



Face mask – it's role in prevention of COVID-19

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ABSTRACT

The novel corona virus disease (COVID-19) is causing huge morbidity throughout the world. Wearing masks is an important strategy for its prevention besides hand washing, using alcohol based sanitizer and physical distancing. In the absence of AGPs (Aerosol Generating Procedures), health workers providing direct care to COVID-19 cases should wear a medical mask. In settings where AGPs are performed (e.g. COVID-19 intensive and semi-intensive care units), health workers should wear a respirator (N95 or FFP2 or FFP3 standard). Respirators can be reused up to 5 times assuming there is no soiling and minimal to no viral contamination of the mask. Cloth face masks are advised in public settings. It is crucial to wear, remove and dispose mask appropriately for maximum protection. With disposable masks becoming an impending threat to nature, reusable LEAF mask with long lasting filters offers a promising solution to protect our environment.

Keywords: Masks, Corona, Prevention

INTRODUCTION

A novel corona virus (2019- SARS CoV-2) originated from Wuhan, China in December 2019. It has spread rapidly throughout the world causing huge morbidity. The corona virus disease (COVID-19) was declared a pandemic by the World Health Organization (WHO) on 11 March, 2020.¹

The disease causes symptoms like fever, cough, breathing difficulty and other respiratory problems. It spreads from person to person through respiratory droplets, expelled when a COVID-19 patient coughs, sneezes or speaks. These droplets may land on surfaces around the patient. People can become infected by touching their eyes, nose or mouth after touching these surfaces.² Viable virus has been isolated from specimens of asymptomatic individuals, suggesting that they may transmit the virus to others.³ In settings where Aerosol Generating Procedures (AGPs) are performed, airborne transmission of SARS CoV-2 may be possible.

The preventive strategies for COVID-19 are frequent hand washing, using an alcohol based sanitizer, wearing mask and physical distancing.

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Masks can be used either for protection of healthy people (worn to protect oneself when in contact with an infected individual) or for source control (worn by an infected person to prevent onward transmission).⁴

USE OF MASKS IN HEALTH CARE SETTINGS TO PROVIDE CARE TO SUSPECTED OR CONFIRMED COVID-19 CASES

Medical masks are defined as surgical or procedure masks that may be flat or pleated. They are affixed to the head with straps that go around the ears or head. Their performance characteristics are tested according to a set of standardized test methods aiming to balance high filtration, adequate breathability and optionally, fluid penetration resistance.^{5,6}

Filtering facepiece respirators (FFR) or respirators similarly offer a balance of filtration and breathability. The test methods for measuring filtration efficiency vary by type of aerosol (sodium chloride, dioctyl phthalate or paraffin oils).⁷ Medical masks filter 3 micrometre droplets, whereas,



respirators filter 0.075 micrometre solid particles. US N95 FFRs filter at least 95% sodium chloride particles.⁴

Universal masking in health facilities is defined as the requirement to wear a mask by all health workers and anyone entering the facility, regardless of the activities undertaken.

Targeted continuous medical mask use is defined as the practice of wearing a medical mask by all health workers and caregivers working in clinical areas during all routine activities throughout the shift. Here, masks are only changed if they become soiled, wet or damaged or if the health worker/caregiver removes the mask (e.g. for eating, drinking or caring for a patient who requires droplet/contact precautions for other reasons).

In the absence of AGPs, health workers providing direct care to COVID-19 cases should wear a medical mask in addition to other PPE (Personal Protective Equipment) that are part of droplet and contact precautions. AGPs include tracheal intubation, non-invasive ventilation, tracheotomy, cardiopulmonary resuscitation, manual ventilation before intubation, bronchoscopy, sputum induction induced by using nebulized hypertonic saline and autopsy procedures.

