Face Masks—Rationale in Prevention of Respiratory Viral Epidemic (COVID-19)

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ABSTRACT

Almost every country in the world is struggling with the recent crisis of coronavirus disease (COVID-19). Droplets and contact are considered as main transmission routes in human-to-human transfer of coronavirus infection. Physical distancing and meticulous hand hygiene are key measures recommended to prevent the infection. Lately, wearing of face mask by general public is also added in the measures to curb the spread of COVID-19. However, different types of masks have created confusion among general public to choose proper face mask. Moreover, shortage of surgical masks and respirators (N95/equivalent or higher version) due to sudden rise in demand has driven health authorities to bring about alternate policies to compensate insufficient supply. This article reviews availability of various types of masks, their usage, and role in prevention of respiratory viral infection, especially coronavirus. In addition, recommended guidelines of extended use and reuse of mask during short supply, especially in recent pandemic, have also been reviewed.

Keywords: COVID-19, Fabric mask, Face mask, N95, Respirator, Surgical mask.

International Journal of Experimental Dental Science (2020): 10.5005/jp-journals-10029-1208

INTRODUCTION

Respiratory diseases caused by viruses are leading cause of morbidity and mortality across the world. Since the spread rate of these infections is so fast, it usually causes outbreak. Transmission of these viruses usually occurs by three different routes, namely droplets, aerosols, and contact (direct and indirect).

Droplets are tiny drops of liquid (saliva, mucus, etc.) measuring 5–10 micron, which contains particles of microbes like virus. They stay in air for short time and disperse less than 1 m.

Aerosol can be defined as floating solid particles or droplets in the air, which are usually smaller than 5 microns. Droplets usually settle down at the surface under gravity; however, aerosol stays in the air for longer duration of time due to its smaller size and dispersed over long distances (>1 m).¹

Contact:

1. Direct contact (person-to-person contact): When a healthy individual comes in direct contact of infected body fluid.
2. Indirect contact: Infected droplets settle down under the gravity and evaporate leaving particles (microbes) at the surface, doorknob, clothes etc., and when any healthy individual touches that contaminated surface, then touches his face (nose, mouth and eyes area) without cleaning his hands may get the infection.¹

Coughing, sneezing, talking, and even regular breathing create large amount of droplets and aerosols. When it comes from an infected individual, it may infect healthy person who inhales it or comes in contact with the contaminated surface. Respiratory etiquettes include covering of the mouth and nose with a tissue, handkerchief, or even bent elbow or hand when sneezing or coughing, which aims at limiting the spread of infection. Similarly, it is established scientifically that covering mouth and nose by a face mask prevents the spread of respiratory droplets produced by coughing and sneezing by an infected individual. Many studies in the past have showed that use of a face mask as source control decreases the release of respiratory droplets that carry respiratory viruses.²

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How to cite this article: Ahmad F, Hasan SM, Rai S. Face Masks—Rationale in Prevention of Respiratory Viral Epidemic (COVID-19). *Int J Experiment Dent Sci* 2020;9(1):16–24.

Source of support: Nil

Conflict of interest: None

Since many of viral outbreaks spread by droplets, aerosols, and contact, it can be controlled by wearing face mask, maintaining hand hygiene, and following physical distancing. Although coronavirus disease (COVID-19) is newly emerged in human, these measures are perfectly valid to prevent the spread. While existing data of COVID-19 show that it transmits mainly by droplets and contact, some reports demonstrate aerosol spread as well. It requires further studies to establish the exact routes of transmission of coronavirus among human. Formerly, many studies were performed on influenza (flu) virus, an RNA virus of Orthomyxoviridae family, which spread by droplets and contacts. Coronavirus is also an RNA virus of Coronaviridae family that shows similarity to flu virus. Hence, many methods that are recommended to prevent influenza virus are advised to control coronavirus spread until further epidemiological studies are available for COVID-19.^{3,4}

