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Protection of the COVID-19 warriors

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Abstract

COVID-19, or "Coronavirus Disease 2019" is a viral disease causing lower respiratory infections, which has emerged as a worldwide serious threat to public health. The clinical signs of the COVID-19 may shift, contingent upon seriousness, going from non-pneumonia and gentle pneumonia in mild cases, breathing difficulty, respiratory recurrence $\geq 30/\text{min}$, blood oxygen immersion (SpO_2) $\leq 93\%$, $\text{PaO}_2/\text{FiO}_2$ proportion or P/F [the proportion between the pulse of the oxygen (incomplete weight of oxygen, PaO_2) and the level of oxygen provided (part of motivated oxygen, FiO_2)] < 300 , as well as lung penetrates $>$ half inside 24 to 48 hours, in extreme cases, and respiratory disappointment, septic stun, or potentially various organ brokenness (MOD) or disappointment (MOF), in critical cases. Due to close proximity with the infected patients, healthcare workers are the the most vulnerable persons, physically as well as psychologically. This paper aims to discuss about the safety measures required by healthcare workers for the treatment of COVID-19 patients, as well as techniques for relieving psycholocial burden for healthcare workers.

Keywords: Healthcare workers, SARS-CoV-2 virus, COVID-19, pandemic

Introduction

"COVID-19," or "Coronavirus Disease 2019" is a viral disease causing lower respiratory infections, which has emerged as a worldwide serious threat to public health. In the last two decades, quite a few viral epidemics such as acute respiratory syndrome coronavirus (SARS-CoV), H1N1 influenza, Middle East respiratory syndrome coronavirus (MERS-CoV) have surfaced. It is caused by a novel virus belonging to the coronavirus (CoV) family, formerly named as 2019-nCoV, and now termed as SARS-CoV-2 [1].

Structurally, Coronaviruses are RNA viruses that show up crown-like, when seen under an electron magnifying lens (coronam is the Latin expression for crown) in view of the nearness of spike glycoproteins on the envelope [2]. Approximately, 2% of the population are sound bearers of a CoV and that these infections cause 5% to 10% of intense respiratory infections [3].

The clinical signs of the COVID-19 may shift, contingent upon seriousness, going from non-pneumonia and gentle pneumonia in mild cases, breathing difficulty, respiratory recurrence $\geq 30/\text{min}$, blood oxygen immersion (SpO_2) $\leq 93\%$, $\text{PaO}_2/\text{FiO}_2$ proportion or P/F [the proportion between the pulse of the oxygen (incomplete weight of oxygen, PaO_2) and the level of oxygen provided (part of motivated oxygen, FiO_2)] < 300 , as well as lung penetrates $>$ half inside 24 to 48 hours, in extreme cases, and respiratory disappointment, septic stun, or potentially various organ brokenness (MOD) or disappointment (MOF), in critical cases [4].

Who Timeline-COVID-19 [5]

- **31st Dec 2019:** Novel coronavirus was recognized in Wuhan, Hubei Province.
- **1st January 2020:** IMST (Incident Management Support Team) was established in WHO to deal with the pandemic.
- **4th January 2020:** WHO reported on social media about the COVID-19 cases– in Wuhan, Hubei territory.
- **5th January 2020:** "First Disease Outbreak News" on the SARS-CoV-2 virus was published by WHO.

- **10th January 2020:** A comprehensive package of technical guidance was issued online by WHO. It contained advisory for all nations for detection, testing and management of potential cases.
- **12th January 2020:** The genetic sequence of SARS-CoV-2 virus was revealed by China.
- **13th January 2020:** Authorities affirm an instance of COVID-19 in Thailand.
- **14th January 2020:** Dr. Maria Van Kerkhove confirmed about the human-to-human transmission of the corona virus and warned about a major outbreak in future.
- **20th-21st January 2020:** WHO specialists from its China and Western Pacific regional offices led a concise field visit to Wuhan.
- **22nd January 2020:** WHO confirmed about having an evidence for the human-to-human transmission of the virus in Wuhan, and further research needed to be carried.

No particular treatment has been devised yet for COVID-19, except supportive care [6] Presently, minimizing the risk of infection and transmission is the only method to control the disease, followed by early diagnosis, isolation, supportive and therapeutic measures for the patients.

