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EVIDENCE SEARCH REPORT

RESEARCH QUESTION: What is the risk of COVID-19 transmission during AGMP procedures?	**UNIQUE IDENTIFIER:** PPE120901-01 ESR
CONTEXT: Want to understand the level of risk in various settings	

RESOURCES USED:

- Alberta Health Services
- BMJ Best Practice
- CADTH
- CDC
- CINAHL Plus
- Cochrane Library
- DynaMed
- Embase
- Evidence Check (Australia)
- Google
- Google Scholar
- HSE (Ireland)
- MEDLINE
- MedRxiV
- NCCMT
- Norwegian Institute of Public Health
- PHAC
- SPOR Evidence Alliance
- TRIP Pro
- WHO
- WHO Global Research Database

LIMITS/EXCLUSIONS/INCLUSIONS: Publication date: April 1, 2020-current	**REFERENCE INTERVIEW COMPLETED:** December 9, 2020
DATE: December 11, 2020	
LIBRARIAN: Lance Fox Mark Mueller	**REQUESTOR:** Kathy Malejczyk
TEAM: PPE	
SUBJECTS: Aerosols, Transmission, Risk Assessment	
SEARCH ALERTS CREATED: Y/N (MEDLINE, ETC.) N	

CITE AS:
Fox, L; Mueller, M. What is the risk of COVID-19 transmission during AGMP procedures? 2020 Dec 11; Document no.: PPE120901-01 ESR. In: COVID-19 Rapid Evidence Reviews [Internet]. SK: SK COVID Evidence Support Team, c2020. 41p. (CEST evidence search report)

LIBRARIAN NOTES/COMMENTS

Hi Kathy,

Here is the evidence we were able to find since April 2020. A lot of the literature discusses the use (and effectiveness) of different types of PPE and methods of infection control. Many articles also debate whether specific procedures should actually be considered an AGMP or not. We have tried our best to select articles that focus specifically on the actual level of risk of transmission during an AGMP. In some instances it was a little challenging to determine from the abstract if the article actually talked about the level of risk in more detail, so we did our best to pick and choose. The grey literature search only retrieved a few results and it was difficult to find anything else.

Thanks,
Lance and Mark

SEARCH RESULTS

To obtain the full-text articles or to request offsite access, email library@saskhealthauthority.ca.

SUMMARIES, GUIDELINES & OTHER RESOURCES

Alberta Health Services

- COVID-19 Scientific Advisory Group Rapid Response Report: Transmission Risk in Dentistry. [June 25, 2020]. https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-sag-risk-of-transmission-in-dentistry-rapid-review.pdf
- **LIBRARIAN'S NOTE:** One of the key research questions in this report is the following: " "What are the risks of infection transmission related to aerosol generation from use of dental handpieces and other instruments in dental clinics?"

American Thoracic Society

- SARS-CoV-2 Transmission and the Risk of Aerosol-Generating Procedures. [June 30, 2020]. https://www.thoracic.org/patients/patient-resources/resources/aerosol-generating-procedures-and-risk-of-covid-19-transmission.pdf

CADTH

- CADTH Rapid Response Report: Reference List - Masks During Aerosol Generating ENT Procedures: Clinical Effectiveness and Guidelines. [March 30, 2020]. https://cadth.ca/sites/default/files/covid-19/ra1103-ent-procedures-covid-final.pdf
- CADTH Rapid Response Report: Reference List - Masks During Aerosol Generating Dental Procedures: Clinical Effectiveness and Guidelines. [March 26, 2020]. https://www.cadth.ca/sites/default/files/pdf/htis/2020/RA1101%20COVID19%20Dental%20Procedures%20Final.pdf

Government of Newfoundland and Labradour

- Provincial Guideline for Aerosol-Generating Medical Procedures during the Covid-19 Pandemic. [June 10, 2020]. https://www.gov.nl.ca/covid-19/files/NL-AGMPs-COVID-19-Guideline-June-10-2020.pdf
- **LIBRARIAN'S NOTE:** See section: Risk Assessment for AGMPs, pg 4 for assessing risk of various AGMP scenarios

Health Information and Quality Authority (Ireland)

- Evidence Summary for Aerosol Generating Procedures: Risk of Transmission of SARS-Cov-2 from Patients Without Clinical Symptoms. [June 18, 2020]. https://www.hiqa.ie/sites/default/files/2020-06/Aerosol-Generating-Procedures-risk-of-transmission-of-SARS-CoV-2.pdf

National Collaborating Centre for Methods and Tools

- Evidence brief of aerosol generating procedures in dental care settings. [June 11, 2020]. https://www.nccmt.ca/covid-19/covid-19-evidence-reviews/101
- **LIBRARIAN'S NOTE:** Research question for above resource: "What is the existing evidence of SARS-CoV-2 transmission in dental settings, and the infection transmission from Aerosol Generating Procedures (AGP) use in dental care?"
- Transmission of Acute Respiratory Infections During Aerosol Generating Medical Procedures. [April 22, 2020]. https://www.nccmt.ca/covid-19/covid-19-evidence-reviews/22

Norwegian Institute of Public Health

- COVID-19 Epidemic: Aerosol Generating Procedures in Health Care, and COVID-19. [March 2020]. https://www.fhi.no/globalassets/dokumenterfiler/rapporter/2020/aerosol-generating-procedures-in-health-care-and-covid19-rapport-2020.pdf
- **LIBRARIAN'S NOTE:** "In relation to the Norwegian Institute of Public Health's role in handling the COVID19 epidemic, we have been asked to prepare a rapid summary of the available research on aerosol generating procedures in health care, and the associated risk of COVID-19 infection for health care workers." (pg. 5)

NSW Agency for Clinical Innovation

- COVID-19 Critical Intelligence Unit: Spirometry and Transmission Risk. [April 6, 2020]. https://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0009/579492/20200406-Evidence-Check-Spirometry.pdf
- **LIBRARIAN'S NOTE**: Review answers the following question: Is there evidence that spirometry is an aerosol generating procedure and what risk does it carry?

SPOR Evidence Alliance

- Mark Hofmeister, et al. Transmission of Acute Respiratory Infections during Aerosol Generating Medical Procedures. University of Calgary Health Technology Assessment Unit. Produced for Infection Prevention and Control, Alberta Health Services. [April 8, 2020]. https://sporevidencealliance.ca/wp-content/uploads/2020/04/AGMP_Report_Submit.pdf

Swedish Agency for Health Technology Assessment and Assessment 0f Social Services

- Risk for transmission of viral infection during treatment with nebuliser or high-flow nasal cannula. [June 8, 2020]. https://www.sbu.se/en/publications/responses-from-the-sbu-enquiry-service/risk-for-transmission-of-viral-infection-during-treatment-with-nebuliser-or-high-flow-nasal-cannula2/
- Risk for transmission of viral infection during treatment with non-invasive ventilation using CPAP or BiPAP. [June 8, 2020]. https://www.sbu.se/en/publications/responses-from-the-sbu-enquiry-service/risk-for-transmission-of-viral-infection-during-treatment-with-non-invasive-ventilation-using-cpap-or-bipap/

ARTICLES

1. Adir Y, Segol O, Kompaniets D, et al. COVID-19: minimising risk to healthcare workers during aerosol-producing respiratory therapy using an innovative constant flow canopy. The European respiratory journal. 2020;55(5):05. DOI: 10.1183/13993003.01017-2020
URL: https://www.ncbi.nlm.nih.gov/pubmed/32312865
DOI: 10.1183/13993003.01017-2020

2. Ali K, Raja M. Coronavirus disease 2019 (COVID-19): challenges and management of aerosol-generating procedures in dentistry. Evid Based Dent. 2020;21(2):44-5. DOI: 10.1038/s41432-020-0088-4
ABSTRACT: Data sources Experimental investigation.Study design A retrospective review to evaluate the use of a negative-pressure otolaryngology viral isolation drape (NOVID) system to reduce cross-infection through aerosol. The apparatus consists of a plastic drape suspended over the surgical field in the head and neck region with a smoke evacuator suction placed inside the chamber with an ultra-low penetrating air (ULPA) efficiency rating and a fluid suction high-efficiency particulate air (HEPA) filter compartment. Spread of patient secretions and droplet formation was evaluated using 1% fluorescein dye in 10 ml of normal saline and ultraviolet light. The

dye was applied topically in the nasal cavity and nasopharynx preoperatively and intraoperatively prior to the use of instruments such as micro-debrider, electrocautery and high-speed drilling. Following completion of the surgical procedure, an ultraviolet Wood's lamp was used to evaluate the presence of droplets on the surgical drapes and surgical gowns of the operating team.Results The study sample consisted of four patients who underwent endonasal endoscopic surgical procedures; two of these patients required concurrent endoscopic sinus surgery. A micro-debrider was used in three cases; electrocautery in three cases, while a high-speed drilling was employed in two cases. Presence of fluorescein was identified around the patients' nares; on the chest wipe and instrument tray in all four patients. Dye contamination was noted on the gauze placed over the smoke evacuator (two cases of skull base surgery); no fluid droplets were identified beyond the nares or the smoke evacuator (two cases of sinus surgery). However, fluid contamination was identified underneath barrier several centimetres away from the nares (one case of trans-sphenoidal surgery). Droplets were also identified on the surgeon's gown in the abdominal region in all cases and on the arm region in one case. In one case, droplets were also identified on the abdominal region of the nurse, but this was attributed to cross contamination from surgical gauze and instruments. Conclusions This retrospective study provides preliminary data on aerosol and droplet contamination during endonasal and transoral surgery performed under a negative pressure isolation drape system. Although the authors did not screen patients for SARS-CoV-2, they propose smoke evacuator ULPA filter attachment is appropriate to capture particles down to 0.1 microns including SARS-CoV-2 which is 0.125 microns. It would be helpful to see direct evidence to support this claim in future studies. The authors have not provided details regarding set-up time and training requirements for effective application of the isolation drape apparatus or the associated costs etc. It would have also been helpful if the authors could comment on any potential difficulties in undertaking the surgical procedure with the isolation system in place. The sample size is limited to four patients and variations in the magnitude and extent of aerosol contamination needs to be investigated further before drawing any conclusions. Although unlikely, this study design did not capture the presence of aerosol/droplets in the air within the operating room which may follow removal of the isolation drape system or from exposed surgical instruments. Notwithstanding the limitations of the design, negative-pressure aspiration of air under a chamber barrier is likely to minimise the contamination from aerosol and droplet during endonasal and transoral surgery.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32591652
DOI: 10.1038/s41432-020-0088-4

3. Al-Moraissi EA, Abood MM, Alasseri NA, et al. Is Standard Personal Protective Equipment Effective Enough To Prevent COVID-19 Transmission During Aerosol Generating Dental, Oral and Maxillofacial Procedures ? A Systematic Review. medRxiv. 2020:2020.11.20.20235333. DOI: 10.1101/2020.11.20.20235333
ABSTRACT: A systematic review was performed to answer the following questions: 1) Do dental, oral and maxillofacial (OMF) surgical procedures generate bioaerosols (and if so, which ones), which can result in transmission of COVID-19?; 2) Are aerosolized airborne droplets (and to which extent is splatter) in dental and OMF procedures infective?; 3) Is enhanced personal protective equipment (PPE) an essential to prevent spreading of COVID-19 during dental and OMF aerosol generating procedures (AGPs)? Authors performed a systematic review to retrieve all pertinent literature that assessed effectiveness of surgical mask vs respirators for protecting dental health care workers during dental and OMF AGPs surgical procedures. Additionally, studies which assessed potential aerosolization during dental, OMF and orthopaedic surgeries were retrieved. There is moderate evidence showing that ultrasonic scaling and bone drilling using high speed rotary instruments produces respirable aerosols. Additionally, there is very weak/inconclusive evidence to support the creation of infectious aerosols during dental procedures. According to available very weak/inconclusive evidence, transmission of SARS-CoV-2 via infective aerosol during AGPS, so far, must remain speculative and controversial. As, however, this is a probable opportunistic way of transmission which at least cannot be sufficiently excluded and therefore should not be dismissed out of hand prematurely, proper and equally important properly applied protective equipment (i.e., N95 respirators or FFP-2 masksv or above regarding mouth and nose protection) should always be used during AGPs.Competing Interest StatementThe authors have declared no competing

interest.Clinical TrialCRD42020192912Clinical Protocols https://www.crd.york.ac.uk/prospero/#recordDetails Funding StatementnoneAuthor DeclarationsI confirm all relevant ethical guidelines have been followed, and any necessary IRB and/or ethics committee approvals have been obtained.YesThe details of the IRB/oversight body that provided approval or exemption for the research described are given below:it systematic review (not required)All necessary patient/participant consent has been obtained and the appropriate institutional forms have been archived.YesI understand that all clinical trials and any other prospective interventional studies must be registered with an ICMJE-approved registry, such as ClinicalTrials.gov. I confirm that any such study reported in the manuscript has been registered and the trial registration ID is provided (note: if posting a prospective study registered retrospectively, please provide a statement in the trial ID field explaining why the study was not registered in advance).YesI have followed all appropriate research reporting guidelines and uploaded the relevant EQUATOR Network research reporting checklist(s) and other pertinent material as supplementary files, if applicable.Yesits systematic review, not required
URL: http://medrxiv.org/content/early/2020/11/23/2020.11.20.20235333.abstract
DOI: 10.1101/2020.11.20.20235333

4. Ari A. Promoting Safe and Effective Use of Aerosol Devices in Covid-19:Risks and Suggestions for Viral Transmission. Expert Opinion on Drug Delivery. 2020;17(11):1509-13.
URL: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexc&AN=2006123427

5. Asadi S, Bouvier N, Wexler AS, et al. The coronavirus pandemic and aerosols: Does COVID-19 transmit via expiratory particles? Aerosol Science and Technology. 2020;54(6):635-8.
URL: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=2004590142

6. Ashinyo ME, Dubik SD, Duti V, et al. Healthcare Workers Exposure Risk Assessment: A Survey among Frontline Workers in Designated COVID-19 Treatment Centers in Ghana. J Prim Care Community Health. 2020;11:2150132720969483. DOI: 10.1177/2150132720969483
ABSTRACT: BACKGROUND: Healthcare workers (HCWs) are faced with an elevated risk of exposure to SARS-COV-2 due to the clinical procedures they perform on COVID-19 patients. However, data for frontline HCWs level of exposure and risk of COVID-19 virus infection are limited. OBJECTIVE: We investigated the level of exposure and risk of COVID-19 virus infection among HCWs in COVID-19 treatment centers in Ghana. METHODS: A cross-sectional study was utilized in this study and HCWs were invited by convenience to participate in the study, 408 HCWs in 4 COVID-19 treatment centers participated in the study. Adherence to infection prevention and control (IPC) measures were used to categorized HCWs as low or high risk of COVID-19 virus infection. The WHO COVID-19 risk assessment tool was used to collect quantitative data from the study participants. RESULTS: There was a high (N = 328, 80.4%) level of occupational exposure to the COVID-19 virus. However, only 14.0% of the exposed HCWs were at high risk of COVID-19 virus infection. Healthcare workers who performed or were present during any aerosol-generating procedures (AGP) were 23.8 times more likely to be exposed compared to HCWs who did not perform or were absent during any AGP (AOR 23.83; 95% CI: 18.45, 39.20). High risk of COVID-19 virus infection was less likely among registered nurses (AOR = 0.09; 95% CI: 0.02, 0.60), HCWs who performed or were present during any AGP (AOR = 0.05; 95% CI: 0.01, 0.50) and HCWs with a master's degree qualification (AOR 0.06; 95% CI: 0.01, 0.63). CONCLUSION: Despite the high level of exposure to the COVID-19 virus among HCWs in the treatment centers, only 14.0% were at high risk of COVID-19 virus infection. To protect this group of HCWs, treatment centers and HCWs should continue to adhere to WHO and national IPC protocols in managing of COVID-19 cases.
URL: https://www.ncbi.nlm.nih.gov/pubmed/33213266
DOI: 10.1177/2150132720969483

7. Azim A. Protecting Healthcare Workers against Covid-19 during Aerosol Generating Medical Procedures (Agmps) in Icus. EC Nursing and Healthcare. 2020;2:33-45.

