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ORIGINAL ARTICLE

Factors associated with influenza vaccination of general medicine interns in Nancy, France, in 2017

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Abstract

Winter flu is an epidemic infectious disease which sometimes causes serious complications in vulnerable people treated in general practice. Currently, the most effective means of prevention is influenza vaccination, which is recommended for healthcare professionals, including general medicine interns. The target of 75% coverage set by WHO for healthcare professional is rarely reached. Our survey provides an assessment of reported influenza vaccination of general medicine interns (GMI) and evaluates factors influencing their vaccination status. A cross-sectional survey was conducted from 27 September to 2 November 2017 in the Faculty of Medicine at the University of Lorraine in France. An anonymous self-administered questionnaire was distributed electronically (SurveyMonkey software) to all GMI. It collected data on their vaccination status and on levers and barriers to influenza vaccination. The data were analysed using SAS 9.4 software. Multivariate analysis helped identify factors associated with their influenza vaccination status. Of the 595 GMI invited, 269 participated in the survey, with a response rate of 45.2%. During the 2015, 2016, and 2017 winters, overall self-declared vaccine coverage was 37.9, 49.4, and 56.5%, respectively. Being at the end of training ($p = 0.008$, OR = 3.2), the presence of a mobile vaccination team ($p = 0.019$, OR = 3.1), and recommending vaccination to one's relatives and friends ($p < 0.0001$, OR = 5.4) were the three factors independently associated with influenza vaccination. The two main reasons which had a strong influence on non-vaccination were forgetting to do so (30.5%) and lack of time (24.8%). Influenza vaccination coverage of GMI in Nancy falls well short of WHO targets. Vaccination campaigns and facilitated access to vaccination at study and work placement locations should be considered.

Keywords Influenza vaccination · General medicine interns · Levers and barriers

Introduction

According to the World Health Organization (WHO), influenza is responsible for approximately 5 million cases of serious illness each year worldwide, and between 290,000 and 650,000 deaths [1]. In Europe, influenza affects approximately one in three children and one in ten adults [2].

Influenza vaccination (IV) is the main prevention method, combined with hygiene measures [3]. The WHO recommends IV for certain categories of professionals, including healthcare workers with the minimum vaccination coverage (VC) objective set at 75% [4].

The aim of vaccinating healthcare professionals is twofold. In addition to providing protection for themselves, it also reduces the risk of transmission to their patients [5]. Numerous studies in Europe show a low rate of influenza vaccine coverage (IVC) among health professionals [6–8]. More specifically, the average vaccination rate in European countries is

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approximately 24% [2]. In France, the national survey Vaxisoins, conducted in 2009 among healthcare professionals working in healthcare establishments, found an average IVC rate of 25.6%. Physicians (55%) were vaccinated more against influenza than nurses (24.4%), midwives (22.6%), and nursing assistants (19.5%) [9].

A few studies have focused on French healthcare students. Some assessed their knowledge, attitude, and practices [10] regarding most vaccines (mandatory or recommended), while others examined their VC and their perceptions of these same vaccines [11, 12]. These surveys generally noted insufficient IVC. In the Paris region in 2008, the VC of 250 hospital interns was very high for compulsory vaccines (diphtheria, tetanus, poliomyelitis, and viral hepatitis B) but very low for recommended vaccines, with an IVC of 45.6% [12].

The same observation was made in 2009 in a survey involving 432 healthcare students (doctors, nurses, and midwives) in 15 hospitals in Paris. VC was over 90% for compulsory vaccines including viral hepatitis B, but only 39.6% for influenza [11]. However, these studies did not examine the levers and barriers involved in the decision by healthcare students to get vaccinated.

The objective of this study was to describe the IV status of general medicine interns (target population for recommended IV) and to identify the levers and barriers to having this vaccination.

Methods

Study type

A cross-sectional survey was conducted using self-questionnaires from 27 September to 2 November 2017.

