EM CASES SUMMARY

Episode 139 COVID-19 PPE, Conservation Strategies & Protected Code Blue

With Dr. Laurie Mazurik
Prepared by Anton Helman, March 2020

The single most important thing we can do as ED providers in this COVID pandemic is to protect ourselves, our colleagues, our patients, our families and our friends against transmission of the virus; and there is no higher risk of transmission that during the resuscitation of a sick COVID patient. In this podcast we speak with a world expert on PPE, Dr. Laurie Mazurik about protecting against transmission of the virus *before, during* and *after* your shift. Not only do we discuss the details of all PPE from head protection to footwear, but we give tips on the equally important non-PPE protection as well. We touch on PPE conservation strategies as we struggle with supplies, give you the bottom line on donning/doffing sequencing, and discuss the core principles of *the protected code blue*...

Protecting against COVID-19 transmission before your shift, during your shift and after your shift

Before and after your shift

Adapted from decontamination checklist by Lauren Westafer

- Avoid public transit
- Bring your own food/drink supply
- Remove jewelry, watches
- If you have long hair, tie it up in a tight bun
- Obtain clean scrubs at the hospital if possible
- Place all your work gear – stethoscope, pens, phone, clipboard etc in a freezer zip lock bag
- Use a separate pair of waterproof shoes that you leave at work
- Take an extra large freezer bag or garbage bag to place your clothes into
- Take with you disinfectant wipes (or if they have run out in your community mix 25mL of bleech in 750mL of water in a spray bottle so that you can wipe down your car steering wheel, gear shift and seat).
- After your shift, if possible, shower at the hospital leaving your scrubs there (or place them in a separate freezer bag) and change into the clothes that you kept in the freezer bag. If there is no shower at the hospital, wash your hands, arms and face with soap. Change from your hospital shoes into your home shoes. Sanitize your

badge and phone and place all your gear back into a freezer bag.
- When you get home leave your work gear in the garage or shed or under an upside down bucket outside. Put your water bottle and food container directly into the dishwasher and clothes into the washing machine using hot water.
- Take a shower

*Tip for interviewing and swabbing low risk COVID patients: For isolated low risk patients, consider not entering the patient room initially; rather do a **phone interview**. Then make an assessment plan. When obtaining swabs, **stand to the side and behind the patient**, and ask them to put their mask just below their nose and turn away from you if they feel they are going to sneeze or cough.*

Personal protective Equipment (PPE)

Transmission of COVID-19 is approximately 3 x more likely to occur at the ED than elsewhere and certain procedures like intubation create the highest risk. You need to learn about PPE, and how to use it properly. Yours and the lives of others depends on it.

Tip 1: PPE recommendations change frequently. This is especially the case in emerging diseases, where there may be some uncertainty about the mode of transmission and in the case of COVID 19, the sheer amount of PPE being consumed is leading to global shortages. Make every effort to adapt.

Tip 2: Non-PPE Protection is equally important!

- Distance of 2 m
- Structural Barriers between you and the patient (wall, doors, etc.)
- Interview patients by phone & use telemedicine where possible
- Keep the time you are with the patient to a minimum. Avoid all unnecessary procedures
- Keeping your environment clean. Wipe keyboards, desktops, pens, etc.
- Eat in designated areas, and bring your own snacks and food
- **Wear only your scrubs under PPE; n**o jewelry, watches, or street clothes under PPE.
- No pens, charts or clipboards should go into the room.
- You can decide if you want to take your stethoscope in but clean it with a CAVI Wipe afterwards.
- If you have a beard or mustache strongly consider shaving it or trimming it so it does not break the N95 respirator's seal.
- **Avoid aerosol generating procedures where possible;** nebulizers, BVM,CPAP,BiPAP, High Flow Nasal Cannula and bronchoscopy.

Tip 3: Not all PPE is equal!

Gowns

Gowns are graded in fluid resistance from: Level 1 (~no resistance to fluids), to Level 4 which is impervious. They also

vary in coverage, with some covering only the front of you, like an apron with sleeves.

- If you have yellow porous see-through gowns, you have a level 1 gown and this in not adequate protection for COVID 19.
- The gown should be fluid resistant, long sleeved and fully cover your back.
- A washable, (reusable) Level 2 gown is the minimum requirement for high risk procedures

If you have porous see-through gowns, you have a level 1 gown and this in not adequate protection for COVID 19; a washable, (reusable) Level 2 gown is the minimum requirement for high risk procedures

Eye Protection

Eye protection comes in the form of goggle or glasses. These may be personal issue and re-used by cleaning with a solution that does not etch the surface. They protect your eyes from being touched or having secretions sprayed into them.