Masking nose and mouth of the symptomatic person has been proved to be an effective way to prevent the spread of respiratory infection (source control). However, in recent pandemic many asymptomatic patients who are unknowingly infected with coronavirus have been reported to be infective for at least 2 days before any symptoms arises. These nonsymptomatic carriers are

growing concern in controlling of COVID-19 pandemic. Therefore, the World Health Organization (WHO) recommends wearing mask for asymptomatic individuals. Also, studies have shown that practising of wearing face mask by mass population has controlled disease in many countries, for example, East Asian countries. Observing the result of face mask practice, many countries have recommended their people to wear face mask in public places. In addition, mask wearing by healthy individuals amidst recent pandemic acts like an added layer that not only protect them from infected droplets but also remind them not to touch their faces by hands.^{5,6}

Considering the importance of face mask during this crisis, many countries are facing two issues. First, demand of face mask has increased abruptly; however, supply is limited.⁷ Second, different types and shapes of mask have created confusion among general public and even some healthcare personnel. This article discusses different types of masks and their uses for general public and healthcare workers (HCWs).

TYPES OF MASKS

There are different types of face mask, which can be divided on the basis of their material and filtering capacity.

Fabric Mask/Cloth Mask/Nonmedical Mask (Fig. 1A)

- It is made up of cotton or other common textile.
- Easily available, low cost, reusable.
- Single/double/multiple layers, with or without removable filter, limited filtering capacity.
- Fit on face: Loose, leakage of air around the edges.
- Filtering capacity: Filter only large droplets (mainly source control).
- No standardization required.

Recommendations

- In public places like grocery store, public transport, other public setups, etc.^{8–10}
- Usually for healthy/asymptomatic individuals. It can be used by symptomatic person, only if no availability of surgical mask.⁸
- Wash daily with detergent and hot water (60°C).

- Don't use if wet, physically damaged, soiled, or contains visible body secretions.¹⁰

Limitations

- Not resistant to fluid.
- Cannot protect from small droplets and aerosols.
- Not tested medically.

Surgical Mask/Medical Mask (Fig. 1B)

- Three layers or Three Ply
- First/outer layer: nonwoven fabric
- Mid layer: Filter (melt-blown polymer usually—polypropylene)⁸
- Inner layer: woven and smooth
- Loose, leakage of air around the edges
- Fluid resistant
- Effective barrier for capturing large droplets of saliva or respiratory secretions released from the mouth and nose of wearer (source control)^{11,12}
- Protect wearer from large droplets, splashes, spray, or other body fluid and secretions (prevention)

Recommendations

- In public places, grocery store, shopping malls, public transport, hospitals etc.⁸
- For healthcare personnel performing nonaerosol-generating procedures⁹
- Disposable: Discard after use/wet/visible blood or secretion/physically damage

Limitations

Cannot protect from aerosols/airborne particles.

Standardization of Surgical Mask

Different countries have various agencies to approve the surgical grade mask. Manufacturers have to meet the ASTM F2100 standard in the United States and the EN14683 standard in Europe before marketing masks for medical uses. They can be tested on the basis of bacterial filtration efficiency (BFE) at 3.0 µm, particle filtration

Figs 1A and B: Fabric/cloth mask and surgical mask (three-ply)

efficiency (0.1 μm PFE), fluid resistance, breathability, and flame spread.

There are three ASTM level masks: ASTM level 1, ASTM level 2, and ASTM level 3.

- ASTM level 2 and level 3 can filter $\geq 98\%$ bacteria and 0.1 μm particulates, while level 1 mask can filter $\geq 95\%$ (in exhaled air).
- Level 3 mask has better fluid resistance.

EN14683 standard masks can be divided into four categories: type I, type IR, type II, and type IIR.

- Type I and type II can filter $\geq 95\%$ and $\geq 98\%$ bacteria, respectively; however, they are not resistant to fluid.
- Type IR and type IIR have same BFE as type I and type II, respectively, but, they are resistant to fluid.

Respirators

Respirators protect user from inhaling aerosols (airborne microbes and particulate), toxic gases, fumes, and vapors.¹³

They can be further classified as air-purifying and air-supplied respirators.

Air-purifying Respirators

They remove aerosols (airborne droplets and solid particles), vapor gases, or a mixture of contaminants from the air through the use of filters or cartridges. They purify/filter the air of working area and do not supply oxygen from external source.

There are four different types of air-purifying respirators.

