Airway Management in COVID-19: The University of the Philippines – Philippine General Hospital Experience

Anna Margarita F. Hilvano-Corsiga, MD

Department of Anesthesiology, Philippine General Hospital, University of the Philippines Manila

ABSTRACT

As a designated COVID-19 referral center, managing COVID-19 patients who will require respiratory support was expected. This paper describes how the University of the Philippines - Philippine General Hospital Department of Anesthesiology created and continuously revised airway management guidelines for these patients in light of the constantly evolving COVID-19 pandemic.

Keywords: COVID-19, SARS-CoV-2 airway management, intubation, developing country

INTRODUCTION

The COVID-19 pandemic has brought about dramatic changes in healthcare across the globe. It is none different in our setting. Being a tertiary hospital in a developing country, the University of the Philippines-Philippine General Hospital (UP-PGH) was designated as a national COVID-19 Referral Center in March 2020.

Since SARS-CoV-2 was established to spread through both direct means (droplet and human-to-human transmission) and by indirect contact (contaminated objects and airborne contagion), airway management was shoved into the frontlines.[1] Most patients initially needed airway support and airway manipulation was immediately tagged as a high-risk aerosol-generating procedure.

CREATION OF AIRWAY MANAGEMENT GUIDELINE

Designated airway management team

The UP-PGH Department of Anesthesiology spearheaded the hospital's COVID-19 airway management team. The department formulated guidelines, clinical pathways, and procedures to ensure safety of both patients and healthcare workers involved in airway management during the COVID-19 pandemic. Using existing data and international experience and recommendations, it prepared a 29-page COVID-19 primer as a guide for all airway operators who attend to COVID-19 intubations in different areas of the hospital. The primer included conduct of intubation in the operating room for emergency surgeries for COVID-19 patients. It also covered referrals from different areas outside the operating room complex, including the

Corresponding author: Anna Margarita F. Hilvano-Corsiga, MD
Department of Anesthesiology
Philippine General Hospital
University of the Philippines Manila
Taft Avenue, Ermita, Manila 1000, Philippines
Email: ahcorsiga@up.edu.ph

emergency room and wards. The primer also included specific guidance on how to disinfect equipment used in COVID-19 intubations because the department wanted to ensure proper and effective disinfection of reusable airway devices used in COVID-19 patients.[2]

Anesthesiologists are airway management experts who are accustomed to working in a controlled environment such as the operating room where there is adequate space, lighting, monitors and equipment. However, during the COVID-19 pandemic, this role was expanded to handling emergency intubations outside of the operating theater namely the emergency room, wards, and intensive care units. This was based on the best practice to have the most skilled airway operator available to intubate COVID-19 patients to minimize time of exposure of the medical staff.[3]

Initial preparation

Basic training immediately began with rigorous and successive simulation sessions in donning and doffing of appropriate personal protective equipment (PPE). Donning and doffing were initially unfamiliar skills for most of the institution's healthcare workers (Figure 1). This was deemed necessary and crucial in the care of COVID-19 patients to protect the assigned airway operators. Checklists were prepared and supervised simulations and debriefing were done not only among anesthesiologists but for the other hospital staff members of the other units as well.

Rapid procurement of appropriate airway and safety equipment was done. The video laryngoscope was determined to be the most appropriate tool in COVID-19 airway management as it improves first pass-success and decreases time to intubation while increasing distance between patient and airway operator.[4,5] Prior to the pandemic, the department only had one functional reusable video laryngoscope. Procurement of single use, hand-held video laryngoscopes was done simultaneously with procurement of reusable ones. Simulation sessions were also done for all trainees to improve on their video laryngoscopy skills at the start of the pandemic (Figure 2). Powered air purifying respirators were also procured in limited quantities for use when dealing with high-risk patients. However, emphasis was still given to the use of properly-fitted N95 masks as this was more readily available in our setting.

