National Collaborating Centre for Infectious Diseases

Centre de collaboration nationale des maladies infectieuses

Purple Paper

Dear Reader:
As the H1N1 pandemic subsides, public health jurisdictions across Canada are in the process of debriefing their response. We hope to use the *Purple Paper* as a conduit for information-sharing amongst frontline colleagues across the country. Beginning with this issue of the Newsletter, you will find a new series, called "2009 H1N1 Influenza Pandemic Debrief", featuring feedback from Medical Officers of Health (MOHs) to a brief questionnaire. We hope this series will be informative and draw attention to challenges MOHs and their organizations faced on the frontline during this public health emergency.

2009 H1N1 Influenza Pandemic Debrief Series

Province: Not Identified
Public Health Setting: Urban/Rural

What would you do again in a similar public health emergency?

Everything I can to get MDs onside.

What would you NOT do again in a similar public health emergency?

Allow all comers to get vaccine. It should be strictly targetted to the current priority group.

What was the most difficult situation your organization experienced?

Media play of people waiting outside with babies in cold and snow.

What was the most important lesson learned?

Communicate , communicate , communicate.

What were your most important sources of information?

Provincial DH Emerg ops ctr as well as schools as outbreak s in schools seemed to predict outbreaks in communities

Province: Ontario
Public Health Setting: Urban/Rural

What would you do again in a similar public health emergency?

Collaborate with community partners in the community response- health sector, social services sector etc.

Partner in the delivery of immunizations with various partners in the health sector.

What would you NOT do again in a similar public health emergency?

In an ideal world, improve operational details/supports like adminsitrative tracking of financial expenditure; better IT systems

What was the most difficult situation your organization experienced?

1) Evolving information- trying to operationalize plans with limited, conflicting or changing information
2) Media was not as helpful as usual- highlighting discrepancies in information and conflict rather than helping us get the key messages out

What was the most important lesson learned?

Impact of fear on demand for services. Must manage fear/anxiety as part of emergency response

What were your most important sources of information?

Ministry of Health- Chief MOH
Ontario Agency of Health Protection and Promotion
Media
CDC/WHO bulletins- in the beginning before arriving here

Province: Ontario
Public Health Setting: Urban/Rural

What would you do again in a similar public health emergency?

The best thing that we did was handle the emergency using an IMS approach. People were chosen for tasks based on skill set or ability NOT on position within the organization. This of course resulted in some reversal of roles as those in particular with planning and logistical skills became

functional managers. Essentially I "cherry picked" the organization for the best talent that I had and placed them in positions with the necessary authority and responsibility for an area. It was amazing to see how when you aligned skills with a task how much could be accomplished.

I also went and personally met with every organization/CEO/leadership of each area that was going to be impacted by the Pandemic in August, well before we needed to respond. This allowed for collaboration and improved the trusting relationship in particular between our school boards, hospitals and Family Health Teams.

What would you NOT do again in a similar public health emergency?

The communication needs were enormous. We needed far more resources in this area than what I both provided but also what I was able to provide. I would definitely hire on contract more staff for this area.

What was the most difficult situation your organization experienced?

There were many challenges. One was finding adequate facilities. We wanted to be located in a fixed location for the entire response because of the efficiencies. Securing a location was challenging. In one City we were lucky we rented an empty school. The other locations relied on strip malls which really didn't work.

A second challenge was the logistics of school based immunization. We ended up only going into the secondary schools as logistically we could not go into the primary schools in a short enough time and manage the consents and parental need to be on site.

Uncertainty. We did not know when we were going to begin and when the next change from PHAC or the Ministry of Health was going to occur.

What was the most important lesson learned?

You can never be too prepared! I thought we were but we weren't.

Welcome the media. I never refused an interview. I spoke honestly and allowed them to see our challenges, admitted our mistakes and invited open criticism. Overall we got great media coverage and at the end glowing editorials.

What were your most important sources of information?

Unfortunately it was often the CBC. I would hear things on the news in the evening prior to hearing them from the Ministry. The emails between MOH's were also very helpful. I consistently felt like the Federal and Provincial public health authorities were following an unseen higher authority and that they were not really the ones making the decisions.

