

Face Mask Information

Editor's foreword:

Although it is always possible to avoid them, face masks are "mandatory" in many areas. Interestingly enough, humans have evolved for hundreds of thousands of years to have completely smooth breathing paths. Note that no mammal has fur inside its mouth. Almost every living breathing (o₂ exchanging) animal has a clear breathing path.

Therefore, it stands to reason that breathing obstructions are likely dangerous, harmful, and antithetical to our overall pattern of evolution. One might respond that we have also evolved to not have fur, but that is not essential either, unless the human is in a very cold climate. Even in animals that have fur, it notably stops around the mouth.

How have humans evolved for hundreds of thousands (if not millions) of years to not need masks? If they were essential for our biological immune system, then why were they not required sooner? Remember that even clothes are not essential, and they also act as optional and modular depending on the climate and social requirements. Most mammals do have fur; it just varies depending on the average temperature of their environment, and it never obstructs their breathing.

Also, a large part of human communication is conveyed through non-verbal facial cues. An example of this would be a response of a smile or a frown, and the even more subtle facial expression responses while communicating with other humans.

Studies

5 NIH/National Library of Medicine studies from 2004-2020 all finding verifiable health effects from wearing a face mask, including scientifically verified reduction in blood oxygen level:

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Effect of a surgical mask on six minute walking distance

"Dyspnea variation was significantly higher with surgical mask (+5.6 vs. +4.6; P<0.001) and the difference was clinically relevant."

[EDITOR'S NOTE: Dyspnea is 'shortness of breath' or a person having trouble breathing]

Link - <https://pubmed.ncbi.nlm.nih.gov/29395560/>

Archive - <https://archive.is/Y7wwb#selection-2221.62-2221.193>

Exercise with facemask; Are we handling a devil's sword? [sic]

"Further contrary to the earlier thought, no evidence exists to claim the facemasks during exercise offer additional protection from the droplet transfer of the virus. "

Link - <https://pubmed.ncbi.nlm.nih.gov/32590322/>

Archive - <https://archive.is/bWbIR#selection-2181.1049-2181.1216>

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The physiological impact of wearing an N95 mask during hemodialysis as a precaution against SARS in patients with end-stage renal disease

"Wearing an N95 mask for 4 hours during HD significantly reduced PaO₂ and increased respiratory adverse effects in ESRD patients. "

Link - <https://pubmed.ncbi.nlm.nih.gov/15340662/>

Archive - <https://archive.is/Nlwkc#selection-2085.14-2085.147>

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Respiratory consequences of N95-type Mask usage in pregnant healthcare workers-a controlled clinical study

" Breathing through N95 mask materials have been shown to impede gaseous exchange and impose an additional workload on the metabolic system of pregnant healthcare workers, and this needs to be taken into consideration in guidelines for respirator use. "

Link - <https://pubmed.ncbi.nlm.nih.gov/26579222/>

Archive - <https://archive.is/Kdxh7#selection-2589.23-2591.264>

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Contamination by respiratory viruses on outer surface of medical masks used by hospital healthcare workers

"Respiratory pathogens on the outer surface of the used medical masks may result in self-contamination."

Link - <https://pubmed.ncbi.nlm.nih.gov/31159777/>

Archive - <https://archive.is/W2cuN>

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A cluster randomised trial of cloth masks compared with medical masks in healthcare workers

"This study is the first RCT of cloth masks, and the results caution against the use of cloth masks. This is an important finding to inform occupational health and safety. Moisture retention, reuse of cloth masks and poor filtration may result in increased risk of infection. Further research is needed to inform the widespread use of cloth masks globally."

Link - <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4420971/>

Archive - <https://archive.is/MHIFH>

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Facemasks and similar barriers to prevent respiratory illness such as COVID-19: A rapid systematic review

"The evidence is not sufficiently strong to support widespread use of facemasks as a protective measure against COVID-19."

