Rhinologic Practice Special Considerations during COVID-19: Visit Planning, Personal Protective Equipment, Testing, and Environmental Controls

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Abstract

As rhinologists return to practice amidst SARS-CoV-2, special considerations are warranted given the unique features of their subspecialty. Rhinologist manipulation of nasal tissue, proximity, and frequent aerosol generating procedures (AGPs) create high-risk for infection transmission. To mitigate risk, four areas of special consideration are: 1) pre-visit planning for risk stratification/mitigation, 2) appropriate personal protective equipment, 3) pre-procedural testing, and 4) environmental controls. During pre-visit planning, risk factors of the patient and procedures are considered. High-risk AGPs are identified by duration, proximity, manipulation of high-viral load tissue, and use of powered instrumentation. Appropriate personal protective equipment includes selection of both respiratory and eye protection. COVID-19 testing can screen for asymptomatic carriers prior to high-risk procedures; however, alternative testing methods are required in rhinologic patients not appropriate for nasopharyngeal testing due to nasal obstruction or skull base defects. Lastly, AGPs in rhinologic practices require considerations of room air handling and environmental controls.
Introduction

The predilection of the SARS CoV-2 (“novel corona virus”) to exist with high viral loads in the nose and nasopharynx creates unique challenges for managing patients with rhinologic conditions during the COVID-19 pandemic. It is now recognized that Otolaryngology-Head Neck surgeons are especially vulnerable to high viral load exposure during rhinologic and endoscopic sinus and skull base procedures. Additionally, rhinologic surgeons and their teams are at high risk in office-based settings due to close proximity to patients in smaller while performing nasal endoscopy, nasal debridement and other nasal procedures. Strategies to mitigate these risks have been four-fold (Figure 1). The first is identification of factors resulting in “high-risk” or aerosol generating; the second is to choose appropriate personal protective equipment (PPE) to the entire healthcare team, the third is to test the patients for COVID-19 prior to elective visits/procedures, and the fourth is environmental modification of the physical location where examination and procedures are to be performed. Within each of these facets, there are issues that are unique to rhinologic surgeon that need to be thoughtfully considered.

Pre-visit Planning

Pre-visit planning is essential for risk stratification and mitigation. This begins with office preparation through identification of PPE needs and pathways to secure necessary supplies. Education regarding reuse/extended use of single use PPE and utilization of reusable PPE is essential prior to restarting the office-based practice. Once visits are scheduled, pre-visit planning for individual patients begins with a screening call to the individual to screen for the possibility of an active infection or asymptomatic carriage prior to the day of appointment (signs/symptoms, potential exposures, etc). This call is also used to educate patients for the
modified etiquette and protocols necessary for care during the pandemic including wearing a
mask and practicing social distancing at all times while in the clinic. On the day of a clinic visit,
consideration can be given clinic check-in screening tools (temperature, pulse-ox, etc.) and
obtaining the patient history at via distance communication (telephone or virtual
communication).²

Identification of High-Risk and Aerosol Generating Procedures
Identification of factors creating a “high-risk” procedure is imperative to estimate the potential
for high viral load exposure and allow surgeons and their teams to select appropriate levels of
respiratory protection. Eye protection is encouraged when examining any rhinology patient.²-³
Increased risk is created with: prolonged procedural duration, aerosol generating procedures,
proximity to aerosols, manipulation of high-viral load tissue, and use of energy instrumentation
(cautery, laser, drill, saws, and ultrasonic technology).¹

The SARS CoV-2 virus is thought to spread via respiratory droplets and aerosols. Respiratory
droplets during normal speech and respiration travel less than 6 feet in the unmasked patient.⁴
Therefore, during examination of the nose, the physician should encourage masking the mouth.
Patients should be advised prior to nasal endoscopy and procedures to cover their faces if a
sneeze or cough is impending; droplets and aerosols generated during forceful coughing or
sneezing can extend to 23 to 27 feet.⁵-⁶ The droplet nuclei in aerosols can be inhaled by
bystanders directly into the lung as opposed to respiratory droplets. While droplets typically fall
to the ground within 30 min (ref), aerosols may linger in the air for up to 3 hours, and remains
viable during that time.⁷
Systematic review of data from the 2003 SARS outbreak for transmission to healthcare workers identified endotracheal intubation as the procedure that had the greatest association with nosocomial infection across multiple studies. Extrapolation of this data suggests that high-risk aerosol generating procedures are those events associated with similar or greater duration of exposure and proximity to aerosols from the airway compared to intubation. The average time for intubation varies between less than 1 minute to 25 minutes depending on situation (emergent versus planned) and difficulty. For rhinologists, consideration to the duration of their surgical cases and clinic procedures needs to be considered as they may meet criteria as high-risk AGP due to their duration and the staff proximity to the airway. Physicians should also be cognizant that speech itself is aerosol generating and engage in only essential conversation when in close proximity of an unmasked patient. Additionally, sneezing can be induced when examining patients during allergy exacerbations, sinusitis exacerbations, or with any manipulation of the nasal passageways; this can convert any encounter to an aerosol enriched environment and increase the “at-risk” radius beyond 6 feet.