Filtering Facepiece Respirators (FFRs)

They remove particles from the inhaled air by filtering; nevertheless, they don't protect from hazardous gases.

The FFR classes include **N** (not resistant to oil), **R** (somewhat resistant to oil), and **P** (strongly resistant to oil) series, which are available at 95, 99, and 100 filtration efficiency levels.

N95 is the most widely used respirator by HCWs in this group (Fig. 2).¹⁴

- It provides a tight fitting against the wearer's face, covering the nose and mouth.
- Minimal leakage when donned properly.
- Filter is made up of melt-blown nonwoven polypropylene.
- It may have an exhalation valve located on the filter, which reduces breathing resistance during exhalation. Also, valve controls CO_2 and heat build-up in the mask (Fig. 2).
- Filter capacity: filters 95% of particles in the inhaled airstream, protect from aerosols (airborne droplets and solid particles).

Recommendations

- Use during treatment/care of respiratory virus-infected patients (e.g., coronavirus positive) in isolation, hospital wards, ICU setups, etc., with other personal protective equipment (PPE).
- Use during aerosol-generating procedures (AGPs) (endotracheal intubation, ultrasonic scaling etc.).¹⁵
- It can be used in crowded/confined public places if other options are not available; however, this is not recommended by studies, and it is not encouraged as well due to less availability. N95 must be prioritized and conserved for HCWs, especially during pandemic when resources are stretched.¹⁶

Fig 2A to D: Various types of N95 masks

- Ideally, it should be discarded after each patient encounter and after AGPs. It should not be used when it is physically damaged, wet, or shows any visible blood or body fluid. Also, when it is unable to create a tight seal or shows any breathing difficulty, it should be discarded.

Limitations

- It cannot protect against harmful gases and vapors.
- Limited supply.

N99 and N100 have filtering capacity of 99 and 99.97% of airborne particles, respectively. This is the American Standard of measuring filtering capacity of respirators that is managed by NIOSH.

Europe has two different standards. The "filtering facepiece" (FFP) score that comes from EN standard 149:2001. Other is the EN 143 standard that denotes P1/P2/P3 ratings. The CEN (European Committee for Standardization) manages both the standards.

FFP1, FFP2, and FFP3 have particles filtering capacities of 80%, 94%, and 99%, respectively. In this manner, N95 and FFP2 are comparable in filtering capacity. Similarly, KN95, a Chinese respirator, is equivalent to N95 (Fig. 2).

Similarly, other countries such as Australia, China, Japan, South Korea, etc., have developed their own standardization systems and produce respirators with different names and capacities. To understand the efficacy of any respirators, one should study the manufacturer's guidelines. Detailed description of all these FFRs is beyond the scope of this article.

Dust Mask

It is a comfort half face mask that covers nose, mouth, and chin with single or double straps and usually made up of paper-like material.

Figs 3A and B: Elastomeric half facepiece respirator with cartridges

Figs 4A and B: Elastomeric full facepiece respirator and HCW wearing it with other PPE

Although it looks similar to FFRs, it is neither respirator nor protect from toxic air. Unlike FFR, it does not require any approval from agencies of standardization. It can be worn during construction or household activities like mowing, gardening, sweeping, dusting, etc. European FFP1 can also be used as dust mask.¹⁷

Recommendation: It can be used by general public in the public setups during this pandemic when other types of mask are not available; however, it must not be confused with N95 or other respirators.

Elastomeric Half Facepiece Respirators

These devices are reusable with exchangeable cartridges or filters. The facepiece is made up of rubber or silicone that forms a tight seal against the user's face. They protect against gases, vapors, and/or particles if equipped with the appropriate filters and/or cartridges. Cartridges should be changed according to use and manufacturer's guidelines (Fig. 3).¹⁴

Elastomeric Full Facepiece Respirators

These full facepieces cover roughly from the hairline to below the chin. These types of respirators tend to provide a more reliable face seal than FFRs or elastomeric half facepiece respirators (Fig. 4).¹⁴