Study population

The study population comprised all three intern classes enrolled in the "diplôme d'études spéciales (D.E.S)" (equivalent to a Master's Degree) in general medicine for the 2016–2017 academic year, at the Faculty of Medicine in Nancy. This D.E.S. takes 3 years (six semesters) to complete. Furthermore, interns who had already successfully completed all six semesters of training and who were authorised to work as substitute private doctors while waiting to support their final thesis (referred to here as "non-thesis substitute private doctors") also participated in this study.

The study questionnaire was therefore given to all GMI in the faculty covering all six semesters of the academic year 2016–2017.

Methodology

Questionnaire

An anonymous self-administered questionnaire was sent electronically to the GMI via the SurveyMonkey® platform (Palo Alto, CA, USA). The questionnaire was developed by the study's team of investigators. To assess the clarity of the various items, the questionnaire was pre-tested with a small group of GMI. The first part of the questionnaire focused on demographic characteristics (age, sex, year of study, work placement training locations) and the declared vaccination status of the GMI during the previous three winters. The second part collected data on the levers and barriers to IV as well as proposals for actions to improve the IV status of the respondents. Questions regarding levers and barriers were answered according to their level of influence (strong, moderate, or zero), irrespective of the individual GMI vaccination status.

Data collection

The questionnaire was distributed online by the Department of General Medicine (DGM) using the students' university email addresses. Each GMI received an invitation email to participate signed by the department head, with the Internet link to the questionnaire. To improve the response rate, two reminders were sent by the DMG by Internet.

Statistical analyses

Data were exported from SurveyMonkey into an Excel spreadsheet and analysed using SAS software version 9.4 (SAS Institute Inc., Cary, NC, USA). As all the variables collected were qualitative, they are presented as numbers and percentages. Two groups were defined in the study population: the first comprised GMI vaccinated for influenza at least once in the previous 3 years (hereafter "vaccinated") while the second GMI not vaccinated in the previous 3 years (hereafter "not vaccinated").

Positive (levers) and negative (barriers) factors associated with vaccination at least once in the three previous years were identified. This analysis was carried out in two stages: (i) a bivariate analysis (chi-square test or Fisher's exact test), making it possible to identify the factors associated with a p value threshold of 0.10; (ii) these factors were then introduced into a multivariate analysis model (logistic regression) to identify factors independently associated with vaccination at the p value threshold of 0.05, using two-sided tests.

Ethics and good practice

Participation was voluntary and not compensated. The survey was completely anonymous at all stages. As no information on respondents' health was collected, no ethical approval was required.

Results

Response rate

Of the 595 questionnaires distributed to GMI, we obtained 269 usable responses, with a response rate of 45.2%.

Influenza vaccine coverage in GMI

Reported IVC increased steadily over the three previous years from 37.9% ($n = 102$) for the winter of 2014–15, to 49.4% ($n = 133$) for 2015–16 and 56.5% ($n = 152$) for 2016–17. A total of 70 (26%) GMI were vaccinated in all 3 years; 76 (28.3%) were not vaccinated at all during this period, while 193 (71.7%) were vaccinated at least once. At the time of the survey, 201 GMI (74.7%) planned to be vaccinated during the winter of 2017–2018.

GMI motivation for IV

Of the 266 GMI respondents, 104 (39.1%) cited patient protection as the primary motivation for their IV. The other main motivations cited were personal protection ($n = 63$, 23.7%), protection of family and friends ($n = 55$, 20.7%), and prevention of absenteeism ($n = 17$; 6.4%) (Fig. 1).

Two hundred and forty-seven GMI (91.8%) said they were concerned about IV, and 177 (65.8%) said they had been encouraged to get vaccinated against influenza, primarily in their medical work environment. The principal incentives for vaccination came from medical colleagues ($n = 113$, 63.8%), the fact that vaccination was available at their work placement location ($n = 67$, 37.9%), and being encouraged by their training supervisor ($n = 55$, 31.1%). Seventy-six GMI reported occupational health interventions which facilitated access to IV during hospital-based work placement (28.2%).

Barriers to GMI having IV

Information on the barriers to IV was collected for 262 GMI. The two main barriers were forgetting ($n = 98$, 37.4%) and lack of time ($n = 64$, 24.4%) (Fig. 2). Both had a strong influence on non-vaccination (30.5% and 24.8%, respectively). In contrast, fear of adverse effects of IV had little influence (no influence in 77.5% of cases and a strong influence in 6.5% of cases). This was also true for perceived non-effectiveness of the vaccine (no influence = 69.1%, strong influence = 8.4%). Only one GMI claimed to be against vaccines in general.

