Part 1: Basics of infection control in the time of COVID-19

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Disclosures

• I have no relevant financial relationships with the manufacturer(s) of any commercial product(s) and/or provider of commercial services discussed in this CME activity.

• I do not intend to discuss an unapproved/investigative use of a commercial product/device in our presentation.

• Slides utilized from AAP and CDC
Acknowledgements

Project Firstline is a national collaborative led by the US Centers for Disease Control and Prevention (CDC) to provide infection control training and education to frontline healthcare workers and public health personnel. AAP is proud to partner with Project Firstline, as supported through Cooperative Agreement CDC-RFA-OT18-1802. CDC is an agency within the Department of Health and Human Services (HHS). The contents of this program do not necessarily represent the policies of CDC or HHS and should not be considered an endorsement by the Federal Government.
16 inside infection control videos

Episode 9:
What is Personal Protective Equipment (PPE)?

View on Web Episode 9
[Video – 4:03]
YouTube Episode 9 [Video – 4:03]
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Episode 9 Transcript [TXT – 4 KB]

Episode 10:
Why is Eye Protection Recommended for COVID-19?

View on Web Episode 10
[Video – 5:55]
YouTube Episode 10 [Video – 5:55]
Facebook Episode 10
Episode 10 Transcript [TXT – 5 KB]

Episode 11:
Why are Gloves Recommended for COVID-19?

View on Web Episode 11
[Video – 8:46]
YouTube Episode 11 [Video – 8:46]
Facebook Episode 11
Episode 11 Transcript [TXT – 7 KB]
Objectives

• Understand how COVID-19 is transmitted.
• Understand the rationale for infection control practices for COVID-19.
Coronavirus Disease 2019 (COVID-19): What we know

- The epidemiology of SARS-CoV-2 indicates that most infections are spread through close interactions with infectious individuals.

- Being within about 6 feet of, or in a shared poorly ventilated space with, an infected individual for an extended period increases the risk of transmission.

Asymptomatic and Pre-Symptomatic Spread

• SARS CoV-2 can spread before an infected individual shows symptoms – when they are “pre-symptomatic” – and even if they never show any symptoms at all – when they are “asymptomatic.”

• Spreads mainly from person to person through respiratory secretions that are produced when an infected individual coughs, sneezes, or talks: they can land in the eyes, nose, or mouth of people nearby and can be inhaled into the lungs.
Speech particle emissions are heterogeneous

Particle emissions increase with voice loudness (amplitude)

Quiet, nose breathing better than roaring

Asadi 2019
Choir practice
1 person cold like symptoms 3 days prior
5 days after practice 6 members fever
53 of 61 at 2.5 hour choir practice infected
Chairs spaced 6-10 inches apart
Typically 122 members, some empty seats
Snacks

After choir practice with one symptomatic person, 87% of group developed COVID-19

- Avoid groups
- Stay at least 6 feet apart
- Wear face coverings

CDC.GOV
Optimize Indoor Air Quality; Minimize Proximity to Others

• COVID-19 is more likely to spread in environments where individuals are close together and in spaces that are poorly ventilated.

• Ensure that care processes do not require people to be close together except when clinically necessary.
  • eg, review waiting area layouts and processes.

• Ensure that HVAC systems have been recently inspected and optimized.

• Review standards for air-exchanges in clinical spaces:
  • https://www.cdc.gov/infectioncontrol/guidelines/environmental/appendix_air.html

• Consider auxiliary filtration if appropriate.
Try to avoid aerosol-generating procedures (AGP) if possible

• Procedures that are likely to produce aerosols at potentially high concentrations can increase the risk for transmission to people in proximity to the patient. These procedures should be performed in airborne isolation (aka, “negative pressure”) rooms with only essential staff present.
Data is limited regarding which procedures in healthcare settings are aerosol generating. It is uncertain if standard nebulizer treatments are aerosol generating.

