

Infection Prevention and Control considerations in the initial care of COVID-19 patients

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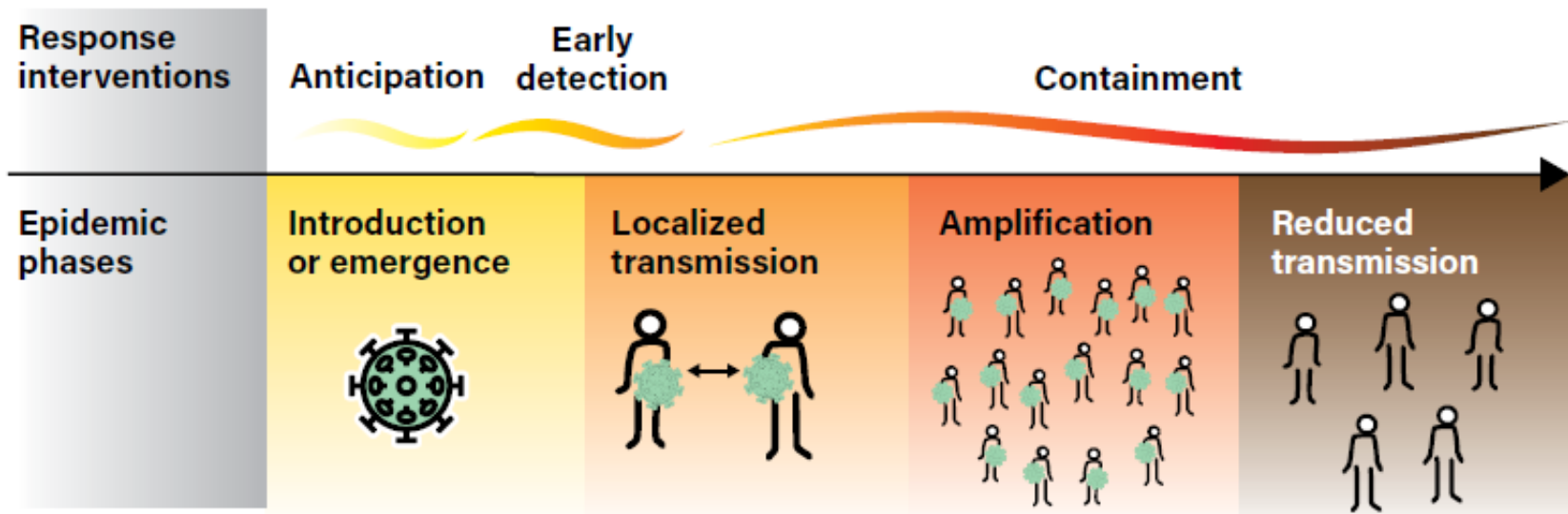
PHE/IHM – PAHO HQ

Virtual, April 15, 2021



Infection Prevention and Control and COVID-19

Figure 1. Epidemic phases and response interventions



Source: Managing epidemics: key facts about major deadly diseases. Geneva: World Health Organization; 2018.

<https://www.who.int/emergencies/diseases/managing-epidemics/en/>

Infection Prevention and Control and COVID-19

Standard Precautions

1 – Limit human-to-human transmission

2 – Reduce secondary infections

3 – Prevent transmission through amplification and super-spreading events



Hand hygiene (water and soap or alcohol-based solutions)



Use of personal protective equipment (PPE) according to risk



Respiratory hygiene (or cough etiquette)