A Powered Air-purifying respirator

B Air supplied respirator with cylinder

Figs 5A and B: Power-driven air-purifying respirator and air-supplied respirator

Powered Air-purifying Respirators

Powered air-purifying respirators (PAPRs) are battery-powered devices that use a blower to pull air through attached filters (for particles) or cartridges (for gases or vapors) to clean it before delivering it to the breathing zone of the wearer (Fig. 5A).¹⁴

Air-supplied Respirators

They provide clean breathing air from a source independent of the work area and protect users from many types of airborne contaminants (particles, gases, and vapors) and, in certain cases, oxygen-deficient atmospheres (Fig. 5B).¹⁴

There are three types of atmosphere-supplying respirators:

- Supplied-air respirators (SARs)
- Self-contained breathing apparatus (SCBAs)
- Combination of SARs and SCBAs.

MASK FOR GENERAL PUBLIC DURING THE PANDEMIC OF COVID-19

It is reported that practising of mask wearing by general population at confined or crowded public places helped to control previous

respiratory epidemic in many countries. Likewise, existing data of COVID-19 from countries that were affected by virus in early stage of pandemic show that wearing mask by general public at public setups is an effective tool to prevent the spread of COVID-19. Following these studies, the WHO as well as the disease control center of many countries recommend wearing of face mask at public places, even at home if living in crowded places where maintenance of physical distancing is not possible. Nevertheless, practising of mask wearing is a part of a comprehensive strategy that includes physical distancing and frequent hand hygiene, and alone, face mask cannot protect the individual getting infected.¹⁸

WHO SHOULD WEAR FACE MASK?

Main rationale of mask wearing is to prevent the spread of droplets from the wearers. In addition, healthy people who wear mask may protect themselves from the infected droplets to some extent.

While it is a common belief that only symptomatic individuals may spread infection, many asymptomatic patients who are unknowingly infected with virus may infect others. Hence, asymptomatic and even healthy individuals should use face mask at public setups, especially places where physical distancing of 1 meter is difficult to maintain.¹⁹

All people should wear face mask except:

- Young children who are less than 2 years
- Patients who are suffering from breathing difficulty such as COPD, active asthma patients, etc.
- Any individual who is unconscious, developmental disabilities, or physically/mentally so disabled that he cannot remove mask by himself

It is recommended to wear cloth mask/fabric mask by general population if they are asymptomatic. However, surgical mask is advised for the symptomatic and risk population²⁰ (Table 1).

*Although the WHO recommends fabric mask for general public, some countries in East Asia, for example, Singapore, advice surgical mask for mass population. They argue that surgical masks are standard and medically approved; therefore, it is more effective

in source control. However, availability of surgical masks to common public is still questionable, especially in recent pandemic.

WHO RECOMMENDATION FOR FABRIC MASK²⁰

According to the WHO, ideal combination of material for fabric masks should include at least three layers as follows:

- An innermost layer of a hydrophilic material (e.g., cotton or cotton blends);
- An outermost layer made of hydrophobic material (e.g., polypropylene, polyester, or their blends), which may limit external contamination from penetration through to the wearer's nose and mouth.
- A middle hydrophobic layer of synthetic nonwoven material such as polypropylene or a cotton layer that may enhance filtration or retain droplets.

METHOD OF MASK WEARING (DONNING)^{21–23}

- Clean your hands with soap and water or alcohol-based sanitizer.
- Hold the mask; inspect it for any physical damage and if present don't use it.
- Mask with ear loop: Hold it by ear loop, and place the loops behind ears.
- Mask with ties: Bring the mask to the nose level, secure the upper tie first at crown of head.
- Adjust the mask at the nose level by pinching or molding to secure the fit around nasal contour.
- Then secure the lower tie at the nape of neck.
- Pull the bottom of mask to cover the chin region.

METHOD OF MASK REMOVING (DOFFING)^{21–23}

- Perform hands cleaning with soap and water or sanitizer before touching the mask.
- Avoid touching the front of the mask, which is usually contaminated.
- Only touch the ear loops/ties.
- Face mask with ear loops: Hold both of the ear loops and gently lift and remove the mask.
- Face mask with ties: Untie the bottom bow first then untie the top bow and pull the mask away from face as the ties are loosened.
- Immediately throw the mask if single use, such as surgical mask, in the trash.
- Clean hands with soap and water or hand sanitizer.

