

Recommendations to Improve the Influenza Immunization Rates of Respiratory Healthcare Professionals: A Survey Conducted in Puerto Rico

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Objective: Influenza affects 5–15% of the worldwide population and is responsible for 4–5 million cases and 250,000–500,000 deaths. Despite established recommendations, vaccination rates continue to be low. Our study aimed to identify barriers to influenza immunization and attitudes toward the vaccine among respiratory health care (HC) professionals in Puerto Rico.

Methods: We conducted an anonymous written survey that was handed out to 130 HC professionals, including physicians, nurses and respiratory therapists, who attended the Annual Respiratory Disease Congress held in San Juan, Puerto Rico, on August 2018.

Results: A total of 68 health care professionals participated in the study. Nearly 34% of participants reported never receiving influenza immunization themselves, 13% reported intermittent immunization, and 53% received immunizations yearly. Approximately 82% and 87% of the participants believed the influenza vaccine to be safe and effective, respectively. Sixty-five percent of respiratory therapists considered the vaccine effective, as compared to 94% of physicians and 100% of nurses and other HC professionals ($p=0.023$). Most of the participants (87%) recommended influenza immunization, although 38% of participants indicated being concerned about potential side effects of the vaccine. Knowledge of current clinical indications for influenza immunization for medical conditions varied from 59% for patients on systemic steroids to 94% for patients with diabetes mellitus.

Conclusion: This survey among respiratory HC professionals in Puerto Rico demonstrated barriers in knowledge about vaccination, its indications, and its safety. Addressing these barriers provides us with opportunities to improve influenza immunizations rates among HC workers and their patients. [*PR Health Sci J* 2023;42(3):207-211]

Key words: Influenza immunization, Healthcare professional, Puerto Rico

Influenza is responsible for 4–5 million cases and 250,000–500,000 deaths worldwide (1). It is one of the most common triggers of asthma exacerbation, pneumonia, and death for elderly and immunocompromised individuals (2). From 2018 to 2019, there were 52,253 reported cases of influenza, including 3 deaths and 2,376 hospitalizations in Puerto Rico (3).

Despite established recommendations, vaccination rates are low. Among adults in the USA, only 34.6–45% reported receiving the influenza immunization annually (4)(5). Hesitancy to influenza immunization is multifactorial. A meta-analysis identified a negative attitude toward the vaccine, a low perceived risk of the disease, and a lack of knowledge as the most important barriers (6).

The influenza vaccine is safe and cost-effective (7). To increase influenza vaccination rates and decrease disease outbreaks, barriers to influenza immunization among healthcare (HC) professional should be evaluated. HC professionals are exposed to influenza more so than the general population and

convey their knowledge and bias toward the vaccine to the population they serve. Our study aimed to identify barriers to influenza immunization and attitudes toward the vaccine among respiratory HC professionals in Puerto Rico.

Methods

We conducted an anonymous written survey that was handed out to 130 respiratory HC professionals, including

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physicians and respiratory therapists, attending the August 2018 Annual Respiratory Disease Congress in San Juan, Puerto Rico. Survey participation was voluntary. The 20-item questionnaire, was derived from a published survey on influenza immunization (8). The complete questionnaire was translated to Spanish. Questions on geographical residency were excluded and substituted for profession and place of work. It underwent face and content validated by 2 certified allergists. The survey included demographical variables, health habits, influenza immunization status, and knowledge and vaccine safety concerns. The documents were collected at the end of the conference. This study was approved by the Institutional Review Board of the University of Puerto Rico Medical Sciences Campus (protocol A5390118).

Data was analyzed with descriptive statistics. A chi-squared test or Fisher’s Exact test was performed to determine an association between HC professionals’ characteristics (e.g., sociodemographic and lifestyle behaviors) and their stance on influenza vaccines, and knowledge about the vaccine, assessed through a questionnaire including 18 items, scoring 1 point for each correct answer (i.e., the scores ranged from 0 to 18). The knowledge score was dichotomized as low (< 80% of questions answered correctly) and high (80% or more questions answered correctly), using 15 correct items as the cutoff point. All statistical analyses were performed using Stata v. 15 (College Station, Texas 77845 USA). A p-value less than 0.05 was considered significant.

Results

Participants’ characteristics

A total of 68 HC professionals participated in the study; 49% were women and 94% were 33 years of age or older. Overall, 52% of the subjects who were invited to participate completed the survey. Most participants were physicians, either primary care providers or subspecialists, and respiratory therapists (69% and 25%, respectively). About 16% reported working exclusively at hospitals.