Online lectures were conducted in conjunction with face-to-face simulation sessions. This was done to keep everyone abreast of the then rapidly-evolving global COVID-19 situation in terms of guidelines and best practices. Daily online endorsement rounds were put into place to review the previous day's COVID-19 intubations and surgeries. All members of the department were encouraged to attend, from trainees to the most senior consultants, to give light to the situation on the ground and to have inputs from the most senior and experienced airway managers. Debriefing for difficult cases was done daily to process the challenges encountered, maneuvers done, and steps taken to ensure

Figure 1. Anesthesiology residents during a donning/doffing simulation session.

Figure 2. Simulation of COVID-19 intubation using a video laryngoscope.

safety for all. Recalibration of guidelines, forging of strong communication lines within the airway team and with other services working in the COVID-19 wards were done constantly to adjust to the actual experience in our institution.

Components of COVID-19 intubation algorithm

To adapt to the rapidly-changing situation and the constant challenges that have emerged in the conduct of airway management during the COVID-19, UP-PGH Department of Anesthesiology developed an institution-specific airway algorithm designed initially for COVID-19 intubations. The goal was to create an algorithm that 1) uses existing equipment in the institution 2) is simple and can be understood by the least-experienced members of the airway team 3) utilizes the basic and advanced skill sets of the airway team in the institution 4) is easy to follow in high-stress

