Infection Prevention and Control (IPC) measures – CoViD 19 (Part-I)

DR. HARISH DULANI
SECRETARY (HICC)
SPECIALIST & HOD (OPHTHALMOLOGY)
ESICMH, JAIPUR
Topics which will be covered in this presentation

1. Awareness of common signs and symptoms, need for self-health monitoring and need for prompt reporting of such symptoms.
2. Standard, Airborne/Respiratory, Contact and Droplet precautions.
3. Safety Precautions while away from work.
4. Guidelines to be followed on detection of suspected/confirmed COVID-19 case in a non-COVID Health Facility.
5. Management of Health care workers working in COVID and Non-COVID areas of the hospital.
Staff Awareness

- All healthcare and supportive staff should monitor their own health at all the time for appearance of COVID-19 symptoms and promptly report them at the earliest.
- Refer the following link for symptoms awareness: https://www.youtube.com/watch?v=7zzfdYShvQU
Symptoms can range from mild to severe illness, and appear 2-14 days after you are exposed to the virus that causes COVID-19.

*Seek medical care immediately if someone has emergency warning signs of COVID-19.*

- Trouble breathing
- Persistent pain or pressure in the chest
- New confusion
- Inability to wake or stay awake
- Bluish lips or face

This list is not all possible symptoms. Please call your medical provider for any other symptoms that are severe or concerning to you.

cdc.gov/coronavirus
# Standard Precautions

[https://www.cdc.gov/infectioncontrol/basics/standard-precautions.html](https://www.cdc.gov/infectioncontrol/basics/standard-precautions.html)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
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<tbody>
<tr>
<td>Perform hand hygiene</td>
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<tr>
<td>Use personal protective equipment (PPE) whenever there is an expectation</td>
<td>of possible exposure to infectious material</td>
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<td>Follow respiratory hygiene/cough etiquette principles</td>
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<td>Ensure appropriate patient placement</td>
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<td>Properly handle and properly clean and disinfect patient care equipment</td>
<td>and instruments/devices</td>
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<td>Clean and disinfects the environment appropriately</td>
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<td>Handle textiles and laundry carefully</td>
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<td>Follow safe injection practices</td>
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<td>Wear a surgical mask when performing lumbar punctures</td>
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<td>Ensure healthcare worker safety including proper handling of needles and</td>
<td>other sharps</td>
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Cover your Cough

Stop the spread of germs that can make you and others sick!

Cover your mouth and nose with a tissue when you cough or sneeze. Put your used tissue in the waste basket.

You may be asked to put on a facemask to protect others.

If you don’t have a tissue, cough or sneeze into your upper sleeve or elbow, not your hands.

Wash hands often with soap and warm water for 20 seconds. If soap and water are not available, use an alcohol-based hand rub.

CDC
STOP
AIRBORNE PRECAUTIONS
STOP

EVERYONE MUST:

- Clean their hands, including before entering and when leaving the room.
- Put on a fit-tested N-95 or higher level respirator before room entry.
- Remove respirator after exiting the room and closing the door.
- Door to room must remain closed.
STOP CONTACT PRECAUTIONS

EVERYONE MUST:

Clean their hands, including before entering and when leaving the room.

PROVIDERS AND STAFF MUST ALSO:

Put on gloves before room entry. Discard gloves before room exit.

Put on gown before room entry. Discard gown before room exit.

Do not wear the same gown and gloves for the care of more than one person.

Use dedicated or disposable equipment. Clean and disinfect reusable equipment before use on another person.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
STOP DRÖPLET PRECAUTIONS STOP

EVERYONE MUST:
Clean their hands, including before entering and when leaving the room.

Make sure their eyes, nose and mouth are fully covered before room entry.

or

Remove face protection before room exit.
Safety Precautions while away from work

- Understand the risk outside the workplace.
- Safety precautions should be adopted outside workplace.
- Maintain social distancing.
- Avoid unnecessary travel.
- Promptly report outstation travel of themselves and family.
Safety measures upon reaching home

1. Sanitize your shoes before entering home
2. Dispose your mask separately & safely
3. Bath immediately
4. Spray disinfectant on your belongings
5. Wash your clothes soon
6. Disinfect handles
Stop the Spread of Germs

Help prevent the spread of respiratory diseases like COVID-19.

1. Stay at least 6 feet (about 2 arms’ length) from other people.
2. Cover your cough or sneeze with a tissue, then throw the tissue in the trash and wash your hands.
3. When in public, wear a cloth face covering over your nose and mouth.
4. Do not touch your eyes, nose, and mouth.
5. Clean and disinfect frequently touched objects and surfaces.
6. Stay home when you are sick, except to get medical care.
7. Wash your hands often with soap and water for at least 20 seconds.

cdc.gov/coronavirus
Guidelines to be followed on detection of suspected/confirmed COVID-19 case in a non-COVID Health Facility

- **Reference:**

- **Action to be taken on detection of suspected/confirmed COVID-19 case in non-COVID health facility:** (Applicable to all hospital areas except ILI OPD/Fever Clinic/Isolation ward)

