**Simulation Algorithm: Tracheo-Innominate Fistula, COVID-19 Positive**

**Case:** Patient is 60 years old, trauma, had external-fixation by orthopaedics, percutaneous tracheostomy inserted 7 days ago for failure to wean, was found to be COVID-19 positive
- Definitive surgical management of the pelvis is required, and the patient is brought from intensive care unit to the operating room (OR). In the OR are present a junior anesthesia resident (actor) and a registered nurse (actor) already wearing extended personal protective equipment (PPE).
- As the patient is moved to the table and the anesthesia machine is connected to the tracheostomy, massive hemoptysis occurs.
- 1 senior anesthesia resident (AN), 2 nurses (RN), and 1 senior thoracic resident (THOR) are in the surgeon lounge
- Vitals signs are on the monitor: heart rate (HR), blood pressure (BP), oxygen saturation (SpO2), electrocardiogram (EKG)

**Simulation Start:**
Junior AN pages senior AN resident, indicates:
bleeding patient, COVID-19 positive, suggests to bring help

**Arrival in antechamber (AN + RN)**

**OR entered directly:**
Resident reminds that patient is COVID-19 positive

- Suction (blood +++)
- Request for bronchoscope (a participant must leave room while patient bleeds)
- Attempt at intubating or removal of perc trach (suggestion that THOR should be paged)
- Page THOR

**Donning then OR entered**

**Third Minute**

- SpO2 = 88%   HR = up to 105
- BP = 80/50   EKG: Sinus

**At 6 minutes**

- SpO2 = aim 70%
- HR = 120 bpm   BP = 65/40
- EKG: Sinus

**At 8 minutes**

- SpO2 = aim 65%
- HR = 120 bpm   BP = 0/0
- EKG: Sinus

**Description of the surgical management of a TIF by THOR**

**Arrival in antechamber (THOR)**

**OR entered directly:**
Resident reminds that patient is COVID-19 positive

**Donning then OR entered**

- Verbalizes diagnosis of tracheo-innominate fistula (TIF)
- Removal of the trach and compression with finger
- Intubation with single lumen tube

**Doffing for everyone in antechamber**
## Simulation PPE Confidence

Adapted from O’Keeffe et al. 2016¹ and LoSavio et al. 2020².

### Participant’s Name:

### Participant’s Department and Training Level:

### Simulation Date:

|   | Not at all | A little bit | To some extent | Quite a bit | Extremely |
|---|------------|--------------|----------------|-------------|-----------|
| 1 |            |              |                |             |           |

### 1. Are you aware of the current LHSC guidelines for PPE use?

   Yes/No

### 2. BEFORE the simulation and debrief, what was your confidence in the following:

- a) Management of a surgical emergency with a COVID-19 positive patient?
- b) Performing OR skills while wearing PPE?
- c) Donning PPE?
- d) Doffing PPE?

|   | Not at all | A little bit | To some extent | Quite a bit | Extremely |
|---|------------|--------------|----------------|-------------|-----------|
| a) |            |              |                |             |           |
| b) |            |              |                |             |           |
| c) |            |              |                |             |           |
| d) |            |              |                |             |           |

### 3. AFTER the simulation and debrief, what was your confidence in the following:

- a) Management of a surgical emergency with a COVID-19 positive patient?
- b) Performing OR skills while wearing PPE?
- c) Donning PPE?
- d) Doffing PPE?