### Aerosol Generating and Non-Aerosol Generating Procedures

#### Complete List of Aerosol Generating Procedures
- ENT Surgery involving nose/sinus, pharynx, trachea*
- Transsphenoidal surgery*
- Bronchoscopy*
- Airway procedures including tracheostomy, cricothyrotomy
- EGD including lower endoscopy
- Colonoscopy
- TEE
- ECT utilizing BVM ventilation
- Endobronchial procedures
- Dental Surgery
- Intubation/extubation/CPR
- Bag-valve mask ventilation
- Standard nebulizer treatment
- Non-invasive ventilation: CPAP/BiPAP
- High frequency oscillating ventilation
- Hi flow oxygen: Nasal cannula >15LPM
- Suction: Deep, open ETT, tracheostomy
- Sputum Induction
- NP swab
- PFT’s including spirometry and peak flow testing
- Treadmill Stress tests to maximal effort
- Autopsy

#### Examples of Non-Aerosol Generating Procedures
- Thoracotomy/thoracostomy
- NG/OG tube placement
- Tympanostomy
- Swallow study
- Tissue-based procedures: biopsy, drains
- Non-rebreather
- Routine tracheostomy dressing change
- In line ET tube suction
- Suctioning of oropharynx
- Modified barium swallow
- Cesarean section
- Pharmacologic stress test
- Dental cleaning and other routine dental procedures
- Management of epistaxis
- Oropharyngeal swab
- Chest PT
- Vibrating mesh nebulizer, eg. “Aerogen”

*High Risk aerosol generating procedures
Infection control methods

- Infection control practices are critical tools to protect people from infectious diseases, including COVID-19.
- Preventing exposures is especially important when vaccines and specific treatments are still being developed.
- Each component builds on the next and should be used together all the time.
  - Source Control
  - Visitor Exclusion
  - Screening and Triage practices
  - Environmental and Hand Hygiene
  - Personal Protective Equipment
Source control

• Source control should be practiced by everyone in the healthcare facility.

• Wear a mask to cover your nose and mouth any time you might be near other people.
  • Remember to mask even when you’re not in patient care areas, eg, break rooms.

• Cloth masks should be worn by patients and visitors.

• Healthcare personnel should wear surgical masks while at work, and switch to respirators (eg, N95 or PAPR/CAPR) when caring for known or suspected COVID-19 patients.

• Limitation on parents/guardians
**Triage and screening**

- **Instruct patients before seeking care:**
  - When to choose telehealth options
  - What to expect on arrival for in-person care
  - Report symptoms and exposures, wear a source control mask at all times
  - Whether others are allowed to accompany them

- Provide supplies for respiratory hygiene and cough etiquette (hand sanitizer, tissues, no-touch disposal receptacles).

- Limit and monitor points of entry to the facility.

- Prevent crowding of patients in shared areas.
  - Limit the number of individuals in waiting areas
  - Consider having patients wait in their cars or a separated area and call them when it’s their turn to be seen

- Screen patients, visitors, and staff on arrival for symptoms consistent with COVID-19 or exposure to others with SARS-CoV-2 infection and ensure they are practicing source control.
Triage and screening continued

- Calling with concern for COVID-19

- Where those with likelihood of COVID-19 will be seen

- If scheduled well or follow up appointments screen positive can they be rescheduled or candidate for telehealth
  - Diagnosed with or symptoms concerning for mild COVID-19 within 10 days prior to appointment, or have exposure to someone with COVID-19 within 14 days of the appointment

- Screen again for symptoms on arrival (healthcare providers, visitor, parents, patients)

- Visual alerts for masking, hand hygiene, distancing

- Easy access to masks and hand hygiene
Environmental hygiene

• SARS-CoV-2 belongs to a family of viruses that are inactivated by standard hospital disinfectants and detergents. The virus has a lipid envelope, a fat-based external layer that is disrupted by detergents and by chemicals such as alcohols and disinfectants. When this outer layer is damaged, the virus is not able to cause an infection.

