Infection Prevention and Control and novel coronavirus (COVID-19): standard precautions and use of personal protective equipment

Dr. João Toledo
Health Emergencies Department / PAHO – WDC
February 19, 2020
Infection Prevention and Control and COVID-19

Limit human-to-human transmission

Reduce secondary infections

Prevent transmission through amplification and super-spreading events
Healthcare workers and COVID-19

Outline

Overview of the natural history of COVID-19

Standard precautions

Transmission-based precautions

Risk evaluation and PPE

Requirements for the use of PPE
Outline

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Natural history of COVID-19

Source: PAHO, 2020
Natural history of COVID-19

Susceptible host
Any individual exposed to the virus

Portal of Entry
Airway; others?

Pathogen
COVID-19

Reservoir
Unknown

Transmission
Spillover? H2H Tx

Portal of Exit
Airway; others?

Source: PAHO, 2020
Natural history of COVID-19

Susceptible host
Any individual exposed to the virus

Portal of Entry
Airway; others?

Transmission
Spillover? H2H Tx

Portal of Exit
Airway; others?

Reservoir
Unknown

Pathogen
COVID-19

Other coronavirus (SARS; MERS-CoV)?

Survival in surfaces?
Ventilation systems?

Respiratory droplets
Mucous membrane contact

Source: PAHO, 2020
## Natural history of COVID-19

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Route / mechanism of transmission</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhu N et al., NEJM 2020</td>
<td>3 cases of “unusual SARI”</td>
<td>Bronchoalveolar lavage fluid (BAL)</td>
<td>SARS-CoV-2 positive in BAL</td>
</tr>
<tr>
<td>Fuk-Woo Chan J et al., Lancet 2020</td>
<td>A family of 6 individuals</td>
<td>Respiratory samples (nasopharyngeal swab)</td>
<td>3/6 (50%) patients SARS-CoV-2 ; none of them exposed to seafood market</td>
</tr>
<tr>
<td>Chen H et al., Lancet 2020</td>
<td>9 infants</td>
<td>Mother-to-child transmission (intrauterine transmission)</td>
<td>SARS-CoV-2 negative in amniotic fluid, cord blood, neonatal throat swab, and breastmilk</td>
</tr>
<tr>
<td>Kai-Wang To K et al., CID 2020</td>
<td>12 patients admitted to a healthcare facility</td>
<td>Saliva</td>
<td>SARS-CoV-2 detected in 11/12 (91.7%) of patients</td>
</tr>
<tr>
<td>Wang D et al., JAMA 2020</td>
<td>138 patients admitted to a healthcare facility</td>
<td>Faeces</td>
<td>17/138 (12.3%) referred diarrhea and abdominal pain</td>
</tr>
<tr>
<td>?</td>
<td>?</td>
<td>tears, semen, vaginal fluid, other body fluids, viral sanctuaries?</td>
<td>?</td>
</tr>
</tbody>
</table>
Outline

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Standard precautions

1985
- HIV
- Universal precautions

1987
- “Bdy substance isolation”

1996
- Standard precautions
- Transmission-based precautions

Standard precautions

“(…) A set of practices that are applied to the care of patients, regardless of the state of infection (suspicion or confirmation), in any place where health services are provided. (…)”
### Standard Precautions

- **Hand hygiene (water and soap or alcohol-based solutions)**
- **Use of personal protective equipment (PPE) according to risk**
- **Respiratory hygiene (or cough etiquette)**
- **Safe injection practices**
- **Sterilization / disinfection of medical devices**
- **Environmental cleaning**

*PAHO. Prevention and Control of Healthcare associated infections – Basic Recommendations* - PAHO, 2017 (adapted)
Today’s lecture . . .

. . . Our focus will be on the use of **personal protective equipment (PPE)** according to the risk.
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Transmission-based precautions

- **Contact precaution**
- **Droplet precaution**
- **Airborne precaution**
As a reminder, transmission of COVID-19

* Transmission routes involving a combination of hand & surface = indirect contact.