Factors associated with GMI having IV

In bivariate analysis, female sex ($p = 0.02$), being at the end of training ($p = 0.01$), feeling concerned by vaccination ($p < 0.0001$), being encouraged to get vaccinated ($p = 0.002$), the presence of an occupational medicine vaccination intervention ($p = 0.0006$), the availability of a mobile vaccination team ($p = 0.01$), advising vaccination to patients ($p < 0.0001$) and family/friends ($p < 0.0001$), planning to be vaccinated during the following winter season ($p < 0.0001$), and supporting mandatory vaccination ($p < 0.0001$) were all statistically associated with a better IVC in GMI (Table 1).

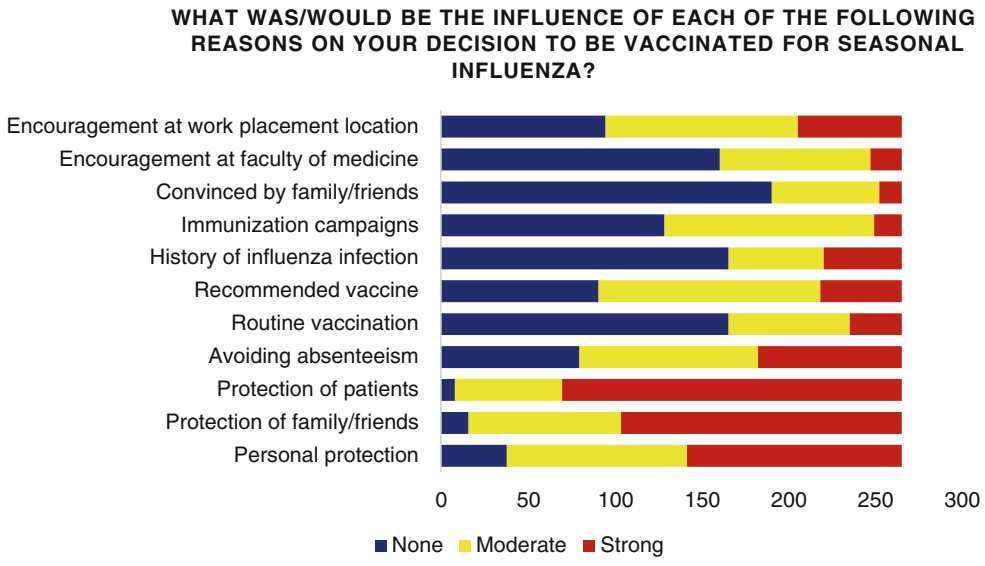

Fig. 1 Levers for influenza vaccination in general medicine interns from the University of Lorraine in Nancy ($n = 266$)

