

Pandemic Influenza H1N1 2009 – The Canadian Experience

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ABSTRACT

The cornerstone of Canadian response to the pandemic H1N1 outbreak was the Canadian Pandemic Influenza Plan. The Plan was based on a moderate scenario, articulated around 7 pillars: surveillance, antiviral drugs, vaccines, public health measures, clinical care, communications, and research. This presentation provides an overview of Canada's response to pandemic H1N1. It presents the context (Who did what? How? ...), what happened (focusing on pregnant women), addresses making decisions together, and includes some post-H1N1 reflections.

Introduction

As an introduction to pandemic influenza infections, most people have heard about the Spanish flu of 1918: an avian flu passed to humans and killing millions around the world. That was an H1N1 virus. (H stands for haemagglutinin, which is involved in viral attachment; N stands for neuraminidase, involved in viral release from the already infected cell.) H1N1 was virtually the only influenza virus circulating in humans until 1957, when the Asian flu, H2N2, began. In 1968 H3N2 arrived, the "Hong Kong flu", then taking over as the dominant influenza virus. H1N1 disappeared until 1977, when a relative of the original strain from 1918, having been kept in a lab since the original outbreak, escaped and began infecting humans again. In 2008/2009 the influenza virus that caused most illnesses in Canada was seasonal H1N1. Yet we had been expecting another influenza virus, planning for its arrival over many years: H5N1 (avian influenza) from the Far East.

Here is a story about one country's H1N1 experience over a short time period. On August 18, 2009, in a teleconference with the World Health Organization (WHO), Brazil shared preliminary experiences with the first wave of their flu season (May to October). They reported at that time that almost 25% of H1N1 infected women were pregnant—a very high percentage, given that about 1.9% of the population is pregnant at any time. They also reported that, of the mortality in this population, 9.1% occurred in the first trimester, 27.3% in the second, and 54.5% in the third. The women who succumbed were deteriorating quite quickly, often undergoing emergency caesarean sections in the Emergency Department or in the critical care unit. Mortality was 31% in pregnant women, as opposed to 7% in non-pregnant women. Of interest is that babies born of H1N1 infected mothers were not managed under any special infectious precautions, nor given oseltamivir. None of the babies at the time of the teleconference had come down with pandemic influenza. This presentation will provide an overview of Canada's response to pandemic H1N1, including context (Who did what? How? ...), what happened (focusing on pregnant women), making decisions together, and including some post-H1N1 reflections.

Roles and Responsibilities in Pandemic Response

The federal government facilitates health system preparedness, provides national leadership and guidance, and exercises its regulatory function. (For example, in preparation for the second wave of H1N1 pandemic, an interim order was put into place so that the access to oseltamivir was extended to children under the age of 1 year. It is not normally recommended in this population.) The Provinces and Territories

deliver health care services to the population during a pandemic. They deliver vaccines through the local health authorities and adjust public health guidance to according their populations' situation.

Canadian Pandemic Influenza Plan (CPIP)

The cornerstone of Canadian response to the pandemic H1N1 outbreak was the Canadian Pandemic Influenza Plan. The Plan was based on a moderate scenario, articulated around 7 pillars:

- Surveillance,
- Antiviral drugs,
- Vaccines,
- Public health measures,
- Clinical care,
- Communications,
- Research.

One billion dollars were allocated over 5 years for pandemic preparedness and planning in Canada's 2006 budget.

Pandemic H1N1 Canada 2009-2010

The first Canadian case of H1N1 influenza occurred on April 12, 2009, and was reported on April 26, 2009. The pandemic response lasted 10 months (until the end of December 2009). The cumulative numbers of severe laboratory-confirmed cases (as of April 17, 2010) were¹:

