

A Model Plan for Influenza Pandemic Preparedness

2002

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Terms of Reference

In 1999 the World Health Organisation (WHO) produced a detailed blueprint for an Influenza Pandemic Plan, setting out the issues that arise nationally and internationally in relation to a possible future influenza pandemic. A pandemic will result in significant increases in morbidity and mortality. Services such as acute hospitals and general practice will experience greatly increased workloads, well in excess of those seen during conventional influenza epidemics.

As Ireland did not have detailed plans to deal with an influenza pandemic the Minister for Health and Children decided to establish an expert committee to oversee the preparation of a national Influenza Pandemic Plan, in accordance with WHO guidelines. The Committee was under the chairmanship of Professor William Hall, Director of the Virus Reference Laboratory, University College Dublin.

The Committee was requested to address all relevant issues, including:

- Prevention strategies:
 - Surveillance and early warning systems
- Scientific and medical issues:
 - Vaccination policy
 - Pharmaceutical supplies and logistic matters
 - Hospital and community responses
- Economic, legal and political concerns
- Communications:
 - Effective management process

Abbreviations

CVRL	Central Veterinary Research Laboratory
EISS	European Influenza Surveillance Scheme
ICGP	Irish College of General Practitioners
NDSC	National Disease Surveillance Centre
NIRC	National Influenza Reference Centre
VRL	Virus Reference Laboratory
WHO	World Health Organization

Summary of Recommendations

Chapter 1. Introduction

- 1.1 The National Influenza Pandemic Committee should be maintained on a permanent basis to oversee the ongoing development of the national pandemic plan and to act as a national advisory body in the event that influenza pandemic is anticipated.
- 1.2 The plan must be subject to regular review and implementation of the plan should be tested using simulated pandemic scenarios on a regular basis.

Chapter 2. The Epidemiology of Influenza

Chapter 3. WHO Levels of Alert

- 3.1 Ireland should adopt the World Health Organization definitions for levels of alertness and preparedness for an influenza pandemic.

Chapter 4. Animal Influenza in Ireland

Chapter 5. Surveillance

- 5.1 The coordinated national surveillance system must be maintained and developed, using a nationally agreed definition of “influenza –like illness”, consistent surveillance methods, and national coordination of data collection, analysis and dissemination. The system should comprise of community-based surveillance of influenza based on sentinel practises during the inter-pandemic period, complemented by institutional surveillance, with enhanced measures during a pandemic. Regional levels of influenza activity should be reported weekly using clinical data from hospitals, nursing homes and schools.
- 5.2 The Virus Reference Laboratory must be supported and adequately resourced to extend its rapid testing systems (molecular-based assays) to identify a range of respiratory pathogens (e.g. respiratory syncytial virus, *Mycoplasma pneumonia*, *Chlamydia pneumonia*) as part of the national influenza surveillance programme. Measures must be in place to ensure that in a pandemic setting additional resources will be available to maintain increased level of activities in the facility.

Chapter 6. Vaccines

- 6.1 The National Influenza Pandemic Committee recommends that a comprehensive monitoring system must be developed to measure influenza vaccine uptake both in different at risk groups and across different socio-economic groups.

- 6.2 A concerted effort must be sustained to increase the uptake of influenza vaccine across the population, and in particular, the uptake of influenza vaccine and pneumococcal vaccine in high-risk groups.
- 6.3 Long-term contingency arrangements for the provision of vaccine in the event of a pandemic must be established.
- 6.4 A mechanism for the distribution and security of vaccine and antivirals must be developed, in consultation with medical disaster coordination groups.
- 6.5 During a pandemic procedures must be in place to allow immediate licensing of influenza vaccine that will provide protection against the pandemic strain as recommended by WHO.
- 6.6 It is essential that all adverse events related to the introduction of new vaccination programmes be reported to the Irish Medicines Board.
- 6.7 Investigation should continue into the method of delivering the vaccine during a pandemic (i.e. single or multi-dose vials), and studies should be undertaken to define the formulation and dosage regimens that will make the best possible use of available vaccine antigen at the time of a pandemic.

Chapter 7. Antivirals

- 7.1 Ireland must consider stockpiling a quantity of antivirals as a first line response to an influenza pandemic threat especially in the event of a delay in the availability of vaccine.
- 7.2 Procedures should be in place to allow immediate licensing of other antivirals in the event of a pandemic.
- 7.3 Criteria must be developed for the use of both antivirals and other drugs during a pandemic.
- 7.4 Supplies of antibiotics and ancillary drugs during a pandemic must be reviewed and estimations of requirements during a pandemic regularly reassessed by each health board region.

Chapter 8. Action Plan

- 8.1 Each health board must convene an influenza pandemic group to develop a pandemic contingency plan that addresses the response of the health board to a pandemic.

Chapter 9. Communication

- 9.1 The National Influenza Pandemic Plan Committee should establish links with the media industry
- 9.2 A co-ordinated message must be produced to impart information to health authorities, health professionals, the media and the general public. This co-ordinated message will need to be delivered by a number of credible voices from the medical and nursing professions.

Chapter 10. Influenza and public health legislation

- 10.1 In the event of a pandemic, influenza or an identified viral sub-type, ought to be scheduled as an “infectious disease”. This will facilitate regulations providing for public health measures.
- 10.2 Any secondary legislation made in the context of a national influenza pandemic plan will have to be carefully analysed in the context of constitutional and human right parameters.
- 10.3 Further legal opinion ought to be sought to establish the exact boundaries of legislation in the context of an extreme emergency such as the pandemic.
- 10.4 Consideration ought to be given to the possibility of a Constitutional amendment in order to provide for the declaration of a general state of emergency if it is the case that the Constitution does not already provide for this.
- 10.5 Consideration ought to be given to a general review and revision of existing legislation in order to alter the existing penalties to provide a more coercive deterrent to non-compliance with public health law.

Chapter 1 Introduction

The circulation of influenza viruses typically follows a seasonal pattern and influenza epidemics are frequent during the winter months in temperate regions of the world. These epidemics cause an increase in morbidity and mortality, particularly among the elderly and persons with decreased immunity. Occasionally a new strain of influenza virus appears to which the overall population has no immunity. Such strains may produce an influenza pandemic.

Unlike influenza epidemics pandemics are very severe outbreaks that rapidly spread to involve all parts of the world. During a pandemic disease often occurs outside of the usual influenza season, including the summer months, and multiple waves of disease occur before and after the main outbreak. Mortality during a pandemic is very high and is not confined to the usual risk groups: high attack rates occur in all age groups with particularly high mortality among healthy young adults.

It is estimated a fifth of the world's population were infected with influenza in the influenza pandemic of 1918-1919 and that 20-40 million died. The mortality was highest among the 20-40 year age group and contemporary reports describe a very rapid onset of disease with death often occurring within hours. The impact of the 1918-1919 pandemic was so severe that the average life expectancy in the USA was reduced by 10 years. Since then there have been a further three influenza pandemics: 1957 (severe), 1968 (moderate) and 1977 (mild). The fact that the last severe pandemic was in 1957 makes it more likely that the world's population would have little or no immunity to a new pandemic influenza strain, thus making a severe pandemic more likely.

It is almost inevitable that another influenza pandemic will occur. It is impossible to predict when this might occur, but a pandemic has the potential to cause widespread human suffering. The impact of a pandemic will be measured not only by the morbidity and mortality from influenza and its complications but also by the resulting economic and social disruption. An influenza pandemic would result in a global health and economic crisis, the scale and impact of which would be greater than either of the two world wars fought in the previous century.

With the ease of global travel a novel virus has the potential to spread rapidly across countries and continents. Contingency planning is required to enable a coordinated response to minimise the effects as far as possible.

The Minister for Health and Children has convened the National Influenza Pandemic Committee to develop a pandemic plan for Ireland.

This plan provides guidelines for the detection and management of influenza in Ireland. Health Boards and other agencies in their regions will be able to use the plan and adapt it to meet requirements at local level as the basis for the preparation of detailed operational plans for each region.

1.1 Development of the Plan

The Committee has worked under the Chairmanship of Professor William Hall, Director of the Virus Reference Laboratory. Two subgroups were established to deal with two main aspects of influenza control namely surveillance and vaccination. Members of the committee and subcommittees are listed in Appendix A. In addition to the committee members, expert opinion was sought on certain specialised issues.

This is Ireland's first influenza pandemic plan and it is envisaged that it will be revised, adapted, added to and refined as further information becomes available.

1.2 Scope and structure of the document

The epidemiology of influenza and information on past pandemics are described in Chapter 2. Chapter 3 outlines the adopted WHO levels of alertness at each stage of a pandemic. Chapter 4 deals with animal influenza in Ireland. Chapter 5 describes the function of surveillance and how this is achieved in Ireland. Influenza vaccination is discussed in Chapter 6 along with recommendations for pneumococcal vaccination. Antiviral drugs, their availability, their use as prophylactic medication and as a treatment option are the subject of Chapter 7. The involvement of specific key institutions is discussed in Chapter 8. Communication and the media are dealt with in Chapter 9 and lastly legislation in regard to influenza is the subject of chapter 10.

1.3 Use of the Plan

The plan addresses a considerable range of issues and as such it is relevant to many agencies and groups. This includes Governmental Departments, State and Non-State health service agencies, health professionals, the pharmaceutical industry, the media and the public.

Recommendations

- 1.1 The National Influenza Pandemic Committee will be maintained on a permanent basis to oversee the ongoing development to the national pandemic plan and to act as a national advisory body in the event that an influenza pandemic is anticipated.
- 1.2 The plan must be subject to regular review and implementation of the plan should be tested using simulated pandemic scenarios on a regular basis.