- Inform the Nodal Officer of ILI/Fever OPD for assessment of the clinical status of the patient and look after for further testing and management requirements, if:
  - A suspected COVID-19 patient is identified in examination area or IPD of the health care facility.
  - Any patient, who have been admitted for non-COVID illness, if developed unexplained fever/cough/breathing difficulty during their stay.
In case of confirmed positive patient presented/diagnosed in examination area/IPD

- Concerned persons will vacate area immediately; inform the in-charge of the related Department.
- Concerned Department In-Charge will:
  - Inform the Chief Controller - CoViD 19 for further sharing of information to state health authorities about the case.
  - Inform the Nodal Officer of ILL/Fever OPD, who will assess the clinical status of the patient and look after for further testing/management/referral requirement.
  - Inform the Infection Control Officer, who will take care of appropriate infection control practices to be followed in concerned area and ambulance.
  - Prepare a list with details, of all contacts of this patient (other patients being managed in the same room or ward, healthcare workers who have attended to him/her, support staff who may have come in close contact, caretaker/visitors etc.) and this list will be provided to Nodal Officer of ILL/Fever OPD and Infection Control Officer for further investigation and follow up.
In case of confirmed positive patient presented/diagnosed in examination area/IPD (Cont.)

- Follow appropriate standard precautions while referring/transporting the patient.
- Area should be thoroughly cleaned and disinfected including high and low touch surfaces and should be kept open (all windows and doors) and working should be closed for 3 hours. (If patient diagnosed positive later, at least 8 hours after examination, there is no need to close the area).
- Safety Audit Team will supervise the work of cleaning and disinfection so that no area remained untouched by the procedure and ensure that the disinfection procedures are strictly followed.
- All close contacts (other HCWs and supportive staff) of the confirmed case should be put on Hydroxychloroquine chemoprophylaxis after cardiac consultation and keeping in mind contraindications, as per MoHFW guidelines as amended.
Management of Health care workers working in COVID and Non-COVID areas of the hospital


CLINICAL AREA:
- All the Healthcare workers (HCW) must report every exposure to COVID-19 to the Nodal Officer (ILI) and HOD of the concerned department immediately.
- The Nodal Officer will arrange for meeting of Quarantine Board, which will assess the level of exposure and the risk as per assessment format at Annexure I, by getting the exact details of exposure to ascertain whether the exposure constitutes a high risk or low risk exposure (as described below):
  - High risk exposure:
    - HCW or other person providing care to a COVID-19 case or lab worker handling respiratory specimens from COVID-19 cases without recommended PPE or with possible breach of PPE
    - Performed aerosol generating procedures without appropriate PPE.
    - HCWs without mask/face-shield/goggles:
    - having face to face contact with COVID-19 case within 1 meter for more than 15 minutes
    - having accidental exposure to body fluids
  - Low risk exposure:
    - Contacts who do not meet criteria of high risk exposure
Management of Health care workers working in COVID and Non-COVID areas of the hospital

- As per assessment of the Board:
  - High risk exposure contacts will be quarantined initially for 07 days. Thereafter taking profile of such doctors, nursing officers and other health workers, a decision shall be taken by the Nodal Officer (ILI)/Head of the Department/Quarantine board for further period of one week.
  - After a week, they shall be tested as per ICMR testing protocol, actively monitored for development of symptoms and managed as per laid down protocol.
  - If they test negative and remain asymptomatic, complete 14 day quarantine and return to work.
  - If they test positive and/or symptoms develop, they will follow SOP as described below.
  - Low risk contacts shall continue to work. They will self-monitor their health for development of symptoms. In case symptoms develop, they will follow SOP as described below.

- Regular quarantine of healthcare workers after performing duty in COVID-19 areas: Quarantine of healthcare workers, other than what is stipulated above is not warranted.
Management of Health care workers working in COVID and Non-COVID areas of the hospital

SOP to be followed in case HCW reports symptoms suggestive of COVID-19

- If High Risk Contacts/any other healthcare worker who is manifesting signs and symptoms suggestive of COVID-19 or tested positive for CoViD-19, he/she will be isolated immediately and the following procedure will follow.

- In case of mild/very mild/pre-symptomatic case, he/she will have an option of home isolation, subject to the conditions stipulated in the revised guidelines for home isolation of very mild/pre-symptomatic COVID-19 cases. Such cases would end their home isolation as per timeline provided in the said guidelines. [https://www.mohfw.gov.in/pdf/RevisedguidelinesforHomeIsolationofverymildpre-symptomati_cCOVID19cases10May2020.pdf](https://www.mohfw.gov.in/pdf/RevisedguidelinesforHomeIsolationofverymildpre-symptomati_cCOVID19cases10May2020.pdf)
Management of Health care workers working in COVID and Non-COVID areas of the hospital

- In cases where home isolation is not feasible, such mild/very mild/pre-symptomatic cases will be admitted to a COVID Care Center#.
- Moderate cases that require oxygen therapy shall be managed at a Dedicated COVID Health Center#.
- Severe cases will be managed in a Dedicated COVID Hospital#.
- # The details of categorization of health facilities as COVID Care center, Dedicated COVID Health Center and Dedicated COVID Hospitals along with categorization of patients (mild/moderate/severe) is available at: https://www.mohfw.gov.in/pdf/ClinicalManagementProtocolforCOVID19.pdf
  https://www.mohfw.gov.in/pdf/FinalGuidanceonManagementofCovidcasesesversion2.pdf
Management of Health care workers working in COVID and Non-COVID areas of the hospital

