**Clinical Librarian Service Search Results**

**Request:** Is low flow oxygen via nasal cannulae considered aerosol generating, as far as it relates to viral transmission?

**Summary**

I have searched the databases listed at the end of this document and have found a number of evidence-based articles. I have organised the results into the following sections: [Reports and Guidance](#ReportsandGuidance), [COVID-19 Journal Articles](#COVID19JournalArticles) and [Non-COVID-19 Journal Articles](#NonCOVID19JournalArticles).

Consensus guidelines for managing the airway in patients with COVID-19 (Cook et al. 2020)2 state the following regarding ‘High‐flow and low‐flow nasal oxygen’:

*“There is much debate about the degree to which high‐flow nasal oxygen is aerosol‐generating and the associated risk of pathogen transmission. Older machines may expose staff to greater risk. The risk of bacterial transmission has been assessed as low, but* ***the risk of viral spread has not been studied****. There are other reasons not to use high‐flow nasal oxygen in a situation of mass illness and mass mechanical ventilation. First, it may simply delay tracheal intubation in those for whom treatment escalation is appropriate. Second, the very high oxygen usage risks depleting oxygen stores, which is a risk as a hospital's oxygen usage may increase many‐fold during an epidemic. For all these reasons, high‐flow nasal oxygen is not currently recommended for these patients around the time of tracheal intubation.*

*Low‐flow nasal oxygen (i.e. < 5 l.min−1 via normal nasal cannula) may provide some oxygenation during apnoea and might therefore delay or reduce the extent of hypoxaemia during tracheal intubation.* ***There is no evidence we are aware of regarding its ability to generate viral aerosols, but on balance of likelihood, considering the evidence with high‐flow nasal oxygen, this appears unlikely.*** *It is neither recommended nor recommended against during emergency tracheal intubation of patients who are likely to have a short safe apnoea time. In patients who are not hypoxaemic, without risk factors for a short safe apnoea time, and who are predicted to be easy to intubate, it is not recommended.”*

However, Whittle et al. (2020)4 state the following:

*“Supplemental oxygen by nasal cannula provides up to about 5–6 L/min of flow increasing fraction of inspired oxygen (FiO2) to approximately 45%. The actual FiO2 may be variable depending on the patient’s inspiratory peak flow. Limitations of flow in the tubing and entrainment of room air prevent higher effective oxygen concentrations regardless of the wall settings. Adequate humidification of the supplemental oxygen is needed to maintain mucociliary action.* ***While effective for mildly hypoxic patients, supplemental oxygen delivered by nasal cannula can induce significant dispersion of exhaled air, even at low flow rates****.* ***In studies using a high-fidelity human mannequin model, the reported maximal distance of exhaled air dispersion was 30 cm at 1 L/min, and 40 cm at 5 L/min (Figure 1)."***

Ferioli et al. (2020)5, in their article ‘Protecting healthcare workers from SARS-CoV-2 infection: practical indications’ state the following:

*“The risk of transmission of respiratory infections for healthcare workers depends on several conditions; some of them are nonspecific such as prolonged exposure, inadequate hand hygiene and personal protective equipment (PPE), insufficient spacing or rooms without negative pressure or insufficient air changes every hour [7]. In healthcare workers' clinical practice, another important variable to consider is the exhaled air dispersion distance during oxygen administration and ventilatory support.*

*All data relating to exhaled air dispersion during such procedures come from scientific studies conducted in a negative pressure room, on a high-fidelity human patient simulator (HPS) that represents a 70 kg adult male sitting on a 45° inclined hospital bed. Exhaled air dispersion distance from the HPS has been evaluated using a laser smoke visualisation method and calculated on the median sagittal plane. Table 1 shows the maximum dispersion distances, the medium values are as follows...****Oxygen therapy*via*nasal cannula****:* ***exhaled air spreads from the HPS's nostrils towards the end of the bed almost horizontally to 66 cm when the oxygen flow setting is 1 L·min−1, to 70 cm when it is increased to 3 L·min−1 and 1 m when it is 3–5 L·min−1****[8].”*

The World Health Organization (2020)1 states that:

*“HFNC and NIV devices carry a risk of aerosol generation and thus requiring airborne precautions by the health workers using them.”*

Technical information from the company, Vapotherm (2020)3 states:

*“With HVNI at 40 L∙min****-1****and the addition of a mask, 83.2% of the particle mass is captured and terminated in the mask. That is compared to 73.6% of the particle mass captured in the mask whilst on Low Flow Oxygen at 6 L∙min****-1****, and 87.2% for tidal breathing with a mask. It is important to note that the proportion of droplets (i.e., ≥ 5μm) which are captured in the mask over HVNI therapy is 85.9%, as compared to 75.9% while receiving Low Flow oxygen at 6 L∙min****-1****, and 89.9% performing tidal breathing. It is also important to note that the particles which escape the mask during HVNI have a longer travel length, with 15.9% of particles travel greater than 1m. That is compared to 6.9% on Low Flow oxygen at L∙min****-1****(which has fully 19.5% of particle mass lands and is trapped at <1m from the mask). Of note, if the patient is tidal breathing in the room, without therapy and without a surgical mask, 31% of particle mass leaving the nose and mouth will deposit greater than one meter from the face.”*

I hope that I have interpreted your request correctly. Please let me know if you would like me to search further.

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**Accessing Articles**

Links are provided where online access to the full text is available. An OpenAthens username and password may be required for online access to articles. You can register for one here: <https://openathens.nice.org.uk/>

Unfortunately there may occasionally be some problems accessing the links provided. In this case the items can be accessed via the Library Journals link: <http://journals.nice.org.uk/>. [Log in to OpenAthens via the link in the top tight-hand corner].

If the full text is not available, you can request an Inter-Library Loan freely and directly via our Inter-Library Loans system: CLIO. Register for CLIO (using your library membership number) at: [https://derbyill.cliohosting.co.uk](https://derbyill.cliohosting.co.uk/). Further information can be found at: <http://www.uhdblibrary.co.uk/ills>.

**Feedback**

Once you have read this report, I would appreciate it if you would complete our online literature search feedback form at:

<https://www.smartsurvey.co.uk/s/LiteratureSearchFeedback20202021/>

This relates to this specific search and will help us to monitor and improve our service. Many Thanks.

Suzanne Toft

Training Librarian (Chartered)

[suzanne.toft@nhs.net](mailto:suzanne.toft@nhs.net)

Ext. 88148

**Current at:** 16 April 2020

**Time taken for search:** 5 hours.

**Please acknowledge this work in any resulting paper or presentation as:**

Evidence Search: Is low flow oxygen via nasal cannulae considered aerosol generating, as far as it relates to viral transmission? Suzanne Toft. (16 April 2020). Derby, UK: University Hospitals of Derby & Burton NHS Foundation Trust Library and Knowledge Service.

**Disclaimer:** Please note that the information supplied by the Library and Knowledge Service in response to a literature search is for information purposes only.  Every reasonable effort will be made to ensure that this information is accurate, up-to-date and complete. However, it is possible that it may not be representative of the whole body of evidence. No responsibility can be accepted by the Library for any action taken on the basis of this information.