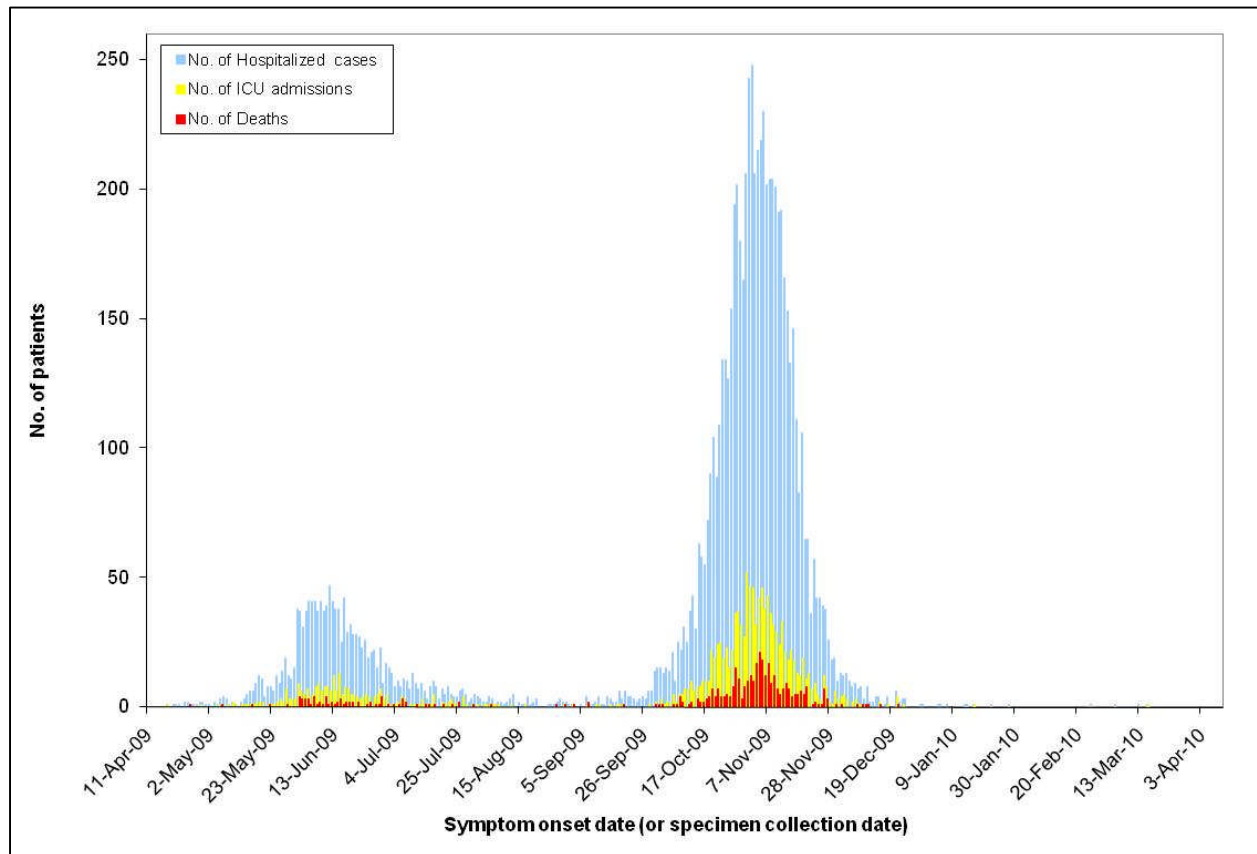
- 8,678 hospitalized cases (highest in age <20 years),
- 1,473 (17.0%) admitted to ICU (<5 years and 45-64 years),
- 428 (4.9%) deaths (median age: 54 years).

The populations in Canada identified to be at greatest risk from H1N1 are pregnant women in their second and third trimesters of pregnancy and new mothers four weeks after giving birth, children under five (especially those under two), people with underlying chronic medical conditions, those who are severely obese, and people living in remote and isolated areas.

It has been conjectured that reasons for the excess morbidity and mortality in pregnant women could be attributable to a decreased immune status in pregnancy, or as in the obese, the increased abdominal girth, particularly in the second and third trimesters, resulting in poor lung excursion and thus predisposing to viral pneumonitis.

Comparison of Severity of Disease in First and Second Wave

During the first wave of the disease (*see* Figure 1), there were high rates of illness in patients in intensive care units (ICUs) and on ventilation. There was high vulnerability among Aboriginal people and pregnant women; and younger individuals were more severely affected. In the second wave, the median age of patients was higher; also, the proportion of people who contracted H1N1 and had underlying conditions was higher. There were a lower proportion of cases among people of Aboriginal origin and in pregnant women. Overall hospitalizations were 5 times higher, deaths were 5 times higher, and ICU admissions were 4 times higher than in the first wave.

FIG. 1 PH1N1 2009 Summary for Canadian Laboratory-Confirmed Hospitalized Cases and Deaths, PHAC

Focusing on Pregnant Women

Canada rapidly put into place interventions to protect pregnant women, including a comprehensive citizen awareness campaign advising pregnant women of the dangers of H1N1. Pregnant women were one of the top priority groups for immunization at the start of Canada's vaccination campaign, resulting in a vaccination rate of about 34% - only slightly higher than normal for seasonal vaccination.

