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## Protective Device during Airway Management in Patients with Coronavirus Disease 2019 (COVID-19)

To the Editor:

Healthcare workers are exposed to a higher than average risk of infection by the contagious coronavirus disease 2019 (COVID-19), which requires special attention to their protection.<sup>1</sup> Anesthesiologists and nurse anesthetists are particularly confronted by a high-risk situation when managing the airway of infected patients: oxygenation by bag-mask, cough during laryngoscopy, and tracheal intubation and extubation. Careful planning is required, and guidelines have been published for anesthesiology teams<sup>2,3</sup> to follow in such cases. Thus, airway management must be realized in an airborne isolation room (negative pressure).



**Fig 1.** Neonatal plexiglass incubator hood (after removing one side and strengthening the base).



**Fig 2.** Installation on operating table and access by the two portholes.

Airborne precautions, hand hygiene, and donning of personnel protective equipment including reinforced overshirt, double gloves, glasses, and filtering facepiece particles class 2 mask must be respected. It is also recommended that tracheal intubation is carried out under rapid sequence induction by an expert anesthesiologist using video laryngoscopy.<sup>2,4</sup>

To reduce the risk of contamination during airway management, several devices are described (transparent field over the patient, protective helmet, plexiglass box).<sup>2,5</sup> We hereby describe a novel device by recycling and reusing existing hospital equipment; it is based on a neonatal incubator hood, which has been modified by reinforcing the base and removing one side (fig. 1).

On the model available in our hospital, it can simply be unscrewed and the four sides are removable. After testing two models with different sizes of portholes (12 and 15 cm), we opted for the larger one, providing adequate ability to perform intubation (using MacGrath in our institution) without movement difficulties (figs. 2 and 3). The space around the arms is minimal and offers the best benefit–risk ratio, reducing the diffusion of aerosolized particles as much as possible compared with the absence of a protective device. In addition, the side porthole offers the possibility for a second operator to perform additional maneuvers, such as suction or the Sellick maneuver (fig. 4). To harden the entire device, we used a rigid plastic board cut to the dimensions of the hood and fixed directly with screws on the existing screw holes. The manufacturing process was carried out with the help of a technical agent, in particular for the manufacture of the new base, with compatible equipment for hospital use (especially for hygiene). The entire process took less than an hour. The hood used was part of a defective incubator that was intended to be destroyed (obsolete equipment).

Because of the importance of the risk of projections of contaminated aerosols during the various maneuvers on the



**Fig 3.** Bag-mask ventilation.

airways, especially extubation (because of the cough), we decided to keep in place our device for the duration of the surgical procedure. We tested the device during airway management in different non-COVID-19 patients, and simulation sessions were carried out to train the teams in its use and handling. Our device seems to be very easy and quick to use, confirmed when taking care of COVID-19 surgical patients. We were so satisfied that we used it successfully in the intensive care unit and we plan to use it in the emergency room.

In our protocols, in accordance with the recommendations of our hygiene department, the anesthesiologist remains in the operating room during the entire operation and keeps on all personnel protective equipment except the upper gloves, which are changed after intubation and after each maneuver at risk of contamination such as a tracheal aspiration, gastric tube placement, and extubation. All installations intended to remain in the operating room (including our device) are cleaned with a broad spectrum cleaner and disinfectant (Anios Oxy'Floor in our hospital) after the exit of the COVID-19 patient from the operating room. A period of 3 h is observed before using the room or its installations.

Unlike a transparent field or plastic screens, which present a risk of viral dissemination during their manipulation after use, our device is just removed and cleaned after the intervention. It also has the advantage of being more robust, allowing a three-dimensional view and offering more space



**Fig 4.** Tracheal intubation with MacGrath.

compared with a manufactured plexiglass box. The only drawback noted is the weight of the device, requiring more precautions during handling and cleaning.

