Implementing the Dutch College of General Practitioners' guidelines for influenza vaccination: an intervention study

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SUMMARY

Background. *Influenza is a major health problem in most Western countries. In September 1993, the Dutch College of General Practitioners (NHG) issued guidelines for influenza vaccination. Although most general practitioners (GPs) are well acquainted with NHG standards, knowledge does not invariably lead to application.*

Aim. *To evaluate a regional intervention promoting the implementation of NHG's influenza vaccination guidelines.*

Method. *In a non-equivalent control group design (pre-test 1992, post-test 1993), two general practice regions were studied. In the intervention region, Amersfoort, there were 82 practices (118 GPs, 250 000 patients) and in the control region, Arnhem, 97 practices (124 GPs, 300 000 patients). In the intervention region, all professionals involved in influenza vaccination were approached at educational meetings and by mail. Postcard material and vaccines were distributed. The main outcome measures were five organizational aspects measured by a questionnaire (registration of high-risk patients, mail prompt, vaccine in stock, special vaccination hours and vaccination by practice assistant), and the vaccination rate (number of vaccines delivered divided by the total number of regional health insurance patients).*

Results. *All practices in the intervention region were involved; 78% responded to the pre-test and post-test questionnaires compared with 76% in the control region. Three of the five organizational aspects improved more in the intervention region: mail prompt by 25% (95% CI 11–38%), vaccine in stock by 29% (95% CI 16–44%), and special vaccination hours by 16% (95% CI 2–27%). Multivariate analyses failed to reveal any modifying factors. The vaccination rate increased by 21% (from 7.7% to 9.3%) in the intervention region, and by 6% (from 8.5% to 9.0%) in the control region. The mean increase in the intervention region exceeded that in the control region by 1.1 per 100 patients (95% CI 0.6–1.6). Multiple regression analysis revealed that this was an independent effect.*

Conclusions. *This complex intervention was considered to be effective. The same strategy might be appropriate for other regions and other guidelines.*

Keywords: Nederlands Huisartsen Genootschap; influenza; vaccination; intervention trials.

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Introduction

INFLUENZA is a major health problem in most Western countries. In England and Wales, an average of 12 000 people a year died of influenza and related causes between 1978 and 1988.[1] In The Netherlands, the mortality due to influenza or its complications exceeds 2000 per year.[2] However, influenza can be prevented in at least 50% of people aged 65 years or older, provided they have been vaccinated.[3] Vaccination prevents hospitalization for related diseases for about 70% of cases and reduces the mortality due to influenza by 80%.[4,5,6,7] Vaccination is cost-effective and has few side effects.[8,9,10,11]

Approximately 12% of the Dutch population have an indication for vaccination. For the most part, this group consists of people with chronic obstructive pulmonary disease, heart problems and diabetes.[12] Before autumn 1996, Dutch public health administrators did not suggest that old age in itself is an indication that vaccination is necessary. As elsewhere, the vaccination rate in The Netherlands is low; in 1992, only 40% of high risk people were vaccinated, usually by their GP.[13,14,15,16]

In September 1993, the Dutch College of General Practitioners (NHG) issued the following guidelines for influenza vaccination:[17]

- All indicated patients should be recorded on a list or on computer. These include all patients with chronic heart, lung and kidney complaints; diabetics; patients with reduced resistance; and patients in residential or nursing homes.
- Adequate information should be given on indication, side effects and efficacy.
- Mail prompts with information and an appointment should be sent to all high-risk patients.
- Special vaccination hours should be organized during which vaccines can be administered by the practice assistant.
- Vaccine should be kept in stock in the office.

These guidelines constitute an NHG standard[18,19] promoting practice organization that facilitates preventive activities. Although most GPs are well acquainted with NHG standards, unfortunately knowledge does not invariably lead to application.[20] We therefore developed the intervention described here, comprising a combination of strategies that influence internal and external motivation,[21] to speed implementation of these influenza vaccination guidelines in the region of Amersfoort. This study assesses the effectiveness of the intervention on the organizational aspects of influenza vaccination and on the vaccination rate, and compares the results with those obtained from a similar region acting as a control.

