

Helpful Literature for MAC Anesthesia in COVID Patients

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Nasal Microbial Dispersion

1. Simonds AK, et al. Evaluation of droplet dispersion during non-invasive ventilation, oxygen therapy, nebuliser treatment and chest physiotherapy in clinical practice: implications for management of pandemic influenza and other airborne infections. *Health Technol Assess*. 2010 Oct;14(46):131-172. doi: 10.3310/hta14460-02.

<https://www.ncbi.nlm.nih.gov/pubmed/20923611>

Evaluation of the characteristics of droplet/ aerosol dispersion around delivery systems during non-invasive ventilation (NIV), oxygen therapy, nebulizer treatment and chest physiotherapy. Results: NIV, O2 and physiotherapy are not aerosol-generating procedures. Physiotherapy and NIV generate large droplets (producing droplets of > 10 µm in size) adjacent to the patient, but these fall significantly at 1 meter from the patient due to their large mass. Nebulized saline delivered by a mouthpiece produces an aerosol of droplets, but most are in the expected droplet range for the device and large droplets were not seen in patients and coryzal subjects.

Recommendations: health-care workers providing NIV and chest physiotherapy, working within 1 meter of an infected patient should have a higher level of respiratory (droplet) protection, but not airborne precautions. These results may have infection control implications for other airborne infections, such as severe acute respiratory syndrome and tuberculosis, as well as for pandemic influenza infection.

2. Hui DS, Chow BK, Lo T, et al. Exhaled air dispersion during high-flow nasal cannula therapy versus CPAP via different masks. *Eur Respir J* 2019. DOI:

<https://doi.org/10.1183/13993003.02339-2018>.

Negligible leakage from traditional CPAP mask. Exhaled air dispersion from high-flow nasal cannula (HFNC) and CPAP is limited provided there is good mask interface fitting. However, exhaled air leakage to 620 mm laterally occurs when the connection between HFNC and the interface tube becomes loose.

3. Leung CC, Joynt GM, Gomersall CD, et al. Comparison of high-flow nasal cannula versus oxygen face mask for environmental bacterial contamination in critically ill pneumonia patients: a randomized controlled crossover trial. *J Hosp Infect* 2019; 101: 84-7.

<https://www.ncbi.nlm.nih.gov/pubmed/30336170>

Randomized controlled crossover non-inferiority trial (N = 20) evaluating the degree of environmental contamination by viable bacteria associated with the use of high-flow nasal cannula compared with conventional oxygen mask for critically ill patients with Gram-negative pneumonia. The results show that high-flow nasal cannula use was not associated with increased air or contact surface contamination by either Gram-negative bacteria or total

bacteria, suggesting that additional infection control measures are not required. (Note the study of bacterial, not viral, spread). No specific oxygen flow rate for conventional oxygen mask was given (titrated to O₂ sat >92%).

Recent Literature in COVID-19 Patients

1. World Health Organization. Clinical management of severe acute respiratory infection when novel coronavirus (2019-nCoV) infection is suspected. Interim guidance.

[https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-\(ncov\)-infection-is-suspected](https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected)

HFNC do not create wide-spread dispersion of exhaled air and therefore should be associated with low risk of transmission of respiratory viruses. This document also recommends wearing a standard medical face mask if the healthcare worker is within 2 meters of the patient and there is a physical bed separation of at least 1 meter.

For severe COVID-19 patients where oxygen therapy is needed, give supplemental oxygen with target >94%. Initiate oxygen therapy at 5 L/min and titrate flow rates to reach target SpO₂ ≥ 93% during resuscitation; or use face mask with reservoir bag (at 10–15 L/min) if patient in critical condition. Once patient is stable, the target is > 90% SpO₂ in non-pregnant adults and ≥ 92–95% in pregnant patients.

2. Loh, N.W., Tan, Y., Taculod, J. et al. The impact of high-flow nasal cannula (HFNC) on coughing distance: implications on its use during the novel coronavirus disease outbreak. *Can J Anesth/J Can Anesth* (2020).

<https://doi.org/10.1007/s12630-020-01634-3>

In healthy volunteers, cough-generated droplets spread to a mean distance of 2.48 meters at baseline and 2.91 meters with HFNC. Authors note embracing the potential of nosocomial airborne transmission and ensure HFNC devices are at least used in single occupancy rooms or negative pressure airborne isolation rooms when possible. Healthcare workers caring for those using HFNC should be wearing full airborne personal protective equipment (i.e., N95 mask or equivalent, gown, gloves, goggles, hair covers, and face shield or hoods).

3. Zhao S, et al. Anesthetic Management of Patients With Suspected or Confirmed 2019 Novel Coronavirus Infection During Emergency Procedures. *J Cardiothorac Vasc Anesth*. 2020 Feb 28. pii: S1053-0770(20)30197-X. doi: 10.1053/j.jvca.2020.02.039.

