Developing a COVID-19 emergency airway team

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Abstract
The COVID-19 disease pandemic has changed the world of medicine as we know it, with inevitable long-standing repercussions. The impact to the anesthesiologist is profound, resulting in modification to multiple areas of practice. With the high contagiousness of the disease from droplets, but also aerosolization being a significant factor, the whole process of airway management carries significant risk to the health care provider. During troubled times, response teams for acute events are often developed. We focus this short piece on the development and implementation of an airway response team for COVID-19 patients.

Keywords: COVID-19, Airway, Emergency, Intubation, Personal protective equipment, Airway team, Emergency team, PPE, Donning, Doffing

The COVID-19 disease pandemic has changed the world of medicine as we know it, with inevitable long-standing repercussions. The impact to the anesthesiologist is profound, resulting in modification to multiple areas of practice. With the high contagiousness of the disease from droplets, but also aerosolization being a significant factor, the whole process of airway management carries significant risk to the health care provider. During troubled times, response teams for acute events are often developed. We focus this short piece on the development and implementation of an airway response team for COVID-19 patients.

With the rising number of cases and the potential for hospitals to get overwhelmed, the emergency teams’ expansion may spread into areas such as the emergency departments, operating room recovery’s or intensive care units. Staff that do not normally look after critically ill patients (eg, nonmedical staff) may be recruited into patient care and therefore, hypervigilance and communication is required when arriving in unfamiliar or expanded areas. The airway procedure in each of these areas should ideally take place in a negative pressure room with > 12 exchanges per hour. Many hospitals have already allocated designated units to cover these requirements. Should they not be available in times of crisis, positive rooms with a higher exchange are often used as an alternative.

General and infrastructure considerations
Experiences with the H1N1 outbreak highlighted potential strain with supply chain of personal protective equipment (PPE) due to surge in cases, as the national supply is very much governed by demand. A close to link to the institutional supply chain is therefore critical in the safety of frontline and higher risk health care workers (eg, the emergency teams) for the supply of PPE. A number of institutions across the country now have designated PPE rooms, which are staffed 24 hours a day. These are able to supply workers with essential equipment to perform our jobs safely.

Closed loop communication must occur between the anesthesia, nursing, and respiratory therapy teams in order to ensure swift care of the patient. Once an emergency response team is established, a plan of action should be generated, with team members knowing their roles and actions for a given event. This will vary dependant on the institution and local guidelines. With PPE and in a negative pressure room, noise can be problematic, so a clear primary and auxiliary plan(s) must be identified prior to entering the room. It is crucial that emergency intubation events are simulated by the response teams before such an urgent airway management scenario occurs. Many departments have developed an intubation pack (bag/cart), which can be taken and easily refilled, along with checklists to ensure during busy times, nothing is missed.

The continuation of early warning systems, or development of such, play a role in an emergency team structure and may help in the early detection and treatment of patients who may be deteriorating. From a practical standpoint, the length of time taken to attend patients that require mechanical ventilation has significantly increased, especially with the addition of the donning and doffing process. Therefore early recognition and airway management planning may help prevent significant cardiopulmonary deterioration, before emergency team arrival.
The relatively unknown timeline regarding the COVID-19 pandemic and volume surges has led many departments to develop a dedicated call system for emergency response teams. For example, teams with members ranging up to 3–4 (eg, airway team of Attending, Resident, x 2 CRNA) per, working 12–24 hours shifts. In hard hit states, such as New York and Michigan, institutions have had to deploy multiple teams simultaneously to provide 24 hours coverage. The staffing and scheduling for these teams has been made possible by the availability of anesthesia providers due to reductions in elective surgical case volume.

**Principles of response teams**

At present, little literature exists to guide our management of the pandemic. The bulk of guidance is based on expert recommendations and past experiences\(^3,14\). A smaller amount being from case reports and case series\(^7\), which may be affected by location and availability of resources. However, a number of unanimously agreed principles do exist.

With the goal of exposing as few health care providers as possible, a commonly used model is having 2 anesthesia providers in the room\(^2,13\) to manage the airway. The 2 providers split the responsibility of induction and intubation. These roles are supplemented by a “runner” outside the room, for any emergent needs and to facilitate rapid supply of instruments which may not be immediately available in the room\(^2\). It is widely accepted, that most experienced personnel be present in the room to attend the patient\(^5,13,15\) and perform the laryngoscopy. One of the key factors here is that the patient is intubated as swiftly and safely as possible to minimize droplet spread and aerosolization\(^16\) of the virus which may occur with multiple attempts. Patients with COVID-19 pneumonias are at significant risk for cardiopulmonary dysfunction, and are therefore exposed to the challenges of a physiologically difficult airway\(^9,17\). This concern further adds to the necessity of two experienced providers being in the room.