Methods

Design, setting and subjects

We used a non-equivalent control group, pre-test/post-test design (Figure 1).[22] There are a number of regional organizations of GPs in The Netherlands, and the intervention was carried out in the one that serves Amersfoort and its surrounding area. This region is situated in the middle of The Netherlands, with 82 prac-

Figure 1. Non-equivalent control group, pre-test, post-test design.

	Pre-test 1992 (t_0)	Intervention 1993	Post-test 1993 (t_1)
Intervention region	✓	✓	✓
Control region	✓		✓

tices (118 GPs) and about 250 000 patients. We chose as a control group the practice region of Arnhem and its locality, with 97 practices (124 GPs) and 300 000 patients. This area has a similar degree of urbanization and professional medical organization.

Intervention

The NHG influenza vaccination guidelines advise GPs to register their high-risk patients, send them a postcard informing them about immunization, organize special vaccination hours, and keep vaccine in stock to minimize delays for patients.

We used a 'shotgun' method — a combination of several interventions dealing with influenza vaccination[23] and directed at all professionals involved. This method has proved successful in quality assurance for drug prescribing.[24] Internal motivation was stimulated by competence-oriented strategies (educational materials and group education) and performance-oriented strategies (feedback of the 1992 vaccination rates); external motivation was promoted by peer review and practical support.[21]

In the autumn of 1993 — just after the publication of the influenza vaccination guidelines — a complex intervention was carried out targeting all those involved: GPs, practice assistants, pharmacists, consultants, local public health authorities, and the general public. Regional professional organizations were approached through their leading figures to coordinate the activities involved in influenza vaccination, including the vaccine distribution. The guidelines were discussed at group meetings using educational material about indications and about organizing the vaccination in a practice. In total, 84 GPs and 22 pharmacists attended 14 combined meetings, while 34 GPs and 25 consultants received information by mail. A conference in a local hospital was attended by 90 medical professionals (GPs, consultants and pharmacists); there was a separate meeting for 42 practice assistants and 30 pharmacy assistants. Information was given about practice routines and the number of vaccine prescriptions over the past year. Postcards with information slips to send to high-risk patients were distributed. There was no financial incentive for GPs to improve the vaccination rate or to attend the meetings. Written information was made available to regional professional and lay journals.

Basic characteristics

In 1992 (t_0) and in 1993 (t_1), a month after concluding the intervention, we sent a written questionnaire to all GPs in both areas, and a shorter anonymous questionnaire (mainly regarding the organizational aspects of the vaccination) to the non-respondents at t_0. We registered age (years), sex (male: yes/no), list size (number), type of practice (solo: yes/no), urbanization (in a city with more than 100 000 inhabitants: yes/no), percentage of patients insured in the regional social health insurance association, percentage of patients over 65 years of age, and presence of a computer storing a GP's information system and a complete sex–age register (yes/no). In addition, we asked questions assessing opinions about indications for vaccination (yes/no).

Outcome measures

The outcome measures relating to the vaccination organization were the registration of high-risk patients, the use of a mail prompt, whether vaccine was held in stock, whether special vaccination hours were held, and whether vaccination was performed by a practice assistant (yes/no in each case). Clearly, the organizational outcome measures could only be obtained from the responding practices. The outcome measure regarding the vaccination rate was acquired for all practices from the regional health insurance association, which provided the vaccination data for the whole of 1992 and 1993, as well as the average size of all practices in those years in both regions. The health insurance association covers influenza vaccination without co-payment only for patients at risk, and the pharmacy receives payment for every single vaccine for which the patient is registered by name. The vaccination rate was defined as the ratio of the number of influenza vaccine prescriptions to the total number of patients. To check the validity of the figures on the total number of vaccines, we asked every practice to register the number of vaccinees in 1993 and the reason for each vaccination (the patient was at risk, or was not at risk but had requested vaccination).