ABSTRACT: COVID-19 has emerged as a major healthcare crisis across the globe. The problem has been further amplified by nosocomial transmission of infection among healthcare workers especially those involved in care of sick patients. Among the various interventions
done by healthcare workers, aerosol generating medical procedures form a special group of high risk procedures. Current article
highlights the measures to be taken in order to control spread of infection while performing these procedures. These measures can be
classified general measures (administrative control, engineering control, personal control) as well additional measures (barrier precautions and measures specific to different procedures).More research is needed in this field to establish hierarchy of risk involved
with different aerosol generating medical procedures, most efficient strategies of infection prevention
URL:
https://www.researchgate.net/profile/Armin_Ahmed2/publication/344546240_Protecting_healthcare_Workers_against_Covid-19_during_Aerosol_Generating_Medical_Procedures_Agmps_in_ICUs/links/5f86ab8592851c14bcc6a8bd/Protecting-healthcare-Workers-against-Covid-19-during-Aerosol-Generating-Medical-Procedures-Agmps-in-ICUs.pdf

8. Banik RK, Ulrich A. Evidence of Short-Range Aerosol Transmission of SARS-CoV-2 and Call for Universal Airborne Precautions for Anesthesiologists During the COVID-19 Pandemic. Anesth Analg. 2020;131(2):e102-e4. DOI: 10.1213/ANE.0000000000004933
URL: https://www.ncbi.nlm.nih.gov/pubmed/32355051
DOI: 10.1213/ANE.0000000000004933

9. Bertroche JT, Pipkorn P, Zolkind P, et al. Negative-Pressure Aerosol Cover for COVID-19 Tracheostomy. JAMA Otolaryngol Head Neck Surg. 2020;146(7):672-4. DOI: 10.1001/jamaoto.2020.1081
URL: https://www.ncbi.nlm.nih.gov/pubmed/32343299
DOI: 10.1001/jamaoto.2020.1081

10. Bianco F, Incollingo P, Grossi U, et al. Preventing transmission among operating room staff during COVID-19 pandemic: the role of the Aerosol Box and other personal protective equipment. Updates Surg. 2020;72(3):907-10. DOI: 10.1007/s13304-020-00818-2
ABSTRACT: The COVID-19 pandemic is highly challenging for the operating room staff and healthcare workers in emergency departments. SARS-CoV-2 is a positive-sense single-stranded RNA beta-coronavirus that primarily targets the human respiratory system, with fever, cough, myalgia, and pneumonia as the most common manifestations. However, since SARS-CoV-2 RNA was detected in stool specimens much more attention has been paid to gastrointestinal symptoms such as loss of appetite, nausea, and diarrhea. Furthermore, the expression of ACE-2 receptors in absorptive enterocytes from ileum and colon suggests that these organs should also be considered as a potential high risk for SARS-CoV-2 infection. During aerosol-generating medical procedures (AGMP; e.g. intubating and extubating patients or any surgical procedures), the production of both airborne particles and droplets may increase the risk of infection. In this situation, the surgical staff is strongly recommended to wear personal protective equipment (PPE). A transparent plastic cube, the so-called "Aerosol Box" (AB), has been recently designed to lend further protection against droplets and aerosol exposure during the AGMP.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32449034
DOI: 10.1007/s13304-020-00818-2

11. Bidkar P, Goneppanavar U, Kaur J, et al. Safety tent for enhanced personal protection from aerosol-generating procedures while handling the COVID-19 patient airway. J Anaesthesiol Clin Pharmacol. 2020;36(Suppl 1):S157-S60. DOI: 10.4103/joacp.JOACP_211_20

ABSTRACT: The world is going through the COVID-19 pandemic, which has high virulence and transmission rate. More significant the viral load during exposure, the greater is the likelihood of contracting a severe disease. Healthcare workers (HCWs) involved in airway care of COVID-19 patients are at high risk of getting exposed to large viral loads during aerosol-generating actions such as coughing or sneezing by the patient or during procedures such as bag-mask ventilation, intubation, extubation, and nebulization. This viral load exposure to airway caregivers decreases considerably with the use of an aerosol box during intubation. The safety tent proposed in this article is useful in limiting the viral load that HCWs are exposed to during airway procedures. Its role can be expanded beyond just intubation to protect against all aerosol-generating actions and procedures involving the patient's airway.
URL: https://www.ncbi.nlm.nih.gov/pubmed/33100673
DOI: 10.4103/joacp.JOACP_211_20

12. Bolton L, Mills C, Wallace S, et al. Aerosol generating procedures, dysphagia assessment and COVID-19: A rapid review. Int J Lang Commun Disord. 2020;55(4):629-36. DOI: 10.1111/1460-6984.12544
URL: https://www.ncbi.nlm.nih.gov/pubmed/32478950
DOI: 10.1111/1460-6984.12544

13. Brown J, Gregson FKA, Shrimpton A, et al. A quantitative evaluation of aerosol generation during tracheal intubation and extubation. Anaesthesia. 2020;06:06. DOI: 10.1111/anae.15292
ABSTRACT: The potential aerosolised transmission of severe acute respiratory syndrome coronavirus-2 is of global concern. Airborne precaution personal protective equipment and preventative measures are universally mandated for medical procedures deemed to be aerosol generating. The implementation of these measures is having a huge impact on healthcare provision. There is currently a lack of quantitative evidence on the number and size of airborne particles produced during aerosol-generating procedures to inform risk assessments. To address this evidence gap, we conducted real-time, high-resolution environmental monitoring in ultraclean ventilation operating theatres during tracheal intubation and extubation sequences. Continuous sampling with an optical particle sizer allowed characterisation of aerosol generation within the zone between the patient and anaesthetist. Aerosol monitoring showed a very low background particle count (0.4 particles. l(-1)) allowing resolution of transient increases in airborne particles associated with airway management. As a positive reference control, we quantitated the aerosol produced in the same setting by a volitional cough (average concentration, 732 (418) particles.l(-1) , n = 38). Tracheal intubation including facemask ventilation produced very low quantities of aerosolised particles (average concentration, 1.4 (1.4) particles.l(-1) , n = 14, $p < 0.0001$ vs. cough). Tracheal extubation, particularly when the patient coughed, produced a detectable aerosol (21 (18) l(-1) , n = 10) which was 15-fold greater than intubation ($p = 0.0004$) but 35-fold less than a volitional cough ($p < 0.0001$). The study does not support the designation of elective tracheal intubation as an aerosol-generating procedure. Extubation generates more detectable aerosol than intubation but falls below the current criterion for designation as a high-risk aerosol-generating procedure. These novel findings from real-time aerosol detection in a routine healthcare setting provide a quantitative methodology for risk assessment that can be extended to other airway management techniques and clinical settings. They also indicate the need for reappraisal of what constitutes an aerosol-generating procedure and the associated precautions for routine anaesthetic airway management.
URL: https://www.ncbi.nlm.nih.gov/pubmed/33022093
DOI: 10.1111/anae.15292

14. Bryant J, Tobias JD. Enclosure with augmented airflow to decrease risk of exposure to aerosolized pathogens including coronavirus during endotracheal intubation. Can the reduction in aerosolized particles be quantified? Paediatr Anaesth. 2020;30(8):900-4. DOI: 10.1111/pan.13934
ABSTRACT: INTRODUCTION: As the pandemic of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 or COVID-19) has impacted hospital routines in recent weeks, recommendations to reduce healthcare worker

infections are being developed. METHODS: We report preliminary experience with the efficacy of an enclosure with augmented airflow to decrease the risk of exposure to aerosolized pathogens during airway management including endotracheal intubation. A particle generator was used to test the efficacy of the reduction of aerosolized particles by measuring their concentration within the enclosure and in the environment. RESULTS: No reduction in the concentration of aerosolized particles was noted with the enclosure flap open, whether the interior suction was on or off. However, with the enclosure closed and no augmented airflow (suction off), the particle concentration decreased to 1.2% of baseline. The concentration decreased even further, to 0.8% of baseline with the enclosure closed with augmented airflow (suction on). DISCUSSION: Aerosolized particulate contamination in the operating room can be decreased using a clear plastic enclosure with minimal openings and augmented airflow. This may serve to decrease the exposure of healthcare providers to aerosolized pathogens.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32464695
DOI: 10.1111/pan.13934

15. Burton MJ, Clarkson JE, Goulao B, et al. Antimicrobial mouthwashes (gargling) and nasal sprays to protect healthcare workers when undertaking aerosol-generating procedures (AGPs) on patients without suspected or confirmed COVID-19 infection. Cochrane Database Syst Rev. 2020;9:CD013628. DOI: 10.1002/14651858.CD013628.pub2
ABSTRACT: BACKGROUND: COVID-19 infection poses a serious risk to patients and - due to its contagious nature - to those healthcare workers (HCWs) treating them. The risks of transmission of infection are greater when a patient is undergoing an aerosol-generating procedure (AGP). Not all those with COVID-19 infection are symptomatic, or suspected of harbouring the infection. If a patient who is not known to have or suspected of having COVID-19 infection is to undergo an AGP, it would nonetheless be sensible to minimise the risk to those HCWs treating them. If the mouth and nose of an individual undergoing an AGP are irrigated with antimicrobial solutions, this may be a simple and safe method of reducing the risk of any covert infection being passed to HCWs through droplet transmission or direct contact. Alternatively, the use of antimicrobial solutions by the HCW may decrease the chance of them acquiring COVID-19 infection. However, the use of such antimicrobial solutions may be associated with harms related to the toxicity of the solutions themselves or alterations in the natural microbial flora of the mouth or nose. OBJECTIVES: To assess the benefits and harms of antimicrobial mouthwashes and nasal sprays administered to HCWs and/or patients when undertaking AGPs on patients without suspected or confirmed COVID-19 infection. SEARCH METHODS: Information Specialists from Cochrane ENT and Cochrane Oral Health searched the Central Register of Controlled Trials (CENTRAL 2020, Issue 6); Ovid MEDLINE; Ovid Embase and additional sources for published and unpublished trials. The date of the search was 1 June 2020. SELECTION CRITERIA: This is a question that urgently requires evidence, however at the present time we did not anticipate finding many completed RCTs. We therefore planned to include the following types of studies: randomised controlled trials (RCTs); quasi-RCTs; non-randomised controlled trials; prospective cohort studies; retrospective cohort studies; cross-sectional studies; controlled before-and-after studies. We set no minimum duration for the studies. We sought studies comparing any antimicrobial mouthwash and/or nasal spray (alone or in combination) at any concentration, delivered to the patient or HCW before and/or after an AGP. DATA COLLECTION AND ANALYSIS: We used standard Cochrane methodological procedures. Our primary outcomes were: 1) incidence of symptomatic or test-positive COVID-19 infection in HCWs or patients; 2) significant adverse event: anosmia (or disturbance in sense of smell). Our secondary outcomes were: 3) COVID-19 viral content of aerosol (when present); 4) change in COVID-19 viral load at site(s) of irrigation; 5) other adverse events: changes in microbiome in oral cavity, nasal cavity, oro- or nasopharynx; 6) other adverse events: allergy, irritation/burning of nasal, oral or oropharyngeal mucosa (e.g. erosions, ulcers, bleeding), long-term staining of mucous membranes or teeth, accidental ingestion. We planned to use GRADE to assess the certainty of the evidence for each outcome. MAIN RESULTS: We found no completed studies to include in this review. AUTHORS' CONCLUSIONS: We identified no studies for inclusion in this review, nor any ongoing studies. The

absence of completed studies is not surprising given the relatively recent emergence of COVID-19 infection. However, we are disappointed that this important clinical question is not being addressed by ongoing studies.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32936947
DOI: 10.1002/14651858.CD013628.pub2

16. Chanpong B, Tang M, Rosenczweig A, et al. Aerosol-Generating Procedures and Simulated Cough in Dental Anesthesia. Anesth Prog. 2020;67(3):127-34. DOI: 10.2344/anpr-67-03-04
ABSTRACT: Dental professionals are at an increased risk for exposure to the severe acute respiratory syndrome coronavirus 2 with aerosol-generating procedures (AGPs), and dental anesthesia practices have additional risks due to airway management procedures. The purpose of this pilot study was to examine the extent of splatter on dental personnel that may occur with AGPs and coughing in a dental anesthesia practice. A Dentoform model was fitted into a dental mannequin and coated with Glo Germ to detect splatter during simulated dental AGPs produced with use of a high-speed handpiece, an ultrasonic scaler, and an air-water syringe, all in conjunction with high-volume suction. A simulated cough was also created using a ventilator programmed to expel Glo Germ within the velocity and volume parameters of a natural cough with dental personnel in their customary positions. A UV light was used after each procedure to systematically evaluate the deposition of Glo Germ splatter on each person. After AGPs were performed, splatter was noted on the face, body, arms, and legs of the dentist and dental assistant. The simulated cough produced more extensive splatter than AGPs; additional Glo Germ was seen on the shoes, the crown of the head, and the back of the dental personnel. Therefore, it is recommended that full personal protective equipment consistent with AGPs be used and changed between patients to reduce the risk of contamination and infection for dental personnel and patients.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32556161
DOI: 10.2344/anpr-67-03-04

17. Chari DA, Workman AD, Chen JX, et al. Aerosol Dispersion During Mastoidectomy and Custom Mitigation Strategies for Otologic Surgery in the COVID-19 Era. Otolaryngol Head Neck Surg. 2020:194599820941835. DOI: 10.1177/0194599820941835
ABSTRACT: OBJECTIVE: To investigate small-particle aerosolization from mastoidectomy relevant to potential viral transmission and to test source-control mitigation strategies. STUDY DESIGN: Cadaveric simulation. SETTING: Surgical simulation laboratory. METHODS: An optical particle size spectrometer was used to quantify 1- to 10-microm aerosols 30 cm from mastoid cortex drilling. Two barrier drapes were evaluated: OtoTent1, a drape sheet affixed to the microscope; OtoTent2, a custom-structured drape that enclosed the surgical field with specialized ports. RESULTS: Mastoid drilling without a barrier drape, with or without an aerosol-scavenging second suction, generated large amounts of 1- to 10-microm particulate. Drilling under OtoTent1 generated a high density of particles when compared with baseline environmental levels ($P < .001$, $U = 107$). By contrast, when drilling was conducted under OtoTent2, mean particle density remained at baseline. Adding a second suction inside OtoTent1 or OtoTent2 kept particle density at baseline levels. Significant aerosols were released upon removal of OtoTent1 or OtoTent2 despite a 60-second pause before drape removal after drilling ($P < .001$, $U = 0$, $n = 10, 12$; $P < .001$, $U = 2$, $n = 12, 12$, respectively). However, particle density did not increase above baseline when a second suction and a pause before removal were both employed. CONCLUSIONS: Mastoidectomy without a barrier, even when a second suction was added, generated substantial 1- to 10-microm aerosols. During drilling, large amounts of aerosols above baseline levels were detected with OtoTent1 but not OtoTent2. For both drapes, a second suction was an effective mitigation strategy during drilling. Last, the combination of a second suction and a pause before removal prevented aerosol escape during the removal of either drape.
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ABSTRACT: BACKGROUND: COVID-19 has become a global pandemic with a dramatic impact on healthcare systems. Concern for viral transmission necessitates the investigation of otologic procedures that use high-speed drilling instruments, including mastoidectomy, which we hypothesized to be an aerosol-generating procedure. METHODS: Mastoidectomy with a high-speed drill was simulated using fresh-frozen cadaveric heads with fluorescein solution injected into the mastoid air cells. Specimens were drilled for 1-minute durations in test conditions with and without a microscope. A barrier drape was fashioned from a commercially available drape (the OtoTent). Dispersed particulate matter was quantified in segments of an octagonal test grid measuring 60 cm in radius. RESULTS: Drilling without a microscope dispersed fluorescent particles 360 degrees, with the areas of highest density in quadrants near the surgeon and close to the surgical site. Using a microscope or varying irrigation rates did not significantly reduce particle density or percent surface area with particulate. Using the OtoTent significantly reduced particle density and percent surface area with particulate across the segments of the test grid beyond 30 cm (which marked the boundary of the OtoTent) compared with the microscope only and no microscope test conditions (Kruskall-Wallis test, p = 0.0066). CONCLUSIONS: Mastoidectomy with a high-speed drill is an aerosol-generating procedure, a designation that connotes the potential high risk of viral transmission and need for higher levels of personal protective equipment. A simple barrier drape significantly reduced particulate dispersion in this study and could be an effective mitigation strategy in addition to appropriate personal protective equipment.

