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RESEARCH PAPER



## Behavior of nurses and nurse aides toward influenza vaccine: the impact of the perception of occupational working conditions

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### ABSTRACT

Although influenza vaccination of hospital healthcare workers (HCWs) has been associated with a reduction in patient mortality and morbidity, HCW vaccine coverage is low in France. Previous studies identified the role of perceptions of vaccine efficacy and safety as well as practical issues (e.g., limited time). We aimed to determine whether HCW behavior toward influenza vaccine was associated with occupation-related psycho-social issues and perceptions of management. Between February and August 2018, an anonymous online questionnaire explored the perceptions and behavior of nurses and nurse aides regarding the influenza vaccine, as well as the perceived quality of professional management, perceived psychological contract breach, perceived workload, and compassion fatigue using previously validated scales. Among the 791 respondents (mean age  $36.9 \pm 10$  years, female 85.0%; nurses 76.4%), 28.6% had been vaccinated during the current year (i.e., the study year) and 13.0% during the previous year. Among those not vaccinated during the study year, their vaccination intention for the coming year on a 1–5 scale was 1/5 for 68.5% and 5/5 for 15.4%. Positive behavior/intention regarding the influenza vaccine (recent vaccination and/or high future intention) was positively correlated with perceptions of management and negatively correlated with feelings of a psychological contract breach and compassion fatigue. In multivariate analysis, this positive behavior/intention was correlated with management perception independently of the perceptions of vaccination itself. Among nurses and nurse aides, the propensity to be vaccinated appears to depend closely on the perceived working conditions. These factors should be addressed when promoting vaccination among these populations.

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Influenza; vaccine; healthcare workers; nurse; nurse aides; management; psychological contract; compassion fatigue; work overload

## Introduction

Influenza is estimated to be annually responsible for 13,000 to 15,000 deaths in France,<sup>1</sup> 130,000 in Europe,<sup>2</sup> 12,000 to 56,000 in the USA,<sup>3</sup> and 650,000 worldwide.<sup>4</sup> A high proportion of severe cases occurs in elderly people and/or persons with comorbid conditions, including chronic heart and lung diseases, diabetes mellitus, and immunosuppression.<sup>5</sup> These persons have a high risk of acquiring the infection during stays in hospitals or other healthcare facilities during the influenza season.<sup>6,7</sup> Among a variety of procedures, the vaccination of healthcare workers (HCWs) has been shown in different studies to prevent the onset of nosocomial influenza among hospitalized patients and residents of nursing homes.<sup>8</sup>

In some healthcare facilities, HCW vaccination is mandatory, but most jurisdictions have not adopted this policy. When vaccination is only recommended, vaccine coverage tends to be low, particularly in Europe where the median vaccine coverage of HCWs is 45%<sup>9</sup> compared to 78% in the 2017–18 season in the USA,<sup>10</sup> where many facilities mandate vaccination. An impressive number of studies have explored the reasons that contribute to this situation, showing the influence of various factors<sup>11</sup> such as the perception of the limited efficacy of the vaccine for

themselves<sup>12</sup> or their patients,<sup>13</sup> the perception of influenza as a benign disease,<sup>14</sup> the fear of vaccine adverse effects,<sup>15</sup> or the lack of convenient access to vaccination.<sup>16</sup>

However, these different studies may have left unexplored other issues associated with HCW behavior toward vaccine policies, particularly in terms of the perception of their working conditions. For example, in nurses, an excessive work load may be associated with poorer compliance to guidelines,<sup>17</sup> including preventive occupational guidelines such as hand hygiene.<sup>17,18</sup> Importantly, the proportion of employees with negative perceptions about their workplace has increased in recent years in various professional areas, including among HCWs;<sup>19</sup> in this population, a sense of excessive workload,<sup>20</sup> loss of meaning,<sup>21</sup> and suicide risk<sup>22</sup> have been widely documented.

We therefore aimed to explore the extent to which the behavior of HCWs toward influenza vaccine was associated with their perceptions of the professional sphere.

