

Targeting pneumococcal vaccination to high-risk groups: a feasibility study in one general practice

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Summary

The Department of Health recommends pneumococcal vaccination opportunistically or when immunising against influenza. This was a study in one general practice to assess the feasibility of targeting patients for pneumococcal vaccination in primary care. We also examined the rate of uptake of pneumococcal vaccine in identified risk groups after one year of a pneumococcal vaccination programme. A self-administered questionnaire was given to patients attending for influenza vaccine between September and December 1996. A total of 551/747 (73.8%) patients returned completed questionnaires. Few patients receiving influenza vaccination (133/509, 26%) were aware of pneumococcal vaccine. Only 55/108 (51%) of those given influenza vaccination were in a clinical risk group for pneumococcal vaccine. Attitudes towards vaccination were more positive and intention to take up pneumococcal vaccination significantly greater in high-risk patients compared to those who were not in a risk group. A targeted vaccination campaign directed at high-risk patients, both opportunistically and those attending for influenza vaccination over one year, resulted in the following proportions of patients in at-risk groups being vaccinated: coronary disease 144/312 (46%), diabetes 79/132 (60%), splenectomy 2/2 (100%), chronic obstructive airways disease and asthma 135/700 (19%), and chronic renal failure 5/9 (56%). Most doses of pneumococcal vaccine (336/463; 73%) were delivered to patients in high-risk groups. We conclude that a well-organised pneumococcal vaccination campaign can improve coverage of at-risk patients in general practice. Programmes to increase patient awareness of the vaccine, improved availability of vaccine, and practice guidelines, would help to target the vaccine to at-risk patients. Patients with chronic lung disease and asthma were particularly difficult to define and target in this study. A review of the UK guidelines, aligning those for pneumococcal and influenza vaccination and including patients over 65 years, would improve the logistics of vaccine delivery.

Keywords: pneumococcal vaccination; influenza vaccination; primary care; audit

Pneumococcal disease is an important cause of mortality and morbidity particularly from pneumonia, bacteraemia and meningitis, especially in vulnerable groups such as the elderly, very young, patients with chronic disease and the immunocompromised. The Department of Health in its 'Green Book' recently recommended pneumococcal vaccination for patients aged over two years "in whom pneumococcal infection is likely to be common and/or dangerous".¹ Previous versions had only suggested that the vaccine should be considered for at-risk groups.² This stronger wording follows evidence of increasing antibiotic resistance to *Streptococcus pneumoniae* in the UK and the failure of antimicrobial therapy to improve the high mortality from bacteraemic pneumonia.³

One recent study of pneumococcal vaccination showed an uptake of 4% prior to a public health campaign and an estimated uptake of 33% afterwards.⁴ Previous studies have also shown poor rates of influenza vaccination for patients at high risk, varying between 4.5% and 19.5%⁵ in the UK. One reason for poor vaccine uptake may be a lack of an effective education and vaccination programme by health providers.⁶ Other reasons found in previous studies for failure to vaccinate have included poor knowledge and negative attitudes amongst doctors and patients.⁷ Previous studies looking at influenza vaccination have shown that, when patients consider themselves to be healthy or believe that vaccination is painful or ineffective and where there is lack of an organised immunisation programme, vaccination is less likely. However, recommendation from a doctor, self-identification as high risk and belief that the vaccination will not cause discomfort were modifiable factors that could improve uptake. Intention to be immunised was also a good predictor of vaccine uptake.⁸

Offering pneumococcal vaccine to patients attending for annual influenza vaccination, opportunistic vaccination, better risk group identification,¹ and the use of community nurses to vaccinate household patients,⁴ have been suggested as methods of targeting at-risk groups.

Most practices will seek to use a combination of methods rather than any single method to implement a successful programme. There have been no studies to my knowledge to evaluate the effectiveness of a coordinated approach. This study set out to identify the potential problems and feasibility of a coordinated pneumococcal vaccination programme in a single general practice over a period of one year.

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Methods

Our practice conducts an annual influenza vaccination programme, targeted primarily at high-risk groups as defined currently by the Department of Health (table 1), although patients specifically requesting influenza vaccination, usually aged 65 years or over, are not refused. We had not previously considered a programme for pneumococcal vaccination except for asplenic patients. We discussed the new recommendations for pneumococcal vaccination with doctors, nurses, the health visitor and practice manager at one of the monthly primary healthcare team meetings.