Guidance or information relating to specific drug queries or procedures should be referred to Medicines Information on RDH ext. 85379 or Burton ext. 5168 or 5101. For local UHDB guidelines and policies please refer to the red button on the Trust intranet, or [**https://derby.koha-ptfs.co.uk/cgi-bin/koha/opac-main.pl**](https://derby.koha-ptfs.co.uk/cgi-bin/koha/opac-main.pl)

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**Reports and Guidance**

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[Back to top](#_Summary)

1. **Oxygen sources and distribution for COVID-19 treatment centres Interim guidance**

**Date:** 4 April 2020

**Author:** World Health Organization

This interim guidance on oxygen sources and distribution strategies for COVID-19 treatment has been adapted from WHO and UNICEF’s technical specifications and guidance for oxygen therapy devices, which is part of the WHO medical device technical series. This guidance is intended for health facility administrators, clinical decision-makers, procurement officers, planning officers, biomedical engineers, infrastructure engineers and policy-makers. It describes how to quantify oxygen demand, identify oxygen sources that are available, and select appropriate surge sources to best respond to COVID-19 patients’ needs, especially in low-and-middle income countries.

**Database:** World Health Organization

1. **Consensus guidelines for managing the airway in patients with COVID-19: Guidelines from the Difficult Airway Society, the Association of Anaesthetists the Intensive Care Society, the Faculty of Intensive Care Medicine and the Royal College of Anaesthetists.**

**Author(s):** Cook, T M; El-Boghdadly, K; McGuire, B; McNarry, A F; Patel, A; Higgs, A

**Source:** Anaesthesia; Mar 2020

**Publication Date:** Mar 2020

**Publication Type(s):** Journal Article

**PubMedID:** 32221970

Available at [Anaesthesia](https://onlinelibrary.wiley.com/doi/full/10.1111/anae.15054) - from Wiley Online Library

Available at Anaesthesia - from University Hospitals of Derby and Burton NHS Foundation Trust Local Print Collection Print holdings: Latest five years: UHDB - Derby site. [Print holdings: 2000 - 2012 - UHDB - Burton site]

Available at [Anaesthesia](https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/anae.15054) - from Unpaywall

**Abstract:** Severe acute respiratory syndrome-corona virus-2, which causes coronavirus disease 2019 (COVID-19), is highly contagious. Airway management of patients with COVID-19 is high risk to staff and patients. We aimed to develop principles for airway management of patients with COVID-19 to encourage safe, accurate and swift performance. This consensus statement has been brought together at short notice to advise on airway management for patients with COVID-19, drawing on published literature and immediately available information from clinicians and experts. Recommendations on the prevention of contamination of healthcare workers, the choice of staff involved in airway management, the training required and the selection of equipment are discussed. The fundamental principles of airway management in these settings are described for: emergency tracheal intubation; predicted or unexpected difficult tracheal intubation; cardiac arrest; anaesthetic care; and tracheal extubation. We provide figures to support clinicians in safe airway management of patients with COVID-19. The advice in this document is designed to be adapted in line with local workplace policies.

**Database:** Medline

# COVID-19 Transmission Assessment Report: ****High Velocity Nasal Insufflation (HVNI) Therapy Application in Management of COVID-19****

**Authors:** Leonard, S., Volakis, L.I., DeBellis, R., Kahlon, A., MD, Mayar, S., Dungan II, G.C.

Available at <https://vapotherm.com/blog/transmission-assessment-report/>

**Executive Summary:** COVID-19 is a viral pneumonia which emerged in 2019 and reached Pandemic status by March 2020. The disease presents with a range of symptoms, up to profound hypoxemic respiratory failure. Management recommendations around the world call for the use of High Flow delivery of high flow oxygen – such as High Velocity Nasal Insufflation (HVNI). A caution with HVNI arose because of a concern for generation droplets and aerosols created or propelled by the therapy. Literature review shows 1) all respiratory therapy has potential to create aerosols, and 2) High Flow therapies, when properly applied, are low risk compared to NIPPV and airway management. Personal Protective Equipment (PPE) is essential with any respiratory therapy for COVID-19 patients. A surgical mask over the face during HVNI has been posited from experiences in China. A Computational Fluid Dynamic simulation shows that for HVNI therapy with a surgical mask in place over the patient’s face the percentage of particles which remain airborne or deposit on a surface further than the immediate area of the bed is similar to low flow oxygen with a mask or a patient breathing with no therapy wearing a mask. Leaks are greater with HVNI and can be associated with a small percentage of particle mass escape from the mask. Minimizing the mask leak is recommended to further reduce risk to the care giver.

**Source:** VAPOTHERM, INC. Science & Innovation

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**COVID-19 Journal Articles**

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[Back to top](#_Summary)

1. **Respiratory support for adult patients with COVID-19**

**Authors:** Whittle JS, Pavlov I, Sacchetti AD, Atwood C, Rosenberg MS.

**Source:** Journal of the American College of Emergency Physicians. Open Early View. First published: 02 April 2020. doi.org/10.1002/emp2.12071

Available at <https://onlinelibrary.wiley.com/doi/pdf/10.1002/emp2.12071>

**Abstract:** The COVID-19 pandemic is creating unique strains on the healthcare system. While only a small percentage of patients require mechanical ventilation and ICU care, the enormous size of the populations affected means that these critical resources may become limited. A number of non-invasive options exist to avert mechanical ventilation and ICU admission. This is a clinical review of these options and their applicability in adult COVID-19 patients. Summary recommendations include: (1) Avoid nebulized therapies. Consider metered dose inhaler alternatives. (2) Provide supplemental oxygen following usual treatment principles for hypoxic respiratory failure. Maintain awareness of the aerosol-generating potential of all devices, including nasal cannulas, simple face masks, and venturi masks. Use non-rebreather masks when possible. Be attentive to aerosol generation and the use of personal protective equipment. (3) High flow nasal oxygen is preferred for patients with higher oxygen support requirements. Noninvasive positive pressure ventilation may be associated with higher risk of nosocomial transmission. If used, measures special precautions should be used reduce aerosol formation. (4) Early intubation/mechanical ventilation may be prudent for patients deemed likely to progress to critical illness, multi-organ failure, or acute respiratory distress syndrome (ARDS).

**Database:** Wiley Online Library

1. **Protecting healthcare workers from SARS-CoV-2 infection: practical indications.**

**Author(s):** Ferioli, Martina; Cisternino, Cecilia; Leo, Valentina; Pisani, Lara; Palange, Paolo; Nava, Stefano

**Source:** European Respiratory Review: an official journal of the European Respiratory Society; Mar 2020; vol. 29 (no. 155)

**Publication Date:** Mar 2020

**Publication Type(s):** Journal Article

**PubMedID:** 32248146

Available at [European respiratory review: an official journal of the European Respiratory Society](http://err.ersjournals.com/lookup/doi/10.1183/16000617.0068-2020) - from HighWire - Free Full Text

Available at [European respiratory review: an official journal of the European Respiratory Society](https://err.ersjournals.com/content/errev/29/155/200068.full.pdf) - from Unpaywall

**Abstract:** The World Health Organization has recently defined the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection a pandemic. The infection, that may cause a potentially very severe respiratory disease, now called coronavirus disease 2019 (COVID-19), has airborne transmission via droplets. The rate of transmission is quite high, higher than common influenza. Healthcare workers are at high risk of contracting the infection particularly when applying respiratory devices such as oxygen cannulas or noninvasive ventilation. The aim of this article is to provide evidence-based recommendations for the correct use of "respiratory devices" in the COVID-19 emergency and protect healthcare workers from contracting the SARS-CoV-2 infection.

