SUPPLEMENT ARTICLE

Diagnosis of 2009 Pandemic Influenza A (pH1N1) and Seasonal Influenza Using Rapid Influenza Antigen Tests, San Antonio, Texas, April–June 2009

Pauline M. Lucas,[1] Oliver W. Morgan,[2] Thomas F. Gibbons,[1] Alicia C. Guerrero,[1,4] Genny M. Maupin,[1,5] Jenny L. Butler,[1,4] Linda C. Canas,[1] Vincent P. Fonseca,[3] Sonja J. Olsen,[2] and Victor H. MacIntosh[1]

[1]Department of Defense Global Laboratory-based Influenza Surveillance Program, United States Air Force School of Aerospace Medicine, Brooks City-Base, San Antonio, Texas; [2]Division of Preparedness and Emerging Infections, Centers for Disease Control and Prevention, Atlanta, Georgia; [3]Texas Department of State Health Services, Austin, Texas; [4]Conceptual Mind Works, San Antonio, Texas; [5]Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee

Clinicians frequently use influenza rapid antigen tests for diagnostic testing. We tested nasal wash samples from 1 April to 7 June 2009 from 1538 patients using the QuickVue Influenza A+B (Quidel) rapid influenza antigen test and compared the results with real-time reverse transcription polymerase chain reaction (rRT-PCR) assay (gold standard). The prevalence of 2009 pandemic influenza A (pH1N1) was 1.98%, seasonal influenza type A .87%, and seasonal influenza type B 2.07%. The sensitivity and specificity of the rapid test for pH1N1 was 20% (95% CI, 8–39) and 99% (95% CI, 98–99), for seasonal influenza type A 15% (95% CI, 2–45) and 99% (95% CI, 98–99), and for influenza type B was 31% (95% CI, 9–61) and 99% (95% CI, 98–99.7). Rapid influenza antigen tests were of limited use at a time when the prevalence of pH1N1 and seasonal influenza in the United States was low. Clinicians should instead rely on clinical impression and laboratory diagnosis by rRT-PCR.

The United States Department of Defense (DoD) Global Influenza Surveillance Program is part of a system supported by the DoD Global Emerging Infections Surveillance and Response System (GEIS) for surveillance and response to emerging pathogens in United States military populations worldwide and also in areas where DoD overseas medical research laboratories and their partner countries are located [1]. The surveillance system routinely collects respiratory specimens from individuals with influenza-like illness (ILI) for respiratory pathogen testing at the United States Air Force School of Aerospace Medicine (USAFSAM) at Brooks City-Base, Texas [1–3]. The first 2 patients with 2009 pH1N1 infection in Texas were identified through this system.

The USAFSAM laboratory performs rRT-PCR according to CDC recommendations to confirm pH1N1 infection in patients [4]. However, in military and nonmilitary settings, clinicians frequently use influenza rapid antigen tests to provide rapid diagnostic testing for patients presenting with ILI and to guide treatment with antiviral medications [5]. Some clinicians may also use influenza rapid antigen tests to select patients from whom respiratory samples might be sent for rRT-PCR testing. Rapid influenza antigen tests have also been used by the military to guide isolation or cohorting of ill

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Correspondence: Victor H. MacIntosh, M.D., Epidemiology Consult Service, USAF School of Aerospace Medicine, 2513 Kennedy Cir, Bldg 180, Brooks City-Base, TX 78235 (victor.macintosh@us.af.mil); Dr Oliver Morgan, Division of Emerging Infections and Surveillance Services, Centers for Disease Control and Prevention, MS C-12, 1600 Clifton Rd NE, Atlanta, GA 3033 (omorgan@cdc.gov).

