Boosting uptake of influenza immunisation: a randomised controlled trial of telephone appointing in general practice

Sally Hull, Nicola Hagdrup, Ben Hart, Chris Griffiths and Enid Hennessy

SUMMARY

Background: *Immunisation against influenza is an effective intervention that reduces serologically confirmed cases by between 60% and 70%. Almost all influenza immunisation in the UK is done within general practice. Current evidence on the effectiveness of patient reminders for all types of immunisation programmes is largely based on North American studies.*

Aim: *To determine whether telephone appointments offered by general practice receptionists increase the uptake of influenza immunisation among the registered population aged over 65 years in east London practices.*

Design of study: *Randomised controlled trial.*

Setting: *Three research general practices within the East London and Essex network of researchers (ELENoR).*

Method: *Participants were 1820 low-risk patients aged 65 to 74 years who had not previously been in a recall system for influenza immunisation at their general practice. The intervention, during October 2000, was a telephone call from the practice receptionist to intervention group households, offering an appointment for influenza immunisation at a nurse-run clinic. Main outcome measures were the numbers of individuals in each group receiving immunisation, and practice costs of a telephone-appointing programme.*

Results: *Intention to treat analysis showed an immunisation rate in the control group of 44%, compared with 50% in the intervention group (odds ratio = 1.29, 95% confidence interval = 1.03 to 1.63). Of the patients making a telephone appointment, 88% received immunisation, while 22% of those not wanting an appointment went on to be immunised. In the control group, income generated was £11.35 per immunisation; for each additional immunisation in the intervention group the income was £5.20. The 'number needed to telephone' was 17.*

Conclusion: *Uptake of influenza immunisation among the low-risk older population in inner-city areas can be boosted by around 6% using a simple intervention by receptionists. Immunisation rates in this low-risk group fell well short of the 60% government target. Improving immunisation rates will require a sustained public health campaign. Retaining the item-of-service payments to practices should support costs of practice-based interventions.*

Keywords: *influenza; immunisation; telephone appointment system.*

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Introduction

INFLUENZA causes an acute respiratory illness, which affects all age groups. Older people and those with chronic disease are most at risk of complications, including increased mortality.[1-3] Immunisation against influenza is an effective intervention that reduces serologically confirmed cases by 60% to 70%.[4] Immunisation also reduces severity of disease, hospitalisation for pneumonia, and death from both respiratory and all other causes among the elderly.[5-7]

Almost all influenza immunisation is done within general practice.[8] In previous years, general practitioners (GPs) have been encouraged to target immunisation at those aged over 75 years and patients in high-risk chronic disease groups.[3] In 1996, 44% of those aged over 65 years in high-risk groups were immunised, and 23% of the low-risk population aged over 65 years.[9,10]

For the winter of 2000, the Department of Health in the United Kingdom (UK) urged GPs to immunise everyone on their lists aged over 65 years in addition to the previous groups, and there was a nationally agreed item-of-service payment for this programme.

Increasing the level of immunisation requires well organised systems within general practices to identify and recall the population at risk,[10] alongside evidence of effective recall methods for different populations. Evidence on the effectiveness of patient reminders for all types of immunisation programmes comes mostly from North American studies, with increases in immunisations for all ages and settings ranging between 5% and 20%, telephone prompts being more effective than postal reminders.[11] No trials on the combined use of postal and telephone reminders have been reported for the UK population.

East London is one of the most deprived areas of the UK, with high rates of chronic disease.[12] In such an area the Inverse Care Law is likely to apply, with low rates of influenza immunisation, in spite of high numbers of patients at risk.[13]

Finding simple ways to improve immunisation uptake may reduce influenza-related morbidity and health service use. In view of this, we designed a pragmatic randomised controlled trial to examine whether telephone appointing, for patients who have not previously been recalled for influenza immunisation, is an effective intervention among inner-city populations. Our primary outcome was uptake of influenza immunisation.

Methods

Participating practices

Three general practices in the east London and Essex net-

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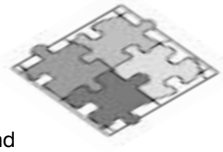

What do we know?

Influenza immunisation prevents the development of symptomatic illness and reduces hospitalisation and all-cause mortality among older people. Immunisation rates remain low among those over 65 years of age.

What does this paper add?

