Hospital Preparedness
Infection Prevention and Control for COVID-19

FAQs, Resources and Tips for IPC implementation

Virtual IPC training series

HAI Surveillance Network, AIIMS -ICMR

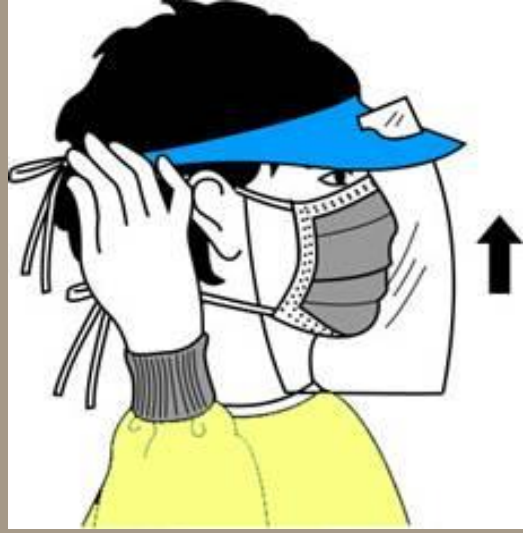
National AMR Surveillance Network, NCDC

Part -1 (Revised)

Updated as of 20 May 2020

COVID-19 related Infection Control and Prevention topics discussed in Part - 2

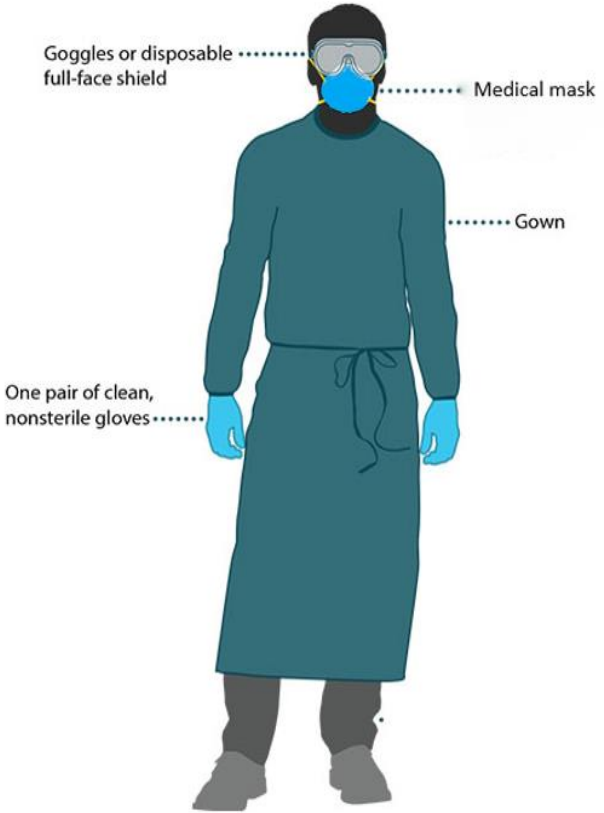
- PPE Optimization; Use, Reuse and Extended Use (Updated as of 20 May 2020)
- Face Covers and Cloth masks; when and how to use? (Updated as of 15 April 2020)
- Airborne Infection Control- Ventilation (Updated as of 15 April 2020)
- Aerosol Generating Procedures (Updated as of 15 April 2020)
- Triage (Updated as of 15 April 2020)
- General questions
  - Biomedical waste management (Updated as of 20 May 2020)
  - Home made ABHR preparation (Updated as of 20 May 2020)
  - Chloroquine prophylaxis (Updated as of 15 April 2020)
  - Treatment options (Updated as of 15 April 2020)
  - Blood and blood products shortage management (Updated as of 15 April 2020)



PPE Optimization
Use, Reuse and Extended Use

How to ration PPE use?

- Personal Protective Equipment (PPE) must be rationally used for activities commonly performed by HCWs
- Use of PPE should be based on transmission based precautions (TBPs)
- HCWs involved in direct care of COVID-19 patients should wear appropriate PPE
  - Gloves (non-sterile, examination)
  - **Medical mask**
  - Eye protection (goggles or face shield)
  - Gown (long-sleeved, non-sterile)

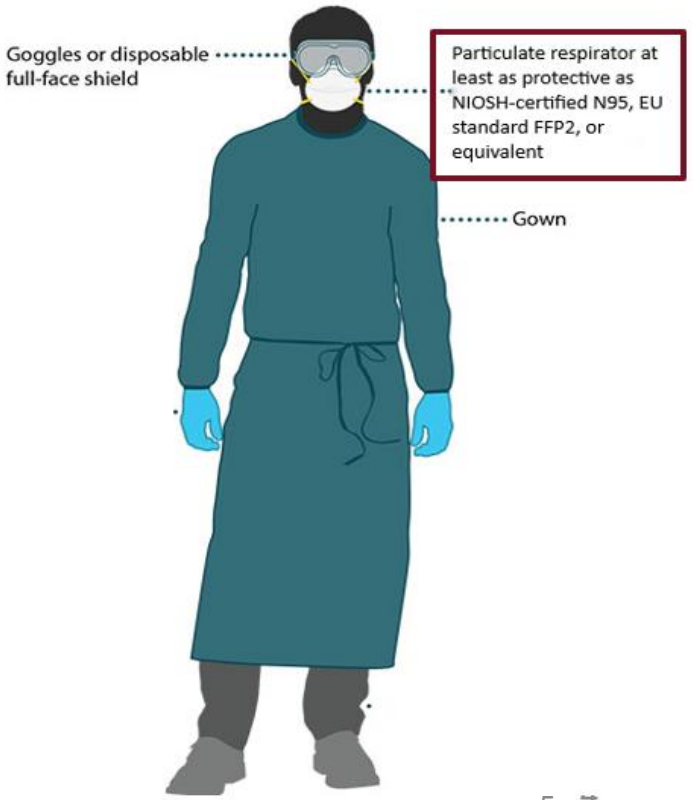


*Note: information on this slide is PPE as recommended by WHO

COVID-19: Guidance for infection prevention and control in healthcare settings. Version 1.0. https://apps.who.int/iris/handle/10665/331215

Aerosol Generating Procedures (AGP) require additional PPE

- AGPs associated with increased risk of transmission of other coronaviruses (SARS-CoV and MERS-CoV)
- Perform AGPs in adequately ventilated rooms
  - Negative pressure room (**at least 12 air changes/hour**)
  - **Natural ventilation (air flow at least 160 L/s per patient)**
- Wear appropriate PPE
  - Gloves (sterile where indicated)
  - **Particulate respirator** (N-95/FFP 2/ FFP 3)
  - Eye protection (goggles or face shield)
  - Gown (long-sleeved, non-sterile)



*Note: information on this slide is PPE as recommended by WHO

When should I use coveralls or a Hazmat suit?

- Coveralls, double gloves, or head covers (hood) that cover the head and neck used in the context of filovirus disease outbreaks (e.g. Ebola virus) are not required when managing COVID-19 patients.

- CDC includes use of coveralls as a contingency strategy when gowns are not available
  - material and seam barrier properties determine protective level
  - features including closures, will affect the protective level
  - HCP unfamiliar with the use of coveralls must be trained and practiced in their use, prior to using during patient care

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1. 1. https://apps.who.int/iris/bitstream/handle/10665/331695/WHO-2019-nCov-IPC_PPE_use-2020.3-eng.pdf
2. 2. https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/isolation-gowns.html

HOW TO PUT ON AND TAKE OFF

Personal Protective Equipment (PPE)

World Health Organization

How to put on PPE (when all PPE items are needed)

Step 1
- Identify hazards & manage risk. Gather the necessary PPE.
- Plan where to put on & take off PPE.
- Do you have a buddy? Mirror?
- Do you know how you will deal with waste?

Step 2
- Put on a gown.

Step 3 - Put on medical mask and eye protection (e.g. face shield, eye visor/goggles)

\+  or 

Note: If performing an aerosol-generating procedure (e.g. aspiration of respiratory tract, intubation, resuscitation, bronchoscopy, autopsy), a particulate respirator (e.g. US NIOSH-certified N95, EU FFP2, or equivalent respirator) should be used in combination with a face shield or an eye protection. Do user seal check if using a particulate respirator.

Step 4
- Put on gloves (over cuff).

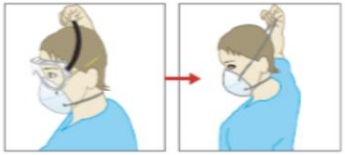
How to take off PPE

Step 1
- Avoid contamination of self, others & the environment
- Remove the most heavily contaminated items first

Remove gloves & gown
- Peel off gown & gloves and roll inside, out
- Dispose gloves and gown safely

Step 2
- Perform hand hygiene

Step 3a
If wearing face shield:
- Remove face shield from behind
- Dispose of face shield safely



Step 3b
If wearing eye protection and mask:
- Remove goggles from behind
- Put goggles in a separate container for reprocessing
- Remove mask from behind and dispose of safely

Step 4
- Perform hand hygiene

Reproduced from "Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care - WHO Interim Guidelines" available at http://www.who.int/csr/resources/publications/WHO_CDS_EPR_2007_6/en/index.html

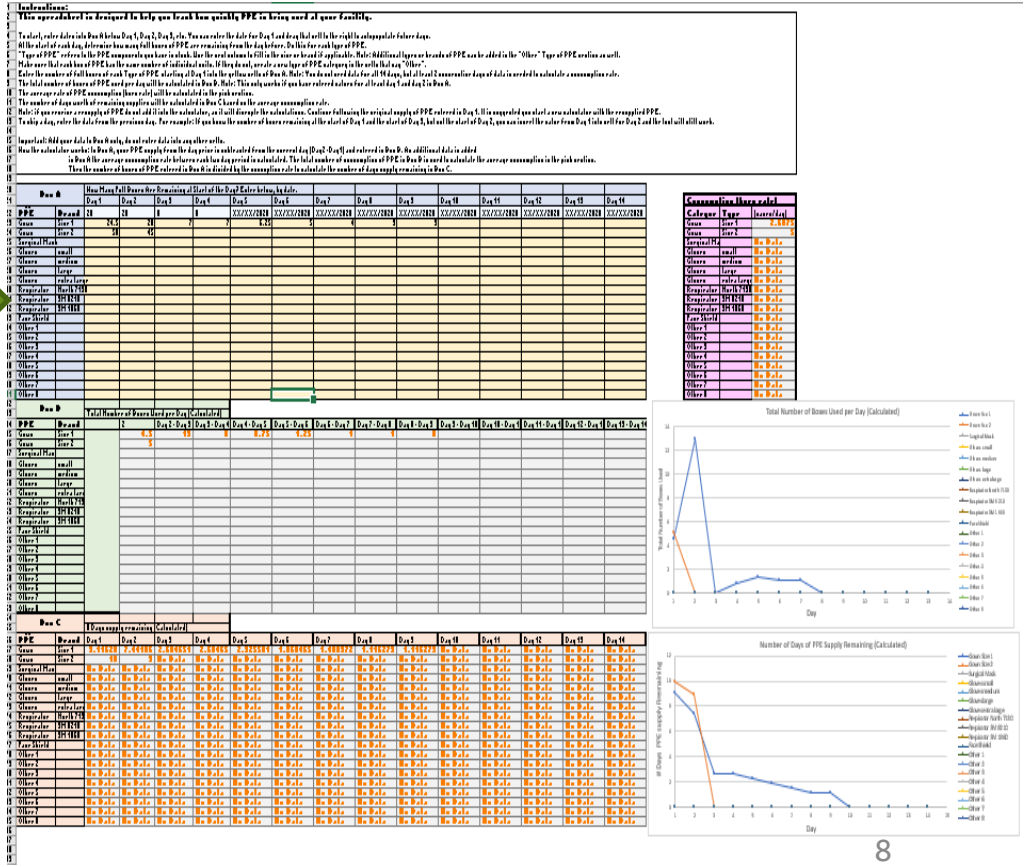
How can I calculate the PPE requirement for my hospital or department?

- A PPE burn calculator to facilitate administrators to indent and track utility of PPE is available from CDC

https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/burn-calculator.html

- WHO has developed a tool for forecasting supplies, diagnostics and equipment requirements including PPEs

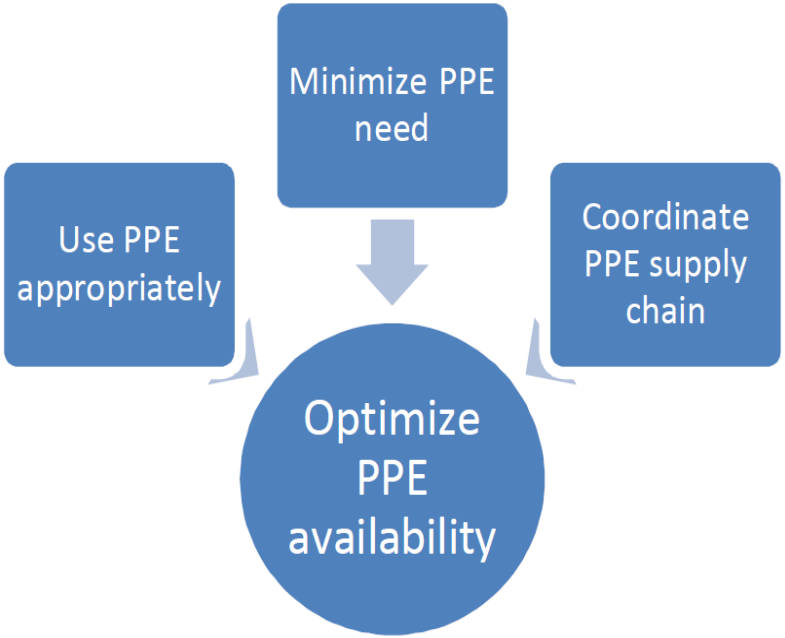
https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/covid-19-critical-items



How do we handle shortages of PPE?

Strategies to optimize the availability of PPE

- **Minimize need for PPE**
  - Consider telemedicine for patient care
  - Use physical barriers (i.e.. glass/ plastic windows)
  - Restrict HCW not involved in direct patient care from entering rooms of COVID-19 patients
- **Coordinate PPE supply chain management mechanism**
  - Forecast PPE use
  - Monitor and control PPE request
  - Monitor end to end distribution



https://apps.who.int/iris/bitstream/handle/10665/331498/WHO-2019-nCoV-IPCPPE_use-2020.2-eng.pdf

Can PPEs be re-used?