• Routine practices for hand hygiene and environmental cleaning and disinfection are effective against SARS-CoV-2.

• Check HVAC, airflow

• Physical barriers – Plexiglass
Personal protective equipment (PPE)

• Review correct use-donning, doffing

• PPE for care of patients with suspected or confirmed COVID-19:

  • **Respirator (N95, PAPR)**: Filters out particles in the air so they're not inhaled. Provides a barrier against splashes to the nose and mouth; keeps the person wearing them from breathing out infectious particles.

  • **Eye protection**: Blocks splashes that may land in the eyes. Coverage needed straight in front of you, and on the sides of your face. If reusable, they need to be cleaned and disinfected before reuse.

  • **Gown**: Protects clothes from contact with soiled surfaces and makes removal easier.

  • **Gloves**: Makes removing infectious material from hands easier. Hand hygiene is necessary before and immediately after glove use.
Personal Protective Equipment (PPE) continued

• Your PPE only works best if used correctly **every time**.
• An N95 that doesn’t have a good seal on your face, or gloves that aren’t removed carefully immediately after use, **defeat the purpose of PPE**.
• Ensure your health care facility provides adequate training and opportunity for practicing donning and doffing of PPE, as outlined in their IPC policy.
• Using personal protective equipment (PPE):
  – Step-by-step donning and doffing PPE,
  – Signage outlining donning and doffing steps, and
  – Video walking through donning and doffing process.

COVID-19 Personal Protective Equipment (PPE) for Healthcare Personnel

Preferred PPE – Use N95 or Higher Respirator

Face shield or goggles
N95 or higher respirator
When respirators are not available, use the best available alternative, like a facemask.

One pair of clean, non-sterile gloves

Isolation gown

Acceptable Alternative PPE – Use Facemask

Face shield or goggles
Facemask
N95 or higher respirators are preferred but facemasks are an acceptable alternative.

One pair of clean, non-sterile gloves

Isolation gown

cdc.gov/COVID19
SEQUENCE FOR PUTTING ON PERSONAL PROTECTIVE EQUIPMENT (PPE)

The type of PPE used will vary based on the level of precautions required, such as standard and contact, droplet or airborne infection isolation precautions. The procedure for putting on and removing PPE should be tailored to the specific type of PPE.

1. GOWN
   - Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back
   - Fasten in back of neck and waist

2. MASK OR RESPIRATOR
   - Secure ties or elastic bands at middle of head and neck
   - Fit flexible band to nose bridge
   - Fit snug to face and below chin
   - Fit-check respirator

3. GOGGLES OR FACE SHIELD
   - Place over face and eyes and adjust to fit

4. GLOVES
   - Extend to cover wrist of isolation gown

USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION

- Keep hands away from face
- Limit surfaces touched
- Change gloves when torn or heavily contaminated
- Perform hand hygiene

HOW TO SAFELY REMOVE PERSONAL PROTECTIVE EQUIPMENT (PPE)

EXAMPLE 1

There are a variety of ways to safely remove PPE without contaminating your clothing, skin, or mucous membranes with potentially infectious materials. Here is one example. Remove all PPE before exiting the patient room except a respirator, if worn. Remove the respirator after leaving the patient room and closing the door. Remove PPE in the following sequence:

1. GLOVES
   - Outside of gloves are contaminated!
   - If your hands get contaminated during glove removal, immediately wash your hands or use an alcohol-based hand sanitizer
   - Using a gloved hand, grasp the palm area of the other gloved hand and peel off first glove
   - Hold removed glove in gloved hand
   - Slide fingers of ungloved hand under remaining glove at wrist and peel off second glove over first glove
   - Discard gloves in a waste container