Telephone appointing by general practice receptionists can increase influenza immunisation rates for low-risk older patients in inner-city practices. The practice costs of such programmes should be supported by maintaining the item-of-service fee.

work of researchers (ELENoR) took part in the study. All three practices have a multi-ethnic, mobile, inner-city population and have previously run influenza immunisation recall systems for high-risk groups. The practices all use the EMIS computer system for clinical and administrative recording. Immunisation is almost exclusively done by appointment at clinics run by practice nurses. The project was approved by the East London and City research ethics committee.

Trial procedure

Each practice identified the population of its registered patients aged between 65 and 74 years. Patients with chronic disease (asthma, diabetes, chronic obstructive pulmonary disease, ischaemic heart disease, renal disease) who had been recalled in previous years were excluded from the study population (Figure 1). The unit of randomisation was the household. In each practice the study population was condensed to a list of households, which were randomised to either the control or intervention group by the study coordinator using a computer programme (STATA[14]). The list of intervention households was given to the receptionist team, who sought missing telephone numbers from the paper notes before making up to two phone calls, at different times of day, to each household in the intervention group. Receptionists were given trial information sheets, including suggestions for phrasing invitations to patients, but no specific training to deliver the intervention.

The intervention, during the two weeks between 25 September and 6 October 2000, was timed to coincide with the East London and the City Health Authority mailshot, which sent a letter and leaflet to every GP-registered patient aged 65 years and above, urging them to contact their GP for immunisation. In addition, there was a national television campaign during September to promote influenza immunisation uptake.

Receptionists recorded the details of the telephone call, including who replied, whether an appointment was made, and the reasons for not wanting an appointment. In one practice a time sheet was kept, to provide basic information on the costs to the practice of the intervention.

Nurses who undertook the immunisation clinics were unaware of the household allocation to control or intervention group. All influenza immunisations were recorded by the nurses at the time of immunisation on the practice computer system. The three practices provided computerised influenza immunisation status information on the study population in mid-December.

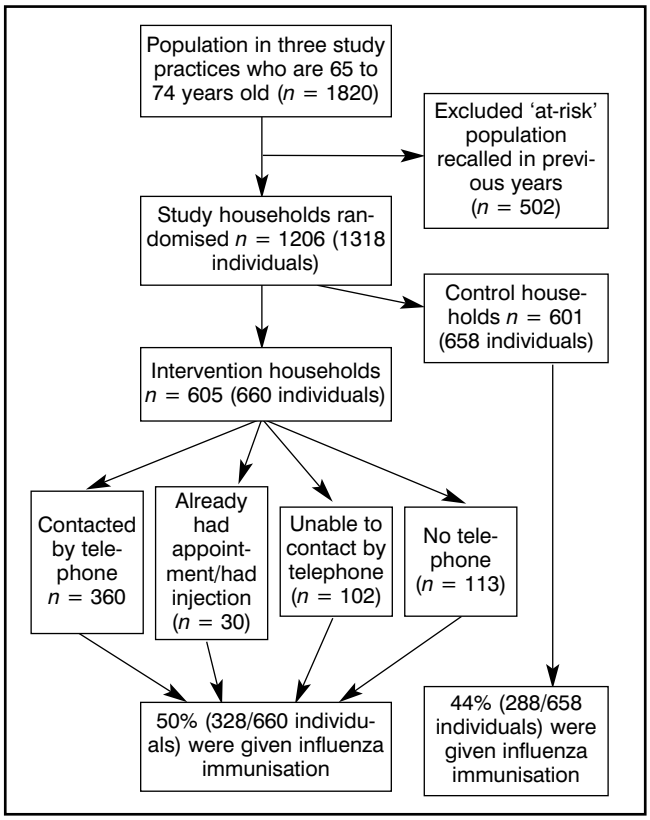

Figure 1. Progress of participants from the three practice sites through the trial.

Sample size calculation

National and local levels of immunisation up until the year 2000 ran at below 50% for those aged 75 years or more.[3] It was considered that a clinically important effect would be achieved by a 10% boost in immunisation rates. Using a power of 0.8, and $\chi = 0.05$, it was calculated that 384 subjects would be required in each group to demonstrate an increase in immunisation rates from 40% to 50%.