Safe injection practices

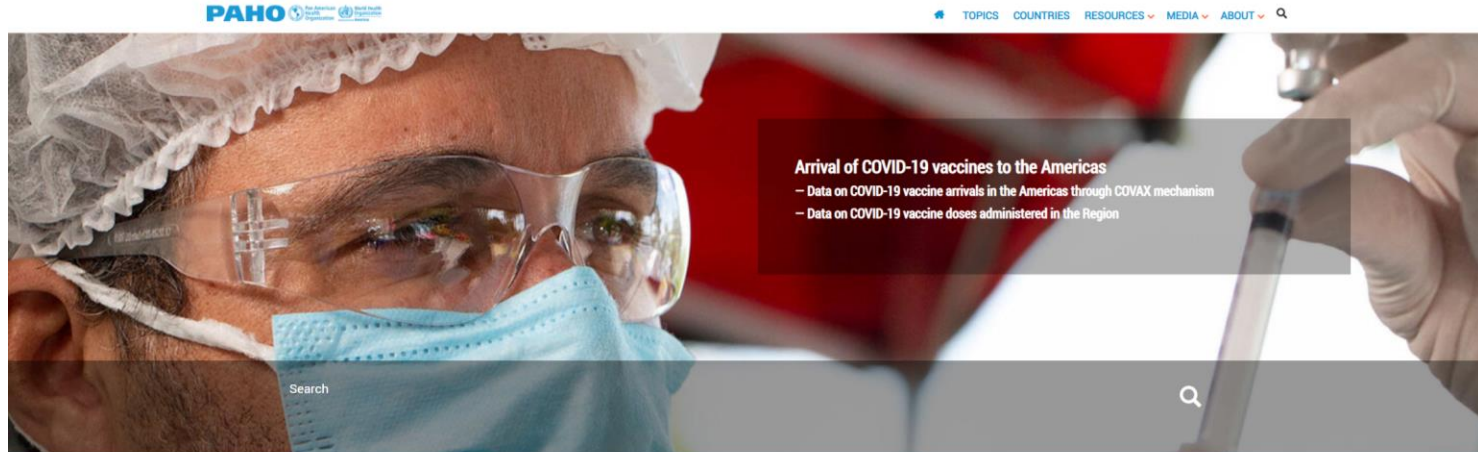


Sterilization / disinfection of medical devices



Environmental cleaning

<https://www.paho.org/en/>
<https://www.paho.org/es>



PAHO The Americas Regional Office of the World Health Organization





TOPICS COUNTRIES RESOURCES MEDIA ABOUT

Arrival of COVID-19 vaccines to the Americas
– Data on COVID-19 vaccine arrivals in the Americas through COVAX mechanism
– Data on COVID-19 vaccine doses administered in the Region

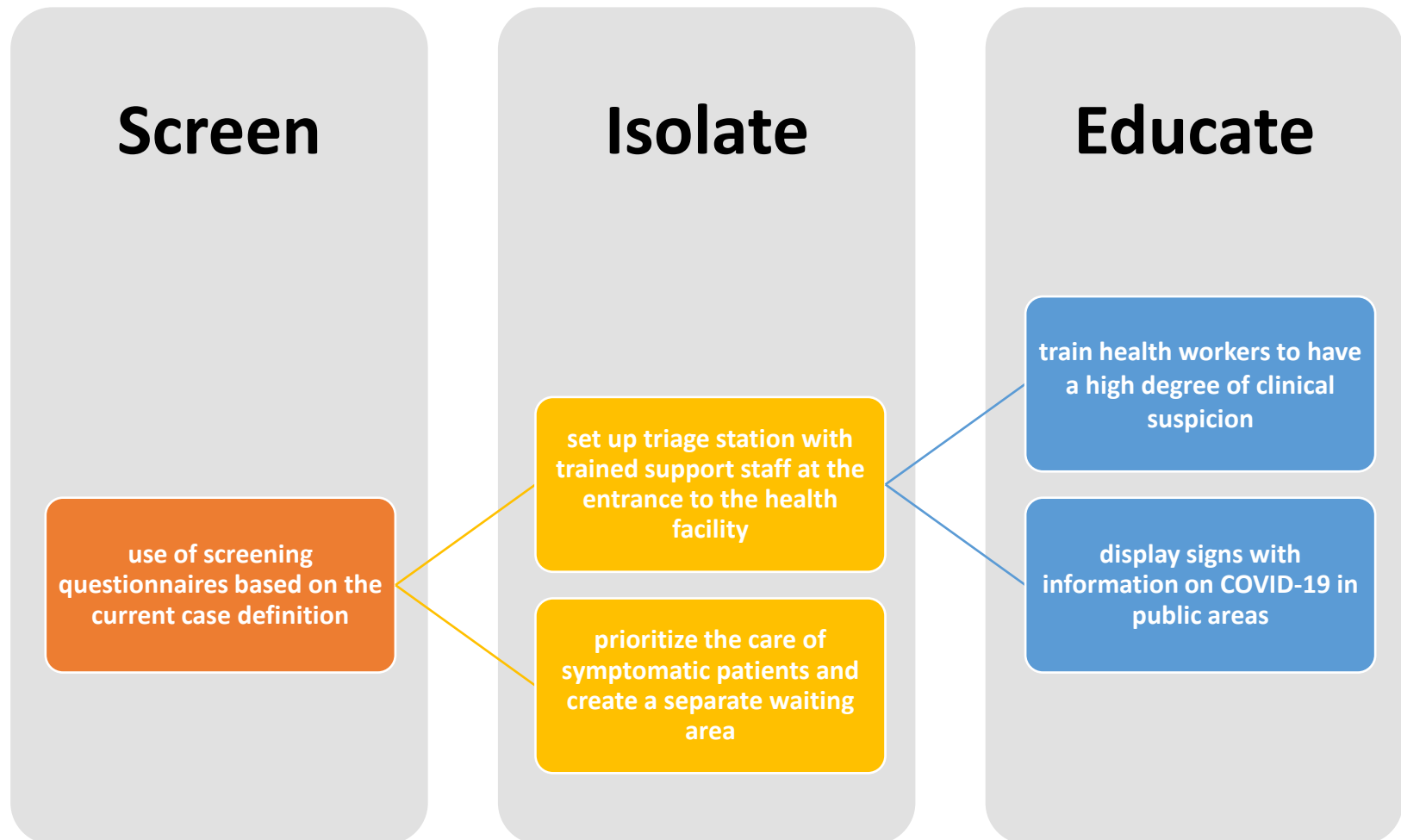
Search

Regarding fraudulent messages about PAHO/WHO and COVID-19.