## Material and methods

The study population was French nurses and nurse aides currently working in a healthcare institution. We elaborated

an online questionnaire assessing sociodemographic data, the last year they received the influenza vaccine, their vaccination intention for the next 12 months (for those who had not received the vaccine during the calendar year of the study, i.e., 2018), and their perceptions of influenza vaccine efficacy, usefulness, and danger. The questionnaire also featured four sets of questions constituting previously validated scales to explore four occupation-related issues: perception of management<sup>23</sup> (seven questions); perception of psychological contract breach with the employer<sup>24</sup> (nine questions such as “I did not receive all that was due in return from my commitment”, “My employer has fulfilled his/her commitments very well”, “My employer has broken his/her commitments, even though I have fulfilled my part of the contract”, “I feel betrayed by the institution”, or “I feel very angry at the institution”); the perception of work overload<sup>25</sup> (four questions); and compassion fatigue<sup>26</sup> (five questions such as “I no longer bother about patients’ problems” or “I have become more insensitive to people’s problems since starting this job”). Study participation was anonymous.

The questionnaire was accessible between February 13 and August 8, 2018 via the webpages [www.flu-ideas.com](http://www.flu-ideas.com) and [www.flu-ideas.fr](http://www.flu-ideas.fr). The links were shared on various social networks (Twitter™, Facebook™). Twenty hospitals selected to cover every French region were asked to diffuse the questionnaire by e-mail to all their employees, but only two accepted. In another 10 French hospitals located in the region of the study coordinators (Auvergne-Rhône-Alpes), billboards informing HCWs about the study and how to participate were displayed.

The difference between two groups regarding a quantitative variable was explored using the Mann-Whitney test, and the correlation between two quantitative variables using the Spearman test. Participants were separated into two groups according to their vaccine status and their intention to be vaccinated; variables significantly ( $p < .05$ ) associated with either positive or negative behavior toward influenza vaccine were analyzed in a multivariate logistic regression model (no parsimony criteria was used), provided that they had a continuous effect on the dependent variable.

Participants were informed at the beginning of the questionnaire that they were free to participate in the study and that their responses were anonymously collected and not communicated to other entities. The French national data protection agency (Commission Nationale Informatique et Liberté) was notified about the data collection process.

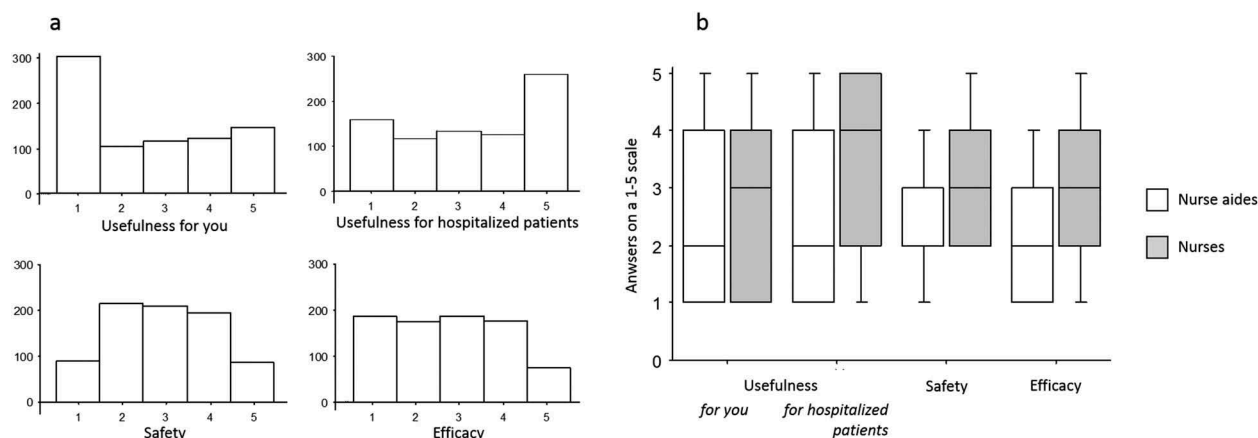
## Results

During the study period, 791 participants aged 20 to 65 years (mean  $36.9 \pm 10$ ) completed the questionnaire (females 85.0%); 23.6% were nurse aides and 76.4% were nurses. In addition, 719 other participants who only partially answered the questionnaire were excluded. Participants had graduated as a nurse or nurse aide a mean of  $11.9 \pm 10$  years beforehand. They worked in a university hospital (35.3%), general hospital (33.4%), nursing home (16.2%), private clinic (7.6%), or other type of healthcare structure (7.5%). Among the 101 French geographical departments, 90 counted at least one participant, 58 at least five participants, and 19 at least ten participants; one department (Isère) included more than 10% of all participants (11.4%).