Link - <https://www.medrxiv.org/content/10.1101/2020.04.01.20049528v1>

Archive - <https://archive.is/OpVAB>

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Physical interventions to interrupt or reduce the spread of respiratory viruses. Part 1 - Face masks, eye protection and person distancing: systematic review and meta-analysis

"Compared to no masks there was no reduction of influenza-like illness (ILI) cases (Risk Ratio 0.93, 95%CI 0.83 to 1.05) or influenza (Risk Ratio 0.84, 95%CI 0.61-1.17) for masks in the general population, nor in healthcare workers (Risk Ratio 0.37, 95%CI 0.05 to 2.50). "

Link - <https://www.medrxiv.org/content/10.1101/2020.03.30.20047217v2>

Archive - <https://archive.is/3jUOF#selection-1339.1292-1339.1562>

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Universal Masking in Hospitals in the Covid-19 Era

"We know that wearing a mask outside health care facilities offers little, if any, protection from infection."

Link - <https://www.nejm.org/doi/full/10.1056/NEJMp2006372>

Archive - <https://archive.is/sXfd1>

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N95 Respirators vs Medical Masks for Preventing Influenza Among Health Care PersonnelA Randomized Clinical Trial

Question Is the use of N95 respirators or medical masks more effective in preventing influenza infection among outpatient health care personnel in close contact with patients with suspected respiratory illness?

Findings In this pragmatic, cluster randomized clinical trial involving 2862 health care personnel, there was no significant difference in the incidence of laboratory-confirmed influenza among health care personnel with the use of N95 respirators (8.2%) vs medical masks (7.2%).

Meaning As worn by health care personnel in this trial, use of N95 respirators, compared with medical masks, in the outpatient setting resulted in no significant difference in the rates of laboratory-confirmed influenza.

Link - <https://jamanetwork.com/journals/jama/fullarticle/2749214>

Archive - <https://archive.is/KYAb>

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Effectiveness of N95 respirators versus surgical masks in protecting health care workers from acute respiratory infection: a systematic review and meta-analysis

Background: Conflicting recommendations exist related to which facial protection should be used by

health care workers to prevent transmission of acute respiratory infections, including pandemic influenza. We performed a systematic review of both clinical and surrogate exposure data comparing N95 respirators and surgical masks for the prevention of transmissible acute respiratory infections.

Methods: We searched various electronic databases and the grey literature for relevant studies published from January 1990 to December 2014. Randomized controlled trials (RCTs), cohort studies and case–control studies that included data on health care workers wearing N95 respirators and surgical masks to prevent acute respiratory infections were included in the meta-analysis.

Results: We identified 6 clinical studies (3 RCTs, 1 cohort study and 2 case–control studies) and 23 surrogate exposure studies. In the meta-analysis of the clinical studies, we found no significant difference between N95 respirators and surgical masks in associated risk of (a) laboratory-confirmed respiratory infection (RCTs: odds ratio [OR] 0.89, 95% confidence interval [CI] 0.64–1.24; cohort study: OR 0.43, 95% CI 0.03–6.41; case–control studies: OR 0.91, 95% CI 0.25–3.36); (b) influenza-like illness (RCTs: OR 0.51, 95% CI 0.19–1.41); or (c) reported workplace absenteeism (RCT: OR 0.92, 95% CI 0.57–1.50).

- <https://www.cmaj.ca/content/188/8/567> -

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The use of masks and respirators to prevent transmission of influenza: a systematic review of the scientific evidence

Discussion

None of the studies we reviewed established a conclusive relationship between mask/respirator use and protection against influenza infection.

Link - <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5779801/>

Archive - <https://archive.is/TDeD4>

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Use of surgical face masks to reduce the incidence of the common cold among health care workers in Japan: a randomized controlled trial

Background: Health care workers outside surgical suites in Asia use surgical-type face masks commonly. Prevention of upper respiratory infection is one reason given, although evidence of effectiveness is lacking.

Methods: Health care workers in a tertiary care hospital in Japan were randomized into 2 groups: 1 that wore face masks and 1 that did not. They provided information about demographics, health habits, and quality of life. Participants recorded symptoms daily for 77 consecutive days, starting in January 2008. Presence of a cold was determined based on a previously validated measure of self-reported symptoms. The number of colds between groups was compared, as were risk factors for experiencing cold symptoms.

Results: Thirty-two health care workers completed the study, resulting in 2464 subject days. There were 2 colds during this time period, 1 in each group. Of the 8 symptoms recorded daily, subjects in the mask group were significantly more likely to experience headache during the study period ($P < .05$). Subjects living with children were more likely to have high cold severity scores over the course of the study.

Conclusion: Face mask use in health care workers has not been demonstrated to provide benefit in terms of cold symptoms or getting colds. A larger study is needed to definitively establish noninferiority of no mask use.