- Those who test negative, will be managed as in non-COVID area as per their clinical diagnosis. Their resuming work will be based on the clinical diagnosis and the medical certification by the treating doctor.
- For HCWs (with low risk exposure), who continue to work and develop symptoms:
- And test positive, further management would be based on their clinical presentation and as described above.
- Those who test negative, will return to work subject to medical certification for ailment
- Discharge of COVID-19 positive HCWs will be in accordance with the discharge policy available at: https://www.mohfw.gov.in/pdf/ReviseddischargePolicyforCOVID19.pdf
Infection Prevention and Control (IPC) measures – CoViD 19 (Part-II)

DR. DILEEP SHARMA
INFECTION CONTROL OFFICER
SPECIALIST & HOD (MICROBIOLOGY)
ESICMH, JAIPUR
Topics which will be covered in this presentation

1. Staff cohorting, touch contamination & social distancing in hospital
2. Hand Hygiene
3. Masks management
4. Personal Protective Equipments
5. PPE Donning and Doffing
6. Cleaning and Disinfection
Staff Cohorting at risk area

- Working in shifts,
- Prevent movement between shifts and
- Design duty roster to ensure staff cohothing.

Touch Contamination

- Identify ‘high touch’ areas
- Regular disinfection of the high touch areas
- Avoid sharing of devices / tools by HCWs, if possible.
- If shared, disinfect them in between use.
- Limit use and movement of physical files / registers / receipts

Social Distancing in Hospital

- Ensure distance between HCWs >1 meter
- Rearrange furniture layout to facilitate social distancing
- Adhere to lift safety precautions
- Avoid HCWs gathering for food/snacks
- Maintain corridors free of crowding
- Physical meetings should be reduced to minimal level with limited number of participants
HIGH TOUCH SURFACES TO DISINFECT DAILY

- Tables
- Counter tops
- Light switches
- Doorknobs
- Remotes
- Desks
- Hard-backed chairs
- Computers & keyboards
- Phones
- Tablets
- Toilets
- Sinks

# Hand Hygiene

- Most important single step to prevent all hospital acquired infections.
- Refer the following link for steps: [https://www.youtube.com/watch?v=VsC0Sg0duUM](https://www.youtube.com/watch?v=VsC0Sg0duUM)
- Added suggestion: Take precaution NOT to touch tap knob with bare hands after hand washing. Either wash it with hands simultaneously, use tissue paper or use elbow operated tap.
- 5 moments of hand hygiene:

| 1 | BEFORE TOUCHING A PATIENT | WHEN? | Clean your hands before touching a patient when approaching him/her. |
|   |                          | WHY?  | To protect the patient against harmful germs carried on your hands. |
| 2 | BEFORE CLEAN/ASEPTIC PROCEDURE | WHEN? | Clean your hands immediately before performing a clean/aseptic procedure. |
|   |                          | WHY?  | To protect the patient against harmful germs, including the patient’s own, from entering his/her body. |
| 3 | AFTER BODY FLUID EXPOSURE RISK | WHEN? | Clean your hands immediately after an exposure risk to body fluids (and after glove removal). |
|   |                          | WHY?  | To protect yourself and the health-care environment from harmful patient germs. |
| 4 | AFTER TOUCHING A PATIENT  | WHEN? | Clean your hands after touching a patient and her/his immediate surroundings, when leaving the patient’s side. |
|   |                          | WHY?  | To protect yourself and the health-care environment from harmful patient germs. |
| 5 | AFTER TOUCHING PATIENT SURROUNDINGS | WHEN? | Clean your hands after touching any object or furniture in the patient’s immediate surroundings, when leaving – even if the patient has not been touched. |
|   |                          | WHY?  | To protect yourself and the health-care environment from harmful patient germs. |
How to Handrub?

**Rub hands for hand hygiene! Wash hands when visibly soiled.**

1. **Apply a palmful of the product in a cupped hand, covering all surfaces.**
2. **Rub hands palm to palm.**
3. **Right palm over left dorsum with interlaced fingers and vice versa.**
4. **Palm to palm with fingers interlaced.**
5. **Backs of fingers to opposing palms with fingers interlocked.**
6. **Rotational rubbing of left thumb clasped in right palm and vice versa.**
7. **Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa.**
8. **Once dry, your hands are safe.**
9. **Dry hands thoroughly with a single use towel.**
10. **Use towel to turn off faucet.**
11. **Your hands are now safe.**

**Duration of the entire procedure:** 20-30 seconds

How to Handwash?

**Wash hands when visibly soiled! Otherwise, use handrub.**

1. **Wet hands with water.**
2. **Apply enough soap to cover all hand surfaces.**
3. **Rub hands palm to palm.**
4. **Right palm over left dorsum with interlaced fingers and vice versa.**
5. **Palm to palm with fingers interlaced.**
6. **Backs of fingers to opposing palms with fingers interlocked.**
7. **Rotational rubbing of left thumb clasped in right palm and vice versa.**
8. **Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa.**
9. **Rinse hands with water.**
10. **Clean your hands.”