The 2 anesthesia providers, or 1 anesthesia provider and a skilled critical care nurse (being capable of safely facilitating tracheal intubation), is often added to by a respiratory therapist (RT), the net result being 3 medical staff present in the room. The overlying principle is a reduction of exposure to healthcare providers and minimal use of PPE.

A practical example being within our health care system, a 3 man team exists (Table 1). Comprised of an attending, a resident and a Crna. The latter 2 switching the roles of being in the room and the runner. Both the attending and runner carry a pager. Pages come directly to the team, as well as alerts, for example code blue. Upon a call, the runner will immediately attend the event to begin assessment and planning, which the 2 other team members bring the equipment.

**PPE**

With knowledge from past disease outbreaks such as SARS and MERS, health care workers are at a particularly high risk of contracting illness and therefore having an appropriate and regular supply of PPE is crucial in the battle against disease spread\(^4\). With the main mode of transmission of Sars-Cov-2 being droplet infection\(^1,13\) and aerosolization, when entering a positive or suspected patient room, the minimum standards (per WHO guidelines) are for respiratory/airborne level\(^2\), involving: a respirator such as N95 facemask (or FFP2), goggles, face shield, long sleeved gown with hood, and double gloving\(^18,19\). Antifogging measures are optional but advised\(^5\) due to significant risk of this issue occurring. Boot covers are also optional, due to the concern over contamination. Packs that contain all these necessary items can be pre-prepared and stored, ready to “grab and go” to attend an emergency event (Fig. 1). A Powered Purifying Air Respirator (PAPR) can also be used/substituted in appropriate settings for face shields and eye protection\(^15\), particularly in high risk aerosol generating procedures\(^2,20\). A HEPA filter should be attached to the bag-valve mask during

| **Table 1** Provider roles within our institution. |
|--------------------------------------------------|
| **Attending Anesthesiologist** Preoxygenate and intubate patient, confirm ETCO2. Clamp tube before transfer to ventilator. Observe secondary provider donning/doffing. |
| **Secondary provider** Induce general anesthesia per plan, provide hemodynamic support, assist intubator, communicate with runner outside room, observe attending an |
| **Respiratory therapist** Have ventilator ready, provide HEPA filter |
| **Runner** Have auxiliary equipment available (eg, plans B, C, D), close communication with secondary provider, assist nursing staff in patient transfer plans, observe and assist in room team donning/doffing |

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**Figure 1.** Our institution grab and go pack of personal protective equipment (PPE) items. Contents: inner gloves, outer gloves, N95 respirator, goggles, face shield, level 1 barrier mask, boot covers, long sleeve full body suit with hood (size of gown displayed on outside of pack), and outer plastic gown.
preoxygenation and then attached to the endotracheal tube after intubation to further minimize aerosolization. Hand hygiene should be practiced before donning and during/after doffing\(^5\).

Donning and doffing of PPE safely is one of the most crucial aspects of ensuring maximal protection of health care workers, while also minimizing disease spread. Guidelines should be drafted by each institution, with the overriding principles of simplicity and diligence\(^5\). Designated areas for donning and doffing for each intubation location must be recognized in advance, and made available to staff. A 2 person checking “buddy” system, to minimize the chance of errors, is frequently used and this may be the role of the runner identified previously. Donning and doffing instructions can be printed (Fig. 1) and placed in each PPE grab and go pack, to help eliminate errors. The whole process should be practiced, before an actual event\(^5,21\). Instructions for closed loop communication within the teams, can also be printed and made available (Fig. 2).

Single use equipment where possible has been recommended; however, this goal must be balanced against the supply of such equipment, especially should there be an unexpected surge in cases. Should reusable items be used, a simple post usage storage and decontamination system must be in place.

### Special circumstances

Should the emergency team be called to a cardiac arrest, ACLS algorithm\(^22\) for a COVID-19 suspected or confirmed case now exist. The principles of attending any COVID-19 patient remain, but start with considering the appropriateness of the CPR. Donning (and subsequent doffing) must follow strict local guidelines. Intubation is prioritized, and CPR is paused for this process. Vascular access teams are encouraged to follow the same principles.