Analysis

The data of the questionnaires were coded and 10% were double-coded as a control. For the partnership practices, data describing the organization of the practice were aggregated to practice level, as were the vaccination data obtained for each GP from the regional health insurance association. Data were analysed with the SPCC-PC program (version 4.0).

The differences between the intervention and control regions in the GP and practice characteristics are expressed in Table 2 as means ($\bar{x}$) and proportions. To assess the effectiveness of the intervention regarding the five organizational aspects of the vaccination, we proceeded as follows:

(1) The changes from 1992 to 1993 were calculated from the formula for the difference of proportions for paired cases[25]
(2) The standard errors of the differences between these changes (with 95% confidence intervals (95% CIs), Z-statistics and *P*-values) were calculated from the formula for the pooled variance estimate for unpaired cases.[26]

We checked the results in the different subgroups of all relevant variables.

To assess the effectiveness of the intervention on the vaccination rate, we calculated the difference between the regions (with 95% CI, Z-statistic and *P*-value) in the mean increase in vaccination rate between 1992 and 1993.[26] Controls for interaction and modification of effect were carried out using multiple linear regression.[27] Continuous predictor variables were dichotomized (high/low). The interaction variables were defined according to the regression equations for dummy variables.[27] First, the increase between 1992 and 1993 was related to all the relevant variables and interaction variables at t_0. Then, the predictor variables contributing significantly to the increase ($P<0.05$) were integrated into the final model.

Results

Response and basic characteristics

In the intervention region, 78% of the practices returned both questionnaires, while in the control region 76% did so (Table 1). The analysis of the initial non-responders (from whom a 50% response to the shorter, anonymous questionnaire was obtained in both regions) revealed no differences between responders and

non-responders with regard to the five organizational aspects. We found a high consistency in the answers at t_0 and t_1. Vaccination data for the two years were available for all practices, with the exception of two in the control region.

In 1992, the basic characteristics of the GPs, including their opinions about indications for vaccination, differed little between regions and were comparable with the available national figures (Table 2).[28] At practice level, the intervention region had fewer solo practices and a lower mean percentage of regional health insurance patients. More practices in the control region were situated in a city of more than 100 000 inhabitants.

Organization of the vaccination

There was a greater improvement in the intervention region than in the control region for three of the five organizational aspects of influenza vaccination (Table 3): the number of practices having vaccine in stock increased 29% more in the intervention region than in the control region; the number of practices using mail prompts increased 25% more; and the number of practices holding special vaccination hours increased 16% more. In general, the same difference in improvement was found in different subgroups of all relevant variables (type of practice, urbanization, percentage of regional health insurance patients, percentage of patients over 65 years of age, presence of a computer, and baseline vaccination rate; these variables are not shown in Table 3). In 1992, there had been no significant difference between the regions in the five organizational aspects of the vaccination.

Vaccination rate

Between 1992 and 1993, the vaccination rate increased by 21% in the intervention region, and by 6% in the control region (Table 4). The mean increase in the intervention region exceeded that in the control region by 1.1 per 100 patients. The results for practices whose GP responded to the questionnaires in 1992 and 1993 did not differ from those where GPs did not respond. In 1993, practice assistants registered just as many vaccinations of low-risk patients in both regions. In the intervention region, 0.7 per hundred patients were registered for vaccination, and in the control region 0.8 (not shown in Table 4).

A multiple linear regression was performed with the intervention and all relevant predictor variables at t_0 (type of practice, urbanization, percentage of regional health insurance patients, percentage of patients aged over 65, computerized sex–age register, registration of high-risk patients, mail prompt, vaccine in stock, special vaccination hours, vaccination by practice assistant, vaccination rate, and the three significant interaction variables: type of practice, urbanization, and vaccination by the practice assistant with the intervention). Three variables contributing significantly ($P<0.05$) to the increase in the vaccination rate between 1992 and 1993 were included in the final model (Table 5). The intervention had an independent effect. There was an interaction between the intervention and the degree of urbanization; for example, the intervention was more influential in the city of the intervention region. 'Vaccine in stock in 1992' was an independent predictor variable. The adjusted R square of 0.19 indicates the amount of variability in vaccination rates that can be explained by the model produced.