Chapter 2 Epidemiology of Influenza

Influenza commonly called the “flu” is one of the oldest and most common diseases known to man. Hippocrates first described influenza in 412 BC. The first well-described pandemic of influenza occurred in 1580. Since then, there have been 31 documented influenza pandemics, including three in this century: 1918, 1957 and 1968. The 1918 pandemic (“Spanish Flu”) was particularly virulent, resulting in as many as 40 million deaths worldwide.¹

2.1 Influenza virus structure

There are three types of influenza virus, A, B and C. Influenza C is rarely a cause of human illness. Whereas influenza B changes very little from year to year, influenza A can undergo considerable antigenic change resulting in new infections. Influenza A therefore is the most clinically important of the three viruses, responsible for both epidemics and pandemics.

Influenza virus is a single stranded RNA orthomyxovirus. Influenza virions are irregularly shaped spherical particles, 80-120 nm in diameter. The virus’ genetic material is associated with two major proteins: nucleoprotein and matrix protein. The three types of influenza virus can be differentiated by their particular nucleoproteins and matrix proteins. This complex is enclosed in a lipid envelope which has two glycoproteins: haemagglutinin and neuraminidase.²

The haemagglutinin permits virus particles to adhere to and then to enter the host cell. The neuraminidase facilitates shedding of progeny virions from the infected cell after the new particles have been assembled at the cell surface.

Influenza A can be classified into subtypes on the basis of the two surface glycoproteins, the haemagglutinin and neuraminidase. Fifteen subtypes of haemagglutinin have been identified, designated H1-H15. Of these only H1, H2 and H3 subtypes are associated with human infection. Whether the remaining subtypes could become involved in human infection in the future is unclear. There are nine distinct forms of neuraminidase designated N1-N9, but only N1 and N2 have a role in the release of virus from infected human cells. The other subtypes of haemagglutinin and neuraminidase have been identified in viruses infecting aquatic birds, horses, pigs and several other animal species.

The immune response following natural infection or vaccination results in the production of antibodies against the two surface proteins, and in particular to haemagglutinin. Immunity to these proteins can protect or reduce the likelihood of infection and lessen the severity of disease if infection occurs.

2.1.1 Antigenic drift and shift

Influenza A and B are subject to changes in their surface glycoproteins during viral replication. Minor changes are known as “*antigenic drift*” and major changes, which occur with influenza A viruses, are known as “*antigenic shift*”.

The constant antigenic drift in influenza A and B viruses is responsible for frequent epidemics and regional outbreaks and necessitates annual reformulation of the influenza vaccine. If a new strain differs only slightly from a previous strain, there is likely to be some immunity amongst the general population. The greater the difference between previous strains and the emerging strain, the higher the risk of the virus causing an epidemic as there will be little pre-existing immune recognition³. Epidemics usually have a lower attack rate than pandemics. High morbidity and hospitalisation rates may follow epidemics whereas pandemics are associated with high attack rates and mortality rates.

When major changes in the surface antigens occur a novel virus subtype is produced, and this is known as “*antigenic shift*”. The emergence of these completely new subtypes occurs at irregular and unpredictable intervals and only with type A viruses. Pandemics due to these viruses result in very high attack rates due to very low levels of pre-existing immunity, leading to high mortality rates.

Typically a pandemic starts from a single focus and spreads worldwide. Pandemics can occur in any season and affect all ages. An estimated 20-40 million died worldwide in the Spanish Pandemic Flu of 1918.^{5,6} A pandemic may last up to three years with secondary and tertiary waves occurring during this period. It is not possible to predict when the next pandemic will occur.

2.2 Inter pandemic influenza

Influenza constitutes an ongoing threat to public health outside of pandemics. Even when the incidence of influenza is low, during these periods, influenza accounts for 3,000-4,000 excess deaths per year in the United Kingdom⁷. An increase in mortality typically accompanies an influenza epidemic. An estimated 20,000 or more excess deaths occurred in each of five influenza epidemics in the years 1972 through to 1995 in the United States of America. It is estimated that 90% of these deaths occurred in the elderly. The deaths may be directly related to viral pneumonia, secondary bacterial pneumonia or due to worsening of pre-existing chronic medical conditions. Approximately 110,000 hospitalisations per year are related to influenza in the United States⁸.

Influenza viruses circulating globally in the year 2000 include influenza B and two subtypes of influenza A, H1N1 and H3N2.

2.3 Pandemic influenza

Most experts agree that another pandemic is likely to occur, although the exact timing or severity cannot be predicted. Increases in global travel and in the world population during the past century will probably accelerate the rapid spread of the virus. The average time between each of the last four pandemics was 25 years; the last pandemic was over 32 years ago in 1968.

New pandemic viruses emerge principally from aquatic birds, mainly ducks, which harbour many novel types of influenza viruses that have not yet infected humans.

Many epidemics originate in China and spread westward to Asia, Europe and beyond and are thought to be due to¹ to the following:

- Genetic reassortment of viruses occurring in humans or between human and animal viruses. This theory is supported by the close physical proximity of humans to ducks and domestic pigs present in farming communities in Southeast Asia and China. Human influenza occurs normally every month of the year rather than being confined to a season in these countries, providing opportunity for co-infection between animals and humans.
- Direct transfer of viruses between animals and humans, such as swine to human. Whether these subtypes go on to cause pandemics is determined by the efficiency with which they spread from person to person. Such a direct transfer occurred with avian influenza A (H5N1) in Hong Kong SAR in 1997. Fortunately, this subtype proved inefficient at spreading amongst humans and the threat was removed once all poultry stocks had been killed.
- Re-emergence of viruses from unrecognised or unsuspected reservoirs. This relates to the re-emergence of H1N1 in 1977. Where did this virus survive for twenty years before reappearing? One suggestion is that the virus remained dormant in another species.

2.4 Influenza pandemics this century

Three pandemics have occurred in this century: Spanish Flu 1918, Asian Flu 1957 and Hong Kong Flu 1968. The virus responsible for Spanish Flu originated from swine while the viruses in the other pandemics contained gene segments, which were closely related to avian viruses.

The impact of the Spanish flu was unprecedented, with an estimated 20-40 million deaths worldwide. The attack rate was as high as 40% and all age groups were affected. The highest fatality rate occurred in 20 – 50 year old adults. The responsible strain type A (H1N1), circulated in the general population until the 1950's and can still be identified in pigs in some countries.⁹ It was then replaced by Asian flu, which occurred in 1957-58 and was due to type A (H2N2). Asian flu first appeared in February 1957 in Singapore and after spreading throughout the Southern Hemisphere by the summer of that year, proceeded to infect throughout the Northern Hemisphere. The age specific death rates were highest in the very young and the elderly. The overall impact however, was only one tenth of that observed during the 1918 pandemic (Spanish Flu).⁴ Hong Kong Flu (influenza A, H3N2) first occurred in 1968. The mortality rate due to this strain was almost half that due to the Asian Flu. As the neuraminidase surface glycoprotein was the same as in a previously circulating strain (N2), cross immunity resulted in decreased virulence.

In 1977, re-emergence of a strain of H1N1 occurred. The susceptible population included people born after 1957 who had no previous exposure and therefore no protection to the H1N1 subtype. Outbreaks of influenza illness occurred primarily in school children and college age adults, whereas older adults were minimally affected. The H1N1 strain did not manage to replace the previously existing strain, and as a result it has co-circulated with type A (H3N2) for more than 20 years¹.

A recent concern was related to an influenza A virus subtype H5N1, originating in Hong Kong.¹⁰ This subtype was not previously seen in humans. Eighteen human cases occurred, resulting in six deaths. The simultaneous occurrence of outbreaks of H5N1 virus in chickens from Hong Kong SAR, suggested these birds were the source and that the virus had crossed over into humans. The potential for replication and human transmission however was poor and mass slaughter of poultry ended the attack.

For a new virus subtype to cause a pandemic:

- The surface glycoproteins must be altered;
- It must be readily transmissible from humans to humans;
- There must be a low level of immunity in the population;
- The strain must be virulent.

2.5 Modelling

Planning for a future pandemic needs to be based on as accurate as possible an understanding of the potential impact of a pandemic. Modelling exercises can help to identify and quantify the effects on mortality and morbidity.

For the purposes of modelling, using the 1996 census, the Irish population is estimated to consist of 33.1% 0-19 year olds, 55.5% 20-64 years olds and 11.4% over the age of 65 (Appendix D Table 1).¹¹

Estimates of the proportion of the population who are considered to be at high risk have been modelled using two different distributions. These two scenarios were calculated using upper and lower age-specific attack rates from the 1918, 1928-9 and 1957 pandemics (Appendix D Table 2 and 3)⁴.

The variables used to define the distribution of hospitalisations and deaths due to influenza are those stated by Meltzer 1999¹². The symptomatic attack rate of influenza in any given population in a pandemic situation is unpredictable, so the attack rates 10%, 15%, 20%, 25%, 30% and 35% have been modelled. Hospitalisations and deaths have been expressed in rates per 1000 symptomatic cases by Meltzer et al to give upper and lower estimates according to age and high-risk status have been applied to each variable. Table 4 in Appendix D, modified from Meltzer et al, was used to calculate these estimates for Ireland.¹²

The following tables present the range of estimates of the potential impact (on death rates and hospitalisation rates) of an influenza pandemic using published population-based data from the literature⁴, Meltzer et al¹² and 1996 Central Statistics Office census data¹¹. The full tables are presented in Appendix D. The increase in the number of hospitalisations and deaths is expected to occur over a period of two months.