Face Shields

- Face shields provide superior protection to goggles or glasses, because they cover you face, part of your neck and all of your mask. There are re-useable face shields, usually personal issue, and like glasses must be cleaned with solutions that do not etch their surface.
- Bibbed face shields may be available. They have a small drape that hangs down to cover your neck,
- If you are thinking about combining a face shield with goggles or glasses, *think twice*, as this combination often fogs, leading to you touching the equipment to adjust it.

Reusable face shields provide superior protection to goggles or glasses.

Hair Cover or Bouffant

These not in the current guidelines by WHO *but* frontline staff expressed concerns that their hair, sides of face and neck exposed to a patient's cough. A Bouffant seems to capture some of the spray.

Neck protection and hoods

Hoods are not currently recommended and are hard to find. They provide additional head and neck cover.

Two things you can do to provide neck protection

1. Tie your gown as high on your neck as possible
2. After doffing, clean your neck with hand sanitizer or soap and water (and take a shower if there may have been a significant breach during the procedure)

Footwear

- Boot or shoe covers are not currently recommended by WHO. You will see them used in China in high viral load areas i.e. COVID 19 wards, ICU, etc.
- Rubber shoes are not currently recommended by WHO. Wear closed shoes, and always leave them at work.

Gloves

Nitrile gloves come in 2 lengths extended and regular. Reserve the extended if for some reason the others don't cover the cuff of your gown. Should you wear 1 pair or 2 pairs? Well that depends if you have to wear PPE all shift, you may end up washing your hands so much that your skin breaks down. Some people may choose to wear two pairs, disposing of the outer pair between patients and washing the under pair the same way they would their hands. Check with your IPAC to decide what's best for you.

Masks

- Surgical masks were designed to protect the patient from you and have a simulated workplace protection factor (SWPF) of 2. They are loose fitting. These are to be given to the patient to prevent them from spreading the virus. They are also felt to be adequate respiratory protection for droplet spread diseases like COVID 19, *except* if aerosols are generated.
- N95 respirators are fitted, have a SWPF of ~ 10, and provide airborne protection, stopping particles as small as ~3 microns. Although COVID 19 is droplet spread (~10 microns), aerosol generating procedures such as BVM, BiPAP, CPAP, HFNC, Bronchoscopy and Intubation, will create smaller droplet nuclei, which are suspended in the air for a period of time. This puts you at greater risk of inhaling and contracting the virus.
- Powered Air Purifying Respirators provide the highest level of respiratory protection (SWPF 1000+) and are not currently recommended and extremely difficult to obtain in Canada.

PPE conservation strategies

There is a global PPE Shortage and strategies are being developed to preserve, use longer and re-use PPE. For example, staff are asked to use a single mask or N95 respirator for as long as possible, changing it only if it gets wet or contaminated. There are tests looking at the use of UV light or microwaving to sterilize a mask or N95 but there are no clear indications at this time that is safe to do. There have been suggestions that if someone runs out of respiratory protection, they should use a bandana. However, we can definitely do better. Scientists and mask/respirator experts need to collaborate to provide a better option. Using washable re-usable gowns, face shields and glasses or goggles are also part of the conservation strategy.

Manufacturers retooling to make PPE: e.g. Bauer Hockey Equipment to make Face shields for Health Care Providers: https://globalnews.ca/news/6734828/coronavirus-bauer-face-shields/

Using industrial protective equipment: cleanable and re-usable face shields from big box hardware stores

Quilted materials may be best as they are breathable and the mesh of fibres is better than one layer.

Re-using N95 masks: putting an N95 in a conventional oven at 70C (158F) for 30 minutes should be effective in killing SARS CoV2 and does not degrade the mask itself (see chart below)

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.

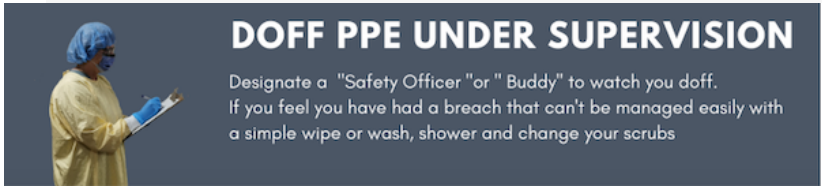
PPE donning/doffing sequence

This takes practice, and is best done under the supervision of a **designated buddy** or safety officer who uses a **checklist** to insure you do this properly without a breach in protection.

The only hard rules to remember for PPE donning/doffing:

1. *Mask/N95 should always be FIRST ON & LAST OFF.*
2. *Take your dirtiest PPE off first.*

2.