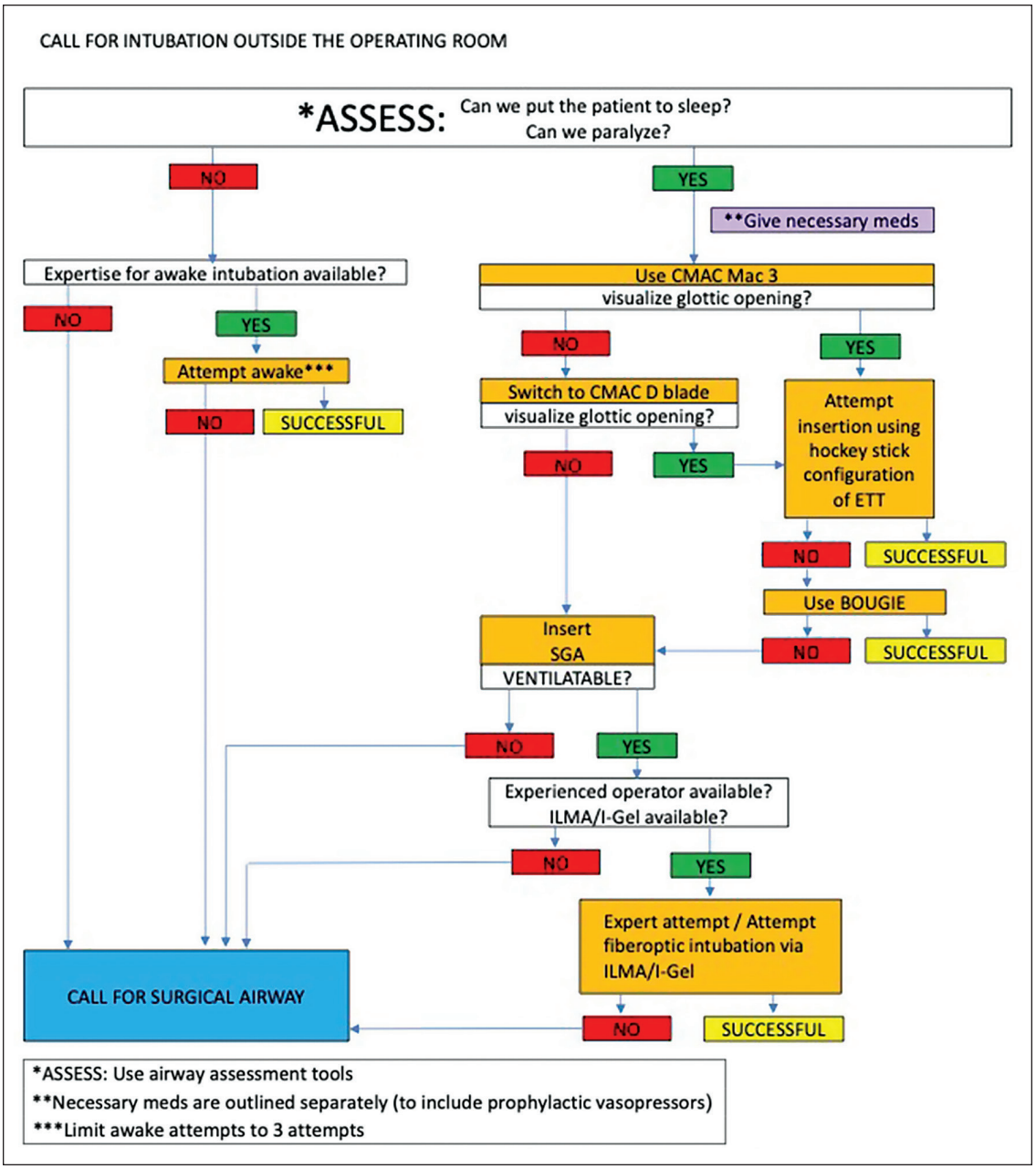

Figure 3. The UP-PGH Department of Anesthesiology Airway Algorithm.

situations and 5) limits efforts at securing the airway to three attempts (Figure 3).[6]

The activation of the airway response team came with a specific set of instructions for preparation of the patient for intubation while the team is in transit. Necessary equipment such as a suction machine and a working ventilator beside the patient were outlined. Preoxygenation of the patient was emphasized before the arrival of the airway team.[3]

The importance of airway assessment and proper patient positioning was highlighted. The airway team was expected to do these crucial initial steps once they arrive. Effective and efficient airway assessment even in emergency situations help in guiding the degree of preparation needed by the airway management team.[7] Proper patient positioning by using resources available, e.g., pillows, linen, plastic IV bottles, have been shown to improve laryngoscopic view and consequently first pass success. The tragus-to-sternum method of patient positioning was put into light because this has been demonstrated to improve visibility of the glottic opening and improve ventilation by opening the airway.[8] The 25-degree back up position has also been shown to improve conditions for intubation. The combination of these two simple maneuvers has also been demonstrated to be beneficial in improving first pass success rates (Figure 4).[9]

Figure 4. Tragus-to-sternum position combined with the 25-degree back up position.

Bag-mask ventilation was discouraged in COVID-19 patients because of aerosol-generation. The recommendation of rapid sequence intubation with the use of a fast-acting muscle relaxant in non-complicated airways was then made.[3] Prophylactic vasopressors in critically-ill COVID-19 patients has also been recommended based on the observation of peri-intubation hypotension and cardiac arrest.[10] The use of a clear acrylic aerosol box was initially thought to be of benefit as it appeared to prevent the spread of SARS-CoV-2 viral particles.[11] These were initially included in the guidelines. However, further studies and use showed that the utilization of these aerosol boxes made it more difficult for the airway operator to maneuver inside the box and intubate, thus, increasing time to intubation and decreasing first pass success.[12,13] Hence, these were eventually removed from the intubating guidelines.

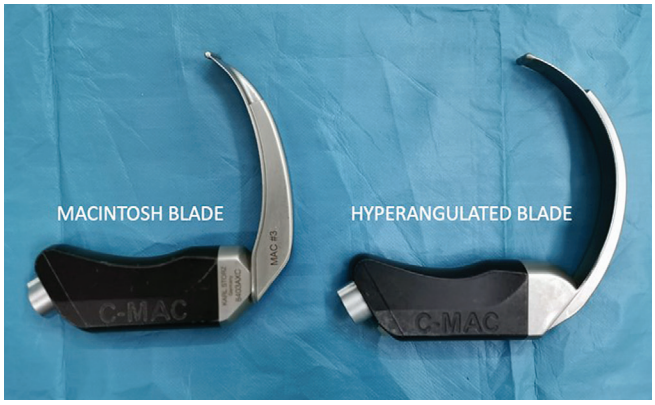

Figure 5. The CMAC (Storz, Germany) video laryngoscope Macintosh blade and the hyper-angulated blade.