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14. ABSTRACT
Clinicians frequently use influenza rapid antigen tests for diagnostic testing. We tested nasal wash samples from 1 April to 7 June 2009 from 1538 patients using the QuickVue Influenza A1B (Quidel) rapid influenza antigen test and compared the results with real-time reverse transcription polymerase chain reaction (rRTPCR) assay (gold standard). The prevalence of 2009 pandemic influenza A (pH1N1) was 1.98%, seasonal influenza type A .87%, and seasonal influenza type B 2.07%. The sensitivity and specificity of the rapid test for pH1N1 was 20% (95% CI, 8?39) and 99% (95% CI, 98?99), for seasonal influenza type A 15% (95% CI, 2?45) and 99% (95% CI, 98?99), and for influenza type B was 31% (95% CI, 9?61) and 99% (95% CI, 98?99.7). Rapid influenza antigen tests were of limited use at a time when the prevalence of pH1N1 and seasonal influenza in the United States was low. Clinicians should instead rely on clinical impression and laboratory diagnosis by rRT-PCR.

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service members. We assessed the performance of the QuickVue Influenza A+B (Quidel, San Diego, CA) rapid influenza antigen test for diagnosing infection with pH1N1 and seasonal influenza, as used in a real-world clinical setting.

METHODS

Study Population

The study population included individuals who presented to outpatient clinics operated by Randolph and Lackland Air Force Bases in San Antonio, Texas, from 1 April to 7 June 2009 and who had a respiratory specimen that was tested by both influenza rapid test at the clinic and influenza rRT-PCR assay at the USAFSAM laboratory. These clinics provide outpatient and inpatient healthcare in the San Antonio area to ~93,000 active and retired service members and their families [6], including basic military and other trainees at Lackland where 86,000 trainees graduate annually [7].

Clinical and Laboratory Information

Influenza rapid antigen tests and results were identified from the Composite Health Care System (CHCS) [8] at USAFSAM; CHCS is an electronic system for DoD medical records that includes laboratory tests and results data. CHCS and USAFSAM laboratory records were used to obtain results for rRT-PCR and virology testing. Where >1 specimen was collected from an individual, only data for the first sample was included. We further assessed ILI in 2 ways: (1) coded diagnoses from the DoD Standard Ambulatory Data Registry (SADR), an ambulatory care module supplementing CHCS, using the International Classification of Disease version 9 (ICD-9) and a validated ICD-9 code set used for DoD enhanced ILI syndromic surveillance [9], and (2) data on clinical symptoms from the DoD Global Influenza Surveillance Program questionnaires [10]. Questionnaire data were used to classify cases meeting a case definition or not, where the case definition for ILI was temperature of $\geq 100.5^{\circ}$F plus cough or sore throat, and to determine the number of days between the onset of illness and specimen collection. Finally, we determined seasonal influenza vaccination status from the Air Force Complete Immunization Tracking Application (AFCITA), or if not available in AFCITA, from the questionnaire. Demographic information was obtained from CHCS and questionnaires.

Specimen Collection

In the course of routine medical care, providers at the clinics examined patients with respiratory illness and collected respiratory samples for laboratory investigation based on clinical judgment. Rapid influenza antigen tests were performed by clinic laboratories except those located in Wilford Hall Medical Center at Lackland AFB; there the hospital laboratory performed the rapid test. Laboratories at these clinics also sent respiratory samples to USAFSAM for rRT-PCR testing and viral culture. Typically a nasal wash was collected, resulting in at least 2 mL of specimen fluid; 300 μL were used for the rapid influenza antigen test and the residual was placed in viral transport media and forwarded to USAFSAM for rRT-PCR and other testing (see below). The DoD influenza program at USAFSAM recommends the nasal wash in preference to other sample collection methods [11]. A small number of nasopharyngeal swab specimens were collected and similarly tested.

Rapid Influenza Test

All rapid influenza antigen tests were performed using the QuickVue Influenza A+B rapid influenza antigen test. Laboratories at the medical treatment facilities performed the QuickVue rapid influenza antigen test using the procedure outlined in the package insert: 300 μL of nasal wash was transferred to an extraction tube into which a test strip was placed for 10 minutes.