The manufacturing process of the device is relatively simple and fast, without the need for specific materials. It can be manufactured using existing resources, the main material being a device available in almost all hospitals. It provides an additional barrier against the risks of contamination at no additional cost, and it is reusable and ecological.

The spread of the COVID-19 was very rapid and health-care workers are confronted with airway management of infected patients, exposing them to a major risk of contamination. In addition to the established protection rules, the use of additional devices, like the one we describe, to reduce the risk during high-risk situations is desirable. The proposed device can be used on routine procedures in all areas managing airways of COVID-19 patients.

### Research Support

Support was provided solely from institutional and/or departmental sources (hospital equipment).

### Competing Interests

The authors declare no competing interests.

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## Transesophageal Echocardiography Probe Sheath to Decrease Provider and Environment Contamination

### To the Editor:

The 2019 novel severe acute respiratory syndrome coronavirus (SARS-CoV-2) and its associated disease, coronavirus disease 2019 (COVID-19), have resulted in a global pandemic and caused significant morbidity and mortality.<sup>1</sup> The American Society of Echocardiography (Durham, North Carolina) released a statement adjudicating the use of personal protective equipment for all echocardiographic procedures. Special attention was given for transesophageal echocardiograms (TEE) which “carry a heightened risk of spread of the SARS-CoV-2 since they can provoke aerosolization of a large amount of virus.”<sup>2,3</sup> The concern for potential aerosolization and provider contamination during the performance of TEE has led our institution to define all TEEs, even in the presence of an endotracheal tube managed airway, as an aerosol-generating procedure. This is in part because of the risk of small particle generation occurring during the procedure but also because

of concerns over cross contamination of the probe, operator, echo machine, and surrounding surfaces with oropharyngeal secretions which are known to contain the virus.<sup>4</sup> As such, full COVID-19 personal protective equipment consisting of an N95 respirator, face shield, gown, and two layers of gloves was mandated for all staff involved in the performance of TEE.

To reduce the risk of both aerosolization and provider/environmental contamination, we devised a sheathing system using two preexisting commercially available products seen in figure 1A. As demonstrated in figure 1B, a CIV-Flex 8.9 cm × 91.5 cm Transducer Cover (CIVCO, USA) probe cover is combined with a Blox 54 FR Endoscopic Bite Block (EndoChoice, Inc., USA) to create a freely sliding barrier which still allows the imager to position the TEE probe normally, then engage the bite block to the patient's mouth and secure it around the head with the included elastic strap. Note that the distal end of the sheathing system is open to allow the probe to advance past the bite block with one of the included rubber bands holding the components together (fig. 1C) and the proximal extent of the sheath extending to the 1-meter mark (fig. 1D). The second rubber band is folded three times and secured around the proximal end of the sheath to keep it from moving. Step-by-step assembly instructions are demonstrated in Supplemental Digital Content, video 1 (<http://links.lww.com/ALN/C390>). This way, the combination of a secured airway *via* an endotracheal tube and a fully enclosed TEE sheath, we have converted our TEE procedure categorization from a high-risk aerosol-generating procedure to a low-risk procedure, removing the need for use of N95 masks. This simple and easily generalizable modification preserves scarce personal protective equipment resources<sup>5</sup> and reduces the risk of contamination by the provider to oneself or the environment.

Although use of a TEE probe cover has been previously described,<sup>6</sup> it does not eliminate contamination when the cover is moved within the oropharynx and the esophagus. The sheath design herein described maintains a noncontaminated surface for the echocardiographer to grasp when manipulating the TEE probe. In addition to mitigating the risk that SARS-CoV-2 poses to both patients and providers, we believe that this inexpensive adjustment to practice will reduce both unnecessary personal protective equipment usage and risk for contamination.

### Research Support

Support was provided solely from institutional and/or departmental sources.

### Competing Interests

Dr. Cawcutt was paid an honorarium for the creation of educational materials by the Society of Healthcare Epidemiology of America (Arlington, Virginia) and is a paid medical writer for The Clorox Company (Oakland, California). The other authors declare no competing interests.