D is for Danger

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We all learn our resuscitation basics – DRSABCD. D is for danger. I don't know why, but when I was in medical school, danger referred to relatively trivial (like looking for a puddle on the floor that you might slip in – quick, get a towel before starting CPR!) or unlikely scenarios (like downed electrical mains sitting in that puddle of water!). Things have changed. In the current COVID-19 pandemic, danger to staff is at the top of everyone's agenda, particularly with respect to personal protective equipment (PPE).

I'll be taking you through what you need to know about the PPE for COVID-19, the logic underlying it, and the logistics of how to do it.

The first thing to know is that suspected and confirmed cases should be treated as equivalent. The same rules apply whether I am planning to swab someone, have already swabbed them, or they have returned a positive PCR. The level of PPE is based on how sick the patient is – and whether or not you are planning to poke the viral hornet's nest – not the arbitrary timing of the swab or how long it takes the lab to get the result to you.

Levels of PPE for COVID-19

For COVID-19 there are three levels of PPE relevant to clinicians.

Droplet: most patients with suspected or confirmed COVID-19

Kit: gown (or apron*), surgical mask, eyewear, gloves.

It seems that the most common route of transmission is by droplets, which a surgical mask can protect against. This is your default: the vast majority will fall into this category.

Airborne: patients who are critically unwell OR for staff on COVID-19 wards

Kit: gown (or apron*), N95 mask, eyewear, gloves.

Sicker patients are expected to shed more virus and have closer contact with staff, thus a higher level of PPE is used here – think a patient with falling saturations now escalated from nasal prongs to a Hudson mask, a patient who is having rapid response team

reviews, a patient in resus in ED or in ICU/HDU, or someone who would fulfil these criteria if it weren't for a resuscitation plan limiting escalation of therapy. Similarly, for staff who spend their entire shift looking after suspected or confirmed COVID-19 patients (e.g. COVID wards) it is reasonable to provide a higher level of PPE to minimise their occupational risk.

Aerosol Generating Procedures (AGPs): patients having specific interventions or therapies

Kit: includes surgical gown, N95 mask, disposable eyewear, gloves (± double glove) ± additional kit (disposable cap, face shield, etc.)

Reserved for when clinicians are poking the viral hornet's nest: performing intubation, CPR, bronchoscopy, suctioning, certain surgeries or applying high flow nasal cannulae**. The kit involved in this level is more variable centre-to-centre, but usually involves some additional kit to give added protection for those at risk of getting showered in virus.

Gown or apron?

*Regarding gown/apron choice, at the hospital where I work at we currently use long-sleeve gowns for all interactions with suspected or confirmed COVID-19 patients, but both the NSW Clinical Excellence Commission and NHS guidelines recommend that unless you are performing an aerosol generating procedure (described earlier) or doing something where you are likely to expose your arms to contamination (examining the patient, changing an incontinence pad), an apron will suffice. This means the nurses may be able to just use an apron if they are changing a fluid bag in the patient room, turning off an infusion pump or other interactions where their arms are unlikely to be contaminated.

About high flow nasal cannulae

**High flow nasal cannula is something quite different to the standard nasal cannula and has a dedicated machine and equipment. The use of normal nasal cannulae at the oxygen flows you'd usually use on the ward is not an aerosol generating procedure.

Donning and doffing

The next thing to discuss is how to don (put on) and doff (take off) your PPE.

The donning matters so that you have the protection you need during the patient interaction, and so that you can doff in the correct order. Doffing is arguably the more important step, as clinicians are dealing with contaminated materials, and this is the time they can contaminate themselves.

The more places you look, the variety of different ways you'll see endorsed as legitimate ways of doing this – which makes it more complicated. Part of this variability is driven by the kit available at different centres. The method I'll discuss is for the first two levels

of PPE, which will cover the vast majority of patient interactions, and relates to the thumbs up, plastic bag-style gowns where you put your head through a loop.

Donning

The main things that matter here are:

- **Choosing the appropriate level of PPE.**
- **If you are using an N95 mask, you MUST fit check it.**
- **Put it on in an order that won't muck with your mask/eyewear and so that you can take it off in the correct order.**

Process

1. Wash your hands.

2. Gown: loop over your head and tie it at the back – this keeps the ties from flapping around in the most contaminated area (the front), and then falling off at the end when you doff. Some resources say to put the gown on after your mask, but this will get caught on your mask and eyewear if your gown has a loop for your head to go through. Trust me: if your gown has a loop to put your head through – put the gown on first.

3. Mask.

1. Surgical mask (droplet precautions). As discussed, this will be sufficient for the vast majority of patient interactions. Place the mask so that it covers the nose and mouth, and is tied behind the head with one tie above the ears and one below. Press on the flexible metal nasal bridge so that it follows the form of your nose.
2. N95 mask (airborne precautions). These come in a variety of styles (duckbill, hemisphere…) but they all must comply with the same standards regarding particulate filtering and seal. N95 is the US standard and is equivalent to KN95 (Chinese) and P2 (EU). They are reliant on all the air going through the mask and not around it, so checking the fit is imperative.

How to put on an N95 mask

To put one of these on it is best to watch a video, but the basic steps are:

- **Open the mask.**
- **Put your thumb and index looped around the two straps.**
- **Dig your chin into the base of the mask.**
- **Lift the straps up and over your head with one going above your ears and one below, and**
- **Press down on the flexible metal nasal bridge so that the fit is snug.**

FIT CHECK: you must fit-check an N95 mask.