Detection and Characterization of Influenza by Virology and rRT-PCR

Influenza virus culture was carried out by traditional methods [12]. During the period covered by this study, USAFSAM used primers and probe sets provided by CDC for the universal detection of influenza A and influenza B and subtyping oligonucleotides for contemporary seasonal A/H1 and A/H3 influenza viruses; specimens that were influenza A positive and negative for seasonal H1 and H3 were forwarded to CDC (Atlanta, GA) for detection and characterization of pH1N1. Due to the large number of specimens submitted in late April, rRT-PCR testing for influenza B was stopped on 30 April 2009 to improve molecular laboratory throughput. Beginning 13 May, USAFSAM conducted rRT-PCR testing for pH1N1 using CDC primers and probes. All study samples were tested on original specimens using the CDC rRT-PCR protocol for influenza A (H1N1) [13].

All primers and probes (FAM) were individually purchased (Biosearch Technologies) as Analyte Specific Reagents and performance characteristics were independently validated at USAFSAM for each target and specimen type (nasal wash and nasopharyngeal). Positive clinical samples were characterized by the cycle threshold (Ct) value (positive Ct $\leq$ 37). Lower Ct values indicate more viral nucleic acid in the sample.

Analysis

We used rRT-PCR testing as a reference standard against which we compared the performance of the QuickVue Influenza A+B Test to identify seasonal influenza type A, pH1N1, and seasonal influenza type B. We calculated sensitivity, specificity, positive predictive values (PPV), and negative predictive values (NPV) with binomial proportion confidence intervals. For influenza B we limited the analysis to the period until 29 April when

Table 1. Summary of Respiratory Specimens by Influenza Test and USAF Bases Treatment Facility, San Antonio, Texas, 1 April to 7 June 2009

Test Performed	Randolph	Lackland[a]	Total
	n (%)	n (%)	n (%)
Rapid Antigen Test Only	6 (3%)	137 (8%)	143 (8%)
RT-PCR Test Only	72 (36%)	83 (5%)	155 (8%)
Both Rapid Antigen Test and RT-PCR	120 (61%)	1418 (86%)	1538 (84%)
RT-PCR Results not available	0	2 (<1%)	2 (<1%)
Total[b]	198 (100%)	1640 (100%)	1838 (100%)

Note. USAF, United States Air Force.

[a] Lackland includes Wilford Hall Medical Center and Brooks City-Base, Reid Trainee Health and Kelly Clinics.

[b] Percentages do not add up to 100 due to rounding.

influenza B rRT-PCR testing ceased. We used the Wilcoxon rank-sum (Mann-Whitney) test for pH1N1 to compare median values for Ct, temperature, and time between onset of symptoms and sample collection date [14]. We used STATA (version 9) for the analysis.

Ethical Review

This activity was reviewed for human subjects concerns by the 711th Human Performance Wing (higher command for USAFSAM) Internal Review Board and CDC and was determined to be exempt and related to public health response.

RESULTS

From 1 April to 7 June 2009, respiratory specimens from 1838 individuals were tested for influenza, of which 84% (n = 1538) had both an influenza rapid antigen test and rRT-PCR tests performed, 8% (n = 143) had a rapid test only, 8% (n = 155) had rRT-PCR only, and .1% (n = 2) had both tests performed but rRT-PCR results were not available (Table 1). Information about specimen type was available for 93% (n = 1716/1838) of specimens, of which 99% were nasal washes and 1% were nasopharyngeal swabs. Patients for whom both tests were performed did not differ from those with just one type of test performed, with respect to age, sex, or the proportion presenting with ILI (Table 2).

Of 1538 patients with both tests performed, 11% were <5 years old, 24% were 5–19 years old, 59% were 20–60 years old, and 6% were >60 years old (Table 2). Sixty-six percent of patients with both tests were male, 63% were active duty military, and 62% had received a seasonal influenza vaccine since September 2008. Seventy-four percent (n = 1141/1538) of patients with both tests had a diagnosis of code-based ILI by ICD-9 codes (Table 2). There were 529 (34%) patients who also had a DoD influenza surveillance questionnaire completed, of which 303 (57%) met the surveillance case definition for ILI.