Influenza immunization practices and beliefs

Nearly 34% of participants reported never receiving influenza immunization themselves, 13% reported intermittent immunization, and 53% received immunizations yearly, as recommended by CDC guidelines (9). Table 1 shows that approximately 82% and 87% of the participants believed the influenza vaccine to be safe and effective, respectively; those not currently working were less likely to consider the vaccine safe than those working at HC facilities (not working = 40%, ambulatory = 90%, hospitals = 73%, hospitals and ambulatory combined = 80%, $p=0.041$). Furthermore, those working at hospitals, as compared to those working at ambulatory facilities, were less likely to consider the influenza vaccine effective (64% vs. 95%, $p=0.021$) or to recommended it (64% vs. 95%, $p=0.028$). Moreover, 65% of respiratory therapists considered

the vaccine effective, as compared to 94% of physicians and 100% of nurses and other HC professionals ($p=0.023$).

Most of the participants (87%) recommended influenza immunization. Participants who recommended the vaccine were more likely to consider the vaccine safe (98% vs. 13%, $p<0.001$) and effective (100% vs. 13%, $p<0.001$). However, 38% of participants indicated being concerned about potential side effects of the influenza vaccine and 3% considered the vaccine unnecessary. Furthermore, 40% and 35% of participants believed influenza immunization may lead to allergic reactions and neurologic complications, respectively, whereas 3% believed it may cause autism.

Table 1. Healthcare professionals’ stance on influenza vaccines according to sociodemographic characteristics and lifestyle behaviors (n=68)†.

	n	The Influenza Vaccine is...		
		Safe n (%)	Effective n (%)	Recommended n (%)
Among all	68	56 (82.35)	59 (86.76)	59 (86.76)
Gender				
Female	34	28 (82.35)	29 (85.29)	29 (85.29)
Male	33	27 (81.82)	29 (87.88)	29 (87.88)
Age				
<52 years old	29	25 (86.21)	24 (82.76)	24 (82.76)
≥52 years old	39	31 (79.49)	35 (89.74)	35 (89.74)
Profession‡				
Physician	47	42 (89.36)	44 (93.62)	43 (91.49)
Respiratory therapist	17	11 (64.71)	11 (64.71)	12 (70.59)
Others	4	3 (75.00)	4 (100.00)	4 (100.00)
Workplace§				
None	5	2 (40.00)	4 (80.00)	4 (80.00)
Ambulatory	42	38 (90.48)	40 (95.24)	40 (95.24)
Hospital	11	8 (72.73)	7 (63.64)	7 (63.64)
Ambulatory + Hospital	10	8 (80.00)	8 (80.00)	8 (80.00)

†Variables of safety, effectiveness, and recommendation had four, two, and one missing values, respectively. ‡Statistical significance was observed for the association between profession (3 categories) and perception of effectiveness (Fisher’s Exact p-value = 0.023). §Statistical significance was observed for the association between workplace (4 categories) and perception of safety (Fisher’s Exact p-value = 0.041), effectiveness (Fisher’s Exact p-value = 0.021), and recommendation of the influenza vaccine (Fisher’s Exact p-value = 0.028).

Knowledge about influenza immunization

On average, participants correctly responded to 12.9 ± 3.5 questions (median: 14, interquartile range [IQR]: 4.5) directed to assess knowledge regarding influenza immunization. (Table 2). Nearly 90% of the professionals admitted not knowing what type of vaccine the influenza vaccine is. Knowledge about indications for influenza immunization varied from 59% for patients on systemic steroids to 94% for patients with diabetes mellitus. Individuals with atopic dermatitis and uncontrolled asthma were not recognized as subjects that benefit from immunization (46–47%). HC professionals considered that subjects with controlled asthma would not benefit from the vaccine by (21-31%). Seventy-five percent of professionals responded correctly that influenza immunization is not indicated in infants younger than 6 months of age, and

Table 2. Knowledge of healthcare professionals regarding influenza vaccine (n = 68).

Questions	Correctly answered n (%)
Should cardiac patients get flu vaccine?	61 (89.71)
Should neurologic patients get flu vaccine?	52 (76.47)
Should diabetes patients get flu vaccine?	64 (94.12)
Should liver patients get flu vaccine?	51 (75.00)
Should renal patients get flu vaccine?	48 (70.59)
Should cancer patients get flu vaccine?	44 (64.71)
Should pulmonary patients get flu vaccine?	58 (85.29)
Should patients on steroids get flu vaccine?	40 (58.82)
Should infants younger than 6 months receive flu vaccine?	51 (75.00)
Should children 6 months-12 years old receive flu vaccine?	50 (73.53)
Should children 13-21 years old receive flu vaccine?	48 (70.59)
Should 22-65 years old receive flu vaccine?	52 (76.47)
Should >65 years old receive flu vaccine?	60 (88.24)
Is influenza vaccine live?	10 (14.71)
Is influenza vaccine attenuated?	35 (51.47)
Is influenza vaccine recombinant?	25 (36.76)
Is influenza vaccine toxoid?	65 (95.59)
Do not know which is influenza vaccine	61 (89.71)

89% correctly identified immunization indication in the elderly.