Table 1. Number of GPs and practices in both regions (with percentages), from which vaccination data and responses were obtained in 1992 and 1993 (t_0 and t_1).

	Intervention region				Control region			
	GPs		Practices		GPs		Practices	
	n=118	(%)	n=82	(%)	n=124	(%)	n=97	(%)
Response at t_0 and t_1	84	(71)	64	(78)	88	(71)	74	(76)
Vaccination data	118	(100)	82	(100)	122	(98)	95	(98)

Table 2. Basic characteristics in 1992 (t_0) of GPs and practices, showing means ($\bar{x}$, with standard deviations [SDs]) or numbers (with percentages), as appropriate. Data for The Netherlands are shown as a comparison.

General practitioners (n)	Intervention region (n=84)	Control region (n=88)	The Netherlands (n=6595)
Age ($\bar{x}$) [SD])	44 (7)	43 (6)	43
Male (%)	67 (80%)	74 (84%)	85%
FTE ≥ 0.8 (%)	75 (89%)	81 (92%)	–
List size ($\bar{x}$) [SD])	2336 (676)	2408 (457)	2310
Indications ('yes'):			
Asthma/COPD (%)	84 (100%)	87 (99%)	–
Heart disease (%)	81 (96%)	86 (98%)	–
Diabetes mellitus (%)	84 (100%)	85 (97%)	–
Practices (n)	(n=64)	(n=74)	(n=4800)
Solo (%)	36 (56%)	55 (74%)	73%
In city with ≥ 100 000 inhabitants (%)*	19 (30%)	37 (50%)	28%
Percentage in regional health insurance ($\bar{x}$) [SD])*	56 (11)	63 (11)	61%
Percentage of over-65s ($\bar{x}$) [SD])	12 (5)	12 (6)	13%
Sex–age register (%)	36 (56%)	51 (69%)	70%

FTE = full-time equivalent. * Difference between regions: P<0.05.

Table 3. Percentage changes (△%) in five aspects of the organization of the influenza vaccination from 1992 to 1993 in the intervention and control region. Difference of changes (△△%, 95% confidence interval, Z-statistic and P-value)*.

	Intervention region			Control region			Difference of differences		
	1992	1993	△%	1992	1993	△%	△△%	(95% CI)	Z
Registry	47/64	57/64	16%	51/74	60/74	12%	4%	(-12% to 18%)	0.41
Mail prompt	24/64	44/64	31%	20/74	25/74	6%	25%	(11% to 38%)	3.45†
Vaccine in stock	36/64	50/64	22%	48/74	43/74	-7%	29%	(16% to 44%)	4.13†
Vaccination hours	43/64	54/64	18%	56/74	58/74	2%	16%	(2% to 27%)	2.19**
By practice assistant	53/64	55/64	3%	57/74	62/74	7%	-4%	(-13% to 6%)	0.73

*There were comparable results in the analysis of the different subgroups: practice type, urbanization, percentage of patients in regional social health insurance, percentage of over-65s, computerized sex–age register and vaccination rate 1992. **P<0.05. †P<0.001.

Table 4. Mean number of influenza vaccines per 100 patients insured in the regional health insurance association (provided by the association) with the increase (△) between 1992 and 1993 in the intervention and control regions, and the difference in the increase (△△, 95%CI, Z-statistic and P-value).

	Intervention region				Control region				Difference of differences		
	(n)	1992	1993	△	(n)	1992	1993	△	△△	(95% CI)	Z
All practices	(82)	7.7	9.3	1.6	(95)	8.5	9.0	0.5	1.1	(0.6 to 1.6)	4.46*
Responding	(64)	7.8	9.3	1.5	(72)	8.5	9.0	0.5	1.0	(0.5 to 1.4)	4.37*
Non-responding	(18)	7.5	9.5	2.0	(23)	8.3	9.0	0.7	1.3	(-0.2 to 2.8)	1.93

*P<.001.