Link - <https://pubmed.ncbi.nlm.nih.gov/19216002/>

Archive - <https://archive.is/1Hzxa>

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Comparison of Filtration Efficiency and Pressure Drop in Anti-Yellow Sand Masks, Quarantine Masks, Medical Masks, General Masks, and Handkerchiefs

Conclusion

Medical masks show no significant differences in penetration and pressure drop between inward tests (which mimic inhalation) and outward tests (which mimic exhalation). General masks and handkerchiefs have no protection function in terms of the aerosol filtration efficiency.

[EDITOR'S NOTE: Aerosol droplets are how respiratory viruses spread]

Link - <https://aaqr.org/articles/aaqr-13-06-0a-0201.pdf>

Archive -

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A cluster randomised trial of cloth masks compared with medical masks in healthcare workers

Conclusions

This study is the first RCT of cloth masks, and the results caution against the use of cloth masks. This is an important finding to inform occupational health and safety. Moisture retention, reuse of cloth masks and poor filtration may result in increased risk of infection. Further research is needed to inform the widespread use of cloth masks globally. However, as a precautionary measure, cloth masks should not be recommended for HCWs, particularly in high-risk situations, and guidelines need to be updated.

Link - <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4420971/>

Archive - <https://archive.is/MHIFH>

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Effectiveness of Masks and Respirators Against Respiratory Infections in Healthcare Workers: A Systematic Review and Meta-Analysis

Conclusion

This systematic review and meta-analysis supports the use of respiratory protection. However, the existing evidence is sparse and findings are inconsistent within and across studies.

Link - <https://academic.oup.com/cid/article/65/11/1934/4068747>

Archive - <https://archive.is/NghAW>

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Comparison of the Filter Efficiency of Medical Nonwoven Fabrics against Three Different Microbe Aerosols

Conclusion

In this study, we compared the filter efficiencies of medical nonwoven fabrics using aerosols containing three test microbes: the phi-X174 phage, influenza virus, and S. aureus. Among the

three types of spherical microbe particles, the filter efficiency against influenza virus particles (particle diameter of approximately 120 nm determined by DLS) was the lowest, and that against the phi-X174 phage (approximately 28 nm) was the highest for both sample 1 and 2. These findings suggest that the result of filter efficiency tests using the phi-X174 phage could be overestimated, compared with the filter efficiency against real pathogens such as the influenza virus.

Link - https://www.jstage.jst.go.jp/article/bio/23/2/23_61/_pdf/-char/en
Archive - <https://archive.is/ejDNN>

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Postoperative wound infections and surgical face masks: A controlled study

Abstract

It has never been shown that wearing surgical face masks decreases postoperative wound infections. On the contrary, a 50% decrease has been reported after omitting face masks. The present study was designed to reveal any 30% or greater difference in general surgery wound infection rates by using face masks or not.

Link - <https://link.springer.com/article/10.1007/BF01658736>
Archive - <https://archive.is/ALysm>

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Surgical face masks in modern operating rooms—a costly and unnecessary ritual?

Abstract

Following the commissioning of a new suite of operating rooms air movement studies showed a flow of air away from the operating table towards the periphery of the room. Oral microbial flora dispersed by unmasked male and female volunteers standing one metre from the table failed to contaminate exposed settle plates placed on the table. The wearing of face masks by non-scrubbed staff working in an operating room with forced ventilation seems to be unnecessary.

Link - [https://www.journalofhospitalinfection.com/article/0195-6701\(91\)90148-2/pdf](https://www.journalofhospitalinfection.com/article/0195-6701(91)90148-2/pdf) -
Archive - <https://archive.is/59aMo>

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Is a Mask Necessary in the Operating Theatre [Editor's note: 'operating theatre' refers to the operating room for surgery on patients]

Summary: No masks were worn in one operating theatre for 6 months. There was no increase in the evidence of wound infection.

Link - <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2493952/pdf/annrcse01509-0009.pdf>
Archive - <https://web.archive.org/web/20200717141836/>

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Link broken

<https://www.cidrap.umn.edu/news-perspective/2020/04/commentary-masks-all-covid-19-not->

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Rapid Expert Consultation on the Effectiveness of Fabric Masks for the COVID-19 Pandemic (April 8, 2020)

Objective:

The aim of this rapid expert consultation is to respond to your request concerning the effectiveness of homemade fabric masks worn by the general public to protect others, as distinct from protecting the wearer. The request stems from an interest in reducing transmission within the community by individuals who are infected, potentially contagious, but asymptomatic. Overall, the available evidence is inconclusive about the degree to which homemade fabric masks may suppress the spread of infection from the wearer to others.

