

Influenza and Pneumococcal Vaccination in Heart Failure - a little Applied Recommendation

Wolney de Andrade Martins, Margarete Domingues Ribeiro, Lucia Brandão de Oliveira, Luciana da Silva Nogueira de Barros, Ana Cristina da Silva Moreira Jorge, Camila Mirante dos Santos, Daniella de Paiva Almeida, Isaias Fiuza Cabral, Renata Tavares de Souza, Thyago Antônio Biagioni Furquim

Clínica de Insuficiência Cardíaca (CLIC) do Hospital das Clínicas de Teresópolis Costantino Ottaviano (HCTCO) - Centro Universitário Serra dos Órgãos (UNIFESO), Teresópolis, RJ - Brazil

Abstract

Background: Heart failure (HF) is associated with frequent decompensation and admissions to the emergency service. Influenza (INF) and Pneumococcal (PNM) vaccinations are recommended in the guidelines, however, respiratory infections are the third leading cause of hospitalization in heart failure.

Objective: To assess the frequency of vaccination against INF and PNM in patients with HF in government healthcare units.

Methods: An observational study carried out in Teresópolis, a mountain region in Rio de Janeiro, employed three strategies: (I) study of requests for vaccine against INF and/or PNM in the Health Department of Teresópolis between 2004 and 2006; (II) direct inquiry to 61 patients with heart failure treated in primary care about their vaccination status against INF and PNM; (III) direct inquiry about their vaccination status against INF and PNM to 81 patients with decompensated chronic heart failure treated in the only emergency service open to the public.

Results: In strategy I, INF and/or PNM vaccination was 15.3% of those with indications for cardiovascular and respiratory diseases. The median time between indication and vaccination was 32 days. In strategy II, the percentage of patients vaccinated against INF, aged > 60, was 23.1% and 24.6% against PNM at all ages. In strategy III, the percentage of patients vaccinated against INF was 35.8% and against PNM was 2.5%.

Conclusion: The rate of vaccination against INF and PNM in patients with HF is very low and even lower in those with decompensated HF treated in emergency services. (Arq Bras Cardiol 2011;96(3):240-245)

Keywords: Vaccination; human influenza; pneumonia; heart failure.

Introduction

Heart failure (HF) is a progressive clinical syndrome characterized by heart muscle failure to pump enough blood to the organic systems. Increase in cardiovascular risk factors and greater longevity of the population contribute for the HF to have an epidemic form. HF is associated with frequent readmissions and each has additional weight in the worsening of the survival curve. The main factors that precipitate decompensation and hospitalization include failure to follow the treatment, acute myocardial ischemia, high blood pressure and respiratory infections such as pneumonia and viral diseases¹⁻².

Pulmonary congestion is present in most patients with HF and predisposes them to respiratory infections. These include influenza due to high prevalence in the community, with

direct and indirect action in mortality and hospitalization of patients more vulnerable to viral complications, especially the elderly. Influenza and pneumococcal vaccination has decreased overall and cardiovascular mortality in the elderly, and has reduced the risk of hospitalization for pneumonia or death from all causes³⁻⁴. Epidemiological evidence has encouraged vaccination programs in high-risk populations. The societies specializing in cardiology in North America¹, Europe⁵ and Latin America⁶ included in their guidelines the recommendation of influenza and pneumococcal vaccination in chronic cardiac patients. In Brazil, both the Ministry of Health⁷ and the Brazilian Society of Cardiology² (SBC) also recommend vaccinations against influenza and pneumonia in these patients.

Considering the clinical and epidemiological importance of HF, the importance of vaccination as a prophylactic measure and the lack of data on the effectiveness of the recommendation of vaccination in Brazil, this study aimed to estimate the rate of influenza and pneumococcal vaccination in patients with HF under outpatient care and patients with decompensated heart failure, treated in government healthcare units of Teresópolis, a mountainous region of Rio de Janeiro.