- **In the context of limited supplies, consider**
  - Using reusable personal protective equipment where options exist (e.g., cloth gowns, reusable goggles or face shields)
  - Make sure manufacturer's instructions for reprocessing are followed (i.e., cleaning and disinfecting)
- **Assign personnel as needed to:**
  - Ensure equipment are correctly reprocessed after each use
  - Ensure reusable PPE are routinely inspected, maintained and replaced when needed
    - mend a small hole in a gown, replace missing fastening ties
    - dispose of cloth gowns when they are thin or ripped

Guidelines for re-use of Personal Protective Equipment HICC, AIIMS, New Delhi
https://www.fda.gov/medical-devices/personal-protective-equipment-infection-control/faqs-shortages-surgical-masks-and-gowns

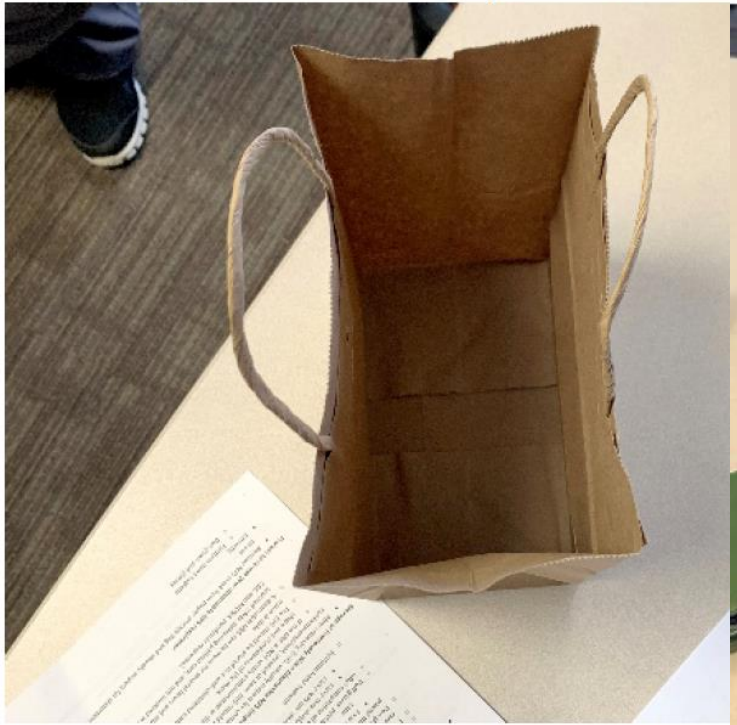
Can the N95 masks be reused after a set time period ?

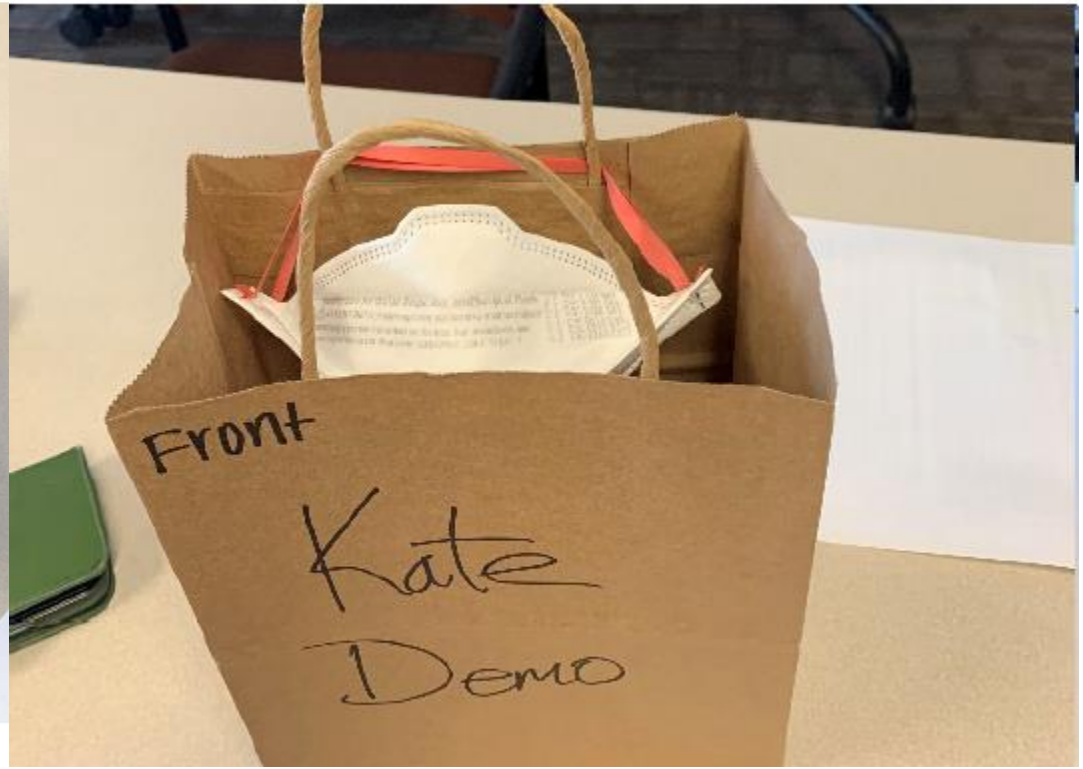
- SARS-COV-2 virus can survive up to 72 hours on plastic, stainless steel and cardboard surfaces
- One strategy
  - Issue five N95 respirators to each healthcare worker
  - The healthcare worker will wear one respirator each day and store it in a breathable paper bag at the end of each shift
  - Reuse with a minimum of five days between each Filtering Facepiece Respirator (FFR)
  - Healthcare workers should treat the FFRs as though they are still contaminated
  - If supplies are limited and five respirators are not available FFR decontamination may be necessary

https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html

Can the N95 masks be reused after a set time period ?

The bag has to be open wide and stay that way.





https://snlg.iss.it/wp-content/uploads/2020/03/COVID-Extended-Use-Reuse-of-PPE-and-N95-ext.pdf

Can the N95 masks be reused after a set time period ?

https://snlg.iss.it/wp-content/uploads/2020/03/COVID-Extended-Use-Reuse-of-PPE-and-N95-ext.pdf

When should a healthcare worker get a new N95 ?

- After use during aerosol generating procedures
- If the respirators contaminated with
  - blood
  - respiratory or nasal secretions
  - other bodily fluids from patients
- Respirator is wet
- Following close contact with, or exit from, the care area of any patient co-infected with an infectious disease requiring contact precautions.
- It can no longer be properly fitted
- Breathing through the respirator becomes difficult

1. https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html
2. https://www.ecdc.europa.eu/sites/default/files/documents/Cloth-face-masks-in-case-shortage-surgical-masks-respirators2020-03-26.pdf
3. https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html

What precautions should you take before using a decontaminated FFR?

- Clean hands with soap and water or an alcohol-based hand sanitizer before and after touching or adjusting the FFR.
- Avoid touching the inside of the FFR.
- Use a pair of clean (non-sterile) gloves when donning and performing a user seal check.
- Visually inspect the FFR to determine if its integrity has been compromised.
- Check that components such as the straps, nose bridge, and nose foam material did not degrade, which can affect the quality of the fit, and seal.
- If the integrity of any part of the FFR is compromised, or if a successful user seal check cannot be performed, discard the FFR and try another FFR.
- Users should perform a user seal check immediately after they don each FFR and should not use an FFR on which they cannot perform a successful user seal check

How long can I extend the use of a N-95 respirator

Key consideration for safe extended use is respirator must maintain its fit and function

- Workers in other industries routinely use N 95 respirators for several hours uninterrupted
- Experience from these settings indicate respirators can function within their design specifications up to 8 hours of continuous or intermittent use
- If extended use of N95 masks are permitted, Hospital administrators should ensure
  - Adherence to administrative and engineering (e.g., use of barriers to prevent droplet spray contamination)
  - strict adherence to hand hygiene practices and proper Personal Protective Equipment (PPE) donning and doffing technique

https://apps.who.int/iris/bitstream/handle/10665/331215/WHO-2019-nCov-IPCPPE_use-2020.1-eng.pdf
https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html

Other recommendations for extended use of N 95 respirators

- Consider use of a cleanable face shield (preferred) over an N-95 respirator and/or other steps (e.g., masking patients, use of engineering controls) to reduce surface contamination.
- Perform hand hygiene with soap and water or an alcohol-based hand sanitizer before and after touching or adjusting the respirator (if necessary for comfort or to maintain fit)

CDC, Respirator Extended Use Recommendations- https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html

Can N-95 Respirators be re-used?

Additional guidance forthcoming from MoHFW

- Various disinfection or sterilization methods may be effective for reprocessing of respirators; however, only few have been documented in the literature
- If this strategy is adopted, it's important to take into consideration that there are currently **no standardized methods or protocols** for ensuring the effectiveness nor integrity of the respirators after reprocessing.
- Additional questions regarding different methods are discussed in successive slides.

1. Recommended Guidance for Extended Use and Limited Reuse of N95 Filtering Facepiece Respirators in Healthcare Settings -NIOSH
https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html
2. Local practice at US hospital for re-processing N95s with UV germicidal irradiation:
https://www.nebraskamed.com/sites/default/files/documents/covid-19/n-95-decon-process.pdf
3. Guidelines for re-use of Personal Protective Equipment HICC, AIIMS, New Delhi

What are the possible ways N-95 respirators can be sterilized for reuse?

- **Periodic Reuse**
- **Promising methods**
  - Ultraviolet irradiation
  - Hydrogen peroxide vapour
  - Moist heat
- **Promising Methods with some limitations**
  - Steam sterilization
  - Liquid hydrogen peroxide
- **Method with serious limitations**
  - Ethylene oxide

Methods currently not recommended

- Autoclave
- Isopropyl Alcohol
- Soap
- Dry microwave irradiation
- Chlorine (bleach)

https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html

Can the masks be reused after “hanging to dry”?

Additional guidance forthcoming

- The virus needs a host cell to survive
- SARS-CoV-2 can survive 3 hours in air, 4 hours on a copper surface, up to 24 hours on cardboard surfaces and up to 72 hours on a stainless or a plastic surface
- Polypropylene which on the external surface of an N 95 mask is a hydrophobic plastic material with zero moisture content
- Some researchers have recommended rotating through a series of masks, so that worn masks can “rest” and passively become virus-free again
- Sites are numbering respirators, drying them, and reusing in the numbered sequence after 5 days. Use of brown paper bags to pull moisture from masks is also being done

1. *https://www.nejm.org/doi/10.1056/NEJMc2004973*
2. *https://utrf.tennessee.edu/information-faqs-performance-protection-sterilization-of-masks-against-covid-19/*
3. *https://www.cambridge.org/core/journals/infection-control-and-hospital-epidemiology/article/absence-of-contamination-of-personal-protective-equipment-ppe-by-severe-acute-respiratory-syndrome-coronavirus-2-sarscov2/EA37207FECDD23BE900526CEE5BA9430*

How much contamination is there on the masks?

- Researchers in Singapore swabbed N95 face masks, goggles and shoes of 30 health care workers as they exited rooms of 15 patients with COVID-19

No viral genetic material was detected.

  - Suggests extended use of masks and goggles might work, in certain conditions
  - The study might have missed some virus on masks due to the limited way researchers tested the masks
  - Patients were in isolation rooms with 12 air changes per hour

Conditions might differ at other health care facilities

https://www.cambridge.org/core/journals/infection-control-and-hospital-epidemiology/article/absence-of-contamination-of-personal-protective-equipment-ppe-by-severe-acute-respiratory-syndrome-coronavirus-2-sarscov2/EA37207FECDD23BE900526CEE5BA9430

Is it possible to avoid contamination of the N-95 respirators?

- Contamination of the respirator surface can be potentially avoided by wearing a medical mask over it, or using a face shield that can be cleaned
- Committee report by the US National Academy of Sciences on the possibility of reusing respirators during an influenza pandemic in 2006 could not identify any existing method that effectively
  - Removes the viral threat
  - Harmless to the user
  - Does not compromise the integrity of the facemask

1. https://www.ecdc.europa.eu/en/publications-data/cloth-masks-sterilisation-options-shortage-surgical-masks-respirators
2. https://www.nap.edu/catalog/11637/reusability-of-facemasks-during-an-influenza-pandemic-facing-the-flu

Can the masks be sterilized by heat treatment?

- It is reported, SARS CoV-2 cannot survive 65^0C for 30 minutes
  - It should be safe to re-use the mask after sterilizing in hot air at 70^0 C for 30 minutes
- It is recommended to suspend the masks in the hot air oven without contacting or putting the masks too close to a metal surface
- The respirator can be hung in the oven using a wood or a plastic clip on its edge of non-breathing zone or put on a wood grill at least 6 inches away from a metal surface

https://utrf.tennessee.edu/information-faqs-performance-protection-sterilization-of-masks-against-covid-19/

Can the masks be sterilized using steam/ water?

- Some studies have shown that the electric decay (efficiency) of the respirator is unnoticeable by sterilization using 125^0C steam for three minutes
- The charge loss or the filtration efficacy (FE) degradation is only in the range of 0.5%
  - i.e., the retained filtration efficacy (FE) is 98.5% for N 95 having an initial FE of 99% after the heat treatment at 70^0C for 24 hours accordingly

Limited evidence exists to support this methodology

1. Cloth masks and mask sterilization as options in case of shortage of surgical masks and respirators – 26 March 2020. Stockholm: ECDC; 2020.
https://www.ecdc.europa.eu/sites/default/files/documents/Cloth-face-masks-in-case-shortage-surgical-masks-respirators2020-03-26.pdf
2. https://utrf.tennessee.edu/information-faqs-performance-protection-sterilization-of-masks-against-covid-19/

Can the facial masks be sterilized using alcohol?

No

Alcohol will penetrate the fabric and the **charges will be erased** by either alcohol liquid or its vapor

Can Facial Masks be Disinfected for Re-use?

(Measurement results by 4C Air Inc.)

Samples	Meltblown fiber filtration media		Static-charged cotton		E. Coli. Disinfection Efficiency
	Filtration efficiency (%)	Pressure drop (Pa)	Filtration efficiency (%)	Pressure drop (Pa)	
70°C hot air in oven, 30min	96.60	8.00	70.16	4.67	>99%
UV light, 30min	95.50	7.00	77.72	6.00	>99%
75% alcohol, soaking and drying	56.33	7.67	29.24	5.33	>99%
Chlorine-based disinfection, 5min	73.11	9.00	57.33	7.00	>99%
Hot water vapor from boiling water, 10min	94.74	8.00	77.65	7.00	>99%
Initial samples before treatment	96.76	8.33	78.01	5.33	

Conclusions: DO NOT use alcohol and chlorine-based disinfection methods. These will remove the static charge in the microfibers in N95 facial masks, reducing filtration efficiency. In addition, chlorine also retains gas after de-contamination and these fumes may be harmful.