### Participant’s Additional Comments:

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1) O’Keeffe D., et al. 2016. Ebola emergency preparedness: simulation training for frontline healthcare professionals. MedEdPORTAL. 12(1)

2) LoSavio P., et al. 2020. Rapid implementation of COVID-19 tracheostomy simulation training to increase surgeon safety and confidence. American Journal of Otolaryngology. 41(5)
### Post-Simulation MMOQ Questionnaire

Adapted from Bierer et al. 2018

| Method | Disagree | Neutral | Agree |
|--------|----------|---------|-------|
| 1) Simulation objectives clearly defined? | 1 | 2 | 3 | 4 | 5 |
| 2) Simulation execution was realistic? | 1 | 2 | 3 | 4 | 5 |
| 3) Simulation debriefing was useful? | 1 | 2 | 3 | 4 | 5 |

| Materials | Disagree | Neutral | Agree |
|-----------|----------|---------|-------|
| 4) Simulation mannequin was realistic? | 1 | 2 | 3 | 4 | 5 |
| 5) Vital Sign Simulator was realistic? | 1 | 2 | 3 | 4 | 5 |
| 6) Simulation equipment selection was realistic? | 1 | 2 | 3 | 4 | 5 |

| Members | Poor | Decent | Superb |
|---------|------|--------|--------|
| 7) Nursing staff performance and involvement was: | NA | 1 | 2 |
| 8) Anesthesia staff performance and involvement was: | NA | 3 | 4 |
| 9) Surgical staff performance and involvement was: | NA | 5 |
| *Please do not evaluate your own department, select NA. | |

| Overall | Disagree | Neutral | Agree |
|---------|----------|---------|-------|
| 10) Overall team interactions were realistic? | 1 | 2 | 3 | 4 | 5 |
| 11) Overall simulation was realistic? | 1 | 2 | 3 | 4 | 5 |
| 12) This simulation is a useful team training tool? | 1 | 2 | 3 | 4 | 5 |

Participant’s Additional Comments:

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3) Bierer J., et al. 2018. Development of an In Situ Thoracic Surgery Crisis Simulation Focused on Nontechnical Skill Training. *Ann Thorac Surg* 106(1)
LHSC PPE Checklist: Donning

| Donning Step                                                                 | Yes | No | N/A |
|------------------------------------------------------------------------------|-----|----|-----|
| **1. Perform hand hygiene**                                                  |     |    |     |
| Hand hygiene completed                                                       |     |    |     |
| Step 1 performed in correct sequence (ie as first step)                     |     |    |     |
| **2. Collect PPE**                                                          |     |    |     |
| Perform inspection                                                            |     |    |     |
| Remove jewelry                                                                 |     |    |     |
| Step 2 performed in correct sequence (ie after previous completed step)     |     |    |     |
| **3. Put on neck protection (if used)**                                      |     |    |     |
| Verify full coverage of neck to chin                                          |     |    |     |
| Step 3 performed in correct sequence (ie after previous completed step)     |     |    |     |
| **4. Put on inner gloves (if used)**                                         |     |    |     |
| Select correct type (should be extended cuff gloves) and size                |     |    |     |
| Ensure cuffs of gloves are pulled up                                          |     |    |     |
| Step 4 performed in correct sequence (ie after previous completed step)     |     |    |     |
| **5. Put on gown**                                                           |     |    |     |
| Select appropriate size/type (level 3 or higher) and apply with opening in back |     |    |     |
| Fully cover torso from neck to knees and arms to end of wrists               |     |    |     |
| Ensure gown is fully wrapped around the waist                                 |     |    |     |
| Fasten all ties securely                                                      |     |    |     |
| Step 5 performed in correct sequence (ie after previous completed step)     |     |    |     |
| **6. Put on N95 respirator**                                                 |     |    |     |
| Remove eye glasses, if applicable, before donning N95                        |     |    |     |
| Select approved respirator and inspect for damage                            |     |    |     |
| Pull up respirator chin to nose                                              |     |    |     |
| Top band first – secure at crown of head, followed by bottom elastic securing at the nape of the neck |     |    |     |
| Ensure respirator fully covers nose                                          |     |    |     |
| Form flexible nose piece over nose bridge                                     |     |    |     |
| Adjust fit and perform user seal checks prior to moving on                   |     |    |     |
| Replace eye glasses if removed                                               |     |    |     |
| Step 6 performed in correct sequence (ie after previous completed step)     |     |    |     |
| **7. Put on goggles/safety glasses**                                         |     |    |     |
| Position eye protection over eyes                                            |     |    |     |
| Ensure fit is comfortable and secure                                          |     |    |     |
| Step 7 performed in correct sequence (ie after previous completed step)     |     |    |     |
| **8. Put on face shield**                                                    |     |    |     |
| Position face shield over face                                               |     |    |     |
| Ensure fit is comfortable and secure                                          |     |    |     |
| Step 8 performed in correct sequence (ie after previous completed step)     |     |    |     |
| **9. Put on outer bouffant**                                                 |     |    |     |
| Outer bouffant used                                                           |     |    |     |
| Step 9 performed in correct sequence (ie after previous completed step)     |     |    |     |
| **10. Put on outer gloves**                                                  |     |    |     |
| Select correct type (should be extended cuff gloves) and size                |     |    |     |
| Extend to cover wrist of gown                                                |     |    |     |
| Step 10 performed in correct sequence (ie after previous completed step)    |     |    |     |
## LHSC PPE Checklist: Doffing