Coronavirus Disease (COVID-19) pandemic

- 
COVID-19 Resources
- 
Technical Guidelines
- 
Communication Material
- 
COVID-19 Vaccines

Three aspects in the initial management of COVID-19 – what health workers should know



Spatial separation and physical barriers



Source – Google images

<https://www.paho.org/en>

Guidelines for care of critically ill adult patients with COVID-19 in the Americas. Short version, ~~v.2, 29 July 2020~~, v.3, to be published soon




- Each clinical question presents a group of recommendations / good practices that provide guidance for the management of critical patients with COVID-19
- GRADE system

<https://iris.paho.org/handle/10665.2/52614> – to be updated

Question 7 –

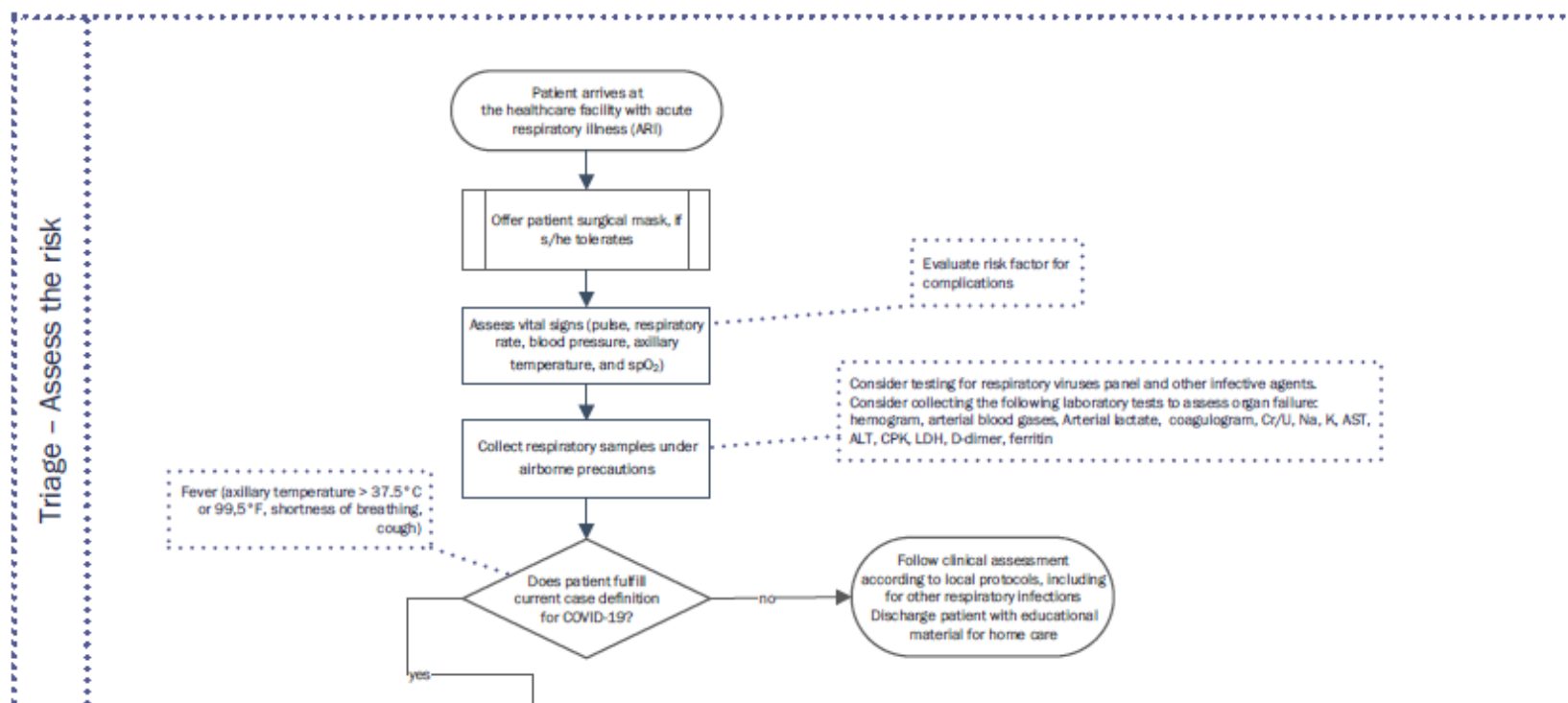
What is the triage strategy that should be used for critical patients with COVID-19?