Pandemic pH1N1 Weekly Literature Synthesis (Week of January 17-23, 2010)

Personal Protective Equipment

Face masks to prevent transmission of influenza virus: a systematic review.
Cowling BJ et al. *Epidemiol Infect. Published online January 22, 2010.*

Protecting healthcare workers from pandemic influenza: N95 or surgical masks?
Gralton Jan et al. *Crit Care Med 2010; 38:657-667.*

Two systematic reviews were published in the past week that examined the effectiveness of face masks, namely surgical masks and N95 respirators, in protecting against influenza transmission.

In the first systematic review, the authors searched three databases for primary research articles in the English language published between January 1960 and August 2009. The databases used were PubMed (1960-2009), Science Citation Index (Web of Science) (1970-2009), and the Cochrane Library (1988-2009). Twelve articles were selected based on preset criteria. Of these, 1 was a controlled volunteer study of influenza virus filtration of face masks or respirators, 6 were observational or intervention studies of face masks or respirators to prevent influenza or influenza-like illness (ILI) in healthcare settings, and the remaining 5 were observational or intervention studies in the community setting.

Authors of the second literature review primarily focused on publications related to the use of face masks in healthcare settings with exposure to either influenza or SARS. Here, the authors searched the

following databases for English language articles published any time prior to 2009: Web of Science, MEDLINE, EMBASE, and Cochrane Database of Systematic Reviews. Twenty-one human studies, as well as 25 laboratory studies that assessed mask filtration efficiency, were identified and reviewed.

Overall, both systematic reviews concluded that definitive evidence for the use of surgical masks and N95 respirators to prevent or reduce influenza and SARS transmission remains elusive. There are a number of reasons for this limited evidence base:

1. The study designs, participants, interventions and reported outcome measures varied markedly across different studies. Therefore, systematic reviews are often limited to qualitative descriptions of results rather than examination by the more rigorous methodology of meta-analysis. In both systematic reviews presented here, comparison of studies was entirely (or almost entirely) based on qualitative synthesis of the applicability of the study findings and study limitations.
2. Many studies (e.g. case series studies) do not have the adequate statistical power to determine the causal association between the use of face masks and reduction of influenza transmission.
3. In many intervention studies, face masks are often used in conjunction with complementary personal protective equipment (e.g. goggles, gloves and gowns) and other infection control measures (e.g. hand hygiene, patient isolation). This renders the assessment of the independent protective value of face masks against influenza transmission difficult. In situations where droplet spread is the predominant mode of transmission, gowning and gloving may be more important than mask use.
4. Compliance, correct donning and doffing, and appropriate fit of face masks are often not reported, but these are all important factors that can influence the effectiveness of face masks.
5. The applicability of laboratory filtration efficiency tests of face masks may be limited in real life scenarios. Laboratory tests often involve the use of air-borne particles that are inert or larger than influenza, travelling at constant air flow. These conditions are atypical of coughing and sneezing.

Epidemiology of pH1N1

Incidence of 2009 pandemic influenza A H1N1 infection in England: a cross-sectional serological study.

Miller E et al. *Lancet. Published online January 21, 2010.*

Several estimates for the incidence of pH1N1 during the first wave of the pandemic have been calculated based on data from clinical surveillance and simulation modelling studies. Although these figures provide timely approximation of the spread of the pandemic, they are sensitive to the irregularities and flaws associated with the data collection process. For example, when there is a heightened sense of urgency in the general public about pH1N1, consultation with health care practitioners would increase, thus leading to a bias in the data collected that is primarily driven by the patients' health-seeking behaviour. To provide a direct measure of the incidence of pH1N1 infection in the population during the first wave of the pandemic in **England**, the investigators of this **serological survey** report the age-specific prevalence of neutralizing antibodies to pH1N1 before and after the first wave of the pandemic.

To establish the baseline prevalence of antibodies to pH1N1 – in other words, to determine the level of pre-existing immunity to the virus – the investigators obtained residual serum samples from individuals aged <1 year to 87 years who had submitted sera in 2008 for diagnostic testing or antibody screening. These individuals resided in regions in England that belong to the Health Protection Agency (HPA) seroepidemiology programme. Similarly, to estimate the incidence of pH1N1 during the first pandemic wave, monthly requests were made for residual serum samples from the same sources.