The following numbers have been extrapolated from overseas data.

Table 7: The estimated minimum and maximum range of excess number of persons hospitalised secondary to influenza based on two scenarios, Distribution A and B.

Attack Rate	Minimum	Maximum
0.10	1430	5806
0.15	2146	8709
0.20	2861	11612
0.25	3576	14515
0.30	4292	17418
0.35	5005	20321
0.40	5720	23224
0.45	6435	26127

Table 8. The estimated minimum and maximum range of excess number of person dying secondary to influenza based on two scenarios, Distribution A and B

Attack rate	Minimum	Maximum
0.10	505	2397
0.15	758	3595
0.20	1010	4794
0.25	1263	5992
0.30	1515	7190
0.35	1768	8389
0.40	2020	9587
0.45	2273	10786

2.6 Clinical features of influenza

Influenza presents with acute onset of fever, headache, myalgia, sore throat, coryza and a dry cough. The cough is often severe and protracted, but the other manifestations are usually self-limiting with recovery in 2-7 days. The clinical features of influenza are often indistinguishable from those caused by other respiratory viruses.

Spread of the virus occurs primarily through aerosol droplet. Transmission may also occur by contact with contaminated environmental surfaces and hands as the virus may persist for hours, especially in cold, dry conditions.

The incubation period is short, typically 1-3 days. Viral shedding precedes the onset of symptoms by 1-2 days, and continues for 3-5 day after clinical onset, however, this is prolonged to 7 days in children.^{13,14} Age specific attack rates during an epidemic reflect persisting immunity from past exposure to similar strains, so that infection rates are often highest in school aged children.

2.6.1 Complications

Pulmonary Complications

Pneumonia is the most common complication and can be either primary viral pneumonia or secondary bacterial pneumonia. Secondary bacterial pneumonia is most commonly due to *Streptococcus pneumoniae*, *Haemophilus influenzae*, or *Staphylococcus aureus*. Secondary bacterial pneumonia should be suspected in anyone who deteriorates after the initial influenza illness has dissipated. It is more likely to occur in those who have underlying respiratory disease such as chronic bronchitis, asthma or cystic fibrosis.^{1-3,14} Primary viral pneumonia although less common, is associated with rapid progression and can lead to severe dyspnoea, cyanosis and death.

Cardiac Complications

Atrial fibrillation is commonly seen as a complication of influenza, especially in the elderly. This abnormal rhythm can exacerbate cardiac failure. Other rare complications include myocarditis and pericarditis.^{1-3,14}

Rhabdomyolysis

Muscle tenderness and limb pain associated with myoglobinuria which can cause acute renal failure has been documented.^{1-3,14}

Central Nervous System

Two rare conditions can arise from influenza infection namely, encephalitis and transverse myelitis.^{1-3,14}

Reye's Syndrome

This syndrome is most frequently seen in patients, especially children, who are on long-term aspirin therapy. The syndrome is characterised by acute encephalopathy and hepatic failure due to fatty infiltration of the liver.^{1-3,14}

Mortality

Death is reported in 0.5 –1 per 1,000 cases of influenza⁸. The majority of deaths occur in those over the age of 65. Even in winters when the incidence of influenza is low, 3,000-4,000 excess deaths may be attributable to influenza in the United Kingdom⁷.

2.6.2 Diagnosis

In addition to the clinical characteristics, laboratory confirmation is required for the diagnosis of influenza. Diagnostic tests for influenza include identification of the virus by cell culture, detection of viral genome by polymerase chain reaction (PCR) testing and antibody detection using serology. Confirmation from cell culture can take as long as two weeks. PCR can give results within seventy-two hours of receipt of sample. Serologic diagnosis requires taking two blood samples from the patient, with an interval of 2-4 weeks between samples. A four-fold rise in demonstrable antibodies

is diagnostic; alternatively a single high titre can be regarded as positive for infection (e.g. if titre = 1:256).

Future developments may include a rapid desktop test, which may be used in the general practice setting. It will be important to confirm positive tests by this method, by performing virological analysis on a nasopharyngeal swab.

The unpredictability of influenza and the serious consequences, which can occur when a pandemic strain appears, provide ample justification for constant vigilance and good planning. This implies that strategic use of available resources must be employed to reduce the extent of the disease and to reduce the impact of secondary social disruption.

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Chapter 3 WHO Levels of Alert

WHO has formulated a stepwise ladder of escalating levels of preparedness and alertness to allow for assessment and appropriate response to the situation that presents itself. Ireland has adopted this system.

The levels run from Interpandemic Phase (Phase 0) i.e. the period between one pandemic and another, up to End of the Pandemic Phase (Phase 5). This is then followed by a post pandemic evaluation.

3.1 Phase 0: The inter-pandemic period.

The interpandemic period is the period during which new haemagglutinin subtypes of influenza A viruses with pandemic potential may emerge. WHO coordinates surveillance through the four WHO Collaborating Centres based in Atlanta, USA; London, UK; Melbourne, Australia; and Tokyo, Japan. There are 110 National Influenza Reference Centres (NIRC) distributed throughout 83 countries that conduct influenza surveillance and forward on results to the relevant Collaborating Centres. The Virus Reference Laboratory, Belfield, Dublin, is the WHO NIRC for Ireland. It is vital to be able to distinguish a virus that does not have the ability to spread and cause a pandemic, and the early detection of low level spread of a true pandemic virus.

There are three levels of preparedness associated with Phase 0

3.1.1. Phase 0: Preparedness level 1

Preparedness level 1 will exist following the first international report(s) of isolation of a novel virus subtype from a single human case, without clear evidence of spread of such a virus or of outbreak activity associated with the new virus.

3.1.2. Phase 0: Preparedness level 2

Preparedness level 2 exists when it has been confirmed that two or more human infections have occurred with a new virus subtype, but the ability of the virus to readily spread from person to person and cause multiple outbreaks of disease leading to epidemics remains questionable.

National health authorities must commence contingency steps to facilitate activation of their national pandemic preparedness plans, should that become necessary.

3.1.3. Phase 0: Preparedness level 3

This level exists when human transmission of a new virus subtype has been confirmed through:

- Clear evidence of person-to-person spread in the general population; or
- Secondary contacts arising from contact with an index case; or

- At least one outbreak lasting over a minimum two-week period in one country; or
- Identification of the new virus subtype in several countries, with no explanation other than contact among infected people.

Before announcing Preparedness level 3, WHO will have consulted international experts to rule out any other possible explanation, such as subversive activity, and also confirm that the new virus has the potential to cause lower respiratory tract disease or other complications.

Surveillance will be enhanced along with preparations for appropriate vaccine manufacture and distribution to priority groups, with dissemination of appropriate information.

3.2 Phase 1: Confirmation of the onset of pandemic.

The pandemic will be declared when the virus with the new haemagglutinin subtype has been shown to cause several outbreaks in at least one country, to have spread to other countries and with consistent disease patterns indicating that serious morbidity and mortality is likely in at least one segment of the population.

3.3 Phase 2: Regional and multi-regional epidemics

Outbreaks and epidemics are occurring in multiple countries and spreading by region across the globe.

3.4 Phase 3: End of the first pandemic wave.

Countries or regions initially affected report that outbreak activity has reversed or stopped, but outbreaks and epidemics of the new virus are still occurring elsewhere.

3.5 Phase 4: Second or later waves of the pandemic

Based on past experiences at least a second wave of severe outbreaks caused by the new virus would be expected to occur 3-9 months after the initial outbreak in many countries.

In addition to an announcement from WHO, it would be expected within Ireland that the national sentinel surveillance scheme will identify the start of a second wave of outbreaks. The National Influenza Pandemic Committee will:

- Continue to coordinate surveillance activities and report to Health Boards on the spread of the virus;
- Estimate the remaining needs for vaccines and estimate the availability of antiviral drugs;
- Determine if the composition of the priority groups had altered.

3.6 Phase 5: End of the pandemic

The end of the pandemic will be defined as:

- Influenza activity returning to essentially normal or inter-pandemic levels,
- And widespread immunity to the new virus subtype evident in the general population.

Influenza monitoring and surveillance will return to interpandemic levels, i.e. return to Phase 0. Approximately 2-3 years will have passed since the initial declaration.

3.7 Post-pandemic phase

The National Influenza Pandemic Committee following declaration of the end of the pandemic will undertake a full evaluation. From this any recommendations and alterations to the pandemic plan should be adopted. This information will be relayed to any international assessment carried out by WHO.

Recommendations

3.1 Ireland should adopt the WHO definitions for levels of alertness and preparedness for an influenza pandemic, for reasons of clarity and consistency.

Bibliography and recommended reading

World Health Organization Influenza Pandemic Preparedness Plan.
<http://www.who.ch/flunet>

Chapter 4 Animal Influenza in Ireland

4.1 Avian Influenza

4.1.1 Prevalence

Avian influenza can occur in most, if not all species of birds. Waterfowl (wild and domesticated) are the major natural reservoir of influenza viruses. All available evidence suggests that primary introduction of influenza viruses into an area is a result of waterfowl activity. Wild waterfowl are usually asymptomatic, may excrete virus for long periods, may be infected with more than one type, and often do not develop a detectable antibody response.

Commercial ducks have frequently been shown to be infected with influenza viruses, but this has rarely been associated with disease in the ducks because of the marked resistance these birds show, even to strains that are highly virulent for chickens and turkeys (e.g. Ireland influenza outbreak in 1983).