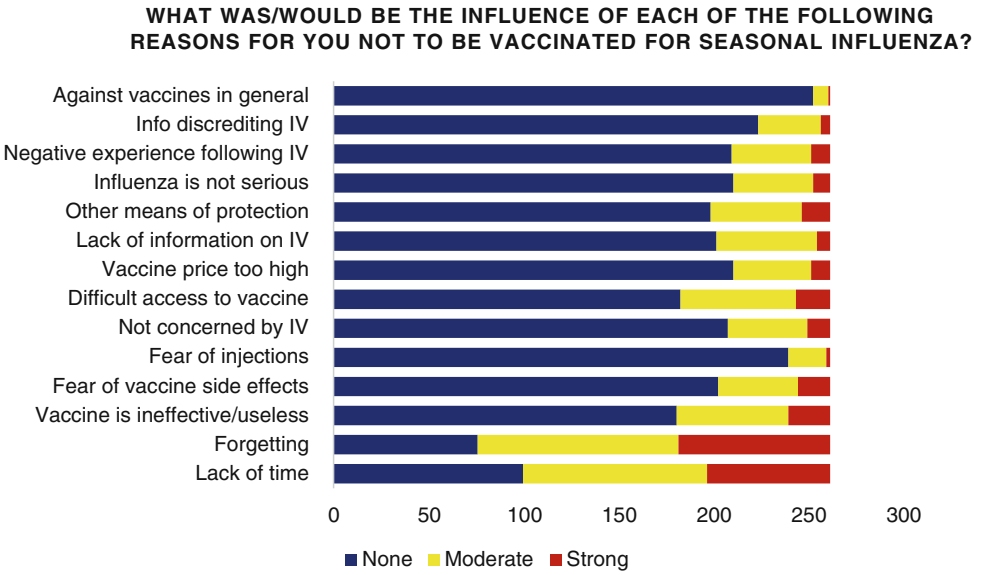

Fig. 2 Barriers to influenza vaccination for general medicine interns from the University of Lorraine in Nancy ($n = 262$)

In multivariate analysis (Table 2), being at the end of training ($p = 0.008$, OR = 3.2), the presence of a mobile vaccination team ($p = 0.0195$, OR = 3.1), and advising vaccination to family/friends ($p < 0.0001$, OR = 5.4) were the three factors independently associated with IV.

Corrective measures proposed by GMI

According to the respondents, the main measures that could improve their IV were the organisation of a vaccination session at work placement sites ($n = 136$, 52.1%) and being summoned for vaccination by occupational health services ($n = 50$, 19.2%). Just over half (53.3%) the GMI said they were in favour of mandatory vaccination for healthcare providers (Fig. 3).

Discussion

Influenza vaccine coverage

Our results for IVC in GMI are similar to those of other studies. The Studyvax study conducted in 2009 found an IVC of 48% [11]. PhD theses showed IVC of 46% in GMI in Lille in 2016 [13] and 60% in GMI in the Faculty of Medicine in Rouen in 2014 [14]. Among senior healthcare professionals, doctors are generally more frequently vaccinated than other healthcare professionals, both in inpatient and outpatient contexts [15]. Le Marechal et al. noted that French general practitioners were for the most part in favour of IV, with an IVC of 71.8% in 2015 [16].

In the French Vaxisoins study, which evaluated VC of healthcare professionals in 2009, IVC was 55% among senior physicians [9]. Another French study evaluating health professionals' VC against seasonal influenza found an IVC of 70% in 2013–2014 and 2014–2015 for general practitioners [17]. VC of senior doctors would therefore seem to be closer to the WHO objectives than that of GMI [14].

Levers and barriers to IV

The main motivation for IV among senior healthcare professionals in many national and international surveys and studies in the literature is personal protection, which comes before the protection of patient and family/friends [8, 12, 18, 19]. In our study, however, as with GMI in Lille, patient protection was the main motivation to get vaccinated [13].

The two main obstacles to IV in the Nancy GMI were forgetting and a lack of time. In the literature too, these are the arguments most frequently mentioned by healthcare students [12, 14]. These barriers may be considered organisational in nature and do not necessarily reflect a real intention to reject vaccination. Indeed, no intern expressed any opposition to vaccination, something which they could have done given that the questionnaire was anonymous. This organisational constraint probably explains the contrast observed between the strong intention of the interns to be vaccinated (74.7%) and the fact that most felt concerned by IV (91.8%) on the one hand, and the low rates of declared IV on the other.

Improving influenza vaccination in healthcare students: potential solutions based on the results of this survey

Organisational strategies that appear to be effective include the availability of free vaccines, easy access in the workplace, posting IV levels for different hospital

Table 1 Identification of factors associated with influenza immunisation of general medicine interns from the University of Lorraine in Nancy: bivariate analysis

