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Physical interventions to interrupt or reduce the spread of respiratory viruses

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ABSTRACT

Background

Viral epidemics or pandemics of acute respiratory infections like influenza or severe acute respiratory syndrome pose a global threat. Antiviral drugs and vaccinations may be insufficient to prevent their spread.

Objectives

To review the effectiveness of physical interventions to interrupt or reduce the spread of respiratory viruses.

Search methods

We searched *The Cochrane Library*, the Cochrane Central Register of Controlled Trials (CENTRAL 2010, Issue 3), which includes the Acute Respiratory Infections Group's Specialised Register, MEDLINE (1966 to October 2010), OLDMEDLINE (1950 to 1965), EMBASE (1990 to October 2010), CINAHL (1982 to October 2010), LILACS (2008 to October 2010), Indian MEDLARS (2008 to October 2010) and IMSEAR (2008 to October 2010).

Selection criteria

In this update, two review authors independently applied the inclusion criteria to all identified and retrieved articles and extracted data. We scanned 3775 titles, excluded 3560 and retrieved full papers of 215 studies, to include 66 papers of 67 studies. We included physical interventions (screening at entry ports, isolation, quarantine, social distancing, barriers, personal protection, hand hygiene) to prevent respiratory virus transmission. We included randomised controlled trials (RCTs), cohorts, case-controls, before-after and time series studies.

Data collection and analysis

We used a standardised form to assess trial eligibility. We assessed RCTs by randomisation method, allocation generation, concealment, blinding and follow up. We assessed non-RCTs for potential confounders and classified them as low, medium and high risk of bias.

Main results

We included 67 studies including randomised controlled trials and observational studies with a mixed risk of bias. A total number of participants is not included as the total would be made up of a heterogeneous set of observations (participant people, observations on participants and countries (object of some studies)). The risk of bias for five RCTs and most cluster-RCTs was high. Observational studies were of mixed quality. Only case-control data were sufficiently homogeneous to allow meta-analysis. The highest quality cluster-RCTs suggest respiratory virus spread can be prevented by hygienic measures, such as handwashing, especially around younger children. Benefit from reduced transmission from children to household members is broadly supported also in other study designs where the potential for confounding is greater. Nine case-control studies suggested implementing transmission barriers, isolation and hygienic measures are effective at containing respiratory virus epidemics. Surgical masks or N95 respirators were the most consistent and comprehensive supportive measures. N95 respirators were non-inferior to simple surgical masks but more expensive, uncomfortable and irritating to skin. Adding virucidals or antiseptics to normal handwashing to decrease respiratory disease transmission remains uncertain. Global measures, such as screening at entry ports, led to a non-significant marginal delay in spread. There was limited evidence that social distancing was effective, especially if related to the risk of exposure.

Authors' conclusions

Simple and low-cost interventions would be useful for reducing transmission of epidemic respiratory viruses. Routine long-term implementation of some measures assessed might be difficult without the threat of an epidemic.

PLAIN LANGUAGE SUMMARY

Physical interventions to interrupt or reduce the spread of respiratory viruses

Although respiratory viruses usually only cause minor disease, they can cause epidemics. Approximately 10% to 15% of people worldwide contract influenza annually, with attack rates as high as 50% during major epidemics. Global pandemic viral infections have been devastating. In 2003 the severe acute respiratory syndrome (SARS) epidemic affected around 8000 people, killed 780 and caused an enormous social and economic crisis. In 2006 a new avian H5N1, and in 2009 a new H1N1 'swine' influenza pandemic threat, caused global anxiety. Single and potentially expensive measures (particularly the use of vaccines or antiviral drugs) may be insufficient to interrupt the spread. Therefore, we searched for evidence for the effectiveness of simple physical barriers (such as handwashing or wearing masks) in reducing the spread of respiratory viruses, including influenza viruses.

We included 67 studies including randomised controlled trials and observational studies with a mixed risk of bias. A total number of participants is not included as the total would be made up of a varied set of observations: participant people and observations on participants and countries (the object of some studies). Any total figure would therefore be misleading. Respiratory virus spread can be reduced by hygienic measures (such as handwashing), especially around younger children. Frequent handwashing can also reduce transmission from children to other household members. Implementing barriers to transmission, such as isolation, and hygienic measures (wearing masks, gloves and gowns) can be effective in containing respiratory virus epidemics or in hospital wards. We found no evidence that the more expensive, irritating and uncomfortable N95 respirators were superior to simple surgical masks. It is unclear if adding virucidals or antiseptics to normal handwashing with soap is more effective. There is insufficient evidence to support screening at entry ports and social distancing (spatial separation of at least one metre between those infected and those non-infected) as a method to reduce spread during epidemics.