The Department of Agriculture, Food and Rural Development has had a serological monitoring programme for avian influenza in place since 1995. The programme is part of the Poultry Health Programme, and monitors commercial breeding poultry just before they come into lay, and when they move between sites. In addition all blood samples from clinically affected poultry are screened.

The subtypes of most importance in poultry are the influenza A H5 and H7, as these are the subtypes, which have been found in cases of highly pathogenic avian influenza in poultry. All the other subtypes cause a much milder disease.

Since 1990 there have been several outbreaks of non-pathogenic avian influenza in poultry in Ireland (1991 – H6 N2, 1993 – H3 N8, 1995 – H7 N7, 1997 – H9 N2 and 1998 – N7 N7). The last outbreak of highly pathogenic avian influenza occurred in 1987.

4.1.2 Control Measures

Highly pathogenic strains

Where infections with avian influenza are confirmed in poultry, control measures are carried out according to European Communities Council Directive 92/40/EEC. Under this Directive, when the virus meets the following definition “*an infection of poultry caused by any influenza A virus which has an intravenous pathogenicity index in six-week old chickens greater than 1.2, or any infection with influenza A viruses of H5 or H7 subtype for which the nucleotide sequencing has demonstrated the presence of multiple basic amino acids at the cleavage site of the haemagglutinin*”, the following measures are put in place:

Stamping out

This involves restriction of all poultry, carcasses and eggs on the premises, slaughter of all poultry in situ, and destruction of all carcasses and eggs.

Movement controls

This involves the declaration of a protection zone (minimum 3 km radius) and a surveillance zone (minimum 10 km radius) around the infected premises. Movements of poultry, poultry transport, carcasses, eggs and other articles likely to transmit the virus are controlled by licence. Clinical and serological surveillance is carried out within the zones. The zones are maintained until 30 days after cleaning and disinfection of the infected premises, assuming no further outbreaks occur in the zones during this time.

Cleaning and disinfection

The infected premises is cleaned and disinfected under Department of Agriculture, Food and Rural Development supervision.

Epidemiological enquiry

An enquiry is carried out to determine the source and extent of the disease.

Non-pathogenic strains

Where non-pathogenic strains of the virus occur, and the virus is a H5 or H7 subtype, the Department has a policy of stamping out of the infected flock/s where practical, or of restriction of premises until after clinical signs have gone and supervision of slaughter, cleaning and disinfection, disposal of litter etc. In addition an epidemiological enquiry and clinical/serological surveillance are carried out.

Definition of disease

The European Community is currently reviewing the definition of avian influenza, in light of recent knowledge about the virus.

Contingency Plan

In order to carry out these measures as quickly as possible, a Contingency Plan has been prepared by the Department of Agriculture, Food and Rural Development. The European Commission approved this plan on 30 October 2000 (Commission Decision 2000/680/EC).

4.2 Equine Influenza

This disease is caused by two subtypes of virus H₇N₇ also known as A/equine 1 (prototype Prague/56), which is a H₇N₇ and A/equine 2 (Prototype Miami/63), which is a H₃N₈. The former does not appear to be prevalent currently and has not been isolated, since about 1979 although antibodies to this type have been detected in non-vaccinated horses born since that year. The H₃N₈ appears to have arisen from recombination from avian strains.

Equine influenza is endemic in most countries with significant equine populations, except Australia. Vaccination is widely practiced, using both strains of virus in the vaccines. Antigenic shift continues and major epidemics occur, despite vaccination and the incorporation of recent isolates into vaccines.

Equine influenza is considered a production disease i.e. occurrences of the disease are not notifiable and there is **no official** measures specifically designed to control this disease in Ireland.

Mandatory industry rules apply regarding vaccination and revaccination for competition horses in the thoroughbred industry. Vaccination in the presence of maternal antibodies appears not only to inhibit the serological response but also inhibits the response to future vaccinations.

Major outbreaks of equine influenza occur at periodic intervals e.g. Eastern Europe 1956; USA 1963; North America and Europe 1978-81, South Africa 1986, India 1987; China 1989 and 1993/94. Specific control measures, in the event of an outbreak are the responsibility of attending private veterinary practitioners.

Vaccination reduces clinical disease due to the virus but does not prevent circulation of the virus or disease occurrence in the non-responders.

4.3 Swine Influenza

This disease is a scheduled and notifiable disease in Ireland. Two subtypes generally affect pigs - namely H₁N₁ and H₃N₂. Three main types of swine viruses are in circulation in Europe - the classical H₁N₁, the avian like H₁N₁ and a human/avian like H₃N₂. More recently a H₁N₂ has been detected in pigs in the UK, France, Italy and the Netherlands. These latter isolates contain a haemagglutinin, which is closely related to a human type of the early 80's. H₁N₇ has also been isolated from pigs in the UK associated with clinical disease.

4.3.1 Position in Ireland

Two types of virus have been isolated in Ireland - a H₁N₁ was isolated for the first time in November 1991, and H₃N₂ was isolated for the first time in June 1993. The H₁N₁ isolated in Ireland, is different from the strains circulating in

Europe and elsewhere, and probably represents a separate introduction of an avian strain into Irish pigs. It is serologically related to Weybridge 79 and OMS/2899/82. The H₃N₂ virus isolated is serologically related to OMS/3633/84.

No evidence for the existence of H₁N₂ in Irish pigs has so far been detected.

4.4 Other Mammals

Other mammals can and do respond clinically to influenza infections notably mink, which have been affected with H₁₀N₄ in Sweden.

4.5 Laboratory Testing

The Central Veterinary Research Laboratory, Abbotstown, Castleknock, Dublin 17 maintains a capability for virus isolation and identification of avian and mammalian influenza viruses. It also has the capacity and expertise for serological identification of antibodies to these viruses in the different species. A specific pathogen free flock is maintained as a source of eggs for virus isolation. Virus isolates from avians are submitted to the EU reference laboratory in accordance with Directive requirements for further biotyping. Isolates from pigs are submitted to specialist laboratories for additional typing. Thus effectively a monitoring programme for all animal viruses is in operation from the CVRL. This allows for accurate diagnosis and the implementation of appropriate control measures.

The Central Veterinary Research Laboratory (CVRL) is the EU National Reference Laboratory for Avian influenza and at an international level participates in proficiency tests organized by the European (EU) Reference Laboratory for Avian Influenza.

Chapter 5 Surveillance

A timely, representative and efficient surveillance system is the cornerstone of influenza control. In the inter-pandemic period it provides valuable data on the incidence and impact of this vaccine-preventable disease. During times of actual or threatened pandemics it is essential for detecting the introduction and spread of new strains, to allow planning of control measures and for the allocation of resources^{1,2}.

This chapter addresses the requirements of a surveillance system during the inter-pandemic period and the enhancements required during the various stages of an influenza pandemic.

5.1. Global surveillance

The World Health Organization's Influenza Programme was established in 1948.^{3,4} There are now 110 National Influenza Reference Centres located in 83 countries around the world. There are four Collaborating Centres for Reference and Research located in Atlanta, USA; London, UK; Melbourne, Australia; and Tokyo, Japan. This network helps to monitor influenza activity worldwide and ensures that virus isolates and information are sent rapidly to one of the WHO Collaborating Centres for urgent strain identification. Results from isolates identified throughout the year are reviewed each February for the Northern Hemisphere and each September for the Southern Hemisphere. Recommendations are then made on the most appropriate composition for the forthcoming year's trivalent vaccine.⁵

All data needs to be rapidly accessible by WHO via the WHO Collaborating Centre in London and WHO National Reference Laboratories reporting to Flunet. The WHO has the central role in identifying a pandemic and coordinating international control measures.

The Virus Reference Laboratory (VRL), Belfield, is one of the 110 WHO National Influenza Reference Centres. It reports to the Public Health Laboratory Service at Colindale in the United Kingdom when confirmation is required on a new virus strain or variant.

The VRL is responsible for the diagnostic component of influenza surveillance in Ireland and specifically:

- has the expertise for rapid definitive identification of influenza viruses, including new pandemic subtypes;
- can evaluate drug resistance of isolates by genotypic analysis;
- prepares reagents for new pandemic subtypes;
- maintains up-to-date international and regional information on influenza epidemiology;
- is advised and consulted by WHO in the event of an outbreak of any unusual strain.

Currently a biosafety level 3 containment laboratory is under construction at Belfield.

5.2. Requirements for a national surveillance system

The national surveillance system must be able to:

- detect increased influenza activity, either epidemic or pandemic. This includes detection of influenza-like illnesses in the community using sentinel general practices and the use of laboratory confirmation of influenza infection to estimate the proportion of these cases that are due to influenza. Viral isolation is required to confirm the diagnosis, to provide strains for antigenic analysis for vaccine formulation and to detect new strains. The system should operate intensively during the local influenza season, with routine diagnostic systems being used at other times;
- rapidly detect and confirm any cases due to potential or actual pandemic strains known to be present overseas, as identified by the WHO or other suitable sources. This will include strains found in animal populations that may pose a threat to humans;
- detect and identify in a timely manner new strains that arise in Ireland;
- rapidly disseminate surveillance results;
- improve the level of surveillance if a pandemic strain is identified outside Ireland.

All elements of the surveillance required during a pandemic period need to be operational during the inter-pandemic period, albeit at a lower level. It will be preferable to enhance existing surveillance activities rather than attempting to establish new surveillance activities during a pandemic.

