sufficient protocol for handling dead bodies infected with COVID-19. Members noted that there is nothing particularly different about COVID-19 when compared to other respiratory pathogens that would require policies above and beyond the standard. GDG members noted that a health and care worker's risk assessment may lead one to determine whether adhering to contact and droplet or airborne precautions is necessary.

Clinical question/ PICO

Population:	Health-care workers, mortuary staff, those working with a decedent with a COVID-19 infection
Intervention:	PPE (Mask, gown, gloves, face shield), body bag
Comparator:	No PPE, Limited PPE, no body bag/covering

Summary

No studies evaluated impacts on risk of SARS-CoV-2 infection.

Outcome Timeframe	**Study results and measurements**	**Comparator** No PPE, Limited PPE, no body bag/ covering	**Intervention** PPE (Mask, gown, gloves, face shield), body bag	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 infection					No studies were found that looked at SARS-CoV-2 infection.

3.5 Special settings

IPC principles and practices are applicable across all settings across the continuum of care where health care is delivered. In the context of COVID-19, there may be additional challenges for specific settings and additional operational considerations when implementing established IPC practices. This section describes IPC measures for vaccination, long-term care, home care and operating theatres, in the current context of COVID-19.

When applying IPC measures, it is important to consider factors that can affect their successful implementation, including potential barriers, as well as strategies to adapt to the setting and situational needs. These may include practical, logistical and organizational aspects and contextual factors. For example, special considerations may be appropriate for people living and working in congregate-living facilities, such as those used for long-term care, or for other populations at risk, or for populations with complex care needs or whose treatment occurs outside hospital settings.

Specialized-care settings such as operating theatres and areas used for vaccination administration were affected by COVID-19. In addition to the core IPC practices outlined in the guideline, this section provides additional information for each setting that will be helpful in the application of IPC principles as well as operational and implementation considerations to reduce SARS-CoV-2 transmission.

3.5.1 IPC principles and procedures for COVID-19 vaccination activities

Background
As with all clinical care and vaccine administration, health and care workers administering COVID-19 vaccines need to take standard precautions and follow safe injection practices. This section summarizes IPC measures and considerations for the safe delivery of COVID-19 vaccines.

Implementation consideration

Health and care workers, policy-makers and decision-makers are encouraged to consider the following when implementing IPC measures while conducting COVID-19 vaccination activities. These considerations are based on expert opinion, standard and transmission-based precautions and as per minimum requirements for IPC programmes.

Standard precautions are designed to prevent infections in clinical settings. In the context of vaccination, follow standard precautions *[32]* with attention to hand hygiene according to WHO 5 moments of hand hygiene *[15]*, and follow safe-injection practices*[99][100][101]*.

- Health and care workers use a risk assessment to determine the need for transmission-based precautions, including the selection and use of appropriate PPE[1] when caring for patients with suspected or confirmed COVID-19
  - Gloves are not indicated for intramuscular or intradermal injections *[99][102]*;
  - Single-use gloves are indicated if there is any skin breakdown *[102]*;
  - Perform hand hygiene when putting on and removing PPE;
  - See WHO's recommendations on mask use in health-care settings.
- Follow routine processes for environmental cleaning and disinfection.
- For COVID-19 vaccination of health and care workers, see Interim recommendations for the use of mRNA COVID-19 vaccines *[103]*.

1 types of PPE: mask, eye protection, gloves, gowns

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3.5.2 Operating theatres

Background

Operating theatres (also known as operating rooms or operating suites) pose a risk of transmission of infectious agents to patients and to health and care workers due to the nature of the work performed there and the specific infrastructure requirements *[104]*. These include procedure rooms and ambulatory care settings, where surgical interventions occur. Health-care facilities with operating rooms (ORs) need to comply with specific infrastructure requirements such as ventilation systems *[7]*, cleaning, disinfection and sterilization processes, specialized training and adequate staff, with additional considerations for the delivery of patient-care services in a sterile environment, scheduling of cases and post-operative recovery. In addition, specific procedures might generate aerosols that can lead to an increased risk of infectious agents, including SARS-CoV-2 *[36][37]*.

As COVID-19 can easily be transmitted to health-care workers and to other patients during surgery, it is important to establish a set of infection prevention and control mitigation strategies to prevent COVID-19 from spreading in the OR. Implementation of infection prevention and control measures helps create a safe environment for clinicians and patients. This includes the implementation of hierarchy-of-control measures (e.g. engineering, administrative, PPE) to reduce the risk of infection with COVID-19. Practices include proper scrubbing procedures for both the patient and the operator; protocols to be followed by the operating personnel at the time of procedures; proper handling of the instruments; and maintenance of an aseptic environment throughout the procedure.

This section presents the current recommendations for IPC measures related to COVID-19 in operating theatre and implementation recommendations for policy-makers and frontline health and care workers.

Conditional recommendation against , Very low certainty evidence

WHO suggests that the designation of a specific operating theatre for patients with suspected or confirmed COVID-19 infection is not needed.

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Practical info

Implementation consideration

- Apply standard and transmission-based precautions.
- Ventilation standards for operating rooms (OR) should be in accordance with national, subnational and local policies *[7]*.
- Health-care facilities should follow any additional requirements or guidance specific to surgical areas, including recommendations for environmental cleaning of operating rooms and air exchange between cases *[105][106]*.
- PPE is worn :
  - Follow recommended practices for putting on and removing PPE; there may be additional considerations for the selection and use of PPE in operating and procedure rooms, based on a risk assessment and maintenance of a sterile environment
  - A particulate respirator (i.e. N95, FFP2 or equivalent) should be used if there is potential for an AGP or a surgical procedure with risk of exposure to infectious agents
- The surgical staff in the operating theatre should be restricted to essential personnel.
- Sterile and clean supplies in patient-care areas should be kept in closed cabinets or closed containers to minimize the risk of contamination.

All medical devices and surgical instruments should undergo standard decontamination procedures. For additional details, see *Decontamination and reprocessing of medical devices for health care facilities: aide-memoire [108]*.

Evidence to decision

Benefits and harms

Small net benefit, or little difference between alternatives

One observational study found a COVID-free pathway associated with decreased risk of SARS-CoV-2 infection vs no COVID-free pathway (adjusted OR 0.53, 95% CI 0.36 to 0.76) *[107]*. The COVID-free pathway included elements other than a COVID-free OR (COVID-free wards, ICU).

Certainty of the Evidence

Very low

As the evidence base is a single observational study, the certainty of evidence has been assessed as very low.

Values and preferences

Substantial variability is expected or uncertain

Because there wasn't enough evidence to determine benefits or harms, the GDG was unable to determine whether decisions to have a designated COVID-19 operating room would be preference-sensitive.

Resources

Important negative issues

The cost and resource considerations likely vary, depending on the setting, existing infrastructure and other factors. GDG members noted that a designated operating room may be associated with significant cost and resource implications.