### Conclusion

As demonstrated through this short article, the COVID-19 disease pandemic has changed the world of medicine as with multiple considerations the anesthesiologist must be aware of. The key factors include that of the most experienced anesthesia provider intubating the patient, using an airborne level of PPE, exposing as few staff as possible during the procedure, having clear lines of closed communication, and a robust infrastructure for supply of PPE and airway equipment.

### Conflict of interest disclosures

The authors declare that they have no financial conflict of interest with regard to the content of this report.

### References

[1] Wang W, Xu Y, Gao R, et al. Detection of SARS-CoV-2 in different types of clinical specimens. JAMA 2020;323:1843–44.
[2] Cook TM. Personal protective equipment during the COVID-19 pandemic—a narrative review. Anaesthesia 2020;75:1114–23.
[3] Balakrishnan K, Schechtman S, Hogikyan ND, et al. COVID-19 pandemic: what every otolaryngologist-head and neck surgeon needs to know for safe airway management. Otolaryngol Head Neck Surg 2020;162:194599820919751.
[4] Umscheid C, Betesh J. Development, implementation, and Impact of an automated early warning and response system for sepsis. J Hosp Med 2014;10:26–31.

[5] Orser BA. Recommendations for endotracheal intubation of COVID-19 patients. Anesth Analg 2020;130:1109–1110.

[6] Meng L. Intubation and ventilation amid the COVID-19 outbreak: Wuhan's experience. Anesthesiology 2020;132:1317–32.

[7] Mark LJ, Herzer KR, Cover R, et al. Difficult airway response team: a novel quality improvement program for managing hospital-wide airway emergencies. Anesth Analg 2015;121:127–39.

[8] Wax RS, Christian MD. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients. Can J Anesth 2020;67:568–76.

[9] Patel A, D’Alessandro MM, Ireland KJ, et al. Rasmussen. Health Security 2020;67:568–76.

[10] Association of State and Territorial Health Officials. Assessing policy barriers to effective public health response in the H1N1 influenza pandemic. Project report to the Centers for Disease Control and Prevention. 2010. Available at: www.astho.org/Programs/Infectious-Disease/H1N1/H1N1-Barrier-Project-Report-Final-hi-res/. Accessed April 17, 2020.

[11] Institute of Medicine. Reusability of Facemarks During an Influenza Pandemic: Project report to the Centers for Disease Control and Prevention. 2006. Available at: http://www.nationalacademies.org/hmd/~/media/Files/ReportFiles2006/Reusability-of-Facemarks-During-an-Influenza-Pandemic-Facing-the-Flu/FaceMasksforweb.ashx. Accessed April 17, 2020. (Accessed April 17, 2020.)

[12] CDC. Strategies to optimize the supply of PPE and equipment. Available at: www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html. Accessed April 17, 2020.

[13] Cook TM, El-Boghdady K, McGuire B, et al. Consensus guidelines for managing the airway on patients with COVID-19: Guidelines from the Difficult Airway Society, the Association of Anaesthetists the Intensive Care Society, the Faculty of Intensive Care Medicine and the Royal College of Anaesthetists. Anaesthesia 2020;75:785–99.

[14] Yao W, Wang T. Emergency Tracheal Intubation in 202 Patients With COVID-19 in Wuhan, China: lessons learnt and international expert recommendations. Br J Anaesth 2020;125:E28–E37.

[15] Zuo MZ, Huang YG, Ma WH, et al. Expert recommendations for tracheal intubation in critically ill patients with novel coronavirus disease 2019. Chin Med Sci J 2020;35:105–9.

[16] Tran K, Cimon K, Severn M, et al. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. PLoS One 2012;7:e35797.

[17] Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet 2020;395:507–13.

[18] Casanova LM, Rutala WA, Weber DJ, et al. Effect of single- versus double gloving on virus transfer to health care workers’ skin and clothing during removal of personal protective equipment. Am J Infect Control 2012;40:369–74.

[19] Zucco L. Perioperative considerations for the 2019 Novel Coronavirus (COVID-19). Available at: https://www.apsf.org/news-updates/perioperative-considerations-for-the-2019-novel-coronavirus-covid-19/. Accessed April 17, 2020.

[20] Saadi RA. A commentary on safety precautions for otologic surgery during the COVID-19 Pandemic. Otolaryngol Head Neck Surg 2020;162:10.1177/0194599820919741.

[21] Nicolle L. SARS safety and science. Can J Anaesth 2003;50:983–5; 985–8.

[22] American Heart Association. Available at: https://cpr.heart.org/en/resources/coronavirus-covid19-resources-for-cpr-training.