Of patients with both tests performed, we identified 56 (4%) with presence of an influenza virus determined by rRT-PCR. All positive samples were from nasal wash specimens. Thirty patients had pH1N1, 13 patients had seasonal influenza type A (H1=12; H3=1), and 13 patients had seasonal influenza type B. Fifty percent (n = 15/30) of patients with pH1N1 were ≤18 years old, compared to 23% (n = 3/13) of seasonal influenza A and 46% (n = 6/13) of seasonal influenza B (P = .0001 using Kruskal Wallis rank test). The proportion of patients with code-based ILI was 87% (n = 26/30) for pH1N1, 100% (n = 13/13) for seasonal influenza A, and 92% (n = 12/13) for seasonal influenza B.

For seasonal influenza type A, the rapid influenza antigen test sensitivity was 15% (95% CI, 2–45) and the specificity was 99% (95% CI, 98–99) compared with rRT-PCR (Table 3). The prevalence of seasonal influenza type A was .87% among patients with both tests performed, the PPV was 12% (95% CI, 1–36), and the NPV was 99% (95% CI, 98.7–99.6). For influenza type B, the sensitivity of the rapid influenza antigen test was 31% (95% CI, 9–61) and the specificity was 99% (95% CI, 98–99.7) (Table 3). The prevalence of influenza type B was 2.07%, the PPV was 44% (95% CI, 14–79), and the NPV was 98% (95% CI, 97–99). For those patients with code-based ILI, the sensitivity of the rapid influenza antigen test for seasonal influenza type A was 20% and for influenza B it was 33% (Table 3).

The sensitivity of the rapid influenza antigen test to detect pH1N1 was 20% (95% CI, 8–39) and the specificity was 99% (95% CI, 98–99) (Table 3). The prevalence of pH1N1 was 1.98% among patients with both tests performed, the PPV was 29% (95% CI, 11–52), and NPV was 98% (95% CI, 98–99). For patients with code-based ILI, the sensitivity of the rapid influenza antigen test was 23% for pH1N1 and the specificity was 99% (Table 3). Using a different subset, those who met the ILI case definition by questionnaire, the sensitivity was 19% (n = 4/21; 95% CI, 5–42) and the specificity was 98% (n = 272/278; 95% CI, 95–99). If we used viral culture as a reference standard instead of rRT-PCR, the sensitivity for detecting pH1N1 was 23% (n = 6/26; 95% CI, 9–44) and the specificity was 99% (n = 996/1005; 95% CI, 98–99). For cases

Table 2. Characteristics of Patients by Influenza Test Type, Randolph and Lackland USAF Bases, San Antonio, Texas, 1 April to 7 June 2009

Patient Characteristic	Rapid Antigen Test Only	rRT-PCR Only	Both Rapid Test and rRT-PCR	rRT-PCR results not available	Total
All Patients	143 (8%)	155 (8%)	1538 (84%)	2 (.1%)	1838 (100%)
Age Group (years)					
0–4	30 (21%)	19 (12%)	168 (11%)	1 (50%)	218 (12%)
5–9	5 (4%)	11 (7%)	87 (6%)	0	103 (6%)
10–19	19 (13%)	25 (16%)	280 (18%)	0	324 (18%)
20–29	41 (29%)	66 (43%)	622 (40%)	1 (50%)	730 (40%)
30–39	11 (8%)	13 (8%)	140 (9%)	0	164 (9%)
40–49	11 (8%)	13 (8%)	80 (5%)	0	104 (6%)
50–59	8 (6%)	7 (5%)	61 (4%)	0	76 (4%)
60–69	9 (6%)	1 (1%)	41 (3%)	0	51 (3%)
⩾70	9 (6%)	0	59 (4%)	0	68 (4%)
Total	143 (100%)	155 (100%)	1538 (100%)	2 (100%)	1838 (100%)
Male Sex	92 (64%)	113 (73%)	1022 (66%)	1 (50%)	1228 (67%)
Received 2008–2009 Seasonal Influenza Vaccine	59 (41%)	75 (48%)	951 (62%)	1 (50%)	1096 (60%)
Active Duty	56 (39%)	93 (60%)	967 (63%)	1 (50%)	1117 (61%)
Code-based ILI by ICD9 Codes[a]	25 (17%)	127 (82%)	1141 (74%)	0	1293 (70%)
Completed DoD Influenza Surveillance Questionnaire	2 (1%)	40 (26%)	529 (34%)	0	571 (31%)
Met DoD Case Definition for ILI, from Questionnaire Data	1 (50%)	26 (65%)	303 (57 %)	0	320 (56%)