Table 2: Data supplied courtesy of Professor Yi Cui | Materials Science and Engineering, Stanford University and Professor Steven Chu | Physics and Molecular & Cellular Physiology, Stanford University on behalf of 4C Air Incorporated.

https://stanfordmedicine.app.box.com/v/covid19-PPE-1-1

Can the facial masks be sterilized using chlorine?

No

Chlorine retains gas after de-contamination (skin and respiratory irritants) which remained after multiple strategies were used to remove them

These chlorine fumes may be harmful

Can Facial Masks be Disinfected for Re-use?

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Chlorine-based disinfection, 5min	73.11	9.00	57.33	7.00	>99%
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https://stanfordmedicine.app.box.com/v/covid19-PPE-1-1

Ethylene oxide is a method with serious limitation

- Ethylene oxide **may be harmful to the wearer**
- Long aeration cycles are needed to ensure removal of highly toxic EtO gas.
- Ethylene oxide is carcinogenic and teratogenic
- Chronic inhalation of ethylene oxide has been linked to neurologic dysfunction and may cause other harmful effects to the wearer

Ethylene Oxide is not a recommended method for decontaminating N 95 respirators

Decontamination and Reuse of Filtering Facepiece Respirators – 10 April 2020. Atlanta: CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html

Can the masks be decontaminated using liquid hydrogen peroxide?

- Submerging N95 masks in liquid hydrogen peroxide showed no negative effect on filtration performance
  - Six N95 models tested demonstrated no changes in filter performance after three cycles of decontamination in liquid hydrogen peroxide
- N95 fit and disinfection efficacy were not assessed for this method

Limited evidence exists to support this methodology

1. *Bergman, M., et al., Evaluation of Multiple (3-Cycle) Decontamination Processing for Filtering Facepiece Respirators. Journal of Engineered Fibers and Fabrics, 2010. 5(4): p. 33-41.*
2. *Viscusi, D.J., King, W.P., Shaffer, R.E., Effect of decontamination on the filtration efficiency of two filtering facepiece respirator models. Journal of the International Society for Respiratory Protection, 2007. 24: p. 93-107*

What are the most promising methods for decontaminating N95 masks?

- Hydrogen peroxide vapour, ultraviolet irradiation and moist heat
- These methods do not appear to break down filtration or compromise the N95
- However, many of these methods can only be used for a limited number of times on the same mask and limited evidence exists for all three techniques

Decontamination and Reuse of Filtering Facepiece Respirators – 10 April 2020. Atlanta: CDC; 2020. https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html

Can N95 masks be decontaminated using hydrogen peroxide vapour?

- Investigations into hydrogen peroxide vapour decontamination of N95s provides evidence of minimal effect to filtration and fit while demonstrating 99.9999% efficiency in killing bacterial spores[1]
- Filtration performance of the ten N95 models tested was not impacted while showing a 6-log reduction in tested spores
- However, other studies found that three cycles of treatment using this technique negatively affected filtration performance[2]
- This is a promising method with a potential for high capacity throughput, but certain systems may be more compatible with decontamination of N95 masks

Limited evidence exists to support this methodology

1. Battelle. Final Report for the Bioquell Hydrogen Peroxide Vapor (HPV) Decontamination for Reuse of N95 Respirators. 2016; Available from: https://www.fda.gov/emergency-preparedness-and-response/mcm-regulatory-science/investigating-decontamination-and-reuse-respirators-public-health-emergencies

2. Bergman, M., et al., Evaluation of Multiple (3-Cycle) Decontamination Processing for Filtering Facepiece Respirators. Journal of Engineered Fibers and Fabrics, 2010. 5(4): p. 33-41.

Can N95 masks be decontaminated using moist heat?

- Moist heat, consisting of ~60°C and 80% relative humidity caused minimal degradation in the filtration and fit performance of tested N95s[1]
- One study showed that N95 masks contaminated with H1N1 influenza virus, treated with moist heat of 65°C and 85% RH, achieved a 99.99% reduction in virus[2]
- One limitation of the moist heat method is the uncertainty of the disinfection efficacy for various pathogens

Limited evidence exists to support this methodology

1. *Viscusi, D.J., et al., Impact of three biological decontamination methods on filtering facepiece respirator fit, odor, comfort, and donning ease. Journal of Occupational and Environmental Hygiene, 2011. 8(7): p. 426-36.*
2. *Heimbuch, B.K., et al., A pandemic influenza preparedness study: use of energetic methods to decontaminate filtering facepiece respirators contaminated with H1N1 aerosols and droplets. American Journal of Infection Control, 2011. 39(1): p. e1-e9.*

Can N95 masks be decontaminated using ultraviolet irradiation?

- UV irradiation is a promising method but the disinfection efficacy is dependent on dose delivered
- Acceptable filtration performance was recorded for eleven models exposed to various UV doses ranging from roughly 0.5–950 J/cm^2 and irradiation was shown to have minimal effect on mask fit[1]
- Not all UV lamps provide the same intensity thus treatment times would have to be adjusted accordingly
- Proper precautions are required to avoid UV exposure to skin or the eyes

Limited evidence exists to support this methodology

1. *Viscusi, D.J., King, W.P., Shaffer, R.E., Effect of decontamination on the filtration efficiency of two filtering facepiece respirator models. Journal of the International Society for Respiratory Protection, 2007. 24: p. 93-107.*
2. *https://www.nebraskamed.com/sites/default/files/documents/covid-19/n-95-decon-process.pdf*

Where can I find the protocol to decontaminate?

Ultraviolet germicidal irradiation (UVGI)	0.5–1.8 J/cm²	Influenza A (H1N1) Avian influenza A virus (H5N1), low pathogenic Influenza A (H7N9), A/Anhui/1/2013 Influenza A (H7N9), A/Shanghai/1/2013 MERS-CoV SARS-CoV H1N1 Influenza A/PR/8/34 MS2 bacteriophage	99.9% for all tested viruses	12, 13, 14
Microwave generated steam	1100–1250 W microwave models (range: 40 sec to 2 min)	H1N1 influenza A/PR/8/34	99.9%	14
Microwave steam bags	1100 W, 90 sec (bags filled with 60 mL tap water)	MS2 bacteriophage	99.9%	15
Moist heat incubation	15–30 min (60°C, 80% RH)	H1N1 influenza A/PR/8/34	99.99%	14

Decontamination and Reuse of Filtering Facepiece Respirators – 10 April 2020. Atlanta: CDC; 2020.
https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html

Where can I find the protocol to decontaminate?

Vaporous hydrogen peroxide (VHP)	**Battelle report:** Bioquell Clarus C HPV generator: The HPV cycle included a 10 min conditioning phase, 20 min gassing phase at 2 g/min, 150 min dwell phase at 0.5 g/min, and 300 min of aeration. **Bergman et. al.:** Room Bio-Decontamination Service (RBDS™, BIOQUELL UK Ltd, Andover, UK), which utilizes four portable modules: the Clarus® R HPV generator (utilizing 30% H_2O_2), the Clarus R20 aeration unit, an instrumentation module and a control computer. Room concentration = 8 g/m³, 15 min dwell, 125-min total cycle time. **Kenney personal communication:** Bioquell BQ-50 generator: The HPV cycle included a 10 minute conditioning phase, 30–40 min gassing phase at 16 g/min, 25 min dwell phase, and a 150 min aeration phase.	*Geobacillus stearothermophilus spores* T1, T7, and phi-6 bacteriophages	>99.999%	3, 4, 6

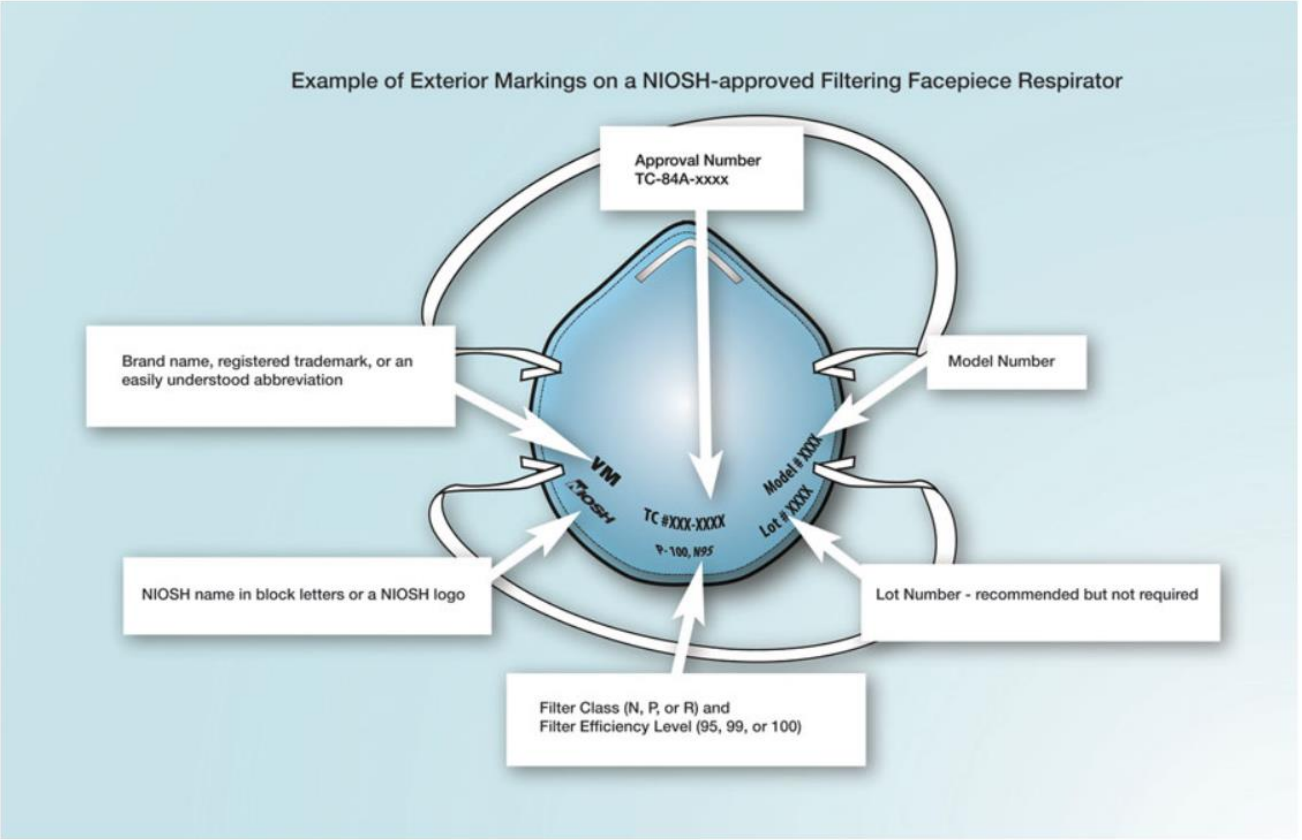
Decontamination and Reuse of Filtering Facepiece Respirators – 10 April 2020. Atlanta: CDC; 2020.
https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html

When you shouldn’t reuse a respirator?

- **After caring for any patient co-infected with an infectious disease requiring contact precautions**
- When the respirator is:
  - **Soiled with bodily fluids**
  - **When it gets wet**
  - **It can no longer be properly fitted**
  - **Breathing through the respirator becomes difficult**
  - **Immediate re-use after an aerosol-generating procedure** is not recommended as it is considered heavily contaminated

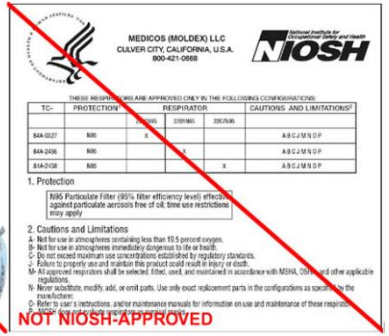
1. https://www.ecdc.europa.eu/sites/default/files/documents/Cloth-face-masks-in-case-shortage-surgical-masks-respirators2020-03-26.pdf
2. https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html

How do I know if the N95 mask is of sufficient quality?



https://www.cdc.gov/niosh/npptl/usernotices/counterfeitResp.html

Examples of Counterfeit Respirators



https://www.cdc.gov/niosh/npptl/usernotices/counterfeitResp.html

Face Covers and Cloth masks
When and How to use?

In Healthcare facility we use reusable cloth masks?

- Limited clinical research evidence on the use of cloth face masks
- Available evidence shows they are less protective than surgical masks
  - Penetration of particles through cloth reported to be high, In one study, 40–90% of particles penetrated the mask
  - May increase the risk of infection due to moisture
  - Liquid diffusion and retention of the virus
  - In a cluster RCT, cases of influenza-like illness and **laboratory-confirmed viral illness were significantly higher** among healthcare workers using cloth masks **compared to** the ones using **surgical masks**

Home-made cloth masks are proposed as a last-resort interim solution by the US CDC until availability of standard PPE is restored

1. https://www.ecdc.europa.eu/en/publications-data/cloth-masks-sterilisation-options-shortage-surgical-masks-respirators
2. https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/face-masks.html

How safe is cloth mask use in healthcare facilities?

- A 2015 study in Vietnam found hospital **HCW wearing cloth masks** were **more likely to become infected** with respiratory and flu-like illnesses **than** people **wearing disposable surgical masks**
  - **Cloth masks stopped 3 %** of particles **vs. medical masks stopped 56 %**

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4420971/?fbclid=IwAR2h04fxKToM4oHN8z8gV5GOZtuOsBNzScOTxlbsmT4VTKJN0JPGfgjKOhk

Can healthcare workers providing clinical care use cloth masks and how long can they be used?

- Ideally, healthcare workers should not use cloth masks
- A homemade mask isn't PPE, but if nothing else is available it may be better than not having anything on your face (but may not be)
- If a healthcare worker must resort to using a homemade mask, it should definitely be paired with a face shield
- When a masks becomes moist it should changed immediately.

https://www.ecdc.europa.eu/sites/default/files/documents/Cloth-face-masks-in-case-shortage-surgical-masks-respirators2020-03-26.pdf

Can staff (receptionist, guards) be given cloth masks instead of disposable surgical masks to conserve PPE?