Equity

Intervention likely increases inequity

GDG members noted that a single designated operating theatre may not be available in low- and middle-income countries. Some health facilities may face challenges in trying to accommodate patients when such rooms are limited or not available. Therefore, the GDG judged that the intervention likely increases inequity.

Acceptability

Important issues, or potential issues not investigated

Acceptability of intervention likely varies.

Feasibility

Intervention is likely difficult to implement

The feasibility of implementing single designated operating rooms for COVID-19 likely varies in different settings and may be difficult to implement, especially in low- and middle-income countries.

Justification

The GDG found insufficient evidence to determine the benefits and harms of a single designated operating theatre for patients with COVID-19, based on low-certainty evidence from a single observational study. Because of a lack of evidence showing benefits, the additional resources that would be required, and feasibility concerns, the GDG agreed on a conditional recommendation against requiring a single designated operating theatre.

Clinical question/ PICO

Population: Health and care workers
Intervention: Designated single operating room
Comparator: No designated operating room

Summary

One study compared patients treated in a COVID-19-free pathway versus no defined pathway. Patients were classified as being treated within a COVID-19–free pathway if there was a policy of complete segregation in the operating room, critical care, and inpatient ward areas from patients with COVID-19 *[107]*. Patients were classified as being treated within no defined pathway if any one of these areas was shared with patients with COVID-19. The rate of postoperative SARS-CoV-2 infection was lower in a COVID-19–free surgical pathway compared to no defined pathway.

Outcome Timeframe	**Study results and measurements**	**Comparator** No designated operating room	**Intervention** Designated single operating room	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 Infection		One observational study found a COVID-free pathway associated with		Very low	There were too few who experienced SARS-CoV-2 infection to

Outcome Timeframe	**Study results and measurements**	**Comparator** No designated operating room	**Intervention** Designated single operating room	**Certainty of the Evidence** (Quality of evidence)	**Summary**
		decreased risk of SARS-CoV-2 infection vs no COVID-free pathway (adjusted OR 0.53, 95% CI 0.36 to 0.76). The COVID-free pathway included elements other than a COVID-free OR (COVID-free wards, ICU).			determine whether a designated operating room for COVID-19 patients made a difference

Good practice statement

Terminal cleaning of operating theatre after surgical intervention/procedures for patients with suspected or confirmed COVID-19 should be performed according to national/subnational and local policies for transmission-based precautions.

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Practical info

COVID-19 specific considerations

- Regular cleaning and disinfection are essential to preventing the transmission of COVID-19.
- Operating theatres are to be cleaned and disinfected following established environmental cleaning processes *[106]*.
- Clean and disinfect any surface that is visibly dirty, use detergents and hospital-grade disinfectant products in operating theatres. Follow the instructions for dilution, contact times and safe use.
- Between patients, clean and disinfect frequently touched surfaces and shared equipment, including stethoscopes, blood pressure cuffs, table and examination beds.
- Post-anesthetic recovery room and stretchers and areas are to be cleaned and disinfected after the patient is discharged/ transferred and before the next patient occupies the space.
- Sterile and clean supplies in patient care areas should be kept in closed cabinets or containers to minimize the risk of contamination.
- All garbage, recyclables, used linen and contaminated instruments shall be removed at the end of each case and before any cleaning commences. Waste containers located in semi-restricted and non-restricted areas should be emptied.
- Wear PPE as required to safely perform environmental cleaning for protection from microorganisms, from chemicals used in cleaning and for prevention of transmission of microorganisms from one patient environment to another.

An operating theatre is cleaned at specific times *[12]*

- **Before the first case of the day:** Before surgical supplies are brought into the operating theatre for the first surgery of the day, a few duties are recommended. Any overhead lights, the operating table, and any other flat surfaces, including countertops, are to be damp-dusted. Surgical equipment trays for the first case should not be opened until after this cleaning is completed.
- **Between cases:** After a surgical procedure, surgical equipment, the floor immediately surrounding the surgical bed, and any furniture are considered contaminated. Clean and disinfect them along with any other objects identified by the facility.

Remove soiled linen, trash and infectious waste.

- **After the last case of the day:** Perform a terminal cleaning of the operating theatre. This is a detailed process that follows specific facility protocols. A terminal clean of an operating theatre includes removing infectious waste and soiled linen; cleaning from top to bottom of all surfaces, including overhead lights; cleaning the operating table, including the mattress; and mopping the floor.

Terminal cleaning of patient-care areas

Where applicable, follow health-care facility protocols for terminal or discharge cleaning specific to operating rooms and in accordance with national/subnational and local policies for transmission-based precautions.

Justification

No studies compared the effects of terminal cleaning versus standard cleaning and the risk of SARS-CoV-2 infection. Environmental cleaning practices, as part of standard precautions and transmission-based precautions, are integral to the prevention and control of health-care-associated infections, including transmission of SARS-CoV-2. These standards are subject to national, subnational, or local policy regulations for cleaning and disinfection requirements.

Clinical question/ PICO

Population: Health and care workers
Intervention: Terminal Cleaning
Comparator: Standard cleaning

Summary

No studies evaluated impacts on risk of SARS-CoV-2 infection.

Outcome Timeframe	**Study results and measurements**	**Comparator** Standard cleaning	**Intervention** Terminal Cleaning	**Certainty of the Evidence** (Quality of evidence)	**Summary**
SARS-CoV-2 Infection				Very low	No studies evaluated the impacts on the risk of SARS-CoV-2 infection.

3.5.3 Home-care settings

Background

Health and care workers providing direct care in home settings should assess infection risk and consider prevention strategies. With a shift in the delivery of care from hospitals to other settings and reduced length of stay in health-care facilities, home care may include a range of types and a broad scope of services, supporting patients with complex care needs and procedures. Health and care workers providing care in the home should follow the same IPC measures in the home as they do in the health-care facility.

In many contexts, health services are delivered at the community level and in the home by community health workers, social care workers, traditional medicine practitioners, or a variety of formal and informal community-based providers, including caregivers.

The application of infection prevention and control practices in community settings presents different challenges for health and care workers entering the home, as the environment and situations vary from one home to another *[109]*. This section is intended to guide public health and infection prevention and control (IPC) professionals, health and care workers and other trained, community-based providers when addressing issues related to home care for patients with suspected or confirmed COVID-19.

For more information on the care of persons with COVID-19 in the home by community workers and caregivers, see section 4.5.

Implementation consideration

Health and care workers, policy-makers and decision-makers are encouraged to consider the following when implementing IPC measures during the provision of home care for patients with COVID-19. This additional information is based on IPC principles and practices, expert opinion, and principles outlined in the core components for for IPC programmes *[9][11][43][47]*

Health and care workers must have appropriate training and guidance on how to care for patients as well as on how to minimize the risk of infection in home-care settings. Caring for an infected person in the home increases the risk of transmitting the virus to others.

