

Rapid Testing for Pandemic Influenza A (H1N1): Diagnostic Test Utility and Specimen Source

To the Editor—The ongoing spread of pandemic influenza A 2009 H1N1 has raised concern about the heightened virulence of and drug resistance anticipated for the influenza A 2009 H1N1 pandemic.¹ Existing studies suggest that rapid tests have low to moderate sensitivity for pandemic influenza A 2009 H1N1.^{2–4} Nonetheless, rapid tests for influenza A 2009 H1N1 have advantages of portability, ease of performance, and point-of-care results. Few data are available concerning the comparison of diagnostic test utility, by specimen source, for influenza A 2009 H1N1 rapid tests. Of relevance, the rapid detection tests are commonly used in Asian-Pacific settings, with procurement of specimens from either the nasopharynx, nose, or throat. We conducted a study to evaluate the diagnostic test utility of the influenza A 2009 H1N1 rapid test at a Thai tertiary care center.

From July 1 through September 30, 2009, adult patients (age, 15 years or older) who presented to an infectious diseases outpatient clinic with influenza-like illness (ILI; defined as cough plus either fever, chills, or body aches) were prospectively enrolled in the study to assess case detection of influenza A 2009 H1N1. Consent was obtained before study participation. Dual specimens were obtained via swabs from the nasopharynx, nares, and throat for the rapid test—the SD Bioline Influenza Antigen A/B (MT Promedct Consulting), which was used in accordance with the manufacturer's instructions—and for reverse-transcription polymerase chain reaction (RT-PCR) assay.⁵ Swabs for RT-PCR were initially placed in a sterile, veal-infused viral transport medium on dry ice and were immediately transported to the Thai National Institute of Health (Nonthaburi) for confirmatory testing for novel influenza A 2009 H1N1.⁵ In addition, we conducted quality-control checks for specimens to assess inappropriate specimen procurement, incorrect specimen con-

tainment, and delayed transport and processing of the specimens prior to laboratory testing. After specimen collection and quality-control checks, specimens that passed the initial quality-control checks were tested within a few hours by study personnel. We calculated the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for the SD Bioline Influenza Antigen A/B versus confirmatory influenza testing by RT-PCR at the same sites. A standard instrument was used to collect data on the study populations. Testing of study participants was approved by the institutional review board.

A total of 602 outpatients were evaluated by study personal at Thammasat University Hospital (Pratumthani, Thailand). Of 602 outpatients, 256 patients (43%) met the inclusion criteria and consented to study participation; 346 patients (57%) were excluded because of a lack of consent (245 [71%]) or because specimens were inadequate for procurement or transportation (101 [29%]). The median age of the participants was 18 years (range, 15–71 years), with a median time from illness onset to specimen collection of 2 days (range, 0–5 days). Overall, there were 51 patients (19.9%) with confirmed diagnosis of influenza A 2009 (H1N1). There were 24 positive nasopharyngeal swab rapid test results, 22 positive nasal swab rapid test results, and 21 positive throat swab rapid test results. Compared with RT-PCR as the gold standard, the nasopharyngeal swab rapid test had 42% sensitivity, 99% specificity, 95% PPV, and 66% NPV, whereas the nasal swab rapid test had 40% sensitivity, 98% specificity, 94% PPV, and 71% NPV (Table 1). In a similar comparison, the throat swab rapid test had a 47% sensitivity, 99% specificity, 92% PPV, and 77% NPV.