Mailing address: Wolney de Andrade Martins •

Hospital Universitário Antonio Pedro - Serviço de Cardiologia - Rua Marquês do Paraná, 303/6º andar - Centro - 24030-215 - Niterói, RJ - Brazil
E-mail: wolney@cardiol.br

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Methods

The study was conducted in the city of Teresópolis, mountainous region of the state, with annual average temperatures below the national average, and 150,268 inhabitants in 2007. Outpatient care controlled by the government is operated by the family health strategy (ESF) in 29.5%, and complemented by other basic care units (UBS) with total coverage of 35.3% of the population. The secondary units are linked with the primary care system through the reference and counterreference system. The ESF is jointly administered by the SUS (Brazilian Health System) and the *Centro Universitário Serra dos Órgãos* (UNIFESO), an education institution with six undergraduate courses in health, with effective inclusion of professors and students from the said system. The largest tertiary unit is the medium-sized teaching hospital linked to SUS as the single urgency and emergency service open to the local public at the time of the study.

The study was observational, cross-sectional and consisted of three strategies:

Strategy I

Study of all “*Special Immunobiological Requests*” in the Health Department (SMS) of Teresópolis filed from January 2004 to December 2006, with special emphasis given to requests for influenza and/or pneumococcal vaccination with an indication for cardiovascular and respiratory diseases for adolescents and adults, considered those older than 12. It considered as clinical indication for HF all statements made in the request form listed below: “heart failure”, “cardiomyopathy”, “ischemic, alcoholic, hypertensive, rheumatic, valvular heart disease, peripartum or other specific etiology.” In one case it was not possible to determine the indication.

Vaccination against influenza and pneumococcus in special groups for clinical purposes happens by reference and scheduling in a single central unit. There is no vaccination against pneumococcus in ESF or UBS units or sub units or campaigns in this city. Vaccination against pneumococcus is exclusive to those with clinical indication, composed of several entities and situations. Therefore, there is no indication for vaccination based on age.

Strategy II

Direct Inquiry to 61 patients diagnosed with HF seen at ESF, UBS or secondary units on their situation on influenza vaccination in the year preceding the interview and against pneumococcus in the 5 years preceding the interview. Patients were admitted to the protocol in random order of arrival to the units with a mean age of 66.5 ± 11.8 years, with 52.0% female. Randomly, 8 units of ESF, one UBS and one secondary unit were covered in the sample. The sampling proportionality between urban (6) and units (3) on the population distribution was duly respected. For sample calculation, we worked with unadjusted prevalence of HF of 2.0%. The sample comprised 2.0% of the number expected of HF patients in the city.

Strategy III

Direct Inquiry to 81 patients diagnosed with chronic acute HF seen at emergency services on their situation on influenza vaccination in the year preceding the interview and against pneumococcus in the 5 years preceding the interview. All patients were decompensated and were included regardless of etiology, severity levels, causes of decompensation or other criteria. The order of admission to the protocol was randomized by the date of service, with direct collection of data, in the shifts covered by the researchers. Whenever patients failed to provide information on their clinical severity, we used data provided by their family or anyone accompanying them. We excluded patients with acute HF (“de novo”) and those with acute coronary syndrome or myocarditis, because they would have had previous diagnosis and the opportunity to vaccinate. Data collection took place between April 2007 to November 2008. The patients had different outcomes, such as discharge for outpatient monitoring, hospitalization or death. The mean age was 63.6 ± 14.0 years, 52.0% were male. That was the only emergency service open to the public in the city at the time of data collection and the sample collected from decompensated patients represented 2.7% of the estimated overall prevalence of HF not adjusted in the city, for all functional classes.

Data were collected after the qualification and training of interviewers in the pilot study. A structured questionnaire was used and later transferred to a spreadsheet. The results were presented as absolute values and percentages. A comparison of the distribution of proportions between groups was performed using the chi-square test. The level of significance adopted was 0.05.

The study was approved by the Ethics Committee on Research of UNIFESO under number 060 and 061/2006, as well as approval from the Health Department of Teresópolis. All patients in strategies II and III signed a consent form after receiving information. This project was supported by the Program for Undergraduate Scientific and Continuing Studies (UNIFESO-PICP) and *Fundação Carlos Chagas Filho de Amparo à Pesquisa of the State of Rio de Janeiro* (FAPERJ).

Results

Strategy I

In the three-year period analyzed, there were 735 pneumococcal vaccinations in the city of Teresópolis, predominantly in the pediatric population with 418 (56.9%), followed by vaccination in patients aged ≥ 12 for all other clinical indications other than cardiovascular or respiratory diseases with 168 (22.9%). Finally, those with respiratory or cardiovascular indication aged ≥ 12 with 149 (20.3%). Over this period, there were 184 references to influenza and/or pneumococcal vaccination to the Central Unit, which were 131 doses against pneumococcus, 35 against influenza and 18 against both. The median time between the indication of the vaccine by the assistant physician and the date of vaccination was 32 days, ranging from 1 to 377 days. Other characteristics of individuals vaccinated against INF and/or PNM are shown in Table 1.