The use of antibacterials have been found to be unsuccessful. For the treatment of SARS and MERS, there are no successful antivirals [7] The most vulnerable persons are the healthcare workers, due to close proximity with the infected patients.⁸ Transmission may occur by direct or indirect contact (Figure 1). Lai J *et al.* conducted a survey of health care workers, engaged in serving the COVID-19 individuals with in some regions in China. The healthcare workforce suffered from psychological burden, especially nurses and women, during the diagnosis and treatment of patients, infected with COVID-19 [9]

The healthcare takers are needed to follow extra precautionary measures for their own security, and for preventing further human-to-human transmission. Proper selection and use of PPE (Personal Protective Equipments), followed by proper training for putting on, removal and disposal of PPE are very essential. As per the guidelines of WHO, PPE is the only one efficacious measure within a package of environmental and engineering controls [10]. Standard precautionary measures are critical.

Standard Precautions (Figure 2)

"A set of practices that are applied to the care of patients, regardless of the state of infection (suspicion or confirmation), in any place where health services are provided." Standard Precautions are an extension of Universal Precautions. Universal Precautions were first recommended in 1987 to prevent the transmission of blood borne pathogenic agents to healthcare personnel. In 1996, the application of the concept was expanded and renamed "Standard Precautions." Standard Precautions aim to prevent the transmission of common pathogenic agents to healthcare workers, patients and visitors in any healthcare setting. While treatment and care for any patient, one should assume that an infectious pathogenic agent could be present in the patient's body fluids, including all secretions except tears and sweat.

At the community level, Standard precautions include [6, 10]

- Proper hand hygiene should be maintained by the frequent use of alcohol-based hand sanitizer when the hands are not dirty, and water and soap when the hands are dirty.

- Frequent touching of nose, eyes and mouth should be avoided.
- The practice of maintaining respiratory hygiene (or cough etiquette) should be incorporated, by sneezing or coughing inside a bent elbow or tissue and then disposing off the tissue.
- A face mask should be worn, if there is presence of any respiratory symptoms. Proper hand hygiene should be performed after disposal of the used mask.
- A minimum of 1 metre of social distance should be maintained from people having respiratory symptoms.
- Personal protective equipment (PPE) should be used.
- Safe injection practices should be followed.
- Medical devices should be sterilized / disinfected.
- Proper Environmental hygiene should be maintained.

PPE (Personal Protective Equipment)

The Occupational Safety and Health Administration (OSHA) defines Personal protective equipment (PPE) as "specialized clothing or equipment, worn by an employee for protection against infectious materials." As directed by OSHA's General Duty Clause, PPE should be used in any potential infectious disease exposure. Employees should be provided with proper PPE. Proper disposal of PPE, or if reusable, proper cleaning, repair and storage of PPE should be considered of great importance [11]

Selection of PPE [12]

The selection of PPE involves three considerations:

- Type of expected exposure, such as splashes, sprays, touch or splashes of blood or other body fluids that might infiltrate the clothing determine the selection of PPE.
- Appropriateness and durability the PPE also affects the selection of PPE, for example, a gown or apron needs to be fluid resistant, fluid proof, or neither, depending on the procedures.
- Proper Fit of PPE is essential. Availability of PPE in sizes appropriate for the workforce is of utmost importance.

PPE should be used judiciously to prevent the shortage. The use of a particular type of PPE varies, depending on the health care setting and type of work force and movement (Table 1). Following recommendations should be observed so as to guarantee rational usage of PPE [10]

- Health care workers who are in direct or indirect contact with the COVID-19 infected patients, should use the following PPE: Gloves, Face Mask, Gowns and Eye Protection (Face Shield).
- Respirators, eye Protection, gloves and fluid resistant gowns are very essential for healthcare involved in aerosol involving procedures.¹³ Aprons are sometimes used as PPE over scrubs, such as in dialysis centers when inserting a needle into a fistula.
- Respirators (e.g. N95 or FFP2 etc.) may be used for managing medical emergencies involving acute respiratory distress when PPE are in limited supply.¹⁴ One respirator can be used for multiple patients, but should not be used for more than 4 hours.¹⁵⁻¹⁷
- Medical Masks should be used by individuals, who are suffering from respiratory symptoms, as well as those who are taking care of COVID-19 patients at home. Using any kind of mask is not recommended for individuals without any symptoms. It may help in cost cutting [18, 19]

- Gloves should always be used when touching contaminated things, blood, body fluids, secretions, excretions, for touching mucous membranes and non-intact skin.
- Face shield should be used during procedures involving splashes of blood, body fluids, secretions or excretions.

Gloves [7, 10]

Gloves may be used for examination as well as for surgical procedures. Examination gloves are non-sterile, nitrile, powder-free and for single-use. Surgical gloves are sterile, nitrile, powder-free, and for single-use. They are available in varied sizes, small, medium, large. Gloves should have long cuffs, reaching well to mid-forearm.