### Behavior toward influenza vaccine

A five-point scale (1–5) was used; participants perceived the median influenza vaccine usefulness for themselves and hospitalized patients to be 2 [IQT, 1–4] and 3 [IQT, 2–5], respectively (where 1 is the least useful and 5 is the most useful); the median efficacy and safety attributed to the influenza vaccine were 3 [IQT: 2–4] and 3 [IQT: 2–4], respectively (Figure 1a) (where 1 is the least efficient/safe and 5 is the most efficient/safe). All figures were higher for nurses than for nurse aides ( $p < .001$ ) (Figure 1b).

Participants had received the influenza vaccine during the year of the study (2018) (28.6%), the year before (13.0%), 2 to 4 years before (4.6%), 4 to 6 years before (4.0%), more than 6 years before (10.7%), or never (39.1%) (Suppl Fig. 1a). The median scores attributed to vaccine usefulness (for themselves or patients), efficacy, and safety



**Figure 1.** Perception of the influenza vaccine on a five-point scale; (a) usefulness “for you,” usefulness “for hospitalized patients,” safety, and efficacy of the influenza vaccine; (b) difference between the perceptions of nurses and nurse aides ( $p < .001$  for the differences in the four dimensions) (boxes: 25th percentile, median, and 75th percentile, whiskers: 10th and 90th percentile).

gradually decreased from the first to the last group ( $p < .001$ ). Participants who were not vaccinated during the year of the study ( $n = 565$ ) were asked to quantify on a 1–5 scale their intention to receive the vaccination in the coming 12 months, with 5 corresponding with the highest intention: responses were 1 for 68.5% of participants, 2 for 6.9%, 3 for 4.8%, 4 for 4.4%, and 5 for 15.4% (Suppl Fig. 1b). The median scores attributed to vaccine usefulness (for themselves or patients), safety, and efficacy gradually increased from the first to the last group ( $p < .001$ ).

We then split the participants into two groups:

- Those who received the influenza vaccine in the study year or the previous year and/or who had a vaccine intention of 5 (“group with positive behavior”, 43.1%);
- Those who had not received the influenza vaccine in the study year or the previous year and/or who had a vaccine intention of less than 5 (“group with negative behavior”, 56.9%).

As expected, the group with positive behavior had better perceptions regarding influenza vaccine usefulness, efficacy, and safety ( $p < .001$ ) (Figure 2c and Table 1). Nurses were more likely than nurse aides to be in the group with positive behavior (46.2% vs 33.2%,  $p = .002$ ), as were men compared with women (52.9% vs 41.4%,  $p = .024$ ). The group with positive behavior was also significantly older ( $38.8 \pm 10$  vs  $35.4 \pm 10$  years,  $p < .001$ ) (Table 1).

### Occupation-related scores (five-point scales)

The median perception of management was 2.7 [IQT:2.0;3.6] (with a high score meaning positive perception), while the median perception of psychological contract breach with the employer was 3.1 [IQT: 2.3;3.9] (with a high score meaning a high level of feelings of contract breach). The median score for excessive workload was 4.0 [IQT:3.2;4.7] (with a high score meaning a high level of feelings of excessive workload), while the median compassion fatigue score was 2.2 [IQT:1.6;3.0] (with a high score meaning a high level of

compassion fatigue) (Figure 3). These scores did not differ according to profession or age.