As it was initially planned to target pneumococcal vaccine to patients attending for influenza vaccine, it was decided to administer a questionnaire to all those to be vaccinated against influenza by practice and district nurses or doctors. In this way, we could assess the likely success of this approach, get some idea of demand for the vaccine, and also inform this group of patients about the vaccine. As the risk groups for influenza and pneumococcal vaccination are identical except for the recommendation to immunise residential, nursing home and other patients in long-stay institutions against influenza, institutionalised patients were excluded from the survey.

A suitable questionnaire was devised after searching the literature on pneumococcal vaccination using Medline and references from any relevant articles identified. The questionnaire was modified after a small pilot study. Patients receiving influenza vaccine between September and December 1996 were handed questionnaires and asked to complete them whilst they were waiting after their immunisation, which they do so routinely in case of anaphylaxis. The questionnaire included an initial section outlining the reasons and indications for pneumococcal vaccination and possible side-effects. Patients were asked to complete questions on general attributes such as age and sex, their perception of whether they were in a risk group, prior knowledge of pneumococcal vaccine, and 10 'balanced' statements (ie, five positive and five negative) on attitudes to pneumococcal vaccination scored from strongly agree (one) to strongly disagree (five) on a five-point Likert scale,⁹ as has been used previously.¹⁰ Data from the questionnaires were coded and entered onto Excel version 5 by a receptionist trained in data entry and the data was transferred onto Epi Info version 6. Questionnaires were analysed using Epi Info version 6. Subgroups were compared using the chi square test for nominal data and the Kruskal-Wallis test for total attitude scores.¹¹

After analysing the results of the questionnaire we purchased sufficient vaccine to ensure availability. A refrigerator was purchased for proper storage of vaccines. A protocol was devised for practice nurses, district nurses and doctors to ensure that the vaccine was being delivered to target groups. Patients were informed about pneumococcal vaccine

through poster displays in the surgery. Pneumococcal vaccine was given to patients between February 1997 and January 1998 during routine surgery attendances, attendance at specialised clinics (eg, diabetic and asthma clinics), after discharge from hospital¹² and during the influenza vaccination programme.

The effect of the vaccination programme was evaluated after one year by conducting an audit of vaccine uptake in risk groups. To avoid overcomplicating the audit, five tracer conditions,¹³ ischaemic heart disease, diabetes, splenectomy, chronic obstructive airways disease (including asthma), and chronic renal failure were chosen to measure vaccine uptake as these are the most accurately recorded of the high-risk conditions on the practice disease register and are conditions which are relatively clearly defined. Asthma and chronic obstructive airways disease were grouped together because of difficulties with classification. The rate of pneumococcal vaccination in each target group was calculated (using the ANNT output of Meditel System 5 reports). Patients who fell into more than one target group were treated separately for each part of the audit. The rate of vaccine delivery to each high-risk group was calculated.

Results

A total of 551/747 (73.8%) patients receiving influenza vaccines between September and the end of December 1996 returned completed questionnaires. Over half of them (321/549, data missing for two patients) were female. Most respondents, 67% (392/509, data missing for 42), were aged 65 years or over, and most (90.6%; 461/509, data missing for 42) were receiving a repeat influenza vaccination. Only 4.5% of respondents (20/442, data missing for 109) stated that they had received pneumococcal vaccine previously. Less than half the respondents (44.1%, 243/551) considered themselves to be in an at-risk group. Table 1 shows the risk groups that vaccinees identified. A number of patients identified themselves as being in two (7%; 38/551) or three (1%; 6/551) risk groups. An analysis of records of a randomly selected sample of respondents showed that more patients (50.9%; 55/108) were actually in a risk group than identified themselves as such in the questionnaire

Table 1 Risk groups identified by patients attending for influenza vaccination

Risk group	Number of patients (n=552)	(%)
Chronic lung disease	106	(19.2)
Angina/heart disease	107	(19.4)
Kidney disease	8	(1.5)
Liver disease	0	(0)
Diabetes	45	(8.2)
Spleen removed	0	(0)
Drugs that lower immunity	21	(3.8)
Chemotherapy/radiotherapy	6	(1.1)

44 patients identified more than one risk group and six of these ticked three risk groups.