The gloves must be in compliance with the following consensus standards:

- EU MDD Directive 93/42/EEC Category III
- ANSI/ISEA 105,
- ASTM D6319, or equivalent
- EU PPE Regulation 2016/425 Category III
- EN 455
- EN 374

Protection against infectious materials is ensured by gloves. Gloves once contaminated, are a source for infection to yourself, patients or environmental surfaces. Thus, in your healthcare setting the risk of disease transmission can be influenced largely by gloves and the way YOU use them.

Important instructions for the use of glove are:

- Not to touch any dirty or areas with heavy contamination prior touching clean and sterile body sites.
- Protect yourself, patients and surfaces and curb ways from getting contaminated by touch.
- Avoid touching them with contaminated gloves with environmental surfaces.
- Touching Surfaces such as door, light switches and cabinet knobs with soiled gloves may lead to contamination of these surfaces.

As per the need, the gloves should be changed. Gloves should be changed immediately before getting started with some other procedure if in case gloves get torn or soiled and added patient care tasks must be performed. Discard gloves in the appropriate receptacle and always change them for every new patient. Never wash patient care gloves to be used again. Washing gloves does not ensure its safety; it is not possible to eliminate all microorganisms and in addition to this washing may render gloves more prone to tearing or leaking.

Gowns [7, 10]

Gowns are the most opted PPE for clothing but aprons occasionally are used where less contamination is expected. Gown should be selected in case of anticipation of arms contamination. The torso should be fully covered by the gown, must properly fit on the body, and must have long snugly fitted sleeves at the wrist. Second are the material used for making the gown. Material used for making of isolation gowns can be cotton or a spun synthetic material. Then the degree of fluid resistance may matter and in fact vary in gowns made with cotton and spun synthetic material. If fluid penetration is expected, a fluid resistant gown must be used, this is another factor that must be taken into account before selection of this garb.

The gowns must be in compliance with the following consensus standards:

- EU PPE Regulation 2016/425 and EU MDD Directive 93/42/EEC
- EN 13795 any performance level, or
- AAMI PB70 all levels acceptable, or equivalent
- FDA Class I or II medical device, or equivalent

Generally, for isolation, clean gowns are used. To perform surgical procedures, sterile gowns are necessary. In cases like these, a sterile gown provides protection to patients and health care workers.

Face Protection [7, 10]

A combination of types of PPE are available for the protection of the face and other parts with potentially infectious materials. Masks must completely cover the mouth and nose in order to avert penetration of fluids. Masks should snugly fit over the mouth and nose. For this reason, masks that have a flexible nose piece, can be secured to the head with string elastic are preferred, barrier for the eyes is provided by the goggles; personal prescription lenses should not be used as a substitute for goggles as they do not provide optimal eye protection.

The employer must make sure that each affected employee uses eye protection with detachable side protectors (e.g. clip-on or slide-on side shields) meeting the stated recommendations of this section are acceptable. (OSHA)

Eyes or personal prescription lenses should be protected by snugly fit goggles over the eyes. In case of unclear vision, clarity of vision can be maintained by antifog goggles.

Eye and face protection devices must be in accordance with the following consensus standards:

- ANSI/ISEA Z87.1-2010, Occupational and Educational Personal Eye and Face Protection Devices, incorporated by reference in § 1910.6;
- ANSI Z87.1-2003, Occupational and Educational Personal Eye and Face Protection Devices, incorporated by reference in § 1910.6; or
- •ANSI Z87.1-1989 (R-1998), Practice for Occupational and Educational Eye and Face Protection, incorporated by reference in § 1910.6;

A face shield should be used as a substitute to wearing a mask or goggles in cases where skin, nose, eye, mouth protection is required or while irrigating a site or suctioning profuse secretions. The face shield should extend above the forehead, below the chin and cover the side of the face.

Healthcare workers are also protected from infectious aerosols, such as Mycobacterium tuberculosis by use PPE. Respirators that filter the air prior its inhalation are recommended for respiratory protection.

N95, N100 or N99 particulate respirators are most commonly used in healthcare. Particles having diameter less than 5 microns are excluded by a device having submicron filter. The CDC's National Institute for Occupational Safety and Health approves the respirators.

Depending upon the risk involved and nature of the exposure, the selection of the respirator should be done just like other PPE. For instance N95 particulate respirators is worn by a healthcare professional attending a patient with infectious disease. However, a powered air-purifying respirator or PAPR are worn by the healthcare professionals whenever they perform any bronchoscopy or any major surgery.

