SPECIAL ARTICLE

COVID-19: Role of Ambulatory Surgery Facilities in This Global Pandemic

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Coronavirus Disease 2019 (COVID-19) has now become a global pandemic. This has led the United States to declare a national emergency and resulted in a ban on all elective diagnostic and therapeutic procedures as well as elective surgery in inpatient and outpatient settings. Ambulatory surgery facilities (ASF) that perform only elective procedures are thus likely to be closed. However, these facilities may be able to assist acute care hospitals as essential (urgent and emergent) surgeries and diagnostic and therapeutic procedures will still need to be performed. The aim of this article is to explore the potential contribution of ASFs in the current health care crisis. It is important to understand that COVID-19–related information is continually evolving, and thus, the discussion provided here is subject to change. (Anesth Analg XXX;XXX:00–00)

GLOSSARY

AED = automated external defibrillator; **ASF** = ambulatory surgery facilities; **CDC** = Centers for Disease Control and Prevention; **CMS** = Centers for Medicare and Medicaid Services; **COVID-19** = Coronavirus Disease 2019; **FAQ** = frequently asked questions; **ICU** = intensive care unit; **NIOSH** = National Institute for Occupational Safety and Health; **PACU** = postanesthesia care unit; **PAPR** = powered air-purifying respirators; **PPE** = personal protective equipment; **SAMBA** = Society for Ambulatory Anesthesia; **SARS-CoV-2** = severe acute respiratory syndrome coronavirus 2; **WHO** = World Health Organization

What started in December 2019 as an initial outbreak in Wuhan, China, Coronavirus Disease 2019 (COVID-19) has escalated in only a few months into a global pandemic currently affecting over 190 countries and territories worldwide.[1] On March 11, 2020, a state of national emergency was declared in the United States. Soon thereafter, travel restrictions and closures of schools and nonessential businesses followed. Federal authorities recommended that hospitals and ambulatory facilities limit elective surgeries to limit exposure to patients, visitors, and staff; prevent unnecessary local travel; conserve supplies for urgent and emergent cases; conserve personal protective equipment (PPE), which are already in short supply; and conserve hospital and intensive care unit (ICU) beds to accommodate the anticipated influx (surge) of critically ill COVID-19 patients.

Several states have now banned all elective diagnostic and therapeutic procedures as well as elective surgery in inpatient and outpatient settings. Ambulatory surgery facilities (ASFs) that perform only elective procedures are thus likely to be closed, resulting in loss of revenue and health care personnel. However, ASFs may be able to assist acute care hospitals as essential (urgent and emergent) surgeries and diagnostic and therapeutic procedures will still need to be performed. The aim of this article is to explore the potential contribution of ASFs in the current health care crisis. It is important to understand that COVID-19–related information is continually evolving, and thus, the discussion provided here is subject to change.

ASFs

There are approximately 5500 ASFs in the United States. The ASFs that choose to shut down normal operations can contribute by providing their supplies to hospitals that need them. Thus, the first step for these facilities is to develop an inventory of the available supplies such as anesthesia machines, which could be modified into ICU ventilators, and disposable supplies like PPE. The Ambulatory Surgery Center Association has a checklist for ASFs to document their inventory (Figure).[2]

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Equipment: Anesthesia workstations, monitoring devices (preoperative area, operating room, and recovery areas), thermometers, crash carts (adult and pediatric), hyperthermia carts, defibrillators and AEDs, intravenous infusion pumps, intravenous administration tubing, portable X-ray units and C-arm units (large and mini), Stretchers/beds, wheel chairs.

Medical Gases: oxygen, air, nitrous oxide, and nitrogen

Disposable Supplies: N95 respirators, surgical masks, personal protective equipment (e.g., gloves, gowns, etc.)

Personnel Willing to Work in a Hospital Setting: Registered nurses, licensed vocational nurse, licensed practical nurse, certified medical assistants, surgical technicians, first assistants, administrative staff, other.

