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Correspondence

Preparedness and disinfection of anesthetic equipment in COVID-19



ARTICLE INFO

Keywords:

COVID-19

Disinfection

Sterilization

Anesthetic equipment

To the Editor,

Even during outbreaks, patients with COVID-19 may still require urgent or emergency anesthesia and surgery. During anesthesia and postoperative recovery, such as endotracheal intubation, anesthesia maintenance, airway management, and respiratory support, patients inevitably result in the formation and diffusion of respiratory droplets and aerosols. Therefore, the department of anesthesiology should sufficiently prepare and disinfect the anesthetic equipment to avoid nosocomial contact transmission of COVID-19.

The key strategy for preoperative virus preventive preparation includes remotely evaluating patients by using a video and electronic case system, wearing tertiary protective gear, carrying sufficient anesthetics and supplies into a negative-pressure operating room, setting up specific transit routes, covering equipment with disposable airtight transparent plastic film, and adding three filters to disposable breathing circuits. Postoperative patient transfer should involve wearing secondary protective clothing and covering with a disposable surgical drape on the specified transit route. Extubated patients inhale oxygen by mask and are carried to the original isolation ward. Critical patients are transferred to the ICU with the support of a simple respirator. All disposable anesthesia supplies used for COVID-19 patients should be packed in a medical waste packaging bag, sealed with a label bearing the "COVID-19 infection" logo, sprayed with chlorinated disinfectant, covered with an additional bag and sealed, and then removed from the contaminated area.

Postoperative disinfection of reused supplies should be performed at the designated site by the specially-assigned worker wearing tertiary protective equipment. The object surface, such as anesthesia machine, ultrasonic instruments, and computers, should be wiped with 1000–2000 mg/L chlorinated disinfectant. Patients' bloodstains and body fluids should be scrubbed with 2000–5000 mg/L chlorinated disinfectant.

Postoperative sterilization of anesthetic equipment bases on the disposability, disassembly, and heat intolerance or resistance. Anesthesia machines consist of disposable parts and reuse parts. Threaded pipes, gas sampling lines, and water traps etc. should be disposed as disposable anesthesia supplies. Reuse parts sterilization could be classified as detachable and nondetachable; the detachable anesthesia machines should be sterilized in accordance with the high-temperature resistance property of the components; the nondetachable

anesthesia machines should be sterilized with anesthesia disinfectors.

For the detachable anesthesia machines, heat-resistant parts are soaked in 2000 mg/L chlorinated disinfectant for 30 min, sealed in double-layer bag labeled with a "COVID-19 infection" logo, sprayed with 1000 mg/L chlorinated disinfectant, and taken to the hospital's central sterile supply department for autoclaving. While heat-intolerant parts, such as flow sensors and ceramic pieces, are soaked in 75% ethanol for 30 min and dried for preservation.

For the nondetachable anesthesia machines, anesthesia disinfectors include ozone disinfectors (ozone mixed with hydrogen peroxide) and compound alcohol disinfectors (ethanol mixed with chlorhexidine). Connecting disinfectors to anesthesia machine with a threaded tube, the whole disinfection process includes the atomization and humidification and the emptying [1]. Compared with ozone disinfectors, the compound alcohol disinfectant is ethanol mixed with chlorhexidine, which does not damage the breathing circuit and components [2].

Endotracheal intubation items, such as video laryngoscopes, fiber optic bronchoscopes, and lighted stylets, are probable sources of infection during endotracheal intubation [3]. The disposable blade of video laryngoscope should be securely separated and discarded like other disposable supplies. The screen and handle surfaces are thoroughly wiped with 75% ethanol at least twice and then sequentially wiped with 0.5% povidone-iodine and 75% ethanol [4]. The fiber optic bronchoscope is disassembled if it is not leaking; the endoscope channels, buttons, and valves are brushed; and the items are rinsed and wiped dry.

As shown in Fig. 1, sufficient preoperative virus preventive preparation and comprehensive postoperative virus elimination in COVID-19 era involves the prevention and sterilization of staff, environment, supplies, and equipment, with an emphasis on the protection and disinfection of anesthetic specialty supplies.

Declaration of competing interest

We declare that the contents have not been published elsewhere and the paper is not being submitted elsewhere. The manuscript has been read and approved by all co-authors. The authors declared no conflict of interest. This work was supported by the National Natural Science Foundation of China (Grant numbers 81774113, 81974540, 81971290, and 81771485).