NOTE. DoD, Department of Defense; ICD9, International Classification of Diseases version 9; ILI, influenza-like illness; rRT-PCR, real-time reverse transcription polymerase chain reaction; USAF, United States Air Force.

[a] ICD-9 079.99, 382.9, 460, 461.9, 465.8, 465.9, 466.0, 486, 487.0, 487.1, 487.8, 490, 780.6, and 786.2.

vaccinated with seasonal influenza vaccine after 1 September 2008, there was no difference in test sensitivity and no difference in Ct values between vaccinated and unvaccinated cases. Calculating the test sensitivity between child and adult, the sensitivity for those with confirmed pH1N1 who were ⩽18 years old was 27% (n = 4/15; 95% CI, 8–55), whereas the test

Table 3. Sensitivity, Specificity, Prevalence,[a] Positive Predictive Value, and Negative Predictive Value of Rapid Influenza Antigen Test Compared to rRT-PCR by Influenza Type, Randolph and Lackland USAF Bases, San Antonio, Texas, 1 April to 7 June 2009

Influenza type	Sensitivity (95% CI)	Specificity (95% CI)	Prevalence % (n/N)	PPV (95% CI)	NPV (95% CI)
All Patients					
Seasonal Influenza A[b]	2/13=15%(2-45)	1464/1479=99%(98-99)	0.87(13/1492 [c])	2/17=12%(1-36)	1464/1475=99%(98.7-99.6)
Seasonal Flu B[d]	4/13=31%(9-61)	610/615=99%(98-99.7)	2.07(13/628 [c])	4/9=44%(14-79)	610/619=98%(97-99)
2009 Pandemic influenza A (H1N1)	6/30=20%(8-39)	1464/1479=99%(98-99)	1.98(30/1509 [c])	6/21=29%(11-52)	1464/1488=98%(98-99)
Patients with ILI[e]					
Seasonal Influenza A[f]	2/10=20%(2-56)	1076/1089=99%(98-99)	0.91(10/1099)	2/15=13%(2-40)	1076/1084=99%(98.5-99.7)
Seasonal Flu B[d]	4/12=33%(10-65)	456/461=99%(97-99.6)	2.54(12/473)	4/9=44%(14-79)	456/464=98%(97-99)
2009 Pandemic influenza A (H1N1)	6/26=23%(9-44)	1076/1089=99%(98-99)	2.33(26/1115)	6/19=32%(13-57)	1076/1096=98%(97-99)

NOTE. 95% CI calculated using binomial exact (Clopper-Pearson) method. Sensitivity, specificity, PPV, NPV, and prevalence calculated among patients with both tests performed (n = 1538). ILI, influenza-like illness; NPV, negative predictive value; PPV, positive predictive value.

[a] Prevalence in the study group.

[b] Influenza type A/H1, n=12; influenza type A/H3, n=1.

[c] The denominators come from the study population with both tests performed; the variability is due to exclusion of other influenza type or subtype, depending on the type or subtype counted or analyzed. Where resulting values were not clearly defined they were also excluded. A total of 6 were handled in this manner.

[d] Real-time RT-PCR testing for influenza B was stopped on 30 April for reasons unrelated to the study. Influenza B data from 30 April to 7 June 2009 were excluded.

[e] ILI based on ICD9 codes, from Table 2: 74% of individuals with both tests (n=1,141/1,538).

[f] Influenza type A/H1, n=10; influenza type A/H3, n=0.

sensitivity for those aged >18 years was 13% (n = 2/15; 95% CI, 2–40).