Statistical analysis

The analysis was done on an intention-to-treat basis. Most households comprised a single person available for study, but 9% were two-person households and one had three. Individuals within two-person households are more likely to be concordant in take-up of an influenza vaccine than would be expected if they were acting independently, and this was the case in this study (χ^2, 1 df = 40, $P<0.001$). Even if the population is typical of other practices in the UK, and hence effects within the population might be similar, the calculation of *P*-values and confidence intervals need to take account of this non-independence. Initial analysis, using logistic regression, used only one patient in each two-person household, chosen at random. This should give conservative values. The second analysis used generalised linear models for analysing the clustered data. The intervention, age, sex,

household size, practice, and their interactions were assessed for independent effects. Other differences in outcome between groups were tested using χ^2. All analyses used Stata 5.[14]

Results

A total of 1261 individuals were involved in the study. Follow-up data on immunisation status were available for all 1261 individuals at the end of the study. A summary of the flow through the trial is shown in Figure 1.

Table 1. Baseline patient characteristics.

	Intervention group	Control group
Mean age (years)	69.2	69.3
Sex (% male)	46.1	44.7
Percentage of households where only one patient is eligible for the trial	90.8	90.7

Practice characteristics and appointments made

Baseline characteristics of patients in the intervention and control groups are shown in Table 1. Characteristics of the three study practices are shown in Table 2. There were marked differences in the availability of patient telephone numbers and the total take-up of influenza immunisation between sites. Table 3 shows that, at all practice sites, telephone number availability was increased by searching through patients' paper records. Overall, 60% of households in the intervention groups were successfully contacted by telephone. By using two attempts the initial contact rate was increased by 15%. Among the intervention group households only about one-quarter made an appointment for influenza immunisation over the telephone at the time of the telephone contact.

Rates of influenza immunisation

Table 4 shows the rates of influenza immunisation in the trial groups. Table 5 shows the results expressed as a difference in rate of immunisation and the odds ratios of the effect of

Table 2. Characteristics of the three study practices.

	Practice 1	Practice 2	Practice 3
Practice characteristics			
Practice population aged 64 to 75 years	660	715	445
High-risk patients, previously recalled, removed from study population[a] (%)	29	30	22
Proportion of total older population (aged >64 years) receiving influenza immunisation by the end of 2000 (%)	62	53	46
Jarman deprivation score (based on enumeration districts)	25	29	23
Study characteristics			
Number of study patients (households)	470 (420)	501 (470)	347 (317)
Mean age of study patients	69.2	69.5	69.0
Proportion of intervention patients with available telephone numbers	86%	83%	70%

[a]High-risk categories include asthma, diabetes, COPD, ischaemic heart disease, renal disease. These patients experienced recall in previous years.

Table 3. Telephone contact and appointments made among the 605 intervention households in the three study practices.

	All practices (605 households)	Practice 1 (211 households)	Practice 2 (236 households)	Practice 3 (158 households)
Telephone number on computer *n* (%)	431 (71)	160 (76)	177 (75)	94 (59)
Telephone number found from all sources *n* (%)	493 (81)	188 (86)	194 (82)	111 (70)
Contact at first call *n* (%)	285 (45)	119 (56)	106 (45)	60 (38)
Contact at first or second call *n* (%)	361 (60)	150 (71)	139 (59)	72 (45)
Appointment made at telephone contact *n* (%)	137 (23)	56 (26)	53 (23)	28 (17)

Table 4. Rate of influenza immunisation among individuals in trial groups (combined data from three study practices).

	Intervention group (individuals)	Control group (individuals)
Influenza immunisation rates	50% (328/660)	44% (288/658)
Breakdown for intervention group[a]		
Rates among those contacted by phone	58% (232/402)	
Rates among those with phone numbers but no contact made	33% (36/108)	
Rates among those with no phone number	26% (31/119)	
Rate of immunisation by expressed intention among the households contacted by phone (n = 360)		
Those who made a telephone appointment	88% (130/147)	
Those who stated 'Will consider' making an appointment	52% (44/85)	
Those who stated 'Do not want an appointment'	22% (25/113)	

[a]Thirty patients were not telephoned as they already had appointments/influenza immunisation.

telephone intervention on immunisation. The unadjusted difference between control and intervention groups in the proportion of individuals immunised was 5.9% (95% confidence interval [CI] = 0.5% to 11%).

Further analysis was undertaken, to explore the effect of the clustered household data and potential confounders and interactions. Practice 3 had lower immunisation rates in the control group than the other two practices ($P<0.003$) and a smaller intervention effect, which was not significantly different from the other sites. Practice site was independently associated with influenza immunisation and the adjusted results all take account of this.