<https://doi.org/10.1016/j.jclinane.2020.109924>

Received 7 May 2020; Received in revised form 17 May 2020; Accepted 24 May 2020

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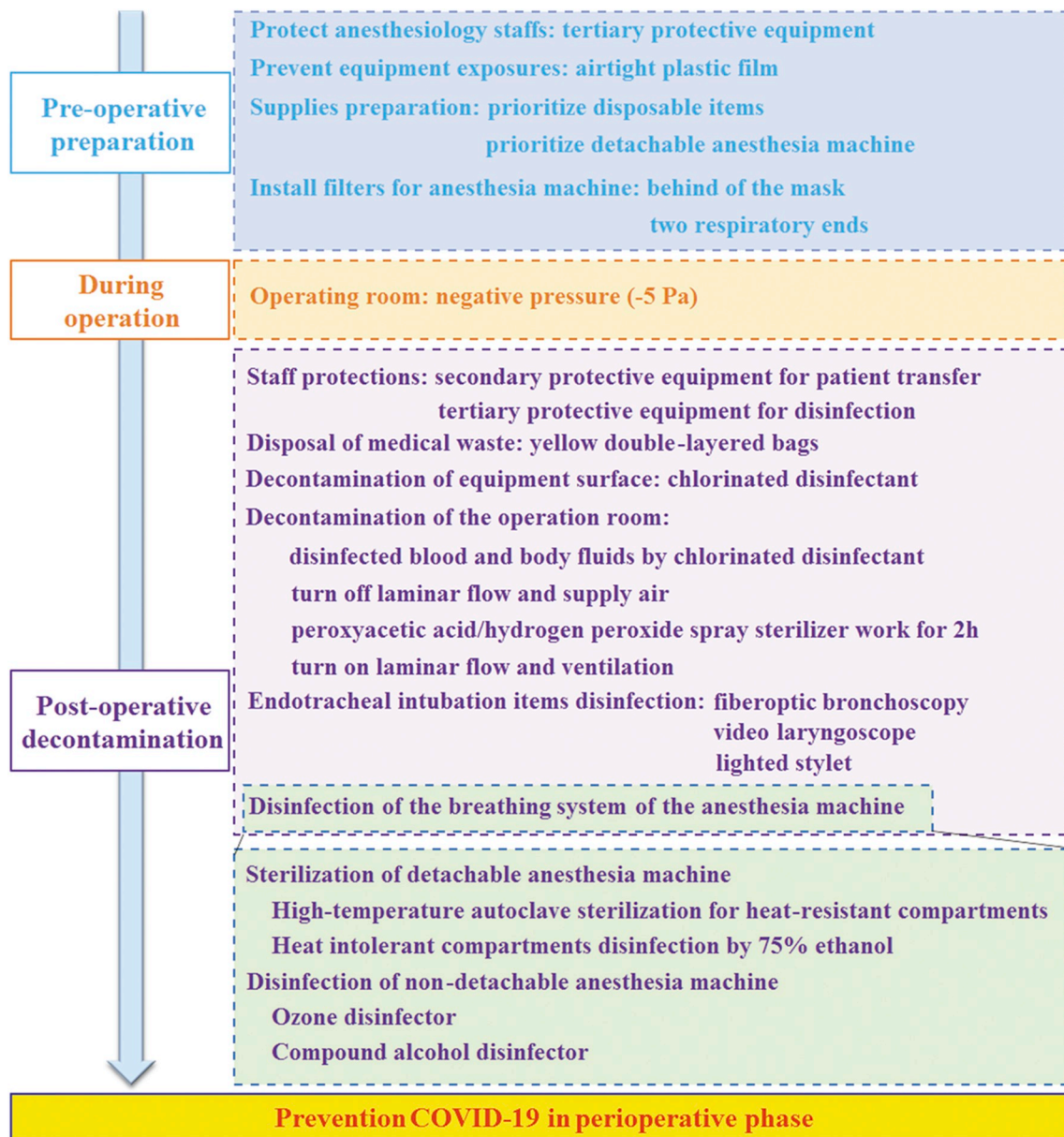


Fig. 1. Flowchart of preparedness and disinfection of anesthetic equipment in COVID-19. The perioperative COVID-19 comprehensive prevention involves pre-operative virus preventive preparation, interoperative prevention and postoperative patient transfer and decontamination.

References

- [1] Perioperative Infection Control Society of Chinese Society of Cardiothoracic and Vascular Anesthesiology Task Force on Disinfection and Sterilization of Breathing Circuit in Anesthesia Machine. Recommendations for disinfection and sterilization of breathing circuit in anesthesia machine. *Chin J Anesthesiol* 2018;38:1417–20.
- [2] Perioperative Infection Control Society of Chinese Society of Cardiothoracic and Vascular Anesthesia PLA Society of Anesthesiology and Resuscitation. Guidelines and recommendations for perioperative infection control in patients with COVID-19. *Periop Safe Qual Assur* 2020;4:5–8.
- [3] Call TR, Auerbach FJ, Riddell SW, Kiska DL, Th ongrod SC, Tham SW, et al.

Nosocomial contamination of laryngoscope handles: challenging current guidelines. *Anesth Analg* 2009;109:479–83.

- [4] Stanton C. Guideline for manual chemical high-level disinfection. *AORN J* 2018;107:7–9.

Na Duan, Wei Gao, Qiang Wang*
 Department of Anesthesiology & Center for Brain Science, The First
 Affiliated Hospital of Xi'an Jiaotong University, Xi'an, China
 E-mail address: dr.wangqiang@139.com (Q. Wang).

* Corresponding author at: Department of Anesthesiology, The First Affiliated Hospital of Xi'an Jiaotong University, Xi'an 710061, Shaanxi Province, China.