Figure. Inventory that an ambulatory surgery facility could collect. Based on the recommendation from the Ambulatory Surgery Center Association.[2] AED indicates automated external defibrillator.

Certain types of ASFs could help decompress hospitals by performing selected essential (urgent and emergent) surgical procedures, which would free-up operating rooms, supplies, and personnel in acute care hospitals. This would also obviate patients having to go to an acute care hospital and risk exposure to multiple potential COVID-19 contacts. The types of ambulatory settings include hospital-based ambulatory centers (typically located within the hospital building or in close proximity of the hospital), short-stay (23-hour stay) facilities, free-standing ambulatory centers, and office-based surgical facilities.

Obviously, not all ASFs are suitable for migration of certain essential (urgent and emergent) surgical procedures that are typically performed in hospitals. Doing so might require specialized surgical equipment and monitoring as well as need particular postoperative care including postoperative parenteral therapy and require extensive in-person follow-up. The ASFs that could most likely help offset the COVID-19–related surge include hospital-based ambulatory centers and short-stay facilities. Free-standing ambulatory facilities and office-based surgical facilities do not have an ability to admit patients and have limited resources and, thus, may not be suitable. However, depending on the length of the COVID-19 crisis, even these ASFs may have to prepare to function in innovative and unprecedented ways to support the health care system. Importantly, such a move may require waivers from regulatory authorities.

Of note, on March 27, 2020, the Texas Department of Health and Human Services notified that all licensed ASFs must report number of ventilators and other respiratory support equipment onsite at the ASF.[3] In addition, ASFs may provide patient care for longer than 23 hours. Furthermore, ASFs do not have to report the patient transfer to a hospital or patient staying at the ASF for longer than 23 hours. This would allow expansion of the type of procedures that can be performed at the facility.[3] It is likely that other states may also have such a directive. On April 3, 2020, Centers for Medicare and Medicaid Services (CMS) provided the process for temporarily enrolling Medicare-certified ASFs as a hospital during the COVID-19 public health emergency.

PREOPERATIVE/PREPROCEDURE CONSIDERATIONS

Procedure Screening

The ASF schedule must be carefully reviewed in advance to ensure that only essential surgeries are being performed. The medical director of the facility, along with other managers, should be involved in this screening process. A procedure justification form may be used to document the necessity of performing the procedure. Such a form should be completed by the surgeon scheduling the case and be reviewed by the medical director of the facility. Furthermore, some state departments of health are requiring ASFs to submit documentation of the essential nature of every procedure performed at the facility. The decision to perform a specific procedure depends on the geographic location of the facility and the risk of COVID-19 infection in the local community and must therefore be continually evaluated.

Essential surgical procedures are defined as those that cannot reasonably be delayed for more than 8 weeks without significant harm to the patient or progression of disease/disability. Surgical procedures that could potentially be performed in select ASFs include superficial and peripheral surgical procedures. For example, trauma-related (eg, fractures and dislocations, tendon repairs, compartment

syndrome, and incision and drainage of infections), cancer-related (eg, diagnostic or therapeutic), or urological procedures with the potential for progression to obstruction or infection or severe pain requiring hospitalization.[4] Although not yet included, certain emergent intraabdominal procedures that are generally performed in hospitals (eg, appendectomy and cholecystectomy) may also be moved to ASFs. With improved surgical and anesthetic techniques as well as optimized pain management with local/regional analgesia, a significant number of procedures could be performed in hospital-based and short-stay ASFs, particularly if the facility has the ability to readily transfer patients to the hospital for postoperative care.

Certain procedures have a very high risk of aerosol generation, including airway instrumentation and otolaryngology procedures, airway surgery, sinus surgery, dental procedures, bronchoscopies, and upper endoscopies. The decision to proceed with these high-risk procedures in an ASF depends on the availability of negative pressure isolation room(s), appropriate face masks (N95 respirators and powered air-purifying respirators [PAPR]), face shields, and other PPE (gowns and gloves). Some states have issued directives prohibiting procedures that would deplete PPE. Therefore, these procedures should be delayed or, if urgent, should be performed in an acute care hospital.