- Cloth/homemade masks are not considered PPE
- The use of cloth masks is noted as a crisis alternative when no facemasks available
  - Receptionist/guards should not only rely on facemasks
  - Consider **engineering controls** that can assist them to perform their job without need for PPE by putting up screen or barrier between guard/receptionist and patients
- <u>If these staff are not in close contact with patients, surgical mask is sufficient</u>

No direct contact with patients

Physical barriers (e.g., glass or plastic screens) at registration desk are encouraged

Maintain spatial distance at least 1m

https://www.ecdc.europa.eu/sites/default/files/documents/Cloth-face-masks-in-case-shortage-surgical-masks-respirators2020-03-26.pdf

Should public be wearing cloth mask/face covers even if they are not symptomatic?

- Experts have stated, mask use by public could decrease the chance of respiratory droplets transferring the virus from one person to another
- CDC now recommends the **use of face covers** but not medical masks or N 95 respirators for public as
  - significant portion of individuals with coronavirus lack symptoms (“asymptomatic”) and that even those who eventually develop symptoms (“pre-symptomatic”) can transmit the virus to others before showing symptoms
- MoHFW recommends use of cloth face covers for public in crowded areas

1. https://www.mohfw.gov.in/pdf/Advisory&ManualonuseofHomemadeProtectiveCoverforFace&Mouth.pdf
2. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html#studies
3. Wei WE LZ, Chiew CJ, Yong SE, Toh MP, Lee VJ. Presymptomatic Transmission of SARS-CoV-2 — Singapore, January 23–March 16, 2020. MMWR Morbidity and mortality weekly report. 2020;ePub: 1 April 2020.Rothe C, Schunk M, Sothmann P, et al.
4. Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany. The New England journal of medicine. 2020;382(10):970-971.

What CDC recommends in the latest advisory for public regarding face covers for COVID-19?

- CDC continues to study the spread and effects of the novel coronavirus across the United States. Currently advised public the following

Cover your mouth and nose with a cloth face cover when around others

- You could spread COVID-19 to others even if you do not feel sick
- Everyone should wear a cloth face cover when they have to go out in public, for example to the grocery store or to pick up other necessities.
- Cloth face coverings should not be placed on young children under age 2, anyone who has trouble breathing, or is unconscious, incapacitated or otherwise unable to remove the mask without assistance.
- The cloth face cover is meant to protect other people in case you are infected.
- **Do NOT use a facemask meant for a healthcare worker**
- Continue to keep about 6 feet (2 meter) between yourself and others. The cloth face cover is not a substitute for social distancing

https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html, Accessed on 05, April 2020

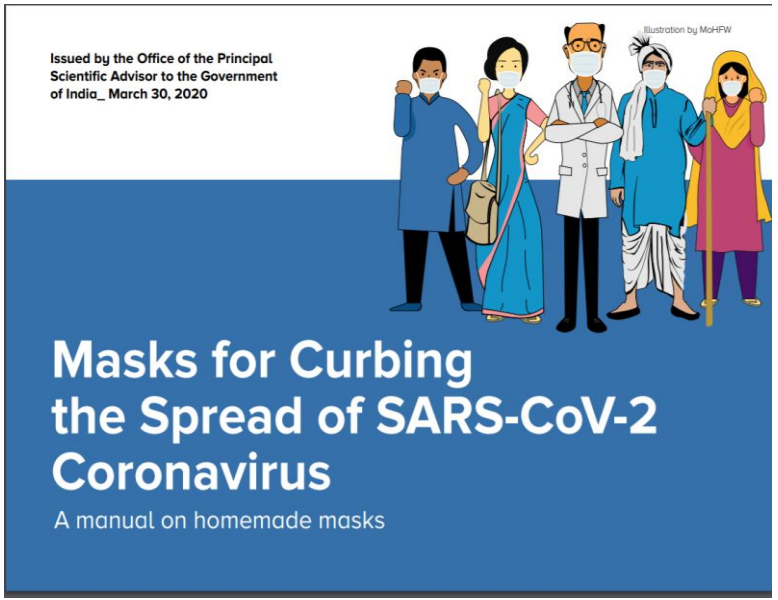
Are homemade cloth masks/ face covers effective?

- A 2008 study of homemade cloth masks worn by members of the general public published in PLOS ONE, backs that up.
  - "though imperfect, homemade masks can offer some protection against viral particles"
- A 2013 study by Cambridge University studied how aerosolized bacteria and viruses passed through home made cloth mask materials inserted into a testing device indicates,
  - only vacuum cleaner bags came close to matching surgical mask's ability to block one type of virus
  - cloth masks made from tea towels blocked the highest % of the virus

1. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0002618
2. https://www.cambridge.org/core/journals/disaster-medicine-and-public-health-preparedness/article/testing-the-efficacy-of-homemade-masks-would-they-protect-in-an-influenza-pandemic/0921A05A69A9419C862FA2F35F819D55

Are there instructions available about how to make homemade cloth masks/ face cover?

- **MoHFW** -Masks for Curbing the Spread of SARS-CoV-2 Coronavirus
  - A manual on homemade masks
- **CDC tutorial** on how to make your face cover



1. https://www.mohfw.gov.in/pdf/Advisory&ManualonuseofHomemadeProtectiveCoverforFace&Mouth.pdf
2. https://youtu.be/tPx1yqvJgf4 : accessed on 05, April, 2020

You can easily make a face cover at home to protect yourself.

Option 1. Make a Face Cover using a Sewing Machine*

Things you will need:

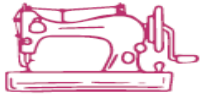
1. 

100% cotton material

*Any used cotton cloth can be used to make this face cover. The colour of the fabric does NOT matter but **you must ensure that you wash the fabric well in boiling water for 5 minutes and dry it well before making the face cover. Adding salt to this water is recommended.***

2. 
Four pieces of cloth strips

3. 
Scissors

4. 
Sewing Machine

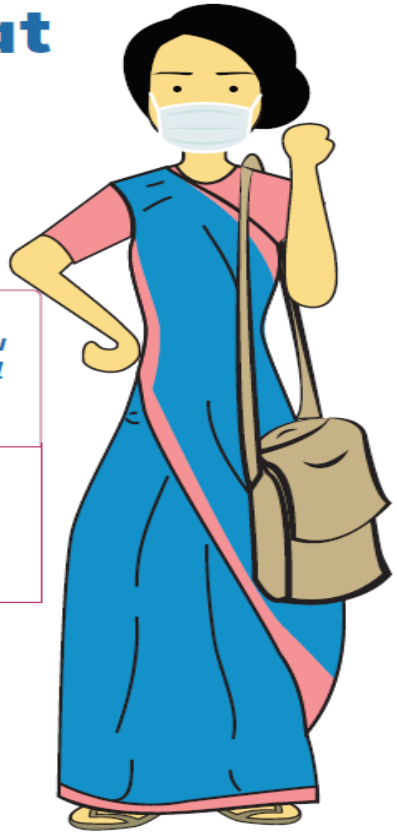


Illustration by MoHFW

Begin with

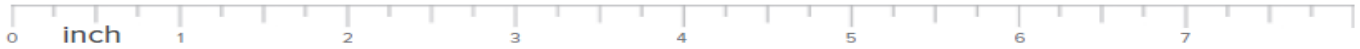
1.a Cutting Fabric – Cut cloth for the face cover at the following sizes as required:

- Adult: 9 inch x 7 inch
- Child: 7 inch x 5 inch

For Adult Size Face Cover

1.b Cutting Strips– Cut 4 strips for tying and piping from cloth: **Two pieces at 1.5”x 5” and Two pieces at 1.5”x 40”**

**You can also make this face cover without a sewing machine*

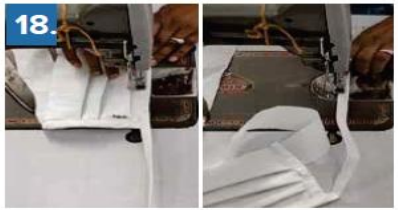


Inch(“)=2.5cms

How many fold should a cloth mask should have?

Secure the pleats with piping on both sides as shown above. *Take extra care to keep all pleats facing downward as shown.*

Now begin attaching the long 40" strips used for tying the face cover to the top and bottom as shown.



Once again fold both these strips three times and stitch as shown above.

Manual on DIY Face Covers_India_5

Is there a protocol for disinfection and reuse of cloth masks?

- No specifications for use and disinfection of cloth masks in the context of patients presenting to health facilities exist
- A homemade mask would have to be
  - laundered after every use following standard linen reprocessing using a commercial washer, laundry detergent, and hot (60-90°C) water

1. https://apps.who.int/iris/rest/bitstreams/1271257/retrieve
2. https://www.who.int/news-room/q-a-detail/q-a-on-infection-prevention-and-control-for-health-care-workers-caring-for-patients-with-suspected-or-confirmed-2019-ncov

Are there instructions available about how to make an in-house face shield?

finished Budmen Face Shield

finished Wolf Disposable Face Shield

finished Badger Shield

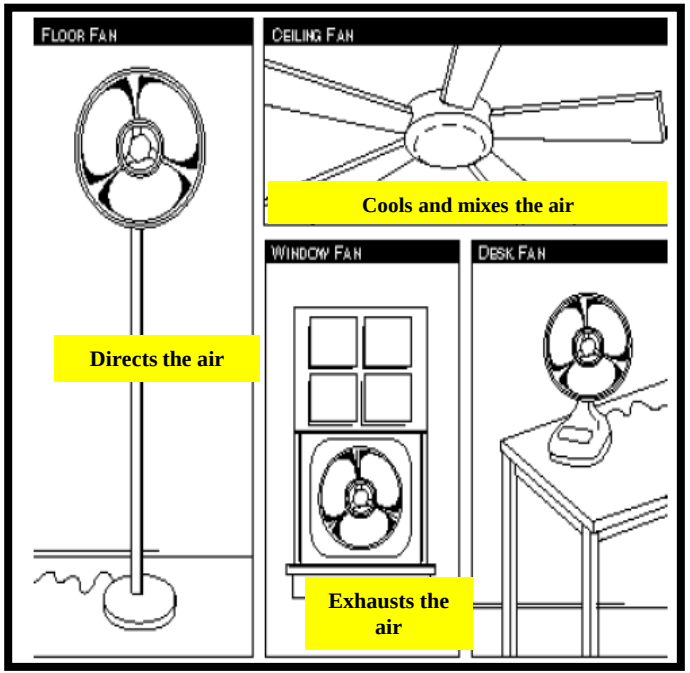
https://docs.google.com/presentation/d/1g79DXrQ8eSzrWWUsku43f9AKUjx26jAVnt1EFQa3heQ/mobilepresent#slide=id.p1

Airborne Infection Control - Ventilation

What factors should be considered for using fans in the isolation wards?

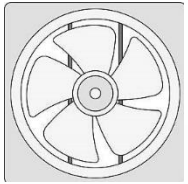
Choose the fan based on what you want the fan to do

- Cool ambient temperature through dissipation of radiant heat
- Provide directionality in order to improve ventilation
  - Intake – suck air out of the room
  - Out-take – blow air in the room



What factors should be considered for using fans in isolation wards?

- Direction of fans should deflect air away from health care workers
  - i.e. airflow should go **from health care worker to patient**
- The use of either fans pictured would work



Can I use fans to direct airflow?

- Yes, that is the best use of fans
- The best placement for fans is
  - in or near windows
  - to help air exhaust out of room

Make sure fans aren't exhausting air into busy corridors

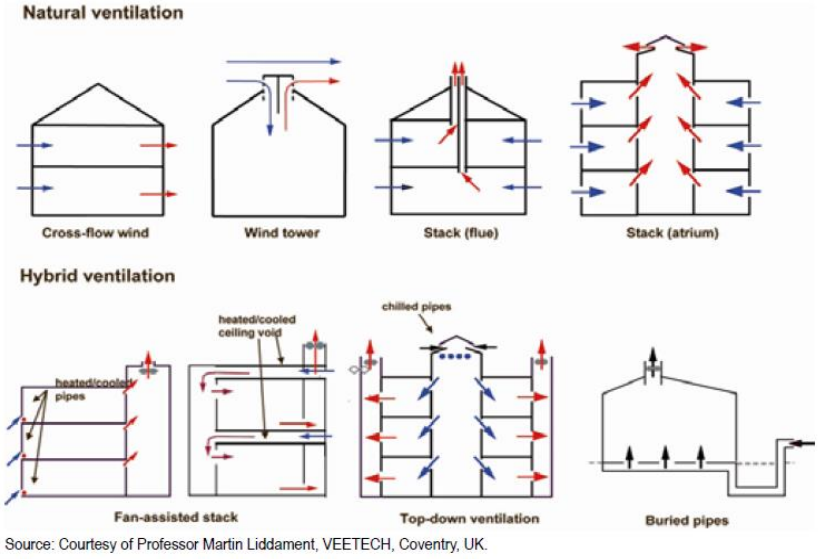
https://tbcindia.gov.in/index1.php?lang=1&level=1&sublinkid=4519&lid=3015

What is the risk to staff/patients if the vent from isolation ward open to other parts of the hospital?

- There are a lot of factors to consider
  - Are these return vents?
  - Where in the hospital does the air go?
  - Does the air vent to wards with immunosuppressed patients?
- **Risk should be low for staff and patients** in other parts of the hospital since the main mode for COVID-19 is droplet transmission not airborne transmission

Do you have any examples of how this can be managed?

- Main principle is to ensure adequate ventilation in your facility
- Natural ventilation through the use of windows, open breezeways, etc.
- Hybrid ventilation uses fans and other means to assist and direct ventilation



Source: Courtesy of Professor Martin Liddament, VEETECH, Coventry, UK.

Figure 5.1 Different natural ventilation and hybrid ventilation systems

1. WHO Severe Acute Respiratory Infections Treatment Centre, WHO 2020 https://www.who.int/publications-detail/severe-acute-respiratory-infections-treatment-centre
2. WHO Natural Ventilation for Infection Control in Health-care Settings, WHO 2009 https://www.who.int/water_sanitation_health/publications/natural_ventilation.pdf

What are the minimum Air Changes per hour (ACH) requirements for health care settings?

