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Published in:
Age and Ageing

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Influenza vaccinations in Northern Ireland: are older patients missing out?

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Abstract

Background: influenza is a common respiratory disease that may affect a large proportion of the population annually. Vaccination is recommended for those most at risk of complications; namely everyone aged 65 and over and those under 65 who are immunosuppressed or who have chronic disease.

Objective: to explore the variations in influenza vaccination rates for the winter of 2000, with special reference to uptake amongst older patients.

Design: an audit of vaccination rates amongst 12 practices that participate in the Northern Ireland Data Retrieval in Primary Care Project.

Methods: data were extracted from the practice computers; Read codes were used to determine if the patient was immunosuppressed or suffered from chronic heart, lung or renal disease or had diabetes mellitus. The postcode of residence was used as a proxy for residence in a nursing or residential home as this could not be determined directly from the data. Multiple regression analysis was used to determine which factors were significantly related to vaccination uptake.

Results: we vaccinated 10 427 patients in these practices against influenza with a vaccination rate of 65.2% for the over-65 population. Uptake rates peaked at age 85 and declined thereafter so that only half of those aged over 90 had been vaccinated. This age related decline in vaccination rates was evident in ten of the twelve practices. The presence of chronic disease increased the likelihood of vaccination even amongst older patients. Logistic regression confirmed the decline in uptake rates at older ages and suggested that patients who shared the address of a nursing or residential home were less likely to have been vaccinated.

Conclusions: we feel that the current monitoring of influenza vaccination rates needs to be extended so that uptake amongst those most at risk, namely the very oldest and those in nursing and residential homes, can be adequately assessed.

Keywords: influenza vaccination, older patients

Introduction

Influenza is a common and highly contagious respiratory illness that may affect up to 20% of the population annually [1]. The likelihood of serious complications or death increases dramatically with age [2–4] and with the presence of co-existing chronic illness [5]. Influenza is responsible for significant hospitalization and between 3000 and 4000 deaths each year in the UK [6]. In epidemic years the death toll is even higher, and may have caused nearly 30 000 deaths in Britain, in 1989/1990 [7], many of these attributed to cerebrovascular or cardiac disease.

Evidence has been accumulating for years to demonstrate that vaccination against influenza is safe, effective and cost-effective and reduces associated
illness, use of health services and mortality [8–16]. Because of antigenic drift, vaccination has to be given annually. The NHS Centre for Reviews and Dissemination [17] recommended that vaccination should be considered for all patients over the age of 65 but especially those thought to be particularly at risk due to chronic disease or those staying in residential homes and long stay facilities. In the year 2000 the vaccination programme was extended in line with these recommendations with a minimum acceptable uptake rate in that year of 65% for Northern Ireland. The programme was associated with an extensive public and professional awareness campaign as to the benefits of vaccination. GPs received an item-of-service payment for vaccinations given.

The aim of this study was to examine for any systematic variations in the uptake of influenza vaccination during the autumn/winter of 2000 that might inform practitioners and those targeting the public health campaign to achieve a better coverage of those most at risk. However as influenza vaccination is among only a small number of cost-effective preventative health interventions for older people [18] we were particularly interested in the uptake of influenza vaccination for this sub-population.

Methods

Data were extracted from the computer systems of 12 general practices, which participate in the Northern Ireland Data Retrieval In Primary Care Project [19]. These practices have a combined list size of almost 90 000 patients (range 2500 to 15 000) and account for 5.2% of the Northern Ireland population. Their computerized data relating to morbidity status is known to be of high quality. Data capture included age, sex, and date of vaccination. Patients were deemed at high risk of developing complications from influenza if they had diabetes mellitus, chronic cardiovascular or respiratory disease (Read codes C10, G1 and G3–G7 and H3–H4 respectively), renal disease (K0) or were immunosuppressed because of drug treatment or disease (B6 784, BNF chapters 6.3, 8.1 and 8.3). Only those patients who were alive and registered with the practice in the late autumn of 2000 were used in the analysis. The postcode was used to ascribe the Townsend deprivation score [20] and the degree of rurality of the electoral ward in which the patient lived to each case so that any systematic variation according to these factors could be explored.

It was not possible to determine from the computerized general practice records if the patient was resident in a nursing or residential home but an approximation was arrived at by assuming that anyone aged over 65 with the same postcode as those for a list of homes (collated for a separate study into resource allocation for the elderly) was living in such a home. Some internal validity for this assertion comes from an examination of the age distributions which showed that 36.5% of patients at these postcodes were aged 65 or over compared to only 11.5% living elsewhere (Chi-square 945.8, $P<0.001$).

Differences between categorical variables were tested using the Chi-square statistic. Multiple logistic regression modelling was carried out to determine which factors were most important in influencing influenza uptake rates. This modelling was done separately for those aged over and under 65 as the indications for vaccination differ for these two age groups.

Results

In the winter of 2000, 10 427 patients in these practices received a vaccination against ‘the flu’ giving vaccination rates of 4.8% and 65.2% respectively for the under- and over-65 populations. Figure 1 shows that vaccination rates increased gradually with age for younger patients with little difference between men and women. There was a more than two-fold increase at age 65, and a gradual decline with age amongst patients over the age of 85 years so that just over half of those aged over 90 were vaccinated. Vaccination rates were about 5% higher for men than for women between the ages of 75 and 90.