Table 2 Patients' perceptions of risk versus actual situation using a random sample of 108 patients taken from the questionnaire respondents

Risk group	Number of patients (n=108)	(%)
Patient correctly identified themselves as not being in a risk group	50	(46.3)
Patient not in a risk group but thought they were	3	(2.8)
Patient correctly identified themselves as being in a risk group	39	(36.1)
Patient in a risk group but chose incorrect group	2	(1.9)
Patient in a risk group but unaware that they were or did not tick a category	14	(13.0)

Table 3 Sources of information about pneumococcal vaccine

Source	Number of patients (n=133)	(%)
General practitioner	34	(26)
Practice nurse	14	(10)
Hospital doctor	1	(1)
Relative	14	(10)
Friend	21	(16)
Newspaper/magazine	30	(22)
Television	3	(2)
Other	9	(7)
Not stated	8	(6)

(table 2). Most patients who were at risk were correct in self-identifying that risk (71%; 39/55).

A quarter (26.1%) of respondents (133/509, data missing for 42) stated that they had heard of pneumococcal vaccine. Table 3 shows the sources that they had heard about it from. Thirteen patients had heard about it from two sources and three patients stated three sources.

Attitudes to vaccination were generally positive. Positive statements, that is those more likely to encourage vaccination, were recoded so that a score greater than three meant a generally positive attitude, a score of three neutral and a score less than three signified an overall negative attitude towards vaccination. Responses to each attitude statement and mean scores are shown in table 4. A total attitude score was derived for each patient by combin-

ing their scores for each statement after recoding positive statements. A higher score meant a more positive attitude. Patients who identified themselves to be in a risk group were significantly more likely to have a positive attitude towards vaccinations than those who did not recognise themselves to be in a risk group (total score 32.9 *vs* 36.8; Kruskal-Wallis H = 72.1, 1 degree of freedom (df), $p < 0.001$). Patients who stated that they had previously heard about pneumococcal vaccination were also more positive towards vaccination (total score 36.9 *vs* 34.0; Kruskal-Wallis H = 28.2, 1 df, $p < 0.001$). Patients who identified themselves to be in a risk group were significantly more like to agree or strongly agree that they would like pneumococcal vaccine than those who did not (145/238 (60.9%) *vs* 113/300 (37.7%); $\chi^2 = 46.1$, 4 df, $p < 0.001$). Patients who had already attended for pneumococcal vaccine were significantly more likely to agree or strongly agree that they would like pneumococcal vaccine than those who did not (16/19 (84.2%) *vs* 198/418 (47.4%); $\chi^2 = 12.1$, 4 df, $p = 0.017$).

A targeted vaccination campaign over one year resulted in the following proportions of patients in at-risk groups being vaccinated: 144 patients with coronary disease out of a total of 312 patients in the practice (46%); diabetes 79/132 (60%); splenectomy 2/2 (100%); chronic obstructive airways disease and asthma 135/700 (19%); chronic renal failure 5/9 (56%). Only the splenectomy patients had been vaccinated prior to the campaign. Most doses of pneumococcal vaccine (336/463; 73%) were delivered to patients in high-risk groups. This figure increased to 365/463 (79%) when nursing home patients without other risk factors were included.

Discussion

The current guidelines for pneumococcal vaccination recommend vaccination at routine consultations, after discharge from hospital, and when immunising against influenza vaccination. This study looked at this strategy as a method of targeting uptake of pneumococcal vaccination to patients in risk groups in one general practice. It is likely that the survey results are valid for this practice given the

Table 4 Attitude score for patients responding to questionnaire. Positive statements, ie, those more likely to encourage vaccination, were recoded so that a high score means a generally positive attitude towards vaccination, a score of three is neutral and a score less than three signifies a negative attitude overall

Attitude statement	% of 551 patients responding			Mean score
	(Strongly) agree	Neutral	Disagree or strongly disagree	
I think that vaccinations are generally safe	517 (93.8)	24 (4.8)	7 (1.3)	4.4
I do not believe in prevention	93 (16.9)	62 (11.3)	379 (68.8)	3.9
I am worried about getting chest infections	297 (53.9)	125 (22.7)	117 (21.2)	3.6
I feel that I would like pneumococcal vaccination	258 (46.8)	203 (36.8)	77 (14.0)	3.6
I would say that overall I am unwell	94 (17.1)	113 (20.5)	334 (60.6)	2.4
Prevention is better than cure	503 (91.3)	25 (4.5)	18 (3.3)	4.6
I don't think that I need pneumococcal vaccination	113 (20.5)	229 (41.6)	191 (34.7)	3.3
I am worried about the side effects of vaccination	77 (14.0)	161 (29.2)	297 (53.9)	3.6
I believe that I am a healthy person	325 (59.0)	117 (21.2)	101 (18.3)	2.5
I never get colds or chest infections	92 (16.7)	92 (16.7)	354 (64.2)	3.7

response rate of 73.8%. Further study would be required before the results could be extrapolated to other practices with a different age structure, case-mix, availability of resources (for example, practice nurses, district nurses, refrigerators for storage, treatment rooms), etc.