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ABSTRACT: A key consideration in the Covid-19 pandemic is the dominant modes of transmission of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus. The objective of this review was to synthesise the evidence for the potential airborne transmission of SARS-CoV-2 via aerosols. Systematic literature searches were conducted in PubMed, Embase, Europe PMC and National Health Service UK evidence up to 27 July 2020. A protocol was published and Cochrane guidance for rapid review methodology was adhered to throughout. Twenty-eight studies were identified. Seven out of eight epidemiological studies suggest aerosol transmission may occur, with enclosed environments and poor ventilation noted as possible contextual factors. Ten of the 16 air sampling studies detected SARS-CoV-2 ribonucleic acid; however, only three of these studies attempted to culture the virus with one being successful in a limited number of samples. Two of four virological studies using artificially generated aerosols indicated that SARS-CoV-2 is viable in aerosols. The results of this review indicate there is inconclusive evidence regarding the viability and infectivity of SARS-CoV-2 in aerosols. Epidemiological studies suggest possible transmission, with contextual factors noted. Viral particles have been detected in air sampling studies with some evidence of clinical infectivity, and virological studies indicate these particles may represent live virus, adding further plausibility. However, there is uncertainty as to the nature and impact of aerosol transmission of SARS-CoV-2, and its relative contribution to the Covid-19 pandemic compared with other modes of transmission.

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ABSTRACT: Background: The current global COVID-19 pandemic is caused by the novel coronavirus Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2). Given that SARS-CoV-2 is highly transmissible, surgical societies have recommended that procedures with a high risk of aerosolization be avoided or delayed. However,

some high-risk procedures, such as those related to head and neck malignancies, cannot always be delayed. Care must be taken during aerosol-generating procedures to minimize viral transmission as much as possible. Preoperative testing for COVID-19, limited operating room personnel, adequate personal protective equipment, and surgical technique are factors to consider for high-risk procedures. Methods: This article presents the case of an awake tracheotomy performed for a transglottic mass causing airway obstruction. Results: With detailed planning and specific techniques, the amount of aerosolization was reduced, and the procedure was performed as safely as possible. Conclusion: This case provides a template for future aerosol-generating procedures during respiratory pandemics.
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ABSTRACT: The American College of Radiology recommends minimizing Magnetic Resonance Imaging (MRI) in COVID-19 patients, postponing non-urgent exams, and using alternative imaging.1 Sedation/anesthesia are aerosol generating procedures (AGP) due to requirement of bag-mask ventilation, intubation, and extubation with consequent risk of exposure to healthcare workers. This is complicated by limitation in the use of personal protective equipment (PPE) in the magnet zone (Zone IV).We describe our experience for children requiring anesthesia for emergency MRI during the COVID-19 outbreak in Philadelphia. Copyright This article is protected by copyright. All rights reserved.
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ABSTRACT: The COVID-19 pandemic resulted in severe limitation and closure of dental practices in many countries. Outside of the acute (peak) phases of the disease, dentistry has begun to be practised again. However, there is emerging evidence that SARS-CoV-2 can be transmitted via airborne routes, carrying implications for dental procedures that produce aerosol. At the time of writing, additional precautions are required when a procedure considered to generate aerosol is undertaken.This paper aims to present evidence-based treatments that remove or reduce the generation of aerosols during the management of carious lesions. It maps aerosol generating procedures (AGPs), where possible, to alternative non-AGPs or low AGPs. This risk reduction approach overcomes the less favourable outcomes associated with temporary solutions or extraction-only approaches. Even if this risk reduction approach for aerosol generation becomes unnecessary in the future, these procedures are not only suitable but desirable for use as part of general dental care post-COVID-19.
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ABSTRACT: The growing fear of virus transmission during the 2019 coronavirus disease (COVID-19) pandemic has called for many scientists to look into the various vehicles of infection, including the potential to travel through aerosols. Few have looked into the issue that gastrointestinal (GI) procedures may produce an abundance of aerosols. The current process of risk management for clinics is to follow a clinic-specific HVAC formula, which is typically calculated once a year and assumes perfect mixing of the air within the space, to determine how many minutes each procedural room refreshes 99% of its air between procedures when doors are closed. This formula is not designed to fit the complex dynamic of small airborne particle transport and deposition that can potentially carry the virus in clinical conditions. It results in reduced procedure throughput

as well as an excess of idle time in clinics that process a large number of short procedures such as outpatient GI centers. We present and tested a new cyber-physical system that continuously monitors airborne particle counts in procedural rooms and also at the same time automatically monitors the procedural rooms' state and flexible endoscope status without interfering with the clinic's workflow. We use our data gathered from over 1500 GI cases in one clinical suite to understand the correlation between air quality and standard procedure types as well as identify the risks involved with any HVAC system in a clinical suite environment. Thanks to this system, we demonstrate that standard GI procedures generate large quantities of aerosols, which can potentially promote viral airborne transmission among patients and healthcare staff. We provide a solution for the clinic to improve procedure turnover times and throughput, as well as to mitigate the risk of airborne transmission of the virus.
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rapidly evolving. During the initial pandemic stages, limiting dental practice and minimizing aerosol-generating procedures was critical, but as the current pandemic evolves, it has highlighted our understanding of potential modes of airobone disease transmission in the dental office and effective methods to mitigate such risks. Going forward, dental health-care providers should be aware of invisible risks within their operatories and stay abreast of evolving infection prevention protocols before, during, and after patient care. This course seeks to review up-to-date infection control recommendations and emerging evidence for ongoing infection control when delivering dental care, particularly in relation to the COVID-19 pandemic.
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that there is at least opportunistic airborne transmission. In order to protect healthcare staff adequately it is necessary that we establish whether aerosol-generating procedures (AGPs) increase the risk of transmission of SARS-CoV-2. Where we do not have evidence relating to SARS-CoV-2, guidelines for safely conducting these procedures should consider the risk of transmitting related pathogens. Currently there is very little evidence detailing the transmission of SARS-CoV-2 associated with any specific procedures. Regarding AGPs and respiratory pathogens in general, there is still a large knowledge gap that will leave clinicians unsure of the risk to themselves when offering these procedures. This review aimed to summarize the evidence (and gaps in evidence) around AGPs and SARS-CoV-2.
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ABSTRACT: BACKGROUND: COVID-19 has caused an unprecedented pandemic and medical emergency that has changed routine care pathways. This article discusses the extent of aerosolisation of severe acute respiratory syndrome coronavirus 2, the virus that causes COVID-19, as a result of oesophagogastroduodenoscopy and colonoscopy. METHOD(S): PubMed and Google Scholar were searched for relevant publications, using the terms COVID-19 aerosolisation, COVID-19 infection, COVID-19 transmission, COVID-19 pandemic, COVID-19 and endoscopy, Endoscopy for COVID-19 patients. RESULT(S): A total of 3745 articles were identified, 26 of which were selected to answer the question of the extent of SARS-CoV-2 aerosolisation during upper and lower gastrointestinal endoscopy. All studies suggested high infectivity from contact and droplet spread. No clinical study has yet reported the viral load in the aerosol and therefore the infective dose has not been accurately determined. However, aerosol-generating procedures are potentially risky and full personal protective equipment should be used. CONCLUSION(S): As it is a highly infectious disease, clinicians treating patients with COVID-19 require effective personal protective equipment. The main routes of infection are direct contact and droplets in the air and on surfaces. Aerosolisation carries a substantial risk of infection, so any aerosol-producing procedure, such as endoscopy, should be performed wearing personal protective equipment and with extra caution to protect the endoscopist, staff and patients from cross-infection via the respiratory system.

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understood. This review paper intends to outline the literature concerning the transmission of virus-laden droplets and aerosols in different environmental settings and demonstrates the behavior of droplets and aerosols resulted from a cough-jet of an infected person in various confined spaces. The case studies that have come out in different countries have, with prima facie evidence, manifested that the airborne transmission plays a profound role in contracting susceptible hosts. The infection propensities in confined spaces (airplane, passenger car, and healthcare center) by the transmission of droplets and aerosols under varying ventilation conditions were discussed. Interestingly, the nosocomial transmission by airborne SARS-CoV-2 virus-laden aerosols in healthcare facilities may be plausible. Hence, clearly defined, science-based administrative, clinical, and physical measures are of paramount importance to eradicate the COVID-19 pandemic from the world.
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ABSTRACT: PURPOSE: To quantify the atomization of liquid over the cornea during flap creation using microkeratome using high-speed shadowgraphy. SETTING: Laboratory study. DESIGN: Laboratory investigational study. METHOD: In an experimental setup, flap creation was performed on enucleated goat's eyes (n = 8) mounted on a stand using One Use-Plus SBK Moria microkeratome (Moria SA) to assess the spread of aerosols and droplets using high-speed shadowgraphy. Two conditions were computed. A constant airflow assumed uniform air velocity throughout the room. A decaying jet assumed that local air velocity at the site of measurements was smaller than the exit velocity from the air duct. RESULTS: With the advancement of the microkeratome across the wet corneal surface, the atomization of a balanced salt solution was recorded on shadowgraphy. The minimum droplet size was approximately 90 mum. The maximum distance traversed was approximately 1.8 m and approximately 1.3 m assuming a constant airflow (setting of refractive surgery theater) and decaying jet condition (setting of an operating theater with air-handling unit), respectively. CONCLUSIONS: The microkeratome-assisted LASIK flap creation seemed to cause spread of droplets. The droplet diameters and velocities did not permit the formation of aerosols. Therefore, the risk of transmission of the virus to the surgeon and surgical personnel due to the microkeratome procedure seemed to be low.
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DOI: 10.1097/j.jcrs.0000000000000326

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ABSTRACT: OBJECTIVES: This study aimed to identify escape of small-particle aerosols from a variety of masks using simulated breathing conditions. This study also aimed to evaluate the efficacy of a negative-pressure environment around the face in preventing the escape of small aerosolized particles. STUDY DESIGN: This study is an evaluation study with specific methodology described below. SETTING: This study was performed in our institution's fresh tissue laboratory. SUBJECTS AND METHODS: A fixed cadaver head was placed in a controlled environment with a black background, and small-particle aerosols were created using joss incense sticks (mass-median aerosol diameter of 0.28 micro). Smoke was passed through the cadaver head, and images were taken with a high-resolution camera in a standardized manner. Digital image processing was used to calculate relative amounts of small-particle escape from a variety of masks, including a standard surgical mask, a modified Ambu mask, and our negative airway pressure respirator (NAPR). RESULTS: Significant amounts of aerosolized particles escaped during the trials with no mask, a standard surgical mask, and the NAPR without suction. When suction was applied to the NAPR, creating a negative-pressure system, no particle escape was noted. CONCLUSION: We present a new and effective method for the study of small-particle aerosols as a step toward better understanding the spread of these particles and the transmission of coronavirus disease 2019. We also present the concept of an NAPR to better protect health care workers from aerosols generated from the upper and lower airways.
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ABSTRACT: The coronavirus disease-2019 (COVID-19) pandemic has heightened the awareness of aerosol generation by human expiratory events and their potential role in viral respiratory disease transmission. Concerns over high severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) viral burden of mucosal surfaces has raised questions about the aerosol-generating potential and dangers of many otorhinolaryngologic procedures. However, the risks of aerosol generation and associated viral transmission by droplet or airborne routes for many otorhinolaryngology procedures are largely unknown. Indoor aerosol and droplet viral respiratory transmission risk is influenced by 4 factors: (1) aerosol or droplet properties; (2) indoor airflow; (3) virus-specific factors; and (4) host-specific factors. Herein we elaborate on known aerosol vs droplet properties, indoor airflow, and aerosol-generating events to provide context for risks of aerosol infectious transmission. We also provide simple but typically effective measures for mitigating the spread and inhalation of viral aerosols in indoor settings. Understanding principles of infectious transmission, aerosol and droplet generation, as well as concepts of indoor airflow, will assist in the integration of new data on SARS-CoV-2 transmission and activities that can generate aerosol to best inform on the need for escalation or de-escalation from current societal and institutional guidelines for protection during aerosol-generating procedures.
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ABSTRACT: Based on available evidence, the COVID-19 virus is thought to spread through close contact and droplet transmission. However, some have debated that it could be airborne. Airborne transmission occurs when particles of less than 0.5 mum within droplets spread through exhaled air via a process called aerosolisation. These particles can remain in the air for long periods and can disseminate over distances further than 1 meter. In the context of COVID-19, airborne particles can occur during certain aerosolised-generating-

procedures (AGP). WHO underlines the use of N95 respirators or equivalent as part of personal protective equipment (PPE) for healthcare workers (HCW) managing COVID-19 positive patients when aerosolised-generating-procedures (AGP) are being conducted.This retrospective observational study describes the result of COVID-19 reverse transcriptase polymerase chain reaction (RT-PCR) in health care workers (HCW) wearing different form of personal protective equipment (PPE) who had had close contact with a confirmed COVID-19 patient during performing such procedures. All HCWs were quarantined for 14 days after the exposure. COVID-19 RT-PCR nasopharyngeal swabs were performed at different intervals. Little is known about the effectiveness of different types of personal protective equipment (PPE) for preventing SARS-CoV-2 in HCWs. We describe the clinical outcome of HCWs exposed to sudden acute respiratory infection patient before the diagnosis of COVID-19 was known. Copyright © The Society for Healthcare Epidemiology of America 2020.
URL: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=633049614

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DOI: 10.1038/s41433-020-1000-3