Every hospital and the associated ASF should prepare a list of surgical procedures that could be transitioned. In addition, there should be procedures and processes in place to transfer patients to the hospital after the surgery, if necessary. These patients could also be transferred to other facilities such as home health care and skilled nursing facilities depending on the procedure and patient characteristics. However, there must be updated transfer agreements between the ASFs and postoperative care facilities.

Patient Screening and Selection Criteria Specific for COVID-19

It is recommended that symptomatic patients or patients at high risk of COVID-19 should not undergo a procedure in an ASF. Since the incubation period for COVID-19 varies from 2 to 14 days, it is possible that a patient may be asymptomatic and still be infected/infectious. Because testing is not currently universally available, for all practical purposes, it may be prudent to treat all patients as a potential infection risk.

It is critical that the ASFs performing essential surgical procedures have heightened screening protocols for patients and other visitors, similar to that performed in hospitals. For patients who are scheduled for essential surgery, telephone screening must be performed 24 hours before the day of surgery and include questions about recent travel, exposure to close contacts who have traveled, COVID-19 symptoms and positive testing results, exposure to close contacts with COVID-19 symptoms and positive testing results. Patients with any of these conditions are advised not to come into the ASF, to self-quarantine and to follow the current US Centers for Disease Control and Prevention (CDC) recommendations for testing.[5] However, if the procedure is essential, it should be at the acute care hospital.

On the day of the procedure, before entering the facility, screening questions are reassessed and body temperatures of both the patient and the companion are checked. If patients are found to be febrile or provide positive responses to the screening questions, they should be asked to self-quarantine at home and to reschedule their procedure. Here again, if the procedure is deemed essential on that day, it should instead be performed in an acute care hospital.

Visitors with a fever or symptoms should not be allowed to enter the facility.[6] Similar to the hospital setting, ASFs must follow strict visitation policy with only 1 visitor permitted per patient. Waiting areas should have notices about social distancing and be equipped with hand sanitizers. Educational material is available on the World Health Organization (WHO) website.[7] Visitors are given the option to wait in their car given that the ASFs may not have large enough waiting areas to practice adequate social distancing.

SCREENING OF STAFF AND VENDORS

The ASF staff and vendors must be screened with a similar questionnaire, and any personnel with positive responses must not be permitted to enter the facility.

INTRAOPERATIVE CONSIDERATIONS

The primary aim for selection of an anesthetic technique is to maintain patient safety as well as the safety of health care workers. Given that COVID-19 appears to be transmitted via aerosolized droplets with close person-to-person contact and less so through fomites, universal precautions and droplet precautions must be followed for all patients. This is particularly important because it is postulated that asymptomatic patients can transmit the disease during the incubation period.[8,9] Of note, the likelihood of COVID-19 transmission from asymptomatic patients is low.[10]

Although the choice of anesthetic technique generally depends on the procedure and the patient, preventing transmission of coronavirus through aerosolization should be a major consideration. It is preferable to avoid airway instrumentation and attendant aerosol generation, thereby increasing the risk of airborne transmission. Therefore, whenever possible, local/regional anesthesia with minimal or no sedation is preferred. However, neuraxial anesthesia may

not be appropriate because of concerns of thrombocytopenia. The patient should wear a surgical mask during the procedure. Administration of high-flow supplemental oxygen should be avoided because of concerns of aerosolization. If necessary, supplemental oxygen should be provided through nasal cannula using low flows.

Aerosolization through exhaled gases could occur during moderate sedation and deep sedation because the patient's airway is not protected (fully sealed). Possible steps to reduce aerosolization again include avoidance of high-flow supplemental oxygen, and if it is clinically feasible, having the patient wear a surgical mask during the procedure.

For patients receiving general anesthesia, there are concerns with the use of supraglottic devices (eg, laryngeal mask airway) because these devices do not always provide complete seal of the airway, with a possibility of ambient leaks, particularly if mechanical ventilation is used. It appears that the safest approach for prevention of aerosolization is the use of endotracheal intubation. It is recommended that rapid sequence induction be used which includes avoidance of positive pressure ventilation after induction of general anesthesia.