In care settings for COVID-19 cases where AGPs are performed (e.g. COVID-19 intensive and semi-intensive care units), health workers should wear a respirator (N95 or FFP2 or FFP3 standard, or equivalent).⁴

The following potential harms and risks should be considered when adopting the approach of targeted continuous medical mask use:

- 1) Self-contamination due to manipulation of the mask by contaminated hands.^{8,9}
- 2) Self-contamination that can occur if medical masks are not changed when wet, soiled or damaged.
- 3) Possible development of facial skin lesions, irritant dermatitis or worsening acne, when used for long hours.¹⁰⁻¹²
- 4) Uncomfortable to wear.^{13,14}

- 5) False sense of security, leading to potentially less adherence to known preventive measures such as physical distancing and hand hygiene.
- 6) Potential risk of droplet transmission and of splashes to the eyes, if mask wearing is not combined with eye protection.
- 7) Difficulty wearing them by vulnerable populations such as those with mental health disorders, developmental disabilities, the deaf and hard of hearing community and children.
- 8) Difficulty wearing them in hot and humid environments.

Roberge et al reported in their study that FFR did not impose any important physiological burden during one hour of use in healthy healthcare workers, at realistic clinical work rates, but the FFR dead-space carbon dioxide and oxygen levels were significantly above and below, respectively, the ambient workplace standards, and elevated PCO₂ is a possibility.¹⁵

GUIDANCE ON THE CORRECT USE OF MASKS

- 1) Perform hand hygiene before putting on mask.
- 2) Ensure that it covers the mouth and nose, adjust to the nose bridge and tie it securely to minimize any gaps between the face and the mask.
- 3) Avoid touching the mask when wearing it.
- 4) Remove the mask using appropriate technique. Avoid touching the front of the mask but untie it from behind.
- 5) After removal or whenever a used mask is inadvertently touched, clean hands with an alcohol-based sanitizer or soap and water.
- 6) Replace masks as soon as they become damp with a new dry mask.
- 7) Avoid re-using single-use masks.
- 8) Discard single-use masks after each use and dispose of them immediately in a closed bin.⁴
- 9) Change the mask after every 6 to 8 hours of use.



Fig 1 Correct way to wear a Face Mask

RATIONAL USE OF MASK IN DIFFERENT SETTINGS

Point of Entry

Triple layer medical mask should be worn at low risk points like health desk, immigration counters, customs and airport security and temperature recording station.

Doctors, nurses and sanitary staff at holding area/ isolation facility of APHO (Airport Health Authority) have moderate risk of infection, so N-95 mask is recommended.

Hospital Setting

Out Patient Department (Respiratory Clinic/Separate Screening Area)

N 95 mask is recommended at triage area, screening area helpdesk/ registration counter, temperature recording station, waiting area and doctor's chamber. Sanitary staff should wear N 95 mask, while, visitors accompanying young children and elderlies should wear triple layer medical mask.

In-Patient Services

The use of masks in the in-patient services is given in the table below.

Table 1 Rational Use of Mask in Hospital In-Patient Setting

S. No.	Setting	Activity	Risk	Recommended PPE	Remarks
1	Isolation rooms	Clinical management	Moderate	N 95 mask, Gloves	Patient masked. No aerosol generating activity.
2	ICU/ Critical care	Critical care Management, Dead body packing	High	Full complement of PPE	Aerosol generating activities performed
3	ICU/ Critical care	Dead body transport to mortuary	Low	Triple Layer medical mask Gloves	
4	Sanitation	Cleaning frequently touched surfaces/ floor/ changing linen	Moderate	N 95 mask Gloves	
6	Non-COVID treatment areas of	Attending to infectious and non-infectious	Risk as per assessed profile of	PPE as per hospital infection prevention	

7	hospital Caretaker accompanying admitted patient	patients Taking care of the admitted patient	patients Low	control practices Triple layer medical mask	Practice hand hygiene, maintain a distance of 1 meter
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Emergency Department

N 95 mask and gloves are recommended while attending emergency cases. Full complement of PPE is recommended while attending to severely ill patients of SARI (Severe Acute Respiratory Infection).

Health Workers in Community Setting

The use of masks among health workers in community settings is given in the table below.