The quality of 101 (17%) of the 602 specimens was determined to be inadequate on the basis of either the collection process, transportation process, or processing of specimens. Such data provide an opportunity for improvement in standardizing the use of rapid tests for case detection of influenza A 2009 (H1N1) and offer a precautionary note for future investigations and ongoing surveillance. Our study findings are consistent with those of other studies of case detection

TABLE 1. Diagnostic Test Utility of the Rapid Tests for 2009 Influenza A H1N, Compared with Reverse-Transcription Polymerase Chain Reaction (the Gold Standard), for Simultaneously Obtained Specimens from 3 Sources

Specimen	Sensitivity, %	Specificity, %	PPV, %	NPV, %
Nasopharyngeal swab	42	99	95	66
Nasal swab	40	98	94	71
Throat swab	47	99	92	77

NOTE. Positive predictive value (PPV) and negative predictive value (NPV) were calculated on the basis of sensitivity and specificity of each test and an observed pandemic influenza A/H1N1 with a mean prevalence of 10% during the period of study.

of influenza A 2009 H1N1 by rapid testing that noted moderate sensitivity,²⁻³ despite confirmation of adequate quality-control checks prior to testing specimens obtained from the nasopharynx, nose, and throat. Although predictive values will vary with the prevalence of circulating influenza virus among populations at risk, the moderate NPVs of 66%–77% suggest there were a substantial number of false-negative test results and, thus, a need for continued improvement in rapid diagnostic tests for novel influenza A 2009 H1N1.

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Correlation between Rates of Carbapenem Consumption and the Prevalence of Carbapenem-Resistant *Pseudomonas aeruginosa* in a Tertiary Care Hospital in Brazil: A 4-Year Study

To the Editor—Antimicrobial resistance is a major concern in hospitals throughout the world. Carbapenem-resistant *Pseu-*

domonas aeruginosa (CRPA) is a leading cause of hospital-acquired infection worldwide and has contributed to increased morbidity and mortality among hospitalized patients.¹

Various previous studies found that use of these drugs was a risk factor for CRPA infection.^{2,3} However, more recent, well-designed studies have not found that use of carbapenem drugs was a potential risk factor for CRPA infection.^{1,10}

Data on antibiotic use and bacterial resistance are important for helping to understand the relationship between the use of these drugs and the emergence of resistance. Thus, hospital-wide surveillance studies aiming to evaluate the correlation between these 2 variables have been undertaken worldwide in recent years.⁴⁻⁹ In fact, the studies have found discrepant results with regard to this relationship. The aim of our study was to assess the correlation between hospital-wide carbapenem consumption and the incidence of CRPA strains in our institution.

This ecological study was undertaken at our university-affiliated 750-bed hospital in São Paulo, Brazil. No novel carbapenem resistance mechanism or outbreak was detected during the study period. Use of carbapenem antibiotics, in defined daily doses (DDDs) per 1,000 patient-days, and the number of CRPA isolates per 1,000 patient-days was recorded on an annual basis from January 1, 2005, through December 31, 2009. All cultures positive for CRPA were recorded. The susceptibility of *P. aeruginosa* isolates was determined by the disk diffusion method. One isolate per patient was included in the analysis. The incidence density of these carbapenem-resistant isolates was calculated on the basis of the number of resistant isolates per 1,000 patient-days. The Pearson correlation coefficient was calculated to identify any relationship between antimicrobial use and the incidence of CRPA.

The mean number of hospital patient-days was 167,382 during the study period. Consumption of carbapenem drugs increased during the 4-year period: the mean and median were 74.07 and 68.34 DDDs per 1,000 patient-days, respectively (range, 67.84–92.81 DDDs per 1,000 patient-days). The mean incidence density of CRPA isolation was 1.40 isolates per 1,000 patient-days (range, 1.13–1.78 isolates per 1,000 patient-days) during the study period (Figure). The Pearson correlation coefficient between carbapenem consumption and the incidence density of CRPA isolation was -0.53 ($P = .46$).

Despite of a slight reduction in 2006 (to 66.81 DDDs per 1,000 patient-days), our study demonstrated increased use of carbapenem antibiotics during the study period. In comparison, we noticed a progressive reduction in the incidence density of CRPA isolation.

In recent years, we have seen controversial results with regard to consumption of carbapenem antibiotics and carbapenem resistance among gram-negative pathogens in surveillance studies. Despite the positive correlation found in some studies,^{5,8} various recent studies have demonstrated a negative relationship between increased carbapenem consumption and