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as of February 19, 2020 – subject to change as new evidence become available
## Transmission-based precautions and COVID-19

<table>
<thead>
<tr>
<th>Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>For any suspected or confirmed case of COVID-19</td>
</tr>
<tr>
<td><strong>Precaution</strong></td>
</tr>
<tr>
<td>Standard + contact + droplet precautions</td>
</tr>
<tr>
<td>For any suspected or confirmed case of COVID-19 and aerosol-generating procedure (AGP)</td>
</tr>
<tr>
<td><strong>Precaution</strong></td>
</tr>
<tr>
<td>Standard + contact + airborne precautions</td>
</tr>
</tbody>
</table>

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Requirements for the use of PPE
Risk evaluation and PPE

Type of interaction with the patient

Amount of body fluid that will be generated

Mode of transmission of the disease

PAHO. Prevention and Control of Healthcare associated infections – Basic Recommendations”- PAHO, 2017 (adapted)
Risk evaluation and PPE

Blood sample collection on a patient with acute diarrhea

Blood sample collection on a patient with diarrhea and tuberculosis
Some questions to consider . . .

- Does the patient fulfill case definition criteria for the disease?
- What is the infectious agent and its mode of transmission?
- What type of procedure will the patient be undergoing?
- Is there any risk of contamination?
- Where should the patient be located?
- What type of PPE will need to be used?
Hand hygiene should always be performed despite PPE use.

Remove and replace if necessary any damaged or broken pieces of re-usable PPE as soon as you become aware that they are not in full working order.

Remove all PPE as soon as possible after completing the care and avoid contaminating the environment outside the isolation room; any other patient or worker; and yourself.

Discard all items of PPE carefully and perform hand hygiene immediately afterwards.

Source: https://apps.who.int/iris/handle/10665/69793
Gloves (sterile / nonsterile)

- Gloves are an essential item of PPE and are used to prevent the healthcare worker from being exposed to direct contact with the blood or body fluid of an infected patient.

- Gloves DO NOT replace hand hygiene.

Source: https://apps.who.int/iris/handle/10665/69793
Gowns (and aprons)

- Gowns are used in addition to gloves if there is risk of fluids or blood from the patient splashing onto the healthcare worker’s body.

- The same gown can be used when providing care to more than one patient but only those patients in a cohort area and only if the gown does not have direct contact with a patient.

- Plastic aprons should be used in addition to gowns if the material of the gown is not fluid repellent and the task to be performed may result in splashes onto the healthcare worker’s body.

Source: https://apps.who.int/iris/handle/10665/69793
Facial mucosa protection (face shield, eye visor, goggles)

Masks, and eye protection, such as eyewear and goggles, are also important pieces of PPE and are used to protect the eyes, nose or mouth mucosa of the health-care worker from any risk of contact with a patient’s respiratory secretions or splashes of blood, body fluids, secretions or excretions.

Source: https://apps.who.int/iris/handle/10665/69793
Putting on a PPE

Source: https://apps.who.int/iris/handle/10665/69793
Doffing a PPE

Source: https://apps.who.int/iris/handle/10665/69793
Respirator (N95) or medical mask?

“(…) The lack of research on facemasks and respirators is reflected in varied and sometimes conflicting policies and guidelines. Further research should focus on examining the efficacy of facemasks against specific infectious threats such as influenza and tuberculosis, (...)”

Source: https://apps.who.int/iris/handle/10665/69793
Respirator (N95) or medical mask?

“(…) SARS care often necessitated aerosol-generating procedures [AGP] such as intubation, which also may have contributed to the prominent nosocomial spread. (…)”

“(…) the factors associated with transmission of SARS-CoV, ranging from self-limited animal-to-human transmission to human superspreader events, remain poorly understood(…)”

Medical masks (droplet precaution)

- Wear a medical mask when within a 1 metre range of the patient.
- Put the patient in a single room or in a room that contains only other patients with the same diagnosis, or with similar risk factors, and ensure that every patient is separated by at least one metre.
- Ensure that the transportation of a patient to areas outside of the designated room is kept to a minimum.
- Perform hand hygiene immediately after removing the medical mask.

Source: https://apps.who.int/iris/handle/10665/69793
Respirator [N95] (airborne precaution)

☐ Use a respirator whenever entering and providing care within the patient isolation facilities ensuring that the seal of the respirator is checked before every use.

☐ Perform hand hygiene immediately after removing the respirator.

☐ Aerosol-generating procedures (AGP) . . .