Significant differences in knowledge were observed with respect to profession categories ($p < 0.05$; Table 3). Respiratory therapists were less likely to respond correctly to questions on indications for influenza immunization and type of vaccine than were physicians and other professionals (12%, 53%, and 75% had more than 80% of questions correct, respectively; $p = 0.002$).

Discussion

This survey among respiratory HC professionals demonstrated barriers in knowledge about vaccination, its indications, and its safety. Addressing these barriers provides us with opportunities to improve influenza immunizations rates among HC workers and their patients.

Based on our survey, three specific recommendations can be offered. First, educate HC professionals about influenza

since they can prevent disease transmission and implement immunization. Target respiratory therapist, empower physicians and establish interdisciplinary team of physician and respiratory therapist champions to educate about influenza (1)(10)(11)(12)(13), and encouraged social networks among HC professionals (14).

Second, immunize patients and HC professionals at hospitals to increase access to vaccines. Employees are 5.7 times more likely to vaccinate if vaccinations were offered at the workplace (15). Seize the opportunity to administer influenza vaccines before patient discharge and implement standing orders and electronic reminder alerts (16).

Third, emphasize influenza vaccine indications and safety. Our survey demonstrated that most HC professionals considered renal (70%), liver (75%) or malignancy (64%) patients' candidates for immunization, while asthma, was not. Educational material should emphasize the benefits of immunization and create awareness of the disease's severity and mortality, the social benefit of immunization, the identification factors of high-risk groups, and the low risk of adverse events (6). Misconception that vaccines cause autism or other neurological conditions must be clarified. Thirty nine percent of providers were concerned of side effects from immunization, 40% for allergic reactions, and 35% for neurologic complications. Martin Arias et al. conducted a metaanalysis evaluating the risk of Guillain-Barre Syndrome (GBS) and influenza immunization. They identified a small, marginally significant -risk, particularly with the pandemic rather than the seasonal vaccine OR=1.41

Table 3. Association between sociodemographic data and knowledge about influenza immunization (n=68).

Characteristics	Knowledge about influenza immunization (scale scores) [†]				P-values [‡]
	Continuous		Categorical		
	Correct answers Mean ± SD	Correct answers Median (P25, P75)	Low scores n = 38 (<15 correct answers)	High scores n = 30 (≥15 correct answers)	
Among all	12.87 ± 3.49	14 (11, 15.5)			
Gender					
Female	12.50 ± 3.66	14 (10, 16)	20 (58.82)	14 (41.18)	0.79
Male	13.42 ± 3.18	14 (13, 15)	17 (51.52)	16 (48.48)	
Missing values	7	7	1 (100.00)	0 (0.00)	
Age					
<52 years old	13.59 ± 2.54	15 (12, 16)	14 (48.28)	15 (51.72)	0.28§
≥52 years old	12.33 ± 4.00	14 (9, 15)	24 (61.54)	15 (38.46)	
Profession					
Physician	13.79 ± 2.84	15 (13, 16)	22 (46.81)	25 (53.19)	0.002*
Respiratory therapist	10.18 ± 3.75	10 (8, 13)	15 (88.24)	2 (11.76)	
Others	13.50 ± 4.36	15 (11, 16)	1 (25.00)	3 (75.00)	
Workplace					
None	12.80 ± 3.42	14 (13, 14)	4 (80.00)	1 (20.00)	0.18
Ambulatory	12.95 ± 3.31	14 (10, 16)	23 (54.76)	19 (45.24)	
Hospital	12.18 ± 3.57	13 (11, 15)	8 (72.73)	3 (27.27)	
Ambulatory + Hospital	13.30 ± 4.55	15 (14, 16)	3 (30.00)	7 (70.00)	
Missing values	16	16	0 (0.00)	1 (100.0)	

[†]Knowledge scale scores range from 0 to 18. [‡]Fisher's Exact test was used to calculate p-values unless otherwise specified. [§] Chi-squared test was used to calculate p-values. * Results were statistically significant ($p < 0.05$).