How To Safely Don, Use, and Remove PPE

There are four important points to remember about PPE use. It is worn before coming in contact with the patient. Once you have PPE on, use it very carefully in order to prevent spreading infection. After completion of your procedure, remove the PPE and dispose it off in the waste Receptacles. Then before going to your next patient immediately perform hand hygiene to keep yourself protected and away from infection.

Sequence for Donning PPE (Figure 3)

The gown is donned first, mask or respirator is put on next; always check the proper fit of the respirator. The goggles or faceshield should be donned next and the gloves are donned last. Keep in mind, the combination of PPE used, and therefore the sequence for donning, will be determined by the precautions that need to be taken.

How to Don A Gown?

First select the suitable type for the procedure and the appropriate size for yourself, before you don a gown. The opening of the gown must be at the back, properly secure the gown at the waist and neck. Two gowns are used if in case one gown does not cover the torso completely. First put on the first gown with the opening in front and then second gown with the opening in the back so that you can be fully covered from front and back both.

Mask [7, 10]

Some masks have elastics and others are fastened with ties. The masks with ties are placed over your nose, mouth and chin. Fit the flexible nose piece to the form of your nose bridge; the lower set is tied at the base of your neck and the upper set is tied at the back of your head. If a mask has elastic head bands, separate the two bands, hold the mask in one hand and the bands in the other. Place and hold the mask over your nose, mouth and chin, then stretch the bands over your head and secure them comfortably on the upper back of your head, the other below the ears at the base of the neck. Remember, it is not recommended to touch it during use, so take some time to ensure that it is secured on your head and fits snugly around your face without gaps.

Respirator [7, 10]

A particulate respirator, like an N95, N99 or N100, should be worn the way pre formed mask with elastic headbands are donned. However, there are some key differences. The respirator needs to be first selected by performing fittest. as per you have been instructed, check the device fit before entering aninfectious area. For donning the device manufacturer's instructions should be followed. In some instances, manufacturer's instructions may vary.

If there is need of eye protection, either a face shield or goggles should be worn. Position either device over the face or eyes and fasten it to head using the attached head band. It should adjusted to fit comfortably. Goggles should fit snugly and should not feel tight.

The pair of gloves is the last item to be worn. Be sure to select the appropriate type of gloves required that best fits you. Hand is inserted into the selected glove and is adjusted as required for comfort. If you are wearing an isolation gown, tuck the cuffs of the gown securely under each glove. This provides a uninterrupted barrier protection for your skin. Safe work practices should also be followed in addition to wearing PPE. Avoid contaminating yourself by not touching or

adjusting PPE and not touching face or any other contaminated surface. Also, remove the gloves if they get torn and repeat hand hygiene before putting on a new pair of gloves. You should also avoid spreading infection by limiting touching surfaces and items with contaminated gloves.

Contaminated and Clean Areas of PPE

In order to remove PPE safely, you must first spot which sites are considered "clean" and which ones are "contaminated." In general, irrespective, of visible soil, the outside front and sleeves of the isolation gown and of the respirator, face shield, goggles, gloves and mask are considered "contaminated". The areas that are considered "clean" are the parts that have to be touched when removing PPE. These areas are- inside the face shield, goggles, gloves and mask including ties and elastics.

The Sequence for Removing PPE

Self-contamination can be eliminated if sequence for removing PPE is followed religiously.

The gloves being the most contaminated parts of PPE are removed first. Next, the face shield or goggles being known as the most cumbersome and it also interferes with removal of other components of PPE. Then the gown followed by the mask or respirator.

The Location for Removing PPE

The factors which decide the location of removal of PPE are the amount and type of PPE, the healthcare worker is wearing and the degree of isolation a patient is in. It is safe to discard gloves in the patient room if only gloves are used. PPE must be removed at the doorway when a full gown or full PPE is worn. Always remove and discard mask or respirators outside the patient's room and after the door closes. Performing Hand hygiene is a mandatory after all the components of PPE are removed.

How to Remove Gloves

The outside of the opposite glove near the wrist is grasped using one gloved hand. The glove is pulled and peeled away from the hands. Remember to turn the glove inside out, with the contaminated side on the inner side. The removed glove should always be held in the other gloved hand. Slide atleast two fingers of the ungloved hand beneath the wrist of the remaining glove. The glove should be peeled off from the inner side, so as to create a bag for both gloves. Glove is to be discarded in the waste container.

How to Remove Goggles or Face Shield

With ungloved hands, hold "clean" ear pieces and lift away from face. Place the goggle or face shield in a designated receptacle for subsequent reprocessing if these are reusable. If not, discard them in the waste container.

