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SYNOPSIS

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Review of "Rapid review on the characteristics of effective non-medical face masks in reducing the risk of SARS-CoV-2 transmission"

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One-Minute Summary

- This rapid review examined the evidence on the characteristics and efficacy of non-medical masks in reducing severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission.
- **Primary findings of the rapid review:**
  - Experimental simulation studies have found that non-medical masks were more effective for source control (i.e., preventing the spread of SARS-CoV-2 if worn by an infectious person) than preventing infections in the person wearing the mask.
  - Non-medical masks reduced the distance respiratory droplets travelled during indoor talking, coughing and sneezing.
  - The filtration efficiency of non-medical face masks (with variable designs and fabrics) ranged from less than 10% to more than 95% in 42 studies.
  - The efficacy of non-medical masks depended on: 1) filtration efficiency, 2) breathability, and 3) fit.
    - When non-medical masks were made from high quality fabrics consisting of multiple layers and snug fit, they reduced the expulsion of respiratory droplets, although to a lesser extent than medical masks.
- **The characteristics of non-medical masks that reduced the risk of spreading or contracting SARS-CoV-2 included:**
  - Tight-fitting, double-layer masks with different material types (e.g., combed cotton and polyester) or masks made from one type of material but with greater than 2 layers exhibited similar source reduction efficiencies as medical masks (>90%). Loose-fitting non-medical masks reduced filtration effectiveness by more than 50% in some studies.
  - Multiple-layer non-medical masks improved filtration efficiency, but masks with more than three layers reduced breathability.
  - Fabrics should be of high-quality and tightly woven, including hydrophobic fabrics (e.g., polyester, spunbound polypropylene, polyaramid); fabrics that can capture charged particles (e.g., polyester, silk); or fabrics with hydrophilic properties that increase comfort

and longevity (e.g., cotton). The filtration efficiencies of most household fabrics were higher for larger, low-velocity respiratory droplets.
    - A triple-layered mask made of a hydrophobic exterior, blended non-woven fabric middle, and hydrophilic interior was the ideal combination for source reduction and potential infection prevention.
- The authors stated that "The existing research on how effective non-medical masks are is of low quality and results will likely change with additional research".

Additional Information

- The authors included 54 primary research articles in their rapid review. Twenty-two studies investigated non-medical masks as source control and 37 studies investigated how non-medical masks can prevent infection. Studies used human volunteers (n=15), manikins (n=15), filter-holders (n=34) and animal models (n=1). Of note, filter holder studies use fabric samples mounted in place by a filter holder and do not take fit of a human face into account.
- Non-medical masks, whether homemade or manufactured, are not considered personal protective equipment since they do not undergo standardized testing. Non-medical masks are not recommended for use by healthcare professionals and those with an increased risk of infection where physical distancing cannot be maintained.
- **Fabrics and designs to avoid in non-medical face masks:**
    - Avoid using vacuum cleaner bags as fabric, as they may contain harmful ingredients and fibers.
    - Avoid loosely-folded face masks, bandana-style face masks, and single-layered neck gaiters, as they do not effectively block respiratory droplets.
    - Avoid respirators with an exhalation valve, as these masks are not effective for source control.
- **Limitations:**
    - The majority of included studies were experimental and used non-human models. None of the studies identified how effective specific types of non-medical masks are in real-world settings.
    - The types and composition of non-medical masks used in the included studies, along with variability in fit and methodologies, made comparisons among studies difficult.
    - Studies that examined filtration efficiency used a variety of methods that targeted a wide variety of droplet sizes (<1 to >5 µm in diameter) using artificial materials. This variability made it difficult to compare filtration efficiencies between studies.

PHO Reviewer's Comments

- The evidence comparing non-medical masks to medical grade masks is limited to experimental studies evaluating filtering efficiency and is not based on clinical or real-world settings. The clinical data on public mask-wearing has been reviewed separately.[1]
- The body of evidence supports mask-wearing in public as effective for source control with possible synergistic effects for infection prevention if both the source and contact are appropriately wearing well-fitted non-medical masks.
- Experimental data supports higher quality masks, such as 3-layer non-medical masks or medical grade masks, as providing superior filtering efficiency. By inference, this may reduce the potential for transmission.

- Variants of Concern (VOC) have emerged in Ontario which have been associated with increased transmissibility. At the time of posting no studies have evaluated the relative effectiveness of different mask types in mitigating transmission from SARS-CoV-2 VOCs.[2]

References

1. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Wearing masks in public and COVID-19 – what we know so far [Internet]. Toronto, ON: Queen's Printer for Ontario; 2020 [cited 2021 Feb 02]. Available from: https://www.publichealthontario.ca/-/media/documents/ncov/covid-wwksf/what-we-know-public-masks-apr-7-2020.pdf?la=en

2. Ontario Agency for Health Protection and Promotion (Public Health Ontario). COVID-19 UK variant VOC-202012/01 – what we know so far [Internet]. Toronto, ON: Queen's Printer for Ontario; 2020 [cited 2021 Feb 02]. Available from: https://www.publichealthontario.ca/-/media/documents/ncov/covid-wwksf/2020/12/what-we-know-uk-variant.pdf?la=en

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