5.3. Current surveillance systems in Ireland

Surveillance consists of two parts: clinical data, which provides the epidemiological features and clinical impact of new variants, and virological data in which influenza viruses are isolated and identified. Although detection of a novel virus is vital, as it may indicate the onset of the next pandemic, the ability to identify minor changes (antigenic drift) is also important to monitor as current circulating strains determine the composition of the annual vaccine.

There is a need to strengthen surveillance capacity at general practice, hospital and health board levels in Ireland. In addition to surveillance of influenza infections and influenza-like illness, surveillance of other aspects of an influenza pandemic may be required. These include secondary infections, influenza-related mortality, vaccine uptake and adverse reactions to vaccines and anti-virals (see Appendix B)

With the introduction of the Computerised Infectious Disease Reporting (CIDR) system diagnostic microbiology laboratories should be able to play a greater role in surveillance of respiratory pathogens, including influenza, causes of secondary bacterial pneumonia following influenza infection and atypical bacterial pathogens.

5.3.1. Inter-pandemic surveillance

A network of sentinel general practices was established in 2000 to report on the occurrence of influenza-like illness in the community. Virological confirmation of cases seen by the sentinel practices, as well as samples from hospitals and other sources, is also carried out.

Data on influenza activity is collected by:

- sentinel general practices reporting during influenza season (October to mid May) on influenza-like illnesses. These practices are distributed throughout the country covering a population of 57,000 at present. In the future this system will be expanded to ensure better representation of the general population and of all health boards. Virological confirmation is obtained by sending combined nasopharyngeal and throat swabs from two cases of clinically diagnosed influenza-like illness from each sentinel practice to the Virus Reference Laboratory each week.
- year-round reporting of influenza isolates from paediatric and adult hospital inpatients, provides further virological data
- developments are in progress to collate data and report on influenza activity in the each of the health boards. The levels of influenza activity are determined by receiving data from a number of sources. These sources include:
 - Sentinel acute and community hospitals providing information on the number of acute admissions due to respiratory disease per week
 - Sentinel schools, located in close proximity to the sentinel practices, reporting weekly on the number of pupils absent on any one day of the week
 - All schools reporting when 10% or more of pupils are absent due to any cause on any one-day of the week
 - Nursing homes reporting when 10% or more of the residents become ill with influenza-like illness over a three-day period.

The levels of influenza activity are graded into four categories as outlined below:

- 1) No activity
- 2) Sporadic activity- when reports of clinically diagnosed influenza-like illness or laboratory confirmed cases are occurring but there are no reports of outbreaks in schools, nursing homes or institutions.
- 3) Localized activity- when reports of clinically diagnosed influenza-like illness or laboratory confirmed cases are occurring in a geographic area containing less than 50% of the health board's population. A geographic area could be a town, city or county.
- 4) Widespread activity – when reports of clinically diagnosed influenza-like illness or laboratory confirmed cases are occurring in a geographic area where more than 50% of the health board's population is affected.

5.3.2 Case definitions

The definition currently used by the Irish College of General Practitioners (ICGP) and the National Disease Surveillance Centre (NDSC) sentinel surveillance system for influenza-like illness in Ireland is as follows:

Suspected Case:

Sudden onset of symptoms with a temperature of 38 °C or more in the absence of any other disease with at least two of the following:

Headache

Myalgia

Sore throat

Dry cough

Confirmed case: When results from virus isolation by cell culture, polymerase chain reaction, serology or any combination of these tests are positive for influenza virus.

5.3.3 Reporting and feedback

A weekly report is compiled and sent electronically to all those participating in the surveillance. The report includes a summary of the clinical and the virological data. The sentinel practices also receive directly the virological results on swabs taken the previous week. The report is also displayed weekly on the NDSC website.

5.3.4 Testing for influenza virus

As there is little difference in the presenting symptoms of a number of respiratory pathogens, virological confirmation is required to confirm that influenza virus is the causative agent⁶⁻⁸. This is achieved by obtaining samples from patients who fulfil the case definition outlined above. Combined nasopharyngeal and throat swabs are obtained from two cases in each sentinel practice per week. The swabs ideally should be taken early on in the disease process (within 72 hours of onset of symptoms) and forwarded to the VRL as soon as possible.

The Virus Reference Laboratory (VRL) has the capacity to determine whether an influenza virus is one of the currently circulating influenza A or B viruses. Further identification of subtypes is carried out on influenza A isolates. On receipt of samples at the VRL the samples are aliquoted for polymerase chain reaction studies and virus isolation. It is not certain that antigen detection methods or rapid culture methods would necessarily detect a new influenza strain with major antigenic changes. Conventional culture methods and possibly PCR should be employed to this end.

Rapid bedside tests for influenza have recently become available, but there is limited information to date regarding their sensitivity or specificity, particularly in a general practice setting. Thus they cannot therefore be recommended for surveillance purposes, but they may have some application in assisting patient management. If used, patients who test positive should also have a nose/throat swab or a nasopharyngeal aspirate/swab sent to the VRL for confirmation.

5.4. Surveillance when pandemic influenza is present overseas

When a new haemagglutinin type with proven human-to-human spread is present

overseas, intensified and targeted surveillance will be required to detect its introduction into Ireland. This will be directed at returning travellers, patients with viral pneumonia and close contacts of these two groups. In addition enhanced surveillance in paediatric hospitals, monitoring of lower respiratory tract infections in adults presenting to Accident and Emergency Departments, as well as observing work absenteeism for periods of three days or more will be carried out.

As new variants may not be reliably detected by the antigen detection or rapid culture systems, conventional cell cultures and polymerase chain reaction need to be performed on all patients. This will ensure the maximum chance of detecting new strains and provide viral isolates for serotyping.

When pandemic influenza is present overseas, inter-pandemic surveillance systems must remain in place and be substantially augmented, as detailed in the procedures set out in Appendix B.

5.5. Surveillance when pandemic influenza is present in Ireland

When pandemic influenza has appeared in Ireland, surveillance systems will be essential to track the spread of the virus and to assist in the allocation of resources and introduction of preventive measures. In the early stages it will be important to sample as many patients with an influenza-like illness as possible. It is likely that the number of samples required will be reviewed as the pandemic progresses. As routine laboratory systems are likely to be overloaded, rapid bedside tests have the potential to help screen patients. This will depend however on whether they have appropriate sensitivity and specificity for the pandemic strain.

If the new strain is associated with high morbidity and mortality (as with the Hong Kong H5N1 strain in 1997) the virus will require a high level of containment. This will be available in the VRL on completion of the new BSL-3 facility. Confirmation of the identity of a new virus strain will be performed at the WHO Collaborating Centre, Colindale, UK, on receipt of samples sent from the VRL.

Antiviral therapy is likely to be in widespread use and there will be an associated need to monitor antiviral susceptibility. This is an area that will be kept under review by the VRL.

Recommendations

- 5.1 The coordinated national surveillance system must be maintained and developed, using the nationally agreed definition of “influenza-like illness”, consistent surveillance methods and national coordination of data collection, analysis and dissemination. The system should comprise of community-based surveillance of influenza, based on sentinel practices during the interpandemic period, complemented by institutional surveillance, and with enhanced measures during a pandemic. Regional levels of influenza activity should be reported weekly using clinical data from hospitals, nursing homes and schools.
- 5.2 The Virus Reference Laboratory must be supported and adequately resourced to extend its rapid testing systems (molecular-based assays) to identify a range

of respiratory pathogens (e.g. respiratory syncytial virus, *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*) as part of the national influenza surveillance programme. Measures must be in place to ensure that in a pandemic setting additional resources will be immediately available to maintain increased level of activities in the facility.

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Chapter 6 Vaccines

6.1 Introduction

Influenza vaccination remains the most effective way to reduce the impact of influenza, especially in high-risk groups. This requires annual vaccination with the most current recommended strains, as advised by WHO.

Vaccines that are well matched to the current circulating strains are 70-90% effective in preventing illness in healthy adult volunteers¹. Annual vaccination offered to all older people, irrespective of whether they have any underlying disease, is cost effective.²⁻⁵ Influenza vaccine has been shown to prevent severe complication and death due to influenza in elderly nursing home residents. Hospitalisation rates, cases of pneumonia and respiratory illness and death rates were reduced by over 50% in one elderly residential population that had been vaccinated⁶. The vaccine is also effective in reducing mortality in older people living in the community and those who are not classed as high risk²⁻⁴.

The ideal time for vaccination in the Northern Hemisphere is from September to mid October as influenza activity increases from October onwards. On average it takes two weeks for the vaccine to induce a protective antibody response.

6.2 Vaccine supply

6.2.1 Inter-pandemic period

During the interpandemic period trivalent influenza vaccine is manufactured according to WHO recommendations released in February for the Northern Hemisphere. These recommendations are based on analysis of samples collected by the four Collaborating Centres.⁷ Ireland is not a vaccine producing country. Consequently supplies are obtained through purchasing contracts with manufacturers elsewhere.

Current vaccines that are licensed for use are listed below ⁸.

Trade Name	Manufacturer	Type
Influvac sub-unit	Solvay Duphar Ltd	Surface Antigen
Fluvirin	Evans Medical Ltd.	Surface Antigen
Begrivac	Wyeth Lederle	Split virus
Inactivated influenza vaccine BP	Pasteur-Merieux	Split virus
Fluarix	SmithKline Beecham plc	Split virus
Fluzone	Connaught Laboratories	Split virus

6.2.2 Pandemic vaccine supply

The financial and logistic issues pertaining to ensuring adequate supplies of vaccine for Ireland, during a pandemic period, need to be addressed.