| Doffing Step | Yes | No | N/A |
|--------------|-----|----|-----|
| **1. Remove outer gloves** | | | |
| Grasp outside of glove with opposite gloved hand, peel off | | | |
| Hold removed glove in gloved hand | | | |
| Slide fingers of ungloved hand under remaining glove at wrist | | | |
| Peel glove off over first glove | | | |
| Discard | | | |
| Step 1 performed in correct sequence (ie as first step) | | | |
| **2. Remove gown** | | | |
| Unfasten ties | | | |
| Pull away from neck and shoulders, touch only inside of gown | | | |
| Turn outside of gown towards the inside | | | |
| Fold or roll into a bundle touching the inner clean side only | | | |
| Discard | | | |
| Step 2 performed in correct sequence (ie after previous completed step) | | | |
| **3. Remove neck protection (if used)** | | | |
| Grasp neck protection from the least contaminated area (e.g. tabs/connector), unfasten | | | |
| Pull away from neck | | | |
| Discard | | | |
| Step 3 performed in correct sequence (ie after previous completed step) | | | |
| **4. Remove inner gloves (if used)** | | | |
| Grasp outside of glove with opposite gloved hand, peel off | | | |
| Hold removed glove in gloved hand | | | |
| Slide fingers of ungloved hand under remaining glove at wrist | | | |
| Peel glove off over first glove | | | |
| Discard | | | |
| Step 4 performed in correct sequence (ie after previous completed step) | | | |
| **5. Perform hand hygiene** | | | |
| Hand hygiene completed | | | |
| Step 5 performed in correct sequence (ie after previous completed step) | | | |
| **6. Remove face shield** | | | |
| Grasp face shield strap at back of head | | | |
| Pull face shield strap out, up and away from head | | | |
| Discard | | | |
| Step 6 performed in correct sequence (ie after previous completed step) | | | |
| **7. Remove goggles/safety glasses** | | | |
| Grasp firmly using two hands | | | |
| Pull away from face, taking care not to contaminate yourself | | | |
| Discard | | | |
| Step 7 performed in correct sequence (ie after previous completed step) | | | |
| **8. Perform hand hygiene** | | | |
| Hand hygiene completed | | | |
| Step 8 performed in correct sequence (ie after previous completed step) | | | |
| **9. Remove N95 respirator** | | | |
| Lift bottom elastic over your head first | | | |
| Never touch the front of the respirator | | | |
| Lift off the top elastic | | | |
| Gently lift away from the face while holding the elastic | | | |
| Discard | | | |
| Step 9 performed in correct sequence (ie after previous completed step) | | | |
| **10. Perform hand hygiene** | | | |
| Hand hygiene completed | | | |
| Step 10 performed in correct sequence (ie after previous completed step) | | | |
**Donning & Doffing Sequence**

