Pandemic influenza: Postpandemic laboratory analysis

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In April 2009, a novel H1N1 influenza virus (pH1N1) was detected in southern USA and Mexico. It was first identified by the British Columbia Centre for Disease Control Public Health Microbiology Reference Laboratory (BCPHL), Provincial Health Services Authority Laboratories, in British Columbia at the end of April. Because it was a novel reassortment of swine, avian, and human genes, no commercial test was available. However, the staff at the BCPHL developed a diagnostic assay within 48 hours to identify pH1N1 by reverse transcriptase polymerase chain reaction (RT-PCR) and gene sequence analysis. We note a few of the many observations made from the ensuing pandemic for consideration by our medical community.

Influenza A, known to mutate on a regular basis, causes pandemics about every 40 years. Some pandemics are moderate in impact (1968), while some are severe (1918). Preparations, while not complete or even possible for every contingency, were well underway in 2009. In 2007, the *BCMJ* published a comprehensive plan for influenza diagnosis in British Columbia for such an event.[1] The Canadian Public Health Laboratory Network (CPHLN; www.cphln.ca) recommended that molecular microbiology (RT-PCR) be the new laboratory gold standard for all types of influenza.[2] Once BCPHL rapidly implemented this new test, it was used to assist clinicians, public health, and infection control staff to manage patients, help assess how this new virus behaved clinically, and help minimize impacts.

As shown in **Figure 1**, there were two waves in the pandemic; the first in late April to end of May, and the second from mid-September to late December. In the first wave, most of the influenza virus identified was the seasonal influenza A H3N2 subtype with the proportion of pH1N1 increasing by late May. In the second wave the number of specimens reached 10 times peak seasonal influenza test volumes; during this wave the pH1N1 virus was detected in approximately half of specimens tested. Overall, 7600 of 25 536 specimens were positive for pH1N1 (29.8%) over the whole pandemic.

A retrospective investigation was conducted on specimen source and symptoms listed on laboratory requisitions. The latter was done to provide insight into the effectiveness of provincial testing guidelines, which if followed, supported triaging of specimens at BCPHL for the most severe cases. The majority of specimens were submitted from community physicians during the first wave compared with the majority from hospital physicians during seasonal influenza (**Figure 2**). However, in the second wave, more specimens were submitted by hospital

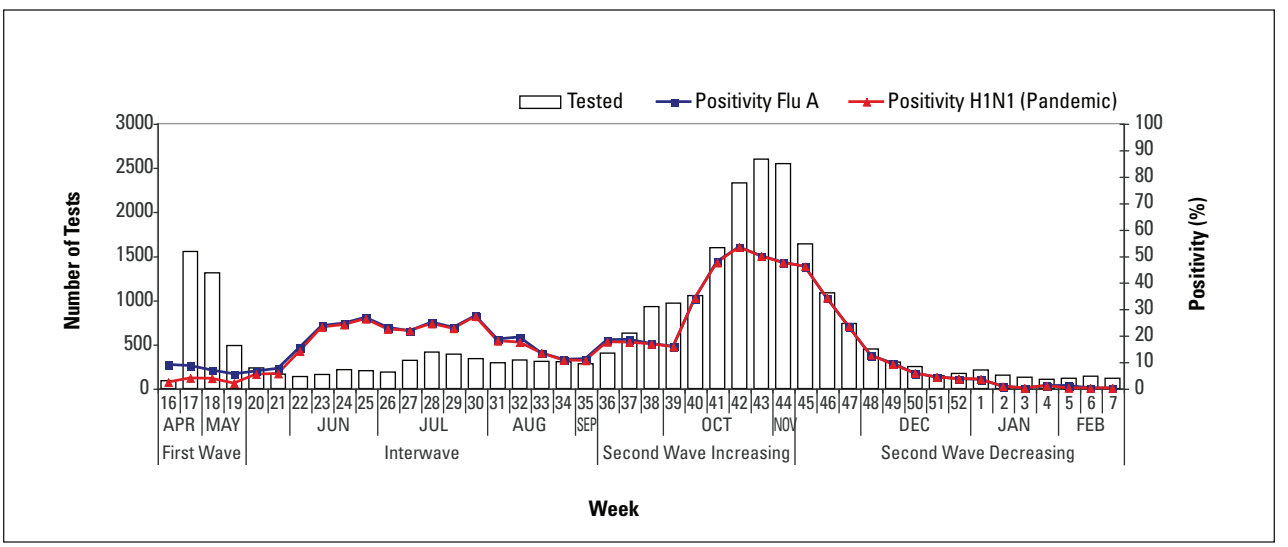

Figure 1. BCPHL pandemic test volumes and pH1N1 positivity rate.

physicians, possibly because of clinical testing guidelines limiting laboratory utilization to cases requiring interventions.

