

Nova Scotia Health System Pandemic Influenza Plan

Chapter 1 Introduction

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Context

Pandemic influenza is a type of influenza that occurs every few decades and spreads rapidly to affect most countries and regions around the world. Unlike the “ordinary” influenza that usually occurs every winter in Canada, pandemic influenza can occur at any time of year and is much more serious. It is estimated that between 500 and 1500 Canadians die each year from ordinary influenza and its complications. Three pandemics of influenza occurred during the 20th century and were responsible for many thousands of deaths. Experts predict another pandemic of influenza, but they cannot say exactly when it will happen. When it does, it may come in two or more waves several months apart, and each wave may last two to three months. As much as a quarter of the population may be affected, maybe more.

Pandemic influenza is likely to cause the same symptoms as an ordinary influenza, but the symptoms may be more severe because nobody will have any immunity or protection against that particular virus. A serious pandemic is also likely to cause many deaths, disrupt the daily lives of many people, and cause intense pressure on health and other services. Every pandemic is different, and until the virus starts circulating, it is impossible to predict its full effects.

The Nova Scotia Health System Pandemic Influenza Plan, based on the Canadian Pandemic Influenza Plan (2004), will outline roles, responsibilities, and key activities of the health-sector response before, during, and following an influenza pandemic.

Influenza Background

Influenza A, B, and C viruses are known to cause disease in humans. While influenza B viruses are strictly human pathogens, influenza A viruses are readily isolated from avian species, pigs, and other animals. Influenza A viruses cause moderate to severe illness and affect all age groups; influenza B viruses generally cause milder illness. Influenza C is associated with mild respiratory disease and does not cause the type of potentially serious illnesses associated with A and B.

The onset of influenza A is typically sudden and may include fever, cough, sore throat, headache, and prostration. The disease process may lead to primary pneumonia or give rise to secondary bacterial complications such as streptococcal, staphylococcal, and *Haemophilus influenzae* infections that may lead to death from pulmonary complications

(Hilleman 2002). Pneumonia and influenza are among the leading causes of death in Canada contributing to over 8000 deaths in 1997 (Statistics Canada 2002).

A human influenza epidemic is a widespread occurrence of influenza in a community at a particular time. An influenza pandemic is an outbreak of the disease typically characterized by the rapid spread of a new type of influenza virus to all areas of the world, resulting in an unusually high number of illnesses and deaths, over a period of approximately two to three years.

The Influenza Virus

The influenza virus is spherical in shape and consists of genetic material within a lipid envelope. On the surface are proteins that attach the virus to a host cell and allow the genetic material to escape and invade other cells. During infection or vaccination, the human immune system recognizes these surface antigens and forms antibodies to fight them.

Influenza A viruses are divided into subtypes based on differences in their surface glycoprotein antigens: haemagglutinin (HA) and neuraminidase (NA). The HA helps the virus attach to the respiratory cells, and the NA helps the virus penetrate into the cells after attachment.

Fifteen distinct forms of HA have been discovered for Influenza A and are designated H1 to H15. The neuraminidase is known to exist in nine distinct forms, designated N1 to N9. Various combinations of HA and NA have been found. For example, two influenza A subtypes, H3N2 and H1N1, have been known to circulate in the human population since 1977.

To date, only three different HA and two different NA subtypes have been known to cause human epidemics. However, all of the influenza subtypes are known to exist in avian (bird) populations, particularly ducks, which are thought to be the primary reservoir for influenza viruses. The ducks, in turn, can transmit these viruses to pigs and to chickens. It is theorized that pigs act as “mixing vessels” for human and bird viruses and can pass on new viruses to humans; however, there is no evidence to fully support this theory (Laver and Garman 2002).

Antigenic Drift

The influenza season accounts for many illnesses and deaths each year. The annual recurrence of illness is caused by subtle genetic changes in the virus types, known as antigenic drift. Both influenza A and B undergo these changes, which account for different epidemiologies, strains, and vaccines each season. Since successful immunization requires antigenic match between the vaccine and the circulating strains, the changes that occur to the virus from year to year necessitate an annual influenza vaccination.

Antigenic Shift

Occasionally, major changes to the surface proteins occur, and an entirely new subtype of influenza A virus emerges. When this happens, pandemics are possible. These new subtypes, which may be particularly virulent strains of virus, cause pandemics when

- There is susceptibility in the population.
- Human-to-human transmission is evident.
- There is evidence that the virus is virulent and will cause serious disease.

There is no way of predicting when a new subtype will emerge and cause disease in humans.