**Duration of the entire procedure:** 40-60 seconds

*World Health Organization, Patient Safety, Save Lives.*

*Clean your hands.*
Masks Management

- Most important preventive measure in context with CoViD-19 and other Air-borne infections.
- Refer the following link for reuse of certified quality masks (Advisory for personal use of N95 masks issued to all healthcare workers by AIIMS, New Delhi, English):
  
  https://www.youtube.com/watch?v=b4vF_B9FFxk&feature=youtu.be
HOW TO WEAR A MEDICAL MASK SAFELY

Do's

1. Wash your hands before touching the mask
2. Inspect the mask for tears or holes
3. Find the top side, where the metal piece or stiff edge is
4. Ensure the colored-side faces outwards
5. Place the metal piece or stiff edge over your nose
6. Cover your mouth, nose, and chin
7. Adjust the mask to your face without leaving gaps on the sides
8. Avoid touching the mask
9. Remove the mask from behind the ears or head
10. Keep the mask away from you and surfaces while removing it
11. Discard the mask immediately after use preferably into a closed bin
12. Wash your hands after discarding the mask

Remember that masks alone cannot protect you from COVID-19. Maintain at least 1 metre distance from others and wash your hands frequently and thoroughly, even while wearing a mask.
Facemask Do’s and Don’ts
For Healthcare Personnel

When putting on a facemask
Clean your hands and put on your facemask so it fully covers your mouth and nose.

DO secure the elastic bands around your ears.
DO secure the ties at the middle of your head and the band of your head.

When wearing a facemask, don’t do the following:

DON’T wear your facemask under your nose or mouth.
DON’T allow a strap to hang down. DON’T cross the straps.
DON’T touch or adjust your facemask without cleaning your hands before and after.
DON’T wear your facemask on your head.
DON’T wear your facemask around your neck.
DON’T wear your facemask around your arm.

When removing a facemask
Clean your hands and remove your facemask touching only the straps or ties.

DO leave the patient care area, then clean your hands with alcohol-based hand sanitizer or soap and water.
DO remove your facemask touching ONLY the straps or ties, throw it away*, and clean your hands again.

*If implementing limited-reuse: Facemasks should be carefully folded so that the outer surface is held inward and against itself to reduce contact with the outer surface during storage. Folded facemasks can be stored between uses in a clean, sealable paper bag or breathable container.

Additional information is available about how to safely put on and remove personal protective equipment, including facemasks:

cdc.gov/coronavirus
Respirator On / Respirator Off

When you put on a disposable respirator

Position your respirator correctly and check the seal to protect yourself from COVID-19.

1. Cup the respirator in your hand. Hold the respirator under your chin with the nose piece up. The top strap (on single or double strap respirators) goes over and rests at the top back of your head. The bottom strap is positioned around the neck and below the ears.

2. Place your fingertips from both hands at the top of the metal nose clip (if present). Slide fingertips down both sides of the metal strip to mold the nose area to the shape of your nose.

3. Place both hands over the respirator, take a quick breath in to check the seal. Breathe out. If you feel a leak when breathing in or breathing out, there is not a proper seal.

4. Select other PPE items that do not interfere with the fit or performance of your respirator.

Do not use a respirator that appears damaged or deformed, no longer forms an effective seal to the face, becomes wet or visibly dirty, or if breathing becomes difficult.

Do not allow facial hair, jewelry, glasses, clothing, or anything else to prevent proper placement or to come between your face and the respirator.

Do not crisscross the straps.

Do not wear a respirator that does not have a proper seal. If air leaks in or out, ask for help or try a different size or model.

Do not touch the front of the respirator during or after use! It may be contaminated.

When you take off a disposable respirator

1. Remove by pulling the bottom strap over back of head, followed by the top strap, without touching the respirator.

2. Discard in a waste container.

3. Clean your hands with alcohol based hand sanitizer or soap and water.

Employers must comply with the OSHA Respiratory Protection Standard, 29 CFR 1910.134, which includes medical evaluations, training, and fit testing.

Additional information is available about how to safely put on and remove personal protective equipment, including respirators:

cdc.gov/coronavirus
Personal Protective Equipments (PPEs)

Components of PPE:
- Face Shield
- Shoe Cover
- Face mask and Respirator
- Gloves
- Goggles
- Head cover
- Gown
Where social distancing feasible: Installation of physical barriers (e.g., glass or plastic screens) are encouraged if possible.

If social distancing is not feasible: Use mask, eye protection and other appropriate PPE

- Physical barrier AND
  - Physical distance of at least 1 m
  - Glass or plastic barrier

- No physical barrier AND
  - Physical distance is not feasible
  - Face shield or goggles
  - Facemask

No PPE required

Use mask and eye protection
Communicability, the capability of a pathogen to be transmitted from one human or animal to another.

The basic reproduction number (RO or R naught) determines the severity of an epidemic. It indicates the average number of people that will be infected by a single person (“The Source”) in a population that has not developed any immunity or has not been vaccinated.

If RO is less than 1 the disease will die out, if it is equal to one the disease will remain stable in a population, and if it is greater than 1 it can cause an outbreak or epidemic.

RO of airborne diseases: Measles and Pertussis (15), Seasonal flu (1.3), COVID-19 (2.2-5.7), SARS-CoV-1 (3.0) and MERS-CoV (0.45).