(95%CI, 1.20–1.66) (17). The latest MMWR recommends precaution with influenza immunization if subjects developed GBS within 6 weeks of a previous influenza immunization. Risk-benefit should be considered and discussed on an individual basis (9). Similarly, egg allergy is not a contraindication for influenza vaccination. Egg-allergic patients are not at a greater risk of a reaction than nonallergic subjects, so special precautions are not warranted (18).

Limited information about influenza immunization attitudes and practices has been published in Puerto Rico. Arriola et al. identified barriers for the low influenza immunization rate among adult Puerto Ricans during the 2013–2014 influenza season (19). The most common barrier identified was limited access, particularly among younger adults. Older adults were more concerned about the safety of the vaccine. Those who received recommendation from a HC professional, who also administered the vaccine, had the highest likelihood of receiving immunization. Sanchez et al. conducted a survey among hospital HC professionals and identified an increase in the likelihood of immunization to influenza if one had been previously immunized as part of a mandatory policy or had not experienced side effects (20).

We acknowledge that there are limitations to our study. We had a small sample size of respondents, which was volunteer and non-incentivized. Since most of the participants were pulmonologists and respiratory therapists, we cannot generalize to other medical specialists. Finally, our study was based on self-report. Nevertheless, it provides information about the knowledge of HC professionals and barriers for influenza immunization, particularly in the field of respiratory therapy, a specialty not frequently included among published surveys of HC professionals.

In conclusion, our study demonstrates poor compliance with the CDC recommendations for influenza immunization among respiratory HC professionals. Educational interventions for HC professionals on the benefits of influenza immunization are required. Improving influenza immunization rates in the population starts at the HC professional level.

Resumen

Objetivo: Influenza afecta a 5–15% de la población mundialmente y es responsable de 4–5 millones de casos y 250,000–500,000 muertes. A pesar de las recomendaciones, la tasa de vacunación es baja. Nuestro estudio pretende identificar barreras para la inmunización y actitudes hacia la vacuna entre profesionales de cuidado de salud respiratoria en Puerto Rico. **Métodos:** Administramos una encuesta escrita anónima entre 130 profesionales, incluyendo médicos, enfermeras y terapeutas respiratorios, que asistieron al Congreso Anual de Enfermedades Respiratorias llevado a cabo en San Juan, Puerto Rico, en agosto del 2018. **Resultados:** Sesenta y ocho profesionales de salud participaron. Un 34% de los participantes reportó que nunca había recibido la vacuna de influenza, 13% reportó inmunización

intermitente, y 53% la recibe anualmente. Aproximadamente 82% y 87% de los participantes consideró que la vacuna de influenza era segura y efectiva, respectivamente. Sesenta y cinco por ciento de los terapeutas respiratorios consideró la vacuna efectiva, comparado con 94% de los médicos y 100% de las enfermeras y otros profesionales de salud ($p=0.023$). La mayoría de los participantes (87%) recomendó la inmunización, a pesar de que 38% indicó tener preocupación sobre los potenciales efectos secundarios de la vacuna. El conocimiento sobre indicaciones clínicas de la inmunización varió según la condición de 59% para pacientes en esteroides sistémicos a 94% para diabetes mellitus. **Conclusión:** Esta encuesta entre profesionales de salud respiratoria en Puerto Rico demostró barreras en conocimiento sobre vacunación, sus indicaciones y su seguridad. Eliminar las barreras nos permitiría mejorar la tasa de inmunización de influenza entre profesionales de salud y sus pacientes.