2. GOGGLES OR FACE SHIELD
   - Outside of goggles or face shield are contaminated!
   - If your hands get contaminated during goggle or face shield removal, immediately wash your hands or use an alcohol-based hand sanitizer
   - Remove goggles or face shield from the back by lifting head band or ear pieces
   - If the item is reusable, place in designated receptacle for reprocessing. Otherwise, discard in a waste container

3. GOWN
   - Gown front and sleeves are contaminated!
   - If your hands get contaminated during gown removal, immediately wash your hands or use an alcohol-based hand sanitizer
   - Unfasten gown ties, taking care that sleeves don’t contact your body when reaching for ties
   - Pull gown away from neck and shoulders, touching inside of gown only
   - Turn gown inside out
   - Fold or roll into a bundle and discard in a waste container

4. MASK OR RESPIRATOR
   - Front of mask/respirator is contaminated — DO NOT TOUCH!
   - If your hands get contaminated during mask/respirator removal, immediately wash your hands or use an alcohol-based hand sanitizer
   - Grasp bottom ties or elastics of the mask/respirator; then the ones at the top, and remove without touching the front
   - Discard in a waste container

5. WASH HANDS OR USE AN ALCOHOL-BASED HAND SANITIZER IMMEDIATELY AFTER REMOVING ALL PPE

PERFORM HAND HYGIENE BETWEEN STEPS IF HANDS BECOME CONTAMINATED AND IMMEDIATELY AFTER REMOVING ALL PPE
As a brewery, we always plan to have extra materials on hand—which works out well when we have friends in need. We happened to have a number of extra masks, so we’re donating them to our friends at Barbara Bush Children’s Hospital.

No days off. Thanks to some serious teamwork, Massachusetts is set to receive over 1 million N95 masks for our front-line workers. Huge thanks to the Krafts and several dedicated partners for making this happen.
PPE Reuse

• Practices for extended use (more than 1 patient encounter) and reuse of PPE should be defined in the facility’s IPC policy and will be driven by the patient(s) for whom care is provided and the procedures performed:

  – **When caring for an asymptomatic patient with unknown status:** Masks, eye protection, and gowns may be used all day if not soiled or contaminated. If some or all of these items are reusable, these items might be able to be sanitized at the end of the day and reused. If used, gloves should be changed between patients.

  – **When caring for a patient with a COVID-19–compatible illness:** Gloves and gown should be removed and disposed of between patients. Eye protection (goggles and/or face shields) should be sanitized between patients. Masks should be changed between patients unless covered by a face shield or another mask.

  – **When performing an aerosol-generating procedure (AGP):** When performing AGPs, the highest available level of PPE should be used. PPE reuse should follow policies for the care of patients with a COVID-19–compatible illness.
Strategies for Optimizing the Supply of PPE

- Consider these options and **implement them sequentially**.
- Understand current PPE inventory, supply chain, and **utilization rate**.
- Train health care personnel on PPE use and have them demonstrate competency with donning and doffing any PPE ensemble that is used to perform job responsibilities.

# Contingency and Crisis Capacity Strategies

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<tr>
<th>PPE</th>
<th>Contingent Capacity Strategies</th>
<th>Crisis Capacity Strategies</th>
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| All PPE   | • Selectively cancel elective and non-urgent procedures and appointments for which PPE is typically used by health care providers.  
            • Decrease length of hospital stay for medically stable patients with COVID-19. | • Cancel all elective and non-urgent procedures and appointments for which PPE is typically used by HCP. |

