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Pneumococcal Vaccine Effectiveness and Its Interaction With Age: A UK Population Based Study in Older Adults

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Real-world effectiveness of influenza vaccination in older adults in the UK from 1997-2012: A quasi-experimental cohort study

Background

A recent, large-scale trial found pneumococcal vaccination to be effective against pneumococcal pneumonia in older adults, yet was not powered to determine efficacy with age. Routinely collected data health records offer an opportunity to investigate vaccine effectiveness by age, and recently developed quasi-experimental methods provide a means of adjusting for confounding effects that commonly bias observational data.

Objectives

This study sought to determine the age-specific effectiveness of the pneumococcal vaccination in UK adults aged 65y and older.

Methods
Setting

Three annual cohorts of adult patients aged 65y and older, who were recommended vaccination against streptococcus pneumoniae from 2003 to 2005, were recruited from the data of patients from general practices registered to the Clinical Practice Research Datalink with linkage to Hospital Episode Statistics and the Office of National Statistics databases.

Exposure

Pneumococcal vaccination

Main outcome measure

Survival times until a composite outcome comprising hospitalisation for pneumococcal pneumonia and antibiotic prescribing for lower respiratory tract infections.

Statistical analysis

The results from three quasi-experimental methods were obtained for comparison. The marginal effect across each cohort was estimated from a survival analysis with inverse probability treatment weights. The weights were from high-dimensional propensity scores based on potential confounders. Two before-and-after approaches, the prior event rate ratio and the pairwise methods, enabled an investigation of the age interaction, as well as sub-groups.

Results

For the 2005 cohort of patients aged over 64y, the risk of experiencing an infection with symptoms consistent with those of pneumococcal pneumonia was reduced by five percent (95% confidence interval 1% to 8%), by nine percent (2% to 16%) for the older 2004 cohort comprising ages over 74y, and by 11% (7% to 16%) for 2003 cohort of ages over 79y. The age-related pattern was repeated for key age sub-groups across all three cohorts. The interaction with age was modelled across all the ages in the 2005 cohort, and found to be significant at the 5% level, with predicted risk reductions of 4%, 12% and 15% at ages 65y, 75y and 80y, respectively

Conclusions

All three methods consistently estimated an effectiveness of the pneumococcal vaccine that increases with age among patients aged 65y and older. The pre-adjusted bias suggests that the vaccination is targeted towards those most likely to benefit long-term from immunity to pneumococcal infection.