Determination of Length of Time for "Postaerosol Pause" for Patients Under Investigation or Positive for Coronavirus Disease 2019

To the Editor

Both aerosol and droplet precautions have been recommended for the care of patients with suspected or confirmed coronavirus disease 2019 (COVID-19) while undergoing intubation as part of a general anesthetic.[1,2] Multiple articles have indicated focused workflows specific to intubation and the use of personal protective equipment.[3,4] Extensive information is available regarding environmental cleaning and scheduling of procedures to maintain infection control standards.[5] New guidelines have suggested that a waiting period may be necessary immediately after intubation, but before allowing personnel in and out of a closed intubation room.[6] We offer a quantitative model to determine the length of a "postaerosol pause" following intubation of COVID-19 patients.

The Centers for Disease Control and Prevention (CDC) environmental infection control guidelines include airborne contaminant removal times for 99% and 99.9% efficiency based on air exchange rates per hour (ACH).[2] The values are given under the assumption that there is not further aerosol-generating source. We obtained the ACH per procedural area and the time for full air exchange in minutes for the rooms in different procedural areas including buildings of various ages and sites for different functions (ie, operating rooms, fluoroscopy suites, endoscopy). This was cross-walked with the CDC guidelines for contaminant removal based on those rates. To decrease contamination to surrounding rooms, the length of the pause of door opening was determined at the 99th percent and 99.9% for those areas.

The Table is the summary of a cross-walk of known information from hospital facilities in our institution with CDC guidelines on contaminant removal.
For areas instituting a pause postintubation/extubation or for room cleaning following an aerosol-generating procedure, the time for use of personal protective equipment for aerosol and/or halting of traffic of personnel through doors was implemented in alignment with the analysis by area.

Understandably, much debate and discussion during the COVID-19 pandemic have centered around safeguarding frontline health care workers, with many of the lessons taken from previous experiences with SARS, EBOLA, and H1N1. During this time, professional medical societies have provided guidance regarding the care of COVID-19 patients, including precautions during intubation/extubation, patient transport to the OR, care of the anesthesia machine and equipment, among others. With regard to appropriate decontamination of the operating room, both the American Society of Anesthesiologists (ASA) and Anesthesia Patient Safety Foundation (APSF) have recommended following current CDC guidance of using EPA-registered, hospital-grade disinfectant from List N.[2] A recent article on perioperative infection control also made specific evidence-based recommendations such as designating and maintaining clean and dirty areas, treating operating rooms with UV-C, using longer staff shifts, performing one case in each OR daily, with terminal cleaning after each case.[6]

Another consideration is the specific use of negative pressure rooms. When bearing in mind safety precautions in these discussions, it is important to remember the benefit of a negative pressure room is to protect individuals outside the room from an infectious contaminant in the room. The design is not to protect the provider/caregiver in the room. Therefore, this should not impact the decision around implementing a pause.

Amidst these discussions, less attention has been given to whether implementing a pause to allow removal of aerosolized particles should be widely deployed in operating and procedure rooms. In this area, both the ASA and APSF state that "Upon patient leaving the room, entry should be delayed until sufficient time has elapsed for enough air changes to remove aerosolized infectious particles."[7] During the pandemic, some hospitals have instituted this "pause" after intubation and extubation; however, there are several questions to consider before recommending widespread adoption of this practice. As with any improvement changes, local barriers to implementation exist, as well as consideration benefits and consequences. In the short term, initiating this change may not pose significant challenges and may be advantageous. While elective surgeries are being canceled, or postponed, certain hospitals and

Table. Procedure Area, ACH, and Contaminant Removal

Procedural Room Area	ACH	Full Exchange (min)	Time Required for Removal (min) 99% Efficiency	Time Required for Removal (min) 99.9% Efficiency
Area A	20	3	14	21
Area B	16	3.75	14–18	21–28
Area C	15	4	18	28
Area D	6	10	46	69

Abbreviation: ACH, air exchange rate per hour.

ambulatory surgery centers may have the opportunity to initiate this change without affecting their case efficiency. Waiting after intubation and extubation also reassures the operating room staff that safety is a priority. Furthermore, this precautionary measure may reduce the usage of personal protective equipment. Another consideration is whether to implement this practice in only COVID-19 or PUI patients or expand it to all patients, given the known risk of asymptomatic viral shedding. Until widespread rapid testing becomes available, some may consider a pause for all cases, which affects operating room efficiency. Indeed, challenges to sustaining a pause for COVID patients in the long term include effects on operating room delays and efficiency. Although operating rooms with more rapid ACH rates could be selectively utilized for these patients over others, this option is not always available to institutions or specific sites with low ACH rates. For instance, procedures such as interventional radiology cases can typically only be performed in certain fluoroscopy-enabled suites, where the ACH rate may be suboptimal for rapid turnover. We hope that this analysis assists other institutions to use a quantitative approach to determining a postaerosol pause if desired. These considerations are particularly relevant as hospitals and health systems consider the next phase of readjusting to the "new normal," rescheduling canceled elective surgeries, and adopting a long-term sustainable approach to caring for COVID-19 patients.

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