Two laboratory tests were used to measure the antibody titer in serum samples: hemagglutination inhibition assay and microneutralization assay. The hemagglutination inhibition assay measures the proportion of antibodies that specifically bind to the hemagglutinin surface proteins of influenza viruses, whereas the microneutralization assay measures the broader range of neutralizing antibodies. Therefore, although there is often a positive

correlation between the two laboratory assays, estimates of immunity based on hemagglutination inhibition tend to be slightly more conservative. Nonetheless, there is general consensus that a hemagglutination inhibition titer of 1:32 or more against the influenza virus would confer protection against infection. Accordingly, the authors calculated the incidence of pH1N1 by subtracting the proportion of serum samples with hemagglutination inhibition titer of 1:32 or more in the baseline survey from that in the pandemic survey.

Results from the pre-pandemic baseline serological survey showed that there were statistically significant differences in the antibody titers among age groups but not between the sexes. Hemagglutination inhibition and microneutralization antibody titers both increased significantly with age. Hemagglutination inhibition antibody titer of 1:32 or more ranged from 1.8% in children aged <5 years to 31.3% in adults aged ≥80 years. Similarly, microneutralization antibody titers of 1:40 or more ranged from 2.8% to 47.0% in the respective age groups. Together, the two laboratory assays indicated that a substantial proportion of older adults had pre-existing immunity to pH1N1.

By early October 2009, samples obtained in August and September from 6 regions in England were ready for testing. Significant differences in antibody titers among regions were found that were consistent with a higher incidence of cases in London and the West Midlands than in the other 4 regions (East Midlands, South East, South West, and North East).

In London and the West Midlands, all age groups <25 years showed a significant increase between baseline and September 2009 in the proportion of samples with hemagglutination inhibition titer of 1:32 or more. The difference in the proportion was 21.3% (95% confidence interval [CI] 8.8-40.3) for children aged <5 years, 42.0% (95% CI 26.3-58.2) for children aged 5-14 years, and 20.6% (95% CI 1.6-42.4) for individuals aged 15-24 years. Combining the <5 years and 5-14 years age groups gave an estimated pH1N1 incidence by September 2009 during the first pandemic wave of 31.6% (95% CI 20.7-44.2). This estimate suggests that in regions with high incidence of pH1N1, one in three children was infected with pH1N1 during the first wave of the pandemic – a rate that is 10 times higher than the initial HPA estimate based on clinical surveillance. This finding is consistent with the higher level of susceptibility to pH1N1 infection in children than older adults, and has important implications about increased potential for transmission in schools. No significant change in proportion of samples with hemagglutination inhibition antibody titer of 1:32 or more was detected in the older age groups.

In the remaining 4 regions with a lower incidence of pH1N1, only children aged <5 years showed a significant increase of 8.2% (95% CI 0.9-23.9) in the proportion of samples with antibody titer 1:32 or more between baseline and September 2009. The observed increase in the 5-14 years age group was not significant (5.1%; 95% CI -0.6-12.9). Combining the <5 years and 5-14 years age groups yielded an estimated incidence of pH1N1 by September 2009 of 6.3% (95% CI 1.8-12.9).

pH1N1 in Vulnerable Populations

Correlates of severe disease in patients with 2009 pandemic influenza (H1N1) virus infection.
Zarychanski R et al. *CMAJ. Published online January 21, 2010.*

Numerous case-series studies have suggested that underlying co-morbidity, First Nations ethnicity and longer lag from onset of symptoms to anti-viral treatments are associated with severe pH1N1 disease. To provide further corroborating evidence that these factors are correlates of severe pH1N1 disease, investigators of this **Canadian** study used a **cumulative case-control study design** to compare the characteristics of pH1N1 cases who had severe disease to those of pH1N1 cases who had only moderate or mild disease in the province of **Manitoba**.

