Letter to the Editor

Utilization of rapid antigen assays for detection of severe acute respiratory coronavirus virus 2 (SARS-CoV-2) in a low-incidence setting in emergency department triage: Does risk-stratification still matter?

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To the Editor—We read with interest the article by Smith et al1 describing the use of rapid antigen detection (RAD) for severe acute respiratory coronavirus virus 2 (SARS-CoV-2) in guiding hospital admission triage. Given the rapid turnaround of point-of-care testing, various studies have utilized RAD tests at the point of entry into the healthcare system.1,4 However, most of these studies have occurred during periods of heightened transmission, with detection rates of 5%–21%.1,4 RAD testing in clinical scenarios with lower incidence, such as asymptomatic individuals, may potentially result in low detection rates with high false-positive rates.5 False-positive RAD tests have resulted in SARS-CoV-2–negative patients being admitted to coronavirus disease 2019 (COVID-19) cohort wards, with subsequent nosocomial transmission.2 Conversely, given broad variations in potential infectivity among individuals with false-negative RAD tests, negative RAD tests need to be interpreted cautiously, especially in the context of significant contact history or clinical syndromes compatible with COVID-19. We describe our institution’s experience with the implementation of RAD testing for SARS-CoV-2 to guide admission triage in a low-incidence setting. RAD testing was utilized in tandem with pre-existing triage strategies that stratified admissions according to epidemiological risk and clinical syndromes,6 which allowed a comparison of these approaches.

In Singapore, a Southeast Asian city-state, hospitals instituted admission triage strategies early on to segregate patients presenting with clinical syndromes compatible with COVID-19.8 At our institution, the largest hospital campus in Singapore, patients with epidemiological risk were admitted directly to the isolation ward; patients without epidemiological risk who presented with clinical syndromes compatible with COVID-19 were isolated in modified cohort cubicles with reduced bed density in the “respiratory surveillance ward (RSW)” until SARS-CoV-2 was excluded by polymerase chain reaction (PCR) testing.9 During the first wave of COVID-19 from January to June 2020, these admission triage strategies were extremely successful in correctly placing suspected COVID-19 cases. Although ≥1,500 cases of COVID-19 were managed in our institution, <5% of cases were admitted outside isolation areas.7 However, with the emergence of more transmissible variant strains, a second wave of COVID-19 began at the end of April 2021, providing the impetus for universal screening of inpatients via PCR testing of respiratory samples on admission and every 7 days subsequently. On June 27, 2021, our institution began utilizing RAD testing to screen all admissions for SARS-CoV-2. Thereafter, patients with a positive RAD result were transferred to isolation areas in the emergency department and then admitted to negative-pressure single rooms for confirmatory PCR testing. Patients with negative antigen tests were still risk-stratified for admission to isolation areas based on epidemiological risk and clinical syndromes. Our institution utilized the Veritor SARS-CoV-2 antigen rapid test kit (Becton Dickinson, Franklin Lakes, NJ), with a positive percentage agreement of ≥80% and a negative percentage agreement of 99.5% compared to PCR testing.6

Over a 6-week study period from June 27, 2021, to August 25, 2021, 6,665 admissions were systematically tested for SARS-CoV-2 with RAD tests and PCR. Moreover, 40 patients tested positive for SARS-CoV-2 by RAD; among them, 29 tested positive by PCR, with a mean cycle-threshold value for SARS-CoV-2 E-gene of 18.9 (Fig. 1). Two patients who tested negative for SARS-CoV-2 by RAD subsequently tested positive by PCR; however, they were admitted initially to isolation due to epidemiological risk. The sensitivity of RAD was 93.6% (95% CI, 78.6%–99.2%), with specificity of 99.8% (95% CI, 99.7%–99.9%). The positive predictive value of RAD was 72.5% (95% CI, 59.2%–82.7%), and the negative predictive value was 99.9% (95% CI, 99.8%–99.9%). Over the same period, 812 (12.2%) of 6,665 admissions fulfilled epidemiological and clinical criteria for COVID-19, and these patients were initially admitted to isolation areas while awaiting the results of PCR testing; 29 (3.6%) of these 812 patients subsequently tested positive. The sensitivity of combined epidemiological and clinical criteria was 93.6% (95% CI, 78.6%–99.2%), with a specificity of 88.2% (95% CI, 87.4%–88.9%). The positive predictive value of epidemiological and clinical criteria was 93.6% (95% CI, 78.6%–99.2%), with a specificity of 88.2% (95% CI, 87.4%–88.9%). The positive predictive value of epidemiological and
clinical criteria was 3.6% (95% CI, 3.2%–4.0%), while the negative predictive value was 99.9% (95% CI, 99.8%–99.9%). Two asymptomatic patients with no known epidemiological risk tested positive for SARS-CoV-2; 1 patient was admitted to isolation due to a positive RAD test. The sole case of COVID-19 admitted outside isolation occurred in an asymptomatic patient with no known epidemiological risk, for whom RAD testing was not performed due to previous nasal surgery.

Before the implementation of RAD testing, COVID-19 cases detected outside the isolation ward over a 6-month period (January–June 2020) spent an average of 16.5 hours (N = 32; SD, 9.76) from admission to isolation, with an average of 2.1 (SD, 3.25) inpatient close contacts identified for each index case. Of 68 inpatient close contacts identified, 1 patient subsequently tested positive within the incubation period. In contrast, after introduction of RAD testing, COVID-19 cases initially detected on RAD testing spent an average of 0.2 hours (N = 29; SD, 0.68) from admission to isolation (mean difference, −16.3; 95% CI, −19.9 to −12.7; P < .001), with an average of 0.3 (SD, 0.84) inpatient close contacts identified for each index case (mean difference, −1.8; 95% CI, −3.5 to −0.06; P = .004). Of 8 inpatient close contacts identified, none tested positive subsequently. No nosocomial COVID-19 clusters were detected among staff or by inpatient universal surveillance during the study period.

In conclusion, RAD testing for SARS-CoV-2 as part of an admission-triage strategy demonstrated high sensitivity and specificity, even in a low-incidence setting. Although a triage strategy based on epidemiological risk and clinical syndrome was resource-intensive, the potential for false-negative RAD tests and the possibility that patients with epidemiological risk could still be incubating at point of admission meant that RAD testing could not be used alone for isolation triage. The introduction of RAD testing substantially reduced potential exposure, in terms of both time to isolation and number of exposed inpatients. A robust admission triage strategy based on epidemiological risk and clinical syndrome, supported by an expansion of hospital isolation facilities and RAD testing for earlier isolation of positive cases, successfully limited nosocomial exposures.

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