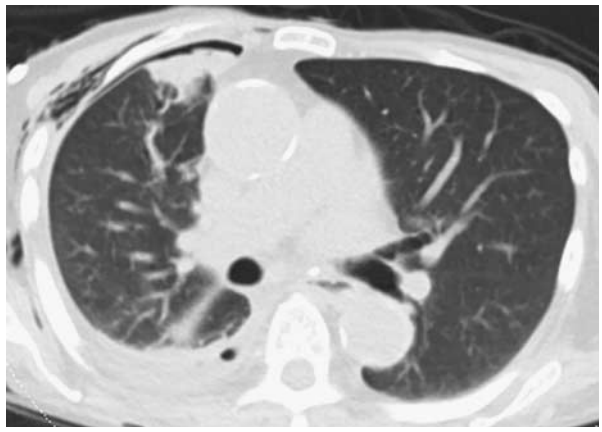

FIGURE 5. Axial computed tomography scan of the chest without contrast after pleuroscopy, showing the alveolopleural fistula defect filled with fibrin sealant.

has not been previously described in the literature but was both well tolerated and successful in this case.

This technique may not be feasible in all patients as some APFs may be too difficult to visualize or treat on the basis of its location and anatomy. There is also a theoretical risk of embolization of the sealant, which was not seen in this case. We believe this pleuroscopic technique with direct visualization of the APF and treatment with a topical sealant to be a viable option in patients who are too frail for surgical VATS and warrants further study in this patient population.

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Negative Pressure Aerosol Chamber

A Portable Barrier Device for Bronchoscopy

To the Editor:

In the setting of COVID-19 pandemic, proceduralists can be exposed to noxious airborne particles that pose a significant health risk.[1,2] While severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is usually transmitted through droplets, certain procedures such as bronchoscopy could aerosolize viral particles and infect health care workers (HCWs) present in the room.[3] This risk is greatly decreased with the appropriate use of personal protective equipment (PPE).[4] We designed a "negative pressure aerosol chamber" (Fig. 1), inspired on the ISOPODs and earlier isolation boxes previously described in Asia.[5] These devices theoretically facilitate an additional

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layer of protection of HCWs and limit bioaerosol spread.

Given its characteristics, our innovative chamber proved to be a valuable portable resource particularly for bronchoscopy (Fig. 2). Other uses from said chamber include, and not limited to: tracheostomy placement and exchanges, intrahospital and interhospital transfers, extubation, transport, noninvasive ventilation (continuous positive airway pressure, bilevel positive airway pressure, high-flow nasal cannula) among other potential uses.

To expand the benefits of our device, we conceived several features that enhance its capabilities. These include: (1) 50 L chamber. (2) An adapter for wall or portable suction (generating negative flows of 50 to 70 L/min, Fig. 3). (3) Closed access ports for enhancing bioaerosol containment, and flaps for enhancing seal. Four stainless steel grommets have been attached at the base of the device to assist in attaching to the bed and provide stability (Fig. 4). (4) This chamber is reusable. Our semiflexible construction material facilitates durability, portability, decontamination, and enhanced visibility. (5) The device is made of a medical-grade stainless steel frame and the outside is made from a clear, plastic, latex-free vinyl. (6) The versatility that allows for negative flow/pressure to be used in situations that include transport-transfer, airway manipulation, and aerosol-generating procedures as nebulizations or bronchoscopy. This chamber could prove to be particularly beneficial for facilities with limited resources as PPE or negative pressure rooms. (7) Customizable access ports—we suggest 2 at the head and 2 on each side. The width can be customized to accommodate effective seal for different bed/mattress sizes (range: 20.5″ for operation room tables to 36.5″ for intensive care unit beds).

FIGURE 1. Negative pressure aerosol chamber.

In preliminary testing, our negative pressure isolation chamber has been demonstrated to: (1) allow for expeditious intubation (mean intubation time of 15.1 ± 5 s); (2) contain bioaerosol (on trials with UV light as the fluorescent powder was nebulized within the chamber—see Fig. 5); (3) evacuate of contained aerosol at 6 minutes with negative flows of 50 L/min (with a viral filter in line for wall suction or with HEPA filters for portable suction systems); (4) have resistant material to various external factors that could impair chamber integrity.

This chamber should not be used in lieu of the Centers for Disease Control and Prevention (CDC) recommendations for HCW PPE and the best evidence available to limit exposures.[5] There is no current evidence to indicate that this device significantly reduces the likelihood of infection among

FIGURE 2. Set up for bronchoscopy.

FIGURE 3. Suction access port.

FIGURE 4. Aerosol containment in fogger testing.