Influenza Pandemics

Three documented influenza pandemics occurred during the 20th century: the Spanish pandemic in 1918–19, the Hong Kong influenza pandemic in 1968, and the Asian influenza pandemic in 1957. Of the three, the most devastating outbreak was the Spanish flu, which killed over 21 million people worldwide—more deaths than during the First World War. Over one half million people were affected in Quebec, and over 1600 people died in Toronto (Tamblyn 1999). During this particular pandemic the traditional *U*-shaped mortality curve that reflects deaths of the very young and the very old, was *W*-shaped to reflect the large number of deaths in the young adult range. It has subsequently been discovered that the virus that caused this pandemic was a H1N1 subtype. It remains unknown as to why this particular virus was so virulent.

Preparedness Planning

Preparedness planning for pandemic influenza is occurring around the world. The World Health Organization (WHO) will announce the onset of a new influenza pandemic and coordinate international surveillance. In Canada, the federal government through Health Canada and the Public Health Agency of Canada provides nationwide coordination of the health response to pandemic influenza.

Pandemic influenza response plans exist at the national, provincial, and local levels. The Nova Scotia plan, flowing from the Canadian Pandemic Influenza Plan (CPIP), guides and supports the provincial health sector response. Each health-care agency is planning for action during a pandemic.

Minimizing the societal disruption of pandemic influenza involves more than a health-care sector response for the population of Nova Scotia. Any response to any emergency is graduated and in line with the severity of the event. The provincial government through its business continuity planning initiative is establishing plans that will see minimum service levels from all departments and agencies should the province be faced with a pandemic event. Government is also encouraging non-government organizations, industry, and other private business to do the same, through the development of mitigation projects and internal planning to ensure continuity of service delivery.

This plan was drafted by the Nova Scotia Pandemic Influenza Working Group, a joint committee of the Departments of Health, Health Promotion and Protection, and Community Services. It was developed in collaboration with the Nova Scotia Emergency Management Office, district health authorities, and the IWK Health Sciences Centre, together with other provincial, federal, and health-sector partners.

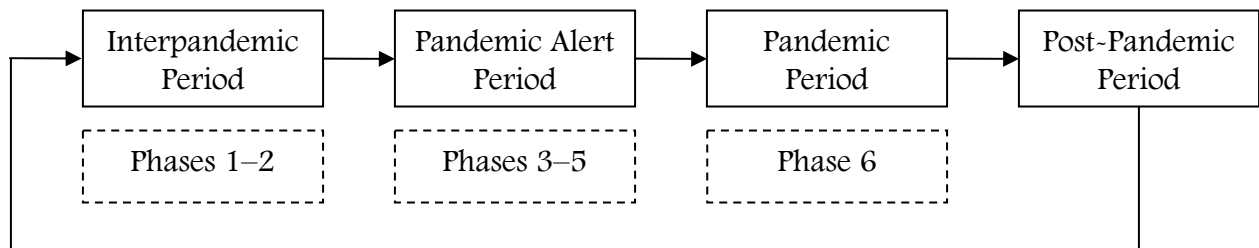
This plan will continue to evolve, as new information and evidence come forward, and as decisions are finalized or modified in the Canadian plan. It complements similar health services plans that are in development in each of the district health authorities.

The Plan

The Nova Scotia Health System Pandemic Influenza Plan describes action, organized by phase corresponding to the likely course of spread, in areas of

- Communications
- Surveillance
- Public health measures
- Vaccines
- Antivirals
- Health services

Each individual component is organized according to activities required during specific periods and phases of a pandemic.



The following table defines each phase within the pandemic period. Note: This table uses the nomenclature for Canadian pandemic phases revised following the 2005 WHO global influenza preparedness plan (Public Health Agency of Canada 2006).

Canadian Pandemic Phase Terminology

Interpandemic Period (Phases 1 and 2)

Phase	Definition
1.0	No new virus subtypes have been detected in humans. An influenza virus subtype that has caused human infection may be present in animals located outside of Canada. If present in animals, the risk of human infection/disease is considered to be low.
1.1	No new virus subtypes have been detected in humans. An influenza virus subtype that has caused human infection is present in animals in Canada, but the risk of human infection/disease is considered to be low.
2.0	No new virus subtypes have been detected in humans. However, an animal influenza virus subtype that poses substantial risk to humans is circulating in animals located outside of Canada.
2.1	No new virus subtypes have been detected in humans. However, an animal influenza virus subtype that poses substantial risk to humans is circulating in animals in Canada.