Initially, per the WHO's guidance, non-adjuvanted vaccine was recommended for pregnant women, as there was a lack of clinical data on the adjuvanted vaccine's safety in this population. This precautionary measure particularly applied to women under 20 weeks' gestation. When non-adjuvanted vaccine was not available and H1N1 was present in the community, pregnant women received adjuvanted vaccine. Over 100,000 pregnant women received the H1N1 flu vaccine in Canada with no serious side effects.

Pregnant women accessed antivirals through their physicians. Canada recommended that women continue to breastfeed their babies when taking antiviral medications. As of March 6, 2010, there were 1,299 hospitalized women (reported to the Public Health Agency of Canada) between 15 and 44 years of age for whom information on pregnancy was available:

- 20% were pregnant,
- 61% were in their third trimester (information on pregnancy trimester was available for 134 women),
- 4 pregnant cases resulted in death - 3 of these women in their third trimester. All were in the first wave.

Most frequent underlying medical conditions for hospitalized pregnant women were:

- Chronic pulmonary disease (including asthma),
- Diabetes, and
- Immunosuppression (including cancer).

The vast majority of babies born to mothers with documented H1N1 infection did not themselves become unwell.

Making Decisions Together ... in Real Time

In 2009 many believed the pandemic would first appear in Asia, possibly an avian flu, but ...

- April 23, 2009 – novel H1N1 was confirmed in Mexico.
- April 30, 2009 – in Canada the pandemic alert was raised to Level 4.

Before the pandemic started, we did not know which vaccine to produce, seasonal influenza or H1N1 vaccine. There was also no knowledge about how virulent H1N1 would be or whether the seasonal flu would also arrive, either concurrently or separately. There were questions regarding adjuvanted vs. non-adjuvanted vaccine for pregnant women, with changing evidence. And there were vaccine production issues. Although guidance existed on the use of antivirals, adaptation to a different set of circumstances was required, such as in First Nations communities. The use of N95 masks was also addressed.

For many healthcare workers the impact was a massive influx of specimens and tests; shifting epidemiology, uncertain biology; complex methodology; new sets of patients (the severely ill, health care workers, animal workers, etc.); redeployment of human resources as a result of H1N1 efforts and overtime; and depending on public perception in a region, more patients were presenting.

The H1N1 Experience

Table 1 provides some historical facts about H1N1. In the 2009 pandemic, North America was hit first and hardest. Thanks to effective collaboration across sectors and governments, Canada had its largest mass immunization in history: 40-45% of the population was immunized, with an even higher rate in children.

TABLE 1 H1N1 - A Historical Perspective

Year	Findings
1918	<ul style="list-style-type: none"> ▪ Worst pandemic in history: 50+ million deaths ▪ 99.5% of Canadians survived ▪ 90-95% of deaths were due to pneumonia ▪ The world was different
1950s and '60s	<ul style="list-style-type: none"> ▪ 1-5 million deaths ▪ Advent of antibiotics and reasonable hospital care
2009	<ul style="list-style-type: none"> ▪ Fewer deaths ▪ International and national planning and coordination ▪ Prevention - cough in sleeve, stay home, wash hands ▪ Vaccine ▪ Antivirals ▪ Antibiotics, other drugs, and advanced ICU care

Early antiviral, antibiotic treatment and effective ICU care resulted in 85% survival in severe cases. Thousands of people were in hospital/ICU, with hundreds of deaths. Had the pandemic initiative not been put into place, the potential alternative would have been illness among 25-30% of the population and thousands of deaths in healthy young people.

The experience affirmed the importance of practicing and testing plans; the value of secure domestic vaccine supply and antiviral stockpiles; the importance of adapting, since surprises are likely; and the value of education to effect behaviour change, e.g., coughing in sleeve, hand washing, staying home. (Of interest is that the incidence of *C. difficile* infections decreased during the pandemic, probably as a result of increased hand washing.)

We learned much through the pandemic planning and experience, but there remains unfinished business in terms of needing greater clarity on roles and responsibilities. Information-sharing can improve, as can the timeliness of guidance for health professionals and professional associations, the timeliness of vaccine administration, and overall surveillance.

REFERENCE

1. FluWatch, Public Health Agency of Canada, April 10, 2010 (Week 14). http://www.phac-aspc.gc.ca/fluwatch/09-10/w14_10/index-eng.php (August 2, 2010).