Among the 30 patients with a rRT-PCR positive test for pH1N1, the median age was lower among patients with a positive rapid influenza antigen test than among patients with a negative test (16 vs 21.5 years), although this difference was not significant ($P = .5$) (Table 4). All of these patients had a cough or sore throat. Eighty percent of patients with a positive rapid influenza antigen test also had a fever compared to 74% of individuals with a negative test ($P = .7$). The time between symptom onset and sample collection was similar for those who had a positive rapid influenza antigen test (median, 1 day [range, 0–4 days]) compared with those who had a negative rapid influenza antigen test (median, 1 day [range, 1–8 days]) ($P = .6$) (Table 4). The median Ct value in individuals with a positive rapid influenza antigen test was 20.3 compared with 25 ($P = .003$) in individuals who had a negative rapid influenza antigen test (Table 4).

DISCUSSION

At the beginning of the pH1N1 outbreak and when the prevalence of pH1N1 and seasonal influenza infection in the United States was low, the QuickVue Influenza A+B rapid influenza

Table 4. Patient Characteristics, Presentation, and Laboratory Results for Patients with 2009 Pandemic Influenza A (H1N1) Confirmed by rRT-PCR, Randolph and Lackland USAF Bases, San Antonio, Texas, 1 April to 7 June 2009

Viral Culture Result	Age (Years)	Cough and/or Sore Throat	Fever (>100.5°F)	Influenza-Like Illness[a]	Time between onset and samplecollection date (day)	Ct Value[b]
Positive Rapid Influenza Antigen Test						
Influenza A	16	Yes	Yes	Yes	4	25.0
Influenza A	16	Yes	Yes	Yes	0	20.6
Influenza A	10	Yes	Yes	Yes	1	21.9
Influenza A	16	Yes	No	No	1	19.1
Influenza A	24	Yes	Yes	Yes	0	19.6
Influenza A	66	Yes	-	-	1	20.0
Negative Rapid Influenza Antigen Test						
Influenza A	16	Yes	Yes	Yes	1	25.0
Influenza A	42	Yes	Yes	Yes	0	28.6
Influenza A	40	Yes	No	No	0	28.8
Influenza A	18	Yes	Yes	Yes	7	28.9
Influenza A	17	Yes	Yes	Yes	1	30.1
Influenza A	51	Yes	Yes	Yes	0	36.9
NRV	16	Yes	No	No	8	22.6
NRV	27	Yes	Yes	Yes	3	31.4
Influenza A	54	Yes	No	No	0	25.0
Influenza A	59	Yes	No	No	2	25.7
Influenza A	23	Yes	No	No	1	22.9
Influenza A	38	Yes	Yes	Yes	0	31.1
Influenza A	15	Yes	Yes	Yes	1	23.4
Influenza A	3	Yes	Yes	Yes	1	25.8
NRV	45	Yes	Yes	Yes	2	34.7
Influenza A	18	Yes	Yes	Yes	1	24.2
Influenza A	22	Yes	Yes	Yes	1	32.4
Influenza A	9	Yes	Yes	Yes	1	22.4
Influenza A	17	Yes	-	-	1	25.6
NRV	21	Yes	Yes	Yes	0	34.2
Influenza A	12	Yes	Yes	Yes	1	18.5
Influenza A	23	Yes	Yes	Yes	1	23.0
Influenza A	9	Yes	Yes	Yes	3	21.7
Influenza A	25	Yes	No	No	3	28.0

NOTE. Ct, cycle threshold value; NRV, no respiratory virus isolated.

[a] Temperature of ≥100.5°F plus cough or sore throat.

[b] Lower Ct values indicate larger quantities of virus.

test, as used routinely by San Antonio Air Force outpatient clinics, had low sensitivity for pH1N1 (20%) and influenza type B (31%) and was even lower for seasonal influenza type A (15%). The specificity of the test was high for pH1N1, seasonal influenza A, and influenza B. Moderate and low sensitivity of the QuickVue Influenza A+B has also been reported previously for seasonal influenza [15, 16], although some studies have reported much higher sensitivities [17, 18]. The Naval Health Research Center reviewed 767 patients from 20 April through 30 May 2009 and found that for pH1N1, the QuickVue Influenza A+B rapid influenza antigen test had a sensitivity of 51% [19]. Another study of 84 nasopharyngeal swabs that tested positive for pH1N1 by RT-PCR found the sensitivity for the QuickVue Influenza A+B Test was 53.3%, the BD Directigen EZ Flu A+B test (Becton Dickinson) was 46.7%, and the BinaxNOW Influenza A&B (Inverness Medical) was 38.3% [20].