The high viral loads present in nasopharyngeal tissue is another risk factor for rhinologists during AGPs. The highest viral loads appear to exist in nasal cavity and nasopharynx. Under standard conditions, clinic endoscopy manipulating nasal/nasopharyngeal tissue create aerosolized droplets that travel up to 66 cm from the nare. The risk of aerosolization during suctioning of the nasal cavity and nasopharynx remains unclear. While use of nasal atomizer sprays has been discouraged to decrease the risk of aerosolization, adequate anesthetic via alternative means (pledgets, etc.) is very important not only for patient comfort, but to decrease airway irritability that can induce forceful coughing or sneezing during procedures.
Lastly, the powered instrumentation utilized by rhinologists in clinic or operating room settings is known to create aerosol generation. Drills may be the highest risk instruments for aerosol generation and are known to include viable infectious particles that travel the entire room.\textsuperscript{14,16-18} This aerosol effect is known to also occur with use of ultrasonic instruments.\textsuperscript{16} Additionally, data confirms that laser and electrocautery energy instruments create an aerosolized plume of viable infectious particles.\textsuperscript{17,19-22}

Selection of Personal Protective Equipment:

Selection of PPE must prioritize the health of the operating team. For all aerosol generating procedures, minimum recommended PPE includes gloves, gown, eye protection (googles verses face shield), and minimum of an N95 respirator. While N95 respirators are recommended for AGPs, achieving a durable correct fit with these respirators is a challenge for many. This may be related to facial habitus, duration of procedure, and need for uncommon positioning and movement of the head on the neck.\textsuperscript{23-24} Additionally, the tight-seal needed necessitated for N95s with their non-adjustable bands, can cause significant facial trauma and respiratory compromise to healthcare workers over repeated use, or after procedures that last long durations.\textsuperscript{25-26} For standard airborne precautions, N95 masks are appropriate for respiratory protection. However, for surgeons involved in recurrent or long-duration high-risk aerosol generating procedures, enhanced respiratory protection with filters certified as 99, 100, or HEPA may be appropriate in these circumstances.\textsuperscript{1,27-28} Options for enhanced respiratory protection that meet these criteria include: disposable masks rated between N-P 99-100, elastomeric respirators with filters rated between N-P 99-100, powered air-purifying respirator (PAPR), or controlled air-purifying
respirator (CAPR). The American Academy of Otolaryngology – Head and Neck Surgery Guidance for Return to Practice recommends that when treating known COVID-19 infected patients, “maximal available and appropriate PPE should be used during all levels of interaction”.\textsuperscript{2}

Eye protection is appropriate during patient interactions.\textsuperscript{29} Regarding eye protection, there is mixed information current published concerning appropriateness of face shields verses goggles for protection from infectious particles during AGPs. The CDC current recommendations for PPE during the COVID pandemic include both goggles and face shields as acceptable eye protection during standard AGPs.\textsuperscript{30} However, under their referenced supplementary material for SARS viruses, the CDC also specifically states that fitted goggles need to be worn during AGPs and face shields “should not be worn as a primary form of eye protection”.\textsuperscript{27} Evidence from the medical literature supports the use of goggles in preference over face shields to adequately protect from aerosols. A cough simulator study showed that face shields were only 23-68\% effective at blocking aerosols and their efficacy decreased with exposure time.\textsuperscript{31} Evidence from 2003 SARS additionally showed the use of goggles was an independent factor decreasing the risk of nosocomial infection. Thus, the American Academy of Ophthalmology recommends that goggles are preferred over face shields for ocular protection during AGPs.\textsuperscript{3,32} A preference for occlusive eyewear is further supported by the American Academy of Otolaryngology – Head and Neck Surgery Guidance for Return to Practice.\textsuperscript{2}

COVID-19 Testing

Current guidelines recommend COVID-19 testing prior to performing non-emergent high-risk aerosol generating surgery and consideration for testing before aerosol generating procedures;
recognizing there are limitations on availability of testing in certain areas. The decision to perform testing prior to in-clinic procedures needs to be guided by testing availability and frequency of COVID-19 disease in the community. Where available, pre-visit testing can be employed to screen patients for asymptomatic carriage of the SARS Cov2 virus, especially in geographical areas with high prevalence. It is important to be familiar with the sensitivity and specificity of the test used. Results of testing can help defer non-essential procedures, as well as help cohort patients for examination and management in suitable environmental settings. If testing is not available or results cannot be obtained in an actionable time period, full COVID-19 precautions should be used for all patients undergoing AGPs in regions experiencing high incidence of disease.