From ECUUS

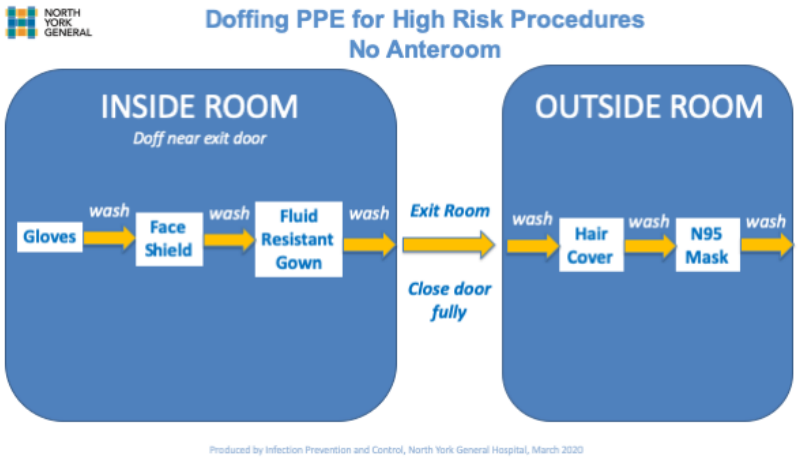
Don't forget to do a seal check on your N95.

Where do you DOFF PPE?

If you have a room with an anteroom, you doff in the ante room unless your gown or gloves are heavily soiled. Remove heavily soiled gowns or gloves in the patient's room standing at least 2 m from them. Then take your mask/N95 off in the anteroom.

If you don't have an ante room, take everything off except your N95/Mask (and hair cover if you have one) off in the room (at least 2 m/ 6ft from the patient). Take your N95/Mask off outside

the patient's room as it is your most important defence against respiratory infection when you are exposed to the patient. Sometimes though, the room is so small you can't possibly be 2 m away from the patient, so may have to doff outside the room and clean that area where you doffed, afterwards.



PPE doffing if no anteroom example

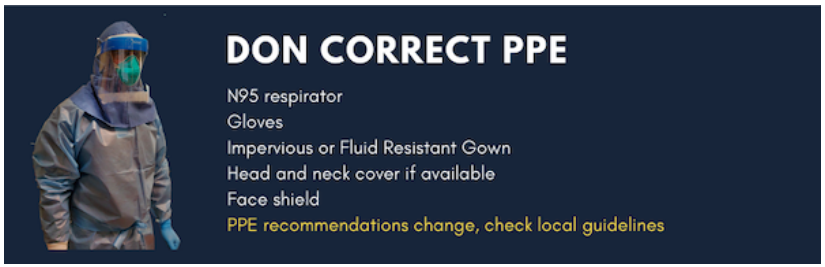
The risk of transmission is related to the viral load and duration of exposure

Viral loads are highest in the very ill patients and exposure risk is highest if aerosols are generated through:

- Triggered coughing i.e. intubation without paralytics or suction
- BiPAP, CPAP
- High flow oxygen systems such as high flow nasal cannula
- Nebulizers
- Bag mask ventilation with a poor seal

PPE for high risk procedures that generate aerosols

The highest risk to staff is intubation.
It was estimated that 9% of staff involved in intubating SARS patients at one Toronto hospital contracted SARS. None died. It is expected that within the patient care setting, SARS-CoV-2 will spread to health care workers the same way as SARS did in 2003.



From ECUUS

The current recommendation in Canada for performing an aerosol generating procedure is: N95, eye or face protection, gown and gloves.

No head or neck protection is recommended at present. From doing informal glo-germ tests (blow a small amount of florescent powder at someone in PPE before they doff from ~ 1 m away,) we found contamination of neck, ears and hair. In the Middle East where they intubate the much more lethal corona virus MERS, part of their protocol after removing PPE it to always wash their face and neck.

Wear hair head/cover and wash your face and neck afterwards. If you have a breach that is not easily solved this way, take a shower.

Be prepared for personal protection recommendations to change or vary between various regions or countries. Supply chain issues are occurring. Learn about the different types of PPE and be ready to find new ways to reduce your risk. Collectively adapt to whatever comes your way.

Basic protected intubation and code blue principles

1. Avoid all aerosol generating procedures whenever possible
2. Keep both the number of people and the duration of exposure to a minimum
3. Wear the correct PPE and doff under supervision
4. Use clear plans and checklists where possible
5. Think A-B-C not CAB in cardiac arrest. Secure the airway to protect the team first.

To keep you and your team safe you must train, train train; practice, practice practice – please use the following free resources to develop a rapid training course for safe resuscitation of COVID-19 patients in your ED