The higher the RO value, the faster a disease spreads through the population as the spread is exponential. Once the population approaches saturation, that is, everyone is diseased, the spread levels off.
Social distancing can reduce RO by lowering the probability of person-to-person transmission.

Since individuals already shed SARS-CoV-19 viruses before becoming symptomatic, wearing masks to create a barrier and retain droplets should potentially also lower RO.

Once vaccines become available, RO can likely be decreased effectively.

There is the possibility that a virus could mutate to become more or less efficient in establishing an infection, resulting in a higher or lower RO, respectively.

In addition, some infected individuals participate in superspreading events where excessive disease spreading is traced to a single person, who is also called a superspreader (reviewed by Stein 2011).
Rational use of Personal Protective Equipments in different areas of the hospital

- Additional guidelines on rational use of Personal Protective Equipment (setting approach for Health functionaries working in non-COVID areas):

- Video on use of PPE in different areas of the hospital:
  https://www.youtube.com/watch?v=LzB5krucZoQ&feature=youtu.be

- Re-processing and re-use of eye-protection - Goggles:
  https://www.mohfw.gov.in/pdf/Advisoryonreprocessingandreuseofeye protectiongoggles.pdf
PPE Donning and Doffing

- PPE donning is most important step to prevent, getting infection from patients.
- PPE doffing is the most critical step to prevent self contamination.
- Separate donning and doffing area (at least).
- Checklist should be prepared for steps of doffing as per PPE type and recommendations.
- Hand sanitization must be performed after each step of doffing.
- Buddy system/observer should be followed during doffing.

PPE Donning and Doffing by AIIMS: https://www.youtube.com/watch?v=KXueclFu1PU

Added suggestions:
1. No personal belongings.
2. Discard N-95 and new pair of gloves just outside the doffing area.
Improper PPE use was likely a contributing factor in superspreading hospital events during the SARS and MERS outbreaks.

In the 2003 SARS epidemic, 20.5% of all healthcare providers treating SARS patients in Hong Kong hospitals became infected, and 36.7% in a Canadian hospital episode.

The incorrect removal of PPE, for example, gloves, endangers hospital personnel and first responders and their patients.

Thus, instead of offering protection, PPE without guided training can instill a false sense of security and accomplish the opposite, the expansion of an outbreak.
Asymptomatic Transmission – CoViD-19

- References:
  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7216769/

- Duration of viral shedding in survivors: Median - 20 days, longest - 37 days.

- LD50 by inhalation, to be 280 viral particles approximately similar to other coronaviruses and Influenza A virus in comparison to very low LD50 of Mycobacterium tuberculosis (10 bacteria) by inhalation. (Watabanebe et al.)

- Viral shedding from the respiratory tract begins 2.5 days before the onset of symptoms and peaks already 0.6 day, on the average, before the onset of symptoms.

- In contrast, SARS-CoV-1 and MERS-CoV virus shedding from the respiratory tract begins at the onset of symptoms, and infectivity is greatest in the second week of illness. Thus, both of these diseases are easier to trace.

- 44% of transmission could already occur before people become aware of carrying the disease. Pre-symptomatic virus shedding is thus likely a major contributor to global CoViD-19 spreading as it occurs undetected under the current limited testing practice.
Asymptomatic Transmission – CoViD-19

- **SARS-CoV-2 presence in asymptomatic persons:** An analysis of the COVID-19 outbreak on the cruise ship Princess Diamond in Yokohama, Japan, showed that, of the 634 persons who tested positive for SARS-CoV-2, 50.5% had no significant symptoms.

- **Transmission of disease through Asymptomatic infected persons:** Li et al. examined the spread of COVID-19 in 375 Chinese cities during January 10-23, 2020 (time period of extensive travel due to the Chinese Spring Festival, and before the Chinese Government implemented travel restrictions to curb the spread of the disease).

- **The authors conclusion:**
  - 86% of all infections were not documented during this time period because infected individuals displayed mild, limited, or no symptoms.
  - They were responsible for 79% of the symptomatic COVID-19 documented cases during that time period.

- **It is unclear to date whether SARS and MERS asymptomatic individuals can transmit the disease.**
Cleaning and Disinfection

- Cleaning achieves approximately a 4 log reduction of contaminating microorganisms.
- Cleaning must precede disinfection –
  - It removes organic matter and visible soil that interfere with the action of disinfectant.
  - It reduces the microorganisms count.
  - It is a form of decontamination.
- No disinfectant is approved for spraying on skin and clothes except use for hand sanitization agents.
- Choice of disinfectant is based upon activity against Enveloped, Lipophilic RNA viruses and EPA approval for use against SARS CoV-2.
Because of their phospholipid bilayer, enveloped viruses are highly sensitive to common household cleaners that contain detergent, bleach, or hydrogen peroxide as well as alcohol-based hand sanitizers and soap.

These disinfectants dissolve the lipid layer and/or denature viral proteins.

Note that, in contrast to sterilization methods, which kill all pathogens, disinfectants greatly reduce the infectious dose by reducing the number of pathogens.