Overall, about half the patients receiving influenza vaccination were in a risk group, mostly chronic chest or heart disease and diabetes, and so were eligible for pneumococcal vaccination. Although one could argue that this shows that the practice policy for influenza vaccination does not fit well with current Department of Health guidance, it may also reflect practical problems with the current guidelines. Although influenza vaccination is recommended for those with specific medical indications and institutionalised patients, the evidence supports vaccinating all patients aged over 65¹⁴ and possibly even all healthy adults.¹⁵ The Department of Health has recently extended its policy to include patients over 75 years¹⁶ and some authors have advocated expanding vaccination against influenza and pneumococcus to all those above the age of 65 years¹⁷ as recommended in the US, where Medicare funds influenza vaccine for all patients over 65 years and has demonstrated this to be a cost-effective use of resources,^{18 19} and by the World Health Organization.²⁰ With the considerable financial penalties for practices who purchase but do not use vaccine, there is justifiable scope for more lax interpretation of the guidelines based on the evidence and clinical judgement. Nevertheless, almost half (49.1%) the patients in this study undergoing influenza vaccination did not fall into a current Department of Health risk group. Similar results were found in Gwent with only a quarter of all influenza vaccine doses being given to patients at low risk.²¹ A review of the UK guidelines, aligning those for pneumococcal and influenza vaccination and including all patients over 65 years, would improve the logistics of vaccine delivery and thereby vaccine uptake.

Attitude towards vaccination, self-identification as high risk and intention to be immunised have been shown to predict subsequent uptake.⁸ Subgroup analysis of responses in our study showed that patients in at-risk groups had more positive attitudes to vaccination, in particular pneumococcal vaccination, than those who were not in a risk group. Patients with more positive attitudes to vaccination and preventive health were more likely to agree to having pneumococcal vaccination than those who were not in a risk group. As patients were fairly good at identifying whether they were at risk, targeting patients who are being immunised for influenza would seem to be a good method for getting initial coverage of pneumococcal vaccination in general practice and was an effective part of our strategy.

Patients with chronic lung disease and asthma, who comprised the largest risk group, had the lowest uptake of the groups being surveyed. This may have been due in part to the inclusion in this large group of many younger and 'inactive' asthmatics (ie, patients who had

asthma in the past but were now asymptomatic and off treatment), not attending for influenza vaccine. There is also some confusion as to whether asthma constitutes a high-risk group for pneumococcal vaccination as it is for influenza vaccination.²² The patients who are eligible for influenza and pneumococcal vaccine in this group will need better identification and targeting if we are to improve vaccine uptake rates.

Studies have shown that recommendation for vaccination by a health worker is the most important factor influencing uptake²³ and agreeing a practice policy has also been shown to improve uptake.⁷ We found the practice guideline to be a useful educational tool, enabling a clear message to be given to patients by doctors and nurses. A poster display all year round, expanded to coincide with the influenza campaign, increased patient awareness of the vaccine. Vaccination reminders on records, prescriptions or appointment lists⁴ are other methods that could have been but were not used in this study.

The difficulties in running this type of programme were similar to those for running any successful immunisation programme, and included identifying and targeting eligible patients for which one needs a good, preferably computerised, chronic disease register. Correctly estimating vaccine requirements, good stock control, and suitable storage of vaccines were vital. Nursing and medical time to inform and vaccinate patients required good organisation of available nursing time and sufficient nursing hours. On the plus side we were able to generate an income of £6.46 per vaccine,* demonstrate good risk management (particularly in vaccinating splenectomised patients), and improve preventive care for many of our patients.

Clinical audit of immunisation rates is likely to be an effective and acceptable way of improving and monitoring vaccine uptake. The audit of immunisation rates conducted in this study showed a good uptake in high-risk groups but would have tended to overestimate uptake because of denominator deficiencies.

In the US, the Surgeon General has set a target of vaccinating 60% of the elderly and high-risk patients with pneumococcal vaccine by the year 2000.²⁴ Although similar targets have not been set by the Department of Health, they may be useful in improving rates and may not be unrealistic, given the experience in this practice. Pneumococcal vaccination has been shown to be a cost-effective medical intervention.²⁵ Further studies may be needed to determine what proportion of at-risk patients currently take up pneumococcal vaccination and how to maximise uptake of pneumococcal vaccine in primary care.