Pre-procedure testing for rhinologic patients has also not been adequately studied. Standard testing is performed trans-nasally to sample the nasopharynx by means of a swab. However, rhinology patients have special considerations that make nasopharyngeal testing difficult, inaccurate, or dangerous. As a result, the method of testing for patients in a rhinology practice deserves discussion and consideration of possible alternative testing methods. Many rhinology patients have anatomical considerations that may make them poor candidates for nasopharyngeal sampling including a severely deviated septum, obstructing nasal tumor, and obstructing nasal mass (such as postoperative dressing/splints). Further, patients undergoing sinus surgery may have pus and/or polyps within the nasal passageway that may impact the sampling, sensitivity, and negative predictive value of the test. Additionally, postoperative patients who have had recent skull base surgery, blind nasopharyngeal testing is inappropriate and may risk significant morbidity from skull base violation. In this select patient group, testing alternatives to nasopharyngeal sampling needs to be considered. The preference for
nasopharyngeal sampling is based on evidence that viral loads are higher in the nasopharynx than
the oropharynx, and experience out of China showing higher rates of disease detection in
nasopharyngeal swabs compared to oropharyngeal swabs.\textsuperscript{12,35-36} However, there is a growing
body of literature that alternative sampling methods may be equivalent alternatives for COVID
detection.

One option is sputum samples rather than nasopharyngeal samples. A study of 213 COVID
positive patients by Yang et al\textsuperscript{31} commonly cited supporting nasopharyngeal swabs, actually
shows that sputum had a higher rate of disease detection (74.4-88.9\% sensitivity) compared to
nasopharyngeal swabs (53.6-73.3\% sensitivity). The high viral load of sputum samples has been
supported in additional studies and suggested as an equivalent or superior testing option.\textsuperscript{37-39}
However, not all patients undergoing testing are capable of producing a sputum sample (<30\%)
limiting its broad application.\textsuperscript{40}

Alternatively, an oropharyngeal sample is an option in patients that cannot have a
nasopharyngeal sample taken due to obstruction, contamination, or safety concerns. Initially
discounted as inaccurate, further data suggests oropharyngeal sample testing may be a reasonable
alternative. The presence of high viral load in the oropharynx tissue has been demonstrated.\textsuperscript{13,39}
Smaller studies than those supporting nasopharyngeal swabs have also shown equivalent or
improved detection rates using oropharyngeal swabs and/or oropharyngeal throat washings.\textsuperscript{37,41-42}
These findings are supported in patient collected samples as well.\textsuperscript{43} As a result, oropharyngeal
sampling is recognized by the CDC as an acceptable alternative site to nasopharyngeal sampling
for COVID-19 testing.\textsuperscript{44} Given these findings, and potential inability to perform an accurate
and/or safe nasopharyngeal swab in rhinology patients, consideration to creating a separate
testing workflow for this patient population should be considered.
Environmental Infection Control

In addition to provider and patient considers, the safety of the physical space must be considered when treating rhinology patients. AGPs are known to create aerosol droplet nuclei that can travel 23 – 27 feet and remain viable while airborne for up to 3 hrs. The CDC recommends that exam rooms remain vacant following a patient interaction dependent on the room characteristics, level of risk, duration of time in the room, and performance of AGP such that “sufficient time has elapsed for enough air changes to remove potentially infectious particles”. If universal precautions are extended to all patients undergoing AGPs, special considerations regarding air handling and room down time prior to cleaning following an AGP are needed. The CDC has detailed the tables regarding air changes per hour and relative time for clearance of 99% and 99.9% of airborne contaminants (ex: for room with 6 air changes per hour, it takes 46 minutes for 99% of airborne contaminants to be removed). Due to the frequency of AGPs in rhinologic clinical practices and need for room turnover, options to improve both the safety of the facility and efficiency of the clinic need to be considered. First, the current air handling of all clinical rooms should be reviewed with the building environmental services to educate the practice on room air handling. If possible, the air changes per hour should be increased to improve the efficiency of air contaminant removal, and therefore decrease the time a room is closed following an AGP (for example, at 12 air changes per hour 99% of airborne contaminants are removed in 23 minutes). Second, the practice can consider designating set rooms for AGPs, so that non-AGP practice visits can continue in other rooms without prolonged turnover times. Lastly, the incorporation of portable, industrial-grade high efficiency particulate air (HEPA) filter units can be used in clinical rooms to provide the
equivalent of additional air changes per hour and decrease the time a room needs closed following an AGP.\textsuperscript{46}

**Future Considerations:**

As rhinologists return to practice in the post-crisis phase, operational efficiencies will become important. This will create a need for improvement in all areas including provider protection with PPE, patient testing and protection, and physical plant optimization. Innovative options to provide improvements in all three areas include creation of barrier pods that also minimize aerosol and droplet dispersal. While these are currently available for use in the ICU and intubation, special designing needs are necessary in the outpatient office that takes into consideration patient safety, potential CO2 retention, ease of use and physician satisfaction. Providers across the country are actively researching and developing various methods of barriers to protect patient and staff that show promise.\textsuperscript{47-48}

**Conclusions**

The SARS-CoV2 COVID-19 pandemic has resulted in world-wide changes in practices. As rhinologists return to routine practice a multi-pronged approach is helpful to establish safe practices for both providers and patients. These include pre-visit planning including identification of high-risk procedures, appropriate choice of PPE, patient COVID-19 testing, and physical facility management. Future directions for research may focus on innervations and innovations that create safe, easy to use barriers in the out-patient clinical setting that protect both the patient and the staff during high risk exams and procedures.
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Figure 1:

AGPs = aerosol generating procedures; PPE = personal protective equipment
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