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DOI: 10.3205/dgkh000342

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ABSTRACT: The importance of this intubation box has come to light recently in view of the coronavirus disease-2019 (COVID-19) pandemic and the fact that intubation is an aerosol-generating procedure (AGP). Risks of the healthcare worker attending to the airway of COVID-19 patients is high and the intubation box aims to minimize that and reduce contamination of the environment. To address this objective of decreasing transmission during AGP, we created a negative airflow aerosol box with a leak-proof airway handling system using readily available and affordable materials. The dimension of this box was 24 x 17.5 x 17.5 cm and it was made of high-quality 4 mm transparent acrylic sheet with two arm holes of 10 cm diameter. The caudal end of the negative airflow aerosol prevention box is wrapped with disposable plastic sheet and the both hand slots are sealed using camera cover and latex hand gloves and it decreases the risk of contamination. How to cite this article: Kumar N, Kumar A, Kumar A, Sinha C. Modified Negative Airflow Aerosol Prevention Box for COVID-19 Patients. Indian J Crit Care Med 2020;24(10):981-982.
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DOI: 10.1111/jocs.14728

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ABSTRACT: BACKGROUND: Many dental procedures produce aerosols (droplets, droplet nuclei and splatter) that harbour various pathogenic micro-organisms and may pose a risk for the spread of infections between dentist

and patient. The COVID-19 pandemic has led to greater concern about this risk. OBJECTIVES: To assess the effectiveness of methods used during dental treatment procedures to minimize aerosol production and reduce or neutralize contamination in aerosols. SEARCH METHODS: Cochrane Oral Health's Information Specialist searched the following databases on 17 September 2020: Cochrane Oral Health's Trials Register, the Cochrane Central Register of Controlled Trials (CENTRAL) (in the Cochrane Library, 2020, Issue 8), MEDLINE Ovid (from 1946); Embase Ovid (from 1980); the WHO COVID-19 Global literature on coronavirus disease; the US National Institutes of Health Trials Registry (ClinicalTrials.gov); and the Cochrane COVID-19 Study Register. We placed no restrictions on the language or date of publication. SELECTION CRITERIA: We included randomized controlled trials (RCTs) and controlled clinical trials (CCTs) on aerosol-generating procedures (AGPs) performed by dental healthcare providers that evaluated methods to reduce contaminated aerosols in dental clinics (excluding preprocedural mouthrinses). The primary outcomes were incidence of infection in dental staff or patients, and reduction in volume and level of contaminated aerosols in the operative environment. The secondary outcomes were cost, accessibility and feasibility. DATA COLLECTION AND ANALYSIS: Two review authors screened search results, extracted data from the included studies, assessed the risk of bias in the studies, and judged the certainty of the available evidence. We used mean differences (MDs) and 95% confidence intervals (CIs) as the effect estimate for continuous outcomes, and random-effects meta-analysis to combine data. We assessed heterogeneity. MAIN RESULTS: We included 16 studies with 425 participants aged 5 to 69 years. Eight studies had high risk of bias; eight had unclear risk of bias. No studies measured infection. All studies measured bacterial contamination using the surrogate outcome of colony-forming units (CFU). Two studies measured contamination per volume of air sampled at different distances from the patient's mouth, and 14 studies sampled particles on agar plates at specific distances from the patient's mouth. The results presented below should be interpreted with caution as the evidence is very low certainty due to heterogeneity, risk of bias, small sample sizes and wide confidence intervals. Moreover, we do not know the 'minimal clinically important difference' in CFU. High-volume evacuator Use of a high-volume evacuator (HVE) may reduce bacterial contamination in aerosols less than one foot (~ 30 cm) from a patient's mouth (MD -47.41, 95% CI -92.76 to -2.06; 3 RCTs, 122 participants (two studies had split-mouth design); very high heterogeneity I(2) = 95%), but not at longer distances (MD -1.00, -2.56 to 0.56; 1 RCT, 80 participants). One split-mouth RCT (six participants) found that HVE may not be more effective than conventional dental suction (saliva ejector or low-volume evacuator) at 40 cm (MD CFU -2.30, 95% CI -5.32 to 0.72) or 150 cm (MD -2.20, 95% CI -14.01 to 9.61). Dental isolation combination system One RCT (50 participants) found that there may be no difference in CFU between a combination system (Isolite) and a saliva ejector (low-volume evacuator) during AGPs (MD -0.31, 95% CI -0.82 to 0.20) or after AGPs (MD -0.35, -0.99 to 0.29). However, an 'n of 1' design study showed that the combination system may reduce CFU compared with rubber dam plus HVE (MD -125.20, 95% CI -174.02 to -76.38) or HVE (MD -109.30, 95% CI -153.01 to -65.59). Rubber dam One split-mouth RCT (10 participants) receiving dental treatment, found that there may be a reduction in CFU with rubber dam at one-metre (MD -16.20, 95% CI -19.36 to -13.04) and two-metre distance (MD -11.70, 95% CI -15.82 to -7.58). One RCT of 47 dental students found use of rubber dam may make no difference in CFU at the forehead (MD 0.98, 95% CI -0.73 to 2.70) and occipital region of the operator (MD 0.77, 95% CI -0.46 to 2.00). One split-mouth RCT (21 participants) found that rubber dam plus HVE may reduce CFU more than cotton roll plus HVE on the patient's chest (MD -251.00, 95% CI -267.95 to -234.05) and dental unit light (MD -12.70, 95% CI -12.85 to -12.55). Air cleaning systems One split-mouth CCT (two participants) used a local stand-alone air cleaning system (ACS), which may reduce aerosol contamination during cavity preparation (MD -66.70 CFU, 95% CI -120.15 to -13.25 per cubic metre) or ultrasonic scaling (MD -32.40, 95% CI - 51.55 to -13.25). Another CCT (50 participants) found that laminar flow in the dental clinic combined with a HEPA filter may reduce contamination approximately 76 cm from the floor (MD -483.56 CFU, 95% CI -550.02 to -417.10 per cubic feet per minute per patient) and 20 cm to 30 cm from the patient's mouth (MD -319.14 CFU, 95% CI - 385.60 to -252.68). Disinfectants antimicrobial coolants Two RCTs evaluated use of antimicrobial coolants during ultrasonic scaling. Compared with distilled water, coolant containing chlorhexidine (CHX), cinnamon extract coolant or povidone iodine may reduce CFU: CHX (MD -124.00, 95% CI -135.78 to -112.22; 20 participants), povidone iodine (MD -656.45, 95% CI -672.74 to -640.16; 40

participants), cinnamon (MD -644.55, 95% CI -668.70 to -620.40; 40 participants). CHX coolant may reduce CFU more than povidone iodine (MD -59.30, 95% CI -64.16 to -54.44; 20 participants), but not more than cinnamon extract (MD -11.90, 95% CI -35.88 to 12.08; 40 participants). AUTHORS' CONCLUSIONS: We found no studies that evaluated disease transmission via aerosols in a dental setting; and no evidence about viral contamination in aerosols. All of the included studies measured bacterial contamination using colony-forming units. There appeared to be some benefit from the interventions evaluated but the available evidence is very low certainty so we are unable to draw reliable conclusions. We did not find any studies on methods such as ventilation, ionization, ozonisation, UV light and fogging. Studies are needed that measure contamination in aerosols, size distribution of aerosols and infection transmission risk for respiratory diseases such as COVID-19 in dental patients and staff.
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DOI: 10.1002/14651858.CD013686.pub2

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ABSTRACT: BACKGROUND: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus responsible for Coronavirus disease 2019 (COVID-19) has a predilection for infecting the mucosa of the upper and lower airways. Otolaryngologists and supporting health care workers (HCWs) are particularly at high risk of becoming infected while treating patients as many in-office procedures and surgeries are Aerosol Generating Medical Procedures (AGMP). Based on a review of the literature and various guidelines, recommendations are made to mitigate the risk to health care workers of becoming infected with SARS-CoV-2 while providing clinical care. RECOMMENDATIONS: During the COVID-19 pandemic all elective and non-time sensitive Otolaryngology procedures should be deferred to mitigate the risk of transmission of infection to HCWs. For non-AGMPs in all patients, even COVID-19 positive patients Level 1 PPE (surgical mask, gown, gloves and face shield or goggles) is sufficient. If local prevalence is favourable and patients are asymptomatic and test negative for SARS-CoV-2, Level 1 PPE can be used during short duration AGMPs, with limited risk of infected aerosol spread. For AGMPs in patients who test positive for SARS-CoV-2 a minimum of Level 2 PPE, with adequate protection of mucosal surfaces, is recommended (N95/FFP2 respirator, gown, double gloves, goggles or face shield and head cover). For long duration AGMPs that are deemed high-risk in COVID-19 positive patients, Level 3 PPE can provide a higher level of protection and be more comfortable during long duration surgeries if surgical hoods or PAPRs are used. It is recommended that these procedures are performed in negative pressure rooms, if available. It is essential to follow strict donning and doffing protocols to minimize the risk of contamination. CONCLUSIONS: By following strict infection prevention recommendations, the risk of HCWs becoming infected with SARS-CoV-2 while treating patients can be minimized. As the COVID-19 pandemic evolves rapidly, these recommendations should serve as guidance and need to be interpreted based on local factors and availability of healthcare resources.
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ABSTRACT: The COVID-19 pandemic has affected the delivery of health services across the world. The World Health Organisation (WHO) declared the COVID-19 outbreak to be a global pandemic on 11th March 2020, prompting the closure of dental services worldwide. The main reason for this was the infection risk associated with Aerosol Generating Procedures (AGP), such as the use of high-speed drills (Al-Halabi et al., 2020). During this period, even access to emergency dental care has been limited. A review of the current guidance issued by international organisations and professional bodies regarding the re-opening of dental services showed considerable variation in the safety procedures required. Most sources recommended triage of patients and an

emphasis on only emergency and urgent care; wearing filtering facepiece class 2 masks; reducing the risk of transmission; and avoiding AGP. All sources stressed the need to focus on activities that minimise risk to staff, patients and the public, and to support high quality clinical care (CoDER, 2020).
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DOI: 10.1922/CDH_Dec20editorialMarcenes03

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ABSTRACT: A tracheostomy performed on patients infected with SARS CoV-2 is one of the procedures with the highest risks of aerosolization. Safety recommendations for carrying out this procedure are not suitable for implementation in every hospital. Despite the use of Personal Protection Equipment, the suit leaves the submental area unprotected, and even the face mask may not provide a full seal. The use of additional biosafety isolation equipment increases safety, thus preventing exposure to infecting particles and allowing the surgeon to perform the technique with the use of the available equipment; it reduces the risks of further trans-surgical complications and increases the possibilities of handling them in case they arise.
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ABSTRACT: BACKGROUND: Adequate personal protective equipment is needed to reduce the rate of transmission of COVID-19 to health care workers. Otolaryngology groups are recommending a higher level of personal protective equipment for aerosol-generating procedures than public health agencies. The objective of the review was to provide evidence that a.) demonstrates which otolaryngology procedures are aerosol-generating, and that b.) clarifies whether the higher level of PPE advocated by otolaryngology groups is justified. MAIN BODY: Health care workers in China who performed tracheotomy during the SARS-CoV-1 epidemic had 4.15 times greater odds of contracting the virus than controls who did not perform tracheotomy (95% CI 2.75-7.54). No other studies provide direct epidemiological evidence of increased aerosolized transmission of viruses during otolaryngology procedures. Experimental evidence has shown that electrocautery, advanced energy devices, open suctioning, and drilling can create aerosolized biological particles. The viral load of COVID-19 is highest in the upper aerodigestive tract, increasing the likelihood that aerosols generated during procedures of the upper aerodigestive tract of infected patients would carry viral material. Cough and normal breathing create aerosols which may increase the risk of transmission during outpatient procedures. A significant proportion of individuals infected with COVID-19 may not have symptoms, raising the likelihood of transmission of the disease to inadequately protected health care workers from patients who do not have probable or confirmed infection. Powered air purifying respirators, if used properly, provide a greater level of filtration than N95 masks and thus may reduce the risk of transmission. CONCLUSION: Direct and indirect evidence suggests that a large number of otolaryngology-head and neck surgery procedures are aerosol generating. Otolaryngologists are likely at high risk of contracting COVID-19 during aerosol generating procedures because they are likely exposed to high viral loads in patients infected with the virus. Based on the precautionary principle, even though the evidence is not definitive, adopting enhanced personal protective equipment protocols is reasonable based on the evidence.

Further research is needed to clarify the risk associated with performing various procedures during the COVID-19 pandemic, and the degree to which various personal protective equipment reduces the risk.
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ABSTRACT: OBJECTIVE: To identify the available evidence on aerosol viral transmission risk during minimally invasive surgery (MIS) and evaluate its impact on guidelines development and clinical activity worldwide during the coronavirus disease 2019 (COVID-19) pandemic. METHODS: We performed a scoping review on PubMed, Cochrane, the Excerpta Medica dataBASE (EMBASE), Clinical Trial Register, and the Grey Literature Repository databases, to identify reports on viral transmission via surgical smoke or aerosolisation. A systematic review of all available national and international guidelines was also performed to report their recommendations. Additionally, a worldwide transdisciplinary survey was performed to capture the actual compliance to dedicated guidelines and their impact on MIS activity. RESULTS: Based on a selection of 17 studies, there was no evidence to support the concerns of an intraoperative viral transmission via pneumoperitoneum aerosolisation. Most national surgical and urological societies either did address this topic or referred to international guidelines. The guidelines of the American College of Surgery, the Royal College of Surgeons, and the European Association of Urology Robotic Urology Section, recommended an avoidance of MIS due to an increased risk of intraoperative aerosol-enhanced transmission. The results of the survey completed by 334 respondents, from different surgical abdominal specialties, suggested a lack of compliance with the guidelines. CONCLUSION: There seems to be a dissonance between contemporary guidelines and ongoing surgical activity, possibly due to the perceived lack of evidence. Recommendations regarding changes in clinical practice should be based on the best available research evidence and experience. A scoping review of the evidence and an assessment of the benefits and harms together with a survey showed that laparoscopic procedures do not seem to increase the risk of viral transmission. Nevertheless, the few publications and low quality of existing evidence limits the validity of the review.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32937006
DOI: 10.1111/bju.15247

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ABSTRACT: BACKGROUND: Recent indirect evidence of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) transmission during endoscopic endonasal procedures has highlighted the dearth of knowledge surrounding aerosol generation with these procedures. As we adapt to function in the era of Coronavirus Disease 2019 (COVID-19) a better understanding of how surgical techniques generate potentially infectious aerosolized particles will enhance the safety of operating room (OR) staff and learners. OBJECTIVE: To provide greater understanding of possible SARS-CoV-2 exposure risk during endonasal surgeries by quantifying increases in airborne particle concentrations during endoscopic sinonasal surgery. METHODS: Aerosol concentrations were measured during live-patient endoscopic endonasal surgeries in ORs with an optical particle sizer. Measurements were taken throughout the procedure at six time points: 1) before patient entered the OR, 2) before pre-incision timeout during OR setup, 3) during cold instrumentation with suction, 4) during microdebrider use, 5) during drill use and, 6) at the end of the case prior to extubation. Measurements were taken at three different OR position: surgeon, circulating nurse, and anesthesia provider. RESULTS: Significant increases in airborne particle concentration were measured at the surgeon position with both the microdebrider ($p = 0.001$) and drill ($p = 0.001$), but not for cold instrumentation with suction ($p = 0.340$). Particle concentration did not significantly increase at the anesthesia position or the circulator position with any form of

instrumentation. Overall, the surgeon position had a mean increase in particle concentration of 2445 particles/ft3 (95% CI 881 to 3955; p = 0.001) during drill use and 1825 particles/ft3 (95% CI 641 to 3009; p = 0.001) during microdebrider use. CONCLUSION: Drilling and microdebrider use during endonasal surgery in a standard operating room is associated with a significant increase in airborne particle concentrations. Fortunately, this increase in aerosol concentration is localized to the area of the operating surgeon, with no detectable increase in aerosol particles at other OR positions.
URL: https://www.ncbi.nlm.nih.gov/pubmed/33012174
DOI: 10.1177/1945892420962335