Vaccine supply may not be available until after the first wave of the pandemic as there is a lead-time to manufacturing of at least 6 months.

During a pandemic monovalent vaccine is manufactured unless the emergence of the pandemic strain coincides with the normal influenza cycle in which case it can be included in the trivalent vaccine. There are a number of rate limiting steps involved in this process, not least the ability to develop seed viruses in a timely fashion.

International difficulties in the manufacturing process⁹⁻¹¹ include:

- Manufacturing of standardised reagents
- Requirement of special biological containment laboratories to protect laboratory scientists
- Identifying the virus strain or genetic reassortant so that this can be introduced into fertilized hen's eggs for growth
- The growth rate of the virus
- Availability of fertilised hen's eggs, especially if the pandemic occurs outside of usual production season. To produce one single dose of vaccine one fertilised hen's egg is needed. This leads to further logistical problems regarding the number of eggs available, the manufacturer's capacity to handle large numbers of fertilised eggs and the use of different species of hens so that adequate numbers of fertilised eggs can be produced.

Ireland does not have any indigenous manufacturers of vaccines. Thus in the event of a pandemic, securing vaccine supplies from a country that does produce vaccines may be difficult as these countries may seek to supply vaccine for their own population.

This matter needs to be considered, perhaps with a view to assuring, by means of an international agreement, that a proportion of vaccine production will be guaranteed to be set aside for non-vaccine producing countries like Ireland.

Assuming that vaccine will be available the following issues will need to be addressed:

- Licensing of the new vaccine needs to be approved by the Irish Medicines Board prior to distribution and administration.
- Depending on the quantities of vaccine obtained, storage and distribution plans need to be in place at health board level (see Chapter 8).

6.3 Vaccine dosage and administration

The current trivalent vaccine used during the interpandemic period contains 15ug of haemagglutinin antigen of each constituent strain (influenza B, influenza A (H1N1) and (H3N2)).

The recommended dose for adults and children aged 13 years or over, is a single injection of 0.5 ml intramuscularly or by deep subcutaneous injection.

For children aged from 4 to 12 years, two doses (0.5ml) are required spaced 4-6 weeks apart if receiving influenza vaccine for the first time. Children aged 6 months to 4 years also require two doses (0.25ml) spaced 4-6 weeks apart if receiving influenza vaccine for the first time.⁸

6.4 Priority groups for vaccination

6.4.1 Inter-pandemic period

The National Immunisation Committee of the Royal College of Physicians of Ireland produce immunisation guidelines for Ireland. The current recommendations are outlined below.

Annual vaccination is recommended for two groups of individuals:

- 1) Any individual older than 6 months of age who is at increased risk of influenza related complications
- 2) Those at increased risk of transmitting influenza to a person at high risk for influenza complications

Vaccination is strongly recommended for adults and children with any of the following:

- Chronic illness requiring regular medical follow up such as diabetes mellitus, cystic fibrosis and chronic heart disease
- Immunosuppression due to disease or treatment, including asplenia or splenic dysfunction
- Persons aged over 65
- Children and teenagers on long-term aspirin therapy due to the risk of Reye's syndrome
- Residents of nursing homes, old peoples' homes, and other long stay facilities where rapid spread is likely to follow introduction of infection.

In addition the Royal College of Physicians of Ireland recommend that all health care workers who have direct patient contact should receive annual influenza vaccination.

6.4.2 During the pandemic

Priorities during a pandemic may differ from interpandemic recommendations. Limitations set by the availability and quantity of vaccine may determine who receives the vaccine. There are a number of crucial differences with a pandemic vaccination programme:¹

- The target population for vaccination will extend beyond the typical high risk groups

- Vaccine will need to be distributed and administered as rapidly as possible as the warning period preceding the pandemic will be short
- It is likely that there will be severe/ moderate vaccine shortage during the first wave of the pandemic; indeed there may be no vaccine available.

Presently it must be assumed that in the pandemic situation all vaccinees will lack previous exposure and will require two doses of vaccine, each containing 15 ug haemagglutinin of the new pandemic strain, to confer maximum protection. It is possible, however, that:

- Significant protection could be obtained by a single dose of vaccine;
- Doses containing less than 15 ug haemagglutinin antigen may confer substantial protection;
- Better protection may be obtained by the use of whole virus vaccine than the split- product or subunit vaccines, permitting the use of lower antigen levels and/or a single dose.

Difficulties arise in prioritising vaccination to all people in high-risk groups, to those who are in institutional settings or aiming the vaccination programme at healthcare workers and essential services. In allocating the available vaccine it will be necessary to rate the relative importance of:

- Protecting individuals from infection and/ or serious illness;
- Maintaining the health of workers in essential services;
- Preventing or minimising the spread of infection.

Further priority setting will be necessary within each of these groups. Assignment into particular priority groups may not be determined on historical information alone, but more crucially on the epidemiology of the particular novel virus. For example the highest mortality for a new pandemic strain may be in young adults as occurred in the 1918 influenza pandemic.

Priorities will need to be evidence-based with clear assumptions regarding the outcomes to be achieved. In the event of an influenza pandemic the clear and desirable outcomes are to minimise death, human suffering and social disruption.

There is unequivocal evidence that the highest mortality and morbidity occurs in the at risk groups. However, there is conflicting evidence on the relative impact on both mortality and morbidity of immunising all those in high-risk groups, only for those in institutional care (e.g. nursing homes), or immunising only health care workers caring for these people.

Protection of health care workers is of prime importance during a pandemic, as health care workers will make the greatest impact to minimising mortality and morbidity. In addition to doctors, nurses, ambulance staff and those working with the elderly, the priority ranking of other health care workers in relation to others in the community also needs further investigation. In the event of a pandemic the Immunisation Advisory Committee of the Royal College of Physicians of Ireland have

recommended that all hospital staff should be vaccinated, as a hospital acts as an amplifier of disease distinct from the community.

Other key personnel required to maintain essential services include ambulance personnel, Garda personnel, fire personnel, laboratory technicians, teachers and food handlers. The order in which the latter groups will be vaccinated is dependent on the amount of available vaccine. These groups will be reviewed further in the light of the epidemiology of the infecting virus strain.

6.5 Vaccine surveillance

6.5.1 Vaccination targets

Vaccination uptake targets need to be established for at-risk populations. These targets will differ between the inter-pandemic and intra-pandemic periods. Once the pandemic has begun these targets will need to be updated by the Pandemic Command Centre, based on the epidemiology of the pandemic strain, vaccine availability, population demographics and other factors. Given that these factors will likely change as the pandemic progresses frequent updates of vaccination targets may be required.

Each Health Board/Authority will need to draft a vaccination plan for their own area (see Chapter 8).

6.5.2 Vaccine uptake register

A register of influenza vaccine uptake needs to be established during the inter-pandemic period to ensure that vaccination targets are being met in the target populations. Having a register established in the inter-pandemic period will facilitate enhanced surveillance and easier identification of target populations once a pandemic commences.

Agreement on vaccination targets and creation of an uptake register will have to be agreed with general practitioners. Issues of data confidentiality will need to be clarified so that GP's can be assured that the data will only be used for monitoring vaccine uptake (see Chapter 8).

6.5.3 Monitoring adverse events related to vaccination.

The Irish Medicines Board (IMB) is the regulatory body for human and veterinary medicines in Ireland and is the national competent authority under European Council Regulations and Directives. One of its main roles is pharmacovigilance and drugs safety monitoring. The IMB is responsible for the national reporting system of monitoring adverse reactions. Of particular importance are all suspected reactions to newly authorised products, serious reactions to established products and suspected reactions to vaccines or medicines in pregnancy. Licenses for new influenza vaccines required during a pandemic will need to be approved by the Irish Medicines Board.

6.6 Pneumococcal vaccination

There is considerable crossover between the eligible groups for influenza vaccination and pneumococcal vaccination.

A major vaccination campaign was launched in October 2000 to improve the uptake of both pneumococcal and influenza vaccines in the at risk groups. Pneumococcal vaccine is given as a single dose and revaccination is only considered in patients at high risk (i.e. patients with asplenia or nephrotic syndrome) after an interval of at least five years. *Streptococcus pneumoniae* is one of the main pathogens responsible for secondary bacterial infection, especially in the elderly or those who have underlying medical conditions. It is prudent to advise pneumococcal vaccination^{1,11} in the following at risk groups.⁸

- Persons aged over 65

Persons over the age of 2 with the following conditions:

- Asplenia or severe dysfunction of the spleen
- Chronic renal disease or nephrotic syndrome
- Chronic heart. Lung or liver disease including cirrhosis.
- Diabetes mellitus
- Sick cell disease
- Immunodeficiency or immunosuppression due to disease or treatment including HIV infection at all stages.

Consideration needs to be given to the use of the newer conjugate pneumococcal vaccines. Although these do not cover as many serotypes as the polysaccharide vaccines they do have better immunogenicity, particularly in the very young and the elderly. They have been shown to significantly reduce the incidence of invasive pneumococcal disease, particularly in children.

Recommendations

- 6.1 The National Influenza Pandemic Committee recommends that a comprehensive monitoring system must be developed to measure influenza vaccine uptake both in different at risk groups and across different socio-economic groups.
- 6.2 A concerted effort must be sustained to increase the uptake of influenza vaccine across the targeted population, and in particular, the uptake of influenza vaccine and pneumococcal vaccine in high-risk groups
- 6.3 Long term contingency arrangements for the provision of vaccine in the event of a pandemic must be established.