CARING OF MASK^{21–24}

- Mask should not be pulled down to chin and then keep it on again. While doing this, inner side of the mask may be contaminated by the exposed area below the chin (submental and submandibular region), which is potentially contaminated.
- It should not be shared with others.
- Wash cloth masks at least daily in soap or detergent and hot water (60°C).
- In case of unavailability of hot water, wash mask at normal temperature water with soap and then either boil it for 1 minute or soak it in 0.1% chlorine for 1 minute followed by thorough

Table 1: Mask for general public

<i>Cloth/fabric mask</i>	<i>Surgical mask</i>
Anyone who is above the age of 2 years except the categories that are explained above as an exception.	Symptomatic individual even with mild symptoms of COVID-19 such as mild body ache, sore throat, burning eyes, loss of appetite, shortness of breath, nasal congestion, sneezing, headache, diarrhea, nausea, vomiting, loss of smell and taste coughing, fever etc.
	Caregiver of suspected COVID-19 patients/COVID-19 positive at home or non-hospital setting.
	High-risk population—People age 60 years or above/with any preexisting medical conditions like diabetes mellitus, hypertension, cardiac/lung problems, cancer, immunocompromised patients etc.

rinsing with normal water to make sure no chlorine residue remains at mask.

ALTERNATIVES TO CLOTH/FABRIC MASKS FOR THE GENERAL PUBLIC

In the context of nonmedical mask shortage, face shields may be considered as an alternative noting that they are inferior to mask with respect to prevention of droplet transmission. If face shields are to be used, ensure proper design to cover the sides of the face and below the chin. In addition, they may be easier to wear for individuals with limited compliance with medical masks (such as those with mental health disorders, developmental disabilities, deaf and hard of hearing community, and children).

MYTHS AND FACTS RELATED TO FACE MASK DURING PANDEMIC OF COVID-19²⁵

Various misconceptions and misinformation are present in the society regarding to face mask that are not only scientifically unproven but also harmful for some users. Some common myths and recommended facts have been explained in Table 2.

SIDE EFFECTS OR POTENTIAL HARMS OF WEARING A MASK²³

- Self-contamination when mask is touched or adjusted by hands and face (nose, mouth, or eyes) is touched with the same hand without hand hygiene or it may happen when masks are not changed when wet, physically damaged, or soiled.
- Mask may cause a false sense of security that leads individual not to follow other preventive methods like frequent hand hygiene and physical distancing.
- Wearing mask for long hours may cause facial skin damage, irritant dermatitis, or worsening acne.
- Breathing difficulties, especially with respirators and in hot and humid environment.
- Difficulty with communication in general, and it is more difficult for the people who use lip reading for communication such as deaf person.
- It is difficult or harmful for many individual to wear masks, especially for children, developmentally challenged persons, psychiatric patients, elderly persons with cognitive impairment, active asthma or COPD patients, facial trauma patients, etc.
- Improper disposal of used/contaminated masks may increase risk contamination in sanitation workers and environment hazard.

MASK RECOMMENDATIONS FOR MEDICAL OR DENTAL CARE PERSONNEL (HCWs)

Use of Surgical Mask

- Healthcare workers should continuously wear a surgical mask during their routine activities throughout the shift with other PPE. It is more important when working in potential higher transmission risk areas such as emergency rooms, triage, OPDs, cancer, transplant units, COVID-19 wards, etc.
- Healthcare workers should make sure that the mask is changed when it is wet, visibly soiled, or damaged. The mask should