How to Remove Isolation Gown

After removing the gloves from the hands, unfasten the gown ties. The gown should be peeled away from the shoulders, by sliding the hands under the gown at the neck and shoulder. The fingers of one hand may be slipped under the cuff of the other arm and the gown may be grasped from inside. The sleeve may be pushed off the other arm. Fold the gown towards the inner side and then fold or roll it into a bundle. (Just the "clean" part of the gown is visible.) It may be discarded into waste container.

Removing A Mask

The mask shouldn't be touched from the front as that area of the mask is considered infected. The mask should be removed by handling only the elastic bands starting with first the bottom and then top tie or band. The mask should be lifted away from the face and discarded it into the waste receptacle.

How to Remove A Respirator

First, the lower elastic should be removed over the head, followed by the upper elastic.

The respirator must be removed slowly to avert it from "snapping" off the face.

Hand Hygiene (Figure 2)

Hand hygiene is the foundation of preventing infection transmission. Hand hygiene must

be performed right after removing whole PPE. If hands are apparently contaminated during PPE removal, they should be washed before removal of complete PPE. The hands should be washed properly with soap and water or if hands are not visibly contaminated, alcohol-based hand rub sanitizer should be used.

Techniques to Relieve Psychologically Traumatized Healthcare Workers

Various breathing activities like Sudarshan Kriya and Yoga

(SKY), chanting may be very helpful for easing mental stress of the healthcare workers associated with the consideration of COVID-19 patients. Sudarshan Kriya Yoga (SKY) is a type of recurrent controlled breathing practice that has been proven to alleviate sadness, and it is instructed by the Art of Living Foundation.²¹ Sudarshan Kriya is a Sanskrit term, which means "proper vision by purifying action." It is an advanced form of cyclical breathing with slow, medium and fast cycles [22]. During various anti-anxiety programs in several populations, SKY has successfully demonstrated significantly reduced anxiety scores, indicating stabilization of disturbed mental activity, enhanced brain function and resiliency to stress [23-25]

A study was conducted to determine the neurophysiological reactions. During, and after SKY, using an EEG (recorded at 19 cortical destinations), electrocardiography (EKG), pulse inconstancy, hand skin temperature, beat plethysmography, galvanic skin reaction and circulatory strain tests were estimated. The authors found out that SKY practice produced statistically significant changes in all physiological measures and the practitioner's health became more resilient, flexible and able to deal with the challenges of stress. This suggests that regular practice of SKY may be a significant wellness practice [26] So, it could be very useful for healthcare workers.

Table 1: Recommended personal PPE during the outbreak of COVID-19 outbreak

Outpatient facilities			
Consultation room	Health care workers	Physical examination of patient with respiratory symptoms	Medical mask Gown Gloves Eye protection
	Health care workers	Physical examination of patients without respiratory symptoms	PPE according to standard precautions and risk assessment.
	Patients with respiratory symptoms	Any	Provide medical mask if tolerated.
	Patients without respiratory symptoms	Any	No PPE required
	Cleaners	After and between consultations with patients with respiratory symptoms.	Medical mask Gown Heavy duty gloves Eye protection (if risk of splash from organic material or chemicals). Boots or closed work shoes
Waiting room	Patients with respiratory symptoms	Any	Provide medical mask if tolerated. Immediately move the patient to an isolation room or separate area away from others; if this is not feasible, ensure spatial distance of at least 1 metre from other patients.
	Patients without respiratory symptoms	Any	No PPE required
Administrative areas	All staff, including health care workers	Administrative tasks	No PPE required
Triage	Health care workers	Preliminary screening not involving direct contact-	Maintain spatial distance of at least 1 metre. No PPE required
	Patients with respiratory symptoms	Any	Maintain spatial distance of at least 1 metre. Provide medical mask if tolerated.
	Patients without respiratory symptoms	Any	No PPE required

Community			
Home	Patients with respiratory symptoms	Any	Maintain spatial distance of at least 1 metre. Provide medical mask if tolerated, except when sleeping.
	Caregiver	Entering the patient's room, but not providing direct care or assistance	Medical mask
	Caregiver	Providing direct care or when handling stool, urine, or waste from COVID-19 patient being cared for at home	Gloves Medical mask Apron (if risk of splash)
	Health care workers	Providing direct care or assistance to a COVID-19 patient at home	Medical mask Gown Gloves Eye protection
Public areas (e.g. schools, shopping malls, train stations).	Individuals without respiratory symptoms	Any	No PPE required