	Overall total		Vaccinated		Not vaccinated		*p**
			N	*%*	*N*	*%*	
Total number	269		193	*71.7%*	76	*28.3%*	
Male	99	*36.8%*	63	*32.6%*	36	*47.4%*	0.02
Age							NS
20–25 years old	23	*8.6%*	19	*9.8%*	4	*5.3%*	
26–30 years old	217	*80.7%*	151	*78.2%*	66	*86.8%*	
30–35 years old	29	*10.8%*	23	*11.9%*	6	*7.9%*	
Internship semester							0.01
1st and 2nd	73	*27.1%*	44	*22.8%*	29	*38.2%*	
3rd and 4th	93	*34.6%*	73	*37.8%*	20	*26.3%*	
5th and 6th	47	*17.5%*	39	*20.2%*	8	*10.5%*	
"Non-thesis substitute private doctors"	55	*20.4%*	37	*19.2%*	18	*23.7%*	
History of influenza	108	*40.1%*	73	*37.8%*	35	*46.1%*	NS
Expecting or already having a child	53	*19.7%*	33	*17.1%*	20	*26.3%*	NS
Feeling concerned by IV	247	*91.8%*	191	*99.0%*	56	*73.7%*	< 0.0001
Existence of a source urging them to have influenza vaccination	177	*65.8%*	138	*71.5%*	39	*51.3%*	0.002
Sources urging vaccination (several answers possible)							
Occupational health services	34	*19.2%*	33	24%	1	*3%*	0.002
Consulting doctor	14	*7.9%*	12	9%	2	*5%*	NS
Paramedical colleagues	27	*15.3%*	19	14%	8	*21%*	NS
Physician colleagues	113	*63.8%*	89	64%	24	*62%*	NS
Media	28	*15.8%*	20	14%	8	*21%*	NS
Internship supervisor	55	*31.1%*	39	28%	16	*41%*	NS
Family/friends	30	*16.9%*	27	20%	3	*8%*	NS
Vaccination at work placement location	67	*37.9%*	53	38%	14	*36%*	NS
Occupational health intervention at work placement locations							0.0006
Yes	74	*28.1%*	65	*34.4%*	9	*12.2%*	
No	174	*66.2%*	113	*59.8%*	61	*82.4%*	
Do not know	15	*5.7%*	11	*5.8%*	4	*5.4%*	
Missing data	6		4		2		
Presence of a mobile vaccination team at work placement locations							0.01
Yes	39	*14.8%*	35	*18.5%*	4	*5.4%*	
No	210	*79.8%*	146	*77.2%*	64	*86.5%*	
Do not know	14	*5.3%*	8	*4.2%*	6	*8.1%*	
Missing data	6		4		2		
Advising one's patients to have IV							< 0.0001
Systematically	98	*37.7%*	80	*42.8%*	18	*24.7%*	
Often	131	*50.4%*	94	*50.3%*	37	*50.7%*	
Occasionally/rarely/never	31	*11.9%*	13	*7.0%*	18	*24.7%*	
Missing data	9		6		3		
Advising one's family/friends to have IV							< 0.0001
Systematically	76	*29.3%*	68	*36.4%*	8	*11.1%*	
Often	106	*40.9%*	86	*46.0%*	20	*27.8%*	
Occasionally/rarely/never	77	*29.7%*	33	*17.6%*	44	*61.1%*	
Missing data	10		6		4		
Intending to be vaccinated in the 2017–2018 season							< 0.0001
Yes	195	*74.7%*	167	*88.8%*	28	*38.4%*	
No	31	*11.9%*	5	*2.7%*	26	*35.6%*	
Do not know	35	*13.4%*	16	*8.5%*	19	*26.0%*	
Missing data	8		5		3		
Being in favour of mandatory vaccination							< 0.0001
Yes	139	*53.3%*	115	*61.2%*	24	*32.9%*	
No	89	*34.1%*	49	*26.1%*	40	*54.8%*	
Do not know	33	*12.6%*	24	*12.8%*	9	*12.3%*	
Missing data	8		5		3		

*Chi-square test or Fisher's test

departments, participation in appropriate training and educational programmes, and vaccination of doctors in hospital units [20]. Furthermore, vaccinated colleagues, especially those from the same profession, have been shown to have a positive "snowball effect" influence on those not vaccinated [21].