It can be seen from Table 5 that these adjustments made very little difference to the results; all were statistically significant and similar to the univariate rates. The adjusted difference in the rate of immunisation was calculated from the odds ratio and its 95% CI predicted by the generalised linear model, which allowed for correlation within households. This difference was calculated by assuming a control rate of 45%, generating the predicted odds after intervention (control odds x odds ratio) and converting this to a percentage uptake (100 x odds/[1 + odds]).

Among patients who were contacted in the intervention group there was a clear, but by no means exact, association between immunisation rates and their expressed intention. Of those who were given an appointment, 88% were subsequently immunised, while 22% of those who definitely did not want a telephone appointment went on to receive immunisation (Table 4). However, 15% of those contacted by telephone were not spoken to personally and their uptake was lower (77% versus 91%, $P = 0.05$, two-sided Fisher's exact test). The number of telephone calls needed to achieve one additional immunisation was 17.[15]

Costs of the intervention

Costs to the practice of implementing the national influenza immunisation campaign will vary widely, depending on how practices distribute the work required for recall and vaccine delivery. Hence we have estimated only the additional costs to the practice of achieving a 6% increase in influenza immunisation rates through telephone appointing (Table 6). The costs will be sensitive to national variation in discounts available on the influenza vaccine and to the presence of an item-of-service fee for immunisations.

Discussion

Main findings

This pragmatic, randomised controlled trial suggests that, within inner London, general practices can boost immunisation rates for influenza immunisation among the fit older population by about 6% using a telephone call from practice receptionists. This effect was achieved in addition to the national advertising campaign, and a mailshot sent to each eligible individual in the study health authority. This improvement in rates can be compared with those reported in a systematic review by Szilagyi, who found a median change in adult influenza immunisation rates, combining all recall methods, of 7% (range = –8.5 to 47).[11] However, none of these studies were based in UK general practice populations.

Although rates of telephone ownership nationally are very high (95% ownership in Tower Hamlets: personal communication), there is variation between practices in their patterns of recording and updating this information, which is reflected in the study practices (Table 3). This study was not designed to investigate the effect of low telephone registration, but clearly this may have an effect on the results obtain-

Table 5. Summary of estimated effect of telephone intervention.

	Effect of intervention	95% CI	*P*-value
Difference in rate of immunisation between control and intervention groups			
Unadjusted: using all individuals	5.9%	0.5%–11.0%	0.031
Adjusted[a]: based on adjusted odds ratio and 45% underlying rate	6.3%	0.7%–12.0%	0.026
Odds ratio of intervention on rate of immunisation			
Unadjusted: using all individuals	1.27	1.02–1.58	0.031
Adjusted[a]	1.29	1.03–1.62	0.026
Adjusted[b]	1.26	1.00–1.58	0.048
Adjusted[c]	1.30	1.04–1.63	0.024

[a]Adjusted for practice site and using generalised linear model to allow for correlation within multi-person households; [b]adjusted for practice site and using one person per household in logistic regression; [c]adjusted for practice site and using other person in multi-person households in logistic regression.

Table 6. Practice costs and income per influenza immunisation (based on one practice list size [9100] calculated for 16 additional influenza injections — equivalent to an increase of 6% in immunisation rates over the control group).

	With item-of-service fee	Without item-of-service fee
Income from influenza immunisation programme in the control group (per injection)[a]	£11.35	£4.90
Income for each additional immunisation achieved by implementing a telephone appointment intervention (per injection)[b]	£5.20	–£1.24

[a]Based on influenza injection bulk purchase discount at £4.90 (item-of-service fee at £6.45 — practice overhead costs not included); [b]based on additional receptionist cost for telephoning (£72.65 for 7.5 hours), telephone calls (£12.25 for 245 calls), and practice nurse time (£13.31 for 1 hour).

able. The influenza immunisation uptake rate among those contacted by telephone was very similar across all three sites (58%) and, given that the intervention effect in practice 3 was not significantly different from the others, it is likely that the smaller effect size in this practice was partly an artefact of the randomisation, although it could also be owing to the lower telephone registration in this practice.