Points of entry			
Administrative areas	All staff	Any	No PPE required
Screening area	Staff	First screening (temperature measurement) not involving direct contact	Maintain spatial distance of at least 1 metre. No PPE required
	Staff	Second screening (i.e. interviewing passengers with fever for clinical symptoms suggestive of COVID-19 disease and travel history)	Medical mask Gloves
	Cleaners	Cleaning the area where passengers with fever are being screened	Medical mask Gown Heavy duty gloves Eye protection (if risk of splash from organic material or chemicals). Boots or closed work shoes
Temporary isolation area	Staff	Entering the isolation area, but not providing direct assistance	Maintain spatial distance of at least 1 metre. Medical mask Gloves
	Staff, health care workers	Assisting passenger being transported to a health care facility	Medical mask Gown Gloves Eye protection
	Cleaners	Cleaning isolation area	Medical mask Gown Heavy duty gloves Eye protection (if risk of splash from organic material or chemicals). Boots or closed work shoes

Ambulance or transfer vehicle	Health care workers	Transporting suspected COVID-19 patients to the referral health care facility	Medical mask Gowns Gloves Eye protection
	Driver	Involved only in driving the patient with suspected COVID-19 disease and the driver's compartment is separated from the COVID-19 patient	Maintain spatial distance of at least 1 metre. No PPE required
		Assisting with loading or unloading patient with suspected COVID-19	Medical mask Gowns Gloves Eye protection
		No direct contact with patient with suspected COVID-19, but no separation between driver's and patient's compartments	Medical mask
	Patient with suspected COVID-19	Transport to the referral health care facility.	Medical mask if tolerated
	Cleaners	Cleaning after and between transport of patients with suspected COVID-19 to the referral health care facility.	Medical mask Gown Heavy duty gloves Eye protection (if risk of splash from organic material or chemicals). Boots or closed work shoes

Special considerations for rapid-response teams assisting with public health investigations ^d			
Community			
Anywhere	Rapid-response team investigators	Interview suspected or confirmed COVID-19 patients or their contacts.	No PPE if done remotely (e.g. by telephone or video conference). Remote interview is the preferred method.
		In-person interview of suspected or confirmed COVID-19 patients without direct contact	Medical mask Maintain spatial distance of at least 1 metre. The interview should be conducted outside the house or outdoors, and confirmed or suspected COVID-19 patients should wear a medical mask if tolerated.
		In-person interview with asymptomatic contacts of COVID-19 patients	Maintain spatial distance of at least 1 metre. No PPE required The interview should be performed outside the house or outdoors. If it is necessary to enter the household environment, use a thermal imaging camera to confirm that the individual does not have a fever, maintain spatial distance of at least 1 metre and do not touch anything in the household environment.

Source: World Health Organisation. Rational use of personal protective equipment (PPE) for coronavirus disease (COVID-19) Interim guidance. 19 March 2020