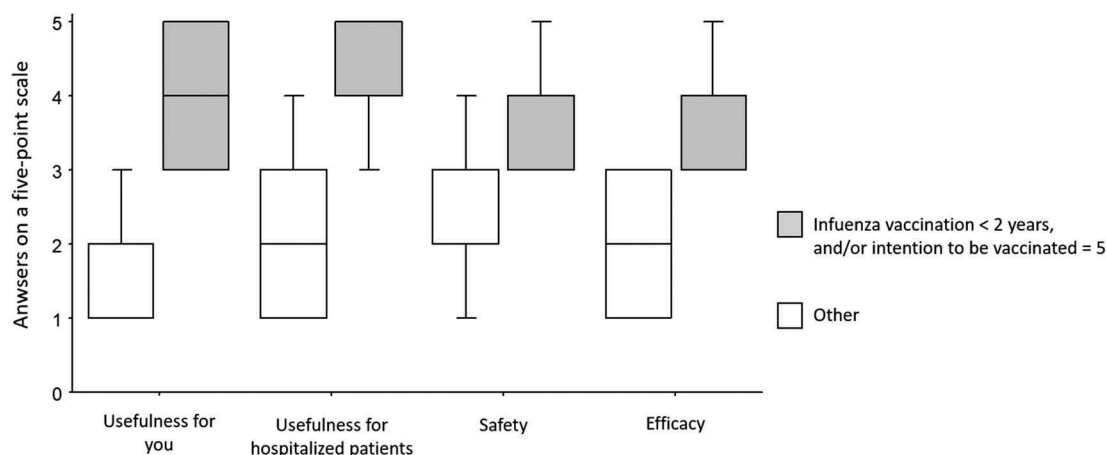
We observed an association between some of these scores and the perceptions of the influenza vaccine (Table 2): perceptions of vaccine usefulness, safety, and efficacy were positively correlated with a better perception of management, and negatively correlated with perceptions of psychological contract breach and compassion fatigue.

In bivariate analysis, the participants with a perception of management score above the median and those with a compassion fatigue score below the median were significantly more likely to be in the group with positive behavior toward influenza vaccine (Table 3). In particular, the participants with higher perception of management scores were more likely to be in the group with positive behavior toward influenza vaccine ( $p < .001$ ) (Figure 4).

In a multivariate analysis model taking in account the different perceptions of vaccination and working conditions, age, gender, and profession, we observed that the group with positive behavior had a better perception of management score independently of the perceptions of vaccine usefulness (for themselves or patients), safety, and efficacy, while this association was also independent of age and gender (Table 1). Other associations disappeared after adjustment: compassion fatigue, vaccine safety, and vaccine efficacy.

### Discussion

Several studies have shown that the vaccination of HCWs is associated with a lower risk of nosocomial influenza for hospitalized patients; however, influenza vaccination coverage in HCWs is less than 40% in France (24.4% for nurses and 19.5% for nurse aides in a 2012 study,<sup>27</sup> and 39.5% for nurses in a 2019 study<sup>28</sup>) compared to higher rates in the USA (91% for nurses, 88% for nurse practitioners, and 71% in a group comprising nurse aides in a 2018 study<sup>10</sup>). Numerous studies have explored the determinants of this suboptimal rate; they identified preoccupations regarding vaccine safety and efficacy as well as practical issues. Such results are especially frustrating, given the increasing efforts being made to inform HCWs about the efficacy of the vaccine, the