Protocols, use of disinfectants and frequency, described in SOP Infection Prevention and Control Guidelines in context with CoViD-19 - Non-CoViD Facility, ESICMh, JAIPUR.
Viral persistence without losing viability on solid surfaces or while airborne plays an important role in the spread of pathogens.

A recent study by Doremalen et al. revealed that both SARS-CoV-2 and SARS-CoV-1 can remain viable for hours in air and on solid surfaces but decay exponentially.

Virus stability is not the cause for the explosive pandemic spread of COVID-19 as compared to the containable SARS outbreak.

Because of the lipid membrane of enveloped viruses, these are generally more prone to desiccation and inactivation than nonenveloped viruses. Once the envelope is disrupted, the virus loses its viability.
# SARS-CoV2 in Air & on Surfaces

<table>
<thead>
<tr>
<th>Material</th>
<th>Half Life (in hrs.)</th>
<th>Infection Capability/Duration (hours)</th>
<th>Max. median Half Life Reported</th>
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<tr>
<td></td>
<td>Median</td>
<td>2.5%</td>
<td>97.5%</td>
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<td>Aerosol</td>
<td>1.09</td>
<td>0.64</td>
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<td>Copper</td>
<td>0.774</td>
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<td>5.48</td>
<td>5.66</td>
<td>4.84</td>
<td>5.83</td>
</tr>
<tr>
<td>30 mins</td>
<td>2.18</td>
<td>2.19</td>
<td>3.84</td>
<td>2.84</td>
<td>5.81</td>
</tr>
<tr>
<td>3 hrs</td>
<td>U</td>
<td>U</td>
<td>3.41</td>
<td>2.21</td>
<td>5.14</td>
</tr>
<tr>
<td>6 hrs</td>
<td>U</td>
<td>U</td>
<td>2.47</td>
<td>2.25</td>
<td>5.06</td>
</tr>
<tr>
<td>1 day</td>
<td>U</td>
<td>U</td>
<td>2.07</td>
<td>2.07</td>
<td>3.48</td>
</tr>
<tr>
<td>2 days</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>2.44</td>
<td>3.48</td>
</tr>
<tr>
<td>4 days</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td>7 days</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Banknote</th>
<th>Stainless steel</th>
<th>Plastic</th>
<th>Mask, inner layer</th>
<th>Mask, outer layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 min</td>
<td>6.05</td>
<td>5.80</td>
<td>5.81</td>
<td>5.88</td>
<td>5.78</td>
</tr>
<tr>
<td>30 mins</td>
<td>5.83</td>
<td>5.23</td>
<td>5.83</td>
<td>5.84</td>
<td>5.75</td>
</tr>
<tr>
<td>3 hrs</td>
<td>4.77</td>
<td>5.09</td>
<td>5.33</td>
<td>5.24</td>
<td>5.11</td>
</tr>
<tr>
<td>6 hrs</td>
<td>4.04</td>
<td>5.24</td>
<td>4.68</td>
<td>5.01</td>
<td>4.97</td>
</tr>
<tr>
<td>1 day</td>
<td>3.29</td>
<td>4.85</td>
<td>3.89</td>
<td>4.21</td>
<td>4.73</td>
</tr>
<tr>
<td>2 days</td>
<td>2.47</td>
<td>4.44</td>
<td>2.76</td>
<td>3.16</td>
<td>4.20</td>
</tr>
<tr>
<td>4 days</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>3.71</td>
</tr>
</tbody>
</table>
| 7 days       | U        | U               | U       | U                 | 2.79            
6 Steps for Safe & Effective Disinfectant Use

Step 1: Check that your product is EPA-approved
Find the EPA registration number on the product. Then, check to see if it is on EPA’s list of approved disinfectants at: epa.gov/listn

Step 2: Read the directions
Follow the product’s directions. Check “use sites” and “surface types” to see where you can use the product. Read the “precautionary statements.”

Step 3: Pre-clean the surface
Make sure to wash the surface with soap and water if the directions mention pre-cleaning or if the surface is visibly dirty.

Step 4: Follow the contact time
You can find the contact time in the directions. The surface should remain wet the whole time to ensure the product is effective.

Step 5: Wear gloves and wash your hands
For disposable gloves, discard them after each cleaning. For reusable gloves, dedicate a pair to disinfecting COVID-19. Wash your hands after removing the gloves.

Step 6: Lock it up
Keep lids tightly closed and store out of reach of children.

coronavirus.gov
### EPA approved active ingredients for SARS CoV-2

- 1,2-Hexanediol
- Chlorine dioxide
- Citric acid
- Dodecylbenzenesulfonic acid; Lactic acid
- Ethanol (Ethyl alcohol)
- Glycolic acid
- Hydrochloric acid
- Hydrogen peroxide
- Hypochlorous acid
- Isopropanol (Isopropyl alcohol)
- L-Lactic Acid
- Octanoic acid

- Peroxyacetic acid (Peracetic acid)
- Phenolic
- Potassium peroxymonosulfate; Sodium chloride
- Quaternary ammonium
- Silver ion; Citric acid
- Sodium chloride
- Sodium chlorite
- Sodium dichloro-S-triazinetrione
- Sodium dichloroisocyanurate
- Sodium hypochlorite
- Thymol
- Triethylene glycol; Quaternary ammonium
TABLE. Chemical compounds used for disinfection, effectiveness of chemical disinfectants and selected products against certain organisms, and selected properties of chemical disinfectants that should be considered when used for cleaning and disinfection