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Table 1 - Characteristics of patients referred by clinical indication of cardiovascular and respiratory diseases aged ≥ 12 to vaccination against influenza and pneumococcus in Teresópolis, RJ, between 2004 and 2006

| Variable | | n | % | p |
|--------------------------|---------|-----|------|---------|
| Gender | Male | 61 | 33.2 | <0.0001 |
| | Female | 123 | 66.8 | |
| Nature of Source Service | Public | 143 | 77.7 | <0.0001 |
| | Private | 36 | 19.6 | |
| | Unknown | 5 | 2.7 | |
| Origin | Urban | 161 | 87.5 | <0.0001 |
| | Rural | 3 | 1.6 | |
| | Unknown | 20 | 10.9 | |

Source: Health Department of the City of Teresópolis (SMT).

Out of those vaccinated against INF and/or PNM in the central unit, 183 patients had indications analyzed and vaccination for clinical indication for HF occurred in 15.3% of those referred for respiratory or cardiovascular diseases. The main indication was "recurrent pneumonia" in patients with pulmonary disease (see Table 2).

Strategy II

Out of the 61 patients evaluated at primary and secondary units, the percentage of HF patients vaccinated against influenza was 72.1% versus 24.6% who denied having received the vaccination, and 3.3% were unaware. When taken separately, in those younger than 60, we obtained 23.1% of individuals vaccinated against influenza in relation to all patients in this age group. With respect to pneumococcal vaccination, the percentage of patients who said they had

Table 2 - Clinical indication of vaccination for cardiovascular and respiratory diseases against influenza and/or pneumococcus in patients aged ≥ 12 between 2004 and 2006, Teresópolis, RJ

| Indication | n | % |
|--|-----|-------|
| Indication for respiratory diseases | | |
| Recurrent pneumonia | 94 | 51.4 |
| Chronic obstructive pulmonary disease | 24 | 13.1 |
| Other pulmonary diseases | 24 | 13.1 |
| Other pulmonary diseases | 142 | 77.6 |
| Indications for cardiovascular diseases | | |
| Heart failure and cardiomyopathies | 28 | 15.3 |
| Hypertension without mention of heart disease | 7 | 3.8 |
| Coronary artery disease without mention of heart disease | 6 | 3.3 |
| Subtotal of cardiovascular diseases | 41 | 22.4 |
| Total | 183 | 100.0 |

Source: Health Department of the City of Teresópolis (SMT).

taken the vaccine was 24.6% against 57.4% who denied it and 18.0% who were unaware.

Strategy III

Out of the 81 patients with decompensated HF treated in the emergency department, the percentage of patients vaccinated against influenza was 35.8% against 64.2% who denied having received it. The percentage of patients who reported having received pneumococcal vaccination within the past 5 years was 2.5%, while 62.9% denied having received such vaccination and 34.6% were unaware of it.

Discussion

The incidence of HF in the USA is approximately 1,000 per 100,000 of the inhabitants after 65 years of age, of which 75.0% have hypertension as the probable cause¹. The prevalence of HF increases linearly with age in both sexes and severity is greater at the extremes of the age group⁶. In Canada, it reaches 350,000, while in the U.S. approximately 5 million people have HF. In Sweden, it is estimated to reach 2.0% of the population^{8,9}. In Brazil, the prevalence of HF is uncertain, however, it is on a rising trend due to increased survival of the general population and the increasing effectiveness of drugs to prolong life in patients with HF. For these reasons, HF represents the leading cause of hospitalization in the Brazilian Health System (SUS) in patients older than 65⁸.

In the last two decades in Brazil, there was a gradual increase in hospital mortality rates for HF with reversal in recent years². Hospitalizations contribute to the total annual cost of US\$ 33.7 billion in the U.S. economy, and in Brazil, in 2002, the cost per patient hospitalized with HF was estimated at R\$ 4,033.62^{1,8}. Most of the financial cost of HF patients is due to frequent hospitalizations. The causal relationship between respiratory infection and clinical decompensation has been confirmed in several epidemiological studies. Vaccination against respiratory infections is cost effective as a public health measure. There was a higher number of hospitalizations for HF during periods of epidemic influenza^{4,9-11}.