- For isolation facility
  - **Old single rooms, ventilation with > 6 ACH per hour**
  - **New/renovated negative pressure AIIR rooms > 12 ACH per hour**

Table 4: Minimum air-changes per hour required for various health care settings

Type of Health-Care Setting	Minimum Air-Changes per Hour (ACH)	Minimum hourly averaged ventilation rates (liters/second/patient)
Registration areas	>6 ACH[3]	>40 l/s/patient
Outpatient departments and their waiting areas	>6 ACH	>40 l/s/patient
Inpatients departments	>6 ACH	>40 l/s/patient
High-risk settings and their waiting areas ART centres	>12 ACH[4]	80–160 l/s/patient

[3] Equivalent to >40 liters/second (l/s) for a 4×2×3m (24 m^3) room.
[4] Equivalent to >80 l/s for a 4×2×3m (24 m^3) room.

1. https://www.cdc.gov/coronavirus/2019-ncov/infection-control/infection-prevention-control-faq.html
2. https://tbcindia.gov.in/index1.php?lang=1&level=1&sublinkid=4519&lid=3015

How to calculate Air Changes per Hour(ACH)?

- Air flow rate=Velocity(m/s)X Area(m^2 or ft)
- ACH (h^{-1})= Airflow rate (m^3/h or ft^3/h) /Room volume (m^3or ft^3/h)x60

OR

https://www.cdc.gov/mmwr/pdf/rr/rr5417.pdf

How to calculate ventilation flow rate?

As a rule of thumb, wind-driven natural ventilation rate through a room with two opposite openings (e.g. a window and a door) can be calculated as follows:

$$\text{ACH} = \frac{0.65 \times \text{wind speed (m/s)} \times \text{smallest opening area (m}^2\text{)} \times 3600 \text{ s/h}}{\text{room volume (m}^3\text{)}}$$

Ventilation rate (l/s) = 0.65 × wind speed (m/s) × smallest opening area (m2) × 1000 l/m^3

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

Example; How can opening windows and doors increase the number of Air Changes per hour in a ward?

- Table below provides estimates of the ACH and ventilation rate due to wind alone, at a wind speed of 1 m/s
  - assuming a ward of size 7 m (length) × 6 m (width) × 3 m (height)
  - with a window of 1.5 × 2 m^2 and a door of 1 m^2 × 2 m^2 (smallest opening)

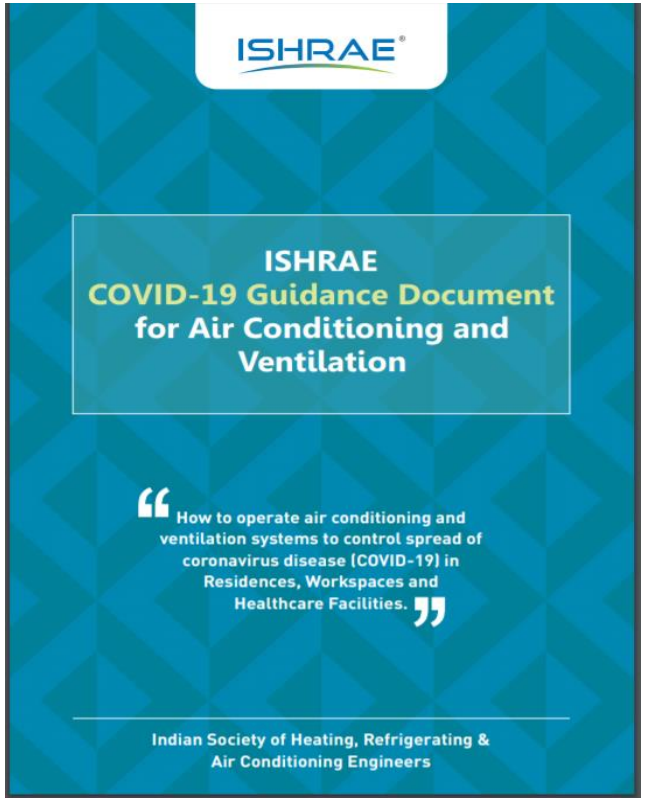
Estimated air changes per hour and ventilation rate for a 7 m × 6 m × 3 m ward

Openings	ACH	Ventilation rate (l/s)
Open window (100%) + open door	**37**	**1300**
Open window (50%) + open door	**28**	**975**
Open window (100%) + door closed	**4.2**	**150**

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

COVID-19 guidance on Air conditioning

- The questions being asked are whether COVID-19 spread can be accelerated or controlled by heating, ventilating, air-conditioning and refrigeration (HVACR) systems, depending on how the system is designed and operated
- Indian Society of Heating, Refrigerating & Air Conditioning Engineers (ISHRAE) in discussion with COVID-19 task force has developed guidelines for air conditioning systems to limit COVID-19 spread



https://mes.gov.in/sites/default/files/COVID%2019%20GUIDELINES%20FOR%20OPERATION%20OF%20AIR%20CONDITIONING%20VENTILATION%20SYSTEM%20DT%2028%20APR%202020_1.pdf

Do you have any examples of how this can be managed?

Examples of architecture that promote natural ventilation “TB centers experience”

Pre-1950’s hospital designed to promote ventilation

- High ceilings with widely spaced beds
- Windows on both sides to encourage cross breeze

(B) General respiratory ward (C) Drug-susceptible TB ward

Figure H.1 Two views of the single-storey tuberculosis inpatient ward; the perimeters are free from obstruction, allowing natural ventilation throughout the year

Singapore TB Control Unit, Tan Tock Seng Hospital

- Windows on both sides slatted and kept open for natural ventilation
- Long sloping roof overhanging windows to keep out rain

WHO Natural Ventilation for Infection Control in Health-care Settings, WHO 2009
https://www.who.int/water_sanitation_health/publications/natural_ventilation.pdf

Do you have any examples from Tuberculosis centers of how this can be managed?

Improving ventilation in a crowded OPD waiting room in Hospital Nacional Dos de Mayo, Lima Peru

- Skylight was sealed and covered with plastic tarp
- Tarp was removed and glass sections were raised on 1M stilts to allow air to enter
- Ventilation improved from 5 to 15 air changes per hour (ACH)

(A) (B)

(A) Photo of the general outpatient waiting room. (B) The ventilation rate increased from a mean of 6.5 ACH to 15 ACH with the opening of skylights in the general outpatient waiting room.

Figure F.3 **Improving natural ventilation in the outpatient waiting room of the Hospital Nacional Dos de Mayo**

WHO Natural Ventilation for Infection Control in Health-care Settings, WHO 2009
https://www.who.int/water_sanitation_health/publications/natural_ventilation.pdf

Do you have any examples of how this can be managed?

Migrants stay in individual units while awaiting screening

- Goal to provide safe conditions and prevent transmission of airborne infection
- Each unit has 3 windows and a 0.8m gap between top of wall and eaves
- Recommendations were to
  - Extend eaves of roof from 450 mm to 1000 mm to allow windows to stay open
  - Increase spacing between units

IOM isolation center in Damak, Nepal

Figure I.1 The IOM Holding Centre in Damak

Figure I.2 Individual isolation unit (left), and the gap between the vertical wall and the roof for natural ventilation (right)

WHO Natural Ventilation for Infection Control in Health-care Settings, WHO 2009
https://www.who.int/water_sanitation_health/publications/natural_ventilation.pdf

Triage

Ways for patients to let health facilities know that they are seeking care for respiratory symptoms ahead of their visit

What is triage strategy for COVID-19? (1 of 2)

Set up the Isolation rooms or Waiting Area for Suspected COVID-19 Patients as below:

- Identify single isolation rooms and immediately isolate patients at high risk for COVID-19 with doors closed
- If separate room not possible
  - designate a separate, well-ventilated area where patients at risk for COVID-19 can wait
  - This area should have benches, stalls or chairs separated by at least 1-meter distance
  - patients waiting should wear facemask, including alternatives to face masks (e.g. scarf or bandana)

1. https://ncdc.gov.in/WriteReadData/l892s/4241764618158452915 9.pdf
2. https://www.cdc.gov/coronavirus/2019-ncov/hcp/non-us-settings/sop-triage-prevent-transmission.html?deliveryName=USCDC_2018-DM24744
3. https://apps.who.int/iris/bitstream/handle/10665/331492/WHO-2019-nCoV-HCF_operations-2020.1-eng.pdf

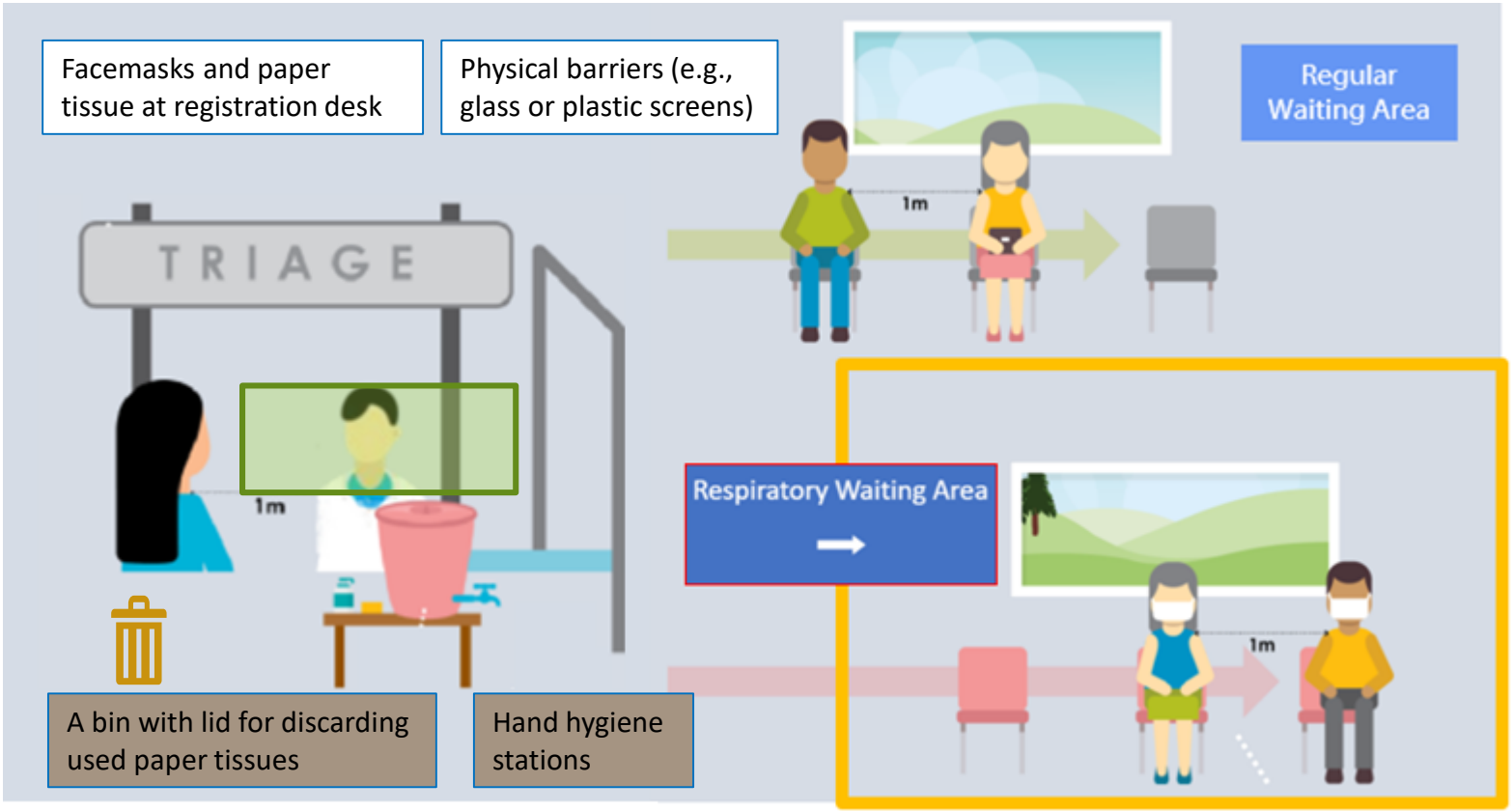
What is triage strategy for COVID-19? (2 of 2)

Set up the Isolation rooms or Waiting Area for Suspected COVID-19 Patients as below cont':

- Reduce time of these patients in waiting area, which may include
  - allocation of additional staff to triage of patients at high risk for COVID-19
  - setting up notification system that allows patients a to wait in a personal vehicle (if medically appropriate) and notified by phone
- Limit the number of accompanying family members in the waiting area for suspected COVID-19 patients
- Anyone in the "respiratory" waiting area should wear a mask including members accompanying persons

1. https://ncdc.gov.in/WriteReadData/l892s/42417646181584529159.pdf
2. https://www.cdc.gov/coronavirus/2019-ncov/hcp/non-us-settings/sop-triage-prevent-transmission.html?deliveryName=USCDC_2018-DM24744
3. https://apps.who.int/iris/bitstream/handle/10665/331492/WHO-2019-nCoV-HCF_operations-2020.1-eng.pdf

How do I set up and equip triage?



WPRO: The COVID-19 risk communication package for healthcare facilities

Sample physical barrier at triage and other strategies (1 of 3)

- If masks are not available, provide paper tissues or request the patient to cover their nose and mouth with a scarf, bandana or T-shirt during the entire triage process, including while in the waiting area.
- Ensure availability of hand hygiene stations in triage area, including in waiting areas.

Sample visual alerts to post at facility entry

STOP!

If you are experiencing cold or flu symptoms like:

- **Fever**
- **Cough**
- **Shortness of breath**

REPORT immediately to the registration desk!

What is triage strategy for COVID-19? (2 of 3)

Set up and equip your Triage Area as below:

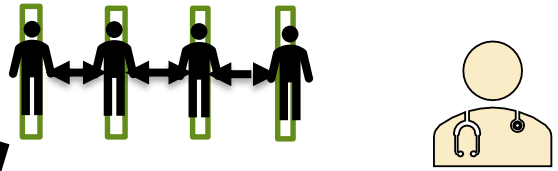
- Consider use of makeshift tents or designated areas outside health facility for pre-triaging. Place markings (paint, chalk, lines, chairs, other) every one meter apart in the registration desk to avoid close contact
- Cohort clinical staff (e.g. physicians and nurses) for physical evaluation of patients presenting with respiratory symptoms at triage.
- Update triage questionnaire to include components of COVID-19 case definition.

Picture Courtesy: Dr Senthil Kumar, M. Reddipaty PHC, Virudhu Nagar , Tamil Nadu

Outside Triage area – Signage directs patients to different areas based on symptoms

COVID-19 Symptoms

COVID-19 Triage area



One meter distance between all patients and given masks

This Photo by Unknown Author is licensed under CC BY-SA

No COVID-19 Symptoms

Hospital Triage area

One meter distance between all patients

This Photo by Unknown Author is licensed under CC BY-SA

Can Asymptomatic/pre symptomatic people spread SARS CoV-2 ?