## Contingency and Crisis Capacity Strategies

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<tbody>
<tr>
<td>N95 Respirators</td>
<td>• Temporarily <strong>suspend annual fit testing.</strong></td>
<td>• Use respirators <strong>beyond the manufacturer designated shelf life</strong> for health care delivery.</td>
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<tr>
<td></td>
<td>• Use N95 <strong>respirators beyond the manufacturer-designated shelf life</strong> for training and fit testing.</td>
<td>• Use respirators approved under standards used in other countries.</td>
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<td>• Extend the use of N95 respirators by <strong>wearing the same N95 for repeated close contact encounters</strong> with several different patients.</td>
<td>• Implement <strong>limited re-use of N95 respirators</strong>. During times of crisis, it may be needed to practice limited re-use on top of extended use.</td>
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<td>• <strong>Use additional respirators</strong> beyond the manufacturer-designated shelf life that have not been evaluated by NIOSH.</td>
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<td>• <strong>Prioritize the use of N95 respirators and facemasks by activity.</strong></td>
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<td>Face Masks</td>
<td>• Place facemasks in a secure and monitored site.</td>
<td>• Use facemasks beyond the manufacturer-designated shelf life during patient care activities.</td>
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<td></td>
<td>• Provide facemasks to symptomatic patients upon check-in at entry points.</td>
<td>• Implement limited re-use of facemasks.</td>
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<tr>
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<td>• Implement extended use of facemasks.</td>
<td>• Prioritize facemasks for selected activities such as essential surgeries, activities where splashes and sprays are anticipated, prolonged face-to-face contact with an infectious patient, and aerosol-generating procedures.</td>
</tr>
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<td>• Restrict facemasks for use by HCP, rather than asymptomatic patients (who might use cloth face coverings) for source control.</td>
<td>• When no facemasks are available: use a face shield that covers the entire front (that extends to the chin or below) and sides of the face with no facemask.</td>
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Tools for Optimizing the Supply of PPE

- **PPE Burn Rate Calculator**
  - Spreadsheet-based model that will help health care facilities plan and optimize the use of PPE for response to COVID-19.
  - Enter the number of full boxes of each type of PPE in stock (gowns, gloves, surgical masks, respirators, and face shields) and the total number of patients at your facility.
  - The tool will calculate the average consumption rate, also referred to as a “burn rate,” for each type of PPE entered in the spreadsheet.
  - This information can then be used to estimate how long the remaining supply of PPE will last, based on the average consumption rate.

- **NIOSH PPE Tracker app**
  https://www.cdc.gov/niosh/ppe/ppeapp.html
  - Mobile app that calculates average PPE consumption rate or “burn rate.” The app estimates how many days a PPE supply will last given current inventory levels and PPE burn rate.
Hand hygiene

• Hand hygiene, which includes using alcohol-based hand sanitizer or washing your hands with soap and water, is a way to prevent delivering infectious material from the environment to your eyes, nose, or mouth, where respiratory viruses can cause infections.

• The virus that causes COVID-19 is inactivated by detergents like soap and water, and by the alcohol in alcohol-based hand sanitizer.
44 children’s hospitalized hospitalizations for respiratory Illnesses down 62%

Antoon. J Hosp Med. Published Online First March 8, 2021. DOI: 10.12788/jhm.3608 | 10.12788/jhm.3608
Masking recommendations evolving as pandemic progresses

Asymptomatic/presymptomatic
Higher NP viral load early

2 medical masks not recommended

Closing

- Winter and typical flu season is almost behind us.
- Rigorous infection control continues to be crucial for protecting our healthcare workforce in the coming months.
- Upcoming sessions will focus on:
  - Scenarios around PPE
  - Continued discussion of infection prevention and control transmission precautions
Resources

- American Academy of Pediatrics COVID-19 Guidance and Resources
  - COVID Town Halls
  - Practice Management Tips
  - Discounts on PPE and COVID-19 Supplies
- Centers for Disease Control and Prevention
  - Standard Precautions
  - Transmission-Based Precautions
  - Clinical Questions about COVID-19: Questions and Answers
- Project Firstline
Additional references


- Chu DK, et al. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. Lancet. 2020; (published online June 1.)


Thank you

Thanks to Maine AAP and Dee Kerry for inviting me to speak and directing me to the resources from AAP ECHO and CDC Project FirstLine

Questions?
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