University of Virginia Department of Anesthesiology / Simulation Center COVID-19 PPE and Airway Management Simulation Training

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Introduction

As rapid dissemination of SARS-CoV-2 occurs throughout the world and in the United States, an apparent need for high quality healthcare training has been quickly recognized. Not only is it important to know how to care for COVID-19 patients, but it is also critical to know how to properly protect healthcare workers from contracting the disease. Through this pandemic, the medical community has learned that many cases of COVID-19 amongst healthcare workers occur through self-contamination, after interacting with COVID-19 positive patients. Once SARS-CoV-2 spread in the United States and the first cases were confirmed in Virginia, physicians at the University of Virginia thought it essential to properly train healthcare providers to prevent further viral spread. A “COVID safety team” of physicians from the Department of Anesthesiology was created to help devise protocols for high-risk procedures and keep other providers up-to-date on the latest coronavirus protocols. This group collaborated with physicians and staff affiliated with the School of Medicine’s Simulation Center to train providers on how to properly don and doff personal protective equipment and intubate patients with the latest protocols.

As the risk to providers caring for COVID-19 patients becomes better understood, developing tools and skills that help to protect providers from contamination and being pulled out of the workforce for quarantine becomes paramount. The use of simulation training allowed for training of anesthesiology attendings, residents, and nurse anesthetists in a safe environment in preparation for caring for COVID-19 positive patients.

Training

Our Simulation was designed to prepare anesthesia providers to safely and successfully intubate SARS-CoV-2 positive or suspected patients without self-contamination. A three-step, 40 minute training session was designed that included: review of newly developed donning and doffing protocols for personal protective equipment (PPE), a pre-training video demonstration of donning, doffing, and intubations in the ICU and OR, partnered intubation in both a simulated ICU and OR settings, and post-training survey of the simulation training. This training simulation was designed as a progression starting with reviewing protocols and watching the pre-training video developed by anesthesiology attendings demonstrating proper PPE donning and doffing procedures and intubation techniques.

Anesthesiology providers were paired with one another for the training. Review of the protocols and pre-training video occurred either in the simulation center or prior to the session. Participants were designated to be either Participant A or Participant B for the purposes of

training. Participants then coached each other through the process of donning COVID-19 PPE with Participant A donning PPE while Participant B coached and vice-versa. At this time, protocol for donning PPE was: washing hands for 20 seconds or hand sanitizer use, don bouffant cap, remove disposable gown from packaging and inspect for tears, don gown, wash hands or use hand sanitizer, don N95 mask, don surgical mask, don eye protection, and finally don two pairs of nitrile gloves. All paired coaching was observed by a resident and faculty member of the COVID-19 intubation training team.

After correctly donning PPE, training pairs completed four intubation scenarios wherein one participant performed the intubation and one participant assisted. The four scenarios were staged in the following order: ICU (participant A intubating), OR (participant B intubating), ICU (participant B intubating), OR (participant A intubating. For each intubation scenario, participants entered the room, introduced themselves to the patient, and prepared for induction and intubation using a video laryngoscope. The intubating participant was required to set up intubating equipment prior to contacting the patient. Preoxygenation was achieved with a two-hand vise-grip with a mask for 5 minutes prior to induction. After the assisting participant induced, the intubating participant utilized the video laryngoscope for placement and visual confirmation of ETT placement. End-tidal CO2 was confirmed in the ICU setting with a colorimetric CO2 detector and in the OR with the usual capnography. Participants were instructed to place contaminated equipment on a designated “dirty” surface following use. Direct laryngoscopy equipment was immediately available and kept clean in reserve.

Following each scenario, participants were debriefed by a faculty observer for areas of success and areas needing improvement. At the conclusion of all four scenarios, participants coached each other through the process of doffing contaminated PPE as follows: removal of outer nitrile glove, bleach wipe or alcohol gel sanitization of inner glove, breaking of gown waist tie, removal of gown by crossing arms and pulling gown at each shoulder, rolling gown and inner glove into tight ball without contacting exterior surfaces, placement in trash receptacle without pressing down on contents, washing hands, removal of eyewear, removal of surgical mask, wash hands, removal of N95 mask and placement in brown paper bag, and one final hand wash. After successfully completing the doffing procedure while observed and coached, participants completed a post-training survey.