Policy issues

Many practices already run a programme of recall for high-risk and older patients, which, alongside the national campaign, enabled 91% of health authorities to reach the target of 60% rates of coverage for those aged over 65 this year.[16] East London and the City Health Authority (ELCHA) was among the 9% which did not achieve this target, with coverage of 55% (ELCHA, personal communication).

Boosting immunisation rates by 6% may seem relatively small to each practice. But this may translate into a significant improvement if extrapolated nationally and may contribute to a significant decrease in hospitalisation and mortality. Improving coverage among the population in high-risk categories must remain the first priority for general practice. Increasing uptake among older people who perceive themselves to be at low risk, above the level of 50% shown in this study, may prove more difficult. In this study, immunisation rates only rose to 58% when phone contact was achieved. Previous studies suggest that public perception of the value of immunisation is low, with less than 30% of patients believing that the vaccine reduced mortality or complications a great deal.[8] Within inner cities, where uptake may be low, there is most need to increase immunisation rates. There is some evidence that the effectiveness of reminders may be greatest in improving immunisation rates where the background rate of immunisation is low.[17] Supporting a range of community and practice-based interventions to boost uptake may be of greatest benefit in areas of social deprivation.

The practical details of implementing an intervention such as this within general practice are straightforward and do not require additional training for reception staff. However, encouraging practices to invest in such practice-based activity, which requires staff time and organisation, will require funding. In 2001, the Department of Health introduced an item-of-service fee to support the introduction of the new expanded immunisation programme, which was also supported by a major national advertising campaign. Sustaining high levels of immunisation among the elderly in future years will require continuing effort and funding.

Our costings suggest that without the item-of-service payment, the additional practice resources required to implement recall interventions, such as the one described here, will be underwritten by the practices and may prove less attractive than alternative activity.

References

1. Wiselka M. Influenza: diagnosis, management and prophylaxis. *BMJ* 1994; **308:** 1341-1345.
2. Cate TR. Clinical manifestations and consequences of influenza. *Am J Med* 1987; **82:** 15-19.
3. Department of Health. *Immunisation against infectious diseases.* London: DoH, 1996: 120-133.
4. Demicheli V, Deeks J, Jefferson T. Vaccines for preventing influenza in healthy adults. (Cochrane Review.) *The Cochrane Library* Issue 2, 2001. Oxford: Update Software. *The Cochrane Library* 2001.
5. Gross PA, Hermogenes AW, Sacks HS, et al. The efficacy of influenza vaccine in elderly persons. A meta-analysis and review of the literature. *Ann Intern Med* 1995; **123(7):** 518-527.
6. Christenson B, Lundbergh P, Hedlund J, *et al*. Effects of a large scale intervention with influenza and 23 valent pneumococcal vaccines in adults aged 65 years or older: a prospective study. *Lancet* 2001; **357:** 1008-1011.
7. Ahmed AE, Nicholson KG, Nguyen-Van-Tam JS. Reduction in mortality associated with influenza vaccine during the 1989-1990 epidemic. *Lancet* 1995; **346:** 591-595.
8. Nguyen-Van-Tam JS, Nicholson KG. Influenza immunisation: vaccine offer, request and uptake in high-risk patients during the 1991/92 season. *Epidemiol Infect* 1993; **111:** 347-355.
9. Irish C, Alli M, Gilham C, *et al*. Influenza vaccine uptake and distribution in England and Wales, July 1989 to June 1997. *Health Trends* 1998; **30:** 52-55.
10. Mangtani P, Roberts J. Shot down. *HSJ* 2000; November: 26-29.
11. Szilagyi PG, Bordley C, Vann JC, *et al*. Effect of patient reminder/recall interventions on immunization rates. *JAMA* 2000; **284:** 1820-1827.
12. East London and the City Health Authority. Health In the East End. *Annual public health report.* London: ELCHA, 1999/2000.
13. Tudor Hart J. The inverse care law. *Lancet* 1971; **i:** 405-412.
14. Stata Corporation. *Stata Statistical Software: Release 5.0.* College Station, TX, 1997.
15. Cook RJ, Sackett D. The number needed to treat: a clinically useful measure of treatment effect. *BMJ* 1995; **310:** 452-454.
16. Department of Health. *Current vaccine and immunisation issues.* London: DoH, 2001.
17. Clayton AE, McNutt LA, Homestead HL, *et al.* Public health in managed care: a randomised controlled trial of the effectiveness of postcard reminders. *Am J Public Health* 1999; **89(8):** 1235-1237.

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