Farmacia HOSPITALARIA
Órgano oficial de expresión científica de la Sociedad Española de Farmacia Hospitalaria

ORIGINALS
Bilingual edition English/Spanish

Implementation of an anti-flu vaccination campaign in a hospital pharmacy service

Implantación de una campaña de vacunación antigripal en un servicio de farmacia hospitalario

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Received 14 January 2019;
Accepted 14 October 2019.
DOI: 10.7399/fh.11198

How to cite this paper
Fernández-Cañabate E, Martínez-Santana V. Implementation of an anti-flu vaccination campaign in a hospital pharmacy service. Farm Hosp. 2020;44(2):41-5.

Abstract

Objective: To determine the impact of the implementation of an influenza vaccination campaign in a hospital pharmacy service on patients who are starting or receiving treatment with biological therapies.

Method: A 15-month quasi-experimental study of patients starting or receiving treatment with biological therapies. Between October and December 2016 and October and December 2017, we compared influenza vaccination rates, the incidence of influenza in the study population, the direct impact of the vaccination campaign on the patient, the effect of the campaign on vaccination rates, and the results of the satisfaction survey.

Results: A total of 188 patients participated in the study. Of the patients who had not been vaccinated in the 2016/2017 campaign, 72.6% were vaccinated ($p < 0.000$) during the 2017/2018 campaign. No statistically significant differences were found between the 2016/2017 and 2017/2018 campaign ($p = 0.636$) in the percentage of patients who contracted flu after receiving the vaccine. In total, 99.5% thought that the campaign was a good initiative, and 50.5% reported that their decision to be vaccinated was influenced by the fact that the campaign was led by the hospital pharmacy service.

Conclusions: The implementation of the influenza vaccination campaign in the hospital pharmacy service achieved led to a marked increase in vaccination rates. This result underlines the key role played by the hospital pharmacy service in achieving this level of success.

KEYWORDS
Flu; Vaccination; Influenza vaccine; Pharmacy service; Hospital; Biological therapy.

Resumen

Objetivo: Determinar el impacto de la implantación de una campaña de vacunación antigripal en los pacientes que van a iniciar o están en tratamiento con terapias biológicas en un servicio de farmacia hospitalario.

Método: Estudio cuasiexperimental de 15 meses de duración en pacientes que van a iniciar o que están en tratamiento con terapias biológicas. Se comparó la tasa de vacunación antigripal entre los meses de octubre y diciembre de los años 2016 y 2017, el grado de incidencia de la gripe en la población de estudio, el impacto directo de la campaña de vacunación sobre el paciente, la influencia de la implantación de la campaña en las tasas de vacunación y los resultados de la encuesta de satisfacción.

Resultados: Participaron en el estudio 188 pacientes. Del total de pacientes que no se habían vacunado en la campaña 2016/17, tras la implantación de la campaña de vacunación antigripal 2017/18 en el servicio de farmacia hospitalario el 72,6% se vacunaron ($p < 0,000$). El porcentaje de pacientes que padecieron la gripe tras la administración de la vacuna no mostró diferencias estadísticamente significativas entre la campaña 2016/17 y 2017/18 ($p = 0,636$). El 99,5% de los pacientes consideró que la campaña fue una buena iniciativa y en el 50,5% influyó en su decisión a vacunarse que se realizara en el servicio de farmacia hospitalario.

Conclusiones: La implantación de la campaña de vacunación antigripal en el servicio de farmacia hospitalario consiguió un gran aumento en la tasa de vacunación, lo que se traduce en la importancia de la intervención farmacéutica en la consecución de este éxito.

PALABRAS CLAVE
Gripe; Vacunación; Vacuna de la gripe; Servicio de farmacia; Hospital; Terapia biológica.

Introduction

Influenza (or flu) is an infectious disease caused by the influenza A or influenza B viruses. It occurs worldwide in seasonal patterns as epidemics or pandemics that cause considerable morbidity and mortality[1]. Flu can cause severe illness and even death in high-risk populations (i.e. pregnant women, children aged 6-59 months, elderly people, immunosuppressed patients, and patients with asthma, lung disease, or chronic heart disease)[2]. The World Health Organization (WHO) has estimated that there are 3 to 5 million severe cases of flu per year[3].