Moreover, in nosocomial environment, patients with HF are at increased risk of lung infections, especially pneumonia¹². There was no evaluation of cost-effectiveness of vaccination against influenza and pneumococcus in patients with HF in Brazil in the databases searched. However, it is plausible to infer that the vaccination strategy is very beneficial, mainly because other measures with greater financial cost, such as providing free medication for outpatients, have been studied with a favorable conclusion⁸.

By analyzing the results of reference sheets for vaccination in the Health Department of Teresópolis (SMS), we observed the irrelevant number of patients vaccinated against the magnitude of the prevalence of HF. The city of Teresópolis had influenza vaccination coverage in the target population of seniors, 84.6% in 2004, 97.5% in 2005 and 117.2% in 2006¹³.

Thus, one can consider that the low rate of vaccination in patients with HF found in this study did not derive from the absence of structural conditions that would enable vaccination against influenza and pneumococcus. The causes of low

vaccination rate can be discussed according to: (1) little indication by health professionals; (2) difficulties of access to vaccination and complex vaccination processes; and (3) patient-dependent causes.

The inclusion of vaccination in chronic cardiac patients is not incorporated into the practice of healthcare plans at basic and specialized healthcare units. Such assertion is based on the low rate of vaccination against influenza - vaccination available once a year in the very basic units - among those younger than 60, i.e., outside usual indication. In this study, we observed the prevalence of indications for pneumococcal vaccination by pediatricians. Among the indications for cardiovascular and respiratory diseases in adolescents and adults, there was a predominance of indication by pulmonologists compared with cardiologists and general practitioners who treat patients with heart failure.

It is likely that the recommendation of vaccination by clinical indication is more incorporated into the clinical practice of pediatricians and pulmonologists than cardiologists and generalists. The causes of failure of assistant physicians to prescribe vaccinations were not the object of this study. However, it is likely to arise out of lack of information about indication of vaccinations to patients with heart failure and availability of such in government-controlled hospitals.

There was a predominance of female patients and almost all urban households among those patients vaccinated against pneumococcus. These demographic characteristics suggest the probable influence of access to vaccination as a facilitator in the vaccination process. The median time between the indication of vaccination by the assistant physician and effective vaccination was also too long in this population. The fact that vaccination is not be applied on the same day it is requested results in obstacles such as transportation costs, difficulty in moving back to the hospital due to exertional dyspnea, availability of a caregiver and memorization of appointment dates. Elderly prejudice against vaccination, given the myth of potential adverse effects also contributes to low rate of vaccination. Despite the immunological abnormalities described in HF, such as increase of interleukins and tumor necrosis factor and hyper-lymphocyte reactivity, immune response to pneumococcal vaccination is effective, with production of antibodies against all serotypes tested¹².

The sample observed in primary care showed the average age expected for the syndrome in most clinical studies, with a slight predominance of females, which can be explained by greater access of women to primary care units⁸. The highest rate of influenza vaccination was certainly due to the Brazilian Campaign for Elderly Vaccination, as due to age segregation, most individuals vaccinated are older than 60, the cutoff point of routine indication for influenza vaccination.

The availability of influenza vaccination each year at UBS and ESF are facilitators of vaccination. However, there is still a significant percentage of unvaccinated individuals, which is explained by unawareness of clinical indication and safety of vaccination in patients with heart failure among health professionals.

Singleton et al¹⁴ found that influenza vaccination coverage among patients with heart disease is associated with age,

because they found 76.7% of vaccinated individuals older than 65, 49.2% between 50 and 64 years, and only 22.7% of individuals vaccinated aged between 18 and 49. Hak et al¹⁵ and Bittner et al¹⁶ also reported similar results when patients aged 65 or older with high-risk medical conditions had a higher rate of vaccination as compared to younger ones. A national study conducted in Spain confirmed the need for vaccination policies in those in younger age groups, since they are often set aside¹⁷. Bittner et al¹⁶ cautioned that even with the recommendations of the *World Health Organization* and the *Centers of Disease Control and Prevention* (CDC) for influenza vaccination in patients with cardiovascular diseases, the coverage is less than expected, even in developed countries, since only 34.0% of North American patients with cardiovascular disease were vaccinated in 2005.