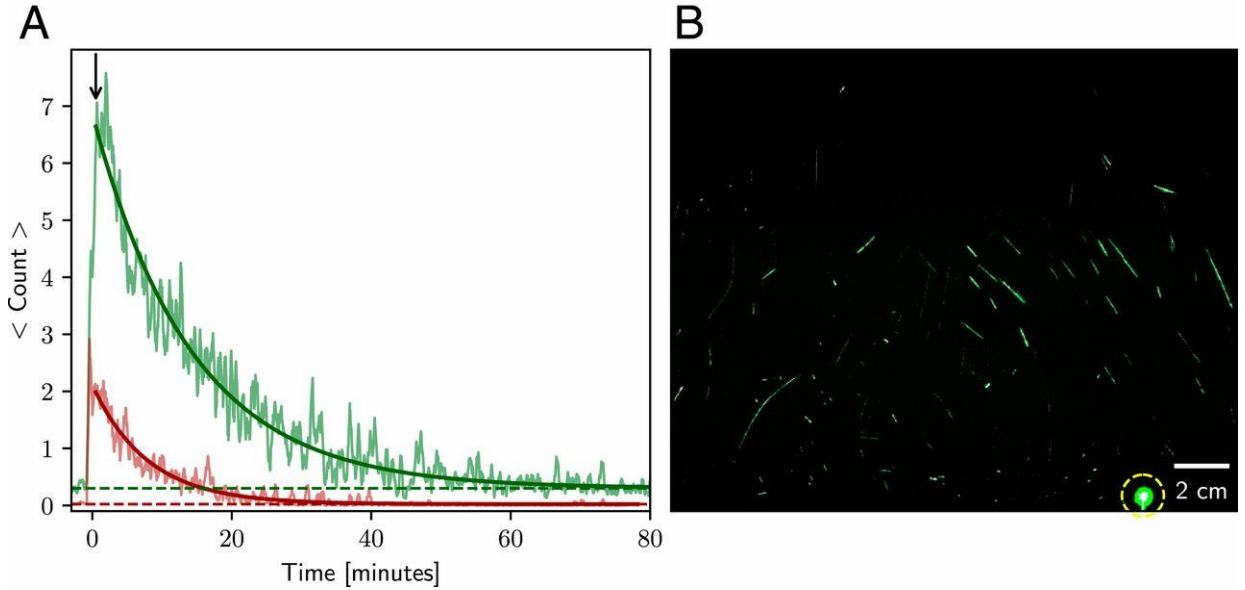
Speech droplets of asymptomatic carriers of SARS-CoV-2 may transmit disease

- Laser light scattering observations found loud speech can emit thousands of oral fluid droplets per second
- If patient is in closed, stagnant-air environment, they disappear from view after 8 minutes to 14 minutes
- Droplet nuclei of ca. 4um diameter, or 12um to 21um droplets prior to dehydration
- Medical-grade N95 masks can block particles of that size.

Valentyn Stadnytskyi et al. PNAS doi:10.1073/pnas.2006874117 ©2020 by National Academy of Sciences

Light scattering observation of airborne speech droplet nuclei

Light scattering observation of airborne speech droplet nuclei, generated by a 25-s burst of repeatedly speaking the phrase “stay healthy” in a loud voice (maximum 85 dBB at a distance of 30 cm; average 59 dBB).



Valentyn Stadnytskyi et al. PNAS doi:10.1073/pnas.2006874117 ©2020 by National Academy of Sciences

PNAS

SARS COV-2 Transmission according to stage of Infection

Table 2. SARS-CoV-2 Transmission According to Stage of Infection.

Stage of Infection*	RNA Detectable in Respiratory Samples, Blood, and Feces	Viable Virus Detectable in Respiratory Samples	Transmission Can Occur	Mechanism of Transmission†						Minimum Recommended Level of Precautions
				Droplet	Natural Aerosol	Aerosol-Generating Procedure	Direct Contact	Indirect Contact	Enteric Route	
Presymptomatic‡	Yes	Yes	Yes§	Yes	Suspected	Suspected	Suspected	Suspected	Unknown	Eye protection (goggles or face shield) Protection from droplet and contact transmission during routine care Protection from airborne and contact transmission during aerosol-generating procedure
Symptomatic	Yes	Yes	Yes	Yes	Suspected	Yes	Strongly suspected	Strongly suspected	Unknown	Eye protection (goggles or face shield) Protection from droplet and contact transmission during routine care Protection from airborne and contact transmission during aerosol-generating procedure
Postsymptomatic	Yes for limited time, occasionally prolonged	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	None

* The incubation period of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), from exposure to symptom onset, ranges from 2 to 14 days. The infectious dose is unknown. The possibility that people who remain asymptomatic throughout infection can transmit the virus remains a topic of debate. The presymptomatic stage occurs 1 to 3 days (or possibly longer) before symptom onset. The postsymptomatic stage occurs a minimum of 7 days after symptom onset and at least 3 days after the resolution of fever and improvement in respiratory symptoms.

† In transmission by droplet, large (≥5 μm) respiratory particles that are released by coughing, sneezing, or speaking land on surfaces or mucosal membranes. In transmission by natural aerosol, small (<5 μm) respiratory particles that are generated by human activities (e.g., singing) are inhaled; this does not necessarily indicate long-distance airborne transmission. In transmission by an aerosol-generating procedure, small respiratory particles that are generated by clinical procedures (e.g., intubation, extubation, use of nebulizers, or bronchoalveolar lavage) are inhaled; this does not necessarily indicate long-distance airborne transmission. In transmission by direct contact, the virus is transferred by body-surface contact. In transmission by indirect contact, the virus is transferred from a contaminated surface to a mucosal surface (e.g., eyes, nose, or mouth). In enteric transmission, the virus is transferred by the fecal–oral route; SARS-CoV-2 RNA has been detected in stool but fecal–oral spread has not been documented.

‡ Testing of patients without symptoms may be performed for preoperative screening, during pregnancy at the time of delivery, when they are unable to provide a medical or exposure history, when they live in a high-risk setting (e.g., congregate settings, including long-term care facilities), or during community surveillance activities.

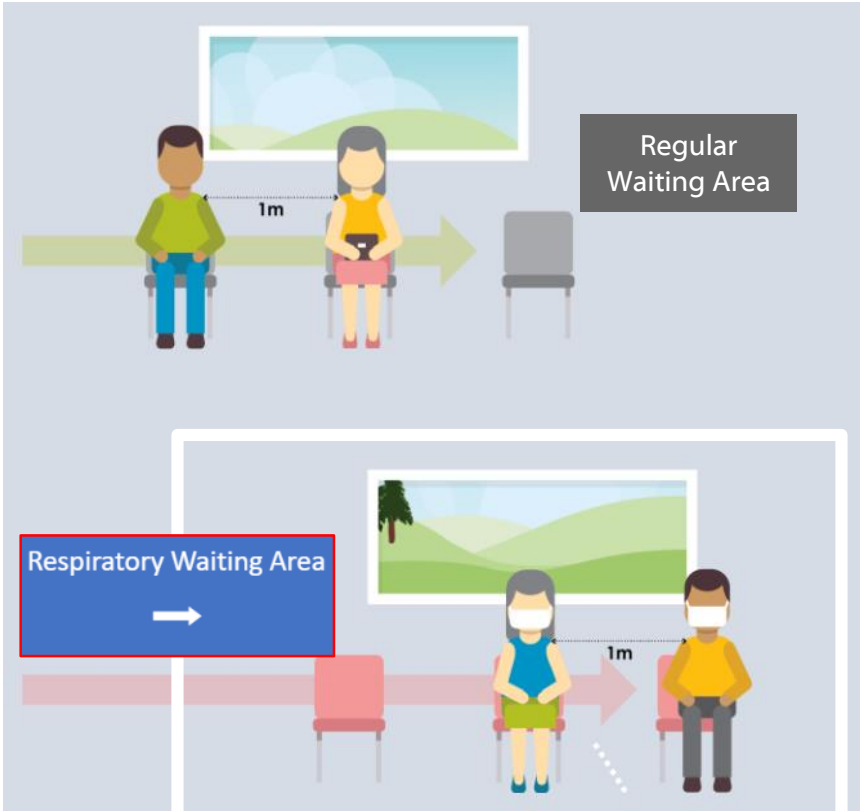
§ This information is based on case reports or case series.

https://www.nejm.org/doi/full/10.1056/NEJMcp2009249?query=featured_coronavirus

How do I Set up a “respiratory waiting area”

A separate, well-ventilated area where patients at high risk for COVID-19 can wait

- Benches, stalls or chairs separated by at **least one-meter** distance
- Dedicated toilets and hand hygiene stations
- Paper tissue, alcohol-based hand rub, and trash bin with lid
- Clear signs informing the location of “respiratory waiting areas”



How should cohorting of patients be done in the context of COVID-19?

- Patients presenting with respiratory symptoms to the ER should be sent to a waiting area exclusively for respiratory patients and should all be wearing mask for source control
- All patients in respiratory area should be triaged according to local case definition or triage algorithm.
- Those who meet the case definition should be treated in single rooms or cohorted with other patients who meet the case definition as well.
- Ideally, suspect patients and confirmed patients should be cohorted separately
  - This may not be possible if there is no laboratory testing available or in times of widespread community transmission.

https://ncdc.gov.in/index4.php?lang=1&level=0&linkid=127&lid=432

What should hospitals do to prepare for surge in number of patients with respiratory symptoms?

Follow the below steps:

- Explore alternatives to face-to-face triage and visits
- Designate an area (e.g., an ancillary building or temporary structure)
  - Identify location as a “respiratory virus evaluation center/ fever clinic” where patients with fever or respiratory symptoms can seek evaluation.
- Expand hours of operation to limit crowding at triage during peak hours
- Cancel group healthcare, elective procedures and surgeries, and non-urgent outpatient visits to ensure availability of HCWs for triage services
- Assess risk of healthcare staff for poor outcome if they contract COVID-19
  - Assign staff to outpatient, emergency rooms, inpatient, and hotlines based on their risk of poor outcomes to increase likelihood staff are available to care for patients

What do we do when we get a confirmed case?

- Provide notification to public health authorities as per MoHFW guidance
- Keep the patient in isolation
- Follow national protocols for clinical management
- Perform contact tracing and testing with quarantine / isolation as recommended per guidelines

https://www.mohfw.gov.in/pdf/RevisedNationalClinicalManagementGuidelineforCOVID1931032020.pdf

What changes do we need to make in management of cancer patients?

- Defer visits and procedures when possible
- Where possible avoid initiation of treatments and surgeries that cause immunosuppression and hospitalization

https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(20)30217-5/fulltext

How should we handle OPD visits?

- Dedicated hotline number
- Increase use of teleconferences or telemedicine
- Cancel OPD visits deemed non-essential
- Refill medications for longer periods of time

1. https://www.mohfw.gov.in/pdf/Telemedicine.pdf Accessed on 4 April 2020
2. https://mciindia.org/MCIRest/open/getDocument?path=/Documents/Public/Portal/LatestNews/Final_FAQ-TELEMEDICINE%20%206-4-2020..pdf Accessed on 4 April 2020

What are the recommendations for planned surgeries?

- Postpone unless essential for patient outcome
- Prepare OT for possible COVID-19 cases
  - Educate the surgeons
  - Develop a preparedness plan for providing essential operations during the pandemic
  - Decrease exposure of healthcare staff, particularly surgeons
  - Develop dedicated COVID-19 OT
  - Prepare for repurposing OT to support critical care patients

1. https://journals.lww.com/annalsofsurgery/Documents/Managing%20COVID%20in%20Surgical%20Systems%20v2.pdf
2. https://doi.org/10.1007/s12630-020-01617-4

Do all patients with confirmed or suspected COVID-19 need to be placed in airborne infection isolation rooms?

No

- Updated CDC Interim Infection Prevention and Control recommends placing patients in a regular examination room with the door closed
- Airborne infection isolation rooms should be reserved for patients undergoing aerosol generating procedures or for diagnoses such as active tuberculosis
- Patients with known or suspected COVID-19 should be cared for in a single-person room with the door closed or cohorted in well ventilated wards with beds at least 1 meter apart.

1. https://www.cdc.gov/coronavirus/2019-ncov/infection-control/infection-prevention-control-faq.
2. htmlhttps://www.cdc.gov/coronavirus/2019-ncov/infection-control/infection-prevention-control-faq.html

Aerosol Generating Procedures

What are some examples of aerosol generating procedures?

Aerosols generated by medical procedures are one route for the transmission of the COVID-19 virus. The following Aerosol-generating procedures (AGPs)are considered to be potentially infectious:

- Intubation, extubation and related procedures
- Tracheotomy/tracheostomy procedures
- Manual ventilation
- Open suctioning
- Bronchoscopy
- Surgery and post-mortem procedures in which high-speed devices are used
- Non-invasive ventilation (NIV) e.g. Bi-level Positive Airway Pressure (BiPAP) and continuous Positive Airway Pressure ventilation (CPAP)
- High-frequency oscillating ventilation (HFOV)
- High-flow Nasal Oxygen (HFNO)
- Induction of sputum (see glossary)
- Some dental procedures (e.g. high speed drilling)

Certain other procedures/equipment may generate an aerosol from material other than patient secretions but are not considered to represent a significant infectious risk. Procedures in this category include:

- Administration of pressurized humidified oxygen
- Administration of medication via nebulization

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/876577/Infection_prevention_and_control_guidance_for_pandemic_coronavirus.pdf

What should we do for aerosol-generating procedures (AGPs)?