Pandemic Alert Period (Phases 3, 4, and 5)

Phase	Definition
3.0	Outside Canada human infection(s) with a new subtype are occurring, but no human-to-human spread (or, at most, rare instances of spread to a close contact) has been observed. No cases identified in Canada.
3.1	Sporadic human infection(s) with a new subtype detected in Canada. Virus is not known to be spreading from human to human, or at most, rare instances of spread to a close contact have been observed.
4.0	Outside Canada small cluster(s) with limited human-to-human transmission are occurring, but spread is highly localized, suggesting that the virus is not well adapted to humans. No cases identified with these cluster(s) have been detected in Canada.
4.1	Sporadic infection(s) with virus that has demonstrated limited human-to-human transmission detected in Canada. No cluster(s) identified in Canada.
4.2	Small, localized clusters with limited human-to-human transmission are occurring in Canada, but spread is highly localized, suggesting that the virus is not well adapted to humans.

Phase	Definition
5.0	Outside Canada larger cluster(s) are occurring, but human-to-human spread is still localized, suggesting that virus is becoming increasingly better adapted to humans but may not yet be fully transmissible (substantial pandemic risk). No cases identified with these clusters have been detected in Canada.
5.1	Sporadic infection(s) with virus that is better adapted to humans detected in Canada. No cluster(s) identified in Canada.
5.2	Larger localized cluster(s) with limited human-to-human transmission are occurring in Canada, but human-to-human spread is still localized, suggesting that virus is becoming increasingly better adapted to humans but may not yet be fully transmissible (substantial pandemic risk).

Pandemic Period (Phase 6)

Phase	Definition
6.0	Outside Canada increased and sustained transmission in general population has been observed. No cases identified with the affected populations have been detected in Canada.
6.1	Sporadic infection(s) with the pandemic virus detected in Canada. No cluster(s) identified in Canada.
6.2	Localized or widespread pandemic activity observed in the Canadian population.

Post-Pandemic Period

In the current WHO document this period is not associated with a numerical phase or specific WHO or national actions. It is indicated that a period of recovery would be expected but that following Phase 6 (the Pandemic Period) there would be a return to the Interpandemic Period (global pandemic phase 1 or 2). This may be due to the problematic issue of determining when “recovery” has been completed. In Canada we will also move from the Post-Pandemic Period back to the appropriate Interpandemic Period phase. National indicators for this change are yet to be determined.

Command and Control

Command and control refers to the process by which decisions are made within government. This process can be different during an emergency or crisis situation than the process used during business as usual.

Command and control for government during an influenza pandemic can be complex, as decisions will involve more than one government department.

A command and control process for emergency operations is in the process of being revised and will be included in a future version of the Nova Scotia Health System Pandemic Plan.

Planning Assumptions

The following assumptions provide a foundation for the action described in the plan. The assumptions are based on historical experience, scientific knowledge, and expert consensus.

- Based on the last two pandemics, it is estimated that the next pandemic virus will be in Canada within three months after it emerges in another part of the world, but it could arrive much sooner due to the increases in the volume and speed of air travel.
- Upon arrival, the virus may spread across Canada with great speed.
- The first peak of illness in Canada may occur within two to four months after the virus arrives in Canada.
- The first peak in mortality will be one month after the peak in illness.
- It is believed that if the pandemic virus arrives close to the usual annual influenza season, the time interval for the virus to have its maximum impact on the population in terms of morbidity, mortality, and societal consequences will be shortened.
- A pandemic usually spreads in two or more waves, either in the same year or in successive influenza seasons.
- A second wave may occur within three to nine months of the initial outbreak wave and may cause more serious illnesses and deaths than the first.
- In any locality, the length of each wave of illness is likely to be six to eight weeks.
- Vaccine will be the primary means of prevention of pandemic influenza. The supply may be limited during the early stage of the pandemic; therefore, priorities for vaccination will need to be established. Vaccine when available should be

distributed in an equitable manner, and provinces/territories should adhere to similar vaccination protocols.

- A substantial portion of the workforce may not be able to work for some period of time due to illness in themselves or their family members.
- Effective preventive and therapeutic resources will likely be in short supply.
- Essential community services are likely to be disrupted.

Additional planning assumptions specific to plan components will be reported in the relevant chapters of this plan.

Estimated Impact of an Influenza Pandemic on Nova Scotia

The impact of the next influenza pandemic is difficult to predict and will depend on how virulent the virus is, how rapidly it spreads from population to population, and the effectiveness of prevention and response efforts. Despite the uncertainty about the magnitude of the next pandemic, estimates of the health and economic impact remain important to aid public health policy decisions and guide pandemic planning.