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ABSTRACT: Background: The COVID-19 pandemic is currently an evolving situation. Operating rooms (OR) are high-risk areas for the transmission of any respiratory infection with multiple personnel involved, in close proximity. Of concern to neurosurgeons, is the high-risk of aerosol generating procedures (AGPs) like transsphenoidal and endonasal surgery. Endonasal AGPs theoretically present a higher risk of viral exposure due to the longer duration of exposure and aggressive disruption of potentially virus-containing mucosa. Objective: The current review discusses potential strategies to neuro-surgeons to avoid transmission of COVID 19 during endo-nasal and trans-sphenoidal surgeries. Materials and Methods: We searched PubMed using the search terms "COVID-19", "SARS-CoV-2", "coronavirus" in combination with "neurosurgery", and identified 13 relevant articles. A pre-surgical risk assessment score is proposed based on the risk of transmission. A flow chart of patient selection and care has been formulated. Conclusion: In all emergency patients, it is preferable to consider transcranial surgery or a sub-labial approach avoiding exposure to mucosa. Due to laboratory constraints routine swabs is not always available. Therefore, routine preoperative screening computed tomography (CT) chest is performed in all patients. Based on risk of transmission of infection to others, we propose a classification of patients for skull-based surgery into low, high and very high risk groups and suggest suitable personal protective equipment. Additionally, we discuss avoiding use of powered drills in or any AGP. However, cold procedures involving shavers and microdebriders generate lesser amounts of aerosol. Post-operatively, the length of stay could be reduced with a multidisciplinary approach.
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DOI: 10.4103/0028-3886.287683

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ABSTRACT: BACKGROUND: The COVID-19 virus is highly contagious, and thus there is a potential of infecting operating staff when operating on these patients. This case series describes a method of performing open tracheostomy for COVID-19 patients while minimizing potential aerosolization of the virus using typically available equipment and supplies. METHODS: This is a case series of 18 patients who were COVID-19-positive and underwent open tracheostomy in the operating room under a negative pressure plastic hood created using

readily available equipment and supplies. Patients had to be intubated for at least 14 days, be convalescing from their cytokine storm, and deemed to survive for at least 14 more days. Other indications for tracheostomy were altered mental status, severe deconditioning, respiratory failure and failed extubation attempts. RESULTS: There were 14 men and 4 women with severe SARS-CoV2 infection requiring long-term intubation since March 23 or later. The mean age was 61.7 years, body mass index was 32.6, and the pretracheostomy ventilator day was 20.4 days. The indications for tracheostomy were altered mental status, severe deconditioning and continued respiratory with hypoxia. Failed extubation attempt rate was 16.7% and hemodialysis rate was 38.9%. All patients were hemodynamically stable, without any evidence of accelerating cytokine storm. To date there was one minor bleeding due to postoperative therapeutic anticoagulation. CONCLUSION: This report describes a method of performing open tracheostomy with minimal aerosolization using readily available equipment and supplies in most hospitals. LEVEL OF EVIDENCE: Therapeutic/care management, Level V.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32404630
DOI: 10.1097/TA.0000000000002780

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ABSTRACT: INTRODUCTION: Barrier enclosure devices were introduced to protect against infectious disease transmission during aerosol generating medical procedures (AGMP). Recent discussion in the medical community has led to new designs and adoption despite limited evidence. A scoping review was conducted to characterize devices being used and their performance. METHODS: We conducted a scoping review of formal databases (MEDLINE, Embase, Cochrane Database of Systematic Reviews, CENTRAL, Scopus), grey literature, and hand-searched relevant journals. Forward and reverse citation searching was completed on included articles. Article/full-text screening and data extraction was performed by two independent reviewers. Studies were categorized by publication type, device category, intended medical use, and outcomes (efficacy - ability to contain particles; efficiency - time to complete AGMP; and usability - user experience). RESULTS: Searches identified 6489 studies and 123 met criteria for inclusion (k = 0.81 title/abstract, k = 0.77 full-text). Most articles were published in 2020 (98%, n = 120) as letters/commentaries (58%, n = 71). Box systems represented 42% (n = 52) of systems described, while plastic sheet systems accounted for 54% (n = 66). The majority were used for airway management (67%, n = 83). Only half of articles described outcome measures (54%, n = 67); 82% (n = 55) reporting efficacy, 39% (n = 26) on usability, and 15% (n = 10) on efficiency. Efficacy of devices in containing aerosols was limited and frequently dependent on use of suction devices. CONCLUSIONS: While use of various barrier enclosure devices has become widespread during this pandemic, objective data of efficacy, efficiency, and usability is limited. Further controlled studies are required before adoption into routine clinical practice.
URL: https://www.ncbi.nlm.nih.gov/pubmed/33189515
DOI: 10.1016/j.ajem.2020.10.071

66. Priyanka, Choudhary OP, Singh I, et al. Aerosol transmission of SARS-CoV-2: The unresolved paradox. Travel Med Infect Dis. 2020;37:101869. DOI: 10.1016/j.tmaid.2020.101869
URL: https://www.ncbi.nlm.nih.gov/pubmed/32891726
DOI: 10.1016/j.tmaid.2020.101869

67. Rajajee V, Williamson CA. Use of a Novel Negative-Pressure Tent During Bedside Tracheostomy in COVID-19 Patients. Neurocrit Care. 2020;33(2):597-603. DOI: 10.1007/s12028-020-01068-1
ABSTRACT: BACKGROUND: Many COVID-19 patients with neurological manifestations and respiratory failure remain dependent on mechanical ventilation and require tracheostomy, which is an aerosol generating procedure (AGP). The risk of SARS-CoV-2 transmission to healthcare staff during AGPs is well documented, and negative-pressure rooms are often unavailable. Innovative techniques to decrease risk to healthcare providers during AGPs are necessary. Our objective was to demonstrate the feasibility of percutaneous dilatational tracheostomy (PDT) performed using a novel prefabricated low-cost negative-pressure tent (AerosolVE).

METHODS: Retrospective review of consecutive PDT procedures performed by neurointensivists on intubated adult patients with COVID-19 using the AerosolVE tent during the pandemic under an innovative clinical care protocol. The AerosolVE negative-pressure tent consists of a clear plastic canopy with slits for hand access attached to a U-shaped base with air vents. Air within the tent is drawn through a high-efficiency particulate air filter and released outside. Preliminary testing during simulated AGPs demonstrated negligible escape of particulate matter beyond the tent. The main outcome measure was successful completion of PDT and bronchoscopy within the AerosolVE tent, without complications. RESULTS: The patients were a 53-year-old man with multifocal ischemic stroke and acute respiratory distress syndrome (ARDS), 53-year-old woman with cerebellar hemorrhage and ARDS, and a 69-year-old man with ARDS. Pre-procedure FiO2 requirement was 40-50% and positive end-expiratory pressure (PEEP) 8-12 cm H2O. The tent was successfully positioned around the patient and PDT completed with real-time ultrasound guidance in all 3 patients. Bronchoscopy was performed to confirm tube position and perform pulmonary toilet. No complications occurred. CONCLUSIONS: It is feasible to perform PDT on intubated COVID-19 patients using the AerosolVE negative-pressure tent. This is a promising low-cost device to decrease risk to healthcare providers during AGPs.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32770341
DOI: 10.1007/s12028-020-01068-1

68. Rakovich G, Urbanowicz R, Issa R, et al. Minimizing the Risk of Aerosol Contamination During Elective Lung Resection Surgery. Ann Surg. 2020;272(2):e125-e8. DOI: 10.1097/SLA.0000000000004087
ABSTRACT: BACKGROUND: In the setting of the COVID-19 pandemic, the conduct of elective cancer surgery has become an issue because of the need to balance the requirement to treat patients with the possibility of transmission of the virus by asymptomatic carriers. A particular concern is the potential for viral transmission by way of aerosol which may be generated during perioperative care. There are currently no guidelines for the conduct of elective lung resection surgery in this context. METHODS: A working group composed of 1 thoracic surgeon, 2 anesthesiologists and 1 critical care specialist assessed the risk for aerosol during lung resection surgery and proposed steps for mitigation. After external review, a final draft was approved by the Committee for the Governance of Perioperative and Surgical Activities of the Hopital Maisonneuve-Rosemont, in Montreal, Canada. RESULTS: The working group divided the risk for aerosol into 6 time-points: (1) intubation and extubation; (2) Lung isolation and patient positioning; (3) access to the chest; (4) conduct of the surgical procedure; (5) procedure termination and lung re-expansion; (6) chest drainage. Mitigating strategies were proposed for each time-point. CONCLUSIONS: The situation with COVID-19 is an opportunity to re-evaluate operating room protocols both for the purposes of this pandemic and similar situations in the future. In the context of lung resection surgery, specific time points during the procedure seem to pose specific risks for the genesis of aerosol and thus should be the focus of attention.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32675514
DOI: 10.1097/SLA.0000000000004087

69. Romano-Bertrand S, Aho-Glele LS, Grandbastien B, et al. Sustainability of SARS-CoV-2 in aerosols: Should we worry about airborne transmission? The Journal of hospital infection. 2020;12.
URL: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=632095192

70. Ross KA, Almuzam S, Britton PN, et al. What risk do aerosol-generating procedures pose to health-care workers? Journal of Paediatrics and Child Health. 2020;56(10):1639-40.
URL: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexc&AN=2006010722

71. Schunemann HJ, Khabsa J, Solo K, et al. Ventilation Techniques and Risk for Transmission of Coronavirus Disease, Including COVID-19: A Living Systematic Review of Multiple Streams of Evidence. Ann Intern Med. 2020;173(3):204-16. DOI: 10.7326/M20-2306

ABSTRACT: BACKGROUND: Mechanical ventilation is used to treat respiratory failure in coronavirus disease 2019 (COVID-19). PURPOSE: To review multiple streams of evidence regarding the benefits and harms of ventilation techniques for coronavirus infections, including that causing COVID-19. DATA SOURCES: 21 standard, World Health Organization-specific and COVID-19-specific databases, without language restrictions, until 1 May 2020. STUDY SELECTION: Studies of any design and language comparing different oxygenation approaches in patients with coronavirus infections, including severe acute respiratory syndrome (SARS) or Middle East respiratory syndrome (MERS), or with hypoxemic respiratory failure. Animal, mechanistic, laboratory, and preclinical evidence was gathered regarding aerosol dispersion of coronavirus. Studies evaluating risk for virus transmission to health care workers from aerosol-generating procedures (AGPs) were included. DATA EXTRACTION: Independent and duplicate screening, data abstraction, and risk-of-bias assessment (GRADE for certainty of evidence and AMSTAR 2 for included systematic reviews). DATA SYNTHESIS: 123 studies were eligible (45 on COVID-19, 70 on SARS, 8 on MERS), but only 5 studies (1 on COVID-19, 3 on SARS, 1 on MERS) adjusted for important confounders. A study in hospitalized patients with COVID-19 reported slightly higher mortality with noninvasive ventilation (NIV) than with invasive mechanical ventilation (IMV), but 2 opposing studies, 1 in patients with MERS and 1 in patients with SARS, suggest a reduction in mortality with NIV (very-low-certainty evidence). Two studies in patients with SARS report a reduction in mortality with NIV compared with no mechanical ventilation (low-certainty evidence). Two systematic reviews suggest a large reduction in mortality with NIV compared with conventional oxygen therapy. Other included studies suggest increased odds of transmission from AGPs. LIMITATION: Direct studies in COVID-19 are limited and poorly reported. CONCLUSION: Indirect and low-certainty evidence suggests that use of NIV, similar to IMV, probably reduces mortality but may increase the risk for transmission of COVID-19 to health care workers. PRIMARY FUNDING SOURCE: World Health Organization. (PROSPERO: CRD42020178187).
URL: https://www.ncbi.nlm.nih.gov/pubmed/32442035
DOI: 10.7326/M20-2306

72. Shah S, Gadiya A, Patel MS, et al. Coronavirus Disease 2019 Transmission: Blood Viremia and Aerosol Generation from Spinal Surgery. Is There an Increased Risk to the Surgical Team? Asian Spine J. 2020;14(5):702-9. DOI: 10.31616/asj.2020.0378

ABSTRACT: As a respiratory pathogen, the novel coronavirus is commonly associated with aerosol-generating procedures. However, it is currently unclear whether spinal surgical procedures pose an additional risk of viral transmission to the surgical team. We reviewed the available evidence to ascertain the presence of coronavirus disease 2019 (COVID-19) blood viremia and the virus' blood transmissibility, as well as evidence of blood-aerosol generation and operating room contamination from spinal surgical procedures. There is established evidence of COVID-19 blood viremia, a viral pathogenic cycle via angiotensin-converting enzyme 2 (ACE-2) receptors and similar blood transmission risk data from the SARS (severe acute respiratory syndrome)/MERS (Middle East respiratory syndrome) era. Spinal surgical practices demonstrate significant blood-aerosol generation from the operative wound due to the use of common surgical instruments, such as electrocautery, as well as high-speed and high-impact devices. Based on the evidence, there is an established additional risk of viral transmission faced by surgical teams from blood-aerosols generated from the operative wound of COVID-19-infected patients via the inhalation of virus-laden aerosols and the subsequent initiation of the viral pathogenic cycle through binding with pulmonary ACE-2 receptors. Recognizing this additional risk amidst the ongoing pandemic serves as a caution to front-line surgical personnel to strictly adhere to personal protective equipment usage in operating rooms, to modify surgical techniques to reduce the hazard of surgical aerosol generation and COVID-19 viral exposure, and to consider it as an integral aspect of planning and adapting to the "new normal" operating practices.
URL: https://www.ncbi.nlm.nih.gov/pubmed/33108836
DOI: 10.31616/asj.2020.0378

73. Shahdad S, Patel T, Hindocha A, et al. The efficacy of an extraoral scavenging device on reduction of splatter contamination during dental aerosol generating procedures: an exploratory study. Br Dent J. 2020;11:11. DOI: 10.1038/s41415-020-2112-7

ABSTRACT: Introduction This study was conducted in light of the SARS-CoV-2 pandemic, which brought UK dentistry to a standstill. The market has seen a recent influx of unproven extraoral scavengers (EOSs), which claim to reduce the risk of particulate spread.Aims To investigate the efficacy of a commercially available EOS device on contamination reduction during dental aerosol generating procedures (AGPs). The secondary aim was to investigate differences between open and closed dental operatories.Method Dental procedures were simulated on a dental manikin using citric acid (10%) added to the water lines with universal indicating paper (UIP) placed in strategic locations in the operatory, on the clinician and assistant. Chromatic change related to settling of splatter containing citric acid on the UIP was analysed to calculate percentage intensity of splatter contamination.Results EOSs resulted in 20% reduction in frequency and 75% reduction in mean intensity of contamination of operatory sites. There was a 33% and 76% reduction in mean intensity contamination for clinician and assistant, respectively. Use of rubber dam and four-handed dentistry resulted in further reduction.Discussion This exploratory study demonstrates contamination by splatter in a simulated dental setting. The concern in dentistry regarding aerosol requires further quantitative investigation of smaller particles.Conclusions The routine use of four-handed dentistry and rubber dam should continue where possible to maximise risk mitigation during AGPs. However, on the basis of our findings, the use of an EOS device can further mitigate the magnitude and concentration of splatter.