- 6.4 A mechanism for the distribution and security of vaccine and antivirals must be developed in consultation with all relevant organisations, including medical disaster coordination groups.
- 6.5 During pandemic procedures must be in place to allow immediate licensing of the influenza vaccine that will give protection against the pandemic strain as recommended by WHO.
- 6.6 It is essential that all adverse events related to the introduction of this new vaccination programme be reported to the Irish Medicines Board.
- 6.7 Investigation should continue into the method of delivering the vaccine during a pandemic and studies should be undertaken to define the formulation and dosage regimens that will make the best possible use of available vaccine antigen at the time of a pandemic.

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Chapter 7 Antivirals

7.1 Current antivirals

There are currently four antiviral drugs that can shorten the course of infection if given early in the disease (treatment) and provide short-term protection against influenza (prophylaxis): amantadine, rimantadine, zanamivir and oseltamavir. Of these only zanamivir (trade name Relenza) is currently licensed in Ireland. Oseltamavir and zanamivir are newer agents classed as neuraminidase inhibitors and as such are active against influenza A and B viruses. The older agents amantadine and rimantadine are only active against influenza A.

Unlike vaccines there is an opportunity to stockpile antiviral products ahead of a pandemic. Like vaccines, however supply is unlikely to meet demand. Strategies for acquiring and using available antivirals will need to be developed, including consideration of the indications and priorities for prophylactic versus therapeutic use. Ideally a combined strategy for antiviral and vaccine use should be developed.

7.1.1. Zanamivir

Zanamivir inhibits the neuraminidase enzyme, thereby preventing release of virus from infected cells. It is indicated for treatment of both influenza A and B in adults and children aged 12 and over who present with symptoms typical of influenza when influenza is circulating in the community. Clinical trials have demonstrated the reduction in the duration of illness by a median of 1- 1.5 days and a reduction in time off work due to illness. In order to be effective the drug needs to be administered within 48 hours of the onset of symptoms.^{1,2}

There is no evidence to date that zanamivir can prevent serious influenza related complications such as bacterial or viral pneumonia³. It does not prevent the development of an immunological response to influenza vaccine.

Zanamivir is produced under the trade name Relenza and is distributed in Ireland by Glaxo Wellcome Ltd. It is manufactured in France.

Dosage and administration

Zanamivir is administered via an oral inhaler as a powder, at a dose of 10 mg (2 x 5 mg inhalations) twice daily for 5-7 days. It has a shelf life of three years.

Contraindications

Hypersensitivity to any ingredient of the preparation is a contraindication to its use. The use of zanamivir in pregnancy, lactation and children has not been assessed. It is therefore not recommended for use in these groups.

Side effects

Side effects include nausea, sinusitis and nasal symptoms. Zanamivir can cause bronchospasm following inhalation and should be used with caution in patients who have asthma or chronic obstructive airways disease.

7.1.2 Oseltamavir

A second neuraminidase inhibitor that has undergone extensive clinical trials, oseltamavir, is not yet licensed in Ireland^{4,5}. It is approved in the United States for treatment of uncomplicated illness caused by influenza infection A and B in patients 1 year and older who have been symptomatic for less than 2 days. This neuraminidase inhibitor was granted approval in the United States for the prevention of influenza in adults and adolescents older than 13 years.

Dosage

The recommended dosage is 75 mg orally twice daily for five days. The dosage is reduced in patients with abnormal renal function. The recommended oral dose for paediatric patients is based on body weight in kilograms. When used for prophylaxis, the dose in adults and adolescents 13 years and older following close contact with an infected individual is 75 mg once daily for at least 7 days. The duration of protection lasts for as long as dosing is continued.

Side effects

Nausea and vomiting are the main reported side effects.

7.1.3 Amantadine

Amantadine is licensed in Ireland for the treatment of Parkinson's disease, but not for the treatment of influenza A infections. It has no activity against influenza B. In other countries it is licensed for use both in the prophylaxis and treatment of infection due to influenza A. Amantadine has been shown to reduce the severity and shorten the duration of illness by approximately one day when taken early on in the course of illness.⁶

Dosage and administration

In adults the recommended dose is 100 mg twice daily for 5-7 days. In children and those over the age of 65, the dose is reduced to 100mg per day. The dose may need to be reduced in those with a history of impaired renal function or a history of a seizure disorder. For prophylaxis during outbreaks the recommended dose is 100mg twice daily for 7-10 days or for as long as the outbreak of influenza A continues.

Side effects

Amantadine has been shown to be 70 – 90% effective at preventing viral replication but it is associated with significant side effects^{7,8}. These include behavioural changes, delirium, hallucinations, agitation and seizures. Severe side effects are more likely to occur in the elderly, in patients with abnormal renal function and in patients with a history of a seizure disorder. Amantadine is not recommended for use during pregnancy or lactation.

7.1.4 Rimantadine

Rimantadine is related to amantadine and similarly is effective against influenza A only⁷. It is associated with fewer side effects than amantadine but is not currently licensed in Ireland.⁹

7.2 Treatment and prophylaxis during a pandemic

Antivirals may be used for treatment or prophylaxis of influenza. In a pandemic situation the use of antivirals for treatment of influenza cases will take precedence over their use for prophylaxis.

In the event of a pandemic, it is unlikely that there will be sufficient quantities of antiviral drugs to meet demands; therefore it may be necessary to target certain groups. Patients who present to hospital early and those who present with a complication of influenza other than secondary bacterial pneumonia are most likely to benefit from treatment. These drugs should only be used where there is surveillance evidence or laboratory confirmation of influenza.

Mechanisms must be in place governing the importation, licensing, storage and distribution of these drugs. Consideration should be given to preserving a supply for health care staff and laboratory workers who may be exposed to a new virus.

WHO has recommended the use of either amantadine or rimantadine in the elderly and high-risk groups when vaccine is not yet available or has just been administered.¹⁰ Dosages for current anti-influenza agents are listed in Appendix C.

7.2.1. Infection Control

Antiviral treatment and prophylaxis will need to be accompanied by infection control measures to minimise transmission from clinical cases to other groups at risk of severe influenza (eg. immunosuppressed individuals) and to reduce transmission to health care workers. Infection control measures must be applied to individuals, small groups (eg. families), larger institutions (eg. nursing homes, schools, hospitals), or within regions.

Infection control measures may include isolation, temporary closure of schools and businesses, use of masks etc. In the likely scenario that there will be limited quantities

of vaccine or antiviral drugs, these measures may well be the main public health intervention.

7.2.2 Treatment

Priorities for treatment

In general, anti-influenza treatment during a pandemic is likely to be limited to those with influenza that is clinically severe, complicated influenza (eg. with encephalitis, pneumonia) or requiring hospitalisation (if the reason for admission is directly attributable to influenza rather than an accompanying bacterial superinfection etc.). Ideally, treatment will be reserved for those presenting early (eg. less than 48 hours) with severe influenza, but early presentation to hospital may not occur. For influenza occurring in closed communities (eg. nursing homes, schools), antivirals may be needed both for treating individuals and to minimise transmission to other residents, staff and visitors.

7.2.3 Prophylaxis

Priorities for prophylaxis

The prophylactic use of antiviral therapy will need to be considered by the Irish Medicines Board, the pharmaceutical industry, the Department of Health and Children, the Royal College of Physicians of Ireland and the National Influenza Pandemic Committee.

The designation of priority groups to receive prophylaxis will be similar to those in whom vaccination is recommended (cf. chapter 6). In the allocation of antiviral drugs, it will be necessary to rate the relative importance of prophylaxis in:

- Protecting individuals from infection and /or serious illness;
- Maintaining the health of workers in essential services. This will be influenced by their risk of exposure, risk of transmission to others (especially those at high-risk), their replaceability within their area of essential services and the extent to which their death or inability to work disrupts the community;
- Preventing or minimising the spread of infection.

These factors will be influenced by:

- The severity, attack rate and epidemiology of the pandemic;
- Groups most at-risk of the pandemic strain (eg. elderly, infants, children, young adults, pregnant women, people with underlying medical conditions etc.);
- The availability and possible variable efficacy of vaccines.

Prophylaxis will also be needed for those in whom influenza vaccination is contraindicated, or whose immunosuppression prevents an adequate response to vaccination.

The evidence regarding the choice and use of antiviral drugs for prophylaxis is likely to change over time. The National Pandemic Committee will need to review the evidence before deciding on final recommendations in the setting of an imminent pandemic.

Assessing requirements for prophylactic drugs

The amount of drug used for prophylaxis will depend on whether a potentially useful vaccine is available, and whether more than one dose is required to induce protection. For example, if vaccine is available, then prophylaxis may need to be given for at least the first 10 days (or longer if more than one dose is required for efficacy) after vaccination, until immunity develops. Prophylaxis in the absence of a vaccine may be needed for the duration of the pandemic (eg. possibly 6-8 weeks), significantly increasing the demand on antivirals.

According to the 1996 census data, at least 237,129 individuals are employed in essential services. If these people were vaccinated in the event of a pandemic and given prophylaxis (at half the treatment dose) for 10 days until potential vaccine immunity had been induced assuming only one dose of vaccine is required, then 2,371,290 doses of amantadine would be needed. If no vaccine was available and prophylaxis was required for throughout the pandemic, the quantity of amantadine will increase between 4-fold and 7-fold.

7.3 Monitoring adverse events related to antivirals

All adverse reactions to antiviral drugs must be reported to the Irish Medicines Board. Pharmacovigilance will be essential, as some of the antivirals will not have been previously used in Ireland.

Medical practitioners and the general public need to be educated before and during a pandemic on the indications, contraindications and adverse events associated with antiviral agents.