- Standard precautions are designed to prevent infections in clinical settings;
- A risk assessment determines the need for additional measures, including PPE.
    - See WHO recommendations for mask use in health-care and community settings.
    - Before leaving the home, remove PPE and perform hand hygiene.
- One of the most important means to prevent infections is by practicing proper hand hygiene. This occurs after any type of contact with the patient or the patient's immediate environment, following the WHO 5 moments.
    - In home-care settings, ensure health and care workers have a supply of alcohol-based hand rub available for use *[15]*.
    - Household members and care providers are encouraged to clean hands regularly, after any type of contact with the person or with the person's immediate environment, before and after preparing food, before eating, after using the toilet, and whenever their hands look dirty.
        - If hands are not visibly soiled, an alcohol-based hand rub can be used.
        - For visibly soiled hands, always use soap and water.
        - After washing hands with soap and water, use disposable paper towels to dry hands. If paper towels are not available, use clean cloth towels and replace them frequently.
- Several factors must be considered in providing care for a COVID-19 patient *(see factors to consider when assessing households).* They include strategies for isolation of patients with COVID-19 when they are sharing living spaces with other household members.
    - The decision to isolate considers a number of factors, such as the home setting, the patient's clinical condition (period of infectivity) and the risk of viral transmission within the household.
    - Isolation, when feasible, along with any other mitigation measures such as distancing and mask use, can help break the chain of transmission of the SARS-CoV-2 virus in the home.
- When providing home care:
    - Limit the patient’s movement around the house and, when necessary, provide the patient with a medical mask.
    - Household members should avoid entering the room where the patient is located or, if that is not possible, maintain a distance of at least 1 metre from the patient and wear a medical mask.
    - Limit the number of caregivers and household members present during a visit. Wherever possible, only household members who are essential for communication or to assist health and care workers should be in the same room as the patient.
    - Consider using natural ventilation by opening windows, if it is possible and safe to do so *[7]*.
- Maintaining a clean environment in the home setting requires regular cleaning of the person's room and essential areas of the home. This is achieved by:
    - frequently cleaning and disinfecting high-touch surfaces and objects in the home;
    - ensuring that only essential equipment and devices are taken into the home; disposing of waste generated from providing care to the patient as infectious waste in strong bags or safety boxes, as appropriate, and ensuring that they are closed completely and removed from the home;
    - handling any linen and laundry as per routine processes and local guidance.

- For more guidance on waste management, please refer to the section on *Water, Sanitation, Hygiene and Waste Management.*

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Info Box

Home-care Risk Assessment
A risk assessment is a standard part of IPC that informs infection prevention and control measures. Health and care workers consider several factors when entering the home environment.

The following questions may be part of a risk assessment in the provision of care to a COVID-19 patient in the home.

- Is the person with COVID-19 living alone? If so, what support network do they have? If not, who is living in the household with them?
- How are the person with COVID-19 and their family living? How feasible and practical would it be to implement recommendations? What alternative options are available?
- What are the needs related to disability, caring responsibilities for adults, older adults or children? What are the needs of other household members?
- How feasible would it be to identify one caregiver to support the person with COVID-19 at home?
- What do household members know about COVID-19 and preventing transmission in the home? What are their information needs about COVID-19 and transmission prevention? Do the household members know where to seek additional support or information related to care for the person with COVID-19, if needed?
- What do the person with COVID-19 and/or their household members think they need to be able to cope at home?
- Does the family members understand when to call for medical assistance? Do they have the means to call for medical assistance?
- What are the psychosocial needs of the person with COVID-19 and household members?
- What is the economic impact on the household? Who is the primary provider financially? What would be the impact if that person were to require isolation and/or need to carry additional household or care responsibilities?
- Which health facility and, if possible, which named professional is responsible for following up on the care of the person with COVID-19? How will follow-up of this care be maintained?

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3.5.4 Long-term care facilities

Background
Long-term care facilities (LTCFs) are high-risk settings for transmission of SARS-CoV-2 to and among residents and staff *[110][111]*.

People living and working in LTCFs, mostly older adults, were disproportionately affected by COVID-19 *[112]*. International comparisons of deaths from COVID-19 among LTCF residents are challenging because of differences in testing capacity, policies and approaches to recording deaths. Vaccination and immunity from infections did result in a decline in deaths; however, outbreaks continued in these types of congregate-living settings with populations at risk of severe disease. COVID-19 was a leading cause of hospital admission of older adults *[112]*.

Residents of these facilities are at a higher risk of developing severe disease and dying because they tend to be older and have underlying medical conditions and/or functional decline *[110]*. Early detection of COVID-19; adequate IPC training and education

for all employees, residents and visitors; and consistent implementation of appropriate IPC policies and measures can significantly reduce the risk of SARS-CoV-2 transmission among residents, staff and caregivers in LTCFs.

Types of LTCFs may vary by country or even at a subnational level. Nursing homes, skilled nursing facilities, assisted living facilities, residential facilities and residential long-term care facilities – collectively known as LTCFs – provide a variety of services, including medical and assistive care, to people who are unable to live independently in the community. Health and care workers include personal care workers and social workers employed by the facility. IPC measures in LTCFs should aim to prevent the introduction of SARS-CoV-2 into LTCFs and, if the virus is introduced, to take immediate and comprehensive measures to control its spread.

IPC measures – in particular, the use of personal protective equipment (PPE) and restrictions on visitors and group activities – may affect the mental and physical health and consequently the overall well-being of residents and staff. Public health and social measures, although critical from a public health perspective, have the potential to further exacerbate health issues and social connections among residents in long-term care homes. Those measures may include restrictions on movement, visits and the imposition of quarantine measures and/or isolation to control the spread and impact of SARS-CoV-2.

To meet the complex care needs of residents in a congregate-living setting, the workforce must seek to maintain resident mobility and strengthen social connections between residents and their families. Preventing the spread of COVID-19 in LTCFs is critical for the health of residents, health and care workers, and other staff.

IPC practices within the facility

Implementation considerations

Health and care workers, policy-makers and decision-makers are encouraged to consider the following when implementing IPC measures in long-term care facilities. This additional information is based on IPC principles and practices, expert opinion and the minimum requirements for IPC programmes.

It is important that health and care workers have appropriate training and guidance on how to care for patients as well as on how to minimize the risk of infection in long-term care settings. This includes training on how to put on and remove PPE, with monitoring and feedback on compliance with IPC practices.

Standard precautions are designed to prevent infections in clinical settings, Health and care workers use a risk assessment to determine the need for transmission-based precautions, including the selection and use of appropriate PPE when caring for patients with suspect or confirmed COVID-19.