Source: https://apps.who.int/iris/handle/10665/69793
Aerosol-generating procedures (AGP)

Number of healthcare providers exposed should be limited

**Aerosol-generating procedures (AGP)**

<table>
<thead>
<tr>
<th>Bronchoscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiopulmonary resuscitation</td>
</tr>
<tr>
<td>Noninvasive ventilation (BiPAP, CPAP, HFOV)</td>
</tr>
<tr>
<td>Surgery</td>
</tr>
<tr>
<td>Tracheal intubation</td>
</tr>
<tr>
<td>Manual ventilation</td>
</tr>
<tr>
<td>Sputum induction</td>
</tr>
<tr>
<td>Suctioning</td>
</tr>
<tr>
<td>Laser plume</td>
</tr>
<tr>
<td>Necropsy</td>
</tr>
</tbody>
</table>
Perform a particulate respirator seal check

Source: https://apps.who.int/iris/handle/10665/69793
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Risk evaluation and PPE

Requirements for the use of PPE
Requirements and technical specifications, use of PPE

- Technical guidance based on WHO documents
- Expert consultation
- Tailored to the region needs

## Use of PPE according to level of care


<table>
<thead>
<tr>
<th>Level of care</th>
<th>Hand hygiene</th>
<th>Gown</th>
<th>Medical mask</th>
<th>Respirator (N95 or FFP2)</th>
<th>Goggle (eye protection) OR Face shield (facial protection)</th>
<th>Gloves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triage</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection of specimens for laboratory diagnosis</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Suspected or confirmed case of COVID-19 requiring healthcare facility admission and NO aerosol-generating procedure</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Suspected or confirmed case of COVID-19 requiring healthcare facility admission and WITH aerosol-generating procedure</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Technical specifications, PPE

Table 2 presents the technical description and specifications of personal protective equipment (PPE) in the context of the 2019-nCoV.

Table 2 – Technical description and specifications of personal protective equipment (PPE)

<table>
<thead>
<tr>
<th>Item</th>
<th>Technical description and specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol-based hand rub solution</td>
<td>Bottle of 100ml &amp; 500ml Hand rub formulations containing 75% isopropanol or 80% ethanol.</td>
</tr>
<tr>
<td>Apron</td>
<td>Polyester with PVC coating or 100% PVC or 100% rubber. Waterproof. Minimum basis weight: 250g/m². Adjustable neck strap (reusable). Covering size: 70-90 cm (width) X 120-150cm (height), or standard adult size.</td>
</tr>
<tr>
<td>Bags for medical waste</td>
<td>Disposal bag for bio-hazardous waste, 30x50cm, with “Biohazard” print, autoclavable polypropylene. 50 or 70 micra thickness</td>
</tr>
<tr>
<td>Body bag</td>
<td>Made of linear reinforced, U-shape zipper and 2 zipper pulls with tie ribs. Adult size 250x120cm Protector body bag specifications: 5 handles Impermeable, linear reinforced LDPE, LDPE, EVA, PEVA, (avoid PVC), minimum thickness 400 microns; Should be able to hold 100-125 kilos (200-250 lbs); Should contain no chlorides: burning of chlorides pollute the environment and can cause damage to retort chambers. Body bags should be non-carcinogenic to health of funeral workers when used for cremations. At least 6 handles included in the body bag to allow burial team to hand carry it safely Heat-sealed: insure superior strength and safety, Provide full containment of blood borne pathogens Cracking point of 25 - 32 degrees below zero Shelf life: minimum 10 years Bag and hands should be of white color</td>
</tr>
<tr>
<td>Disinfectant for surfaces – hypochlorite solution 0.05% (regular cleaning) or 0.5% (disinfection of spill)</td>
<td>NaDCC. granules. 1kg. 65 to 70% + dosage spoon</td>
</tr>
<tr>
<td>Disposable towel for hand drying (paper or tissue)</td>
<td>50 to 100m roll</td>
</tr>
<tr>
<td>Face shields</td>
<td>Made of clear plastic and provides good visibility to both the wearer and the patient. Adjustable band to attach firmly around the head and fit snugly against the forehead. Fog resistant (preferable). Completely cover the sides and length of the face. May be re-usable (made of robust material which can be</td>
</tr>
</tbody>
</table>

In summary,

• The use of personal protective equipment (PPE) by healthcare workers requires an evaluation of the risk related to healthcare-related activities;

• The following precautions are recommended for the care of patients with suspected or confirmed cases of COVID-19:
  o For any suspected or confirmed cases of COVID-19
    o standard + contact + droplet precautions
  o For any suspected or confirmed cases of COVID-19 and AGP
    o standard + contact + airborne precautions

as of February 19, 2020 – subject to change as new evidence become available
Questions?

ipc@paho.org