**for PROTECTED Droplet + Contact with Enhanced PPE**

(Applicable for select High Risk Aerosol Generating Procedures)

| DONNING | Description |
|---------|-------------|
| **Steps** | |
| Perform hand hygiene | |
| Collect PPE | - Perform inspection.  
- Remove jewelry |
| Put on neck protection (if used) | - Verify full coverage of neck to chin |
| Put on inner gloves (if used) | - Select correct type and size  
- Ensure cuffs of gloves are pulled up |
| Put on gown | - Select appropriate size/type and apply with opening in back  
- Fully cover torso from neck to knees and arms to end of wrists  
- Ensure gown is fully wrapped around the waist  
- Fasten all ties securely |
| If personal glasses... | - If preferred, remove for donning of N95 respirator |
| Put on N95 respirator | - Select approved respirator and inspect for damage  
- Observe specific respirator donning instructions  
- Pull up respirator chin to nose  
- Top band first - secure at the crown of the head, followed by bottom elastic securing at the nape of the neck  
- Ensure respirator fully covers nose  
- Form flexible nose piece over nose bridge  
- Adjust fit and perform user seal checks prior to moving on |
| If personal glasses... | - Replace glasses if removed |
| Put on goggles/safety glasses | - Position eye protection over eyes  
- Ensure fit is comfortable and secure |
| Put on face shield | - Position face shield over face  
- Ensure fit is comfortable and secure |
| Put on outer bouffant (if used) | |
| Put on outer gloves | - Select correct type and size  
- Extend to cover wrist of gown |
| Steps                                      | Description                                                                 |
|-------------------------------------------|----------------------------------------------------------------------------|
| Remove outer gloves                       | - Grasp outside of glove with opposite gloved hand, peel off               |
|                                           | - Hold removed glove in gloved hand                                         |
|                                           | - Slide fingers of ungloved hand under remaining glove at wrist             |
|                                           | - Peel glove off over first glove                                           |
|                                           | - Discard                                                                   |
| Remove gown                                | - Unfasten ties                                                            |
|                                           | - Pull away from neck and shoulders, touch only inside of gown              |
|                                           | - Turn outside of gown towards the inside                                  |
|                                           | - Fold or roll into a bundle touching the inner clean side only            |
|                                           | - Discard                                                                   |
| Remove neck protection (if used)           | - Grasp neck protection from the least contaminated area (e.g. tabs/connections), unfasten |
|                                           | - Pull away from neck                                                     |
|                                           | - Discard                                                                   |
| Remove inner gloves (if used)              | - Grasp outside of glove with opposite gloved hand, peel off               |
|                                           | - Hold removed glove in gloved hand                                         |
|                                           | - Slide fingers of ungloved hand under remaining glove at wrist             |
|                                           | - Peel glove off over first glove                                           |
|                                           | - Discard                                                                   |
| Perform hand hygiene                       | Pull off from centre of bouffant                                            |
| Remove outer bouffant                     | Discard                                                                    |
| Perform hand hygiene                       | Grasp face shield strap at back of head                                    |
| Remove face shield                        | Pull face shield strap out, up and away from head                          |
|                                           | Discard                                                                    |
| Remove goggles/safety glasses              | Eye protection varies, discard observing these principles:                 |
|                                           | - Grasp firmly using two hands                                             |
|                                           | - Pull away from face, taking care not to contaminate yourself             |
|                                           | - Discard                                                                   |
| Perform hand hygiene                       | If wearing N95 for extended use, stop here and perform hand hygiene.       |
|                                           | Remove N95 if damaged, soiled, wet, or difficult to breathe through.        |
|                                           | If removing at this time, following the directions below.                  |

**EXTENDED USE NOTE**

If personal glasses...
- If preferred, remove for doffing of N95 respirator
- Care must be taken to ensure glasses are not placed on a contaminated surfaces

Remove N95 respirator
- Lift bottom elastic over your head first
- Never touch the front of the respirator
- Lift off the top elastic
- Gently lift away from the face while holding the elastic
- Discard

Perform hand hygiene
If personal glasses...
- If wearing and removed earlier, replace