**Database:** PubMed

1. **Respiratory support for patients with COVID-19 infection**

**Author(s):** Namendys-Silva S.A.

**Source:** The Lancet Respiratory Medicine; Apr 2020; vol. 8 (no. 4)

**Publication Date:** Apr 2020

**Publication Type(s):** Letter

**PubMedID:** 32145829

Available at [The Lancet. Respiratory Medicine](https://auth.elsevier.com/ShibAuth/institutionLogin?entityID=https://idp.eng.nhs.uk/openathens&appReturnURL=https%3A%2F%2Fwww.clinicalkey.com%2Fcontent%2FplayBy%2Fdoi%2F%3Fv%3D10.1016%2FS2213-2600(20)30110-7) - from ClinicalKey

Available at [The Lancet. Respiratory Medicine](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7129706/) - from PubMed Central

Available at [The Lancet. Respiratory Medicine](https://www.ncbi.nlm.nih.gov/pubmed/32145829) - from PubMed

Available at [The Lancet. Respiratory Medicine](https://doi.org/10.1016/S2213-2600(20)30110-7) - from doi.org

Available at [The Lancet. Respiratory Medicine](https://doi.org/10.1016/s2213-2600(20)30110-7) - from Unpaywall

**First Lines:** As of Feb 27, 2020, coronavirus disease 2019 (COVID-19) has affected 47 countries and territories around the world. Xiaobo Yang and colleagues described 52 of 710 patients with confirmed COVID-19 admitted to an intensive care unit (ICU) in Wuhan, China. 29 (56%) of 52 patients were given non-invasive ventilation at ICU admission, of whom 22 (76%) required further orotracheal intubation and invasive mechanical ventilation. The ICU mortality rate among those who required non-invasive ventilation was 23 (79%) of 29 and among those who required invasive mechanical ventilation was 19 (86%) of 22.

Jonathan Chun-Hei Cheung and colleagues do not recommend use of a high-flow nasal cannula or non-invasive ventilation until the patient has viral clearance. Supporting the recommendation of the authors, I would like to add some points in relation to the use of high-flow nasal oxygen therapy and non-invasive ventilation in patients with COVID-19 infection…

**Database:** EMBASE

1. **Staff safety during emergency airway management for COVID-19 in Hong Kong.**

**Author(s):** Cheung JC; Ho LT; Cheng JV; Cham EYK; Lam KN

**Source:** The Lancet. Respiratory Medicine; 2020; vol. 8 (no. 4); p. e19

**Publication Date:** 2020

**Publication Type(s):** Letter

**PubMedID:** 32105633

Available at [The Lancet. Respiratory medicine](https://auth.elsevier.com/ShibAuth/institutionLogin?entityID=https://idp.eng.nhs.uk/openathens&appReturnURL=https%3A%2F%2Fwww.clinicalkey.com%2Fcontent%2FplayBy%2Fdoi%2F%3Fv%3D10.1016%2FS2213-2600(20)30084-9) - from ClinicalKey

Available at [The Lancet. Respiratory medicine](https://doi.org/10.1016/s2213-2600(20)30084-9) - from Unpaywall

**First Lines:** Medical professionals caring for patients with coronavirus disease 2019 (COVID-19) are at high risk of contracting the infection. Aerosol-generating procedures, such as non-invasive ventilation (NIV), high-flow nasal cannula (HFNC), bag-mask ventilation, and intubation are of particularly high risk. We hereby describe the approach of our local intensive care unit (North District Hospital, Sheung Shui, Hong Kong) to managing the risks to health-care staff, while maintaining optimal and high-quality care.

**Database:** PubMed

1. **[Clinical experience of high-flow nasal cannula oxygen therapy in severe corona virus disease 2019 (COVID-19) patients].**

**Author(s):** He, Guojun; Han, Yijiao; Fang, Qiang; Zhou, Jianying; Shen, Jifang; Li, Tong; Pu, Qibing; Chen, Aijun; Qi, Zhiyang; Sun, Lijun; Cai, Hongliu

**Source:** Zhejiang da xue xue bao. Yi xue ban = Journal of Zhejiang University. Medical sciences; May 2020; vol. 49 (no. 1); p. 0

**Publication Date:** May 2020

**Publication Type(s):** Journal Article

**PubMedID:** 32268019

**Abstract:** Acute respiratory failure due to acute hypoxemia is the major manifestation in severe coronavirus disease 2019 (COVID-19) induced by severe acute respiratory syndrome coronavirus 2 infection. Rational and effective respiratory support is crucial in the management of COVID-19 patients. High-flow nasal cannula (HFNC) has been utilized widely due to its superiority over other non-invasive respiratory support techniques. To avoid HFNC failure and intubation delay, the key issues are proper patients, timely application and improving compliance. It should be noted that elder patients are vulnerable for failed HFNC. We applied HFNC for oxygen therapy in severe and critical COVID-19 patients and summarized the following experiences. Firstly, to select the proper size of nasal catheter, to locate it at suitable place, and to confirm the nose and the upper respiratory airway unobstructed. Secondly, an initial flow of 60 L/min and 37℃ should be given immediately for patients with obvious respiratory distress or weak cough ability; otherwise, low-level support should be given first and the level gradually increased. Thirdly, to avoid hypoxia or hypoxemia, the treatment goal of HFNC should be maintained the oxygen saturation (SpO2) above 95% for patients without chronic pulmonary disease. Finally, patients should wear a surgical mask during HFNC treatment to reduce the risk of virus transmission through droplets or aerosols.

**Database:** Medline

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**Non-COVID-19 Journal Articles**

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[Back to top](#_Summary)

1. **Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: A systematic review**

**Author(s):** Tran K.; Cimon K.; Severn M.; Pessoa-Silva C.L.; Conly J.

**Source:** PLoS One; Apr 2012; vol. 7 (no. 4)

**Publication Date:** Apr 2012

**Publication Type(s):** Review

**PubMedID:** 22563403

Available at [PloS one](http://europepmc.org/search?query=(DOI:10.1371/journal.pone.0035797)) - from Europe PubMed Central - Open Access

Available at [PloS one](http://dx.plos.org/10.1371/journal.pone.0035797) - from Public Library of Science (PLoS)

Available at [PloS one](http://search.ebscohost.com/login.aspx?direct=true&scope=site&site=ehost-live&db=mdc&AN=22563403) - from EBSCO (MEDLINE Complete)

Available at [PloS one](http://gateway.proquest.com/openurl?ctx_ver=Z39.88-2004&res_id=xri:pqm&req_dat=xri:pqil:pq_clntid=145298&rft_val_fmt=ori/fmt:kev:mtx:journal&genre=article&issn=1932-6203&volume=7&issue=4&spage=e35797) - from ProQuest (Health Research Premium) - NHS Version

Available at [PloS one](https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0035797&type=printable) - from Unpaywall