- Hand hygiene is a standard part of infection-control measures (according to the WHO five moments) *[15]*.
    - This occurs after any type of contact with the patient or his/her immediate environment.
        - If hands are not visibly soiled, an alcohol-based hand rub can be used.
        - For visibly soiled hands, always use soap and water.
        - When washing hands with soap and water, use disposable paper towels to dry hands. If paper towels are not available, use clean cloth towels and replace them frequently.
- A risk assessment determines the need for additional measures, including use of PPE.
    - Refer to WHO recommendations and local policies for PPE, including mask use in health-care settings.
    - Remove PPE and perform hand hygiene before leaving the home and discard disposable PPE.
- Beyond standard precautions, no additional measures are required for environmental cleaning for COVID-19. Follow regular processes for environmental cleaning, handling of linen and laundry, and waste management, as per facility requirements.
- Understanding and controlling building ventilation can improve the quality of the air we breathe and reduce the risk of indoor health concerns, including by preventing the virus that causes COVID-19 from spreading indoors *[7]*.
- Residents and staff should be vaccinated for influenza and COVID-19, and residents for *Streptococcus pneumoniae*, according to local policies *[113]*.

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3.6 Prevention, identification and management of SARS-CoV-2 infections in health and care workers

Background
The COVID-19 pandemic has placed a large burden on health systems worldwide and, in turn, affected hospital-acquired infections and health and care workers *[114]*. Health and care workers are at higher risk than the general public of being infected with SARS-CoV-2 *[115]*.

Prevention of infections in the health-care setting requires a multi-pronged and multi-factorial approach that includes IPC and occupational health and safety (OHS) measures as well as adherence to public health and social measures in the community by the health workforce. In hospitals, this involves the hierarchy of controls (hazard elimination, engineering/environmental controls, administrative controls and the optimal use of PPE) and, for IPC and OHS staff, the need to work collaboratively to implement these protocols. See the section on Basic IPC Principles and the section on Introduction to public health and social measures for additional information.

This updated section of the WHO guidelines on infection prevention and control in the context of COVID-19 provides guidance to health managers and OHS teams on the following topics:

- how COVID-19 infections in the health-care setting or during the provision of care can be prevented;
- how COVID-19 infections can be identified;
- once they occur, how COVID-19 infections can be managed safely to prevent onward transmission to other health and care workers or to patients in the health-care setting.

The underpinning basis for all these statements is the notion that the early identification, and thus testing and quarantining of health and care workers and/or other control measures, aim to decrease the risk of nosocomial infection *[116]*.

This update supersedes the previous guidance on the prevention, identification and management of health and care worker infections in the context of COVID-19, issued in October 2020.

Published 10 August 2023.

3.6.1 Identification of health and care workers infections in the health care setting

Good practice statement

Countries should have national and subnational testing strategies for the detection of SARS-CoV-2 infections in health and care workers.

Published 10 August 2023.

Practical info

Implementation considerations

When implementing a national testing strategy, the following contextual factors should be considered:

- Strategies outlined in the OHS and/or IPC national policies should include implementation plans that ensure health and care worker testing is prioritized and made available in health-care facilities. This should include laboratory testing and self-testing kits for SARS-CoV-2 infections *[117]*.
- OHS and IPC programmes should include a committee of multidisciplinary experts to guide policies and protocols implemented by employers/management teams and demonstrated through staff adherence.
- The local situation should be evaluated by considering dynamic indicators: SARS-CoV-2 epidemic trends, transmissibility, the seriousness of COVID-19 and the impact on the health system.

Practical impacts and consequences of identifying COVID-19 cases in health and care workers (including potential absences due to sick leave, or isolation, as well as the absence of the health workforce) and the ability to manage infections and a safe return to work need to be considered. Furthermore, health-care facilities may consider providing self-testing kits to health and care workers; testing free of charge on-site; testing health and care workers post-exposure; testing in settings with vulnerable patients (e.g. ICUs and transplant units); and testing all health and care workers who have signs or symptoms suggestive of COVID-19. These testing strategies for the health workforce should consider the availability of testing kits and the feasibility of carrying out testing, as well as the impact on health systems and services of detecting active infections among workers and having those workers stop working while they isolate (see section on duration of isolation).

For guidance on testing strategies for SARS-CoV-2, refer to *Use of SARS-CoV-2 antigen-detection rapid diagnostic tests for COVID-19 self-testing [4]*.

Justification

GDG members noted the importance of having national and subnational testing strategies for SARS-CoV-2, including in the health workforce. Having testing mechanisms in place allows for the quick identification, swift removal from the workplace and isolation of health and care workers with SARS-CoV-2 infections, thus decreasing the risk of nosocomial transmission.

Good practice statement

Passive screening of symptoms for SARS-CoV-2 and other respiratory infections should be performed based on self-monitoring and reporting of symptoms by health and care workers.

Published 10 August 2023.

Practical info

Implementation considerations

The GDG members recommended that passive screening for SARS-CoV-2 should be combined with screening for other respiratory viruses (e.g. influenza). Early detection of COVID-19 infection among health and care workers can be achieved through passive syndromic screening when combined with laboratory testing to confirm infection. Surveillance is generally seen as a best practice in the field of IPC and as a key to preventing secondary transmission (otherwise referred to as nosocomial transmission) to patients, between health and care workers and throughout health-care settings.

Syndromic screening can be conducted using passive or active methods. The selection of the appropriate method depends on the health-care facility's capacities and the levels of local circulation of the virus. In passive screening, health and care workers self-screen for symptoms and are required to report any concerning symptoms. Active screening includes others screening the health and care workers for symptoms; this process demands a heavy use of resources and often yields only a low number of positive cases.

The key objectives of screening in the current context are:

- to identify possible cases and clusters of infections;
- to implement containment measures, such as quarantine or isolation and IPC measures, to prevent onward transmission;
- to identify the source of infection (whether hospital-acquired or community-acquired).

Definitions of syndromic screening, passive screening, and active screening can be found in the definitions section.

Health and care workers who report any of the symptoms associated with COVID-19 or other acute respiratory illnesses should contact their local OHS service or IPC department for guidance on testing and quarantine/isolation processes. Health-care facilities should ensure that employment policies, such as paid sick leave, having the ability to stay home, work from home or rest, are in place. These policies should guarantee confidentiality and be non-punitive for health and care workers who become infected with SARS-CoV-2 or for contacts of a case.

Justification

GDG members discussed that surveillance of health and care worker infections – even outside the context of SARS-CoV-2 – is a best practice in any health-care setting. They noted the importance of having a system established and policies in place that allow health and care workers to report any symptoms suggestive of respiratory infections, including SARS-CoV-2, and to be referred for testing and abstain from physical presence in the workplace without penalty.

