Accession Number:	H0598	**ECRI Priority:**	High	**Published:**	04/29/2020
Channel:	Devices	**FDA:**	Not Specified	**Last Updated:**	04/29/2020

[COVID-19] Use of Novel Intubation Boxes Does Not Reduce the Need for Appropriate PPE and Intubation Precautions [ECRI Exclusive Hazard Report]

Problem

1. The coronavirus disease (COVID-19) patient surge has contributed to worldwide shortages of personal protective equipment (PPE). Hospitals are looking for alternatives to use when treating and/or intubating a patient.
2. WHO and CDC report that airborne transmission of SARS-CoV-2 virus may be possible during aerosol-generating procedures.
    1. These procedures include endotracheal intubation.
3. When intubating a patient, the healthcare professional (HCP) must wear appropriate PPE to limit the risk of transmission.
    1. Intubation is the highest risk procedure for droplet dispersion in patients with COVID-19. [1]
    2. Appropriate PPE includes: a fit-tested N95 or higher level respirator, gloves, gown, face/eye protection (goggles or disposable face shield). [2]
4. Increased PPE use during the COVID-19 patient surge will likely exceed the available supply, resulting in shortages at many healthcare facilities.
5. Clinicians with inadequate access to standard PPE have been compelled to improvise protective barrier enclosures for use during procedures with a high risk of transmission.
    1. These barriers have been referred to as intubation boxes, intubation shields, and aerosol boxes.
6. The use of inadequate PPE during COVID-19 patient intubation may lead to healthcare personnel exposure to the SARS-CoV-2 virus.

ECRI Recommendations:

HCP performing intubations:

1. To prevent or reduce exposure to SARS-Cov-2 virus during intubation and/or to conserve PPE:

    a. HCP in the room should wear appropriate PPE.
        i. This includes a fit-tested N95 or higher level respirator, gloves, gown, face/eye protection (goggles or disposable face shield). [2]
        ii. Refer to ECRI's recommendations for combating inadequate supplies of PPE. [3-7]
    b. The number of HCP present during the procedure should be limited to only those essential for patient care and procedure support. [8]
    c. Do not allow visitors in the room.
    d. Intubation should be performed by the most qualified individual (e.g. anesthesiologist), because delayed intubation with multiple attempts may prolong dispersion and place the patient at risk of a respiratory arrest. [9]
    e. Intubation should ideally take place in an airborne infection isolation room (AIIR). [8,9]
    f. When performing endotracheal intubation, consider using video-laryngoscopy, instead of direct laryngoscopy, if available. This maximizes the distance between the operator and patient and increases visualization. [10, 11]
    g. Avoid awake fiberoptic intubation unless absolutely necessary, because of abnormal airway anatomy. There is a higher risk of coughing and subsequent aerosol generation with this technique, as well as the need to decontaminate the fiberoptic bronchoscope. [9, 10]
    h. Consider a rapid sequence induction (RSI) to avoid manual ventilation of the patient's lungs and potential aerosolization. If manual ventilation is required, apply small tidal volumes. [9]
    i. After removing protective equipment, avoid touching your hair or face and perform hand hygiene. [9]
    j. Clean and disinfect procedure room surfaces promptly. [8]

For HCP using or considering an intubation box/shield during intubation:

1. Understand the Limitations:

    a. The barrier enclosure should be used for additional protection and should only be considered to be an adjunct to standard PPE and precautions previously discussed.
        i. It should not be considered a replacement for appropriate PPE.
    b. If a patient's condition is quickly deteriorating, it may not be practical to locate the intubation box to perform intubation.
    c. The box may restrict hand movement or be uncomfortable for the user. The box requires training before use in the treatment of patients. Operators should be ready to abandon use of the box should airway management prove difficult.
    d. Devices should be used only with confirmed COVID-19 patients to limit exposure to other patients.
    e. Proper disinfection of the box must be performed after the procedure. Bleach and alcohol solutions can be used. [12]
        i. For appropriate bleach and alcohol solutions, refer to the U.S Environmental Protection Agency (EPA) published List N: EPA's Registered Antimicrobial Products for Use Against Novel Coronavirus SARS-CoV-2, the cause of COVID-19. [13]
        ii. Be aware that the 90º angles at each corner may be difficult to disinfect.
        1. Label and store devices that have been properly disinfected and are ready for re-use.

Background:

1. Based on lessons learned from the 2003 SARS outbreak, healthcare workers who perform intubation or ventilation management have a higher risk of contracting the infection than those who do not perform these tasks. A systematic review showed that compared with healthcare workers who did not perform aerosol-generating procedures, those who performed tracheal intubation had an increased risk of contracting the 2003 SARS (odds ratio, 6.6). [14]
2. Because of the low cost and ease in manufacturing/assembly, multiple companies have started to produce these intubation boxes based on open source designs posted on the internet. [15,16]
    a. Multiple media outlets have reported that these intubation boxes are being implemented at hospitals around the country. [17-21]
3. One pilot study published in the New England Journal of Medicine [22] describes a barrier that consists of a transparent plastic cube designed to cover a patient's head and that incorporates two circular ports through which the clinician's hands are passed to perform the airway procedure.
    a. A laryngoscopist attired in standard PPE stood in position at the head of an airway mannequin. The study simulated a forceful cough to generate a spread of droplets and aerosols using a balloon filled with fluorescent dye.
    b. The balloon was inflated with compressed oxygen that ran through tubing inside the mannequin until the balloon burst.
    c. The experiment was repeated with and without the aerosol box.
    d. With the use of PPE only, dye was found on the laryngoscopist's gown, gloves, face mask, eye shield, hair, neck, ears, and shoes. Contamination on the floor occurred within approximately 1 meter from the head of the bed and also on a monitor located more than 2 meters away.
    e. With the use of the aerosol box, the simulated cough resulted in the contamination of only the inner surface of the box and the laryngoscopist's gloves and gowned forearms.
    f. Study limitations:
        1. The simulation method was not validated for the projectile direction, speed, or turbulence of a true cough, nor did it match the particle-size distribution.

References & Source Documents:

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Geographic Region(s)

Worldwide

Suggested Distribution

Anesthesia, Clinical/Biomedical Engineering, Critical Care, Emergency/Outpatient Services, Infection Control, Nursing, OR/Surgery, Pulmonology/Respiratory Therapy, Risk Management/Continuous Quality Improvement, Internal Medicine, Pain Clinic, Staff Education

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