**Abstract:** Aerosol generating procedures (AGPs) may expose health care workers (HCWs) to pathogens causing acute respiratory infections (ARIs), but the risk of transmission of ARIs from AGPs is not fully known. We sought to determine the clinical evidence for the risk of transmission of ARIs to HCWs caring for patients undergoing AGPs compared with the risk of transmission to HCWs caring for patients not undergoing AGPs. We searched PubMed, EMBASE, MEDLINE, CINAHL, the Cochrane Library, University of York CRD databases, EuroScan, LILACS, Indian Medlars, Index Medicus for SE Asia, international health technology agencies and the Internet in all languages for articles from 01/01/1990 to 22/10/2010. Independent reviewers screened abstracts using pre-defined criteria, obtained full-text articles, selected relevant studies, and abstracted data. Disagreements were resolved by consensus. The outcome of interest was risk of ARI transmission. The quality of evidence was rated using the GRADE system. We identified 5 case-control and 5 retrospective cohort studies which evaluated transmission of SARS to HCWs. Procedures reported to present an increased risk of transmission included [n; pooled OR(95%CI)] tracheal intubation [n = 4 cohort; 6.6 (2.3, 18.9), and n = 4 case-control; 6.6 (4.1, 10.6)], non-invasive ventilation [n = 2 cohort; OR 3.1(1.4, 6.8)], tracheotomy [n = 1 case-control; 4.2 (1.5, 11.5)] and manual ventilation before intubation [n = 1 cohort; OR 2.8 (1.3, 6.4)]. Other intubation associated procedures, endotracheal aspiration, suction of body fluids, bronchoscopy, nebulizer treatment, administration of O2, high flow O2, manipulation of O2 mask or BiPAP mask, defibrillation, chest compressions, insertion of nasogastric tube, and collection of sputum were not significant. Our findings suggest that some procedures potentially capable of generating aerosols have been associated with increased risk of SARS transmission to HCWs or were a risk factor for transmission, with the most consistent association across multiple studies identified with tracheal intubation. © 2012 Tran et al.

**Database:** EMBASE

1. **Aerosol Delivery Through an Adult High-Flow Nasal Cannula Circuit Using Low-Flow Oxygen.**

**Author(s):** Madney, Yasmin M; Fathy, Maha; Elberry, Ahmed A; Rabea, Hoda; Abdelrahim, Mohamed EA

**Source:** Respiratory Care; Apr 2019; vol. 64 (no. 4); p. 453-461

**Publication Date:** Apr 2019

**Publication Type(s):** Journal Article

**PubMedID:** 30670669

Available at [Respiratory care](http://rc.rcjournal.com/lookup/doi/10.4187/respcare.06345) - from HighWire 12 Month Embargo

**Abstract:** BACKGROUND: There has been a growing trend toward delivering aerosolized medications using high-flow nasal cannula (HFNC). In some cases, patients who do not require high-flow oxygen to maintain adequate oxygenation may benefit from aerosol delivery while receiving low-flow oxygen via HFNC. The objective of this study was to quantify and compare the relative pulmonary and systemic delivery of salbutamol, with 2 different nebulizers, in patients with COPD receiving low-flow oxygen therapy through an HFNC. METHODS: Subjects were randomized to receive study doses of 5 mg salbutamol nebulized by either a jet nebulizer or a vibrating mesh nebulizer with a T-piece or spacer on days 1, 3, and 5 of admission. Subjects using the large spacer also received 2 puffs (100 μg each) of salbutamol via a pressurized metered-dose-inhaler prior to the nebulizer dose. Urinary salbutamol excretion 30 min post-inhalation and pooled samples of urinary salbutamol excretion up to 24 h post-inhalation were measured. On day 2, ex vivo studies were performed with salbutamol collected on filters placed between the HFNC and nebulizer, with drug eluted from filters and analyzed to determine inhaled dose. RESULTS: Twelve subjects (6 females), age 51.3 ± 11.2 y, were included. The vibrating mesh nebulizer demonstrated higher urinary salbutamol excretion at 30 min and 24 h post-inhalation compared to a jet nebulizer (P = .001 and P = .02, respectively). No significant difference was found between the T-piece and large-spacer configurations, even though the spacer provided a significantly larger emitted aerosol dose at the opening of the HFNC (P = .002). CONCLUSIONS: Aerosolized medication could be efficiently combined with low-flow oxygen, via HFNC, in COPD subjects without the need to interrupt the gas supply. The vibrating mesh nebulizer delivered larger doses to subjects compared to the jet nebulizer. However, there was no benefit of using the large spacer with HFNC in low-flow delivery, because the small inner diameter of the HFNC does not allow larger aerosol droplet sizes (preserved by the spacer) to reach the subject.

**Database:** Medline

1. **Epidemic and Emerging Coronaviruses (Severe Acute Respiratory Syndrome and Middle East Respiratory Syndrome)**

**Author:** David S. Hui

**Source:** Clinics in Chest Medicine. 2017 Mar; 38(1): 71–86. Published online 2016 Dec 16. doi: 10.1016/j.ccm.2016.11.007

Available at<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7131795/>

**Abstract:** Bats are the natural reservoirs of severe acute respiratory syndrome (SARS)-like coronaviruses (CoVs) and likely the reservoir of Middle East respiratory syndrome (MERS)-CoV. The clinical features of SARS-CoV infection and MERS-CoV infection are similar but MERS-CoV infection progresses to respiratory failure more rapidly. Although the estimated pandemic potential of MERS-CoV is lower than that of SARS-CoV, the case fatality rate of MERS is higher. The transmission route and the possibility of other intermediary animal sources remain uncertain among many sporadic primary cases. Clinical trial options for MERS-CoV infection include monotherapy and combination therapy.

**Database:** PubMed

1. **Use of high-flow nasal cannula oxygenation in ICU adults: a narrative review.**

**Author(s):** Papazian, Laurent; Corley, Amanda; Hess, Dean; Fraser, John F; Frat, Jean-Pierre; Guitton, Christophe; Jaber, Samir; Maggiore, Salvatore M; Nava, Stefano; Rello, Jordi; Ricard, Jean-Damien; Stephan, François; Trisolini, Rocco; Azoulay, Elie

**Source:** Intensive Care Medicine; Sep 2016; vol. 42 (no. 9); p. 1336-1349

**Publication Date:** Sep 2016

**Publication Type(s):** Journal Article Review

**PubMedID:** 26969671

Available at [Intensive Care Medicine](http://search.ebscohost.com/login.aspx?direct=true&scope=site&site=ehost-live&db=mdc&AN=26969671) - from EBSCO (MEDLINE Complete)

Available at [Intensive Care Medicine](http://gateway.proquest.com/openurl?ctx_ver=Z39.88-2004&res_id=xri:pqm&req_dat=xri:pqil:pq_clntid=145298&rft_val_fmt=ori/fmt:kev:mtx:journal&genre=article&issn=0342-4642&volume=42&issue=9&spage=1336) - from ProQuest (Health Research Premium) - NHS Version

Available at [Intensive Care Medicine](https://hal.archives-ouvertes.fr/hal-01455634/file/2016%20Papazianet%20al.%2C%20Use%20of%20high%20flow.pdf) - from Unpaywall