URL: https://www.ncbi.nlm.nih.gov/pubmed/32918060
DOI: 10.1038/s41415-020-2112-7

74. Sharma D, Ye MJ, Campiti VJ, et al. Mitigation of Aerosols Generated During Rhinologic Surgery: A Pandemic-Era Cadaveric Simulation. Otolaryngol Head Neck Surg. 2020:194599820951169. DOI: 10.1177/0194599820951169

ABSTRACT: OBJECTIVE: After significant restrictions initially due to the COVID-19 pandemic, otolaryngologists have begun resuming normal clinical practice. However, the risk of SARS-CoV-2 transmission to health care workers through aerosolization and airborne transmission during rhinologic surgery remains incompletely characterized. The objective of this study was to quantify the number concentrations of aerosols generated during rhinologic surgery with and without interventions involving 3 passive suction devices. STUDY DESIGN: Cadaver simulation. SETTING: Dedicated surgical laboratory. SUBJECTS AND METHODS: In a simulation of rhinologic procedures with and without different passive suction interventions, the concentrations of generated aerosols in the particle size range of 0.30 to 10.0 microm were quantified with an optical particle sizer. RESULTS: Functional endoscopic sinus surgery with and without microdebrider, high-speed powered drilling, use of an ultrasonic aspirator, and electrocautery all produced statistically significant increases in concentrations of aerosols of various sizes (P < .05). Powered drilling, ultrasonic aspirator, and electrocautery generated the highest concentration of aerosols, predominantly submicroparticles <1 microm. All interventions with a suction device were effective in reducing aerosols, though the surgical smoke evacuation system was the most effective passive suction method in 2 of the 5 surgical conditions with statistical significance (P < .05). CONCLUSION: Significant aerosol concentrations were produced in the range of 0.30 to 10.0 microm during all rhinologic procedures in this cadaver simulation. Rhinologic surgery with a passive suction device results in significant mitigation of generated aerosols.

URL: https://www.ncbi.nlm.nih.gov/pubmed/32779974
DOI: 10.1177/0194599820951169

75. Sharma S, John R, Neradi D, et al. Bioaersols in orthopedic surgical procedures and implications for clinical practice in the times of COVID-19 pandemic: a protocol for systematic review and meta-analysis. medRxiv. 2020:2020.07.19.20157511. DOI: 10.1101/2020.07.19.20157511

ABSTRACT: Background Orthopedic surgical procedures involve a number of aerosol generating procedures; these include electrocautery, power instruments for bone cutting, burring and drilling, and tools for wound lavage. This assumes a great significance in the context of the current COVD-19 pandemic, as there are chances of aerosol-borne disease transmission in orthopedic surgical procedures. Hence, this systematic review and meta-analysis will be undertaken to assimilate and analyse the available evidence on bioaerosols in orthopedic surgical procedures and their significance with respect to SARS-CoV-2 virus transmission. Objectives To determine the characteristics (amount and/or density, size, infectivity, and spread etc.) of bioaerosols found in orthopaedic operating rooms (ORs) and to determine the characteristics of aerosols generated by different orthopaedic power tools and devices. Methods A systematic review and meta-analysis will be conducted. The PRISMA guidelines will be strictly followed. The primary search will be conducted on the PubMed, EMBASE, Scopus, Cochrane Library, medRxiv, bioRxix and Lancet preprint databases, using a well-defined search strategy. Any original research study (including cohort, case-control, case series, cadaveric studies and studies, animal models, laboratory based experimental studies) looking at aerosol generation in orthopedic surgical procedures, or aerosol generation by orthopaedic power tools and devices will included. Outcome measures will include characteristics (amount and/or density, size, infectivity, and spread etc.) of bioaerosols found in orthopaedic operating rooms (ORs) and those generated by various orthopaedics power tools and devices. Metanalysis using the random-effects model will be conducted to determined pooled estimates of the outcome variables. Heterogeneity will be assessed by the I2 test. Risk of bias will be assessed by the Risk of Bias in Studies estimating Prevalence of Exposure to Occupational risk factors (RoB-SPEO) tool. The overall strength of evidence will be assessed by the GRADE approach.Competing Interest StatementThe authors have declared no competing interest.Clinical TrialNot applicableFunding StatementNo sources of fundingAuthor DeclarationsI confirm all relevant ethical guidelines have been followed, and any necessary IRB and/or ethics committee approvals have been obtained.YesThe details of the IRB/oversight body that provided approval or exemption for the research described are given below:PRISMA-P guidelines were followed in formulating this protocol.All necessary patient/participant consent has been obtained and the appropriate institutional forms have been archived.YesI understand that all clinical trials and any other prospective interventional studies must be registered with an ICMJE-approved registry, such as ClinicalTrials.gov. I confirm that any such study reported in the manuscript has been registered and the trial registration ID is provided (note: if posting a prospective study registered retrospectively, please provide a statement in the trial ID field explaining why the study was not registered in advance).Yes I have followed all appropriate research reporting guidelines and uploaded the relevant EQUATOR Network research reporting checklist(s) and other pertinent material as supplementary files, if applicable.YesSince this is a protocol for systematic review, it does not contain data. However, the search strategy has been presented in Table 1.
URL: http://medrxiv.org/content/early/2020/07/21/2020.07.19.20157511.abstract
DOI: 10.1101/2020.07.19.20157511

76. Shetty N, Kaweri L, Khamar P, et al. Propensity and quantification of aerosol and droplet creation during phacoemulsification with high-speed shadowgraphy amid COVID-19 pandemic. J Cataract Refract Surg. 2020;46(9):1297-301. DOI: 10.1097/j.jcrs.0000000000000289
ABSTRACT: PURPOSE: To study propensity of aerosol and droplet generation during phacoemulsification using high-speed shadowgraphy and quantify its spread amid COVID-19 pandemic. SETTING: Aerosol and droplet quantification laboratory. DESIGN: Laboratory study. METHODS: In an experimental set-up, phacoemulsification was performed on enucleated goat eyes and cadaveric human corneoscleral rims mounted on an artificial anterior chamber. Standard settings for sculpt and quadrant removal mode were used on Visalis 100 (Carl Zeiss Meditec AG). Microincision and standard phacoemulsification were performed using titanium straight tips (2.2 mm and 2.8 mm in diameter). The main wound incisions were titrated equal to and larger than the sleeve size. High-speed shadowgraphy technique was used to detect the possible generation of any droplets and aerosols. The visualization and quantification of size of the aerosols and droplets along with calculation of their spread were the main outcome measures. RESULTS: In longitudinal phacoemulsification using a peristaltic pump device

with a straight tip, no aerosol generation was seen in a closed chamber. In larger wounds, there was a slow leak at the main wound. The atomization of balanced salt solution was observed only when the phacoemulsification tip was completely exposed next to the ocular surface. Under this condition, the nominal size of the droplet was approximately 50 microm, and the maximum calculated spread was 1.3 m. CONCLUSIONS: There was no visible aerosol generation during microincision or standard phacoemulsification. Phacoemulsification is safe to perform in the COVID-19 era by taking adequate precautions against other modes of transmission.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32649436
DOI: 10.1097/j.jcrs.0000000000000289

77. Shetty R, Balakrishnan N, Shroff S, et al. Quantitative High-speed Assessment of Droplet and Aerosol From an Eye After Impact With an Air-puff Amid COVID-19 Scenario. J Glaucoma. 2020;29(11):1006-16. DOI: 10.1097/IJG.0000000000001672
ABSTRACT: PURPOSE: To quantify aerosol and droplets generated during noncontact tonometry (NCT) and assess the spread distance of the same. METHODOLOGY: This was an experimental study on healthy human volunteers (n=8 eyes). In an experimental setup, NCT was performed on eyes (n=8) of human volunteers under normal settings, with a single and 2 drops of lubricant. High-speed shadowgraphy, frontal lighting technique, and fluorescein analysis were used to detect the possible generation of any droplets and aerosols. Mathematical computation of the spread of the droplets was then performed. RESULTS: In a natural setting, there was no droplet or aerosol production. Minimal splatter along with droplet ejection was observed when 1 drop of lubricant was used before NCT. When 2 drops of lubricant were instilled, a significant amount of fluid ejection in the form of a sheet that broke up into multiple droplets was observed. Some of these droplets traversed back to the tonometer. Droplets ranging from 100 to 500 microm in diameter were measured. CONCLUSIONS: There was no droplet generation during NCT performed in a natural setting. However, NCT should be avoided in conditions with high-tear volume (natural or artificial) as it would lead to droplet spread and tactile contamination.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32947358
DOI: 10.1097/IJG.0000000000001672

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ABSTRACT: The COVID-19 pandemic has strained the healthcare system. It has led to the use of temporary isolation systems and less-then-optimum patient placement configurations because of inadequate number of isolation rooms, both of which can compromise provider safety. Three key elements require special attention to reduce the maximum and average aerosolized contaminant concentration exposure to a healthcare worker in any isolation system: flow rate; air changes per hour; and patient placement. This is important because concentration exposures of aerosolized contaminants to healthcare workers in hospitals using temporary isolation systems can reach levels 21-30 times greater than a properly engineered negative pressure isolation room. A working knowledge of these three elements can help create a safer environment for healthcare workers when isolation rooms are not available.
URL: https://www.ncbi.nlm.nih.gov/pubmed/33207155
DOI: 10.5811/westjem.2020.9.48170

79. Simonds AK. 'Led by the science', evidence gaps, and the risks of aerosol transmission of SARS-COV-2. Resuscitation. 2020.
URL: https://www.resuscitationjournal.com/article/S0300-9572(20)30198-2/fulltext

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URL: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=2006113776

81. Simpson JP, Wong DN, Verco L, et al. Measurement of airborne particle exposure during simulated tracheal intubation using various proposed aerosol containment devices during the COVID-19 pandemic. Anaesthesia. 2020;75(12):1587-95. DOI: 10.1111/anae.15188

ABSTRACT: The COVID-19 pandemic has led to the production of novel devices intended to protect airway managers during the aerosol-generating procedure of tracheal intubation. Using an in-situ simulation model, we evaluated laryngoscopist exposure of airborne particles sized 0.3 - 5.0 microns using five aerosol containment devices (aerosol box; sealed box with and without suction; vertical drape; and horizontal drape) compared with no aerosol containment device. Nebulised saline was used as the aerosol-generating model for 300 s, at which point, the devices were removed to assess particle spread. Primary outcome was the quantity and size of airborne particles measured at the level of the laryngoscopist's head at 30, 60, 120 and 300 s, as well as 360 s (60 s after device removal). Airborne particles sizes of 0.3, 0.5, 1.0, 2.5 and 5.0 microns were quantified using an electronic airborne particle counter. Compared with no device use, the sealed intubation box with suction resulted in a decrease in 0.3, 0.5, 1.0 and 2.5 micron, but not 5.0 micron, particle exposure over all time-periods ($p = 0.003$ for all time periods). Compared with no device use, the aerosol box showed an increase in 1.0, 2.5 and 5.0 micron airborne particle exposure at 300 s ($p = 0.002$, 0.008, 0.002, respectively). Compared with no device use, neither horizontal nor vertical drapes showed any difference in any particle size exposure at any time. Finally, when the patient coughed, use of the aerosol box resulted in a marked increase in airborne particle exposure compared with other devices or no device use. In conclusion, novel devices intended to protect the laryngoscopist require objective testing to ensure they are fit for purpose and do not result in increased airborne particle exposure.

URL: https://www.ncbi.nlm.nih.gov/pubmed/32559315

DOI: 10.1111/anae.15188

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ABSTRACT: BACKGROUND: Exposure of respiratory therapists (RTs) during aerosol-generating procedures such as endotracheal intubation is an occupational hazard. Depending on the hospital, RTs may serve as laryngoscopist or in a role providing ventilation support and initiating mechanical ventilation. This study aimed to evaluate the potential exposure of RTs serving in either of these roles. METHODS: We set up a simulated patient with severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection in an ICU setting requiring endotracheal intubation involving a laryngoscopist, a nurse, and an RT supporting the laryngoscopist. All participants wore appropriate personal protective equipment (PPE). A fluorescent marker was sprayed by an atomizer during the procedure using 3 different methods for endotracheal intubation. The 3 techniques included PPE alone, a polycarbonate intubating box, or a coronavirus flexible enclosure, which consisted of a Mayo stand with plastic covering. The laryngoscopist and the supporting RT were assessed with a black light for contamination with the fluorescent marker. All simulations were recorded. RESULTS: When using only PPE, both the laryngoscopist and the RT were grossly contaminated. When using the intubating box, the laryngoscopist's contamination was detectable only on the gloves: the gown and face shield remained uncontaminated; the RT was still grossly contaminated on the gloves, gown, neck, and face shield. When using the coronavirus flexible enclosure system, both the laryngoscopist and the RT were better protected, with contamination detected only on the gloves of the laryngoscopist and the RT. CONCLUSIONS: Of the 3 techniques, the coronavirus flexible enclosure contained the fluorescent marker more effectively during endotracheal intubation than PPE alone or the intubating box based on exposure of the laryngoscopist and supporting RT. Optimizing containment during aerosol-generating procedures like endotracheal intubation is a critical component of minimizing occupational and nosocomial spread of SARS-CoV-2 to RTs who may serve as either the laryngoscopist or a support role.