Table 5. Final model of the multiple regression with variables contributing significantly (P<0.05) to the increase in the vaccination rate (mean number of vaccines per 100 regional health insurance patients) between 1992 and 1993; B-coefficient, 95% confidence interval (95%CI), P-value.

Predictors	B	(95%CI)	P value
Intervention (intervention = 1; control = 0)	0.68	(0.22 to 1.14)	0.004
Intervention x big city (Intervention = 1; control = 0) (>100 000 = 1; <100 000 = 0)	0.82	(0.15 to 1.48)	0.017
Vaccine in stock at t_0 (no = 1; yes = 0)	0.55	(0.12 to 0.98)	0.013
Constant	0.30	(-0.02 to 0.63)	0.070
Multiple R	0.46		
R square	0.21		
Adjusted R square	0.19		

Discussion

The intervention effectively facilitated the organizational aspects of influenza vaccination. However, there was only a moderately higher increase in vaccination rate in the intervention region. There is no reason to assume that the increase in the intervention region was caused by vaccinating patients who did not have an indication. In the intervention region 4000 more patients at risk were vaccinated, and in the control region 1500 more patients.

The improvement in the organization of the vaccination occurred mainly in the activities that were most susceptible to increase, such as the use of mail prompt and the stocking of vaccine. The improved distribution of the vaccine would have favoured these organizational changes. This might be why the intervention was more effective in increasing the vaccination rate in the city. Many pharmacists prefer to supply their own clients, which makes the organization of the vaccination more complicated in big cities; however, these improvements result in a simplification of the distribution of the vaccine. Simplifying vaccine delivery has been found to be helpful in other interventions.[29,30]

Regarding the validity of the study, we assume that the intervention was influential, although the chosen design was less rigorous than a randomized controlled trial would have been. Therefore, we need to be cautious in concluding that the change in behaviour is due to the intervention and not to some other factor. However, we could not identify any other factors associated with the increase in the vaccination rate. The responses of the GPs might be considered to have caused bias: the response on both questionnaires was high. The consistency in the answers at t_0 and t_1 corroborates the reliability of data from the written questionnaires. There were few differences between the responding and non-responding practices in the basic characteristics or in the vaccination rate. The vaccination rates at t_1 show that there was very little difference between the two regions in terms of their actual rates rather than their increases since 1992. A possible ceiling effect could have given the intervention region more scope to improve: with an average percentage of high-risk patients of 12%, and given the compliance of invited patients and a certain percentage of vaccinated low-risk patients, the ceiling would be well above 10%.[17]

Most studies of the implementation of explicit guidelines show an improvement in clinical practice when the guidelines are subject to rigorous evaluations.[31] In a performance-based, financial incentive programme in a family medicine setting in New York, the same change (21%) was found in the percentage of people vaccinated between 1990 and 1991.[32] Long-term interventions in other settings have shown comparable effects on the vaccination rate.[33,34] Our intervention might lead to a greater increase if executed in successive years.

The basic characteristics of the practices investigated were comparable with national figures. The variables differing significantly between the regions influenced neither the improvement of the vaccination organization nor the increase in the vaccination rate. The results seem to be capable of generalization to other regions, or to other countries with a comparable organization of primary care, such as the United Kingdom.

Laudable as the NHG's publication of guidelines might be, our results suggest that such a strategy is insufficient to promote prevention. In The Netherlands, preventive programmes in family medicine are still underdeveloped — possibly because they lack a fee-incentive, or because preventive work has a low status compared with curative work. Systematic prevention requires a population-oriented approach rather than the case oriented-approach common in family medicine. Moreover, patients' acceptance of preventive actions by their GPs is also in need of further development.

This complex intervention was effective in promoting a regional implementation of guidelines for influenza vaccination, and GPs' behaviour was seen to be influenced. The same strategy could be used for other regions and other guidelines. This study suggests that such intervention strategies ought to be routinely considered in conjunction with the publication of advisory guidelines.

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