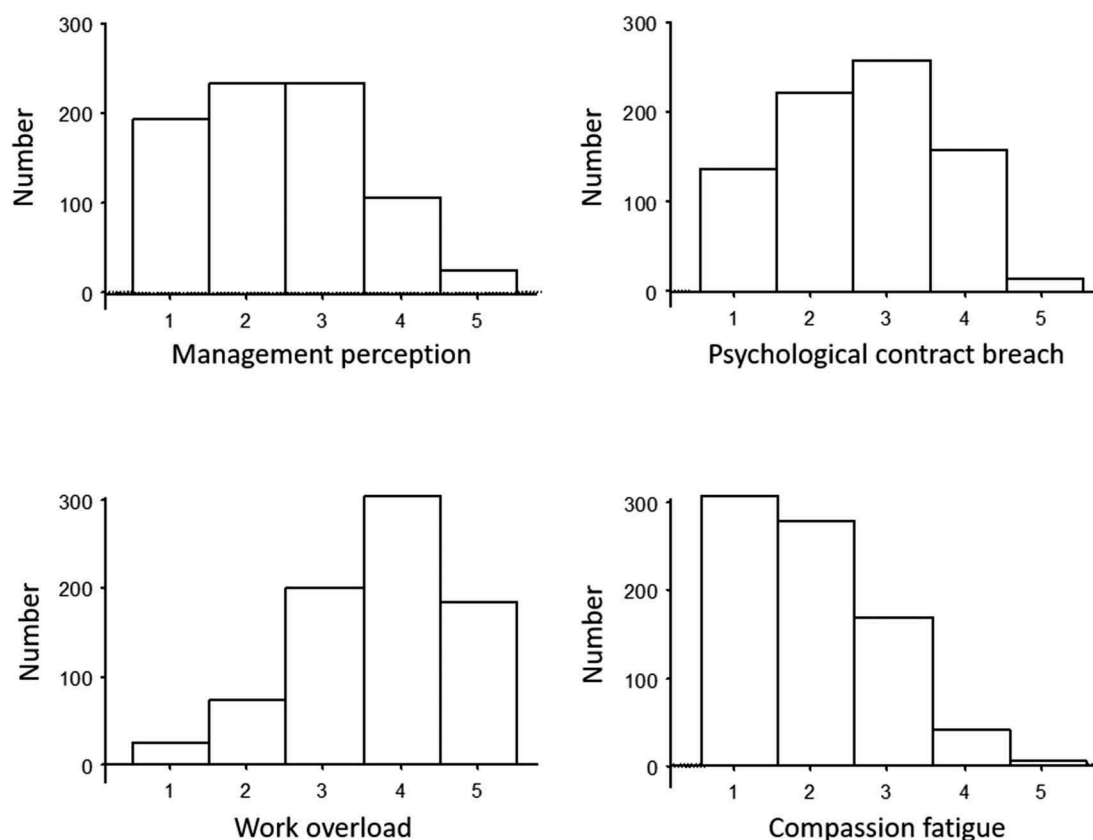


**Figure 2.** Perceptions of the influenza vaccine according to behavior/intention toward influenza vaccine ( $p < .001$  for the four dimensions) (boxes: 25th percentile, median, and 75th percentile, whiskers: 10th and 90th percentile).

**Table 1.** Characteristics of participants in the groups with positive and negative behavior toward influenza vaccine.

		Vaccination intention = 5 Or last vaccination less than 2 years before ("positive behavior toward influenza vaccine")	Vaccination intention <5 Or last vaccination more than 2 years before ("negative behavior toward influenza vaccine")		
		Mean $\pm$ SD if normal distribution Or median and IQT 25-75		p (bivariate analysis)	p (multivariate analysis)
Age		38.8 $\pm$ 10	35.4 $\pm$ 10	p < .001	0.236
Gender	Female	41.4%	58.6%	0.0245	0.215
	Male	52.9%	47.1%		
Profession	Nurse	46.2%	53.8%	.002	.927
	Nurse aide	33.1%	66.9%		
Vaccine usefulness (for you)		4 [3–5]	1 [1–2]	< .001	< .001
Vaccine usefulness (for patients)		5 [4–5]	2 [1–3]	< .001	< .001
Vaccine safety		3.7 $\pm$ 0.9	2.4 $\pm$ 1.0	< .001	.609
Vaccine efficacy		3.7 $\pm$ 1.0	2.0 $\pm$ 1.0	< .001	.241
Perception of management		3.1 $\pm$ 1.0	2.6 $\pm$ 1.0	< .001	.0114
Psychological contract breach		2.9 $\pm$ 1.0	3.1 $\pm$ 1.0	.004	.814
Work overload		3.9 $\pm$ 0.9	4.0 $\pm$ 1.0	.118	-
Compassion fatigue		2 [1.4–3.0]	2.2 [1.6–3.0]	.024	.369

SD: standard deviation, IQT 25–75: interval between the 25% and 75% centiles.

**Figure 3.** Occupation-related scores.

extremely low frequency of severe adverse effects, and the various measures taken to facilitate vaccine uptake (e.g., vaccination in the workplace, free-of-charge vaccine). We therefore wanted to assess the extent to which more specific occupational issues may influence the adherence to influenza vaccination.

Our study allowed us to assess in a large number of HCWs the association between vaccination intention and vaccine