Table 2: Myths and facts of face mask

<i>Myths</i>	<i>Facts</i>
Only sick people should wear mask.	All people who are above 2 years of age should wear mask except some who are described above.
Only N95 or respirator should be used by general public.	Cloth mask is recommended for general public; however, sick, caregiver or risk population should use surgical mask.
Mask should be worn everywhere when people are outside their home.	Mask should be used when someone is at public place which is crowded/confined and physical distance of 1 m is difficult to maintain. It is NOT recommended to wear mask when people are alone or at isolated place, for example driving alone, large public parks or any other place where 1 meter distance can be maintained.
Mask should be used while exercising, jogging or swimming.	People should NOT wear masks while exercising, jogging or swimming as masks may reduce the ability to breathe comfortably. Sweat can make the mask wet more quickly which makes it difficult to breathe.
Cloth masks need not to be washed.	No , mask collects microbes so they should be washed after every use or at least once in a day with detergent and hot water.
N95 or surgical mask can be reused multiple times without considering their condition.	No , these masks are ideally for single use; however, due to limited supply and increased demand, it is recommended to reuse them following certain guidelines provided by health authorities.
Loose-fit also works well.	No , ideally mask should be snugly fit but allow comfortable breathing. Smaller mask should be considered for children.
Mask alone can protect people from getting infected with COVID-19.	No , face mask is just a protective measure which is effective with other measures like physical distancing of at least 1 m and meticulous hand hygiene.

not touched to adjust or displaced from the face; if it happens, the mask should be removed properly and replaced, and hand hygiene should be performed.

- The surgical mask along with other PPE is changed after contacting for any patient on contact/droplet precautions for other pathogens.
- Administrative staff and other staff of healthcare facilities who do not work in clinical areas do not necessarily need to use a surgical mask during routine activities; however, fabric mask is highly recommended. In addition, if resources allow, they can also use surgical masks following complete instructions of wearing and removing of mask.

- In any condition, masks should not be shared between health workers.
- Healthcare workers should follow the guidelines properly to dispose the surgical mask, and its reuse should be avoided.^{17,26}

Use of Respirators

- It is already described in the previous section that respirators provide protection from aerosols and airborne particles. There are various procedures in the medical and dental treatment that create aerosol, which are defined as AGPs. The AGPs in infected patients can create infected aerosols that transfer infection by inhaling if precautionary measures have not been taken.
- AGPs in medical treatment: Endotracheal intubation, tracheostomy, bronchoscopy, CPAP/BiPAP chest physiotherapy, airway suction, nebulization procedure, sputum induction, etc.
- AGPs in dental treatment: Ultrasonic scaler, piezoelectric handpiece, air-driven high-speed handpiece without rubber dam, air polishing, air-water syringe, tooth preparation with air turbine handpiece, tooth preparation with air abrasion.
- In areas where AGPs are performed for COVID-19-confirmed and suspected cases, such as ICU, operation theater, dental clinic, etc., certified respirators like N95 or equivalent (FFP2) or higher versions should be used by HCWs. They should be worn for entire shift following the proper instructions of donning and doffing.^{17,26}

*Dressing rooms, cafeterias, and other shared places of hospitals where mask wearing is not feasible, HCWs should follow the meticulous hand hygiene measures and physical distancing.

Reuse of Respirators

Surge in demand of respirators with limited supply compels healthcare facilities to reuse or extend the use of respirators, especially N95.²⁷ The CDC recommends guidelines for the hospitals to protect HCWs in these circumstances that include the following:

- Reduce the number of HCWs who require respirators using methods of engineering and administrative control.
- Use reusable respirators, for instance, elastomeric half mask and full facepiece and other alternatives.
- Conserve N95 masks for those who are at the highest risk of contracting infection.
- Allow extended use and/or limited reuse of N95 if acceptable by local health authority.

Extended use of N95 mask can be described as of wearing the same N95 while in close contact with multiple infected patients, without removing it between patient encounters. Implementation of the extended-use practice can be applied in wards and other areas where patients are infected with the same pathogen, for example, COVID-19 wards.²⁸

Reuse of N95 masks describes removing of mask after patient encounter, store it, and put it on again for the next infected patient. However, there are certain guidelines and restrictions that limit the number of times a N95 can be reused.²⁸

Policies to follow the extended or reuse practice should be formulated by local health authorities while taking care of availability of respirators, rate and severity of infection, patient load, etc. Overall, it should be tailored according to the requirement and supply of respirators (N95).