There is evidence that symptoms of COVID-19[1] are the best indicators of active infection and indicate that the symptomatic person is in the most infectious period of the course of the disease *[118][119][120][121]*.

Thus, identifying these health and care workers early and testing them and/or preventing them from attending their shift can break the transmission chain and limit the nosocomial transmission of SARS-CoV-2 *[122][123][124]*.

The term passive screening was proposed by the GDG as a method for health workers to self-screen for symptoms and potentially identify infections in the health setting. The GDG members agreed that screening refers to the identification of unrecognized SARS-CoV-2 infections using tests, self-examinations or related procedures. Screening of health and care workers should identify risk factors and prodromal symptoms for early evidence of infection *[115]*. GDG members concurred that passive screening, versus active screening, was preferred. Their justification was the potential cost savings and reduced burden on health administrators and health and care workers by allowing them to perform their own syndromic surveillance and control their own health and well-being.

They noted the importance of establishing policies that would allow health and care workers to report any symptoms suggestive of respiratory infections, including SARS-CoV-2, to be referred for testing and to abstain from physical presence in the workplace.

Information on screening, triage and early recognition of patients with COVID-19 can be found in section 6 of the clinical management of COVID-19: living guideline *[52]*.

[1] Refer to WHO COVID-19 Case Definition for the most up-to-date list of COVID-19 symptoms: fever, cough, general weakness/fatigue, headache, myalgia, sore throat, coryza, dyspnoea, nausea, diarrhoea, anorexia. Symptoms may be non-specific to COVID-19 and may also indicate other influenza-like illnesses for which health and care workers should be referred to their local guidance on those diseases *[5]*.

Good practice statement

Health and care workers should be prioritized for SARS-CoV-2 testing in the context of COVID-19 testing policies for both the community and health-care facilities.

Reference can be made to *WHO's Recommendations for national SARS-CoV-2 testing strategies and diagnostic capacities [125]* and *WHO's Antigen-detection in the diagnosis of SARS-CoV-2 infection interim guidance [4]*.

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Practical info

Implementation considerations

Health and care workers should be included in the health-care facility testing strategy. For example, testing could occur as a follow-up to development of signs or symptoms of COVID-19 following a high-risk exposure to a patient or colleague positive for SARS-CoV-2, or for routine testing. WHO's guidance on testing for SARS-CoV-2 stresses that health and care workers who work in COVID-19 services or facilities have the highest priority, followed by health and care workers prioritized by risk in other clinical areas *[127]*.

Testing for health and care workers can be done using PCR or antigen-based testing for SARS-CoV-2. Additional implementation considerations can be found in WHO's Antigen-detection in the diagnosis of SARS-CoV-2 infection guidance *[54]*.

Justification

Health and care workers are considered a priority group for testing, according to key WHO documents on testing strategies and diagnosis of SARS-CoV-2 infection *[54]*. Based on these WHO guidance documents, the decision to formalize the above

statement as a GPS was reached through discussions with the GDG and online voting. GDG members noted that health and care workers should constitute a priority population since they are at high risk of SARS-CoV-2 acquisition due to the nature of their work and their interaction with infected patients. Furthermore, if infected, they represent a risk for patients, especially those at risk for COVID-19 complications. Prioritizing health and care workers for SARS-CoV-2 testing allows for their quick identification and exclusion from in-person work; thus, preventing onward transmission to high-risk patients or other health and care workers.

Good practice statement

Health-care facilities should have protocols for reporting and managing health and care workers' occupational and non-occupational high-risk exposures to COVID-19.

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Practical info

Implementation considerations

Health and care workers should be encouraged to report both occupational and non-occupational exposures to COVID-19 to OHS or an equivalent department.

OHS teams, along with IPC focal points, should create comprehensive and clear protocols so that health and care workers are able to quickly report high-risk exposures. These protocols should provide details on the essential information to include in the report (such as situational events, symptoms, contacts and exposures) and the mechanism for submitting the report, including next steps and follow-up actions.

The protocols should include instructions for health and care workers to wear a medical mask as soon as they recognize they are symptomatic; to refrain from their work activities; and to report to their OHS/IPC focal point. The focal point should suggest that the symptomatic health and care workers quarantine in a designated setting until testing is carried out; they know what their status is; and can determine how to move forward.

The OHS team or the IPC focal point should:

- meet with the health worker to assess their symptoms and record exposure history (where resources permit);
- ask health and care workers to complete and submit the form for the WHO Risk assessment and management of exposure of health care workers in the context of COVID-19
- identify a risk categorization based on the risk assessment tool for health and care workers who have had an exposure without proper use of PPE and determine appropriate management, including deciding whether the health and care worker should continue working or be excluded from in-person activities;
- arrange for testing following a high-risk exposure (see section 6.3).

Strategies to mitigate workforce shortages should be in place in the event that health and care workers are required to remain off work due to quarantine or isolation.

Justification

GDG members discussed the importance of having protocols in place to facilitate the reporting of high-risk exposures to SARS-CoV-2 and their rapid and appropriate management. Referral to OHS and/or IPC services after high-risk exposures to SARS-CoV-2 is critical for early diagnosis of the infection in health and care workers and for minimizing the spread of infections to other colleagues and patients in a health-care setting. The WHO COVID-19: Occupational health and safety for health and care workers interim guidance *[18]* advises that workplace risk assessments be carried out by OHS and IPC to determine which roles

are at high risk for exposure in health-care facilities, how well health and care workers are to return to work; and how health and care workers can conduct their tasks safely upon their return. High-risk exposures are largely avoidable in health-care settings where protocols and best practices are adhered to by all. If they do occur, they need to be followed up and learned from. High-risk exposure definitions can be found in the definitions section of this guideline.

Preventing hospital-acquired infections requires a multi-pronged, comprehensive approach that involves a hierarchy of controls (hazard elimination, engineering/environmental controls, administrative controls and optimal use of PPE) and for IPC and OHS staff to work collaboratively to implement these protocols *[18]*.

Good practice statement

Any health and care worker who has signs or symptoms[1] of SARS-CoV-2 infection[2] should be excluded from their activities at work that require providing in-person care to patients or other activities in the health-care facility where they are in contact with other health and care personnel.

They should furthermore consult with their occupational health and safety department and plan for isolation in a designated setting for the duration of the required period of isolation outlined by their local policy[3].

[1] Signs or symptoms of COVID-19 include: cough, general weakness/fatigue, headache, myalgia, sore throat, coryza, dyspnoea, nausea, diarrhoea, anorexia *[5]*.

[2] For active infection definition, refer to Public Health Surveillance for COVID-19: Interim guidance *[126]*.

[3] WHO recommendations for the duration of isolation can be found here *[52]*.