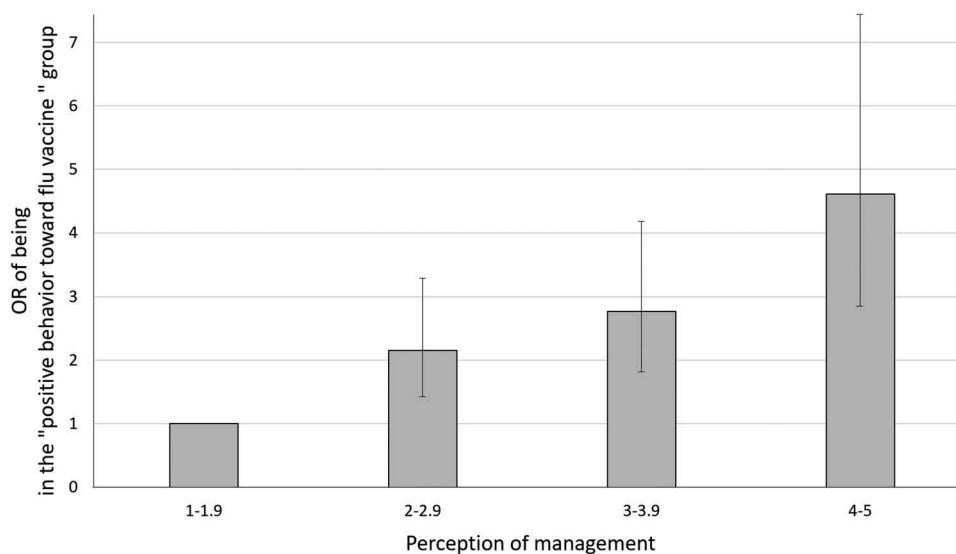
status on the one hand, and four occupation-related issues on the other: the perception of management, psychological contract breach, work overload, and compassion fatigue. The first and third issues relate to working conditions, while the first and second depict the relationship between HCWs and their institution; finally, the fourth (compassion fatigue) allows us to appreciate any modifications to HCWs'

**Table 2.** Correlation between vaccine perceptions and working condition perceptions.

	Perception of management	Psychological contract breach	Work overload	Compassion fatigue
Vaccine usefulness (for you)	$p < .001, \rho = 0.228$	$p = .003, \rho = -0.066$	$p = .104$	$p = .001, \rho = -0.073$
Vaccine usefulness (for patients)	$p < .001, \rho = 0.226$	$p < .001, \rho = -0.105$	$p = .105$	$p < .001, \rho = -0.126$
Vaccine safety	$p < .001, \rho = 0.236$	$p < .001, \rho = -0.089$	$p < .001, \rho = -0.056$	$p < .001, \rho = -0.094$
Vaccine efficacy	$p < .001, \rho = 0.227$	$p < .001, \rho = -0.122$	$p = .042, \rho = 0.037$	$p < .001, \rho = -0.091$

**Table 3.** Probability of being in the group with positive or negative behavior toward influenza vaccine according to the perceptions of working conditions.

	Above or below the median score of perception of working conditions	Percentage in the group with positive behavior toward influenza vaccine	Percentage in the group with negative behavior toward influenza vaccine	p
Perception of management	< 2.7	34.4	65.6	< .001
	> 2.7	50.3	49.7	
Psychological contract breach	< 3.1	46.4	53.6	.069
	> 3.1	39.8	60.2	
Work overload	< 4	45.8	54.2	.122
	> 4	40.2	59.8	
Compassion fatigue	< 2.2	48.1	51.9	.009
	> 2.2	38.6	61.4	

**Figure 4.** Odds ratio (OR) of being in the “group with positive behavior toward influenza vaccine” according to the perception of management score, with the group with lower scores (1–1.9) being the reference (bars: 95% CI).

perception of their own work. This is the first study to explore vaccine uptake according to these occupation-related issues.

Our study confirmed the low adherence to vaccination among the majority of participants. Indeed, only 28.6% declared that they had received the influenza vaccine during the study year, which is in accordance with the figures cited in previous studies;<sup>27</sup> vaccination intention for the forthcoming year for those not recently vaccinated was low (only 15.4% ticked “5” on the five-point scale). As reported in previous studies,<sup>11,29–31</sup> we observed that the behavior toward influenza vaccine was strongly associated with the perception of vaccine usefulness (for themselves or hospitalized patients), safety, and efficacy. It is noteworthy that participants’ perception of vaccine usefulness was much higher for patients than for themselves, suggesting that patients’ vulnerability to influenza is well understood. However, it is worrisome to observe that nearly two-thirds of participants rated influenza vaccine safety to be less than 4 on the five-point scale. Importantly, we

observed that nurse aides had poorer perceptions of the influenza vaccine and a lower vaccine coverage. This last result was already observed in previous studies in France,<sup>27,32</sup> Spain,<sup>33</sup> and the USA.<sup>34</sup> This difference may be related to the fact that nurse aides have shorter professional training than nurses and do not receive a Bachelor’s degree; it may also be due to their different degrees of awareness about the role of vaccines in patient protection.