Vaccination rates were increased by the presence of factors that are known to place the patient at risk of complications from influenza, especially for patients aged less than 65 (Table 1). The presence of chronic disease also increased the probability of vaccination for patients aged over 65 though the effects were more attenuated, especially for those over the age of 85. In younger patients the likelihood of vaccination increased linearly with the number of recorded risk factors but at older ages the presence of any risk factor was more important than the number of risk factors.

Multiple regression allows factors that may potentially influence vaccination rates to be modelled...
simultaneously so that the relative contributions can be assessed. Table 2 shows the results of the final regression models with vaccination status in the winter of 2000 as the dependent variable. Two separate models were developed, one for patients aged less than 65 and one for patients aged over 65. This was because risk factor status is used as an indicator primarily for vaccination in those aged less than 65 years old. A series of eleven dummy variables were included to control for the practice to which the patient was registered. These were highly significant in both sets of models and this indicates that there was still a significant amount of variation between practices that was not explained by differences in demographic profile, or patient risk factor status. For the sake of clarity these dummy variables have not been included in the Table. Neither model showed a significant association between vaccination uptake rates and the patient’s sex, once other factors had been controlled for.

For patients aged less than 65, the likelihood of vaccination increased with age (squared) and also with the number of risk factors, so that a patient with three or more recorded risk factors had an over 50-fold likelihood of being vaccinated compared to a patient with none. Patients living in deprived areas were more likely to have been vaccinated. For patients aged 65 and over, the relationship between vaccination uptake and age was more complicated, and the model includes both a linear and a quadratic function. Taken together this confirms that uptake rate in this age range is best described by an inverted u-shape and the differentiation for maximum supports a turning point of 76 years.

Rather surprisingly those patients who shared a postcode with a nursing or residential home were only about 65% as likely to have received an influenza vaccination as patients living elsewhere.

As almost 55% of the patients were registered to only one third of the practices, it is possible that this reduced uptake at the oldest ages was a feature of only a few of the larger practices. However, Figure 2 shows this was not the case as the decline in vaccination rates was evident for ten of the twelve practices.

**Table 1. Influenza uptake rates by risk factor status**

<table>
<thead>
<tr>
<th>Number of risk factors</th>
<th>Patients nos.</th>
<th>% Vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>64,383</td>
<td>1.8</td>
</tr>
<tr>
<td>1</td>
<td>11,090</td>
<td>17.0</td>
</tr>
<tr>
<td>2</td>
<td>1162</td>
<td>44.2</td>
</tr>
<tr>
<td>3</td>
<td>125</td>
<td>65.6</td>
</tr>
<tr>
<td>None</td>
<td>6077</td>
<td>60.1</td>
</tr>
<tr>
<td>1</td>
<td>3155</td>
<td>71.8</td>
</tr>
<tr>
<td>2</td>
<td>959</td>
<td>73.5</td>
</tr>
<tr>
<td>3</td>
<td>202</td>
<td>75.2</td>
</tr>
</tbody>
</table>

1Chi-squared = 9874.5, df = 3, P < 0.001.
2Chi-squared = 167.5, df = 3, P < 0.001.

**Table 2. Results of final logistic regression analysis. Dependent was having influenza vaccination in winter 2000. (All results adjusted for patient’s practice)**

<table>
<thead>
<tr>
<th>Odds ratio (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression for under-65 year olds</td>
<td></td>
</tr>
<tr>
<td>Age squared (years)</td>
<td>1.001 (1.001, 1.001)</td>
</tr>
<tr>
<td>Risk factors</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>10.83 (9.98, 11.76)</td>
</tr>
<tr>
<td>2</td>
<td>26.94 (23.17, 31.32)</td>
</tr>
<tr>
<td>3+</td>
<td>37.66 (24.53, 57.82)</td>
</tr>
<tr>
<td>Townsend</td>
<td>1.05 (1.04, 1.07)</td>
</tr>
<tr>
<td>Regression for 65+ year olds</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>1.54 (1.38, 1.71)</td>
</tr>
<tr>
<td>Age-squared</td>
<td>0.997 (0.997, 0.998)</td>
</tr>
<tr>
<td>Risk factors</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>1.74 (1.57, 1.92)</td>
</tr>
<tr>
<td>2</td>
<td>1.98 (1.98, 1.68)</td>
</tr>
<tr>
<td>3+</td>
<td>2.08 (1.48, 2.92)</td>
</tr>
<tr>
<td>Nursing/residential home</td>
<td>0.64 (0.53, 0.77)</td>
</tr>
</tbody>
</table>

