

Dx tool in RV diagnosis, surveillance

By Nancy Kronic, PhD

Without a doubt, 2009 was an extraordinary year from the respiratory virus testing perspective. A relatively unremarkable, mild flu season began the year and then, in spring, swine flu, as it was called then, struck. The reported numbers of cases rose from day to day in those early weeks of the outbreak. The general public panicked, governments mobilized, and the rush for a vaccine began. The virus officially became 2009 Influenza A/H1N1. Cases around the world were monitored as the numbers of sick rose and fell through the summer, fall and winter. In labs, some institutions were overwhelmed by the sheer volume of samples they received.

As the 2009 Influenza A/H1N1 pandemic wanes, we have the opportunity to look back at what the last year taught about influenza and the testing methods commonly employed to help diagnose and track the spread of such pathogens. The symptoms of respiratory viruses are so similar that they are nearly impossible to distinguish, and misdiagnosis of influenza based on symptoms alone is common. A 2006 study found that less than 30% of children were correctly diagnosed with influenza based on clinical assessment alone.¹

During the 2009 pandemic, Children's Hospital of Philadelphia saw firsthand how easy it is to mistake influenza for another respiratory virus. The hospital saw a spike in patients with influenza-like symptoms. At first, officials believed the spike in illnesses was due to 2009 Influenza A/H1N1, but lab results revealed many of the cases were caused by rhinovirus.²

The importance of distinguishing those with influenza from those who do not have it is further demonstrated by data from the Centers for Disease Control and Prevention (CDC). At the height of the pandemic, no more than 42% of samples tested for influenza by CDC labs were positive for the pathogen. Misdiagnosis can mean unnecessary or incorrect use of antivirals or antibiotics, and can lead to unneeded medical procedures and tests. Laboratory testing is essential for an accurate diagnosis.

While many types of tests were employed in lab during the 2009 Influenza A/H1N1 pandemic, multiplexed molecular assays emerged as important tools. Comprehensive, fast, and accurate, these assays proved to be cost-effective and assisted a number of lab in saving valuable time and resources as the pressure to process more patient samples increased.

Multiplexed molecular assays have many advantages in contrast to other methods, are sensitive and specific, and can accurately identify a broad range of respiratory viruses. These tests, which are typically PCR-based, also can detect co-infections from a single patient sample. Most multiplexed molecular tests can provide results within 24 hours.

A study conducted during the 2009 Influenza A/H1N1 outbreak in the New York City area evaluated the performance of several different influenza A testing methods, finding that multiplexed tests provided the best diagnostic option in respiratory testing due to high sensitivity for the detection of all influenza strains, including the 2009 Influenza A/H1N1. In the study, more than 6,000 patient samples were submitted over a five-week pe-

riod for a total of 14,114 viral diagnostic tests performed. Testing methods used included rapid antigen, direct immunofluorescent antibody (DFA), viral culture, and PCR. Before the study was conducted, little was known about the performance of these tests for the detection of 2009 Influenza A/H1N1 in the context of seasonal H1N1, H3N2, and other circulating respiratory viruses. The tests needed to be able to subtype influenza A in order to identify high-risk patients with 2009 Influenza A/H1N1 infection and to monitor the spread of the outbreak.

The New York study found the rapid tests' sensitivities were 10.4% and 9.6% for the detection of both seasonal influenza A and novel H1N1, respectively. A particular brand of rapid test yielded better sensitivity results of seasonal influenza A (41.2%) and 2009 Influenza A/H1N1 (40%). The sensitivity of DFA tests was slightly higher for influenza A (48.6%) and 2009 Influenza A/H1N1 (46.7%). The multiplexed PCR-based tests detected 97.8% of both influenza A and 2009 Influenza A/H1N1 cases. The PCR test's specificity was found to be 100% in both flu strains.³

A study in Canada performed a cost analysis comparing PCR testing with other methods such as DFA and shell vial culture, and looked at the charts of 661 pediatric patients to determine the length of hospital stay, the number of days in isolation, antibiotic usage, and all other medical procedures performed. After comparison, the least costly strategy was found to be the multiplexed PCR test, indicating a savings of \$291 per case, resulting in a savings of \$529,620 per year in direct costs for the hospitals involved.⁴

As we look toward next flu season and new flu strains it may bring, we should consider the lessons learned in 2009 about respiratory virus testing and the important role that multiplexed respiratory virus tests can play in assisting in disease diagnosis and surveillance. Multiplexed tests have shown to offer many benefits to the healthcare system, including improved patient care and health outcomes, reduced healthcare costs, and enhanced efficiencies in healthcare delivery and laboratory operations. These tests can provide comprehensive, accurate results within 24 hours, giving us important data about exactly what is infecting a particular patient and circulating in our communities. □

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