During both waves, listed symptoms were included on most requisitions (**Figure 3**). This clear communication with the laboratory was helpful in triaging urgent specimens. We noted only a small number of requisitions (10% to 20%) where no symptoms were indicated. On the other hand, underlying conditions were rarely communicated, despite their inclusion in testing guidelines and usefulness in testing triage.

Consistent perhaps with stress on the frontlines, we also observed that during pH1N1, 26.1% of samples came with incorrect requisitions, something that rarely occurred during seasonal influenza (3.5%). Test requisitions are available online; correct use helps in many ways.

In summary, the BCPHL was able to rapidly provide new diagnostic testing for pH1N1 influenza for British Columbia. Clinical partnerships on guidelines, along with medical microbiologist work within their settings reviewing lab usage (discussion with clinicians ordering RT-PCR in some cases), allowed timely laboratory information flow throughout both waves. As well, attention to communication when ordering laboratory work remains key to both accurate and timely diagnosis. We planned well, but ongoing system improvements should continue. As one BC virologist said, "This was a training virus."

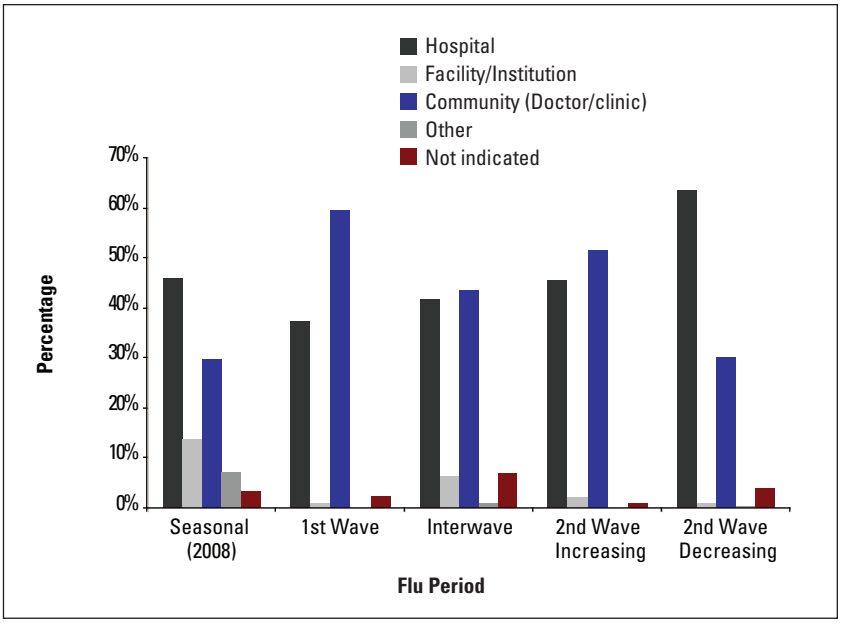

Figure 2. Sample sources during pH1N1 influenza compared with seasonal influenza.

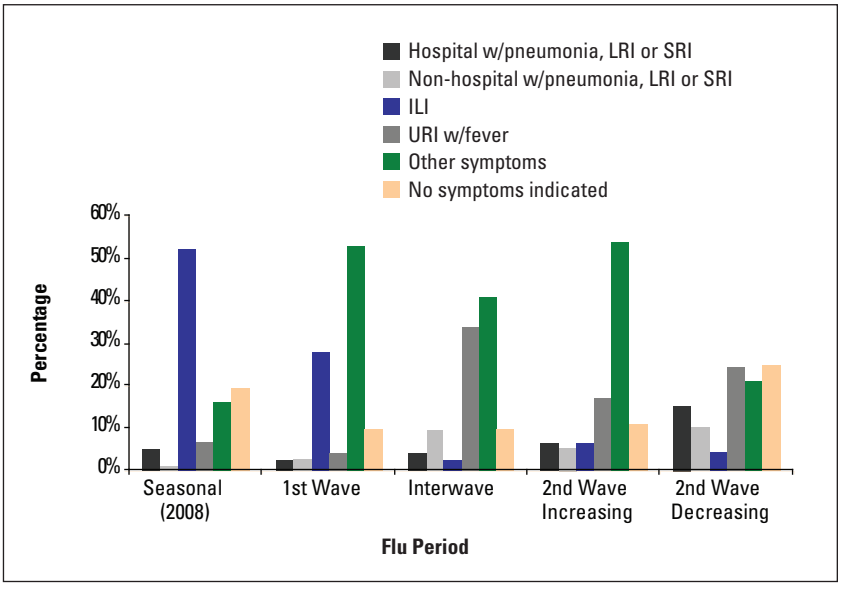

Figure 3. Symptoms indicated on requisitions during pH1N1 influenza compared with seasonal influenza.

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References

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2. Canadian Public Health Laboratory Network. Interim guidance for laboratory testing for detection and characterization of pandemic H1N1. 2009. www.cphln.ca/CPHLN/src/documents/EN_H1N1_Best_Practice_Final_Version.pdf (accessed 22 February 2010).