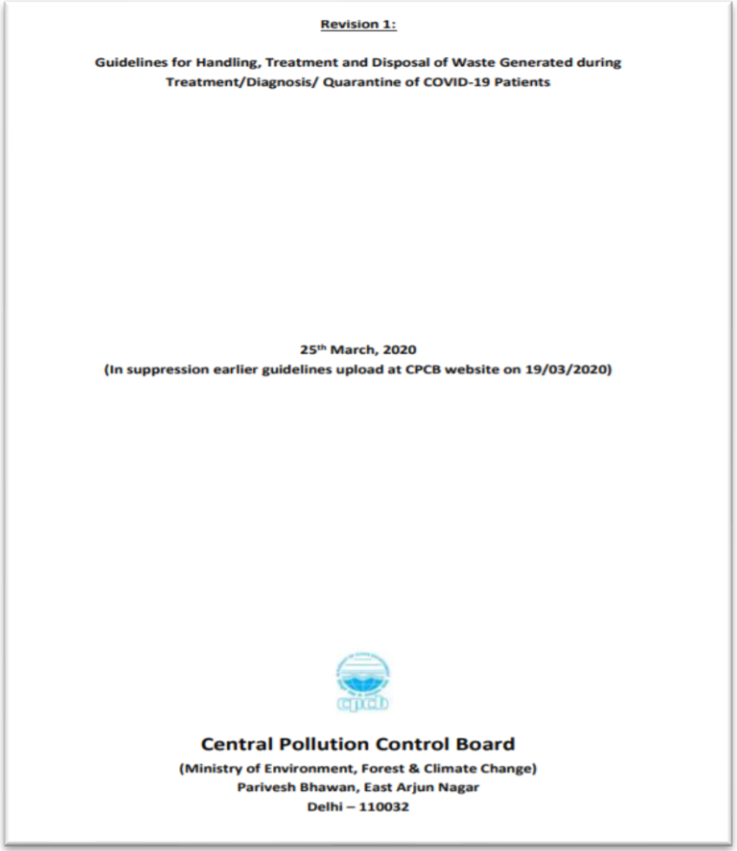
- AGP including those that induce coughing should be performed cautiously and avoided if possible
- If performed, the following should occur:
  - HCP in the room should wear an N95 or higher-level respirator, eye protection, gloves, and a gown
  - N95 masks are considered highly contaminated post procedure and should be discarded immediately
  - The number of HCP present during the procedure should be limited to only those essential for patient care and procedure support
  - Visitors should not be present for the procedure
  - AGPs should ideally take place in an AIIR
  - Clean and disinfect procedure room surfaces immediately after the procedure

https://www.ecdc.europa.eu/sites/default/files/documents/COVID-19-infection-prevention-and-control-healthcare-settings-march-2020.pdf

General Questions

Where can I refer to clear my doubts regarding COVID-19 waste in India ?

- The Central Pollution Control Board (CPCB) has revised the biomedical waste management guidelines to include specific requirements for COVID-19 treatment, diagnostic and quarantine facilities- **Revised on 18 April 2020**
- The **Biomedical Waste Management rule 2016, amendment 2018 & 2019** from **Ministry of Environment, Forest and Climate Change** was prepared in consultation with **MoHFW** to provide guidance on biomedical waste management at healthcare facilities



Revision 1:

Guidelines for Handling, Treatment and Disposal of Waste Generated during Treatment/Diagnosis/ Quarantine of COVID-19 Patients

25th March, 2020
(In suppression earlier guidelines upload at CPCB website on 19/03/2020)

Central Pollution Control Board
(Ministry of Environment, Forest & Climate Change)
Parivesh Bhawan, East Arjun Nagar
Delhi – 110032

https://ncdc.gov.in/WriteReadData/l892s/63948609501585568987.pdf
https://www.livelaw.in/pdf_upload/pdf_upload-373454.pdf

How do I discard my PPE ?

- Goggles and Face Shields, , splash proof apron, Plastic Coverall, Hazmet suit, nitrile gloves - **Red bags**
- Used disposable mask (including triple layer mask, N95 mask, etc.), head cover/cap, shoe-cover, disposable linen Gown, non-plastic or semi-plastic coverall in **Yellow Bag**

1. https://www.livelaw.in/pdf_upload/pdf_upload-373454.pdf
2. https://ncdc.gov.in/WriteReadData/l892s/63948609501585568987.pdf

How should we manage COVID-19 waste?

- CPCB has revised biomedical waste management guidelines which has specific requirements like:
  - Use of double layered bags (using 2 bags) for collection of waste in corona wards
  - Use of dedicated collection bins labelled as “COVID-19” to store COVID-19 waste and kept separately in temporary storage room prior to handing over to authorized staff
  - Maintaining separate record of corona waste
  - **Report opening or operation of COVID-19 sample collection centers** and laboratories to concerned state pollution control board (SPCB)
- It also outlines the roles and responsibilities of **common biomedical waste treatment facility**, **SPCB** and **urban local bodies**

1. https://www.livelaw.in/pdf_upload/pdf_upload-373454.pdf
2. https://ncdc.gov.in/WriteReadData/l892s/63948609501585568987.pdf

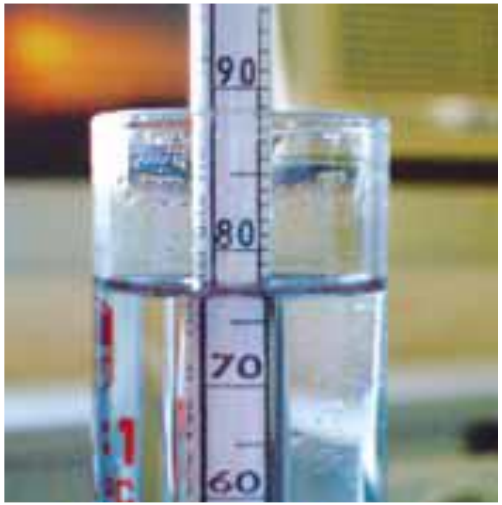
How do we handle shortage of sanitizers?

- WHO recommends local preparation of the hand sanitizer with appropriate quality control procedures
- Health-care settings currently using commercially available hand rubs should continue to use them, if they meet recognized standards for microbicidal efficacy [American Standard for Testing and Materials (ASTM or European (EN) standards] and are well accepted/tolerated by HCWs

https://www.who.int/gpsc/5may/Guide_to_Local_Production.pdf

How should we test the quality of homemade hand sanitizer including those made using the WHO protocol?

- Pre-production analysis should be made every time an analysis certificate is not available to guarantee the titration of alcohol (i.e. local production).
- Verify the alcohol concentration with the alcoholmeter and make the necessary adjustments in volume in the preparation formulation to obtain the final recommended concentration.
- Post-production analysis is mandatory if either ethanol or an isopropanol solution is used.
- Use the alcoholmeter to control the alcohol concentration of the final use solution. The accepted limits should be fixed to ± 5% of the target concentration (75%–85% for ethanol).



https://www.who.int/gpsc/5may/Guidet to Local Production.pdf

How long does SARS CoV-2 survive on surfaces?

- Transmission of coronavirus occurs much more commonly through respiratory droplets than fomites
- Novel coronavirus may remain viable for hours to days on surfaces made from a variety of materials
- A study performed by the National Institutes of Health (NIH), CDC, UCLA and Princeton University, observed that the SARS-CoV-2 was detectable in aerosols for up to three hours, up to four hours on copper, up to 24 hours on cardboard and up to two to three days on plastic and stainless steel
- That survivability of SARS-CoV-2 (COVID-19) is similar to survivability of SARS-CoV-1 (SARS)

https://www.nejm.org/doi/full/10.1056/NEJMc2004973

Is SARS-CoV-2 transmitted in Blood or Urine?

- It is not yet known whether other non-respiratory body fluids from an infected person including vomit, urine, breast milk, or semen can contain viable, infectious SARS-CoV-2.
- SARS-CoV-2 RNA has been detected in blood and stool specimens, but whether infectious virus is present in extrapulmonary specimens is currently unknown.
- Although coronaviruses usually infect the upper or lower respiratory tract, viral shedding in plasma or serum is common. Therefore, there is still a theoretical risk of transmission of coronaviruses through the transfusion of labile blood products.

https://www.cdc.gov/coronavirus/2019-ncov/hcp/faq.html

How do we handle the blood and blood products shortage during COVID-19 ?

- Ensure that donor centers are open for longer hours and adding extra days so as many people as possible can donate
- Create groups on social media for donors and let given them staggered appointments to avoid crowding
- Special awareness campaigns to boost the stock before community spread starts
- Monitor usage to avoid irrational transfusion
- Postpone elective surgeries who may need blood transfusion

National guidance for blood transfusion services in India in light of COVID-19 pandemic. National Blood Transfusion Council, MoHFW. 25 March 2020

What are the chances of COVID-19 relapse after recovery? (1 of 2)

- There have been a handful of case reports of patients with positive SARS-Cov2 results after two initially negative results
- It is unclear whether these are actually relapses, re-infection or positive tests from convalescing patients

Case series:

- Israeli passenger on the Diamond Princess cruise ship who was diagnosed with COVID-19 and treated in Japan
  - After 2 successive negative PCR tests, he was declared cured and cleared to return to Israel
  - Upon arrival, he was screened for COVID-19 again, and the results came back positive
  - Different tests and locations

https://www.upi.com/Health_News/2020/03/06/Experts-unsure-if-cured-COVID-19-patients-are-reinfected-or-relapsed/8101583529793/

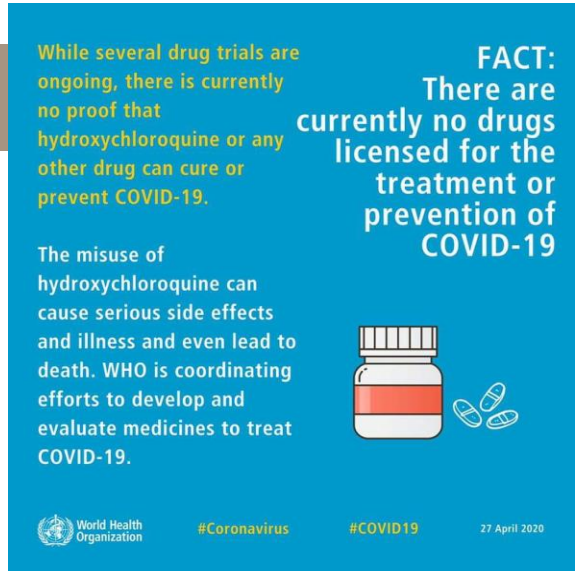
What are the chances of COVID-19 relapse after recovery? (2 of 2)

Case series, cont'd

- 14% of patients who recovered from COVID-19 and were discharged from hospitals in southern Guangdong tested positive in later checkups. Similar cases were reported in Sichuan, Hubei and Hunan
- 4 medical personnel with COVID-19 with symptomatic and radiologic improvement and 3 negative RT-PCR tests had repeatedly positive tests 5 to 13 days later and by a different manufacturer. No family members were infected

https://jamanetwork.com/journals/jama/fullarticle/2762452

Treatment Options



Where can I call with clinical management questions?

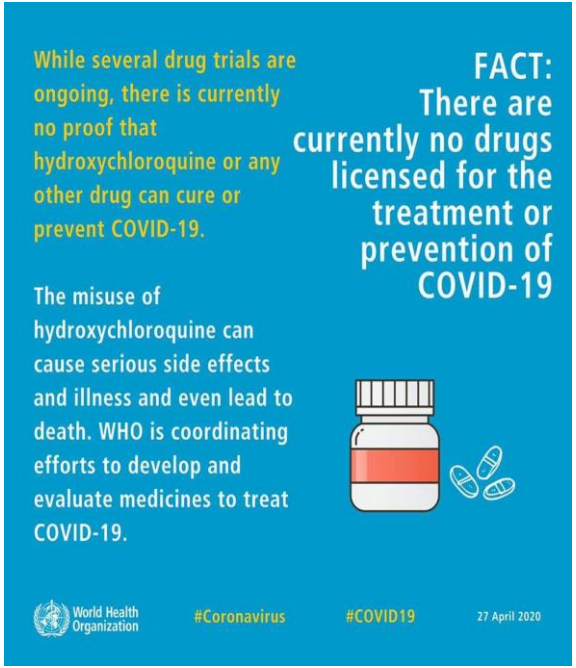
Support to Treating Physicians:

AIIMS, New Delhi is running a 24x7 helpline to provide support to the treating physicians on clinical management. The helpline number is 9971876591. The identified nodal doctor of the State, appointed for clinical management of COVID – 19 should only contact AIIMS Call Centre.

https://www.mohfw.gov.in/pdf/RevisedNationalClinicalManagementGuidelineforCOVID1931032020.pdf

What should we treat patients with?

- Current MoHFW, WHO and CDC guidelines recommend supportive treatment
- There are several planned clinical trials to look at various antivirals (Remdesivir) and other drugs like chloroquine, azithromycin etc.
- Case series and anecdotal data available
- No clear recommendations for treatment of COVID-19 beyond symptomatic support, with many study results in progress



1. https://www.mohfw.gov.in/pdf/RevisedNationalClinicalManagementGuidelineforCOVID1931032020.pdf
2. https://cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html
3. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/patient-management

Should we be giving prophylaxis for high risk individuals?

