Influenza-like Illness (ILI) Experience Among Healthcare Workers in Military Treatment Facilities: An Offshoot of the Pragmatic Assessment of Influenza Vaccine Effectiveness in the DoD (PAIVED) Study

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Background

Healthcare workers (HCWs) are at heightened risk of exposure to respiratory pathogens. There are limited published data on ILI experience among HCWs, and the few available studies were hampered by incomplete vaccination histories. PAIVED, a multicenter, multiservice study assessing influenza vaccine effectiveness in the Department of Defense, provides a unique opportunity to describe ILI experience among HCWs compared to non-HCWs who all received seasonal influenza vaccination.

Objective

Describe and compare ILI experience among healthcare workers and non-HCWs enrolled in the PAIVED study during the 2019-2020 influenza season.

Methods

PAIVED: 2019-2020 Influenza Season

Study Locations

Bethesda, MD (WRNMMC); Portsmouth, VA (NMCP); San Antonio, TX (BAMC, WHASC); San Diego, CA (NMCSD); Tacoma, WA (MAMC); Annapolis, MD (USNA); Fort Bragg, NC (WAMC), Fort Hood, TX (CRDAMC)

Subjects

- Adults eligible for medical care through DoD, seeking influenza vaccination, & able to provide informed consent
- Exclusion criteria
  - Already received/plan to receive 2019-20 live attenuated vaccine
  - Unable to receive standard dose influenza vaccine
  - Unable to return for follow up if ILI occurs

Study Procedures

All Subjects

- Randomized (1:1:1) to receive one of the following licensed, quadrivalent inactivated influenza vaccines:
  - Egg-based (*Afluria®*, *Fluarix®*, *FluLaval®*)
  - Cell-culture based (*Flucelvax®*)
  - Recombinant (*Flublok®*)
- Completed enrollment questionnaire with baseline demographics including HCW status
- Weekly surveillance for ILI symptoms (email or text message)

  ILI defined *a priori* as:
  - Having a cough or sore throat AND
    - Fever/feeling feverish or having chills/night sweats, OR
    - Having muscle/body aches or fatigue

Methods (cont.)

Participants with Confirmed ILI

- Online symptom questionnaire (Flu-PRO) x 7 days
- 2 visits with study personnel
  - Visit 1 (0-14d): vital signs, interview, blood draw, nasal swab
  - Visit 2 (28 ± 7d): vital signs, interview, blood draw

Statistical Analysis

- Descriptive statistics calculated for PAIVED cohort, excluding military recruits & naval academy students, categorized by HCW status
- Tested for differences in demographics and ILI experience using chi-squared or Kruskal-Wallis tests as appropriate, by HCW status

Results

5879 total subjects enrolled in PAIVED during the 2019-20 season

- 1379 (23.5%) participants excluded from analysis due to differences in ILI follow up procedures for military recruits & academy students
- 46 participants excluded due to lack of surveillance data
- Of the eligible subjects enrolled in 2019-20 season, 1546 (35%) were HCWs (Table 1)

Table 1. Self-reported demographics for 2019-20 PAIVED cohort at enrollment, according to HCW status.

2019-20 PAIVED Cohort Demographics	HCW (n=1546)	Non-HCW (n=2867)	P-Value
Age group, n(%)			<0.01
18-24	273 (17.7%)	648 (22.6%)	
25-34	606 (39.2%)	793 (27.7%)	
35-44	344 (22.3%)	508 (17.7%)	
45-54	199 (12.9%)	363 (12.7%)	
55-64	103 (6.7%)	345 (12.0%)	
65+	21 (1.4%)	210 (7.3%)	
Sex, Female, n(%)	654 (42.3%)	908 (31.7%)	<0.01
Race, n(%)			<0.01
White	964 (62.4%)	1599 (55.8%)	
Hispanic	221 (14.3%)	563 (19.6%)	
Black	167 (10.8%)	426 (14.9%)	
Asian	131 (8.5%)	144 (5.0%)	
Multiple races	54 (3.5%)	100 (3.5%)	
Unknown/Other	9 (0.6%)	35 (1.2%)	
Military status, n(%)			<0.01
Active duty	1255 (81.2%)	1774 (61.9%)	
Dependent	149 (9.6%)	529 (18.5%)	
Retired military	142 (9.2%)	564 (19.7%)	
Education level, > high school, n(%)	1244 (80.5%)	1705 (59.5%)	<0.01
BMI, mean (SD)	26.1 (4.1)	27.8 (5.3)	<0.01
Physically active, n(%)	1420 (91.8%)	2432 (84.8%)	<0.01
Current smoking status, n(%)	45 (2.9%)	269 (9.4%)	<0.01
Current vaping status, n(%)	56 (3.6%)	201 (7.0%)	<0.01

Results (cont.)