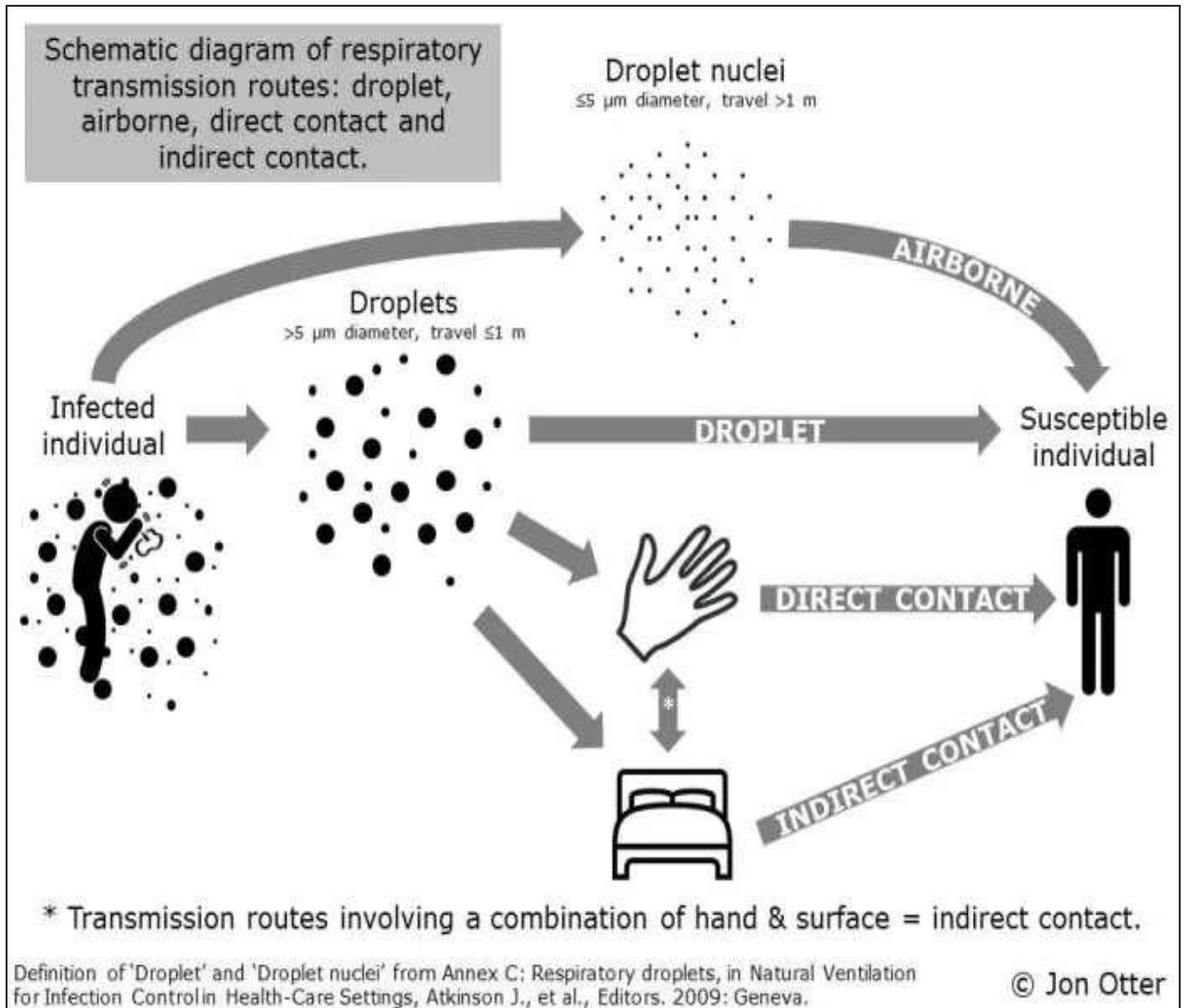
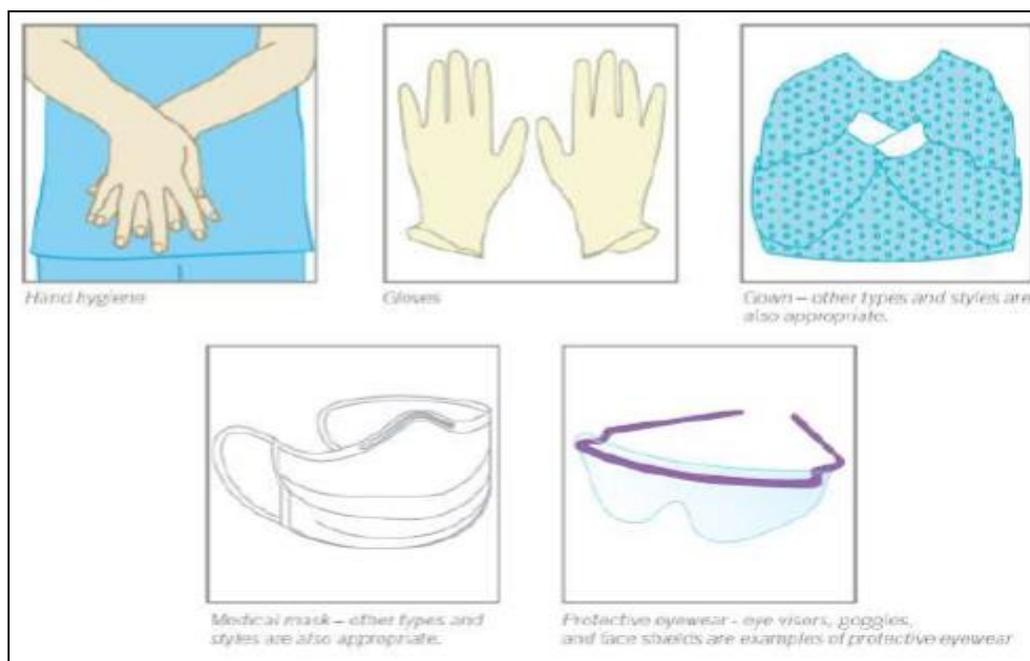
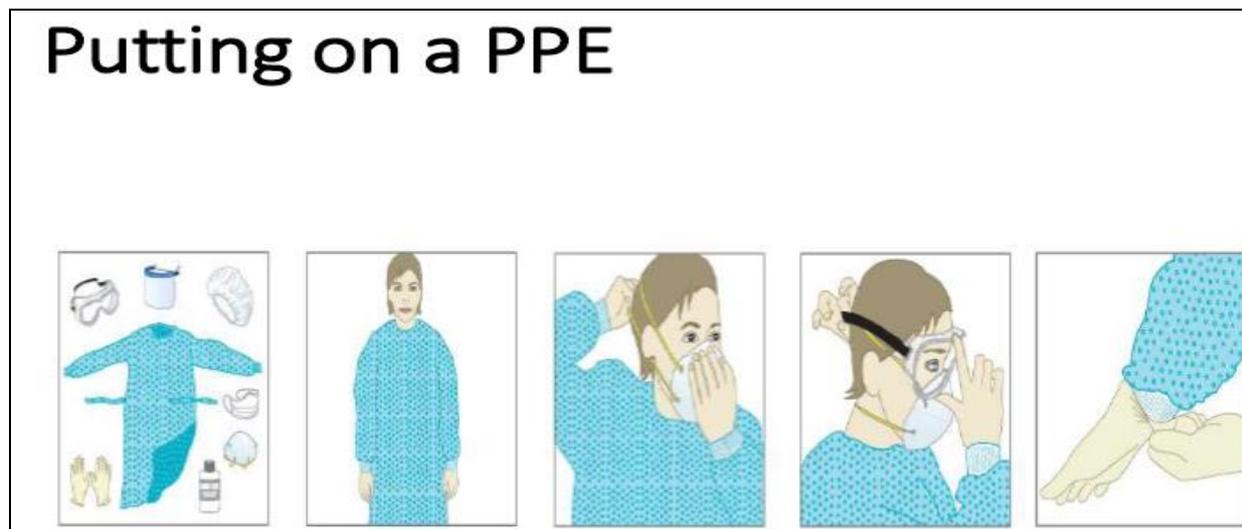