**Abstract:** Oxygen therapy can be delivered using low-flow, intermediate-flow (air entrainment mask), or high-flow devices. Low/intermediate-flow oxygen devices have several drawbacks that cause critically ill patients discomfort and translate into suboptimal clinical results. These include limitation of the FiO2 (due to the high inspiratory flow often observed in patients with respiratory failure), and insufficient humidification and warming of the inspired gas. High-flow nasal cannula oxygenation (HFNCO) delivers oxygen flow rates of up to 60 L/min and over the last decade its effect on clinical outcomes has widely been evaluated, such as in the improvement of respiratory distress, the need for intubation, and mortality. Mechanisms of action of HFNCO are complex and not limited to the increased oxygen flow rate. The main aim of this review is to guide clinicians towards evidence-based clinical practice guidelines. It summarizes current knowledge about HFNCO use in ICU patients and the potential areas of uncertainties. For instance, it has been recently suggested that HFNCO could improve the outcome of patients with hypoxemic acute respiratory failure. In other settings, research is ongoing and additional evidence is needed. For instance, if intubation is required, studies suggest that HFNCO may help to improve preoxygenation and can be used after extubation. Likewise, HFNCO might be used in obese patients, or to prevent respiratory deterioration in hypoxemic patients requiring bronchoscopy, or for the delivery of aerosol therapy. However, areas for which conclusive data exist are limited and interventions using standardized HFNCO protocols, comparators, and relevant clinical outcomes are warranted.

**Database:** Medline

1. **A high-flow nasal cannula system set at relatively low flow effectively washes out CO2 from the anatomical dead space of a respiratory-system model**

**Author(s):** Onodera Y.; Akimoto R.; Suzuki H.; Masaki N.; Kawamae K.

**Source:** Korean Journal of Anesthesiology; Feb 2017; vol. 70 (no. 1); p. 105-106

**Publication Date:** Feb 2017

**Publication Type(s):** Letter

**PubMedID:** 28184277

Available at [Korean journal of anesthesiology](http://europepmc.org/search?query=(DOI:10.4097/kjae.2017.70.1.105)) - from Europe PubMed Central - Open Access

Available at [Korean journal of anesthesiology](http://ekja.org/upload/pdf/kjae-70-105.pdf) - from Unpaywall

**Database:** EMBASE

1. **Simultaneous administration of low flow nasal cannula oxygen support and pharmaceutical aerosols**

**Author(s):** Longest P.W.; Golshahi L.; Farkas D.; Tian G.; Behara S.R.B.; Hindle M.

**Source:** American Journal of Respiratory and Critical Care Medicine; 2015; vol. 191

**Publication Date:** 2015

**Publication Type(s):** Conference Abstract

**Abstract:** Rationale. The delivery of aerosols to the lungs through the nose can be convenient for medications that need continuous delivery, require frequent administration, have high doses, or need to be delivered during non-invasive ventilation. However, aerosols are typically not administered through low flow nasal cannula (LFNC) oxygen delivery systems due to expected poor lung delivery efficiency. A combination of spray dried excipient enhanced growth (EEG) particles together with a new inline dry powder inhaler DPI (figure below) and redesigned nasal cannula interfaces can potentially allow for concurrent LFNC oxygen therapy and efficient aerosol delivery to the lungs. Methods. Two submicrometer EEG dry powder formulations were produced using a spray drying technique containing albuterol sulfate or ciprofloxacin as the drug and a hygroscopic excipient (mannitol). A new inline DPI device was connected with 4 mm tubing to a new streamlined nasal cannula interface. The in vitro test system employed an adult nose-mouth-throat (NMT) geometry and either steady inhalation at 45 L/min or a transient sinusoidal breathing profile with an inhalation period of 2 s and a tidal volume of 750 ml. Drug aerosol characteristics, deposition, and lung delivery were assessed in vitro and optimized using computational fluid dynamics (CFD). Results. Optimization of the inline DPI with the albuterol formulation using a constant ventilatory gas flow of 5 L/min produced an emitted dose out of the cannula of 61.4% with a fine particle fraction (FPF) < 5 mum of 85.3%, indicating a very high quality aerosol. The corresponding deposition in the nasal cavity geometry at a constant inhalation of 45 L/min was 1.1%, which was desirable for high efficiency lung delivery of the aerosol. Using a cyclic respiratory profile and pulsing the ventilatory gas flow to actuate the inhaler for 2 s to coincide with inhalation maintained low NMT depositional loss (4.1%) but increased respiratory losses to the environment (19.8%) resulting in a lung delivery efficiency of 34.8% for the ciprofloxacin formulation. Subsequent CFD simulations indicated that limiting the DPI activation period to 1 s increased lung delivery to approximately 70%. Conclusions. Through a combination of particle engineering leading to EEG powder formulations, a new inline DPI, and redesigned low flow nasal cannula interface, aerosols can be effectively delivered to the lungs during the administration of LFNC oxygen therapy. The developed DPI can be simply connected inline while the patient receives LFNC oxygen support or operated intermittently to coincide with patient inhalation. (Figure Presented).

**Database:** EMBASE

1. **Mechanisms involved in electrospraying of macromolecules for micro-delivery**

**Author(s):** Tan Z.; Wang H.; Xie Z.; Tong C.; Liu B.; Tan Y.

**Source:** Journal of Controlled Release; Sep 2015; vol. 213

**Publication Date:** Sep 2015

**Publication Type(s):** Conference Abstract

**Abstract:** Electrospraying (ES) is of a great interest in development of biomaterials for controlled delivery [1]. By applying a suitable voltage to a conducting liquid supplied into a capillary, the liquid meniscus will take the form of a cone. Increasing the electric field on the surface of the liquid, which is intended to overcome the surface tension, facilitates the emergence of a controlledmicro-sized jet from the tip of the liquid cone, this is called the stable cone-jet mode [2]. The use of micro-sized fine nozzles allows the electrospray to operate at a low flow rate, which accordingly would make the delivery of small volumes and the fabrication of varied sized particles possible [3]. However, the efficiency of materials printing by ES still needs to be improved. This study investigated mechanisms involved in the electrospraying of biological macro-molecules. Hyaluronan (HA) solutions with concentrations ranging from 1 to 5 w/v % were prepared for spraying trials using nozzles with a size of 30 mum. In electrifying HA solutions with a high molecular weight of 2.1 MDa, controllable jets can be achieved only at a lowest concentration of 1 w/v %. Generally, further use of a sonication method to reduce the molecular size, stable cone jets can be obtained relatively easily than using HA solutions of higher concentrations. The improvement of spray stabilities can be attributed to the reduction in viscosity of the solutions after the sonication. Steady microsized jets were observed during the ES process and the jet size was found to increase with the increase of both the molecular size and the concentration. Both parameters can be directly ascribed to the rheological properties of the solutions. A concentration reduction of HA molecules also happens during electrospraying (Fig. 1), which indicates that there is a partial reflection of macromolecules inside the Taylor-cone with the fluid motions during the spraying process. The partial reflection process is affected by molecular sizes, solution concentrations and spraying time. This process would reduce the efficiency of materials printing, and needs to be considered for drug delivery and other applications. (Figure Presented).