*Updated question

N.o	RECOMMENDATION
	<p>It is recommended that institutional protocols for triage of patients with suspected diagnosis or COVID-19 be implemented to classify adequately patients requiring management in an intensive care unit.</p> <p>The duration and severity of symptoms, diagnostic imaging findings (radiography, CT scan or lung ultrasound, according to their availability), origin of pulmonary infiltrates, oxygenation needs, vital organ dysfunction, sepsis and septic shock should be evaluated to identify critical patients infected with COVID-19.</p> <p>The Pan American Health Organization (PAHO) has a patient management algorithm with suspected COVID-19 infection at the first level of care and in remote areas of the Region of the Americas (https://iris.paho.org/handle/10665.2/52501).</p> <p>Point of good practice</p>

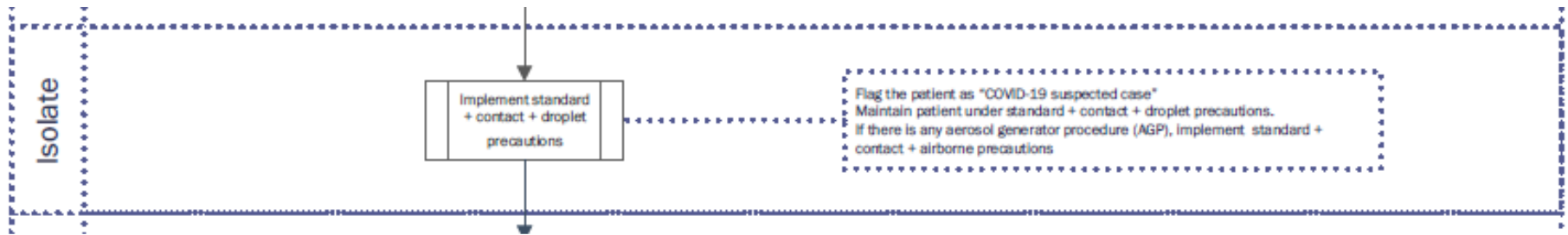
<https://iris.paho.org/handle/10665.2/52614> – to be updated

Initial care of COVID-19: triage / isolate / refer



Source: <https://www.paho.org/en/technical-documents-coronavirus-disease-covid-19>, with adaptations.

Initial care of COVID-19: triage / **isolate** / refer




Source: <https://www.paho.org/en/technical-documents-coronavirus-disease-covid-19>, with adaptations.

Question 3 –

What is the effectiveness and safety of interventions to prevent infection of health professionals who care for patients with COVID-19?

*Updated question

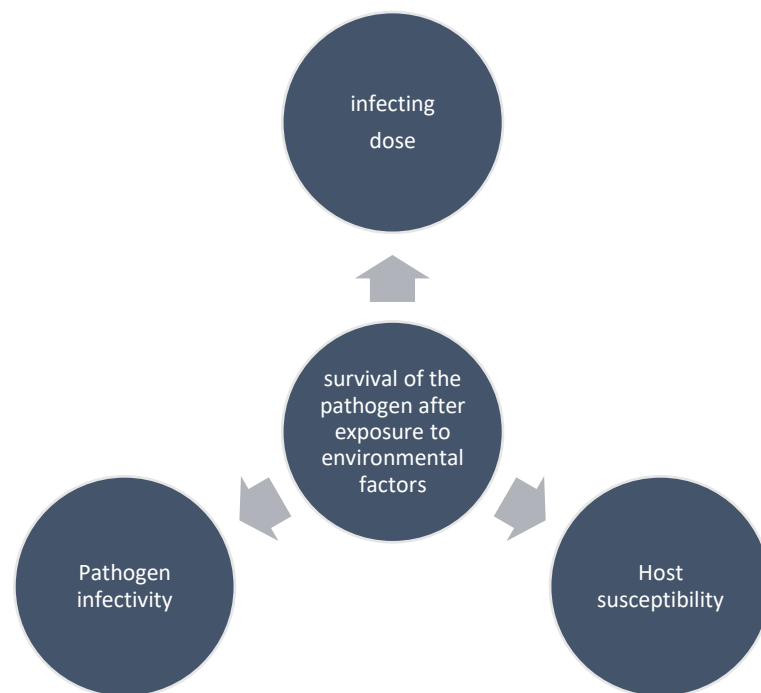
N.o	RECOMMENDATION
	<p>For health workers in contact with COVID-19 patients performing aerosol-generating procedures* in the intensive care unit (ICU) or in a unit where these procedures are performed without adequate ventilation or independent negative pressure system, it is recommended to wear respiratory masks (respiratory masks N-95, FFP2 or equivalent), instead of surgical masks, in addition to other personal protective equipment (gloves, gown and eye protection such as protective masks or safety goggles).</p> <p>* Procedures that generate aerosols and are performed in the ICU include endotracheal intubation, bronchoscopy, open aspiration, nebulized treatment, manual pre-endotracheal intubation ventilation, physical patient pronation, fan patient disconnection, non-invasive ventilation with positive pressure, tracheostomy and cardiopulmonary resuscitation.</p> <p>Point of good practice</p>

<https://iris.paho.org/handle/10665.2/52614> – to be updated

Airborne Transmission – What to consider?