In industrialized countries, the majority of flu-related deaths occur in people aged more than 65 years. Epidemics can cause high rates of labour and school absenteeism with concomitant productivity losses[2]. In 2008, a pharmacoeconomic review of the impact of flu on work absenteeism suggested that the number of working days lost due to flu ranged from less than 1 day to 4.3 days[4]. In 2005, a WHO report suggested that in industrialized countries flu had considerable economic repercussions in terms of healthcare expenditures, loss of working hours, and disruption in social life. According to estimations conducted in Germany, the United States, and France, the total annual cost of flu epidemics ranged between $1 million and $6 million dollars per 100,000 inhabitants[5]. Nichol *et al.* estimated that flu was the cause of 39% of lost working days and a 49% drop in productivity in unvaccinated in people aged 50 years to 64 years[6]. Preaud *et al.* described the economic and health benefits of influenza vaccination in Europe[7].

In the 2016-2017 season, during a moderate influenza outbreak in Catalonia (Spain), 55% of laboratory-confirmed severe influenza hospitalizations involved unvaccinated patients. The vaccination coverage of laboratory-confirmed severe influenza hospitalizations patients aged more than 64 years was 53.6%[8].

In developed countries, the most effective measure to prevent flu is considered to be annual influenza vaccination campaigns targeting those at greater risk of flu or those more vulnerable to flu-associated complications[9].

The Regional Healthcare Service of Catalonia[9] recommends influenza vaccination in the following groups:

1. Those aged 60 years or older.
2. Those younger than 60 years who could be at a high risk of flu-associated complications: immunosuppressed patients are included in this group.

Immunosuppressed patients are a heterogeneous group due to the wide variations in their levels of immunosuppression (i.e. high or low) and in their susceptibility to infection. In these patients, the safety and effectiveness of vaccines depend on the type and level of immunosuppression. In addition, the level of immunosuppression may vary over time in specific patients, thus necessitating a dynamic approach to treatment.

Currently, there is an increasing number of patients receiving treatments that cause immunosuppression. This group includes patients receiving immunomodulating drugs for the treatment of autoimmune diseases, such as rheumatoid arthritis, psoriasis, and inflammatory bowel disease. Some of these diseases carry a higher risk of vaccine-preventable infections because a large part of the risk of infection in these patients is due to treatment with these drugs[10,11].

Patients receiving biologic therapies (BT) are at a high risk of complications from influenza[12]. According to Richi *et al.*[13] therefore vaccination is recommended. It is known that BT induces immunosuppression, which further supports the recommendation of influenza vaccination[10,12]. The Spanish Society of Rheumatology (SER) has highlighted the relevance of achieving high rates of vaccination coverage against seasonal influenza[12]. Some studies have reported good humoral responses to microorganisms, such as the influenza virus, in patients receiving treatment with tumour necrosis factor (TNF) antagonists, tocilizumab, and abatacept[13,14].

High influenza vaccination rates in patients receiving BT could lead to a decrease in morbidity and mortality from influenza virus infection, fewer primary care visits, fewer hospital admissions, and less work absenteeism. A literature search failed to find any studies on influenza vaccination campaigns led by hospital pharmacy services (HPS).

The objective of this study was to determine the impact of a HPS implementing an influenza vaccination campaign in patients who were starting or receiving BT.

Methods

A quasi-experimental 15-month study conducted in a 165-bed hospital. We analysed the impact of an HPS-led influenza vaccination campaign in patients who were starting or receiving BT. We compared the influenza vaccination rates between October and December 2016 (i.e. the 2016/2017 campaign) and October and December 2017 (i.e. the 2017/2018 campaign). We also compared the incidence of influenza in the study population during the study periods. The study comprised three stages: pre-intervention, intervention, and post-intervention.

Inclusion criterion: any patients aged more than 18 years who were receiving BT or who had started pre-BT testing. All participants signed an informed consent form. Exclusion criterion: any patient with conflicting data in their medical history and those who did not provide signed informed consent.

During the pre-intervention stage, retrospective data were collected on the number of patients who received the vaccine during the 2016/2017 influenza vaccination campaign and the number of patients who contracted flu during the same period.

The eCAP platform 10.0.0 was used to collect data on the vaccines administered and patients who had contracted flu during the 2016/2017 campaign. The eCAP platform is a primary care data management system implemented in some Spanish regions. A questionnaire was used to assess patient satisfaction. Other variables were collected from the electronic patient records software xHIS, version 5.FHES.10.01.

The intervention stage was conducted from October to December 2017. The intervention consisted in explaining the benefits of vaccination to all patients who were starting or receiving BT. The intervention took place on the day the patients had their treatment administered at or collected from the HPS or day hospital. The patients who accepted vaccination were given an appointment to sign the informed consent form and have the influenza vaccine administered by the nursing staff at the external consultation department of the HPS.

At the time of vaccination, each patient filled in a questionnaire to assess their level of satisfaction with the influenza campaign (see Appendix 1). During the months of April and May 2018, a phone call was made to all those patients who through the eCAP program had not known if they had contracted flu during the 2017/2018 campaign.