There are several factors that may have contributed to the low sensitivity of the QuickVue Influenza A+B rapid test. Using rRT-PCR as a reference standard may result in lower sensitivity than when using viral culture as the reference standard because rRT-PCR may detect virus particles excreted during mild infections or during the postinfectious period [17, 21]. However, we found that the sensitivity of the rapid influenza antigen test was similar if we used viral culture as a reference standard. Most respiratory specimens collected were nasal washes, and rapid influenza antigen tests may perform differently for nasal washes and nasopharyngeal (NP) swabs. One study found that sensitivity of rapid influenza antigen tests was lower for nasal washes [21], possibly due to dilution of the influenza virus antigens in the saline wash, while another study found that nasal washes increased the sensitivity of rapid influenza antigen tests compared to NP swabs [22]. Nasal wash specimens in this study were collected as part of routine clinical care, and there may have been some variability in the application of the sample collection procedures and addition to viral transport media, which in turn may have reduced the performance of the rapid test or rRT-PCR test. However, these are the normal conditions for which rapid antigen tests are designed. We found that most of the nasal washes positive for pH1N1 were collected within a few days of illness onset, and this was similar for samples that tested positive or negative by the rapid influenza antigen test.

Furthermore, the sensitivity of rapid tests is lower in adults compared with children, possibly due to differences in immune response or viral shedding [18]. We found that the median age of patients with positive rapid influenza antigen tests was 16 years compared with 21.5 years for patients with a negative rapid influenza antigen test, although this difference was not significant. Even though only 26% of patients seen at the Air Force clinics in this study were 18 years old or younger, 50% of pH1N1 positive patients were in this age group ($P = .002$). The level of virus antigen in the respiratory tract and virus shedding following infection with pH1N1 may differ by age and may also differ from infection with seasonal influenza strains. However, experimental infection of ferrets suggests that viral replication in the respiratory tract is higher due to pH1N1 than seasonal influenza type A, which if similar in humans, would likely increase the sensitivity of the rapid influenza antigen tests [23, 24].

We found that patients with pH1N1 who had a positive rapid influenza antigen test had lower Ct values, which indicate higher viral load, than individuals with a negative rapid test. Laboratory-based studies have also shown an association between increased viral titers and high rapid influenza test sensitivity for pH1N1 [18, 25]. One study that reported Ct values found that the highest positivity of rapid influenza antigen tests were found with Ct values of <20, which is similar to the median Ct value of 20.3 for patients with a positive rapid influenza antigen test in our study [26].

Data available through the DoD Global Influenza Surveillance Program at USAFSAM provided a unique opportunity to assess the performance of rapid antigen tests at the start of an outbreak of a pandemic strain of influenza virus. Since the respiratory samples were collected as part of routine clinical practice, our study provides a clear, unbiased picture of the performance of the QuickVue Influenza A+B rapid antigen test. Moreover, the same nasal wash sample was used for the rapid test and rRT-PCR, which provides the most direct comparison of these 2 tests. Even though our study was limited to just one rapid antigen test, it is currently widely used in the United States. As a result of this study's preliminary results and other available data, the Air Force Surgeon General's office issued a policy recommending that rapid influenza antigen tests should no longer be used at Air Force medical facilities to diagnose patients with influenza [27]. Data presented here suggest that rapid influenza antigen tests are of limited use for identifying patients with p(H1N1) or seasonal influenza strains. Instead, clinicians are encouraged to rely on a thorough clinical examination that includes exploration of epidemiological links to other cases and laboratory diagnosis by rRT-PCR, if available.

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