Outcomes

High fidelity medical simulation serves as an excellent tool to develop clinical knowledge, reinforce task training, and devise protocols that are utilized during patient care. By utilizing high-fidelity simulation to accomplish these tasks, medical providers can more easily incorporate these new or improved abilities to clinical scenarios while learning in a low-risk environment. Risk of self-contamination is increased when team members are required to learn on-the-fly in a high-risk environment such as intubating a COVID-19 patient. The result of the improved skills,

knowledge, and abilities may lead to improved clinical outcomes during patient care while minimizing risk to patients and healthcare workers.

In this instance, the University of Virginia Health System's Department of Anesthesiology utilized medical simulation to prepare faculty, residents, and CRNAs treating COVID-19 patients. The aim of this simulation exercise was primarily to improve adherence to protocols developed by members of the Department of Anesthesiology. By improving adherence to the devised protocols, staff members directly involved in high risk procedures (intubation, extubation, and doffing) during patient care are thought to be less prone to commit errors that can lead to self-contamination of SARS-CoV-2. Secondary benefits included improved communication amongst team members, and a better understanding of the risks facing anesthesia team while performing high risk procedures. In addition, running these simulations for nearly 100 providers generated dozens of excellent questions regarding the protocol, allowing the department's COVID safety team to further develop and refine the protocols.

Several challenges were encountered during the development and execution of our simulation. These challenges primarily revolved around an urgency to develop and conduct an appropriate simulation and the material availability to conduct the simulation. As the widespread dissemination characteristics and risk of nosocomial infection associated SARS-CoV-2 amongst health-care workers became acknowledged, a heightened sense of urgency emerged surrounding all aspects of simulation development and execution. The high-risk protocols were developed over a period of approximately one week. Then, following the decision to utilize simulation to help incorporate the newly devised protocols, our simulation exercise was developed in under 24 hours. This included development of an educational video, identifying simulation specialist staffing, and getting participation of staff members. One significant consequence of rapid development and execution of the simulation was bypass of usual educational quality processes, such as faculty development, and rigorous prototyping.

The second challenge revolved around material utilization. As has been well documented, PPE is expected to be in short supply in the coming months due to a high volume of COVID-19 patients being treated in the hospital. This fact was not taken lightly during development of this simulation exercise. Material utilization during a known shortage, (utilized quantities were previously donated due to expiration or defective states), ended up serving as the limiting factor preventing the simulation from being utilized to train all clinical members of the department. It is beyond the focus of this review to help clinicians weigh the cost-benefit of simulation utilization versus reservation for patient care in this global pandemic. It was, however, our team's decision not to accept PPE suitable for patient care after a majority of staff members completed the training.

Internal data from surveys of participants have shown our simulation was useful to establish confidence when adhering to the new protocols. Our simulation devised several built-in learning cycles: first viewing written protocols, then observing a video demonstrating protocols, and lastly having participants conducting the protocols. This allowed many opportunities for reinforcement and refinement of these critical skills. Perhaps the most significant achievement

from conducting the simulation was gaining feedback that led to protocol refinement. By having staff members conduct newly devised protocols in a low-risk environment, we were able to decrease unnecessary risk from learning “on-the-fly”, in a clinical setting that has demonstrated high-risk for nosocomial transmission. This is helping to keep team members healthy and ready to care for our sickest, and most vulnerable patients.

Attachments:

1. COVID Simulation Video (https://www.dropbox.com/s/dtb5pntgh4koh2j/COVIDintubateEXEMPLARSIntro60HD2.mp4?dl=0)

2. V3 COVID Intraoperative airway protocol

3. COVID-19 Out of OR airway protocol

4. Q-A on Airway management