<table>
<thead>
<tr>
<th>Chemical compounds</th>
<th>Chlorine*</th>
<th>Iodophor</th>
<th>Chlorhexidine</th>
<th>Alcohol†</th>
<th>Oxidizing agents</th>
<th>Phenol</th>
<th>Quaternary ammonium</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.01%-5%</td>
<td>0.5%-5%</td>
<td>0.05%-0.5%</td>
<td>70%</td>
<td>0.2%-3%</td>
<td>0.2%-3%</td>
<td>0.1%-2%</td>
</tr>
</tbody>
</table>

Selected products
- Clorox®
- Tincture/Provodine
- Nolvasan®
- Rubbing alcohol
- Virkon-S®
- pHisohex®
- Roccal-D®

Effectiveness of chemical disinfectants against certain organisms:

<table>
<thead>
<tr>
<th>Effectiveness</th>
<th>Chlorine*</th>
<th>Iodophor</th>
<th>Chlorhexidine</th>
<th>Alcohol†</th>
<th>Oxidizing agents</th>
<th>Phenol</th>
<th>Quaternary ammonium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bactericidal</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Bacterial spores</td>
<td>Good</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor†</td>
<td>Fair to good</td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Virucidal</td>
<td>Good</td>
<td>Good</td>
<td>Limited</td>
<td>No</td>
<td>Good</td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Envelope viruses</td>
<td>Yes</td>
<td>Yes</td>
<td>Limited</td>
<td>Yes</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
</tr>
<tr>
<td>Nonenvelope viruses</td>
<td>Yes</td>
<td>Limited</td>
<td>Limited</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Fungicidal</td>
<td>Good</td>
<td>Fair</td>
<td>Fair to good</td>
<td>Good</td>
<td>Fair</td>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>Protozoal parasites</td>
<td>Fair</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
</tr>
</tbody>
</table>

Properties of chemical disinfectants:

<table>
<thead>
<tr>
<th>Property</th>
<th>Chlorine*</th>
<th>Iodophor</th>
<th>Chlorhexidine</th>
<th>Alcohol†</th>
<th>Oxidizing agents</th>
<th>Phenol</th>
<th>Quaternary ammonium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effectiveness in organic matter</td>
<td>Poor</td>
<td>Poor</td>
<td>Fair</td>
<td>Poor</td>
<td>Poor</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Inactivated by soap</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Effective in hard water</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Residual activity</td>
<td>Poor</td>
<td>Good</td>
<td>Fair</td>
<td>Fair</td>
<td>Poor</td>
<td>Fair</td>
<td>Fair</td>
</tr>
</tbody>
</table>

Source: Adapted from the Nebraska Cooperative Extension and the U.S. Department of Agriculture, 2003.

* Bleach should be mixed fresh daily and replaced whenever contaminated with organic matter (1:32 dilution of 5.75% solution provides >1,500 ppm chlorine).
† Rubbing alcohol is flammable.
§ Effectiveness as a bactericidal, virucidal, or fungicidal agent and effectiveness in eliminating bacterial spores and protozoal parasites: good = effective; fair = moderate effect; and poor = inferior effect. Effectiveness in eliminating envelope and nonenvelope viruses: yes = effective; limited = moderate effect; and no = not effective.
† Alcohol synergistically potentiates the sporicidal effect of hypochlorites (chlorine). Mix 5.75% solution of hypochlorite 1:1 with 50% ethyl alcohol/water. Mix fresh at the time of use and provide contact time of ≥30 minutes.
** The effectiveness of 2-phenylphenol (ortho-phenylphenol) is fair.
†† Effectiveness in organic matter: good = effective; fair = moderate effect; and poor = inferior effect. Inactivated by soap and effective in hard water: yes = chemical compound has this property; no = chemical compound does not have this property. Residual activity: good = chemical compound has residual activity; fair = moderate residual activity; and poor = inferior residual activity.
Classification of risk of infection

- **Non critical:**
  - Items come in contact with intact skin.
  - They need low level disinfection.

- **Semi critical:**
  - Items come in contact with mucous membrane.
  - They need intermediate or high level disinfection.

- **Critical:**
  - Items come in contact with sterile tissue, blood and body fluids.
  - They need high level disinfection or sterilisation.
Levels of Disinfection

- **HIGH LEVEL** (Exposure time > 12 m-30m):
  - Capable of killing all microorganisms and low concentrations of bacterial spores.
  - Eg. Glutaraldehyde > 2·0%, ortho-phthalaldehyde 0·55%, hydrogen peroxide 7·5%, peracetic acid* >0·23%, chlorine compounds 1000 ppm

- **INTERMEDIATE LEVEL** (Exposure time >10-30 min):
  - Destroys vegetative bacteria, fungi, and viruses, including *M. Tuberculosis*
  - Eg. Phenolics 0·4-5% aq; iodophores 30-50 ppm free iodine, hydrogen peroxide 3-6%, QAC 0·4-1·6%, chlorine compounds 500 ppm

