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No intention to comply with influenza and pneumococcal vaccination: Behavioural determinants among smokers and non-smokers

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Abstract

Objective. Smoking increases the risk for influenza and pneumococcal disease, but vaccination uptake is lower among smokers than non-smokers. We therefore aimed to determine reasons for not complying with vaccination among smokers and non-smokers.

Method. In 2005 a self-administered questionnaire was sent to a random sample of Dutch patients (n=4,000) assessing medical, social and behavioural determinants. Independent factors associated with not complying with influenza and pneumococcal vaccination among smokers and non-smokers were assessed by multivariate logistic regression analysis.

Results. In all, 1,725 of 4,000 patients returned the questionnaire (response rate: 43%), 426 (25%) were smokers. Among smokers self-reported flu vaccine uptake was 42% and among non-smokers 52% among both only 0,2% received both vaccines. Most important predictors of not complying in smokers and non-smokers were patient's beliefs not to be susceptible to disease (odds ratio (OR) 4.0, 95% confidence interval (CI): 2.0, 8.0 and OR 2.8, CI: 2.0, 3.9), finding it difficult to go to the GP for vaccination (OR 2.5, CI: 1.3, 4.8 and OR 1.8, CI: 1.3, 2.6) and being against vaccination (OR 2.4 CI: 1.3, 4.4 and OR 1.8, CI: 1.3, 2.6), respectively.

Conclusion. There are no substantial differences in determinants associated with not complying with influenza and pneumococcal vaccination between smokers and non-smokers but there is a trend towards stronger associations in smokers.

Keywords: Smoking; Vaccination; Compliance; Behaviour; Prevention; Influenza; Pneumococcal disease; Health education

Introduction

Smokers have a substantially higher risk for both influenza and pneumococcal diseases than non-smokers (Arcavi and Benowitz, 2004; Nuorti et al., 2000; Almirall et al., 1999). Not only do cigarette smokers have higher rates of influenza infection than non-smokers, they also have more severe infections. (Murin and Bilello, 2005) Importantly, cigarette smoking is the strongest independent risk factor for invasive pneumococcal disease (Nuorti et al., 2000). Prevention of secondary bacterial complications from influenza and primary pneumococcal disease is therefore highly important in this large group of persons.

Currently, pneumonia is one of the 10 leading causes of death in many countries including the United States and The Netherlands. (Centers for Disease Control and Prevention, 1997; File, 2004). Recent studies (Fry et al., 2005; Oosterheert et al., 2004) have also shown an increase in hospitalization and mortality due to pneumonia over the last decade. The leading cause for pneumonias is *Streptococcus pneumoniae* and therefore prevention of pneumococcal disease is very important. In The Netherlands, pneumococcal vaccination with the 23-valent polysaccharide pneumococcal vaccine is only recommended for a small group of patients with high pneumococcal-associated mortality risks (Health Council of The Netherlands, 2003). In the United States, such vaccination has been recommended for a large group of persons with increased risks such as elderly persons aged over 65 as well as persons with certain risk-elevating co-morbid conditions (Centers for Disease Control and Prevention, 2006).

In The Netherlands, influenza vaccination is recommended for persons with increased risk of complications such as the

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elderly and persons with co-morbid conditions. In the United States, vaccination is further recommended for children aged 6 to 59 months, pregnant women, persons aged 50 to 64 years and persons living with or caring for persons at high risk (health care workers and household contacts) (Harper et al., 2005).

Current recommendations on influenza and pneumococcal vaccination focus on high-risk groups because of high age or underlying diseases, but smokers are so far not included in these recommendations. Some, however, (Arcavi and Benowitz, 2004; Nuorti et al., 2000) believe it may be reasonable to incorporate pneumococcal vaccination into smoking cessation programs and even consider vaccinating those who continue smoking. If such a vaccination program would be accepted by this target population is unknown. Three studies showed that cigarette smoking was associated with failure to be immunized for influenza (Nichol et al., 1996; Stehr-Green et al., 1990; Nicholson et al., 1999).

The purpose of this questionnaire study was to determine the reasons for not complying with influenza and pneumococcal vaccination in smokers and non-smokers. Such knowledge is indispensable to develop tailored educational strategies to promote vaccination in smokers.