Conclusion:

Bae et al. (2020) evaluated the effectiveness of surgical and cotton masks in filtering SARSCoV-2.10 They found that neither kind of mask reduced the dissemination of SARS-CoV-2 from the coughs of four symptomatic patients with COVID-19 to the environment and external mask surface.

Link - <https://www.nap.edu/catalog/25776/rapid-expert-consultation-on-the-effectiveness-of-fabric-masks-for-the-covid-19-pandemic>

Archive - <https://archive.is/kRDQB>

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Rapid Expert Consultation on the Effectiveness of Fabric Masks for the COVID-19 Pandemic

No public data available

Link - <https://www.nap.edu/read/25776/chapter/1#6>

Archive - <https://archive.is/mWXRZ>

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Nonpharmaceutical Measures for Pandemic Influenza in Nonhealthcare Settings —Personal Protective and Environmental Measures

Methods and Results

We conducted systematic reviews to evaluate the effectiveness of personal protective measures on influenza virus transmission, including hand hygiene, respiratory etiquette, and face masks, and a systematic review of surface and object cleaning as an environmental measure (Table 1). We searched 4 databases (Medline, PubMed, EMBASE, and CENTRAL) for literature in all languages.

Conclusion

Thumbnail of Meta-analysis of risk ratios for the effect of face mask use with or without enhanced hand hygiene on laboratory-confirmed influenza from 10 randomized controlled trials with >6,500 participants. A) Face mask use alone; B) face mask and hand hygiene; C) face mask with or without hand hygiene. Pooled estimates were not made if there was high heterogeneity (I² >75%). Squares indicate risk ratio for each of the included studies, horizontal lines indicate 95% CIs, dashed vertical

Figure 2. Meta-analysis of risk ratios for the effect of face mask use with or without enhanced hand hygiene on laboratory-confirmed influenza from 10 randomized controlled trials with >6,500 participants. A) Face mask...

In our systematic review, we identified 10 RCTs that reported estimates of the effectiveness of face masks in reducing laboratory-confirmed influenza virus infections in the community from literature published during 1946–July 27, 2018. In pooled analysis, we found no significant reduction in influenza transmission with the use of face masks

Link - https://wwwnc.cdc.gov/eid/article/26/5/19-0994_article

Archive - <https://archive.is/PTi7D>

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Simple Respiratory Protection—Evaluation of the Filtration Performance of Cloth Masks and Common Fabric Materials Against 20–1000 nm Size Particles

Description

A shortage of disposable filtering facepiece respirators can be expected during a pandemic respiratory infection such as influenza A. Some individuals may want to use common fabric materials for respiratory protection because of shortage or affordability reasons. To address the filtration performance of common fabric materials against nano-size particles including viruses, five major categories of fabric materials including sweatshirts, T-shirts, towels, scarves, and cloth masks were tested for polydisperse and monodisperse aerosols (20–1000 nm) at two different face velocities (5.5 and 16.5 cm s⁻¹) and compared with the penetration levels for N95 respirator filter media.

Conclusion

The results showed that cloth masks and other fabric materials tested in the study had 40–90% instantaneous penetration levels

Link - <https://academic.oup.com/annweh/article/54/7/789/202744>

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Optical microscopic study of surface morphology and filtering efficiency of face masks

Background

Low-cost face masks made from different cloth materials are very common in developing countries. The cloth masks (CM) are usually double layered with stretchable ear loops. It is common practice to use such masks for months after multiple washing and drying cycles. If a CM is used for long time, the ear loops become stretched. The loop needs to be knotted to make the mask loop fit better on the face. It is not clear how washing and drying and stretching practices change the quality of a CM. The particulate matter (PM) filtering efficiency of a mask depends on multiple parameters, such as pore size, shape, clearance, and pore number density. It is important to understand the effect of these parameters on the filtering efficiency.