The occupation-related scores (five-point scales) showed that a high proportion of participants had concerns regarding their working conditions. Indeed, a good perception of management (score values  $\geq 4.0$ ) was expressed by only 16.7% of participants, intense feelings of psychological contract breach (score values  $\geq 4.0$ ) by more than 20%; and intense feelings of excessive workload (score values  $\geq 4.0$ ) by nearly two-thirds. Compassion fatigue was not uncommon: more than one-quarter of participants had a score  $\geq 3.0$  (and 5.7% a score  $\geq 4.0$ ). These observations echo other reports,<sup>19,22,35,36</sup> which document the severity of emotional



issues in HCWs and the increase in negative feelings among HCWs in several countries, leading to a notable risk of suicide.

Three of these factors (poor perception of management, high psychological contract breach, and compassion fatigue) were associated with more negative behavior toward influenza vaccine; regarding the perception of management, this association was even independent of the perception of vaccine usefulness. This suggests that these parameters influence HCWs when they make their choice about influenza vaccination. One interpretation may be that HCWs experiencing negative perceptions about their occupational conditions will manifest their resentment by refusing a non-mandatory proposition from the institution: i.e., the vaccine. It is noteworthy that in a recent study in France,<sup>28</sup> on a 0–10 scale rating nurses' agreement with mandatory influenza vaccination, the median score was 4, suggesting that implementing mandatory vaccination would be complex in this population. In addition, such a policy may negatively impact their perceptions of both the vaccine and the management, thus reinforcing vaccine refusal.

Although vaccine refusal is not a medical error *per se*, it is interesting to note that in previous studies, occupation-related psychological issues have been linked to medical errors: emotional stability has been linked to patient safety,<sup>37</sup> and depression<sup>38</sup> and burnout<sup>39,40</sup> to errors in patient care. Our study therefore provides another example of how the perception of working conditions influences the commitment of HCWs, suggesting that vaccination campaigns among HCWs should take into account the fact that vaccine refusal may be fueled by the perception of management and psychological contract breach. If such obstacles are addressed, vaccination adherence is likely to improve. Similarly, vaccine-related information and propositions given by nurses and nurse aides (instead of upper management) to their colleagues would probably have a better impact: in this case, the negative feelings caused by the institution would be replaced by positive collegial feelings.

Our study has several limitations, the major one being the recruitment method. First, although we used various distribution channels, our online questionnaire may have only reached HCWs with more internet experience. Moreover, as only two facilities accepted to diffuse the questionnaire to *all* their employees, the results may not be extrapolated to a broader population. However, in 2015, the nurse population in France (N = 638,248) featured 87.6% females (84.6% in our study) with a mean age of 43 years (36 years in our study);<sup>41</sup> in 2011, the nurse aide population in France (N = 340,000) featured 90% females (86% in our study) with a mean age of 40 years (39 years in our study).<sup>42</sup> The participant population was therefore similar to the general HCW population in this regard. In addition, when considering the 101 French geographic departments, 90 counted at least one participant, 34 between two and five participants, and 19 between five and ten participants. Second, as vaccinations and hospital working conditions are polarizing issues, perhaps only individuals with a strong (positive or negative) opinion of these topics may have completed the questionnaire. In addition, in the aforementioned study in France (with more participants),<sup>28</sup> the influenza vaccine coverage in nurses was 39.5%; this difference with our observations may suggest that our results could

have been different if more HWC had participated in the study.

## Conclusion

Perceptions of working conditions (particularly perceptions of management) are likely to influence the acceptance of the influenza vaccine among nurses and nurse aides. Any information concerning this vaccine should be associated with measures addressing occupation-related issues, including factors that may trigger a feeling of psychological contract breach between HCWs and institutions. To prevent nosocomial influenza in susceptible patients, a high vaccine coverage in HCWs is needed; information dissemination to this group should take into account the non-medical factors that may impact the decision of HCWs to receive the vaccine in addition to providing information regarding vaccine usefulness and safety. The communication strategy may differ between nurses and nurse aides.

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No potential conflicts of interest were disclosed.

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