Question – Is the detection of a pathogens in room air sufficient to suggest transmission through the air?

Answer – No



Source: https://apps.who.int/iris/bitstream/handle/10665/331215/WHO-2019-nCov-IPCPPE_use-2020.1-eng.pdf, with adaptations

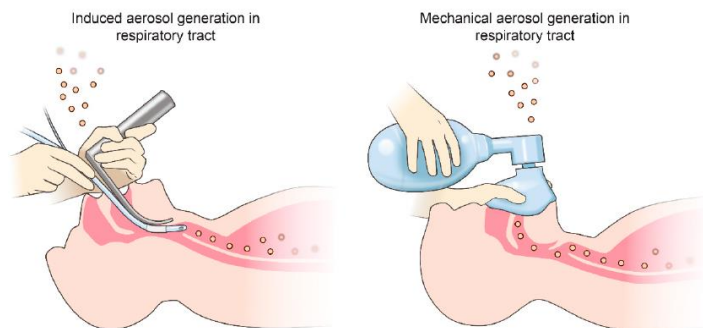
Transmission of SARS-CoV-2: implications for infection prevention precautions

Scientific Brief . 9 July 2020

- The proportion of exhaled droplet nuclei or of respiratory droplets that evaporate to generate aerosols, and the **infectious dose of viable SARS-CoV-2 required to cause infection in another person are not known**, but it has been studied for other respiratory viruses
- Studies in health care settings where symptomatic COVID-19 patients were cared for, but where aerosol generating procedures were not performed
 - Reported the presence of SARS-CoV-2 RNA in air samples;
 - Other similar investigations in both health care and non-health care settings; found no presence of SARS-CoV-2 RNA;
 - **No studies have found viable virus in air samples**
- Within samples where SARS-CoV-2 RNA was found, the quantity of RNA detected was in extremely low numbers in large volumes of air and one study that found SARS-CoV-2 RNA in air samples reported inability to identify viable virus.

<https://www.who.int/publications/i/item/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>

Aerosol-generating procedures (AGP)



Source: Judson SD. et al. 2019. doi:10.3390/v111100940

Number of healthcare providers exposed should be limited

The quality of ventilation has been pointed as a major factor in determining the risk of exposure.

Source: Fennelly K. & Nardell E. 1998.

Aerosol-generating procedures (AGP)

Bronchoscopy

Cardiopulmonary resuscitation

Noninvasive ventilation (BiPAP, CPAP, HFOV)

Surgery

Tracheal intubation

Manual ventilation

Sputum induction

Suctioning

Laser plume

Necropsy

Question 3 –

What is the effectiveness and safety of interventions to prevent infection of health professionals who care for patients with COVID-19?

*Updated question

N.o	RECOMMENDATION
3	<p>For health workers who provide care to patients with COVID-19 without mechanical ventilation in ICU, it is suggested to wear surgical masks instead of respiratory masks, in addition to other personal protective equipment.</p> <p>Conditional Recommendation. Evidence quality: low</p>
4	<p>For health workers performing procedures that do not generate aerosols in patients with COVID-19 and mechanical ventilation (closed circuit), the use of surgical masks instead of respiratory masks, in addition to other personal protective equipment, is suggested.</p> <p>Conditional Recommendation. Evidence quality: low</p>

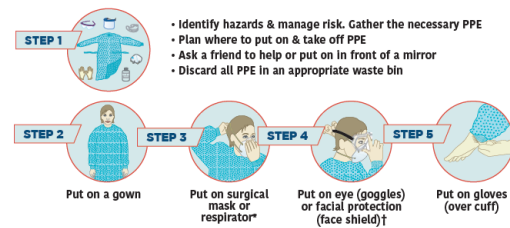
<https://iris.paho.org/handle/10665.2/52614> – to be updated

Personal protective equipment according to the level of care

COVID-19

Coronavirus Disease 2019

HOW TO PUT ON PERSONAL PROTECTIVE EQUIPMENT (PPE)



*Surgical mask or respirator (N95 or similar), depending on the level of care. For aerosol generating procedures (AGP), wear a respirator (N95 or similar)

†e.g. vision, face shields, goggles (consider anti-fog drops or fog-resistant goggles)

HOW TO TAKE OFF PPE

- Avoid contamination of self, others and environment
- Remove the most heavily contaminated items first



Level of care	Hand hygiene	Gown	Surgical mask	Respirator (N95 or similar)	Goggle (eye protection) OR face shield (facial protection)	Gloves
Triage						
Collection of specimens for laboratory diagnosis						
Suspected or confirmed case of COVID-19 requiring healthcare facility admission and NO aerosol-generating procedure						
Suspected or confirmed case of COVID-19 requiring healthcare facility admission and WITH aerosol-generating procedure†						

†AGPs include positive pressure ventilation (BiPAP and CPAP), endotracheal intubation, airway suction, high frequency oscillatory ventilation, tracheostomy, chest physiotherapy, nebulizer treatment, sputum induction, and bronchoscopy.