March 24, 2020, the National Task Force for COVID-19 constituted by ICMR recommends the use of hydroxychloroquine for prophylaxis SAR-CoV2 infection for high risk populations:

- Asymptomatic HCW involved in the care of presumed or confirmed cases of COVID-19
- Asymptomatic household contacts of laboratory confirmed cases

They should

- Follow all prescribed public health measures such as frequent hand washing, social distancing, and appropriate use of PPE
- Self-monitor and report to the public health authorities immediately if they become symptomatic
- High risk contacts should remain home on quarantine while on prophylactic therapy
- Drug should only be given through prescription of licensed medical practitioner

https://www.mohfw.gov.in/pdf/AdvisoryontheuseofHydroxychloroquinasprophylaxisforSARSCoV2infection.pdf

What are the common side effects of Chloroquine

- **Reports of adverse events have been reported including deaths from its use**
- **CNS:** agitation, anxiety, confusion, delirium, depression, extrapyramidal reaction (dystonia, dyskinesia, protrusion of the tongue, torticollis), hallucination, headache, insomnia, motor dysfunction, personality changes, polyneuropathy, psychosis, seizure, suicidal tendencies
- **Dermatologic:** Alopecia, bleaching of hair, blue gray skin pigmentation, erythema multiforme, exacerbation of psoriasis, exfoliative dermatitis, lichen planus, pleomorphic rash, pruritus, skin photosensitivity, Stevens-Johnson syndrome, toxic epidermal necrolysis, urticaria
- **Hematologic & oncologic**: Agranulocytosis (reversible), aplastic anemia, hemolytic anemia (in G6PD-deficient patients), neutropenia, pancytopenia, thrombocytopenia
- **Endocrine & metabolic**: Hypoglycemia
- **Deafness, visual loss**
- Hydroxychloroquine safer but side effects include— ocular effects; skeletal muscle myopathy or neuromyopathy; GI effects (anorexia, diarrhea, nausea, abdominal cramps, vomiting); CNS effects (headache, dizziness); dermatologic effects

International Literature Review on Chloroquine and COVID-19

- Wang and colleagues evaluated *in vitro* five FDA-approved drugs and two broad spectrum antivirals against a clinical isolate of SARS-CoV-2. One of their conclusions was that "chloroquine (is) highly effective in the control of 2019-nCoV infection *in vitro*" and that its "safety track record suggests that it should be assessed in human patients suffering from the novel coronavirus disease". (Wang et al., 2020)
- At least 16 different trials for SARS-CoV-2 already registered in the Chinese Clinical Trial Registry
- Results said to be promising but awaiting data publication and results

1. https://www.sciencedirect.com/science/article/pii/S0166354220301145?via%3Dihub#bib30
2.https://www.unboundmedicine.com/medline/citation/32173110/A_systematic_review_on_the_efficacy_and_safety_of_chloroquine_for_the_treatment_of_COVID_19

Literature on use of Chloroquine for viral diseases

The promise of chloroquine

- The *in vitro* antiviral activity of chloroquine has been identified since the late 1960's
- Both chloroquine and hydroxychloroquine inhibit growth of many viruses in cell culture, including the SARS coronavirus

Not borne out by RCT in the past

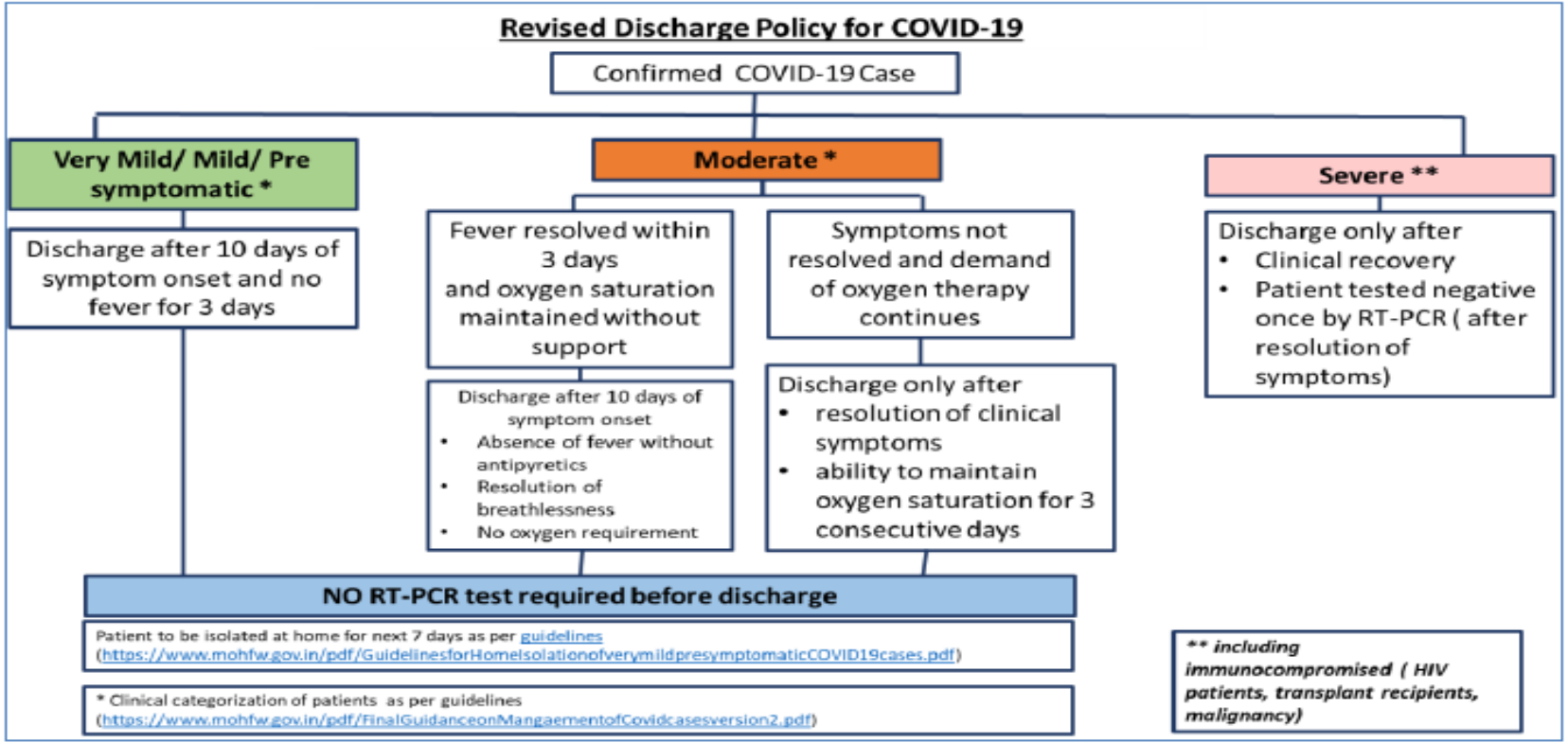
- Chloroquine did not prevent influenza infection in a RCT (Paton et al., 2011)
- No effect on dengue-infected patients in a RCT in Vietnam (Tricou et al., 2010)
- Chloroquine was active *in vitro* but not *in vivo* for ebolavirus in (Dowall et al., 2015; Falzarano et al., 2015), Nipah (Pallister et al., 2009) and influenza virus (Vigerust and McCullers, 2007)

Worsened clinical course

- Chloroquine showed promise against chikungunya virus (CHIKV) *in vitro* (Coombs et al., 1981; Delogu and de Lamballerie, 2011), but enhanced alphavirus replication in various animal models (Maheshwari et al., 1991; Roques et al., 2018; Seth et al., 1999)
- Chloroquine worsened clinical course of CHIKV in nonhuman primate model. Exacerbated acute fever and delayed the cellular immune response, leading to an incomplete viral clearance (Roques et al., 2018)

*https://www.unboundmedicine.com/medline/citation/32173110/A_systematic_review_on_the_efficacy_and_safety_of_chloroquine_for_the_treatment_of_COVID_19_*

Discharge policy: MoHFW



https://www.mohfw.gov.in/pdf/ReviseddischargePolicyforCOVID19.pdf

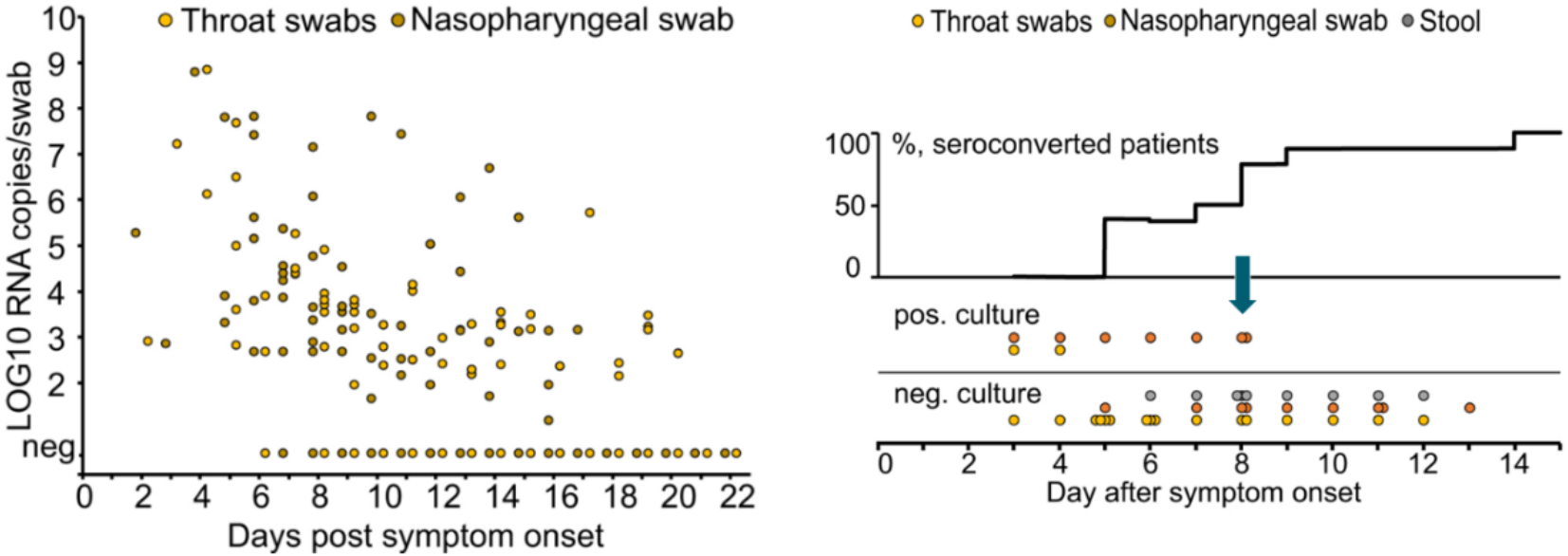
How long do persons remain infectious and shed infectious SARV-CoV-2 RNA after infection ?

At this time, data are limited regarding how long persons shed infectious SARV-CoV-2 RNA after infection

https://www.cdc.gov/coronavirus/2019-ncov/community/strategy-discontinue-isolation.html?deliveryName=USCDC_2067-DM27395

Viral replication declines as COVID-19 disease progresses (1/2)

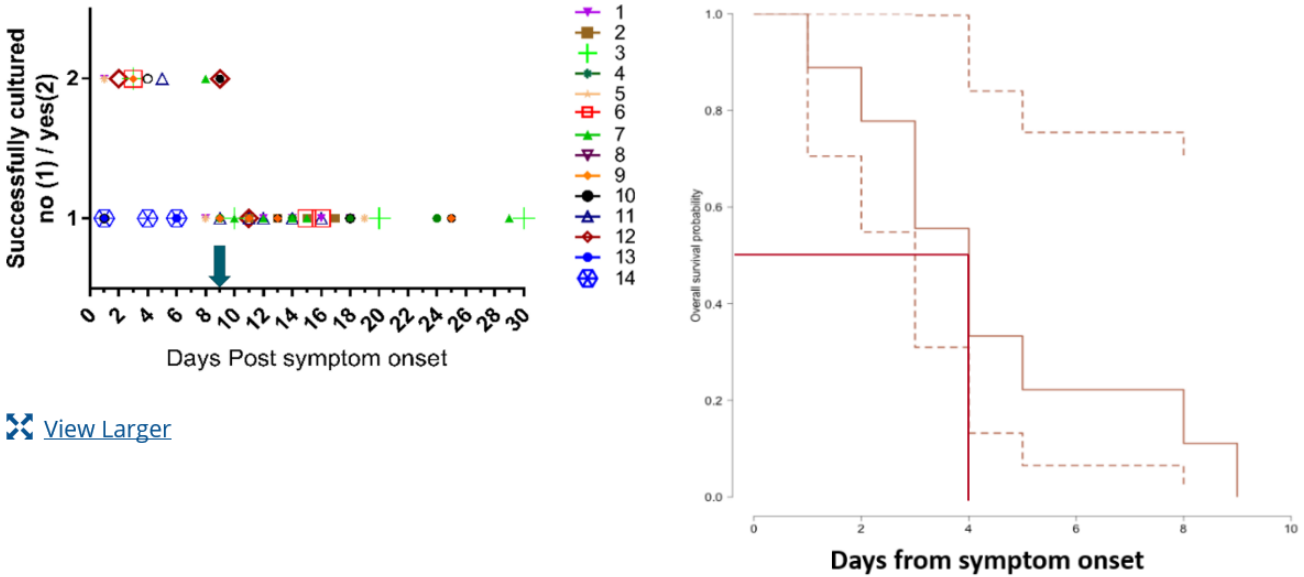
Figure 1: From Wölfel et al. demonstrating declining viral burden in upper respiratory specimens as illness progresses and decreasing capacity to isolate replication-competent virus from these same specimens as the number of patients with detectable IgM and IgG increases.



https://www.cdc.gov/coronavirus/2019-ncov/community/strategy-discontinue-isolation.html?deliveryName=USCDC_2067-DM27395

Viral replication declines as COVID-19 disease progresses (1/2)

Figure 2: From Midgely et al. demonstrating inability to recover replication-competent virus from specimens collected more than 9 days after illness onset. Kaplan-Meier analysis shows time to inability to recover replication-competent SARS-CoV-2 from 14 U.S. patients. Last probability of successful isolation falls to 50% at day 4 after illness onset and to 20% at day 8. After day 9, probability approaches zero. Unpublished CDC data.



View Larger

https://www.cdc.gov/coronavirus/2019-ncov/community/strategy-discontinue-isolation.html?deliveryName=USCDC_2067-DM27395

OTHER TOPICS WILL BE ADDED IN PART 2

Additional FAQ Resources

https://www.who.int/news-room/q-a-detail/q-a-coronaviruses

https://www.cdc.gov/coronavirus/2019-ncov/faq.html

Acknowledgement

- Ministry of Health and Family Welfare, Government of India
- National Centre for Disease Control, New Delhi
- National AMR Surveillance Network Sites- NCDC, New Delhi
- HAI Surveillance Network, JPNATC AIIMS, New Delhi
- Regional Centers, HAI Surveillance Network, AIIMS-ICMR*
- The Tamil Nadu Dr MGR Medical University, Chennai
- Indian Medical Association, Tamil Nadu State Branch
- National Cancer Grid, India
- US Centers for Disease Control
  - India Country Office, New Delhi
  - International Infection Control Program, Atlanta, USA

IPC Capacity Building Regional Sites- HAI Surveillance

1. AIIMS - New Delhi
2. Safdarjung Hospital - New Delhi
3. Hinduja Hospital - Mumbai
4. KGMU - Lucknow
5. PGIMER - Chandigarh
6. Tata Medical Centre - Kolkata
7. Amirtha Institute of Medical Sciences - Cochin
8. KGMU - Lucknow
9. AIIMS - Jodhpur

This work is supported by US Center for Disease Control and Prevention (CDC), India Country office towards hospital preparedness, infection prevention and control (IPC) for COVID-19 for the National AMR surveillance network hospitals coordinated by NCDC, New Delhi.

These FAQs were constructed based on the questions raised during the IPC virtual training by AIIMS- ICMR Healthcare Associated Infection (HAI) Surveillance Network and NCDC –National AMR surveillance network. They are based on the available scientific evidence as of 20 May 2020 in consensus with experts from regional centers for IPC under AIIMS- ICMR HAI surveillance regional centers.

Please note these recommendations might change as more evidence evolves regarding COVID-19.

The findings and conclusions in this report do not necessarily represent the official position of the US Centers for Disease Control and Prevention.