ILI Surveillance

- Median percentage of surveillance completed
  - HCW 86% (IQR 32, 96) vs non-HCW 68% (IQR 9, 94), p<0.001
  - HCWs with ILI 86% (IQR 56, 95); non-HCW with ILI 85% (IQR 44, 94), p=0.02
- 51% HCW, 41% non-HCW responded to >85% ILI surveillance, p<0.01
- Higher percentage of HCWs
  - Reported at least 1 ILI (34% vs 26%, p<0.01)
  - Completed ILI study visits (Visit 1: 92% vs 75%; Visit 2: 87% vs 71%)

Table 2. Self-reported demographics of 2019-20 PAIVED participants who experienced ILI, according to HCW status.

Demographics: Participants with ILI	HCW (n=524)	Non-HCW (n=745)	P-Value
Age group, n(%)			<0.01
18-24	87 (16.6%)	110 (14.8%)	
25-34	212 (40.5%)	218 (29.3%)	
35-44	121 (23.1%)	176 (23.6%)	
45-54	64 (12.2%)	118 (15.8%)	
55-64	35 (6.7%)	83 (11.1%)	
65+	5 (1.0%)	40 (5.4%)	
Sex - Female, n(%)	264 (50.4%)	315 (42.3%)	<0.01
Race, n(%)			<0.01
White	312 (59.5%)	408 (54.8%)	
Hispanic	83 (15.8%)	148 (19.9%)	
Black	54 (10.3%)	108 (14.5%)	
Asian	53 (10.1%)	39 (5.2%)	
Multiple races	17 (3.2%)	36 (4.8%)	
Unknown/Other	5 (1.0%)	6 (0.8%)	
Military status, n(%)			<0.01
Active duty	423 (80.7%)	440 (59.1%)	
Dependent	56 (10.7%)	161 (21.6%)	
Retired military	45 (8.6%)	144 (19.3%)	
Education level, > high school, n(%)	430 (82%)	492 (66%)	<0.01
BMI, mean (SD)	26.1 (4.2)	28.3 (5.3)	<0.01
Physically active, n(%)	475 (90.6%)	612 (82.1%)	<0.01
Current smoking status, n(%)	11 (2.1%)	55 (7.4%)	<0.01
Current vaping status, n(%)	13 (2.5%)	50 (6.7%)	<0.01

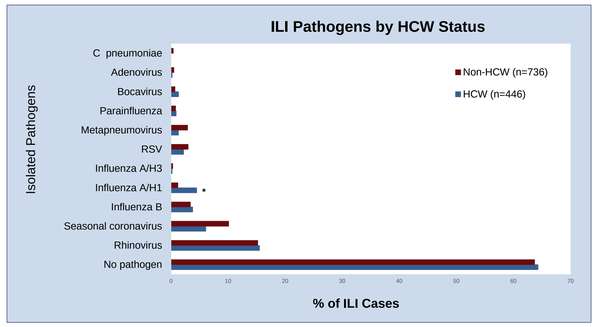

Figure 1. Distribution of pathogens isolated in participants meeting ILI criteria, categorized by HCW status. Excludes military recruits & ILI cases without nasal swab. *Influenza A/H1 was more frequently isolated in HCW than non-HCW (p<0.01).

Results & Future Directions

ILI Symptoms

- 95% of both HCWs and non-HCWs with ILI completed Flu-Pro diary
- Non-HCW had higher mean lower respiratory scores (1.4 ± 0.9 vs 1.3 ± 0.8, p<0.001). All other scores were comparable.
- HCW reported shorter duration of illness
  - Mean illness duration: HCW 12.0 ± 8.4 days vs non-HCW 13.2 ± 9.1 days

Future Directions

- All nasal swab specimens will be tested for SARS-CoV-2 to determine incidence of COVID-19 in PAIVED cohort during 2019-20

Conclusions

HCWs in PAIVED were more likely to report ILI than their non-HCW counterparts yet tended to have lower illness severity, possibly reflecting a higher level of baseline health or enhanced awareness of early ILI symptoms. Influenza A(H1N1) was more commonly detected in HCWs despite all participants receiving licensed influenza vaccines targeting the same viral strains. This highlights the important epidemiologic position HCWs occupy; in addition to being at increased risk of exposure to pathogens through their interaction with patients, HCW also have a heightened likelihood of coming into contact with vulnerable populations who are more likely to suffer complications from infection if secondary transmission occurs. The COVID-19 pandemic underscored the significance of this phenomenon. Exploring ways to mitigate ILI risk in HCWs beyond influenza vaccination is warranted.

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