URL: https://www.ncbi.nlm.nih.gov/pubmed/33229369

DOI: 10.4187/respcare.08568

83. Sobti A, Fathi M, Mokhtar MA, et al. Aerosol generating procedures in trauma and orthopaedics in the era of the Covid-19 pandemic; What do we know? Surgeon. 2020;13:13. DOI: 10.1016/j.surge.2020.08.001
ABSTRACT: PURPOSE: COVID-19 pandemic has created havoc all over the globe and spared no one regardless of status, gender, location and ethnicity. There were questions raised if trauma and orthopaedic (T&O) procedures actually generated aerosols? The need for a review of literature highlighting the nature and impact of aerosol generation within T&O surgery was noted. METHODS: A comprehensive online search was performed for all published articles in the English language, evaluating AGPs in T&O surgery and the relevant personal protection equipment used. RESULTS: The search strategy populated 43 studies. Six studies were identified as duplicates. The shortlisted 37 studies were screened and nine studies were included in the review. An additional four studies were included from the bibliography review. CONCLUSION: Most orthopaedic procedures are high-risk aerosol generating procedures (AGPs). Conventional surgical masks do not offer protection against high-risk AGPs. In the current era of COVID-19 pandemic, there is a significant risk to the transmission of infection to the theatre staff. For protection against airborne transmission, appropriate masks should be used. These need proper fitting and sizing to ensure full protection when used.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32883580
DOI: 10.1016/j.surge.2020.08.001

84. Soma M, Jacobson I, Brewer J, et al. Operative team checklist for aerosol generating procedures to minimise exposure of healthcare workers to SARS-CoV-2. Int J Pediatr Otorhinolaryngol. 2020;134:110075. DOI: 10.1016/j.ijporl.2020.110075
ABSTRACT: OBJECTIVES: In many countries around the world, the COVID-19 pandemic has resulted in health services being diverted to manage patients with the condition. There are situations however that still require the undertaking of aerosol generating procedures (AGP) with potentially high exposure of healthcare workers to SARS-CoV-2 transmission through droplet, contact and possibly airborne routes. The objective of this paper is to explore a structured way for the operative team to approach AGP to reduce aerosolisation of secretions, decrease open airway time and minimise staff exposure. METHODS: The authors (otolaryngologists, anaesthetists and nursing staff) created a unified operative team checklist based on collation of national and international specialty society statements, local state government recommendations, hospital policies and literature review. Simulation was undertaken and the checklist was refined after performing AGP on patients with unknown (presumed positive) COVID-19 status. RESULTS: An 8 step operative team checklist is provided describing details for the immediate pre-operative, intra-operative and post-operative journey of the patient to encourage healthcare workers to reflect upon and modify usual practice during AGP to mitigate exposure to SARS-CoV-2. The example of paediatric laryngo-bronchoscopy for diagnostic purposes or retrieval of an inhaled airway foreign body is used to illustrate the steps however the checklist structure is modifiable for other AGP and adaptable for local needs. CONCLUSIONS: At a time of overwhelming and changing information and recommendations, an operative team checklist may provide some structure to healthcare workers undertaking AGP to reduce anxiety, maintain focus, prompt consideration of alternatives and potentially reduce risk.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32388083
DOI: 10.1016/j.ijporl.2020.110075

85. Sommerstein R, Fux CA, Vuichard-Gysin D, et al. Risk of SARS-CoV-2 transmission by aerosols, the rational use of masks, and protection of healthcare workers from COVID-19. Antimicrob Resist Infect Control. 2020;9(1):100. DOI: 10.1186/s13756-020-00763-0
ABSTRACT: OBJECTIVES: To determine the risk of SARS-CoV-2 transmission by aerosols, to provide evidence on the rational use of masks, and to discuss additional measures important for the protection of healthcare workers from COVID-19. METHODS: Literature review and expert opinion. SHORT CONCLUSION: SARS-CoV-2, the pathogen causing COVID-19, is considered to be transmitted via droplets rather than aerosols, but droplets with strong directional airflow support may spread further than 2 m. High rates of COVID-19 infections in healthcare-

workers (HCWs) have been reported from several countries. Respirators such as filtering face piece (FFP) 2 masks were designed to protect HCWs, while surgical masks were originally intended to protect patients (e.g., during surgery). Nevertheless, high quality standard surgical masks (type II/IIR according to European Norm EN 14683) appear to be as effective as FFP2 masks in preventing droplet-associated viral infections of HCWs as reported from influenza or SARS. So far, no head-to-head trials with these masks have been published for COVID-19. Neither mask type completely prevents transmission, which may be due to inappropriate handling and alternative transmission pathways. Therefore, compliance with a bundle of infection control measures including thorough hand hygiene is key. During high-risk procedures, both droplets and aerosols may be produced, reason why respirators are indicated for these interventions.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32631450
DOI: 10.1186/s13756-020-00763-0

86. Sorbello M, Rosenblatt W, Hofmeyr R, et al. Aerosol boxes and barrier enclosures for airway management in COVID-19 patients: a scoping review and narrative synthesis. Br J Anaesth. 2020;125(6):880-94. DOI: 10.1016/j.bja.2020.08.038
ABSTRACT: Exposure of healthcare providers to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a significant safety concern during the coronavirus disease 2019 (COVID-19) pandemic, requiring contact/droplet/airborne precautions. Because of global shortages, limited availability of personal protective equipment (PPE) has motivated the development of barrier-enclosure systems, such as aerosol boxes, plastic drapes, and similar protective systems. We examined the available evidence and scientific publications about barrier-enclosure systems for airway management in suspected/confirmed COVID-19 patients. MEDLINE/Embase/Google Scholar databases (from December 1, 2019 to May 27, 2020) were searched for all articles on barrier enclosures for airway management in COVID-19, including references and websites. All sources were reviewed by a panel of experts using a Delphi method with a modified nominal group technique. Fifty-two articles were reviewed for their results and level of evidence regarding barrier device feasibility, advantages, protection against droplets and aerosols, effectiveness, safety, ergonomics, and cleaning/disposal. The majority of analysed papers were expert opinions, small case series, technical descriptions, small-sample simulation studies, and pre-print proofs. The use of barrier-enclosure devices adds to the complexity of airway procedures with potential adverse consequences, especially during airway emergencies. Concerns include limitations on the ability to perform airway interventions and the aid that can be delivered by an assistant, patient injuries, compromise of PPE integrity, lack of evidence for added protection of healthcare providers (including secondary aerosolisation upon barrier removal), and lack of cleaning standards. Enclosure barriers for airway management are no substitute for adequate PPE, and their use should be avoided until adequate validation studies can be reported.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32977955
DOI: 10.1016/j.bja.2020.08.038

87. Spear L. Preventing Aerosolized Transmission of COVID-19 to Healthcare Workers. RT: The Journal for Respiratory Care Practitioners. 2020;33(5):9-11.
ABSTRACT: The article discusses the prevention of aerosolized transmission of COVID-19 disease to healthcare workers, caregivers, and respiratory therapists (RT) who conduct nebulizer treatments to patients with pulmonary diseases. Topics include possible transmission of COVID-19 through bioaerosols and the proposal to use pressurized metered-dose inhalers (pMDI) and dry power inhalers (DPI) for aerosol drug delivery in mild COVID-19 patients.
URL:
http://shal.idm.oclc.org/login?url=https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,url,uid&db=rzh&AN=145225945&site=ehost-live&scope=site

88. Tanne JH. Covid-19: CDC publishes then withdraws information on aerosol transmission. BMJ (Clinical research ed). 2020;370:m3739.
URL: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=632983408

89. Thamboo A, Lea J, Sommer DD, et al. Clinical evidence based review and recommendations of aerosol generating medical procedures in otolaryngology - head and neck surgery during the COVID-19 pandemic. J Otolaryngol Head Neck Surg. 2020;49(1):28. DOI: 10.1186/s40463-020-00425-6
ABSTRACT: BACKGROUND: Aerosol generating medical procedures (AGMPs) present risks to health care workers (HCW) due to airborne transmission of pathogens. During the COVID-19 pandemic, it is essential for HCWs to recognize which procedures are potentially aerosolizing so that appropriate infection prevention precautions can be taken. The aim of this literature review was to identify potential AGMPs in Otolaryngology - Head and Neck Surgery and provide evidence-based recommendations. METHODS: A literature search was performed on Medline, Embase and Cochrane Review databases up to April 3, 2020. All titles and abstracts of retrieved studies were evaluated and all studies mentioning potential AGMPs were included for formal review. Full text of included studies were assessed by two reviewers and the quality of the studies was evaluated. Ten categories of potential AGMPs were developed and recommendations were provided for each category. RESULTS: Direct evidence indicates that CO2 laser ablation, the use of high-speed rotating devices, electrocautery and endotracheal suctioning are AGMPs. Indirect evidence indicates that tracheostomy should be considered as potential AGMPs. Nasal endoscopy and nasal packing/epistaxis management can result in droplet transmission, but it is unknown if these procedures also carry the risk of airborne transmission. CONCLUSIONS: During the COVID-19 pandemic, special care should be taken when CO2 lasers, electrocautery and high-speed rotating devices are used in potentially infected tissue. Tracheal procedures like tracheostomy and endotracheal suctioning can also result in airborne transmission via small virus containing aerosols.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32375884
DOI: 10.1186/s40463-020-00425-6

90. Tsui BC, Deng A, Pan S. Coronavirus Disease 2019: Epidemiological Factors During Aerosol-Generating Medical Procedures. Anesthesia and Analgesia. 2020.
URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7302069/

91. Tsui BCH, Pan S. Are aerosol-generating procedures safer in an airborne infection isolation room or operating room? Br J Anaesth. 2020;125(6):e485-e7. DOI: 10.1016/j.bja.2020.09.011
URL: https://www.ncbi.nlm.nih.gov/pubmed/33036758
DOI: 10.1016/j.bja.2020.09.011

92. Vikhe DM, Dhope SV, Mhaske PN, et al. "Pravara tent" - An innovative protective device to control aerosol in dental clinics during the COVID-19 pandemic. Journal of Clinical and Diagnostic Research. 2020;14(11):ZH01-ZH3.
ABSTRACT: Many dental procedures use modern devices like an air rotor and ultrasonic scaler, which generate aerosols and droplets. The dental procedures cannot be performed without the above devices. The ways commonly available today to control aerosols are suction, saliva ejectors, but it does little to control aerosols. The expensive filters like HEPA (high-efficiency particulate air) are available but they are not easily available in rural set-up and economical for everyone. There are many diseases, for example-severe acute respiratory syndrome, tuberculosis, influenza and viral infections, which spread through droplets, so management of the infection control procedures for aerosols is mandatory in dental clinics. A novel human coronavirus-that is, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) also can be transferred through droplets and splatter. The COVID-19 pandemic has led to the manufacturing of novel devices to protect the dentist from the risk of transmission. The "Pravara tent" (the name Pravara was given to the tent by the authors as it was invented at the place called Pravara) is one of the examples of a protective (box) device, which can be used to

control aerosols generated from air rotor and an ultrasonic scaler to reduce transmission of diseases between clinicians, and the patients. So, this tent is a simple, modified, and economical innovative protective device working with high efficacy by creating a barrier between patient and dentist to minimise aerosols during dental procedures. Copyright © 2020 Journal of Clinical and Diagnostic Research. All rights reserved.
URL: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexc&AN=2008471444

93. Wang J, Du G. COVID-19 may transmit through aerosol. Irish Journal of Medical Science. 2020;189(4):1143-4.
URL: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexc&AN=2004577841

94. Williams M, Blake S, Matthews H. Mitigating the risk of aerosol generation from power tools during the COVID-19 pandemic. Ann R Coll Surg Engl. 2020;102(5):393-4. DOI: 10.1308/rcsann.2020.0082
URL: https://www.ncbi.nlm.nih.gov/pubmed/32324054
DOI: 10.1308/rcsann.2020.0082

95. Wilson NM, Norton A, Young FP, et al. Airborne transmission of severe acute respiratory syndrome coronavirus-2 to healthcare workers: a narrative review. Anaesthesia. 2020;75(8):1086-95. DOI: 10.1111/anae.15093
ABSTRACT: Healthcare workers are at risk of infection during the severe acute respiratory syndrome coronavirus-2 pandemic. International guidance suggests direct droplet transmission is likely and airborne transmission occurs only with aerosol-generating procedures. Recommendations determining infection control measures to ensure healthcare worker safety follow these presumptions. Three mechanisms have been described for the production of smaller sized respiratory particles ('aerosols') that, if inhaled, can deposit in the distal airways. These include: laryngeal activity such as talking and coughing; high velocity gas flow; and cyclical opening and closure of terminal airways. Sneezing and coughing are effective aerosol generators, but all forms of expiration produce particles across a range of sizes. The 5-mum diameter threshold used to differentiate droplet from airborne is an over-simplification of multiple complex, poorly understood biological and physical variables. The evidence defining aerosol-generating procedures comes largely from low-quality case and cohort studies where the exact mode of transmission is unknown as aerosol production was never quantified. We propose that transmission is associated with time in proximity to severe acute respiratory syndrome coronavirus-1 patients with respiratory symptoms, rather than the procedures per se. There is no proven relation between any aerosol-generating procedure with airborne viral content with the exception of bronchoscopy and suctioning. The mechanism for severe acute respiratory syndrome coronavirus-2 transmission is unknown but the evidence suggestive of airborne spread is growing. We speculate that infected patients who cough, have high work of breathing, increased closing capacity and altered respiratory tract lining fluid will be significant producers of pathogenic aerosols. We suggest several aerosol-generating procedures may in fact result in less pathogen aerosolisation than a dyspnoeic and coughing patient. Healthcare workers should appraise the current evidence regarding transmission and apply this to the local infection prevalence. Measures to mitigate airborne transmission should be employed at times of risk. However, the mechanisms and risk factors for transmission are largely unconfirmed. Whilst awaiting robust evidence, a precautionary approach should be considered to assure healthcare worker safety.
URL: https://www.ncbi.nlm.nih.gov/pubmed/32311771
DOI: 10.1111/anae.15093

96. Workman AD, Bleier BS, Sayahi T, et al. Aerosol-scavenging isolation barrier mitigates exposure risk during endonasal procedures in coronavirus-2019. Int Forum Allergy Rhinol. 2020;30. DOI: 10.1002/alr.22752
URL: https://www.ncbi.nlm.nih.gov/pubmed/33258275
DOI: 10.1002/alr.22752

97. Workman AD, Jafari A, Welling DB, et al. Airborne Aerosol Generation During Endonasal Procedures in the Era of COVID-19: Risks and Recommendations. Otolaryngol Head Neck Surg. 2020;163(3):465-70. DOI: 10.1177/0194599820931805

ABSTRACT: OBJECTIVE: In the era of SARS-CoV-2, the risk of infectious airborne aerosol generation during otolaryngologic procedures has been an area of increasing concern. The objective of this investigation was to quantify airborne aerosol production under clinical and surgical conditions and examine efficacy of mask mitigation strategies. STUDY DESIGN: Prospective quantification of airborne aerosol generation during surgical and clinical simulation. SETTING: Cadaver laboratory and clinical examination room. SUBJECTS AND METHODS: Airborne aerosol quantification with an optical particle sizer was performed in real time during cadaveric simulated endoscopic surgical conditions, including hand instrumentation, microdebrider use, high-speed drilling, and cautery. Aerosol sampling was additionally performed in simulated clinical and diagnostic settings. All clinical and surgical procedures were evaluated for propensity for significant airborne aerosol generation. RESULTS: Hand instrumentation and microdebridement did not produce detectable airborne aerosols in the range of 1 to 10 mum. Suction drilling at 12,000 rpm, high-speed drilling (4-mm diamond or cutting burs) at 70,000 rpm, and transnasal cautery generated significant airborne aerosols ($P < .001$). In clinical simulations, nasal endoscopy ($P < .05$), speech ($P < .01$), and sneezing ($P < .01$) generated 1- to 10-mum airborne aerosols. Significant aerosol escape was seen even with utilization of a standard surgical mask ($P < .05$). Intact and VENT-modified (valved endoscopy of the nose and throat) N95 respirator use prevented significant airborne aerosol spread. CONCLUSION: Transnasal drill and cautery use is associated with significant airborne particulate matter production in the range of 1 to 10 mum under surgical conditions. During simulated clinical activity, airborne aerosol generation was seen during nasal endoscopy, speech, and sneezing. Intact or VENT-modified N95 respirators mitigated airborne aerosol transmission, while standard surgical masks did not.