Methods

We characterized the surface of twenty different types of CMs using optical image analysis method. The filtering efficiency of selected cloth face masks was measured using the particle counting method. We also studied the effects of washing and drying and stretching on the quality of a mask.

Results

The pore size of masks ranged from 80 to 500 μm , which was much bigger than particular matter having diameter of 2.5 μm or less (PM_{2.5}) and 10 μm or less (PM₁₀) size. The PM₁₀ filtering efficiency of four of the selected masks ranged from 63% to 84%. The poor filtering efficiency may have arisen from larger and open pores present in the masks. Interestingly, we found that efficiency dropped by 20% after the 4th washing and drying cycle. We observed a change in pore size and shape and a decrease in microfibers within the pores after washing. Stretching of CM surface also altered the pore size and potentially decreased the filtering efficiency. As compared to CMs, the less frequently used surgical/paper masks had complicated networks of fibers and much smaller pores in multiple layers in comparison to CMs, and therefore had better filtering efficiency. This study showed that the filtering efficiency of cloth face masks were relatively lower, and washing and drying practices

deteriorated the efficiency. We believe that the findings of this study will be very helpful for increasing public awareness and help governmental agencies to make proper guidelines and policies for use of face mask.

Link - <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6599448/>
Archive - <https://archive.is/21bKj>

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Effectiveness of Surgical and Cotton Masks in Blocking SARS–CoV-2: A Controlled Comparison in 4 Patients

Methods and Findings: The institutional review boards of 2 hospitals in Seoul, South Korea, approved the protocol, and we invited patients with COVID-19 to participate. After providing informed consent, patients were admitted to negative pressure isolation rooms. We compared disposable surgical masks (180 mm × 90 mm, 3 layers [inner surface mixed with polypropylene and polyethylene, polypropylene filter, and polypropylene outer surface], pleated, bulk packaged in cardboard; KM Dental Mask, KM Healthcare Corp) with reusable 100% cotton masks (160 mm × 135 mm, 2 layers, individually packaged in plastic; SeoulSa).

A petri dish (90 mm × 15 mm) containing 1 mL of viral transport media (sterile phosphate-buffered saline with bovine serum albumin, 0.1%; penicillin, 10 000 U/mL; streptomycin, 10 mg; and amphotericin B, 25 µg) was placed approximately 20 cm from the patients' mouths. Patients were instructed to cough 5 times each onto a petri dish while wearing the following sequence of masks: no mask, surgical mask, cotton mask, and again with no mask. A separate petri dish was used for each of the 5 coughing episodes. Mask surfaces were swabbed with aseptic Dacron swabs in the following sequence: outer surface of surgical mask, inner surface of surgical mask, outer surface of cotton mask, and inner surface of cotton mask.

The median viral loads of nasopharyngeal and saliva samples from the 4 participants were 5.66 log copies/mL and 4.00 log copies/mL, respectively. The median viral loads after coughs without a mask, with a surgical mask, and with a cotton mask were 2.56 log copies/mL, 2.42 log copies/mL, and 1.85 log copies/mL, respectively. All swabs from the outer mask surfaces of the masks were positive for SARS–CoV-2, whereas most swabs from the inner mask surfaces were negative (Table).

Objective: To evaluate the effectiveness of surgical and cotton masks in filtering SARS–CoV-2.

Discussion: Neither surgical nor cotton masks effectively filtered SARS–CoV-2 during coughs by infected patients.

Link - <https://www.acpjournals.org/doi/10.7326/M20-1342>
Archive - <https://archive.is/c8I2D>

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Effects of surgical and FFP2/N95 face masks on cardiopulmonary exercise capacity

Background

Due to the SARS-CoV2 pandemic, medical face masks are widely recommended for a large number of individuals and long durations. The effect of wearing a surgical and a FFP2/N95 face mask on cardiopulmonary exercise capacity has not been systematically reported.

Methods

This prospective cross-over study quantitated the effects of wearing no mask (nm), a surgical mask (sm) and a FFP2/N95 mask (ffpm) in 12 healthy males (age 38.1 ± 6.2 years, BMI 24.5 ± 2.0 kg/m²). The 36 tests were performed in randomized order. The cardiopulmonary and metabolic responses were monitored by ergo-spirometry and impedance cardiography. Ten domains of comfort/discomfort

of wearing a mask were assessed by questionnaire.