**Database:** EMBASE

1. **Development and field testing of a miniaturized sampling system for simultaneous sampling of vapours and droplets**

**Author(s):** Breuer D.; Friedrich C.; Mohlmann C.; Dragan G.C.; Zimmermann R.

**Source:** Environmental Sciences: Processes and Impacts; Feb 2015; vol. 17 (no. 2); p. 278-287

**Publication Date:** Feb 2015

**Publication Type(s):** Article

**PubMedID:** 25503956

Available at [Environmental Sciences: Processes and Impacts](https://pubs.rsc.org/en/content/articlepdf/2015/em/c4em00602j) - from Unpaywall

**Abstract:** The sampling of semi volatiles (SV) in workplaces may lead to different results as measurements may be affected by sampling bias. The new European Standard EN 13936 defines "semi-volatiles" as substances with vapour pressures in the range between 0.001 and 100 Pa at room temperature. EN 13936 regulates the basic requirements for SV compounds that can occur as vapour and particle at the same time. Vapour and particles shall not be sampled separately and particles have to be sampled as inhalable fraction. Following EN 13936, the Institute for Occupational Safety and Health (Institut fur Arbeitsschutz-IFA) has developed a miniaturized droplet-vapour sampler (GGP-Mini) which is designed to sample the inhalable aerosol fraction at low flow rates. The GGP-Mini uses 13 mm filters for particle sampling combined with adsorption tubes for vapour sampling. Laboratory tests were performed on 11 polar and non-polar compounds in a boiling point range from 188 degreeC to 318 degreeC. The substances were spiked directly on the filter followed by aspiration of 40 litres of air. Substances with boiling points below 230 degreeC were almost completely evaporated. Substances with boiling points above 230 degreeC up to 300 degreeC were found on both filter and charcoal tube. Lower-volatile compounds remained almost completely on the filter. For polar substances, the atmospheric humidity had a considerable influence upon the distribution of the liquid and vaporous components. A strong influence of the sampling temperature was found in the range from 0 degreeC to 50 degreeC. Droplet-vapour mixtures of n-hexadecane and diethylene glycol with droplet sizes between 1 mum and 4 mum were generated in a flow tube to verify the laboratory results. The aerosol concentrations were analysed on-line with a particle sizer and a flame ionisation detector, while parallel off-line samples were taken with the GGP-Mini. Evaporation losses from filters could be studied by comparing the on-line with off-line measurements. All sampling simulations, both spiking and tests on a droplet aerosol, have shown that the distribution between vapour and droplets is not constant and influenced e. g. by volatility, concentration, temperature and humidity. Only the sum of vapour and droplets constitutes a reproducible result. This journal is Copyright © The Royal Society of Chemistry 2015.

**Database:** EMBASE

1. **Anisokinetic shrouded nozzle system for constant low-flow rate aerosol sampling from turbulent duct flow**

**Author(s):** Sippola M.R.; Nazaroff W.W.

**Source:** Aerosol Science and Technology; Jan 2014; vol. 48 (no. 1); p. 90-98

**Publication Date:** Jan 2014

**Publication Type(s):** Article

Available at [Aerosol Science and Technology](http://www.ingentaconnect.com/openurl?genre=article&issn=0278-6826&volume=48&issue=1&spage=90) - from IngentaConnect - Open Access

**Abstract:** An anisokinetic shrouded nozzle system was designed for sampling particles at a constant low flow rate from a ventilation duct to an aerodynamic particle sizer (APS). Shrouded anisokinetic nozzles are a means for sampling from a moving airstream with higher particle transmission than with unshrouded isokinetic nozzles. This shrouded nozzle sampling system was evaluated in an experimental ventilation duct system. Aspiration and transport efficiency measurements were made for five particle sizes in the range 1-13 mum at each of three duct air speeds in the range 2.2-8.8 m/s. Under these conditions, the shrouded nozzle system showed improved performance compared to buttonhook isokinetic nozzles, especially for larger particles and higher air speeds. Measured transmission efficiencies through the shrouded nozzle sampling system were generally higher and more reliably predictable than those through buttonhook isokinetic nozzles. Model predictions of transport and aspiration efficiencies of the shrouded nozzle system showed good agreement with measurements over the entire range of experimental conditions. The shrouded nozzle sampling system could be used to measure concentrations in ventilation ducts with an APS for particles in the diameter range 1-13 mum. Copyright © 2014 American Association for Aerosol Research.

**Database:** EMBASE

1. **Development of a two-stage virtual impactor system for high concentration enrichment of ultrafine, pm2.5, and coarse particulate matter**

**Author(s):** Wang D.; Kam W.; Cheung K.; Pakbin P.; Sioutas C.

**Source:** Aerosol Science and Technology; 2013; vol. 47 (no. 3); p. 231-238

**Publication Date:** 2013

**Publication Type(s):** Article

Available at [Aerosol Science and Technology](http://www.ingentaconnect.com/openurl?genre=article&issn=0278-6826&volume=47&issue=3&spage=231) - from IngentaConnect - Open Access

Available at [Aerosol Science and Technology](https://www.tandfonline.com/doi/pdf/10.1080/02786826.2012.744446?needAccess=true) - from Unpaywall

**Abstract:** A two-stage particle concentration enrichment system was developed to provide highly concentrated particles at low flow rates, for applications in areas such as toxicity studies of particulate matter (PM) as well as for increasing the signal-to-noise ratio in online particle sampling instruments. The current system is an extension of the Versatile Aerosol Concentration Enrichment System (VACES) developed at University of Southern California and operates by placing a second-stage miniature virtual impactor (VI) downstream of theVACES. Particles are sequentially enriched through each stage. Laboratory evaluations were conducted using various types of polydisperse particles to simulate typical ambient PM components as well as monodisperse polystyrene latex (PSL) particles. The system's configuration was tested by adjusting the intermediate flow rate, which is the intake flow of the second-stage VI (or minor flow of the first-stage VIs), for which 15 L/min was determined to be optimal in terms of maximizing the overall concentration enrichment. Particle size distributions before and after concentration enrichment were compared using a scanning mobility particle sizer. Overall, our results indicate that the sampled particles were relative consistently enriched by factors of 100-120 (i.e., a concentration enrichment efficiency 75-85% of the ideal value) based on both PM mass and number concentrations, and along with similar physical properties of the size distribution (i.e., mode, median). Continuous and time-integrated field tests using urban ambient PM also showed consistent enrichment factors (by roughly 100-120 times) for number and mass concentrations, black carbon, and PM-bound polycyclic aromatic hydrocarbons. Copyright © American Association for Aerosol Research.