Fig 1: Transmission routes



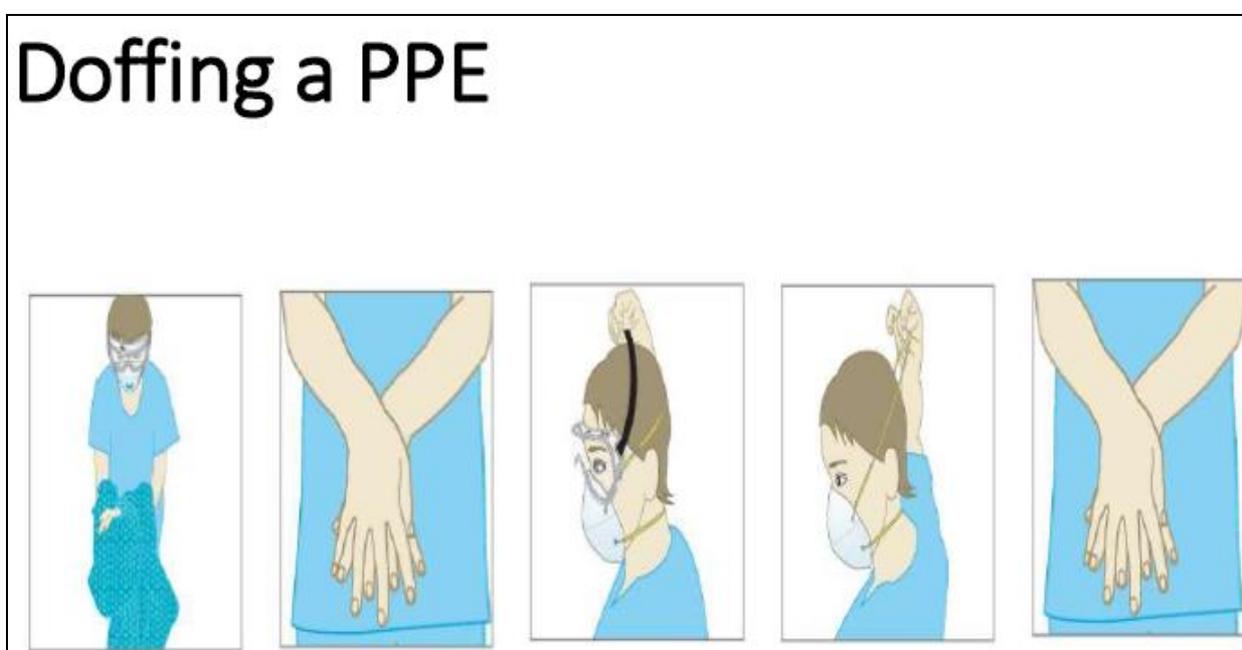
Source: PAHO

Fig 2: Standard Precautions



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

Fig 3: Putting on a PPE



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

Fig 4: Doffing a PPE

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