The following variables were collected: age at time of inclusion, sex, active BT, diagnosis, whether the influenza vaccine was administered in the 2016/2017 or 2017/2018 campaign, and the incidence of influenza in vaccinated and unvaccinated patients in the 2016/2017 and 2017/2018 campaigns.

The following process and outcome indicators were assessed:

- Percentage of patients vaccinated during the influenza vaccination 2016/2017 and 2017/2018 campaigns.
- Direct impact of the campaign on patients. This was measured as the percentage of patients who (a) had voluntarily accepted vaccination after the implementation of the 2017/2018 influenza vaccination campaign and (b) had not accepted vaccination in the 2016/2017 campaign.
- Direct impact of the campaign on the group of patients aged more than or equal to 65 years.
- Incidence of influenza in vaccinated and unvaccinated patients in the 2016/2017 and 2017/2018 campaigns.
- Outcomes of the satisfaction survey. These were defined as (a) the percentage of patients who thought that the information given during the 2017/2018 influenza vaccination campaign was suitable, (b) the percentage of patients who agreed to being vaccinated because the administration of the vaccines was done at the HPS, (c) the percentage of patients who thought that the influenza vaccination campaign led by the HPS was a good initiative, and (d) the assessment of the treatment received.
- Impact of the HPS-led influenza vaccination campaign on the vaccination rate during the 2017/2018 campaign in patients receiving BT or who were about to start BT.

Continuous variables are expressed as means and standard deviations and categorical variables are expressed as percentages. Associations between qualitative variables were analysed using McNemars's test, the chi-square test with corresponding 2 x 2 contingency tables, Yates's test, or

Fisher's test for independent samples. The data was analysed with the R statistics software package for Windows. A P value < 0.05 was used as a cutoff for statistical significance.

Approval for the study was granted by the Ethics Committee of the *Unió Catalana de Hospitales*. The study was conducted according to the ethical principles of the Declaration of Helsinki (Fortaleza, Brazil, 2013), the Standards of Good Clinical Practice, and the applicable regulations in biomedical research (Spanish Law 14/2007 on Biomedical Research). Data confidentiality was protected in accordance with Spanish Law 15/99 on Personal Data Protection.

Results

A total of 188 patients gave their consent to participate in the study, of which 49.5% were men and 50.5% women. The mean age of participants were 52.5 ± 13.19 years. The main diagnoses of the patients were psoriasis (28.7%), psoriatic arthritis (21.3%), and rheumatoid arthritis (20.2%). In total, 97.34% of patients had already started BT. The most common treatments received were adalimumab (39.9%), infliximab (13.8%), and ustekimumab (13.3%) (Table 1).

During the 2016/2017 influenza vaccination campaign, 43.6% of patients were vaccinated, and the incidence of influenza virus infection was 15.4%.

During the 2017/2018 influenza vaccination campaign, 84% of the patients were vaccinated, and the incidence of influenza virus infection was 13.3% (Table 2).

Table 1. Baseline characteristics of the study population

Sex	Men: 49.5% Women: 50.5%
Age	52.25 (20-89) ± 13.19 years > 65 years: 41 (21.81%)
Main diagnosis	Psoriasis: 28.7% Psoriasic arthritis: 21.3% Rheumatoid arthritis: 20.2% Ankylosing spondylitis: 12.5% Crohn's disease: 6.9% Hidradenitis 4.8% Ulcerative colitis: 2.1% Others: 3.5%
Prescribed drugs	Adalimumab: 39.9% Infliximab: 13.8% Ustekimumab: 13.3% Etanercept: 11.2% Golimumab: 7.4% Certolizumab: 3.7% Others: 10.7%

Of the patients who had not been vaccinated during the 2016/2017 campaign, 72.6% were vaccinated during the 2017/2018 campaign ($p < 0.000$) (Table 3). No statistically significant differences were found between the 2016/2017 and 2017/2018 campaign ($p = 0.636$) in the percentage of patients who contracted flu after receiving the vaccine.

During the 2017/2018 campaign, the percentages of vaccinated and nonvaccinated patients who contracted flu was the same (13.3% and 13.3%; $p = 1$). The percentages were similar during 2016/2017 campaign (14.2% and 17.1%; $p = 0.729$) (Table 4).

In total, 21.81% of the patients were aged more than or equal to 65 years. During the 2016/2017 campaign, 25 patients (60.97%) had been vaccinated and 2 (4.8%) of them contracted influenza. During the 2017/2018 campaign, 34 (82.9%) were vaccinated and 6 (14.63%) reported having had influenza. The direct impact of the influenza vaccination campaign was measured as the percentage of patients vaccinated after the 2017/2018 campaign had been implemented but had not been vaccinated during the previous season (53.3%; $p < 0.000$).