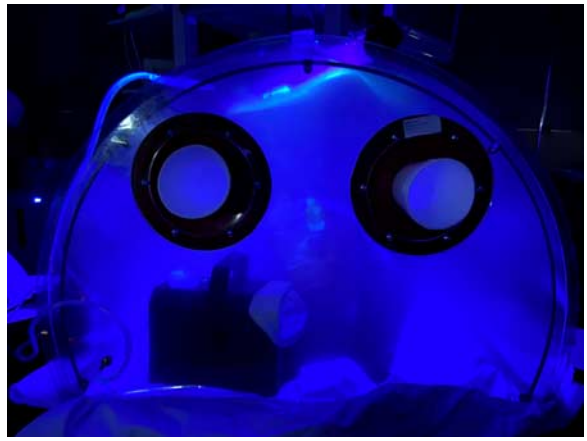

FIGURE 5. Fluorescent testing.

HCWs when exposed to aerosol-generating procedures. The benefits and disadvantages of the negative pressure aerosol chamber are being investigated. Importantly, we had no COVID-19 infections among bronchoscopists, intensivists, or anesthesiologists who used the device at our institution. We have not observed longer procedure times for those cases in which the device had been used.

We believe that these upgrades to previously described barrier devices will enhance its benefits, with minimal although key modifications to enhance theoretical benefits.

Instructionals on suggested use for intubation, extubation, and transport can be found in Appendix 1 (Supplemental Digital Content 1, http://links.lww.com/LBR/A204).

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Flexible Bedside Bronchoscopy Using Closed Sheath System Devised From Ultrasound Probe Cover for Use in SARS-CoV-2 Patients

To the Editor:

Bronchoscopy in confirmed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) patients is relatively contraindicated and reserved for emergencies as recommended by multiple national and international expert opinions and societies. The risk of transmission to health care workers during aerosol-generating procedures is suspected to be extremely high. However, clinicians may encounter certain indications that warrant bedside bronchoscopy for these patients, such as the need to obtain lower respiratory samples in indeterminate and inconclusive SARS-CoV-2 nasopharyngeal swab or alternative testing. Other emergency conditions include therapeutic bronchoscopy in the setting of mucus plugging causing lobar or lung atelectasis, or to assist with performing tracheostomy placement.[1]

Current consensus guidelines for clinicians performing bronchoscopy on SARS-CoV-2 patients recommend performing the procedure in negative pressure room, minimizing personnel, wearing appropriate personal protective equipment (powered air-purifying respirator or N95 mask, eye protection, gown, and gloves), and ensuring adequate sedation or paralytics to minimize patient cough.[2,3] However, bronchoscopy not only derives its risk from the aerosol-generating nature of the procedure, but also through manipulation of the scope, which often includes repeated advancing and retracting motions of the bronchoscope. This can cause lower respiratory secretions on the bronchoscope to be spread to operator's hands, drapes, or other adjacent surfaces. We propose a system to minimize exposure by utilizing a routine ultrasound probe cover to fashion a closed bronchoscopy system, similar to current usage of closed inline suctioning in intubated patients.

If available, we generally use a disposable bronchoscope. We recommend using a universal ultrasound probe cover (Fig. 1) as it is readily accessible in most intensive care settings, or could alternatively use any surgical, interventional, or endoscopy sheaths that are of adequate dimensions. If patient is stable, we would recommend holding ventilation during any steps in which ventilator circuit is open. One would first make a cut in the distal end of the ultrasound cover, then position the distal end of the sheath over the endotracheal tube bypassing the ventilator limb and then secure it distally to bronchoscope adapter on endotracheal tube with the enclosed tape (Fig. 2). Then would insert bronchoscope into the proximal portion of the sheath and secure proximal sheath at the junction of the insertion tube and control section of the bronchoscope with enclosed tape, then apply transparent film dressing (Fig. 3). This allows insertion and retraction of the bronchoscope during procedure within the protective sheath. After completion of bronchoscopy, one would retract the bronchoscope fully into the sheath and place the cap on the bronchoscope adapter. The tape on the distal aspect around the endotracheal tube would then be unwrapped, and the ultrasound sheath would be removed while wrapping the distal end of the sheath on itself and securing it closed with the tape. The complete system including disposable bronchoscope with attached sheath could then be disposed of as intact system.

We recommend using this technique with a disposable bronchoscope, as using a reusable bronchoscope would require removal of the sheath and cleaning the bronchoscope before sending to sterile processing. In addition, this technique may be best utilized

FIGURE 1. General purpose ultrasound probe cover with included tape strips.

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