The choice of maintenance technique—inhalation anesthesia versus total intravenous anesthesia—depends on the clinical scenario. However, the primary aim should be to achieve rapid clearheaded recovery with no coughing on emergence. This can be achieved by avoiding preoperative midazolam and using shortest acting drugs at the lowest possible dose (eg, avoiding deep anesthesia and deep muscle relaxation, and minimizing opioid dose).

Aggressive postoperative nausea and vomiting prophylaxis with at least 2 or 3 antiemetics is critical because postoperative vomiting can generate aerosolization. Similarly, aggressive pain prophylaxis with nonopioid analgesics such as acetaminophen and nonsteroidal anti-inflammatory drugs as well as local/regional analgesia is important to limit postoperative opioid requirements and avoid-opioid–related adverse events—particularly respiratory depression and airway obstruction, which might require supplementary oxygen and airway manipulation/instrumentation.

When general anesthesia with endotracheal intubation is considered necessary, the American Society of Anesthesiologists recommends that all anesthesia personnel utilize PPE appropriate for aerosol-generating procedures during the airway instrumentation process.[11] Therefore, an N95 respirator mask should be used by the individual performing endotracheal intubation and extubation. Although this would be an ideal situation, the shortage of PPE requires conservation strategies, including reuse of N95 respirator masks (see below). Of note, during tracheal intubation and extubation, other personnel in the operating room should be at least 6 feet from the patient's head. Place a facemask on the patient postextubation and before allowing other health care providers within 6 feet of the patient.

All patients should be transported to the postanesthesia care unit (PACU) with a surgical mask and should use this mask for the duration of their stay. If patient develops hypoxia (oxygen saturation <94%), measures such as encouragement of deep breathing should be attempted before providing supplemental oxygen.

Postoperative instructions may be provided to the caregiver in writing and via telephone to minimize time spent by the caregiver in the facility. Follow-up visits may be conducted virtually via telephone or Internet, when possible.

INTRAOPERATIVE MONITORING SPECIFIC FOR COVID-19

When delivering sedation/analgesia techniques (ie, monitored anesthesia care), expired CO_2 monitoring is considered a standard. However, care must be taken not to contaminate the anesthesia machine. This requires that the CO_2 sampling line be placed between the approved viral filter and the machine. Of note, every anesthesia workstation manufacturer has specific recommendations based on the approach to expired gas sampling. Therefore, it is advisable to contact the manufacturer for recommendations on appropriate use of filters and decontamination process in the event of COVID-19 viral contamination.

For gas analyzers that are not integrated in the anesthesia machine, the exhaust gas should be directed to an active (not passive) scavenging system. If the sampled gas is routed to the scavenging system, additional filtration may not be necessary as there are standards for managing biohazards in the central suction system or waste anesthetic gas system. It is prudent to check with the local facilities manager to confirm the risk of biohazard in the suction system.

If sampled gases are returned to the breathing circuit, they need to be filtered. Water traps do have built-in filters. The effectiveness of such filters is determined by the viral filtration efficiency. The General Electric anesthesia workstation includes the D-Fend Pro water trap with a 0.2 μm filter that has a viral filtration efficiency of 99.999%. The Draeger anesthesia workstation uses a 0.2 μm filter in the water trap but the viral filtration efficiency has yet to be determined. If an airway filter option is not available, and the efficiency of water trap filter cannot be confirmed, a 0.2 μm drug injection filter similar to that used in epidural analgesia kits can be placed between the water trap and the patient and reused after wiping the

surface.[12] If it is not possible to filter the sampled air for expired CO_2, it may be necessary to monitor ventilation by other means such as a precordial stethoscope or stethoscope placed on the neck.