The results of the satisfaction survey were as follows: 96.3% of the patients reported that the information received was suitable; 50.5% reported that their decision to be vaccinated was influenced by the fact that the campaign was led by the HPS; 99.5% thought that the campaign was a good initiative; and 99.5% reported that the service provided by the staff involved in the campaign was good or very good.

The fact that the 2017/2018 influenza vaccination campaign was led by the HPS was associated with an increase in the vaccination rate from 43.6% in the previous season to 84% in the second season.

Discussion

An association was found between the implementation of an influenza vaccination campaign led by the HPS and a large increase in vaccination rates. This finding supports the relevance of pharmaceutical interventions led by HPSs.

In total, 72.6% ($p < 0.000$) of the patients vaccinated in the HPS campaign had not been vaccinated in the previous season. This increase was statistically significant.

Nevertheless, there was no decrease in the incidence of flu in vaccinated patients. We suggest that this result was due to the fact that in the 2017/2018 campaign of the 3509 sentinel detections identified, a) the tests identified influenza B virus (59%) and influenza A virus (41%) and b) 90% of circulating type B virus were characterized as B/Yamagata, which is a lineage that was not included in the 2017/2018 vaccine. The Spanish health system has characterised more influenza A (H3N2) viruses belonging to group 3C.2a1 than to group 3C.2a. Group 3C.2a1 was the component chosen for the 2018/2019 season, whereas group 3C.2a was chosen for the season 2017/2018. In Catalonia, the predominant type/subtype of the virus in the 2017/2018 season was the B/A (H3N2)[15].

The efficacy of vaccination during the 2017/2018 campaign may have been related to cross-protection against the Yamagata lineage, moderate protection against the A(H1N1)pdm09 virus, and low or zero protection against the A(H3N2) virus[15]. Richi *et al.*[13] suggested that in patients receiving BT vaccinated against influenza, the predictive factors of an immunological response were baseline seropositivity and anti-TNF thera-

Table 2. Data on the 2016/2017 and 2017/2018 Influenza Campaigns

		2016/2017 influenza campaign (data expressed as numbers and percentages)		2017/2018 influenza campaign (data expressed as numbers and percentages)	
		YES	**NO**	**YES**	**NO**
Results for the total patient sample *n* = 188	Vaccinated patients	82 (43.6%)	106 (56.4%)	158 (84%)	30 (16%)
	Patients with influenza	29 (15.4%)	159 (84.6%)	25 (13.3%)	163 (86.7%)
In patients ≥ 65 years *n* = 41	Vaccinated patients	25 (60.97%)	16 (39.02%)	34 (82.9%)	7 (17.07%)
	Patients with influenza	2 (4.87%)	39 (95.12%)	6 (14.63%)	35 (85.36%)
Patients on receiving biological therapies *n* = 183	Vaccinated patients	82 (44.8%)	101 (55.19%)	153 (83.6%)	30 (16.4%)
	Patients with influenza	29 (15.85%)	154 (84.15%)	25 (13.66%)	158 (86.34%)

Table 3. Percentages of vaccinated patients during the two influenza vaccination campaigns

		Percentage of vaccinated patients during the 2017/2018 campaign	
		YES	NO
Percentage of vaccinated patients during the 2016/2017 campaign	YES	98.80%	1.20%
	NO	72.60%	27.40%
McNemar test		$p < 0.000$	

Table 4. Percentage of vaccinated and nonvaccinated patients in the 2017/2018 campaign and influenza diagnosis

		Percentage Influenza, 2017/2018 campaign	
		NO	YES
Percentage of vaccinated patients, 2017/2018 campaign	YES	86.70%	13.30%
	NO	86.70%	13.30%
Fisher test		$p = 1$	

Percentage of vaccinated and nonvaccinated patients in the 2016/2017 campaign and influenza diagnosis

		Percentage influenza, 2016/2017 campaign	
		NO	YES
Percentage of vaccinated patients, 2016/2017 campaign	YES	82.90%	17.10%
	NO	85.80%	14.20%
Fisher test		$p = 0.729$	

py. This information would have been of great use, had it been known at the time of this study.