Level of care	Hand hygiene	Gown	Surgical mask	Respirator (N95/FPP2)	Goggle (eye protection) OR Face shield (facial protection)	Gloves
Triage	X	X	X		X	X
Collection of specimens for laboratory diagnosis	X	X		X	X	X
Suspected or confirmed case of COVID-19 requiring healthcare facility admission and NO aerosol-generating procedure	X	X	X		X	X
Suspected or confirmed case of COVID-19 requiring healthcare facility admission and WITH aerosol-generating procedure	X	X		X	X	X

General principles of the use of personal protective equipment (PPE)



Hand hygiene should always be performed despite PPE use.



Remove and replace if necessary, any damaged or broken pieces of re-usable PPE as soon as you become aware that they are not in full working condition.



Remove all PPE as soon as possible after completing the care and avoid contaminating the environment outside the isolation room; any other patient or worker; and yourself.



Discard all items of PPE carefully and perform hand hygiene immediately afterwards.

Rational use of personal protective equipment (PPE) for coronavirus disease (COVID-19)

Interim guidance
19 March 2020



Background

This document summarizes WHO's recommendations for the rational use of personal protective equipment (PPE) in health care and community settings, as well as during the handling of cargo. In this context, PPE includes gloves, medical masks, goggles or a face shield, and gowns, as well as for specific procedures, respirators (i.e. N95 or FFP2 standard or equivalent) and aprons. It is intended for those involved in distributing and managing PPE, as well as public health authorities and individuals in health care and community settings, and it provides information about when PPE use is most appropriate.

WHO will continue update these recommendations as new information becomes available.

Preventive measures for COVID-19 disease

Based on the available evidence, the COVID-19 virus is transmitted between people through close contact and droplets, not by airborne transmission. The people most at risk of infection are those who are in close contact with a COVID-19 patient or who care for COVID-19 patients.

Preventive and mitigation measures are key. The most effective preventive measures in the community include:

- performing hand hygiene frequently with an alcohol-based hand rub if your hands are not visibly dirty or with soap and water if hands are dirty;
- avoiding touching your eyes, nose, and mouth;
- practicing respiratory hygiene by coughing or sneezing into a bent elbow or tissue and then immediately disposing of the tissue;
- wearing a medical mask if you have respiratory symptoms and performing hand hygiene after disposing of the mask;
- maintaining social distance (a minimum of 1 metre) from persons with respiratory symptoms.

Additional precautions are required by health care workers to protect themselves and prevent transmission in the healthcare setting. Precautions to be implemented by health care workers caring for patients with COVID-19 include using PPE appropriately; this involves selecting proper PPE and being trained in how to put on, remove, and dispose of it.

PPE is only one effective measure within a package of administrative and environmental and engineering controls, as described in WHO's Infection prevention and control of epidemic- and pandemic-prone acute respiratory infections in health care.¹ These controls are summarized here.

- Administrative controls include ensuring resources for infection prevention and control (IPC) measures, such as appropriate infrastructure, the development of clear IPC policies, facilitated access to laboratory testing, appropriate triage and placement of patient, adequate staff-to-patient ratios, and training of staff.
- Environmental and engineering controls aim at reducing the spread of pathogens and the contamination of surfaces and inanimate objects. They include providing adequate space to allow social distance of at least 1 m to be maintained between patients and between patients and health care workers and ensuring the availability of well-ventilated isolation rooms for patients with suspected or confirmed COVID-19.

COVID-19 is a respiratory disease that is different from Ebola virus disease (EVD), which is transmitted through infected bodily fluids. Because of these differences in transmission, the PPE requirements for COVID-19 are different from those required for EVD. Specifically, coveralls (sometimes called Ebola PPE) are not required when managing COVID-19 patients.

Disruptions in the global supply chain of PPE



The current global stockpile of PPE is insufficient, particularly for medical masks and respirators; the supply of gowns and goggles is soon expected to be insufficient also. Surging global demand – driven not only by the number of COVID-19 cases but also by misinformation, panic buying, and stockpiling – will result in further shortages of PPE globally. The capacity to expand PPE production is limited, and the current demand for respirators and masks cannot be met, especially if widespread inappropriate use of PPE continues.