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Practical info

Implementation considerations

Identifying health workers positive for SARS-CoV-2 infection can be achieved through nucleic acid amplification tests (NAATs), such as real-time reverse-transcription polymerase chain reaction (rRT-PCR) tests, which are the most sensitive and specific tests for diagnosing COVID-19. Otherwise, antigen-detection rapid diagnostic tests (Ag-RDTs) are recommended as a viable alternative to confirm SARS-CoV-2 infection, especially in settings where NAATs are not available or results are not timely. Facilities can follow the WHO guidance for testing or WHO policy brief: COVID-19 testing (14 September 2022) *[128]*.

Health and care workers who are positive for SARS-CoV-2 infection should isolate themselves at home (if they are able to safely isolate and their clinical condition allows them to do so) or in a designated setting such as a health-care facility or non-traditional isolation facility, depending on the country's approach. This decision of where to isolate should be made in conjunction with local public health policies and with the individual's health-care practitioner.

Health and care workers are required to isolate for the duration of time outlined in their local public health policies or they can follow WHO recommendations for the duration of isolation, which can be found under section 4 (COVID-19 care pathway) and include options for using testing as a tool to enable an earlier return-to-work *[52]*.

High-case load scenarios

Health-care facility administrators will need to balance the risk of excluding essential health and care workers, which may contribute to facility-wide shortages, against the risks of possible onward transmission to patients and other health and care workers according to the transmission scenarios in the facility and community. They may do this by choosing to assess infected health and care workers on a case-by-case basis and assess their infectiousness based on symptoms and test results for

earlier return-to-work options and select appropriate units in which these health and care workers may work. For example, high-risk units such as ICUs, transplant units and oncology units may need to be excluded.

Health-care facility administrators should ensure adequate supplies of PPE are available for health and care workers and that processes are in place for monitoring and evaluating IPC procedures, including fit testing, and correct procedures for putting on, taking off and disposing of PPE.

OHS Follow up
Focal points for occupational health and safety should perform workplace risk assessments to determine if an infection was acquired in the health-care facility. If the infection is related to an occupational exposure such as a breach in IPC practices, appropriate corrective measures, such as refresher training on IPC measures, should be put in place to address the exposure.

Return to work
Upon return to work after an infection, health and care workers should continue to follow strict IPC measures; hand hygiene practices; wearing a mask when indicated; wearing of PPE when indicated; and other practices outlined in this guideline. The length of isolation should be determined by the health facility and local guidance for the period of infectiousness. Alternatively, administrators can refer to the section on Duration of Isolation.

In this context, SARS-CoV-2 infection is defined in Public Health Surveillance for COVID-19: Interim guidance *[126]*.

Justification

The decision to formalize the above statement as a good practice statement was reached through in-depth GDG discussions and online voting. Many GDG members noted that health and care workers who have symptoms of SARS-CoV-2 infection pose a high risk of being infectious and thus transmitting the virus to patient populations most at risk of developing complications (those with co-morbidities, of older age or with compromised immune systems).

Testing after high-risk exposures and quarantine for health and care workers

Refer to the WHO Contact tracing and quarantine in the context of COVID-19: interim guidance for recommendations on testing after a high-risk exposure and the length of quarantine for contacts of COVID-19 cases that may be applied to the health and care worker population *[127]*. WHO advises that identification, contact, quarantine and follow-up of individuals at high risk of acquiring SARS-CoV-2 infection who have been in contact with a confirmed or probable case of SARS-CoV-2 infection should be prioritized rather than targeting all contacts.

Health and care workers are a priority population. They should receive support regarding quarantine measures and access to free or affordable and reliable testing (including self-tests).

Table 6 presents a summary of the quarantine scenarios for health and care workers according to vaccination status.

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*Extracted from the **WHO Contact tracing and quarantine in the context of COVID-19: interim guidance** for recommendations on testing after a high-risk exposure and the length of quarantine for contacts of COVID-19 cases, which may be applied to the health and care worker population [127].*

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Practical info

Implementation considerations

Quarantine arrangements can be implemented at home or in another designated setting where the contact can be regularly monitored for signs and symptoms. During quarantine, adequate ventilation and IPC measures should be implemented and maintained.

Quarantined individuals must be supported with adequate food, water, protection, hygiene and communication provisions, including access to education, paid leave or remote work options. In addition, they need to regularly monitor their health status

for symptoms and receive clear instructions on what to do in case they develop signs and symptoms of COVID-19. The instructions need to include referrals to call centres, health care centres or medical staff in case of need as well as testing facilities or self-testing options for the contacts.

All contacts in quarantine who develop signs and symptoms need to undergo testing. Staff supporting contacts in quarantine, either through in-person visits or through call centres, need to be trained to assess and manage them or refer the contacts to needed support.

If other people enter the room of a contact in quarantine, physical contact should be avoided, and face masks should be worn by all parties, unless contraindicated (e.g. in infants). Quarantined individuals should avoid contact with people at high risk of detrimental COVID-19 outcomes.

More implementation considerations can be found at the WHO Contact tracing and quarantine in the context of COVID-19: interim guidance *[127]*.

Table 8. Quarantine scenarios for health and care workers according to vaccination status

Status	Quarantine Scenario
Vaccinated/infected within the last 90 days	**No quarantine required.** If, in the last 90 days, a vulnerable contact or someone in a priority setting has been vaccinated (i.e. has completed the primary series and/or received a booster dose) or has experienced a confirmed SARS-CoV-2 infection, this contact is not considered to be at high risk of infection or further transmission.
Vaccinated/infected more than 90 days	**Quarantine for 10 days** **Quarantine for 5 days plus negative test**
High case load scenarios	**No quarantine required** When the case load is high, and many health and care workers and essential workers are off work due to exposure or infection, health systems may be overstretched. In that context, vaccinated health and care workers and other essential workers who are asymptomatic contacts may have a shortened quarantine or continue to work without quarantine. Daily Ag-RDT testing may be performed up to day 5 after exposure.

*Extracted from the **WHO Contact tracing and quarantine in the context of COVID-19: interim guidance** for recommendations on testing after a high-risk exposure and the length of quarantine for contacts of COVID-19 cases, which may be applied to the health and care worker population [127].*

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3.6.2 Duration of isolation for COVID-19 cases in health and care workers

Conditional recommendation for , Very low certainty evidence

We suggest 10 days of isolation for individuals who are symptomatic due to SARS-CoV-2 infection (very low certainty of evidence).

We suggest 5 days of isolation for individuals who are asymptomatic with SARS-CoV-2 infection (very low certainty of evidence).

We suggest the use of rapid antigen testing to reduce the period of isolation (very low certainty of evidence).

For the most up-to-date, evidence-based recommendations on the length of isolation for positive COVID-19 cases, see the WHO Clinical Management of COVID-19: living guideline, which has been directly applied to the health and care worker population; recommendations remain the same for anyone who becomes a COVID-19 case.

The current version was updated in January 2023: https://app.magicapp.org/#/guideline/6668/section/118562.