- **LOW LEVEL** (Exposure time >1 min):
  - Effective against most bacteria, some viruses, and fungi, but are not tuberculocidal or sporidical.
  - These disinfectants will contain a lesser concentration of active ingredients.
  - Eg. ethyl or isopropyl alcohol 70-90 %, chlorine 100 ppm (1:500 dilution), phenolics ud, iodophores ud, QAC ud (ud=used dilution)
Bio-Medical Waste (BMW) Management

- References for management of CoViD-19 waste:
- Proper discarding of biomedical waste is the most important step to prevent transmission of infection from hospital to community.
- In donning area, use black bin for general waste generated during donning.
- In doffing area, keep red bins and yellow bins.
- In all other area keep all three dust bins as per BMW Management rules, as amended.
KEEP HOSPITALS CLEAN AND SAFE BY IDENTIFYING HAZARDS AND RISKS OF BIOMEDICAL WASTE

**Anatomical waste, chemical waste, soiled waste, chemotherapy waste, discarded linen and medicines and laboratory waste**

**Contaminated plastic waste**

**Glass waste and metallic implants**

**Metal sharps**

**Place the waste in designated colour coded bins**

- **Hazardous and Other waste**
- **Recyclable General waste**
- **Biodegradable General waste**

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* Labelling as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016

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R&D: Anurag Teotia, Puvarna Prabhakaran and Sheelakshi Mamt, Centre for Chronic Disease Control and Centre for Environmental Health, Public Health Foundation of India
Biomedical Waste Management in COVID-19 Isolation Ward

Used syringes, IV sets etc and all used PPEs such as goggles, face-shield, splash proof apron, Plastic Coverall, Hazmat suit, nitrile gloves and all used plastic PPEs

Double layers of bags are used for storage of biomedical waste

Used masks, head cover, shoe-cover, disposable linen Gown, non-plastic or semi-plastic coverall anatomical waste, soiled waste, discarded medicines

Glass and metals waste

Note: (i) General waste not having contamination should be disposed as solid waste as per SWM Rules, 2016.
(ii) Every containers/bins/trolleys used for storage of COVID-19 waste, should be disinfected with 1% sodium hypochlorite solution daily.
# COVID-19: Risk Assessment of Contacts

<table>
<thead>
<tr>
<th>Patient</th>
<th>Mask</th>
<th>Contact</th>
<th>&lt; 5 minutes</th>
<th>5 - 10 minutes</th>
<th>10 - 15 minutes</th>
<th>&gt; 15 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic</td>
<td>No</td>
<td>No</td>
<td>No Risk</td>
<td>Low Risk</td>
<td>High Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Asymptomatic</td>
<td>Yes</td>
<td>No</td>
<td>No Risk</td>
<td>No Risk</td>
<td>Low Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Asymptomatic</td>
<td>No</td>
<td>Yes</td>
<td>No Risk</td>
<td>No Risk</td>
<td>Low Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Asymptomatic</td>
<td>Yes</td>
<td>Yes</td>
<td>No Risk</td>
<td>No Risk</td>
<td>Low Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Symptomatic</td>
<td>No</td>
<td>No</td>
<td>Low Risk</td>
<td>High Risk</td>
<td>High Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Symptomatic</td>
<td>Yes</td>
<td>No</td>
<td>No Risk</td>
<td>Low Risk</td>
<td>High Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Symptomatic</td>
<td>No</td>
<td>Yes</td>
<td>Low Risk</td>
<td>Low Risk</td>
<td>High Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Symptomatic</td>
<td>Yes</td>
<td>Yes</td>
<td>No Risk</td>
<td>No Risk</td>
<td>Low Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Asymptomatic</td>
<td>No</td>
<td>No</td>
<td>No Risk</td>
<td>No Risk</td>
<td>No Risk</td>
<td>No Risk</td>
</tr>
<tr>
<td>Asymptomatic</td>
<td>Yes</td>
<td>No</td>
<td>No Risk</td>
<td>No Risk</td>
<td>No Risk</td>
<td>No Risk</td>
</tr>
<tr>
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<td>Yes</td>
<td>No Risk</td>
<td>No Risk</td>
<td>No Risk</td>
<td>No Risk</td>
</tr>
<tr>
<td>Asymptomatic</td>
<td>Yes</td>
<td>Yes</td>
<td>No Risk</td>
<td>No Risk</td>
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<td>No Risk</td>
</tr>
<tr>
<td>Symptomatic</td>
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<td>No Risk</td>
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<td>No Risk</td>
</tr>
<tr>
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<td>No</td>
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</tr>
<tr>
<td>Symptomatic</td>
<td>Yes</td>
<td>Yes</td>
<td>No Risk</td>
<td>No Risk</td>
<td>No Risk</td>
<td>No Risk</td>
</tr>
</tbody>
</table>

*Distance between patient and contact: < 1 meter*  
*Distance between patient and contact: < 1-5 meter*  

*District Surveillance Unit, Ernakulam*
“IPC in clinical settings is crucial to winning the battle against SARS-CoV-2, as the emergence of this invisible enemy has posed unprecedented threats and challenges to public health worldwide.”

“Timely exchange of knowledge and experience is highly beneficial and essential for successful containment of COVID-19 in healthcare settings worldwide.”

(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7204655/)

THANKS