Based upon the mathematical model presented in the 2006 *Canadian Pandemic Influenza Plan for the Health Sector*, the following impact is estimated for Nova Scotia.

Figure 1: Estimated number of cases by outcome for a pandemic of mild to moderate severity

Outcome (based on a Nova Scotia population of 937,889) ¹	Attack Rate 15%			Attack Rate 35%		
	Mean Number	5th Percentile	95th Percentile	Mean Number	5th Percentile	95th Percentile
Death ²	563	334	791	1,313	779	1,844
Hospitalization with recovery	1,407	1,027	1,785	3,283	2,396	4,165
Outpatient care	70,341	68,357	72,332	164,130	159,502	168,775
Ill, no formal care	68,372	66,690	70,130	159,535	155,610	163,635
Total	140,683	136,421	145,030	328,261	318,315	338,404

Note: This is a modified table based on the format in the 2006 *Canadian Pandemic Influenza Plan for the Health Sector*, www.phac-aspc.gc.ca/cpip/pclcpi/pdf-e/CPIP-2006_e.pdf.

1. Population as of July 1, 2005, from www.gov.ns.ca/finance/publish/FACTS/2005/NS-At-A-Glance.pdf

2. Those who die in hospital are not counted in the “hospitalization with recovery” outcome; therefore, the number hospitalized during a pandemic will be all of the “hospitalization with recovery” group plus likely a large proportion of the fatal cases.

The (CDC) has created and made available a software program, FluAid (<http://www2.cdc.gov/od/fluid/>), which uses the model developed by Meltzer and colleagues to provide an estimate of mortality, hospitalizations, and outpatient visits for a particular population in the event of pandemic influenza.

FluAid is available as downloadable software or an online calculator from the above website. Documentation and other important background papers are also available from this site.

Scope of the Provincial Health System Plan

The Nova Scotia Health System Pandemic Influenza Plan will

- guide and support health-sector response between the Nova Scotia Department of Health, Nova Scotia Department of Health Promotion and Protection, the district health authorities (DHAs), the IWK, Continuing Care, and other health system employers
- develop a process to manage health-care issue resolution
- develop a process for collecting, analysing, and summarizing information from district health authorities and other sources regarding the health-sector impact of the pandemic:
 - human impact (morbidity, mortality, epidemiology)
 - health-sector resource impact
- develop a communication strategy including
 - a process for sharing information and updates to DHAs, other provinces, the federal government, and other stakeholders
 - a process for informing the public and addressing their concerns
- clarify command and control structure and function for provincial leadership during a pandemic of influenza
- clarify the structure and access to expert subject matter specific to pandemic influenza via the Health System Professional Advisory Group

As the planning progressed since the creation of the PIWG, the need for further sub-working groups was identified, and these working groups were created and populated. The working groups were created to manage the many issues identified by the district health authorities for resolution by the Department of Health. The department accepted responsibility for resolving those issues over which it has jurisdiction and ensuring that

any other identified issues are passed along with understanding, to those departments or agencies that are responsible.

Ethical Framework for Decision Making

When an influenza pandemic occurs, individuals in virtually every sector and at all levels of the health care system will be required to make decisions that will fundamentally affect health-care delivery and access to health-care services. It was decided early in the province's planning that a framework for public health decision making would be a valuable tool for decision makers.

Therefore, government has engaged a bioethicist to develop a document to promote thought and reflection on the values inherent in decisions that will have to be made before and during a pandemic. A decision-making framework and toolkit are near completion. The work on ethical decision making that is under way in Nova Scotia is being shared with other jurisdictions through national committees and will be consistent with federal guides and decisions.

A copy of the draft *Ethical Considerations and Decision-Making Framework* is available as Reference 1 of this plan.

Conclusion

Pandemic influenza planning goes beyond the work taking place throughout the health system. As planning evolves, further versions will be developed. Individuals and businesses, too, have a responsibility to seek information from reliable sources and to be discerning about what information they accept and the source of the information.

Provincial planning for the health system will continue to be led jointly. The Departments of Health and Health Promotion and Protection have created a new shared branch, the Health Emergency Management Centre, which will have responsibility for leading all-hazards emergency planning and will continue to advance pandemic planning activities in the province. It will be responsible for the production of future versions of the Nova Scotia Health System Pandemic Influenza Plan.

A full copy of this plan, as well as the Executive Summary and other supporting documents, can be found on the province's pandemic influenza website (www.gov.ns.ca/pandemic).

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