Results

The pulmonary function parameters were significantly lower with mask (forced expiratory volume: 5.6 ± 1.0 vs 5.3 ± 0.8 vs 6.1 ± 1.0 l/s with sm, ffp and nm, respectively; $p = 0.001$; peak expiratory flow: 8.7 ± 1.4 vs 7.5 ± 1.1 vs 9.7 ± 1.6 l/s; $p < 0.001$). The maximum power was 269 ± 45 , 263 ± 42 and 277 ± 46 W with sm, ffp and nm, respectively; $p = 0.002$; the ventilation was significantly reduced with both face masks (131 ± 28 vs 114 ± 23 vs 99 ± 19 l/m; $p < 0.001$). Peak blood lactate response was reduced with mask. Cardiac output was similar with and without mask. Participants reported consistent and marked discomfort wearing the masks, especially ffp.

Conclusion

Ventilation, cardiopulmonary exercise capacity and comfort are reduced by surgical masks and highly impaired by FFP2/N95 face masks in healthy individuals. These data are important for recommendations on wearing face masks at work or during physical exercise.

Link - <https://link.springer.com/article/10.1007/s00392-020-01704-y>

Archive - <https://archive.is/LhG9o>

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Adverse Effects of Prolonged Mask Use among Healthcare Professionals during COVID-19

Objective

Healthcare professionals report side effects of prolonged use of PPE when caring for COVID-19 patients. This study delves into various adverse effects of prolonged mask use and provides recommendations to ease the burden on healthcare professionals.

Methods

This is a cross sectional study among healthcare professionals, primarily located in New York City, who worked in the hospital during the COVID-19 pandemic. All respondents completed an anonymous survey consisting of twenty one questions regarding adverse effects of PPE, medical history, and demographics.

Results

A total of 343 healthcare professionals on the COVID-19 front lines participated in this study. The majority were female ($n = 315$) and 227 were located in New York City. 225 respondents identified as White, 34 as Hispanic, 23 as African American, and 61 as "other" ethnicity. 314 respondents reported adverse effects from prolonged mask use with headaches being the most common complaint ($n = 245$). Skin breakdown was experienced by 175 respondents, and acne was reported in 182 respondents. Impaired cognition was reported in 81 respondents. Previous history of headaches ($n = 98$), skin sensitivity ($n = 164$), and acne ($n = 121$) were found in some respondents. Some respondents experienced resolved side effects once masks were removed, while others required physical or medical intervention.

Conclusion

Prolonged use of N95 and surgical masks by healthcare professionals during COVID-19 has caused adverse effects such as headaches, rash, acne, skin breakdown, and impaired cognition in the majority of those surveyed. As a second wave of COVID-19 is expected, and in preparation for future pandemics, it is imperative to identify solutions to manage these adverse effects. Frequent breaks, improved hydration and rest, skin care, and potentially newly designed comfortable masks are recommendations for future management of adverse effects related to prolonged mask use.

Link - <https://clinmedjournals.org/articles/jide/journal-of-infectious-diseases-and-epidemiology-jide-6-130.php?jid=jide>

Archive - <https://archive.is/5uEQI>

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Preliminary report on surgical mask induced deoxygenation during major surgery

Objectives

This study was undertaken to evaluate whether the surgeons' oxygen saturation of hemoglobin was affected by the surgical mask or not during major operations.

Methods

Repeated measures, longitudinal and prospective observational study was performed on 53 surgeons using a pulse oximeter pre and postoperatively.

Results

Our study revealed a decrease in the oxygen saturation of arterial pulsations (SpO₂) and a slight increase in pulse rates compared to preoperative values in all surgeon groups. The decrease was more prominent in the surgeons aged over 35.

Conclusions

Considering our findings, pulse rates of the surgeon's increase and SpO₂ decrease after the first hour. This early change in SpO₂ may be either due to the facial mask or the operational stress. Since a very small decrease in saturation at this level, reflects a large decrease in PaO₂, our findings may have a clinical value for the health workers and the surgeons.

link - <https://www.sciencedirect.com/science/article/abs/pii/S1130147308702355> -

archive - <https://archive.is/eOjb6>

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Ryan Christian of TLAV, the man who collected all these papers:

- <https://www.thelastamericanvagabond.com> -

- <https://www.bitchute.com/channel/24yVcta8zEjY/> -

go to https://hexagod.net/masks_detail_studies.html for links in this document