Methods

Setting

Data for this population-based questionnaire study were obtained from the computerized medical database of the University Medical Center Utrecht Primary Care Research network that includes information on a cumulative population of approximately 60,000 patients over the years 1989 to 2004. Main characteristics of this patient population are similar to the Dutch population as a whole (Hak et al., 2003). From 1995 onwards medical data of all patients enlisted in the six participating primary care centers have been recorded using a uniform, structured, contact registration format in the computerized general practitioner information system ELIAS® (ISoft, Nieuwegein, Netherlands). ELIAS is one of the most commonly used general practitioner information systems in The Netherlands (Van der Lei et al., 1993). According to the Dutch guidelines on research with humans, for this questionnaire study ethical approval was not required by the Medical Ethical Committee.

Study population

From the database, we randomly selected 4,000 patients over 50 years of age recorded by the general practitioner (GP) as a current smoker or non-smoker. Eligible patients had to have sufficient knowledge of the Dutch language and were able to fill in the questionnaire.

Questionnaire

In 2005, an anonymous self-administered questionnaire (in Dutch) was sent by mail to the selected patients and non-responders were reminded after two weeks by sending them a reminder letter. The development of the questionnaire was based on a review of the literature and two previously developed questionnaires by our research group (Hak et al., 2005; Opstelten et al., 2001). The questionnaire contained questions about the presence of co-morbid conditions, attitudes towards vaccination and additional questions about lifestyle and sociodemographic factors. Questions about co-morbid conditions were used to classify patients into high-risk or low-risk groups according to the ACIP guidelines for influenza vaccination. Patients suffering from chronic heart or lung disease or other chronic disease (e.g. immune compromising diseases such as diabetes mellitus) were classified as belonging to the high-risk group and therefore more susceptible to complications of influenza and pneumococcal disease. All others were classified in the low-risk group (Nexoe et al., 1999). Questions about attitude towards vaccination were based on the Health Belief Model (Nexoe et al., 1999; Opstelten et al., 2001; Green, 2000; Damoiseaux e.a., 1993). Similar to previous studies, patients were asked to answer questions on a five-point Likert scale ranging from 'strongly agree' to 'strongly disagree' (Opstelten et al., 2001; Hak et al., 2005). Both the original questionnaire which is in Dutch and a shortened English translation, with only the questions relevant to the main outcomes of this study, are available from the authors upon request (i.looijmans@umcutrecht.nl).

Health belief model

The health belief model was originally developed to explain and predict patients' participation in preventive health activities (Rosenstock, 1974; Cockburn et al., 1987; Rosenstock et al., 1988). The model argued that an individual's decision about undertaking a recommended health action was a function of the individual's beliefs on subjective dimensions. Action to avoid disease will be taken if the individual believes (1) that he/she is susceptible, (2) that occurrence of disease will have at least moderate severity on some component of life, (3) that taking the recommended health action will be beneficial and (4) that the health action does not entail overcoming important barriers. In addition, a cue to action appears to be essential (Cockburn et al., 1987; Nexoe et al., 1999; Green, 2000).

Outcome measure

The outcome variable for the current study was determined by self-reported compliance with or intention to comply with influenza and pneumococcal vaccination. The questions to divide study subjects into a positive or negative category were the following: Did you receive the flu and pneumococcal vaccine in the past five years? Are you willing to be immunized against flu and pneumococcal disease in the future?

Those who responded positive to either of these questions were regarded as having the intent to comply with flu and pneumococcal vaccinations.

Statistical analysis

Data were analyzed using SPSS for Windows (Version 12.0; SPSS, Inc., Chicago, Illinois). Several continuous variables were dichotomized: age (>65 [all persons recommended for vaccination] or ≤65 [only high-risk persons recommended for vaccination]), co-morbid condition (present or absent), education (high [university preparatory and higher] or low [non-university preparatory]), smoking status (smoker or non-smoker) and the questions on the five-point Likert scale (agree [1–2] or uncertain and disagree [3–5]).

Subgroup analysis was applied to clearly determine differences between smokers and non-smokers. First univariate associations of potential determinants with not complying were assessed. Next, all determinants with a p value less than 0.1 in one or both univariate models were used to assess multivariate associations. Odds ratios (OR) and 95% confidence intervals (CI) were determined. The Hosmer–Lemeshow goodness-of-fit test was used to assess the fit of the final model with the observed data (Opstelten et al., 2001).