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Practical info

Implementation considerations

Health facilities are advised to follow local protocols on the duration of isolation, testing options and return-to-work management.

Upon termination of the isolation period, we recommend that health and care workers undergo a medical assessment in conjunction with OHS and IPC services to determine whether the individuals are fit to return to work safely. These should include factors such as (but not limited to):

- their work setting (dedicated to COVID-19 patients, ICU, or long-term care versus direct patient care or non-patient-facing care);
- clinical conditions of the patients (e.g. immunocompromised) for whom the health and care worker may provide care;
- health facility IPC measures and use of universal masking as per WHO advice on the use of masks in the context of COVID-19 guidance;
- the health and care worker's general health and severity of previous illness with COVID-19.

Testing to reduce the length of isolation is dependent on local policies and could be used during an outbreak or high health workforce absenteeism, based on availability, feasibility and economic abilities of the health-care facility to provide testing to staff. In scenarios where health-care facilities choose to accept that health and care workers return to work before the recommended timelines and the conclusion of the period of infectiousness, health and care workers should strictly adhere to standard and transmission-based precautions and consider working on COVID-19 wards or non-high-risk wards to reduce any

risk of onward transmission to patients and staff.

There should also be occupational health policies in place to ensure health and care workers who are off work for isolation purposes have covered sick leave and are not penalized or otherwise negatively affected in the workplace by their infection. This will help ensure that health and care workers report infections and do not attend work when sick. OHS and IPC staff will need to balance the risk of shortages of essential health and care workers against the risks of exposure and implementation of work restrictions according to the transmission scenarios in the facility and community.

Health and care workers should adhere to the following recommendations when returning to work after a COVID-19 infection:

- Attend refresher training on IPC practices such as hand and respiratory hygiene, fit test and fit check of respirators, PPE use, masking policies and safe physical distancing.
- Continue to follow public health and social measures in their home and community settings *[60]*.
- Continue to self-monitor for symptoms suggestive of COVID-19 and immediately stop working, report to their OHS department and self-isolate if new or worsening symptoms develop/re-appear.
- Receive ongoing support and monitoring from OHS for longer-term health complications and potential psychological implications.

Evidence to decision

Benefits and harms

See below for a copy of the evidence to decision table; for source and any other information, see Clinical Management of COVID-19. The current version was published in January 2023: https://app.magicapp.org/#/guideline/6668/section/118562

Isolation Period: The benefits outlined by the GDG relate to the impact on subsequent hospitalization and mortality across contacts (very low certainty evidence) of a 10-day, compared with a 5-day, isolation period for symptomatic individuals. **Symptomatic individuals are much more likely to test positive than asymptomatic individuals and thus much more likely to transmit SARS-CoV-2.** This provides the rationale, despite the very low certainty of evidence on the impact of isolation on subsequent transmission, hospitalization, and mortality, for the suggestion for 10 days in symptomatic and 5 days in asymptomatic cases. A shortened isolation period, where safe, was agreed upon as preferable as part of the values and preferences, which further informed the recommendation for 5 days of isolation for asymptomatic individuals.

Given the uncertainty involved, the GDG did not incorporate into the evidence review the harms – on mental health, finances or social interaction – related to varying periods of isolation.

Antigen testing: The possible benefit of using rapid tests to determine the period of isolation is, on average, a reduction of 3 days of the isolation period (very low certainty of evidence).

There are minimal harms of employing rapid tests to determine the period of isolation.

Certainty of the Evidence

Very low

Isolation Period: The GDG deemed the evidence reviewed to inform this recommendation to be of very low certainty, rated down due to the high degree of uncertainty in the parameters that inform the model and the indirectness of the data. Specifically, there is a great deal of uncertainty across the following assumptions: i) the infectivity of individuals with positive rapid antigen tests; ii) the effective reproduction number; iii) the assumed hospitalization rate of infected individuals; and iv) the assumed case-fatality rate of infected individuals. Additional sources of uncertainty lie in understanding the contributing role of different public health measures in place in different regions of the world, vaccination status, history of prior infection and the infecting SARS-CoV-2 VoC(s) and resultant changes to infectivity and severity. Evidence was reviewed regarding the duration of viral culture positivity and PCR positivity, which were in both cases deemed to be of very low certainty.

A large source of uncertainty, as voiced by the GDG and not consistently defined in the available evidence, was the definition of what constituted symptomatic infection. From clinical experience, noted by the GDG, classifying patients as

either symptomatic or asymptomatic was not always straightforward.

Antigen testing: The evidence was of very low certainty, rated down for indirectness and uncertainty in the included model parameters. Additional sources of uncertainty from the above recommendations that were not formally evaluated included evaluations of the sensitivity and specificity of various types of rapid tests, the swab technique employed, vaccination status, history of prior infection and the infecting variant(s) , leading to greater uncertainty as assessed by the GDG.

Values and preferences

Isolation Period:

- Given anticipated strong preferences in most individuals for shorter periods of isolation, and their positive social and economic consequences, the Clinical Management GDG placed a high value on shorter periods of isolation.
- Despite the very low certainty of evidence, the Clinical Management GDG placed a high value on the possible increase, in symptomatic patients, of transmission and resulting hospitalization in secondary infections resulting from shorter periods of isolation.
- The GDG nevertheless acknowledged the substantial variability in these values and preferences that is likely to exist.

Antigen Testing: Given anticipated strong preferences in most individuals for shorter periods of isolation, and the positive social and economic consequences of shorter periods of isolation, the Clinical Management GDG placed a high value on shorter periods of isolation.

The Clinical Management GDG nevertheless acknowledges the substantial variability in these values and preferences that is likely to exist.

Resources and other considerations

Isolation Period: The GDG emphasized that there are substantial resource considerations in asking individuals with mildly symptomatic disease to isolate for 5 days. These resource considerations should be incorporated into policies to ensure that the financial, social and mental health-specific impacts of periods of isolation on individuals are minimized.

Antigen Testing: The GDG acknowledged that the resource implications of prolonged periods of isolation may be considerable and may reach beyond the individual, with varying social, economic and mental health impacts. Implementation of the above recommendations should incorporate policies to ensure that those considerations are addressed.

Justification

The clinical management team and respective GDG assessed the evidence and determined the updated recommendations for the suggested duration of isolation timelines. They then were asked to present their findings and summary of evidence to the IPC GDG, whose members agreed that, due to limited evidence on the risks of onward infection transmission among different populations, such as health and care workers, there was no need to make different recommendations for health and care workers.

The Clinical Management GDG reviewed the evidence for onward transmission that may lead to hospitalization or death following contact with persons isolated for 5 days versus 10 for both symptomatic and asymptomatic cases and found there were differences between symptomatic and asymptomatic individuals and therefore decided to make separate recommendations for these two groups, although it may be initially difficult to classify cases into these categories. The Clinical Management GDG discussed that hospitalization and mortality among contacts remain the crucial outcomes for consideration.