The novel aspect of our study is that the influenza vaccination campaign was implemented and led by the HPS. The literature reports that community pharmacy services have implemented flu vaccination campaigns in countries such as Portugal, France, Canada, and the United States[16,17]. The advantages of campaigns implemented by community pharmacy services include opening new vaccine administration channels[16], ease of access, and eliminating the need for appointments. A study conducted in Canada[17] estimated that 28% of vaccinated patients would not have been vaccinated had they not had access to the vaccine via the community pharmacy service. In total, 21% were high-risk patients. A study conducted in Portugal found that during the first vaccination campaign led by community pharmacies, 13% of individuals receiving vaccination had never been vaccinated previously[17]. Kirkdale *et al.*[17] suggested that the implementation of a vaccination campaign by community pharmacies is a challenge due to the following issues: the existence of different regulatory frameworks underlying vaccine provision, differing methods of remuneration for the vaccine and prescriptions, and different types of record-keeping. In our study, the vaccines were provided by the primary care vaccination coordinating centre, the indications for vaccination were addressed by the pharmacists responsible, and the vaccinations were recorded by nursing staff using the eCAP primary care computer platform. All these aspects were managed from the HPS.

A literature search showed that the study by Hill *et al.*[18] is the only one available on the implementation of an influenza vaccination campaign led by an HPS. This study demonstrated an association between improvements in influenza vaccination rates among hospitalised patients and a program conducted by pharmacy technicians and nursing staff[18].

The results of the satisfaction survey showed that around half of the patients decided to be vaccinated because it was administered in the HPS. In addition, 99.5% thought that this approach was a very good initiative, particularly because of its convenience (i.e. it was administered the day patients came to collect their medication or have it administered). Kirkdale *et al.*[3] found that patients had very positive opinions and experiences of vaccination in community pharmacies (level of satisfaction 92-98%). They reported that community pharmacies were chosen because of their ease of access, a preference for community pharmacies, and avoiding visiting family doctors[3].

This study is limited by the fact that, after the vaccinations, laboratory tests were not used to confirm the presence or otherwise of the flu virus. This aspect may have led to some bias in the data. Although the effectiveness of the vaccine was low to moderate and the flu rate was similar in both seasons, the increase in the percentage of vaccinated patients is highly relevant. According to the Spanish National Epidemiological Surveillance Network[15], vaccination can have a high impact on public health by reducing flu-related hospitalizations and mortality in people at risk of complications from influenza. Patients on BT have a higher risk of flu-related complications due to its immunosuppressive effect. It is therefore relevant to increase influenza vaccination rates in this population.

This study shows the impact and relevance of HPS intervention in achieving high rates of influenza vaccination in patients on BT. This type of intervention on the part of hospital pharmacists represents an important contribution to healthcare practice. Such interventions can be incorporated in the work routine of hospital pharmacists as a novel area of responsibility. This approach leads to significant increases in vaccination rates as well as significant decreases in the severity of influenza-driven infections, thus lowering costs within the healthcare system.

Funding

No funding.

Conflict of interests

No conflict of interest.

Contribution to the scientific literature

This article demonstrates the relevance of the Hospital Pharmacy Service in achieving high rates of influenza vaccination in patients undergoing treatment with biological therapies. We believe this paper to be a relevant contribution to healthcare practice, in that it describes a new area that could be to be incorporated into the work of hospital pharmacists. We show that this new approach is associated with significant increases in vaccination rates. It is also associated with decreases in the severity of infections in a population of patients at increased risk of complications derived from influenza due, in part, to immunosuppression induced by biological treatment. Thus, this approach would lead to lower costs within the health system.

These results underline the key role played by the Hospital Pharmacy Service in achieving this level of success. We suggest that the Hospital Pharmacy Service is the ideal place in which to implement vaccination campaigns, given that the service is focused on medication and ease of access to patients in treatment.

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APPENDIX 1. Satisfaction questionnaire on the implementation of an influenza vaccination campaign in patients on biologic therapies

Age:

Gender: ☐ Male ☐ Female

Referral service: ☐ Dermatology ☐ Rheumatology ☐ Gastroenterology

Do you think that the information given in the 2017-2018 flu campaign was suitable?

☐ YES ☐ NO

Was your decision to be vaccinated influenced by the fact that the vaccination would be done in the Hospital de l'Esperit Sant pharmacy service?

☐ YES ☐ NO

Do you think that running the influenza vaccination campaign from the Hospital de l'Esperit Sant pharmacy service was a good initiative?

☐ YES ☐ NO

How do you rate the service given by the personnel involved in the vaccination campaign?

☐ Very bad ☐ Bad ☐ Acceptable ☐ Good ☐ Very good

Did you have flu during the 2016-2017 campaign?

☐ YES ☐ NO ☐ Don't know

Were you vaccinated against flu during the 2016-2017 campaign?

☐ YES ☐ NO ☐ Don't know