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

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CRD summary
The review concluded that there was a limited evidence base to support the use of masks and/or respirators in healthcare or community settings as protection against influenza infection. The review was generally well conducted, and although the evidence was limited and of poor quality, the authors' conclusions were appropriately cautious and can be considered reliable.

Authors' objectives
To assess the effectiveness of masks and respirators in reducing the transmission of influenza.

Searching
PubMed was searched up to January 2011. Bandolier, The Cochrane Library, DARE, HTA database, NHS EED, UK DUETS and CINAHL were searched up to November 2009; search terms were reported. The reference lists of reviews, the European Centre for Disease Prevention and Control's Antimicrobial Resistance and Health Care Associated Infection Programme and the hardcopy files of two authors were also searched. Searches were restricted to studies written in the English language.

Study selection
Randomised controlled trials (RCTs), quasi-experimental and observational studies with available abstracts in a healthcare or community setting were eligible for inclusion in the review. Studies were required to include laboratory confirmed or clinically diagnosed influenza or other viral respiratory infections. Other respiratory viruses were included as a proxy for influenza. Case series and reports, mathematical modelling studies, laboratory studies and reviews were excluded. Studies were also excluded if the effects of mask use couldn't be distinguished from other personal protective equipment or if quantitative data were not available.

Three randomised controlled trials were hospital based and five were conducted in community settings. Seven observational studies were conducted amongst healthcare workers and two were community based. Randomised controlled trials assessed the effects of interventions on influenza or other respiratory viruses and the observational studies all assessed effects on severe acute respiratory syndrome (SARS). In the randomised controlled trials, use of masks/respirator with or without hand hygiene, washing or sanitiser was compared with control and/or respirators. Controls included education, no masks or hand hygiene alone. Several studies did not have microbiological confirmation of cases and controls. Most studies used self-report outcome measures. Studies were conducted in Japan, China/Hong Kong, Canada, USA and Australia.

Two reviewers scanned titles of studies for relevance and four reviewers independently selected studies for the review from the abstracts of potentially relevant studies.

Assessment of study quality
Studies were assessed for quality using the Critical Appraisal Skills Programme tools for RCTs, case control and cohort studies; criteria included randomisation, blinding, description of exposure, compliance, measurement of the outcome, contamination and power.

Two reviewers assessed the quality of the studies.

Data extraction
Data were extracted on the outcomes, according to how these were measured in the individual studies.

Two reviewers extracted data and these were checked by two additional reviewers, with any differences resolved by consensus.
Methods of synthesis
The results of the studies were described narratively in separate subgroups according to study design: randomised controlled trials and observational studies.

Results of the review
Seventeen studies (eight RCTs and nine observational studies) were included in the review. Four of the RCTs randomised individuals (3,356 participants) and four randomised households (1,367 households); randomisation was either by blocks or clusters and one study was a non-inferiority study. Eight retrospective observational studies (2,869 participants, sample sizes ranging from 85 to 990) had a case control design and one (43 participants) was a retrospective cohort study. As microbiological confirmation was not often performed, recall bias in most case control studies was considered likely.

RCTs: Six of eight RCTs reported no significant differences between control and intervention groups in the rates of influenza or other respiratory infections. One RCT reported that combined mask wearing and hand sanitiser use significantly reduced secondary transmission of respiratory infection or influenza compared with education or hand sanitiser alone in crowded households. Another hospital based RCT reported a significantly lower rate of clinical respiratory illness associated with N95 respirator use compared with medical masks.

Observational studies: Eight of nine observational studies reported that mask and/or respirator use was independently associated with a reduced risk of severe acute respiratory syndrome.

Authors’ conclusions
There was a limited evidence base to support the use of masks and/or respirators in healthcare or community settings as protection against influenza infection.

CRD commentary
The review addressed a clear research question. Inclusion criteria were appropriate, although these were broadened to include other respiratory viruses as a proxy for influenza. A wide range of sources was searched but eligible studies were written in English, so it was possible some studies may have been missed. Appropriate methods were used to select studies, extract data and assess studies for quality, which minimised the chance of reviewer error or bias.

A valid tool was used for quality assessment; the authors discussed limitations of each study in tabular format and concluded that, due to methodological weaknesses, interpretation of the results was not clear. The authors acknowledged the limited use of the observational studies for guiding policy on influenza. The included studies varied widely in study design, pathogens, participants, interventions and likelihood of bias and confounding. Synthesis of the study results in narrative format was appropriate; the authors summarised the findings by noting the proportion of studies that reported significant findings for each broad study design.

The review was generally well conducted and the authors’ conclusions appropriately cautious. Although the evidence base was limited and of poor quality, the conclusions can be considered reliable.

Implications of the review for practice and research
Practice: The authors stated that the evidence on transmissibility of the influenza virus was limited and conflicting. They noted that limiting transmission of influenza required a multifaceted approach, of which masks and respirators were only one component; administrative and environmental/engineering controls and personal protective equipment and hand hygiene were also needed. The practical implications of recommendations on mask/respirator use within the healthcare setting should also be considered.

Research: The authors stated that continued research on the effectiveness of masks and/or respirator use was an urgent priority. Carefully designed observational studies, ideally conducted outside a crisis situation, of adequate power, an appropriate control group and microbiologically proven influenza infection as an outcome were needed. The authors suggested that sufficient power might be achieved through large multicentre trials with similar protocols in different sites for multiple years.

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