To fit check your mask, take a deep breath in and out, and feeling with your hands and face whether air is leaking. If you feel air leaking around your nose, press down more firmly over the bridge. If it still leaks, try opening your mouth then pressing down again on the bridge – this may make the mask fit more snugly. If leaking elsewhere, check it is sitting well on your face and not bunched. If you can feel a leak, the mask is not functioning as an N95 mask and you are not safe: do not go into the room.

Process continued

4. Eyewear. This is for everyone. If you usually wear glasses, you need to put eyewear over these. Options include reusable goggles, disposable goggles, a face shield or visor attached to a surgical mask (you can put this over your N95 mask). If you choose the last option, be careful not to disrupt the fit of your N95 mask when putting the surgical mask on top.

5. Wash your hands. Just like you always do before putting on gloves. Yes, you did wash before, but you've just been mucking with your flea-ridden hair – please wash again.

6. Gloves.

Preferably have a colleague watch you do this to check you're properly done up and haven't torn your gown. Then you're good to go into the patient bed-space.

Why hello Mrs. Jones. My - that is a nasty cough you have!...

Doffing

The main things that matter here are:

- **Take the dirtiest stuff off first (gown and gloves).**
- **Wash your hands between every step.**
- **Your mask is your life-vest – take it off last.**

Ideally, you have two bins – one in the patient area, and one outside. You can do all your doffing outside, but you can't do it all inside – you need to leave your mask on until you are out of the patient area.

In the patient's room

1. Gloves off.
2. Wash hands.
3. Gown off – break the two straps at the back, and roll the gown down keeping the dirty surface rolling inwards, then put it straight into the bin.
4. Wash hands. *Thanks again Mrs. Jones – hope you're feeling a bit better tomorrow.*

Step out of the patient's room

1. Eyewear off – lots of the eyewear is reusable, so you don't want to leave it in the room. Grab arms of the glasses near your ears and lift them off your face. If they're

reusable wipe them down with a sterilising wipe (Steri7 or similar); if they're disposable, then straight into the bin.
2. Wash hands.
3. Mask off – grab the straps at the back and lift off your head, allow the mask to come forward off your face, then drop directly into the bin.

For demonstrations of this, see the videos and description on the Clinical Excellence Commission website: http://www.cec.health.nsw.gov.au/keep-patients-safe/COVID-19/Personal-Protective-Equipment-PPE/covid-19-training-videos

The supply of PPE for COVID-19

The last thing I'll discuss is the supply of masks. Like the rest of the world, Australia is working hard to try to increase its supply of surgical and N95 masks, as well as avoiding waste. The Clinical Excellence Commission guidelines advise how to stretch out our supply of masks if availability does get low.

One of the main strategies is prolonged use of a single mask, that is, leaving the mask on for multiple patient interactions for up to 8 hours. If we get to this point, the idea is that you would leave your mask on, and rather than doffing it after you leave the patient area you leave it on for more than one patient interaction without touching it.

It is important to note that this does not involve taking a mask off, putting it in your pocket or under your chin, then putting it back up onto your face for the next patient – you'd be sure to contaminate yourself. Rather, you only ever put a mask on once and take it off once, and as you take it off it always goes straight into the bin.

Some caveats with this blog

- **COVID-19 is new, and everything is changing rapidly. Guidelines are likely to change – the Clinical Excellence Commission has a COVID-19 page that is being constantly updated.**
- **Local protocols vary...a lot. The above is based on local and international guidelines, but every hospital will be different. Follow your hospital's protocols and advice from infection control and infectious diseases.**

PPE for COVID-19 summary

So, in summary, choose your PPE based on how sick your patient is, when donning an N95 mask be sure to fit check it, and when doffing remember the 3 basic principles:

1. take the dirtiest stuff off first;
2. wash your hands between every step; and,
3. your facemask is your life-vest – take it off last.

Useful resources

- NSW Clinical Excellence Commission Guidelines on PPE for COVID-19. (Accessed 14/4/20 http://www.cec.health.nsw.gov.au/__data/assets/pdf_file/0010/575362/COVID-19-Infection-Prevention-and-Control-Advice-for-Health-Workers-V2.pdf)
- NSW Clinical Excellence Commission COVID-19 PPE don and doff demonstration videos. (Accessed 14/4/20 http://www.cec.health.nsw.gov.au/keep-patients-safe/COVID-19/Personal-Protective-Equipment-PPE/covid-19-training-videos)
- NSW Clinical Excellence Commission Fit Check Poster. (Accessed 14/4/20 http://www.cec.health.nsw.gov.au/__data/assets/pdf_file/0010/566776/CEC-Principles-of-Fit-checking-chart-2020.pdf)
- Public Health England PPE guidelines for COVID-19. (Accessed 14/4/20 https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/covid-19-personal-protective-equipment-ppe)
- Mask choice and PPE from Public Health England. (Accessed 14/4/20 https://www.rdash.nhs.uk/wp-content/uploads/2017/08/Appendix-47-Surgical-Face-Mask-FFP3.pdf)
- Risk of self-contamination during doffing of personal protective equipment (American Journal of Infection Control). (Accessed 14/4/20 https://www.ajicjournal.org/article/S0196-6553(18)30680-1/fulltext)

Related Blogs

- Personal Protective Equipment
- Stay safe, Stay home
- In Isolation
- Quarantine Curriculum tips

Related Podcasts

- Role of the COVID-19 team
- Recognising the deteriorating respiratory patient in the context of the COVID-19 pandemic
- Febrile returned traveller

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