URL: https://www.ncbi.nlm.nih.gov/pubmed/32452739
DOI: 10.1177/0194599820931805

98. Workman AD, Welling DB, Carter BS, et al. Endonasal instrumentation and aerosolization risk in the era of COVID-19: simulation, literature review, and proposed mitigation strategies. Int Forum Allergy Rhinol. 2020;10(7):798-805. DOI: 10.1002/alr.22577

ABSTRACT: BACKGROUND: International experience with coronavirus 2019 (COVID-19) suggests it poses a significant risk of infectious transmission to skull base surgeons, due to high nasal viral titers and the unknown potential for aerosol generation during endonasal instrumentation. The purpose of this study was to simulate aerosolization events over a range of endoscopic procedures to obtain an evidence-based aerosol risk assessment. METHODS: Aerosolization was simulated in a cadaver using fluorescein solution (0.2 mg per 10 mL) and quantified using a blue-light filter and digital image processing. Outpatient sneezing during endoscopy was simulated using an intranasal atomizer in the presence or absence of intact and modified surgical mask barriers. Surgical aerosolization was simulated during nonpowered instrumentation, suction microdebrider, and high-speed drilling after nasal fluorescein application. RESULTS: Among the outpatient conditions, a simulated sneeze event generated maximal aerosol distribution at 30 cm, extending to 66 cm. Both an intact surgical mask and a modified VENT mask (which enables endoscopy) eliminated all detectable aerosol spread. Among the surgical conditions, cold instrumentation and microdebrider use did not generate detectable aerosols. Conversely, use of a high-speed drill produced significant aerosol contamination in all conditions tested. CONCLUSION: We confirm that aerosolization presents a risk to the endonasal skull base surgeon. In the outpatient setting, use of a barrier significantly reduces aerosol spread. Cold surgical instrumentation and microdebrider use pose significantly less aerosolization risk than a high-speed drill. Procedures requiring drill use should carry a special designation as an "aerosol-generating surgery" to convey this unique risk, and this supports the need for protective personal protective equipment.

URL: https://www.ncbi.nlm.nih.gov/pubmed/32243678
DOI: 10.1002/alr.22577

99. Xiao R, Workman AD, Puka E, et al. Aerosolization During Common Ventilation Scenarios. Otolaryngol Head Neck Surg. 2020;163(4):702-4. DOI: 10.1177/0194599820933595

ABSTRACT: Otolaryngologists are at increased risk for exposure to suspected aerosol-generating procedures during the ongoing coronavirus disease 2019 (COVID-19) pandemic. In the present study, we sought to quantify differences in aerosol generation during common ventilation scenarios. We performed a series of 30-second ventilation experiments on porcine larynx-trachea-lung specimens. We used an optical particle sizer to quantify the number of 1- to 10-microm particles observed per 30-second period (PP30). No significant aerosols were observed with ventilation of intubated specimens (10.8 +/- 2.4 PP30 vs background 9.5 +/- 2.1, P = 1.0000). Simulated coughing through a tracheostomy produced 53.5 +/- 25.2 PP30, significantly more than background (P = .0121) and ventilation of an intubated specimen (P = .0401). These data suggest that undisturbed ventilation and thus intubation without stimulation or coughing may be safer than believed. Coughing increases aerosol production, particularly via tracheostomy. Otolaryngologists who frequently manage patient airways and perform tracheostomy are at increased risk for aerosol exposure and require appropriate personal protective equipment, especially during the ongoing COVID-19 pandemic.

URL: https://www.ncbi.nlm.nih.gov/pubmed/32539661
DOI: 10.1177/0194599820933595

100. Yu YX, Sun L, Yao K, et al. Consideration and prevention of the aerosol transmission of 2019 novel coronavirus. [Chinese]. [Zhonghua yan ke za zhi] Chinese journal of ophthalmology. 2020;56(9):653-6.

ABSTRACT: This article was published ahead of print on the official website of Chinese Journal of Ophthalmology on March 14, 2020. Novel coronavirus pneumonia broke out and spread to the whole nation since December 2019. The fight against the virus is now at a critical stage. Previous epidemiological investigations and animal experiments suggested aerosol could perform as a virus transmitter. Based on the clinical observation, the possibility of aerosol transmission of 2019 novel coronavirus has aroused much attention. This article focuses on the feature of aerosol transmission and the pathogens involved in. We analyze the possibility of aerosol transmission of the novel coronavirus. Relevant strategies for preventing novel coronavirus pneumonia are established for the medical personnel and general public during their work or daily life. (Chin J Ophthalmol, 2020, 56:653-656).

URL: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=631256187

SEARCH STRATEGIES

Ovid MEDLINE(R) ALL <1946 to December 10, 2020>

#	Searches	Results
1	exp Coronavirus/ or exp Coronavirus Infections/	54813
2	((corona* or corono*) adj1 (virus* or viral* or virinae*)).ti,ab,kw,kf.	2480
3	(coronavirus* or coronovirus* or coronavirinae* or CoV).ti,ab,kw,kf.	57265
4	("2019-nCoV" or 2019nCoV or nCoV2019 or "nCoV-2019" or "COVID-19" or COVID19 or "CORVID-19" or CORVID19 or "WN-CoV" or WNCoV or "HCoV-19" or HCoV19 or "2019 novel*" or Ncov or "n-cov" or "SARS-CoV-2" or "SARSCoV-2" or "SARSCoV2" or "SARS-CoV2" or SARSCov19 or "SARS-Cov19" or "SARSCov-19" or "SARS-Cov-19" or Ncovor or Ncorona* or Ncorono* or NcovWuhan* or NcovHubei* or NcovChina* or NcovChinese* or SARS2 or "SARS-2" or SARScoronavirus2 or "SARS-coronavirus-2" or "SARScoronavirus	78697

	2" or "SARS coronavirus2" or SARScoronovirus2 or "SARS-coronovirus-2" or "SARScoronovirus 2" or "SARS coronovirus2").ti,ab,kw,kf.	
5	(respiratory* adj2 (symptom* or disease* or illness* or condition*) adj10 (Wuhan* or Hubei* or China* or Chinese* or Huanan*)).ti,ab,kw,kf.	566
6	(("seafood market*" or "food market*" or pneumonia*) adj10 (Wuhan* or Hubei* or China* or Chinese* or Huanan*)).ti,ab,kw,kf.	1730
7	((outbreak* or wildlife* or pandemic* or epidemic*) adj1 (Wuhan* or Hubei* or China* or Chinese* or Huanan*)).ti,ab,kw.	337
8	"severe acute respiratory syndrome*".ti,ab,kw,kf.	14695
9	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8	105292
10	limit 9 to dt=20200401-20210228	81794
11	*Aerosols/ or (AGMP or AGP or (aerosol* adj3 generat* adj3 procedur*)).ti. or (AGMP or AGP or (aerosol* adj3 generat* adj3 procedur*)).ab. /freq=2	11485
12	(aerosol* adj3 produc* adj3 procedur*).ti. or (aerosol* adj3 produc* adj3 procedur*).ab. /freq=2	3
13	(aerosol* adj3 generat* adj3 surg*).ti. or (aerosol* adj3 generat* adj3 surg*).ab. /freq=2	10
14	(aerosol* adj3 produc* adj3 surg*).ti. or (aerosol* adj3 produc* adj3 surg*).ab. /freq=2	2
15	11 or 12 or 13 or 14	11496
16	exp Disease Transmission, Infectious/ or (transmiss* or transmit* or infectiousness or infectivity or communicab* or contagious* or ((risk? or danger*) adj3 (infect* or spread* or contaminat* or contract* or expos*))).ab,ti,kf,kw.	704070
17	exp Environmental Exposure/ or exp Occupational Diseases/ or ((work* or occupation* or environment* or inhalation* or respirator*) adj3 (exposure* or risk? or danger* or harm* or hazard* or safe* or unsafe*)).ti,ab,kw,kf.	506849
18	16 or 17	1182096
19	10 and 15 and 18	145
20	remove duplicates from 19	141

Embase <1974 to 2020 December 10>

#	Searches	Results
1	exp Coronavirinae/ or exp Coronavirus infection/	33473
2	(coronavirus disease 2019 or severe acute respiratory syndrome	72336

	coronavirus 2).sh,dj.	
3	((corona* or corono*) adj1 (virus* or viral* or virinae*)).ti,ab,kw.	1931
4	(coronavirus* or coronovirus* or coronavirinae* or CoV).ti,ab,kw.	57555
5	("2019-nCoV" or 2019nCoV or nCoV2019 or "nCoV-2019" or "COVID-19" or COVID19 or "CORVID-19" or CORVID19 or "WN-CoV" or WNCoV or "HCoV-19" or HCoV19 or "2019 novel*" or Ncov or "n-cov" or "SARS-CoV-2" or "SARSCoV-2" or "SARSCoV2" or "SARS-CoV2" or SARSCov19 or "SARS-Cov19" or "SARSCov-19" or "SARS-Cov-19" or Ncovor or Ncorona* or Ncorono* or NcovWuhan* or NcovHubei* or NcovChina* or NcovChinese* or SARS2 or "SARS-2" or SARScoronavirus2 or "SARS-coronavirus-2" or "SARScoronavirus 2" or "SARS coronavirus2" or SARScoronovirus2 or "SARS-coronovirus-2" or "SARScoronovirus 2" or "SARS coronovirus2").ti,ab,kw.	75950
6	(respiratory* adj2 (symptom* or disease* or illness* or condition*) adj10 (Wuhan* or Hubei* or China* or Chinese* or Huanan*)).ti,ab,kw.	684
7	(("seafood market*" or "food market*" or pneumonia*) adj10 (Wuhan* or Hubei* or China* or Chinese* or Huanan*)).ti,ab,kw.	1986
8	((outbreak* or wildlife* or pandemic* or epidemic*) adj1 (Wuhan* or Hubei* or China* or Chinese* or Huanan*)).ti,ab,kw.	154
9	"severe acute respiratory syndrome*".ti,ab,kw.	14645
10	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9	110710
11	*Aerosols/ or (AGMP or AGP or (aerosol* adj3 generat* adj3 procedur*)).ti. or (AGMP or AGP or (aerosol* adj3 generat* adj3 procedur*)).ab. /freq=2	23962
12	(aerosol* adj3 produc* adj3 procedur*).ab,ti,kw.	44
13	(aerosol* adj3 generat* adj3 surg*).ab,ti,kw.	32
14	(aerosol* adj3 produc* adj3 surg*).ab,ti,kw.	12
15	11 or 12 or 13 or 14	24011
16	exp *disease transmission/ or (transmiss* or transmit* or infectiousness or infectivity or communicab* or contagious* or ((risk? or danger*) adj3 (infect* or spread* or contaminat* or contract* or expos*))).ti. or (transmiss* or transmit* or infectiousness or infectivity or communicab* or contagious* or ((risk? or danger*) adj3 (infect* or spread* or contaminat* or contract* or expos*))).ab. /freq=2	297198
17	((work* or occupation* or environment* or inhalation* or respirator*) adj3 (exposure* or risk? or danger* or harm* or hazard* or safe* or unsafe*)).ti,ab,kw.	186784
18	16 or 17	477113

19	10 and 15 and 18	189
20	limit 19 to conference abstract	2
21	19 not 20	187
22	limit 21 to yr="2020 -Current"	178
23	remove duplicates from 22	175

CINAHL Plus

S1	((MH "Coronavirus+" OR MH "Coronavirus Infections+") OR (TI coronavirus* OR corona-virus) OR (AB coronavirus* OR corona-virus)) AND ((TI wuhan or beijing or shanghai or Italy or South-Korea or China or Chinese or 2019-nCoV or nCoV or COVID-19 or Covid19 or SARS-CoV*) OR (AB wuhan or beijing or shanghai or Italy or South-Korea or China or Chinese or 2019-nCoV or nCoV or COVID-19 or Covid19 or SARS-CoV*))	(21,105)
S2	(TI coronavirus* OR corona-virus OR covid19 OR "covid 19" or SARS-Cov*) OR (((TI (novel OR new OR nouveau OR "2019") N2 (coronavirus* or corona virus*)) OR (AB (novel OR new OR nouveau OR "2019") N2 (coronavirus* or corona virus*)) AND ((MH "China+" OR (TI china OR Chinese) OR (AB china OR chinese) OR MH "Italy" OR (TI Italy OR AB Italy) OR MH "Korea" OR MH "South Korea" OR (TI korea OR AB korea)) OR ((MH "Pneumonia+" OR (TI pneumonia OR AB pneumonia)) AND (TI Wuhan OR AB Wuhan))	(12,689)
S3	((TI "COVID-19" OR "2019-nCoV" OR "SARS-CoV*" OR 2019-nCov OR 2019 coronavirus* OR 2019 corona virus* OR covid19) OR (AB "COVID-19" OR "2019-nCoV" OR "SARS-CoV*" OR 2019-nCov OR 2019 coronavirus* OR 2019 corona virus* OR covid19)) OR MH "Coronavirus+" OR MH "Coronavirus Infections+" OR (TI ((novel or new or nouveau or "2019") N2 (coronavirus* or corona virus* or pandemi*)) OR AB ((novel or new or nouveau or "2019") N2 (coronavirus* or corona virus* or pandemi*)))	(31,713)
S4	((TI "2019-nCov" OR "COVID-19" OR covid 19 OR "SARS-CoV-2" OR covid19) OR (AB "2019-nCov" OR "COVID-19" OR covid 19 OR "SARS-CoV-2" OR covid19)) OR ((TI (coronavirus* OR corona-virus*) AND (wuhan OR shanghai OR Beijing OR Italy OR south-korea OR china OR chinese)) OR (AB (coronavirus* OR corona-virus*) AND (wuhan OR shanghai OR Beijing OR Italy OR south-korea	(29,888)

	OR china OR chinese))	
S5	(TI (novel OR new OR nouveau OR "2019") N2 (coronavirus* or corona virus*)) OR (AB (novel OR new OR nouveau OR "2019") N2 (coronavirus* or corona virus*))	(5,780)
S6	S1 OR S2 OR S3 OR S4 OR S5	(34,271)
S7	(MM "Aerosols") OR TI ((AGMP or AGP or (aerosol* N3 generat* N3 procedur*))) OR AB ((AGMP or AGP or (aerosol* N3 generat* N3 procedur*))) OR TI (aerosol* N3 produc* N3 procedur*) OR AB (aerosol* N3 produc* N3 procedur*) OR TI (aerosol* N3 generat* N3 surg*) OR AB (aerosol* N3 generat* N3 surg*) OR TI (aerosol* N3 produc* N3 surg*) OR AB (aerosol* N3 produc* N3 surg*)	(1,965)
S8	(MH "Disease Transmission+") OR TI ((transmiss* or transmit* or infectiousness or infectivity or communicab* or contagious* or ((risk# or danger*) N3 (infect* or spread* or contaminat* or contract* or expos*)))) OR AB ((transmiss* or transmit* or infectiousness or infectivity or communicab* or contagious* or ((risk# or danger*) N3 (infect* or spread* or contaminat* or contract* or expos*)))) OR TI (((work* or occupation* or environment* or inhalation* or respirator*) N3 (exposure* or risk# or danger* or harm* or hazard* or safe* or unsafe*))) OR AB (((work* or occupation* or environment* or inhalation* or respirator*) N3 (exposure* or risk# or danger* or harm* or hazard* or safe* or unsafe*)))	(147,657)
S9	S6 AND S7 AND S8	(152)
S10	S6 AND S7 AND S8 **Limiters** - Published Date: 20200101-20201231	(142)

Keywords Used in Varying Combinations:

AGMP | AGM | "Aerosol Generating Procedures" | "Aerosol Generating Medical Procedures"

COVID | Coronavirus

Transmission | Infectivity | Infectiousness | Communicability | Occupational Risk | Occupational Exposure