Source: <https://apps.who.int/iris/handle/10665/69793>

Question 3 –

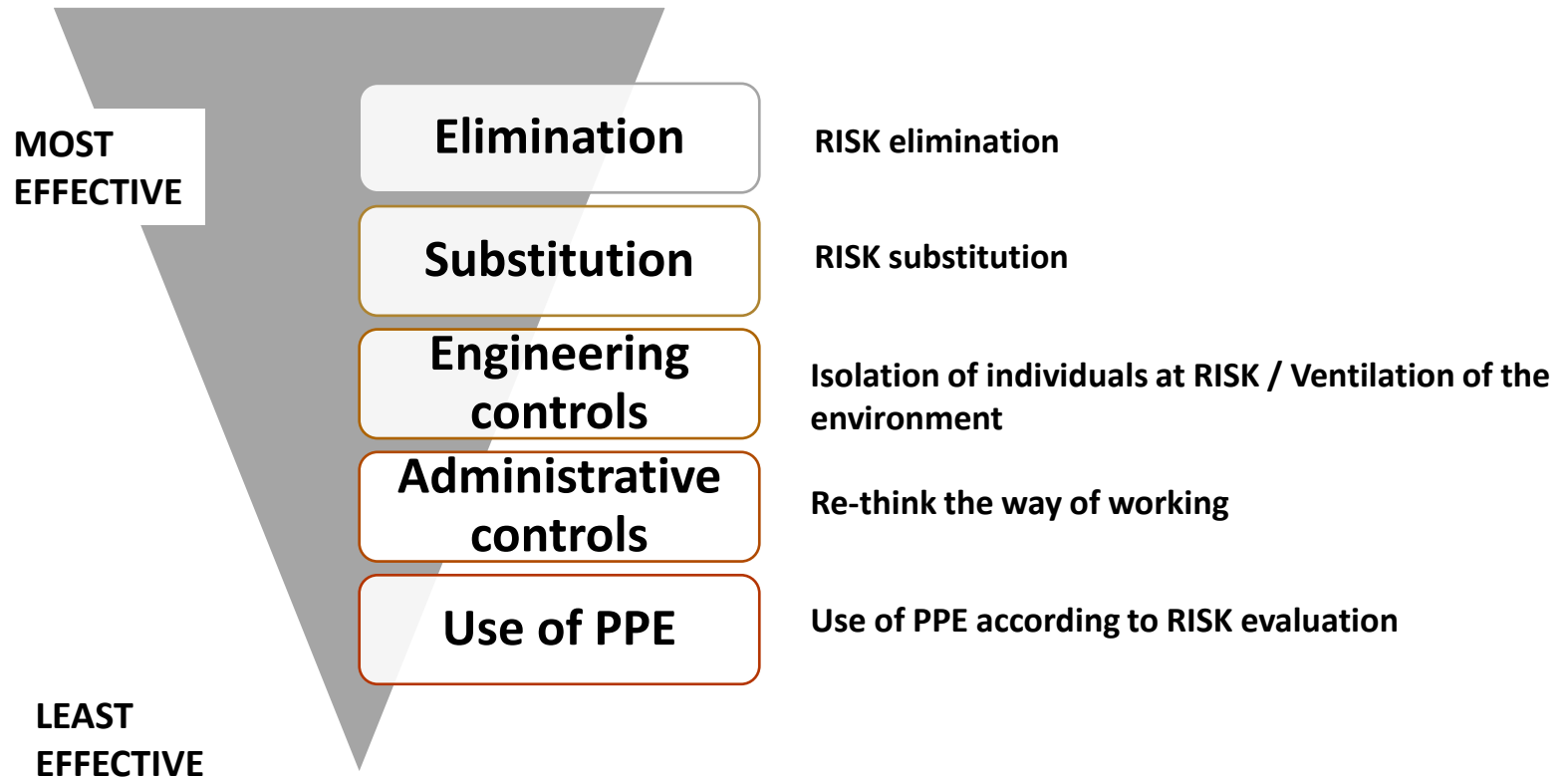
What is the effectiveness and safety of interventions to prevent infection of health professionals who care for patients with COVID-19?

*Updated question

N.o	RECOMMENDATION
	<p>It is recommended that aerosol-generating procedures in patients with COVID-19 in the ICU be performed in designated areas for this purpose and have the best available measures to limit contamination of other patients or health workers. If there is no availability of a room with negative pressure it is suggested to designate an area with natural ventilation in all patient care areas.</p> <p>Point of good practice</p> <p>For natural ventilation, the following average minimum ventilation rates per hour are recommended:</p> <ul style="list-style-type: none"><li data-bbox="175 829 253 901"> • 160 L/s/patient (average ventilation rate per hour) for air transmission prevention rooms (with a minimum of 80 L/s/patient).<li data-bbox="305 939 1841 1058">• When patients are treated in the corridors in emergency or other situations, the ventilation rates should be the same as those required for air transmission prevention rooms.<li data-bbox="305 1086 1841 1205">• Where natural ventilation is not sufficient to meet recommended ventilation requirements, other ventilation systems, such as hybrid (mixed) natural ventilation, shall be used and mechanical ventilation shall not be used if sufficient. <p>Point of good practice</p>