Additional components of COVID-19 intubation algorithm

As the pandemic progressed, the airway team encountered an increasing number of difficult COVID-19 intubation referrals outside of the operating theater. The value of a video laryngoscope with a hyper-angulated blade in difficult intubations has been established.[14,15] In particular, the hyper-angulated CMAC D-Blade (Figure 5) has been demonstrated to improve laryngoscopic view in unexpected difficult direct laryngoscopy.[16] However, since not all members of the airway team were proficient in using these, another series of simulation training sessions were conducted in preparation for the inclusion of these laryngoscope blades in the algorithm.

The use of a bougie (Figure 6) and the hockey stick configuration of a standard malleable stylet (Figure 7) to facilitate the insertion of the endotracheal tube were also taught and emphasized.[17,18] These devices are inserted into the pliable endotracheal tube to increase its rigidity and maneuverability inside the airway. These intubation adjuncts were inexpensive, disposable, and readily available in the institution so their use in difficult COVID intubations were maximized.

The use of a supraglottic airway (SGA) as a rescue airway device was also later on incorporated in cannot-intubate situations.[19] Although its use among COVID-19 patients has been put into question as an aerosol-generating device and its insertion as an aerosol-generating procedure, its value as a rescue device is still important and may be life-saving.[20] In addition, the ability of some SGAs to become conduits

Figure 6. Gum elastic bougie.

Figure 7. Hockey stick configuration of malleable stylet.

for fiberoptic intubation make them a good next option for unanticipated difficult intubations.[21]

Awake intubation in COVID-19 patients were initially discouraged as it is highly aerosol-generating.[22] However, patient safety is still of utmost importance. There have been several instances in this institution in which putting the patient to sleep endangered the patient due to loss of airway patency. These included COVID-19 patients who had obstructing glottic masses in respiratory distress. With emphasis on proper donning of appropriate PPE, the airway team performed awake intubations on these patients. Expertise of the airway operator was always put into consideration so the most experienced member of the airway team performed these intubations. Awake intubation in COVID-19 difficult airway patients in this institution were almost always conducted with a background remifentanil infusion at 1-2 ng/ml target-controlled infusion (TCI) to increase patient comfort and tolerance of procedure as well as decrease the incidence of gagging and coughing.[23,24] Awake intubations were performed either by using a flexible fiberoptic scope or a video laryngoscope.

Front-of-neck access as the last option for airway access is included in many difficult airway algorithms.[14,19] However, members of this institution's anesthesia airway team have not been adequately trained in this skill at the time of the pandemic. To address this, surgeons were placed on standby to perform a surgical tracheostomy bedside and in emergent situations among COVID-19 anticipated difficult airway patients. Future plans include training sessions for front-of-neck access for the anesthesia airway team, particularly the scalpel cricothyroidotomy as recommended by the Difficult Airway Society.[19] This is a viable invasive last option as the equipment and materials needed for this technique are low-cost and readily-available in the institution.

CONCLUSION

COVID-19 has definitely changed airway management whether in the first world setting or in low-resource areas. The situation in the UP-PGH has been none different from hospitals around the world. By developing systems that are tailored to the institution's resources, UP-PGH strived to ensure optimal care for its patients in the midst of the COVID-19 pandemic without compromising the safety of its frontline medical staff.

As we move through this pandemic, we recognize that adaptation is vital to ensure safety of both patients and healthcare workers. We will continue to work on the skills improvement of our airway team members using a combination of tutorials, simulations, and clinical exposure. Our processes will undergo constant evaluation and revision based on updated scientific information, available hospital resources, and results of actual patient encounters.

Statement of Authorship

The author contributed in the conceptualization of work, acquisition and analysis of data, drafting and revising, and approved the final version submitted.

Author Disclosure

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