**Database:** EMBASE

1. **Assessment of early screening methodology using the next generation and fast screen impactor systems**

**Author(s):** Hamilton M.; Daniels G.

**Source:** Journal of Aerosol Medicine and Pulmonary Drug Delivery; Aug 2013; vol. 26 (no. 4)

**Publication Date:** Aug 2013

**Publication Type(s):** Conference Abstract

Available at [Journal of Aerosol Medicine and Pulmonary Drug Delivery](http://pdfs.semanticscholar.org/452a/0cb2661e2a5390a6e736a5d9c0cab61139ba.pdf) - from Unpaywall

**Abstract:** Background: The Fast Screen Impactor (FSI) was evaluated and compared to the current standard Next Generation Impactor (NGI). Method(s): Experiment 1 used a FSI and a NGI with a critical flow controller. A Inhalation Profile Recorder (GSK) was used to record the pressure drop created between the device and the induction port throughout the test operating flow rate conditions. Experiment 2 investigated the significance of the difference in the ramp up phase of the profiles through replication of two patient representative (Asthmatic and COPD) inhalation profiles using the Electronic Lung (eLung). The selected patient profiles represented the range of peak pressure drop 1.6-13.8 kPa, and Peak Inspiratory Flow Rate (PIFR) 43.5-129.9 L/min. Result(s): Fine Particle Dose (FPD) was between 5 and 10% higher by FSI in comparison to both reduced (rNGI) and full Next Generation Impaction. Pressure drop vs time profiles recorded from the apparatus differed, in particular in the ramp up phase. Dose emission from Dry Powder Inhalers (DPIs) can potentially take place at very low flow rates and therefore early in the profile, often prior to PIFR having been achieved. Experiment 2 reported comparable FPD by FSI and NGI. Conclusion(s): Use of the eLung technology enabled separation of the flow profile influencing dose emission from the flow profile through the impactor. The FPD of the emitted dose in experiment 2 was comparable by FSI and NGI, confirming that the difference observed in the first experiment was due to the sharper ramp-up profile for the FSI apparatus.

**Database:** EMBASE

1. **Therapeutic aerosol particle deposition in compartments of the extra-thoracic airway: Comparison of in vivo and in vitro**

**Author(s):** Kalsi H.S.; Biddiscombe M.F.; Meah S.; Usmani O.S.

**Source:** Journal of Aerosol Medicine and Pulmonary Drug Delivery; Apr 2013; vol. 26 (no. 2)

**Publication Date:** Apr 2013

**Publication Type(s):** Conference Abstract

**Abstract:** Inhaled therapeutic aerosol particles must by-pass the extrathoracic airway (ETA) before reaching the lungs. Internal geometric differences between ETA sub-compartments result in different compartmental deposition patterns that contribute to local side effects while reducing lung deposition. Realistic ETA models can be used (in vitro) to forecast deposition in patients (in vivo). Radiolabelling and gamma-scintigraphy can quantify ETA deposition. 12 asthmatics (FEV1 = 76.8 % pred) inhaled radiolabelled b2- agonist aerosols of: 3- & 6-mum from spinning-top aerosol generator (STAG) at slow & fast flows (30- & 60-L/min). These experiments were repeated using simplified ETA models connected to STAG at mouth and suction pump at trachea base. ETA sub-compartments were defined: oral cavity, pharyngeal, laryngeal, trachea, and deposition quantified. Deposition (in vitro and in vivo) was similar in all compartments for 3 mum aerosol inhaled at low flow and for 3- and 6-mum (Figure Presented) aerosols inhaled at both flows in pharyngeal compartment. Oral deposition was significantly greater (p< 0.01) in models compared to patients for 6 mum aerosol at low flow, and both 3- and 6-mum aerosols inhaled at high flows. This deposition pattern was reversed in trachea. Laryngeal deposition for the 6 mum aerosol at both flow rates was greater in patients than models. Aerosol deposition within the sub-compartments of the ETA was comparable between the simplified models and patients in half of all the combined aerosol particle size and flow rate experiments. Deposition within the pharyngeal compartment was similar regardless of the combined effects of aerosol particle size and flow.

**Database:** EMBASE

1. **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.**

**Author(s):** Simonds, A K; Hanak, A; Chatwin, M; Morrell, Mj; Hall, A; Parker, K H; Siggers, J H; Dickinson, R J

**Source:** Health Technology Assessment (Winchester, England); Oct 2010; vol. 14 (no. 46); p. 131-172

**Publication Date:** Oct 2010

**Publication Type(s):** Research Support, Non-U.S. Gov't Journal Article

**PubMedID:** 20923611

Available at [Health technology assessment (Winchester, England)](https://njl-admin.nihr.ac.uk/document/download/2001958) - from Unpaywall

**Abstract:** BACKGROUND: Influenza viruses are thought to be spread by droplets, but the role of aerosol dissemination is unclear and has not been assessed by previous studies. Oxygen therapy, nebulised medication and ventilatory support are treatments used in clinical practice to treat influenzal infection are thought to generate droplets or aerosols. OBJECTIVES: Evaluation of the characteristics of droplet/aerosol dispersion around delivery systems during non-invasive ventilation (NIV), oxygen therapy, nebuliser treatment and chest physiotherapy by measuring droplet size, geographical distribution of droplets, decay in droplets over time after the interventions were discontinued. METHODS: Three groups were studied: (1) normal controls, (2) subjects with coryzal symptoms and (3) adult patients with chronic lung disease who were admitted to hospital with an infective exacerbation. Each group received oxygen therapy, NIV using a vented mask system and a modified circuit with non-vented mask and exhalation filter, and nebulised saline. The patient group had a period of standardised chest physiotherapy treatment. Droplet counts in mean diameter size ranges from 0.3 to > 10 µm were measured with an counter placed adjacent to the face and at a 1-m distance from the subject/patient, at the height of the nose/mouth of an average health-care worker. RESULTS: NIV using a vented mask produced droplets in the large size range (> 10 µm) in patients (p = 0.042) and coryzal subjects (p = 0.044) compared with baseline values, but not in normal controls (p = 0.379), but this increase in large droplets was not seen using the NIV circuit modification. Chest physiotherapy produced droplets predominantly of > 10 µm (p = 0.003), which, as with NIV droplet count in the patients, had fallen significantly by 1 m. Oxygen therapy did not increase droplet count in any size range. Nebulised saline delivered droplets in the small- and medium-size aerosol/droplet range, but did not increase large-size droplet count. CONCLUSIONS: NIV and chest physiotherapy are droplet (not aerosol)-generating procedures, producing droplets of > 10 µm in size. Due to their large mass, most fall out on to local surfaces within 1 m. The only device producing an aerosol was the nebuliser and the output profile is consistent with nebuliser characteristics rather than dissemination of large droplets from patients. These findings suggest that health-care workers providing NIV and chest physiotherapy, working within 1 m of an infected patient should have a higher level of respiratory protection, but that infection control measures designed to limit aerosol spread may have less relevance for these procedures. 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.