Table 2 Identification of factors associated with influenza vaccination in general medicine interns at the University of Lorraine in Nancy: logistic regression

Variables	OR	CI (95%)	*p*
Study semesters			0.008
1st and 2nd	1		
3rd and 4th	1.2	[0.5–2.8]	
5th and 6th	3.2	[1.3–8.1]	
"Non-thesis substitute private doctors"	3.4	[1.3–8.6]	
Presence of a mobile vaccination team			0.0195
No	1		
Yes	3.1	[1.4–6.9]	
Do not know	1.5	[0.4–5.9]	
Advising one's family/friends to have IV			< 0.0001
Occasionally/rarely/never	1		
Often	5.4	[2.1–13.8]	
Systematically	8	[3.1–20.9]	

To increase the IVC in GMI, proactive measures are essential. In the present study, 52% of GMI cited vaccination campaigns at work placement locations as the main organisational measure which would best motivate them to get IV. Accordingly, having a mobile vaccination team come to these locations would appear to be the most effective measure. It is therefore a question of organising such vaccination sessions. The Department of General Medicine at the university in conjunction with the university's health centre could arrange these sessions during mandatory training courses. The second most frequently cited measure by GMI in this study was the being summoned for vaccination by occupational health services. These two organisational measures were seen as the best to overcome the two main barriers to IV cited by the GMI: forgetting and a lack of time.

However, while all measures adopted in various countries to try to increase VC certainly make it possible to improve IVC in healthcare professionals, they are not enough to reach the target of 75% set by the WHO [15]. A US study published in 2009 showed that an increase in IVC can occur from the combination of all these measures [22]. Vaccination behaviour is therefore complex and is likely to be influenced by a wide range of determinants [23]. Some more restrictive measures, such as the obligation to wear masks by all unvaccinated healthcare workers, have been implemented [8]. Mandatory vaccination has also been used with satisfactory results [24, 25] even though some health professionals consider it a violation of freedom of choice and personal autonomy [26].

Strengths and limitations of the study

This survey focused on general medicine interns, a population which has not been extensively studied in the literature. The response rate was close to 50%, which suggests that our results are quite representative. However, our study has limitations. The declarative nature of the survey means data were subject to social desirability bias. However, this should be limited as the questionnaire was anonymous.

Conclusion

There was a large gap between general medicine interns' strong intention to get vaccinated for influenza and the actual rate of vaccination coverage, with a lack of time and forgetting cited as the main impediments. Organisational measures, such as having a mobile vaccination team come to the general medicine department during mandatory courses and to work placement locations, could improve IVC in this population.

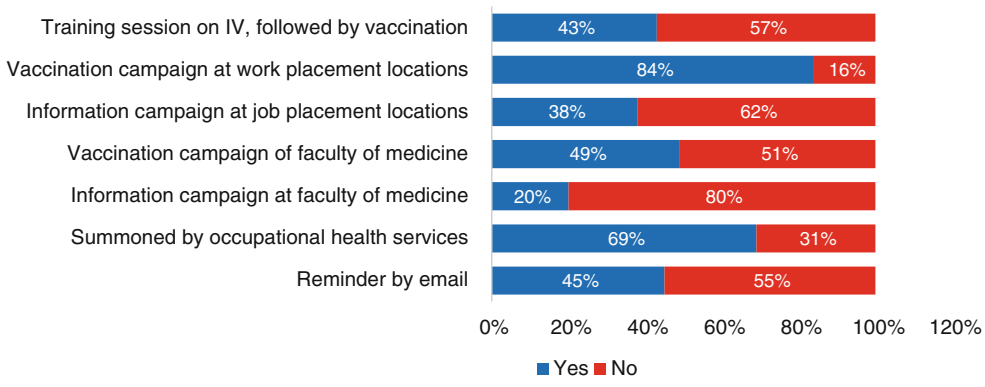

Fig. 3 Organisational measures to improve influenza vaccination in general medicine interns from the University of Lorraine in Nancy ($n = 261$)

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Author contributions C.A.A initiated the study and C.A.A. and C. C. wrote the protocol, with contributions from all authors. C.C. provided the data; N.T. analysed the data, under the supervision of T. M. and P. D-P. C.A.A., C. C., and C. P. wrote the manuscript, which was reviewed by all co-authors.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

Ethical approval The survey was completely anonymous at all stages. As no information on respondents' health was collected, no ethical approval was required for this study.

Informed consent Participation for this study was voluntary and not compensated.

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