The subjects of this study were drawn from all laboratory-confirmed pH1N1 cases in Manitoba. Severe cases were pH1N1 patients who were admitted to an intensive care unit (ICU). Moderate cases were those who were hospitalized but did not require intensive care. Mild cases were patients who did not require hospital care and had remained in the community. Information for each pH1N1 case

was collected from interview (in person or by telephone) or by chart review, and included demographics, medical history, clinical information, treatments and outcome. Ethnicity – of First Nations ethnicity or another ethnic group – was self-reported. Co-morbidity referred to any of the following: heart disease, diabetes mellitus, tuberculosis, asthma, smoking, neuromuscular disease, kidney disease, malignancy, immune suppression, lung disease, cognitive dysfunction, pregnancy, alcoholism, substance abuse and injection drug use.

Baseline Characteristics

Of the 795 laboratory-confirmed pH1N1 cases whose location of care was known, 569 (72%) were mild cases, 181 (23%) were moderate cases and 45 (6%) were severe cases. The mean age of all pH1N1 cases included for analysis was 25.3 years (standard deviation ±18.8 years). Females accounted for 417 (52%) of the cases. Ethnicity was reported for 588 (74%) of 795 cases, of which First Nations ethnicity made up of 215 (37%) of the pH1N1 cases. First Nations patients accounted for 116 (28%) of 410 mild cases, 74 (54%) of 136 moderate cases and 25 (60%) of 42 severe cases. The presence of an underlying co-morbid condition increased with severity of disease: 201 (35%) of 569 mild cases, 103 (57%) of 181 moderate cases and 34 (76%) of 45 severe cases.

Anti-viral treatment was prescribed for 173 (34%) of 511 patients with mild disease, 83 (54%) of 154 patients with moderate disease and 42 (95%) of 44 patients with severe disease. Severity of disease increased with increasing delay from symptom onset to the start of anti-viral treatment. The median interval was 2 days (range 1-3 days) for mild cases, 4 days (range 2-6 days) for moderate cases and 6 days (range 4-9 days) for severe cases.

Severe cases vs. mild cases

Using multivariable logistic regression (a statistical method that enables the determination of the independent contribution of a single risk factor, among many, to an outcome), the authors found that, compared to mild disease, severe pH1N1 disease was associated with a longer anti-viral treatment delay (odds ratio [OR] 8.24; 95% CI 2.82-24.1), First Nation ethnicity (OR 6.52; 95% CI 2.04-20.8) and the presence of an underlying co-morbid condition (OR 3.19; 95% CI 1.07-9.52).

Severe cases vs. moderate cases

Likewise, compared to moderate cases, First Nations ethnicity was associated with increased severity of pH1N1 disease (OR 3.23; 95% CI 1.04-10.1). The odds of association of severe disease with anti-viral treatment delay and with the presence of any underlying co-morbidity were 2.44 and 1.49, respectively; however, neither point estimate reached statistical significance (95% CI 0.79-7.50 and 95% CI 0.46-4.86, respectively).

NCCID Comments:

This study has demonstrated that although delay of anti-viral treatment was the strongest factor associated with severe pH1N1 disease, First Nations ethnicity and the presence of an underlying co-morbid condition are also associated with increased severity of pH1N1 disease. While First Nations ethnicity may indeed imply genetic predisposition of Aboriginal peoples to more severe pH1N1 disease, their increased risk may also reflect social conditions that increase susceptibility. As the authors note, uncontrolled confounders such as housing or living conditions, income inadequacy, diet and access to health care likely contributed to the increased severity of pH1N1 disease among First Nations peoples. Despite the associations reported in this study, the outcomes of pH1N1 in Aboriginal peoples remain a complex issue with multiple factors at play. Further research is needed to delineate the effect of social determinants of health on the severity of pH1N1 and other emerging infectious diseases among Aboriginal peoples.

Notable Publications

Neurological sequelae of pH1N1 influenza in children: a case series observed during a pandemic.
Baltagi SA et al. *Pediatr Crit Care Med 2010. 11:1-6.*

Production of this document has been made possible through a financial contribution from the Public Health Agency of Canada. The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada.

La production du présent document a été rendue possible grâce à la contribution financière de l'Agence de la santé publique du Canada. Les opinions qui y sont exprimées ne reflètent pas nécessairement le point de vue de l'Agence de la santé publique du Canada.