References

- Dini G, Toletone A, Sticchi L, Orsi A, Bragazzi NL, Durando P. Influenza vaccination in healthcare workers: A comprehensive critical appraisal of the literature. *Hum Vaccines Immunother* 2018;14:772–89. doi:10.1080/21645515.2017.1348442.
- Malosh RE, Martin ET, Ortiz JR, Monto AS. The risk of lower respiratory tract infection following influenza virus infection: A systematic and narrative review. *Vaccine* 2018;36:141–7. doi:10.1016/j.vaccine.2017.11.018.
- Ahluwalia IB, Mack KA, Murphy W, Mokdad AH BV. State-specific prevalence of selected chronic disease-related characteristics—Behavioral Risk Factor Surveillance System, 2001. *MMWR Surveill Summ* 2003;52:1–80.
- Schuchat A, Director A, Griffin PM, Rasmussen SA, Leahy MA, Martinroe JC, et al. Morbidity and Mortality Weekly Report Surveillance for Health Care Access and Health Services Use, Adults Aged 18–64 Years—Behavioral Risk Factor Surveillance System, United States, 2014 Surveillance Summaries Centers for Disease Control and Prevention MMWR Editorial and Production Staff (Serials) MMWR Editorial Board. vol. 66. 2017.
- Schuchat A, Director A, Jaffe HW, Rasmussen SA, Leahy MA, Martinroe JC, et al. Morbidity and Mortality Weekly Report Surveillance of Vaccination Coverage Among Adult Populations—United States, 2015 Centers for Disease Control and Prevention MMWR Editorial and Production Staff (Serials) MMWR Editorial Board. vol. 66. 2017.
- Schmid P, Rauber D, Betsch C, Lidolt G, Denker ML. Barriers of influenza vaccination intention and behavior - A systematic review of influenza vaccine hesitancy, 2005–2016. *PLoS One* 2017;12. doi:10.1371/journal.pone.0170550.
- Mohn KGI, Zhou F. Clinical expectations for better influenza virus vaccines—perspectives from the young investigators' point of view. *Vaccines* 2018;6. doi:10.3390/vaccines6020032.
- El Khoury G, Salameh P. Influenza vaccination: A cross-sectional survey of knowledge, attitude and practices among the lebanese adult population. *Int J Environ Res Public Health* 2015;12:15486–97. doi:10.3390/ijerph121215000.
- Redfield RR, Bunnell R, Ellis B, Kent CK, Leahy MA, Martinroe JC, et al. Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices—Morbidity and Mortality Weekly Report Recommendations and Reports Centers for Disease Control and Prevention MMWR Editorial and Production Staff (Serials) MMWR Editorial Board. n.d.
- Maltezou HC, Theodoridou K, Ledda C, Rapisarda V. Vaccination of healthcare personnel: Time to rethink the current situation in Europe. *Future Microbiol* 2019;14:5–8. doi:10.2217/fmb-2018-0262.

11. Pichon M, Gaymard A, Zamolo H, Bazire C, Valette M, Sarkozy F, et al. Web-based analysis of adherence to influenza vaccination among French healthcare workers. *J Clin Virol* 2019;116:29–33. doi:10.1016/j.jcv.2019.04.008.
12. Prematunge C, Corace K, McCarthy A, Nair RC, Pugsley R, Garber G. Factors influencing pandemic influenza vaccination of healthcare workers—A systematic review. *Vaccine* 2012;30:4733–43. doi:10.1016/j.vaccine.2012.05.018.
13. Switzer C, Babiuk L, Loeb M. Determining optimal community protection strategies for the influenza vaccine. *Expert Rev Vaccines* 2019;1–10. doi:10.1080/14760584.2019.1642110.
14. Edge R, Keegan T, Isba R, Diggle P. Observational study to assess the effects of social networks on the seasonal influenza vaccine uptake by early career doctors. *BMJ Open* 2019;9:e026997. doi:10.1136/bmjopen-2018-026997.
15. Shahrabani S, Benzion U. Workplace vaccination and other factors impacting influenza vaccination decision among employees in Israel. *Int J Environ Res Public Health* 2010;7:853–69. doi:10.3390/ijerph7030853.
16. Cataldi JR, O’Leary ST, Lindley MC, Hurley LP, Allison MA, Brtnikova M, et al. Survey of Adult Influenza Vaccination Practices and Perspectives Among US Primary Care Providers (2016–2017 Influenza Season). *J Gen Intern Med* 2019. doi:10.1007/s11606-019-05164-7.
17. Martín Arias LH, Sanz R, Sáinz M, Treceño C, Carvajal A. Guillain-Barré syndrome and influenza vaccines: A meta-analysis. *Vaccine* 2015;33:3773–8. doi:10.1016/j.vaccine.2015.05.013.
18. Greenhawt M, Turner PJ, Kelso JM. Administration of influenza vaccines to egg allergic recipients: A practice parameter update 2017. *Ann Allergy, Asthma Immunol* 2018;120:49–52. doi:10.1016/j.anai.2017.10.020.
19. Arriola CS, Mercado-Crespo MC, Rivera B, Serrano-Rodríguez R, Macklin N, Rivera A, et al. Reasons for low influenza vaccination coverage among adults in Puerto Rico, influenza season 2013–2014. *Vaccine* 2015;33:3829–35. doi:10.1016/j.vaccine.2015.06.093.
20. Sánchez, L., & García-Fragoso L. Determinant factors for acceptance of seasonal influenza vaccination among healthcare workers after the 2009 influenza-A (H1N1) pandemic in a hospital at the metropolitan area of Puerto Rico. *Bol Asoc Med P R* 2013;105:20–4.