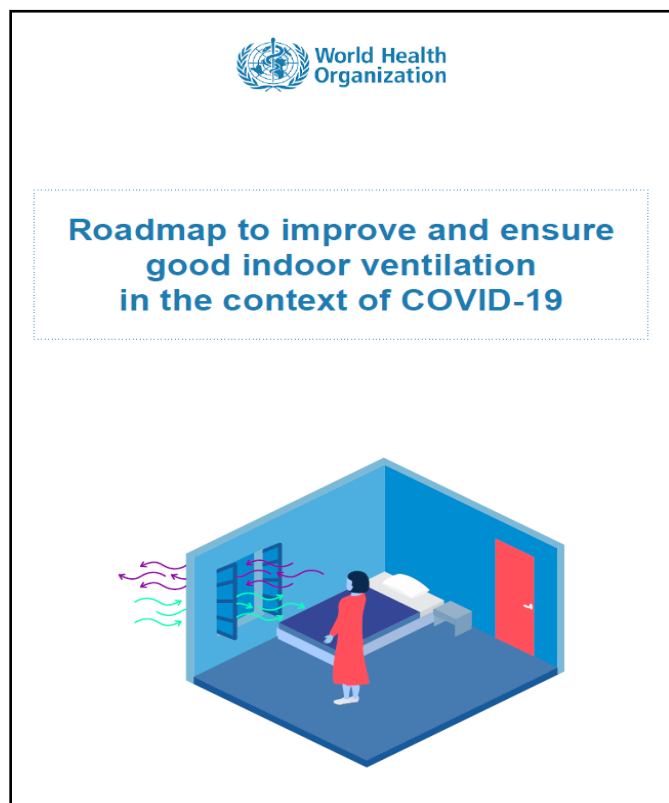
<https://iris.paho.org/handle/10665.2/52614> – to be updated

Hierarchy of controls in infection prevention and control



Adapted from NIOSH, 2020

Ventilation and COVID-19



- Any modifications to health-care ventilation need to be made carefully, taking into consideration the cost, design, maintenance and potential impact on the airflow in other parts of the health-care facility
- Poorly designed or maintained ventilation systems can increase the risk of health-care-associated infections transmitted by airborne pathogens due to incorrect airflow and poor maintenance of the system.

Source: <https://apps.who.int/iris/bitstream/handle/10665/339857/9789240021280-eng.pdf?sequence=1&isAllowed=y>.

Advantages and disadvantages of different types of ventilation systems

	Mechanical ventilation	Natural ventilation	Hybrid ventilation
Advantages	Suitable for all climates	Suitable for warm/mild or moderate climates	Suitable for all climates and weather
	More controlled environment	Lower capital, operational and maintenance costs	Energy-saving
	Smaller range of control of environment by occupants	Capable of achieving very high ventilation rate	More flexible
		Large range of control of environment by occupants	
Disadvantages	Expensive to install and maintain	Easily affected by outdoor climate and/or occupant's behaviour	May be expensive
	Reported failure delivering the required ventilation rate	More difficult to predict, analyse and design	May be more difficult to design
	Potential for noise from equipment	Reduces comfort level of occupants when too hot, humid or cold	
		Inability to establish negative pressure in isolation areas but may be provided by proper design.	

https://www.who.int/water_sanitation_health/publications/natural_ventilation.pdf



Application of Natural ventilation- *TB ward*

Ventilation and COVID-19

- **When AGPs are not performed**, adequate ventilation is considered to be **60 liters/second per patient** (L/s/patient) for naturally-ventilated areas or **6 air changes per hour** (ACH) (equivalent to 40 L/s/patient for a 4x2x3 m³ room) for mechanically-ventilated areas.
- **For areas where AGPs are performed**, The ventilation rate should be **12 ACH** (e.g. equivalent to **160L/s/patient**), ideally 12 ACH for new constructions, with a recommended negative pressure differential of $\geq 2.5\text{Pa}$ (0.01-inch water gauge) to ensure that air flows from the corridor into the patient room.

Table B.1. Air changes/hour (ACH) and time required for airborne-contaminant removal by efficiency *

ACH § ¶	Time (mins.) required for removal 99% efficiency	Time (mins.) required for removal 99.9% efficiency
2	138	207
4	69	104
6⁺	46	69
8	35	52
10 ⁺	28	41
12⁺	23	35
15 ⁺	18	28
20	14	21
50	6	8

* This table is revised from Table S3-1 in reference 4 and has been adapted from the formula for the rate of purging airborne contaminants presented in reference 1435.
 + Denotes frequently cited ACH for patient-care areas.

<https://www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#tableb1>

IPC and COVID-19: summary

Standard, contact and droplet precautions should be used to care for the patient with COVID-19.

Airborne precaution should be in place when AGP is performed

SARS-COV-2 is susceptible to the disinfectants usually used in hospital settings, therefore no changes in types of detergents, or cleaning/disinfectant products is necessary

Due to the transmission mechanism of the disease, the areas near the patient are those with the highest risk of being contaminated and must be cleaned more frequently.

Ventilation rates of 12ACH or 160L/s/patient for AGP areas and 6ACH or 60L/s/patient must be observed

Minimum 1 meter and beds and chairs should be guaranteed

Use of physical barriers, is recommended when possible.

Thank you