Clinical question/ PICO

Population: Asymptomatic COVID-19 patients
Intervention: Isolation for 5 days after positive test
Comparator: Isolation for 10 days after positive test

Outcome Timeframe	**Study results and measurements**	**Comparator** Isolation for 10 days	**Intervention** Isolation for 5 days	**Certainty of the Evidence** (Quality of evidence)	**Summary**
Onward transmission leading to hospitalization (28 days) [1]		9 per 1000 Difference:	11 per 1000 **2 more per 1000** (CI 95% 2 more — 3 more)	Very low Due to certainty of parameters in the model and indirectness.	Whether isolation for 5 days would increase onward transmission leading to hospitalization of secondary cases is very uncertain compared with isolation for 10 days.
Onward transmission leading to death (90 days) [2]		2 per 1000 Difference:	3 per 1000 **1 more per 1000** (CI 95% 0 more — 1 more)	Very low Due to certainty of parameters in the model and indirectness.	Whether isolation for 5 days would increase onward transmission leading to mortality of secondary cases is very uncertain compared with isolation for 10 days.

Clinical question/ PICO

Population: Symptomatic COVID-19 patients
Intervention: Isolation for 5 days after symptom onset
Comparator: Isolation for 10 days after symptom onset plus 3 additional days without symptoms

Outcome Timeframe	**Study results and measurements**	**Comparator** Isolation for 10 days	**Intervention** Isolation for 5 days	**Certainty of the Evidence** (Quality of evidence)	**Summary**
Onward transmission leading to hospitalization (28 days) [1]		9 per 1000 Difference:	28 per 1000 **19 more per 1000** (CI 95% 14 more — 24 more)	Very low Due to certainty of parameters in the model and indirectness.	Whether Isolation for 5 days would increase onward transmission leading to hospitalization of secondary cases is very uncertain compared with isolation for 10 days.
Onward transmission leading to death		2 per 1000	7 per 1000	Very low Due to certainty of parameters in	Whether Isolation for 5 days would increase onward transmission

Outcome Timeframe	**Study results and measurements**	**Comparator** Isolation for 10 days	**Intervention** Isolation for 5 days	**Certainty of the Evidence** (Quality of evidence)	**Summary**
(90 days) [2]		Difference:	**5 more per 1000** (CI 95% 4 more — 6 more)	the model and indirectness.	leading to death of secondary cases is very uncertain compared with isolation for 10 days.

Clinical question/ PICO

Population: Patients with COVID-19
Intervention: Remove isolation based on negative antigen test after Isolation 5 days
Comparator: Isolation for 10 days

Outcome Timeframe	**Study results and measurements**	**Comparator** Isolation for 10 days	**Intervention** Remove isolation based on negative antigen test	**Certainty of the Evidence** (Quality of evidence)	**Summary**
Onward transmission leading to hospitalization (28 days)		9 per 1000	9 per 1000	Very low Due to parameters in the model and indirectness.	Whether removing isolation based on the negative antigen test would increase or decrease onward transmission leading to hospitalization of secondary cases is very uncertain compared with isolation for 10 days.
Onward transmission leading to death (90 days)		2 per 1000	2 per 1000	Very low Due to parameters in the model and indirectness.	Whether removing isolation based on the negative antigen test would increase or decrease onward transmission leading to mortality of secondary cases is very uncertain compared with isolation for 10 days.
Average isolation period (days)	Lower better	10 Days (Mean)	7 Days (Mean) CI 95%	Moderate Due to parameters in the model.	Removing isolation based on the negative antigen test probably decreases average isolation compared with isolation for 10 days.

3.6.3 Risk assessment and management of exposure

The guidance for Risk assessment and management of exposure of health care workers in the context of COVID-19: interim guidance was published 19 March 2020.

3.7 IPC outbreak preparedness, readiness, response and recovery

The COVID-19 pandemic resulted in a high disease burden and impact across settings where health care was delivered, notably in fragile health systems and among at-risk populations. It exposed challenges facing health-care systems and highlighted the need to strengthen IPC programmes and infectious disease outbreak surge capacity and to institute overall reforms to improve care delivery.

Maintenance of the delivery of essential health services is critical to avoid increased morbidity and mortality in the population due to COVID-19 and other infectious diseases and conditions *[129][130]*. Despite these efforts, the pandemic severely affected the health systems, as was reported in several publications and WHO country situation reports *[1][2]*.

Lessons learned from COVID-19 has been used to strengthen health systems for future pandemics through the global architecture for health emergency prevention, preparedness, response, recovery and resilience and to address determinants of health that affect populations and settings at risk *[1][2][130]*.

IPC health emergency **preparedness** and operational **readiness** are critical for an effective response and prompt recovery.

- **Preparedness** includes strategies that are developed well in advance of a disease outbreak or imminent emergency threats is detected; they include planning, organizing, training, equipping, practicing, evaluating and taking corrective actions. IPC aspects of preparedness include establishing or strengthening the IPC core components or minimum requirements, stockpiling IPC supplies, training staff and increasing compliance with recommended IPC practices.
- **Operational Readiness** responds to an emerging threat that is expected to affect a system within weeks to months. Building surge capacity to be able to withstand threats that may externally overwhelm capacity and identifying internal gaps in current practices that could allow a threat to amplify within the health facility must be addressed in this stage.
- **Response** to public health emergencies includes activities in reaction to a known or suspected event. This is when emergency plans are operationalized. Depending upon the nature of the emergency, response activities may be restricted to the health-care facility itself or may include local, community, regional and national actions and may continue for short, intermediate or long periods.
- Once an emergency is declared “over,” the **recovery** efforts begin, including lessons learned to further increase the preparedness level of a facility.

3.7.1 Key activities to strengthen IPC during heath emergencies

Key actions for strengthening IPC outbreak preparedness, readiness and response *[129]* include (though not necessarily in this order)

- Assess IPC capacity
  - Identify IPC areas needing strengthening at the national level.
- Develop or reinforce National emergency preparedness and response plans
  - Develop or reinforce the IPC components of a national or subnational disease-specific outbreak preparedness and response plan or multi-hazard plan.
- Evaluate national IPC guidelines for outbreak management.
  - Develop and incorporate IPC outbreak management within national IPC guidelines.
- Develop and/or strengthen the outbreak component of the national IPC training program
  - Develop or strengthen an outbreak training programme to be incorporated into the national or subnational IPC training programme.
- Coordinate with national surveillance and reporting programme
  - Coordinate with national and subnational surveillance networks that include syndromic and microbiologic surveillance for diseases with outbreak potential. Surveillance and reporting of infections, especially health and care workers and hospitalized patients should be considered an important to guide IPC activities.