Table 2 Rational Use of Mask Among Health Workers in Community Setting

S.No.	Setting	Activity	Risk	Recommended PPE	Remarks
1	ASHAs/ Anganwadi and other field staff	Field Surveillance	Low	Triple layer mask Gloves	Maintain distance of one meter. Carry triple layer masks to distribute to suspect cases detected.
2	Doctors at supervisory level conducting field investigation	Field surveillance Clinical examination	Moderate	N 95 mask Gloves	

Quarantine Facility

The persons on quarantine, health care staff which is monitoring and recording temperature and the support staff should wear triple layer mask. N-95 mask and gloves are recommended for healthcare staff doing clinical examination of symptomatic persons.

Home Quarantine

The quarantined persons should wear triple layer mask. Designated family member taking care of the quarantined should wear gloves while cleaning commonly touched surfaces or handling soiled linen. No PPE is required for other family members.¹⁶

Centers for Disease Control and Prevention (CDC) recommends that people wear cloth face masks in

public settings and when around people who do not share common household. Cloth face masks should not be worn by children under the age of 2 or anyone who has difficulty in breathing, is unconscious, incapacitated or unable to remove the mask without assistance.¹⁷

REUSE OF RESPIRATORS

As coronaviruses lose their viability significantly after 72 hours, the CDC suggests that masks can be re-used up to 5 times assuming there is no soiling and minimal to no viral contamination of the mask. Each healthcare worker caring for suspected or confirmed COVID-19 cases should be issued five respirators. He would wear one respirator each day and store it in a breathable paper bag at the end of each shift. The order of FFR use should be repeated with a minimum of five days between each FFR use.¹⁸



The Health Ministry has warned against wearing N-95 mask with valve as it does not prevent the virus from escaping out of the mask. If the person wearing such a mask is infected, SARS CoV-2 can spread through the exhaled air into the atmosphere, which increases the risk of transmission.¹⁹

SAFE DISPOSAL AND HANDLING OF MASKS

Isolation Wards, Sample Collection Centres and Laboratories

Used masks (triple layer mask, N95 mask, etc.) have to be discarded in separate yellow colour coded plastic bags. They have to be handed over to the waste collector engaged by common biomedical waste treatment facility operator at the doorstep and should be incinerated.

Quarantined Homes and Other Households

Used masks should be kept in a paper bag for minimum 72 hours prior to their disposal as general waste. It is advised to cut the masks prior to disposal to prevent their reuse.²⁰

The Union Ministry of Health and Family Welfare has indicated that the masks used by patients / care givers / close contacts during home care should be disinfected using ordinary bleach solution (five per cent) or sodium hypochlorite solution (one per cent) and then disposed of either by burning or deep burial. Further, wrap and keep in a closed bin before handing the mask over to the sanitary worker. This waste must be treated as domestic hazardous waste and should be incinerated.²¹

Recent Advances

LEAF Mask is the world's first FDA (Food and Drug Administration) registered, transparent mask to have N99-standard air filtering abilities as well as a self-purifying feature. It comes in 3 variants:

- 1) LEAF HEPA has the N99+ HEPA (High Efficiency Particulate Air) filtration and is ultra-light weight.
- 2) LEAF UV contains UV-C sterilization built into the filter housing destroying pathogens at the DNA level and Active-Carbon filtration to eliminate odour and organic substances.
- 3) LEAF PRO adds active ventilation and air quality sensing.

Indiscriminate use of single use masks is posing a serious threat to oceans and marine life by skyrocketing plastic pollution. With disposable masks becoming an impending threat to nature, reusable LEAF mask with long lasting filters offers a promising solution to protect our environment.²²

CONCLUSION

Considering possibility of airborne transmission, mask should be used even if a person is alone in a closed or open space. It is crucial to wear, remove and dispose mask appropriately for maximum protection. Besides mask, compliance with hand hygiene, physical distancing and other infection prevention and control measures are critical to prevent human-to-human transmission of COVID-19.

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