**Database:** Medline

1. **Airflows around oxygen masks: A potential source of infection?**

**Author(s):** Hui, David S; Ip, Margaret; Tang, Julian W; Wong, Alexandra L N; Chan, Matthew T V; Hall, Stephen D; Chan, Paul K S; Sung, Joseph J Y

**Source:** Chest; Sep 2006; vol. 130 (no. 3); p. 822-826

**Publication Date:** Sep 2006

**Publication Type(s):** Research Support, Non-u.s. Gov't Evaluation Study Journal Article

**PubMedID:** 16963681

Available at [Chest](http://ovidsp.ovid.com/athens/ovidweb.cgi?T=JS&PAGE=fulltext&D=ovft&CSC=Y&NEWS=N&SEARCH=0012-3692.is+and+%22130%22.vo+and+%223%22.ip+and+%22822%22.pg+or+%2210.1378/chest.130.3.822%22.di) - from Ovid (Journals @ Ovid) - Remote Access

Available at [Chest](http://gateway.proquest.com/openurl?ctx_ver=Z39.88-2004&res_id=xri:pqm&req_dat=xri:pqil:pq_clntid=145298&rft_val_fmt=ori/fmt:kev:mtx:journal&genre=article&issn=0012-3692&volume=130&issue=3&spage=822) - from ProQuest (Health Research Premium) - NHS Version

Available at [Chest](https://www.ncbi.nlm.nih.gov/pubmed/16963681) - from PubMed

Available at [Chest](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7094573/) - from PubMed Central

Available at [Chest](https://doi.org/10.1378/chest.130.3.822) - from doi.org

Available at [Chest](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7094573) - from Unpaywall

**Abstract:** Patients with respiratory infections often require the use of supplemental oxygen via oxygen masks, which, in the hospital, may become sources of aerosolized infectious pathogens. To assess this risk, a human lung model (respiration rate, 12 breaths/min) was designed to test the potential for a simple oxygen mask at a common setting (4 L/min) to disperse potentially infectious exhaled air into the surrounding area. A laser sheet was used to illuminate the exhaled air from the mask, which contained fine tracer smoke particles. An analysis of captured digital images showed that the exhaled air at the peak of simulated exhalation reached a distance of approximately 0.40 m.

**Database:** Medline

1. **Modified N95 mask delivers high inspired oxygen concentrations while effectively filtering aerosolized microparticles.**

**Author(s):** Mardimae, Alexandra; Slessarev, Marat; Han, Jay; Sasano, Hiroshi; Sasano, Nobuko; Azami, Takafumi; Fedorko, Ludwik; Savage, Tim; Fowler, Rob; Fisher, Joseph A

**Source:** Annals of Emergency Medicine; Oct 2006; vol. 48 (no. 4); p. 391

**Publication Date:** Oct 2006

**Publication Type(s):** Comparative Study Evaluation Study Journal Article

**PubMedID:** 16997675

**Abstract:** STUDY OBJECTIVE: In a pandemic, hypoxic patients will require an effective oxygen (O2) delivery mask that protects them from inhaling aerosolized particles produced by others, as well as protecting the health care provider from exposure from the patient. We modified an existing N95 mask to optimize O2 supplementation while maintaining respiratory isolation. METHODS: An N95 mask was modified to deliver O2 by inserting a plastic manifold consisting of a 1-way inspiratory valve, an O2 inlet and a gas reservoir. In a prospective repeated-measures study, we studied 10 healthy volunteers in each of 3 phases, investigating (1) the fractional inspiratory concentrations of O2 (F(I)O2) delivered by the N95 O2 mask, the Hi-Ox80 O2 mask, and the nonrebreathing mask during resting ventilation and hyperventilation, each at 3 O2 flow rates; (2) the ability of the N95 mask, the N95 O2 mask, and the nonrebreathing mask to filter microparticles from ambient air; and (3) to contain microparticles generated inside the mask. RESULTS: The F(I)O2s (median [range]) delivered by the Hi-Ox80 O2 mask, the N95 O2 mask, and the nonrebreathing mask during resting ventilation, at 8 L/minute O2 flow, were 0.90 (0.79 to 0.96), 0.68 (0.60 to 0.85), and 0.59 (0.52 to 0.68), respectively. During hyperventilation, the FiO2s of all 3 masks were clinically equivalent. The N95 O2 mask, but not the nonrebreathing mask, provided the same efficiency of filtration of internal and external particles as the original N95, regardless of O2 flow into the mask. CONCLUSION: An N95 mask can be modified to administer a clinically equivalent FiO2 to a nonrebreathing mask while maintaining its filtration and isolation capabilities.

**Database:** Medline

1. **Dispersal of respiratory droplets with open vs closed oxygen delivery masks: implications for the transmission of severe acute respiratory syndrome.**

**Author(s):** Somogyi, Ron; Vesely, Alex E; Azami, Takafumi; Preiss, David; Fisher, Joseph; Correia, Joe; Fowler, Robert A

**Source:** Chest; Mar 2004; vol. 125 (no. 3); p. 1155-1157

**Publication Date:** Mar 2004

**Publication Type(s):** Research Support, Non-U.S. Gov't Journal Article

**PubMedID:** 15006983

Available at [Chest](http://ovidsp.ovid.com/athens/ovidweb.cgi?T=JS&PAGE=fulltext&MODE=ovid&CSC=Y&NEWS=N&D=ovft&SEARCH=0012-3692.is+and+%22125%22.vo+and+%223%22.ip+and+%221155%22.pg) - from Ovid (Journals @ Ovid) - Remote Access

Available at [Chest](http://gateway.proquest.com/openurl?ctx_ver=Z39.88-2004&res_id=xri:pqm&req_dat=xri:pqil:pq_clntid=145298&rft_val_fmt=ori/fmt:kev:mtx:journal&genre=article&issn=0012-3692&volume=125&issue=3&spage=1155) - from ProQuest (Health Research Premium) - NHS Version

**Abstract:** Nosocomial transmission of droplet-borne respiratory infections such as severe acute respiratory syndrome (SARS) may be influenced by the choice of oxygen face mask. A subject inhaled saline mist and exhaled through three oxygen masks to illustrate the pattern of dispersal of pulmonary gas. In two commonly used masks, exhaled gas formed a plume emanating from the side vents, while a third mask with a valved manifold, which was modified by adding a respiratory filter, retained the droplets. Maintaining respiratory isolation during the administration of oxygen may reduce the risk of the nosocomial transmission of respiratory infections such as SARS.

**Database:** Medline

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[Back to top](#_Summary)

**Databases searched:**

* + **Guidance:** NICE Guidance, Scottish Intercollegiate Guidelines Network (SIGN) guidance, selected International Guidelines.
  + **Healthcare Databases:** MEDLINE, EMBASE, PubMed
  + **Other:** Google, World Health Organization, British Thoracic Society, Wiley Online Library.

**Local Guidance:** Local guidance has not been searched as part of this literature search. However, local guidelines, policies and procedures are available via the red button on the intranet.

**Search Terms:**

|  |  |
| --- | --- |
| ***Subject Headings*** | ***Free Text Words*** |
| exp AEROSOLS/ | aerosol |
| "EXPIRED AIR"/ | Coronavirus disease 2019 |
| \*"HIGH FLOW NASAL CANNULA"/ | COVID-19 |
| "NASAL CANNULA"/ | droplet |
| exp "OXYGEN INHALATION THERAPY"/ | generat\* |
| \*"OXYGEN NASAL CANNULA"/ | "high flow" |
| "OXYGEN THERAPY"/ | infect\* |
| "PROTECTIVE EQUIPMENT"/ | low-flow |
| exp "VIRUS DISEASES"/ | "low flow" |
|  | low flow |
|  | nasal |
|  | nasal cannula\* |
|  | normal flow |
|  | normal nasal |
|  | oxygen |
|  | SARS-CoV-2 |
|  | transmi\* |
|  | transmission |
|  | viral |
|  | virus |

**Search Limits:** No limits

**Search Date:** 15/04/2020

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[Back to top](#_Summary)