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*Assuming NHS price £9.94, on cost allowance £0.53, dispensing fee £0.99, container allowance £0.07 and a discount of 35%.

- 1 Department of Health, Welsh Office, Scottish Home and Health Department, Department of Health and Social Services Northern Ireland. *Immunisation against infectious disease*. London: HMSO, 1996:169-72.
- 2 Department of Health, Welsh Office, Scottish Home and Health Department, Department of Health and Social Services Northern Ireland. *Immunisation against infectious disease*. London: HMSO, 1992:100-3.
- 3 Obaro SK, Monteil MA, Henderson DC. The pneumococcal problem. *BMJ* 1996;**312**:1521-5.
- 4 McDonald P, Friedman EHI, Banks A, Anderson R, Carman V. Pneumococcal vaccine campaign based in general practice. *BMJ* 1997;**314**:1094-8.
- 5 Wiselka M. Influenza: diagnosis, management and prophylaxis. *BMJ* 1994;**308**:1341-5.
- 6 Holt DM. Recommendations, usage and efficacy of immunizations for the elderly. *Nurse Pract* 1992;**17**(3):51-2, 58-9.
- 7 Hinman AR, Orenstein WA, Mortimer EA Jr. When, where and how do immunizations fail? *Ann Epidemiol* 1992;**2**:805-12.
- 8 Gene J, Espinola A, Cabezas C, *et al.* Do knowledge and attitudes about influenza and its immunization affect the likelihood of obtaining immunization. *Fam Pract Res J* 1992;**12**:61-73.
- 9 Likert R. A technique for the measurement of attitudes. *Arch Psychol (New York)* 1932;**140**:44-53.
- 10 Siriwardena AN. Clinical guidelines in primary care: a survey of general practitioners' attitudes and behaviour. *Br J Gen Pract* 1995;**45**:643-7.
- 11 Brown RA, Beck JS. *Medical statistics on microcomputers*. Plymouth: British Medical Association, 1990; pp 48-9.
- 12 Fiebach N, Beckett W. Prevention of respiratory infections in adults: influenza and pneumococcal vaccines. *Arch Intern Med* 1994;**154**:2545-57.
- 13 Kessner DM, Kalk CE, Singer J. Assessing health quality - the case for tracers. *N Engl J Med* 1973;**288**:189-4.
- 14 NHS Centre for Reviews and Dissemination. Influenza vaccination and older people. *Effect Matt* 1996;**2**(1).
- 15 Nichol KL, Lind A, Margolis KL, *et al.* The effectiveness of influenza vaccination in healthy working adults. *N Engl J Med* 1995;**333**:889-93.
- 16 Calman C, Moores Y. *Influenza immunisation: extension of current policy to include all those aged 75 years and over.* (PL/CMO/98/4.) London: Department of Health, 1998.
- 17 Hattotuwa KL, Hind CRK. Pneumococcal vaccine. *Postgrad Med J* 1997;**73**:222-4.
- 18 Diguseppi C. Why everyone over 65 deserves influenza vaccine. *BMJ* 1996;**313**:1162.
- 19 Centers for Disease Control and Prevention. Recommendations of the Immunization Practices Advisory Committee. Pneumococcal polysaccharide vaccine. *JAMA* 1989;**261**:1265-7.
- 20 Fedson D, Henrichsen J, M kel PH, Austrian R. WHO recommendations on pneumococcal vaccination. Immunization of elderly people with polyvalent pneumococcal vaccine. *Infection* 1989;**6**:437-41.
- 21 Watkins J. Effectiveness of influenza vaccination policy at targeting patients at high risk of complications during winter 1994-5: cross sectional survey. *BMJ* 1997;**315**:1069-70.
- 22 Siriwardena AN. Pneumococcal vaccination campaign based in general practice. Expert advice is unclear. *BMJ* 1997;**315**:815.
- 23 Center for Disease Control and Prevention. Adult immunization: knowledge, attitudes, and practices - De Kalb and Fulton Counties, Georgia. *MMWR* 1988;**37**:657-61.
- 24 Fedson DS. Clinical practice and public policy for influenza and pneumococcal vaccination of the elderly. *Clin Geriatr Med* 1992;**8**:183-99.
- 25 Sisk JE, Riegelman RK. Cost effectiveness of vaccination against pneumococcal pneumonia: an update. *Ann Intern Med* 1986;**104**:79-86.