In evaluating the pneumococcal vaccination coverage in primary care, data are even more alarming, and studies are more scarce. Bratzeler et al³ reported that 54.1% of the entire U.S. population older than 65 have never received this vaccine. This study revealed that in ESF and UBS, the percentage of patients with HF who denied having received the pneumococcal vaccination was much lower than the influenza vaccination and literature data.

The number of 81 patients with acute chronic HF was considered significant in relation to the forecast of the total number of patients with decompensated HF in the city and represented 2.7% of the total number of patients with HF not adjusted. Patients with decompensated HF can be divided into "recurrent" or acute HF - usually secondary to acute coronary syndromes or "acute decompensation of chronic HF." The latter was the object of this study, usually with cardiomyopathy of several causes. Those with recurrent HF had no opportunity of diagnosis and previous vaccination. As a rule, decompensated patients are those in stages C and D of the American College of Cardiologists/American Heart Association and previous class III and IV of the New York Heart Association, an even smaller subgroup.

In the emergency department, there was predominance of male patients, which reflects the distribution of the HF syndrome. In 2007, HF was responsible for 2.6% of hospitalizations and 6.0% of deaths recorded by the Brazilian Health System, having consumed 3.0% of the funds intended to be employed in all admissions made by this system². Data on hospitalization for HF in Brazil derive from diagnostic impressions raised at the time of admission and registered upon authorization for hospital admission (AIH). Such records are notoriously inaccurate due to heterogeneous nomenclatures of HF diagnoses, comorbidities and other diagnoses and contextual issues in the billing system of admissions.

Vaccination rates among patients admitted with decompensated HF are lower than those of primary care. It is possible to infer that the event of decompensation in this group relates to the lower vaccination rate and lower overall adherence to therapy. Respiratory infections are among the most common causes of decompensation in several series. In our institution, decompensation due to respiratory infections are ranked second, after the transgression of salt intake and drug prescription, probably due to high temperature variation in the mountainous region of the state of Rio de Janeiro,

especially in the Winter¹⁸. The time of hospital admission would be conducive to vaccination, however, Bratzer et al³ demonstrated that this practice is not common.

The benefits of vaccination against influenza and pneumococcus are not restricted to prevention of decompensation of HF due to respiratory infections. Vaccination has been related to other gains, such as the reduction of coronary events in both primary or secondary prevention, reduction of cerebrovascular accidents, decrease in hospitalizations and costs for other diseases, especially among the elderly^{15,19,20}. The impact of influenza vaccination and reduced mortality from ischemic heart disease is speculated^{21,22}. Vaccination brings benefits in the outcomes of mortality and morbidity for all age groups with clinical conditions of risk and is increases in most elderly patients¹⁵. There is a relationship between hospital admissions and death from heart failure and influenza epidemics, as well as low atmospheric temperatures. It can be inferred that those places susceptible to greater temperature ranges and weather conditions may be at greater risk of respiratory infections^{9,23}. Vaccination prevents mortality in chronic cardiac patients in the Winter²⁰.

The awareness of health professionals about the importance of influenza and pneumococcal vaccination in all patients with HF, regardless of age, is mandatory. African descendants, non-diabetic patients, and those without lung diseases are also other subgroups that are set aside in vaccination¹⁶. According to the findings of this study, the rural population or those people living in inaccessible areas must be assigned a different strategy for vaccination. The rate of influenza vaccination in the U.S. is stable and below the targets set. In view of the results found by now, it appears that our rates are still lower than those in the U.S.

Easier access to vaccination, through various distribution strategies, campaigns, referrals to general and specialist outpatient clinics, may increase the efficiency of the process^{14,24}. Systematic and multidisciplinary approach to patients with HF, as practiced in the "Heart Failure Clinics"

are effective in reducing hospitalizations by optimizing pharmacological and non pharmacological therapies, including vaccination. However, experiences of multidisciplinary care to patients with HF are still confined to universities, especially to groups that offer heart transplantation. There are no public policy programs directed to patients with HF in primary care, such as those offered to diabetic and hypertensive patients.

Conclusions

The rate of vaccination against INF and PNM in patients with HF is very low and even lower in those with decompensated HF treated in emergency services.

It is necessary to implement measures to increase the rate of vaccination against respiratory infections in patients with heart failure and thereby reduce decompensation and hospitalizations.

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Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any post-graduation program.

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