

Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis

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Summary

Background

No published meta-analyses have assessed efficacy and effectiveness of licensed influenza vaccines in the USA with highly specific diagnostic tests to confirm influenza.

Methods

We searched Medline for randomised controlled trials assessing a relative reduction in influenza risk of all circulating viruses during individual seasons after vaccination (efficacy) and observational studies meeting inclusion criteria. Eligible articles were published between Jan 1, 1967, and Feb 15, 2011, and used RT-PCR or culture for confirmation of influenza. We excluded some studies on the basis of study design and vaccine characteristics. We estimated randomised pooled efficacy for trivalent inactivated vaccine (TIV) and live attenuated influenza vaccine (LAIV) when data were available. We used statistical analysis (eg, at least three studies that assessed comparable age groups).

Findings

We screened 5707 articles and identified 31 eligible studies (17 randomised controlled trials and 14 observational studies). Efficacy of TIV was shown in eight (67%) of the 12 seasons analysed in ten randomised controlled trials (pooled efficacy 51–67% in adults aged 18–65 years). No such trials met inclusion criteria for children aged 2–17 years or adults aged 65 years or older. Efficacy of LAIV was shown in nine (75%) of the 12 seasons analysed in ten randomised controlled trials (pooled efficacy 69–91% in children aged 6 months to 7 years). No such trials met inclusion criteria for children aged 8–17 years. Effectiveness was variable for seasonal influenza: six (35%) of 17 analyses in nine studies showed significant protection against medically attended influenza in the outpatient or inpatient setting. Median monovalent pandemic H1N1 vaccine effectiveness in five observational studies was 69% (range 60–93%).

Interpretation

Influenza vaccines can provide moderate protection against virologically confirmed influenza, but such protection is reduced or absent in some seasons. Evidence for protection in adults aged 65 years or older is lacking. LAIVs confer the highest efficacy in young children (aged 6 months to 7 years). New vaccines with improved clinical efficacy and effectiveness are needed to further reduce influenza-related morbidity and mortality.

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