**Discussion**

This study has demonstrated that while the uptake of influenza vaccination increases over the age of 65 and with the presence of risk factors, the level of uptake fell for patients aged over 85. This is a significant finding given the increased frailty with age, the increased susceptibility of older patients to the complications of influenza and the potential burden that this may place on the health services. It is however important to consider other explanations before accepting this finding. One possibility is that there was a problem with the population estimates used to produce the rates. We estimate that almost 20% of the over-85 in these practice
lists would have to be ‘ghosts’ to bring the vaccination rate for this age group up to the rather modest target of parity with those aged 75–84. It is therefore unlikely that inaccuracies in the practice population lists, inflating the denominators, is a tenable explanation given the extent of the cleaning up of these lists in recent years. Similarly, under-recording of vaccinations on the computer systems is unlikely to be the reason as practices tend to use these systems to generate the returns for the items of service payments and there is no reason to believe that there would be any systematic reduction at older ages. It is acknowledged that there are many organizational and logistical problems to be overcome for practices to achieve good vaccination rates [21, 22], though others suggest that well organized practices could achieve uptakes of 80–85% but probably not much higher due to a small number of ‘hard core’ patients who persistently refuse vaccination cover [23]. It appears from the responses to the separate questionnaire that these practices used a variety of means of recruiting patients for vaccination ranging from an opportunistic approach for patients who attended the surgery for other reasons, to written invitation and set clinics. Most of the GPs, when asked, suggested that an under-vaccination of house-bound patients was unlikely to occur as these patients would be vaccinated by the district nurses and that where a patient could not give consent, this was sought from their nearest relatives. Many of the GPs attributed the lower uptake rates at older ages to a healthy survivor effect leading to a reduced desire for vaccination. Each of the latter suggestions could be tested in a follow-up study.

The definition of risk factor status used in this study was based solely on Read coding, which may not be adequate for identifying all patients at risk. It has been shown elsewhere that this can be improved by supplementing with data relating to prescriptions [24]. On the other hand there may be a considerable duplication in the morbidity lists due to the presence of multiple pathology in some patients [25]. However the level of morbidity recording by these practices is likely to be better than the average, and the search technique used in this study probably reflects that which GPs will tend to use in practice. It should also be noted that the guidance given is rather vague and it is left to individual practices to decide what should be included under the definition of chronic heart and respiratory disease [2]. It was notable that even though the guidance recommends that all patients aged over 64 should be offered vaccination, there was still evidence that sicker patients at these ages were more likely to have been vaccinated. This is in keeping with the spirit of the guidelines though we are uncertain how it has arisen. It may be that GPs are targeting more frail older patients or that these patients are more likely to receive the vaccine because they are more frequent attenders at GP surgeries. It is also possible that those who are sicker are more likely to respond to the advertising and invitations to attend, though the opposite is more usual [26]. These practices are not representative because of their high levels of computerization and disease recording, and it is therefore uncertain how generalizable the findings are to the rest of the population. Nevertheless, the data suggest that there may be an age-related fall-off in influenza vaccination rates for patients over the age of 85, and that this was true for the majority of practices examined. These data may reflect an acceptance by GPs of an age related decline in function and an increasing unwillingness to interfere with the natural aging processes in the mistaken belief that older people will benefit less from vaccination [27]. However there is good reason to believe that GPs may be particularly effective at increasing influenza vaccination rates. There is some evidence that older patients are more willing to accept medical professional advice without question [28], and advice from GPs was the most common reason given for patients presenting for vaccination, [29–31]. Therefore, GPs need to do more to target and encourage older patients to receive the influenza vaccination and this may include some innovative changes to current practices and involve a greater use of other primary care staff such as district nurses, practice receptionists, and pharmacists. Evidence suggests that about half of the deaths from influenza occur amongst residents in nursing and residential homes [32], and though there is some doubt about the efficacy of vaccination in frail elderly in long-term care [33] many European countries including the UK now target this population of frail older people residing in an environment that is likely to allow rapid spread of infection. In this study it was only possible to use the patient’s postcode as a mediocre proxy for residence in a nursing or residential home and therefore the finding relating to this aspect should be treated with some caution. However, it is still worrying that the patients living at these postcodes had lower than the average levels of uptake of influenza vaccination. This finding needs to be followed by a separate study to look specifically at the vaccination rates for both residents and staff of long stay institutions.

This study has implications for how the uptake of influenza vaccine is monitored. At present Health Authorities and Health Boards only monitor the vaccination rates for two broad groups (i) amongst those aged 65 and over and (ii) for those aged less than 65 but deemed ‘at risk’. We suggest that this could be extended to provide a more detailed age breakdown specifically covering those aged 85 and over. The uptake of vaccine amongst the residents of nursing and residential homes could also be monitored, possibly through the inspection and registration mechanisms to ensure that those most at risk from the complications of influenza and who stand to benefit most from the vaccination are receiving it.
Influenza vaccination at older ages

Key points

• Vaccination against influenza is one of the few cost effective interventions available for older people and is recommended for all patients aged over 65.
• This study suggests a decline in vaccine uptake rates amongst patients aged over 85 and the possibility of lower uptake amongst residents of nursing and residential homes.
• The monitoring of vaccination uptake probably needs to be extended to ensure that those at greatest risk of complications, namely older people and those in nursing and residential homes, are receiving it.

References

30. Watkins J. Effectiveness of influenza vaccination policy at targeting patients at high risk of complications.


Received 13 December 2001; accepted in revised form 17 April 2002