Extended use is considered better than reuse as it has less chances of touching respirator once worn properly. Either extended use or reuse, it is necessary to educate HCWs about proper technique of donning and doffing. In case, a mask needs to be adjusted for fit, gloves should be used and discarded immediately. If a mask is adjusted by hands, proper hand hygiene measures must be followed before and after the adjustment of respirators. The N95 mask can be covered by face shield and/or a surgical mask (fluid resistant) to limit the potential surface contamination from large droplets, spray, splatter, splashes, etc. Nevertheless, covering respirators with surgical mask is an additional physiologic burden for the wearer.²⁹

The mask should be discarded properly in the designated area in case of extended use after the shift while for reuse, after removing either it should be hung in specified area or kept in clean, breathable container like a paper bag between uses.

N95 mask should be discarded:

- After performing AGPs.
- If it is soiled or shows visible blood or other body fluids.
- Following close contact with any patient coinfecting with an infectious disease requiring contact precautions.
- If it is physically damaged, difficult to breathe through, or with inadequate seal.

While there is no study to describe the maximum number of safe reuses for a N95, however, up to five uses are accepted by a single wearer.

The most significant risk of extended use and reuse of N95 is of contact transmission from touching the surface of the contaminated respirator (self-inoculation). To overcome the risk of contact transmission of coronavirus from reuse policy of N95 respirators, user should keep the mask in clean breathable paper bag minimum for 5 days between each use. Eventually, to apply this strategy, each HCW requires at least five N95 at a time. If there is further constrained in supply, decontamination of respirators may be an option.

Presently, N95 respirators are for single use; nevertheless, decontamination and reuse have been suggested as a crisis capacity strategy during the pandemic when supply of respirators is extremely limited. Choosing a decontamination method for respirators, its impact should be assessed on the filter performance, fit and seal of mask, and efficacy against pathogen such as coronavirus. Hence, it is necessary to consult the manufacturer company and follow its recommendation. If decontamination recommendations are not given by the manufacturer, it can be decontaminated by accepted methods; however, these decontaminated masks should not be used during AGPs. To date, ultraviolet germicidal irradiation, vaporous hydrogen peroxide, and moist heat have provided most promising result. These methods do not degrade the filter performance or affect fit and seal of respirators. They show satisfactory antimicrobial properties as well. Nevertheless, they can be used only for a limited number of times.³⁰

SUMMARY

- Respiratory viral diseases have mainly three routes of transmission, namely droplets, aerosols, and contact.
- Existing information of COVID-19 shows that it spreads mainly through droplets and contact.

- Infected droplets and aerosol are produced by coughing, sneezing, talking, and even breathing.
- Practice of mask wearing by an infected person reduces the amount of infected droplets spreading in the environment (source control).
- COVID-19 infection spread is reported by asymptomatic patients as well.
- Wearing mask by symptomatic, asymptomatic, and general public is recommended to curb the transmission of COVID-19. Nevertheless, wearing mask alone cannot control the spread of COVID-19. It is a part of a comprehensive strategy that includes measures of frequent hand hygiene and physical distancing.
- Fabric mask, surgical mask, and respirators are three types of masks available in the market.
- General public: Any individual who is above 2 years should wear a fabric mask in public place; however, symptomatic patients should wear a surgical mask. Any individual who cannot remove mask without assistance should not wear it.
- General public should be educated well for wearing, removing, and caring of the masks to reduce the potential side effects, for example, contact transmission.
- Healthcare workers: They should wear surgical mask in all clinical areas throughout their shift. However, in clinical areas where AGPs are performed such as ICU, they should wear respirator like N95 or equivalent or higher versions of respirators.
- Due to surge in demand of N95 masks during COVID-19 pandemic with limited supply, policies of extended use and reuse have been recommended to overcome the shortage of respirators.
- Healthcare workers should be trained properly when extended-use and reuse policies are implemented to reduce the risk of self-inoculation.
- To reduce the risk of contact transmission in reuse practice of N95 masks in current crisis, it should be kept in a clean breathable bag minimum for 5 days between each use.
- In extreme shortage of N95 respirators, decontamination can be used as a crisis capacity strategy.
- Currently, ultraviolet germicidal irradiation, vaporous hydrogen peroxide, and moist heat are recommended methods for decontamination of N95 and other respirators.

ACKNOWLEDGMENTS

The authors would like to thanks Dr Ranjitha, Dr Shashikiran, Dr Milind, Dr Thomas and Kashif Masood for their invaluable help in preparing of manuscript of the present article.

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