<https://www.ncbi.nlm.nih.gov/pubmed/32178954>

Retrospective, multicenter study from 4 hospitals in Wuhan, China over an 8 day period (37 patients total; 26 undergoing GA and 11 undergoing spinal anesthesia) to prevent cross-infection in the OR during emergent procedures for patients with confirmed or suspected 2019-

nCoV by following anesthesia management protocols, and to document clinical- and anesthesia-related characteristics of these patients.

Results: Cross-infection in the operating rooms of the 4 hospitals was effectively reduced by implementing the new measures and procedures. COVID 19-specific guidelines for emergency procedures for patients with confirmed or suspected 2019-nCoV may effectively prevent cross-infection in the operating room. Encouraged delaying surgery if suspicion for 2019-nCoV; if surgery was emergent, anesthesia equipment was single-use only, with thorough disinfection and sterilization of the OR afterward. No specific guidelines for MAC anesthesia.

4. American Society of Anesthesiologists Committee on Occupational Health
COVID-19 Resources for Anesthesiologists Clinical FAQs:

<https://www.asahq.org/about-asa/governance-and-committees/asa-committees/committee-on-occupational-health/coronavirus/clinical-faqs>

“If dispersion of potentially contaminated exhaled gases from an open airway (e.g. “MAC”) is a risk, consider alternate anesthesia plans. Potential contamination of your workspace and the room should be considered. The safety of you and your colleagues is paramount.”

For EGDs and procedures with “high risk of aerosolization,” take into context local COVID 19 risk profile for community spread in your area. ETTs provide most secure airway, but airway masks with apertures for gastroscopes such as the POM (Procedural Oxygen Mask—which we have in endoscopy at Stanford) may limit dispersion as an alternative when N95 supplies are low.

5. American Society of Anesthesiologists Committee on Occupational Health
COVID-19 Resources for Anesthesiologists Information for Health Care Professionals:

<https://www.asahq.org/about-asa/governance-and-committees/asa-committees/committee-on-occupational-health/coronavirus>

Postpone non-urgent surgical procedures until patient determined to be non-infectious or not infected. When possible, perform procedures in an airborne infection isolation room rather than in an operating room. If a procedure cannot be postponed or done at the bedside, then schedule the patient when a minimum number of healthcare workers and other patients are present in the surgical suite. If general anesthesia is not required, the patient should continue to wear the surgical mask.

6. Wax RS, Christian MD. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients. Can J Anesth 2020. DOI:

<https://doi.org/10.1007/s12630-020-01591-x>.

When wearing nasal prongs, a surgical mask can be worn by the patient over the prongs to reduce droplet spread. Should higher oxygen requirements necessitate use of a mask, non-rebreather masks with an attached exhalation filter can be used; however, the infection control efficacy of many mask/filter units has not been well evaluated, so must not lead to reduced

isolation and PPE practices. Use of HFNC should be limited to patients in appropriate airborne isolation. CPAP/BiPAP should be avoided in patients with 2019-nCoV and should never be used outside of appropriate airborne/droplet isolation.

Previous Literature in SARS Patients

1. Peng, P.W.H., Wong, D.T., Bevan, D. et al. Infection control and anesthesia: Lessons learned from the Toronto SARS outbreak. *Can J Anesth* 50, 989–997 (2003).

<https://doi.org/10.1007/BF03018361>

For non-SARS patients, standard precautions (gloves and surgical facemasks) for all patient contact in OR and PACU. For airway procedures in non-SARS patients, add goggles or a facemask.

For SARS patients, choice of anesthesia based on patient's needs; no specific directives. Full droplet/ contact precaution. Gown (double gown for high risk procedures), double glove. Remove and dispose of outer pair after direct patient contact and before touching other areas of the room/ anesthesia machine. Subsequent intervention must be performed with double gloves, N95 mask or equivalent, full-face disposable plastic shield for eye protection. PAPR required for staff member performing laryngoscopy or any other airway intervention (including extubation. Where possible, staff should stay a minimum of 2 meters from the patient to avoid droplet contamination. Laryngeal mask airways are permitted (and preferred, to reduce airway irritation), if appropriate.

2. Chee VW, Khoo ML, Lee SF, Lai YC, Chin NM. Infection control measures for operative procedures in severe acute respiratory syndrome-related patients. *Anesthesiology*. 2004 Jun;100(6):1394-8.

<https://anesthesiology.pubs.asahq.org/article.aspx?articleid=1974243>

Standard PPE, which comprised an N95 mask, a surgical cap, eye protection (goggles or face shield), a gown, and gloves, was mandatory for all patient contact. In addition, enhanced PPE, which comprised standard PPE, plus the use of shoe covers and a positive air-powered respirator, was required for all high-risk procedures in all patients and procedures in all high-risk patients. Patients in the unknown without contact history category were managed as low-risk patients requiring enhanced PPE only during high-risk procedures.