PPE CONSIDERATIONS

The US CDC has described the appropriate provider use of PPE, including various types of masks (ie, conventional surgical facemask, N95 respirator, or PAPR), based on the distance from the patient, type of interaction with the patient, and has also recommended source control (masking of patients):[13]

1. If the health care provider is 6 feet or more away from the patient, no facemask or respirator is required for the provider.
2. If the health care provider is between 3 and 6 feet away from the patient, a surgical facemask is required for the provider.
3. If the health care provider is <3 feet away from the patient and if the patient is wearing a facemask, a facemask is required for the provider.
4. If the health care provider is <3 feet away from the patient and if the patient is unmasked, then the provider should use a respirator.

Putting a facemask on the patient is effective at containing the source and a simple strategy to prevent viral spread.

While reuse of N95 respirators and PAPR is not sanctioned by the manufacturer, the US CDC does provide some guidance. In a recent communication, Dr Peter Tsai, the inventor of the N95 respirator, recommends air drying over 3–4 days.[14] However, this would require that each provider have 4 masks to use on days 1–4 while the other masks are drying. Alternatively, he recommends sterilization of the N95 masks by hanging them in the oven (without contacting metal) at 70°C (158°F) for 30 minutes, as it is reported that COVID-19 cannot survive at 65°C (149°F) for 30 minutes.[15,16] Dr Tsai does not recommend use of ultraviolet light or sunlight, as these might degrade the material and the elastic bands.

Another option that is being explored is the use of a pulsed Xenon-based ultraviolet system which has shown to be effective for 12 disinfection cycles without interfering with mask fit.[17] The National Institute for Occupational Safety and Health (NIOSH) recommends limiting reuse of a respirator to <5 times to ensure adequate safety.[18] Of note, the US Food and Drug Administration recently approved devices for decontaminating N95 masks.

CLEANING OF OPERATING ROOMS, WORKSTATIONS, AND FACILITIES

In addition to the routine cleaning and disinfection protocols, facilities should disinfect high traffic areas more frequently. Facilities should use the appropriate disinfectant and follow the recommended contact time (see the List N on the Environmental Protection Agency website for registered disinfectants that have qualified under the emerging viral pathogens program for use against severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]). The US CDC has provided additional information and recommended practices for terminal cleaning of rooms and PPE to be worn by environmental services personnel.[13]

REGULATORY AND ADMINISTRATIVE CONSIDERATIONS

Accrediting organizations have postponed site visits. The US CMS has extended deadlines for quality reporting measures. In addition, no data reflecting services provided between January 1, 2020 and June 30, 2020 will be used in CMS calculations for the Medicare quality reporting and value-based purchasing programs. This is being done to reduce the data collection and reporting burden on providers responding to the COVID-19 pandemic. There has already been widespread use of telemedicine, which could lead to changes in billing practices.

In the event of closure, an ASF will need to report to the state department of health as an infrastructure failure. They will also need to plan to divert their supplies and inventory and furlough staff. Of note, the ASF needs to ensure that all providers that will be using N95 respirators are fit-tested. Also, all employees should be trained in the use of PPE.

SUMMARY

As the COVID-19 pandemic evolves, so must surgeons and anesthesiologists. ASFs need to be prepared to play previously unimaginable roles—such as trauma, labor and delivery, or performing urgent surgery to free-up acute care hospital capacity. Those ASFs, which are not suitable for performing such procedures, can still contribute by providing the available resources, including equipment and disposables. ASFs can keep patients and staff safe by limiting nonessential surgery; performing heightened screening of patients, visitors, and staff; and following the recommendations for preventing nosocomial spread of COVID-19.

These recommendations provided here should be utilized as a foundational resource, which may readily change as new information becomes available. They are not intended to supersede clinical judgment or individual patient choices or values. Ultimately, clinical decision-making must always be customized to the local environment and uniqueness of the health care system, and patients' needs should be considered. Readers are also urged to utilize information

offered by various professional organizations and government agencies and to carefully consider differing opinions. The Society for Ambulatory Anesthesia (SAMBA) has compiled a COVID-19 frequently asked questions (FAQs) page (www.sambahq.org) to specifically address questions from ambulatory anesthesiologists.

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