7.4 Drug resistance

Surveillance for the development of antiviral resistance will be essential. If resistance to amantadine or rimantadine emerges, strict infection control procedures will need to be introduced to prevent further spread of the resistant virus.

Amantadine and rimantadine

When influenza infected patients are treated with amantadine or rimantadine, they may shed viruses that are resistant to these two drugs. It is not known how often drug-resistant viruses occur in treated individuals, however, viruses readily develop

resistance in vitro. These resistant viruses are still potentially virulent and are readily transmissible.

To reduce the emergence of antiviral drug-resistant strains, amantadine or rimantadine treatment should be discontinued as soon as clinically warranted, generally after 3-5 days of treatment or within 24-48 hours after the disappearance of signs and symptoms.

Monitoring for resistance includes performing standard viral inhibition tests in cell culture.

Zanamivir

So far only one case of resistance to zanamivir has been documented which occurred in a chronically infected immunocompromised child. Low level resistance has been found in vitro, but there is no evidence to date on the clinical significance of such resistance.

7.5 Other drugs

Other drugs that are likely to be in demand during an pandemic include antibiotics, bronchodilators, cardiac drugs, antipyretics, analgesics and oral rehydration fluids.

Recommendations

- 7.1 Ireland should consider stockpiling a quantity of antivirals as a first line response to an influenza pandemic threat, especially in the event of a delay in the availability of vaccine.
- 7.2 Procedures must be in place to allow immediate licensing of other antivirals in the event of a pandemic.
- 7.3 Criteria must be developed for the use of both antivirals and other drugs during a pandemic.
- 7.4 Supplies of antibiotics and ancillary drugs during a pandemic must be reviewed and estimation of requirements during a pandemic regularly reassessed by each health board region.

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Chapter 8 Action Plan

8.1 Responsibilities during a pandemic

Each party in an emergency response must have a clear understanding of their own and other's roles and responsibilities. Each institution/ body may be involved throughout all phases of the pandemic or they may have a specific role at one particular stage. A core group derived from the existing National Influenza Pandemic Committee will be active during the inter-pandemic phase. The core group will consult and liaise with appropriate organisations during the pandemic. In the event of an influenza pandemic being declared by WHO, the following will occur:

A pandemic command centre will be established in the Department of Health and Children and will be managed by an appointed executive of the committee.

The core group will be responsible for:

- Coordinating all levels of surveillance;
- Providing accurate information to the government, international bodies, health professionals, the media and the public;
- Assisting the procurement of vaccine and antiviral drugs;
- Prioritisation of groups for vaccination and antiviral treatment;
- Monitoring for adverse reactions to vaccine and antivirals as well as recording evidence of emerging drug resistance;
- Measuring the impact of the pandemic including the effect on essential services in Ireland.

On the advice of the National Influenza Pandemic Committee, acting through the Health Board Executive, implementation of individual health board pandemic plans will be initiated.

Delivery of health services will remain with individual health boards who will institute their emergency plans to manage the pandemic in their region.

Monitoring of global spread: The National Influenza Pandemic Committee and the Department of Health and Children will collaborate with WHO in the assessment of global spread of the virus and global impact of the pandemic.

8.2 Preparedness strategies

8.2.1 Enhanced surveillance

The main activity during the interpandemic phase is surveillance, of clinical and virological data, and this is currently in place. At Interpandemic Phase 0, Preparedness level 3, WHO will have announced that a new virus has been isolated that can be transmitted between humans (cf. chapter 3). The Virus Reference Laboratory, the National Disease Surveillance Centre and the sentinel general practices will augment their surveillance for influenza. Health Boards and Departments of Public Health will be placed on alert and when the pandemic is

officially announced by WHO (Phase 1), the national and regional pandemic preparedness plans will be activated.

8.3 Vaccination: identifying priorities

Ireland will act on advice from the WHO Collaborating Centre in London as to the appropriate vaccine composition and drug treatment to be used in the pandemic.

Identification of high-risk groups and priority groups to receive vaccination will be guided by WHO, based on the epidemiology of the infecting strain. The National Influenza Pandemic Committee, in collaboration with the Immunisation Advisory Committee of the Royal College of Physicians of Ireland, will make the final recommendations in ranking identified risk groups and providers of essential services (cf. chapter6).

Until a new influenza subtype actually exists there is no way of determining other groups that may be at risk. Current risk groups for whom vaccination is recommended include:

- All those over 65 years of age
- People with chronic illness.

8.4 Treatment and hospitalisation

Guidelines for diagnosis, methods of treatment and criteria for hospital admission will be developed by the National Influenza Pandemic Committee.

In planning to manage this situation the following need to be taken into consideration:

- Home versus hospital care: Providing care to people in their own homes will place extraordinary demands on Public Health Nursing Services, Community Health services and General Practitioners. The involvement of volunteer groups such as St. John Ambulance Brigade of Ireland and Irish Red Cross Society to assist nursing people in their own homes may be required
- Shortages in health care staff: Emergency plans to deal with the potential shortage of general practitioners, hospital doctors, nursing staff and allied health staff to cope with the influx of patients.
- Maintenance of laboratory services and agreement of a standard sequence of laboratory confirmation tests will be essential.

8.5 Projected time frames

In the best case scenario, a new subtype will emerge during the influenza season in the Southern Hemisphere (April to September), allowing Ireland some time to prepare and move through the earlier levels of the plan. Based on previous pandemics, the second wave of outbreaks will be expected to occur 3-9 months after the initial outbreak.

WHO will report when the pandemic period is over, which is likely to be after 2-3 years. This will be heralded by the emergence of immunity to the new virus subtype and the return to baseline of influenza activity.

8.6 Development of regional pandemic plans

Each health board is responsible for adapting the National Influenza Pandemic Plan to allow for regional variation and requirements. The regional plans will need to consider:

- Establishment of regional command centres
- Schedules of at risk staff and key workers (health care workers, emergency services etc.)
- Protecting staff by offering vaccination and prescribing antiviral drugs
- Accounting for staff shortages
- Prioritisation and delivery of essential services
- Evaluating the impact on health services
- Providing care for people at home
- Storage, distribution and administration of vaccines and antiviral drugs
- Provision of essential equipment and ancillary drugs
- Bed capacity requirements
- Disposal of bodies
- Communication with health professionals, media and the public

Regional pandemic plans need to be developed within the framework of existing disaster / emergency plans to ensure that the people responsible for responding to an emergency are rehearsed in the sequence of actions and educated in the differences between responding to a natural disaster and a medical disaster such as a pandemic where the impact is global.

8.7 Field testing of pandemic plans

Coordinated field exercises to test draft pandemic plans within each health board are recommended to identify the strengths and weaknesses of each plan. Regional plans should be tested and reviewed annually. Field testing of the national plan, which will encompass all of the Health Boards, should take place at least every three years.

8.8 Use of scenarios

Scenarios can be used in tabletop or field exercises to identify “what if” situations and stimulate discussion and identification of options.

8.9 Overview of the roles of the organisations involved in pandemic response

8.9.1 Department of Health and Children (DOHC)

The DOHC has national responsibility for planning, initiation, direction and central coordination of the pandemic response.

In order to promulgate these activities, on the DOHC being informed by WHO of the isolation of a new influenza virus with pandemic potential, the Minister for Health and Children, advised by the Chief Medical Officer, will convene an Influenza Pandemic Command Centre. The DOHC and the National Influenza Pandemic Committee will nominate the members of the Command Centre. The Command Centre will be made up of members of the National Influenza Pandemic Committee, or delegates from the organisations represented on that committee. The Command Centre will be advised by a senior officer appointed by the DOHC and other health department officials led by a Coordinator who will assume overall accountability for national arrangements.

In exceptional circumstances, the Minister for Health and Children may set up the Command Centre on the strength of advice from Irish experts in the absence of, or where this differs from, advice from WHO on the grounds of national self-interest.

The DOHC's roles include:

- Liasing with Central Purchasing at ERHA, on behalf of all health boards, in securing supplies of an effective influenza vaccine and anti-viral agents
- Controlling the issue of vaccine and anti-viral agents, in conjunction with Central Purchasing at ERHA, acting on behalf of all health boards.
- Identifying categories of individuals who should be immunised or receive antiviral prophylaxis
- Issuing advice to doctors on the use of vaccines and anti-viral agents and the appropriate treatment of pneumonia
- Issuing other appropriate advice to the health professions, managers, the public and the media
- Liasing with Health Boards, through the Health Board Executive, to ensure that regional pandemic plans are implemented
- Liasing with international agencies such as WHO and EU over the worldwide availability and distribution of vaccine
- Collating and publishing (after the event) a formal report of data relating to the pandemic in Ireland and its impact

8.9.2 The National Disease Surveillance Centre (NDSC)

The principal roles of the NDSC with regard to influenza are:

- To provide epidemiological data with which to inform decisions regarding the national and local response to a pandemic.
- To obtain, analyse and distribute information on influenza activity, including laboratory data, clinical notifications and mortality data within Ireland as well as data from other European countries and the World Health Organisation (WHO).
- To provide epidemiological expertise to aid in the planning and management of the response to a pandemic.

8.9.3 The Virus Reference Laboratory (VRL)

The principal roles of the VRL with regard to influenza are:

- Provision of viral diagnostics.
- Characterisation of strains of influenza virus isolated from clinical cases.
- Assessing the antibody status of population samples.
- Establishing and monitoring the anti-viral sensitivity of isolates.

8.9.4 The Health Board Executive (HeBE)

The principal roles of HeBE with regard to influenza are:

- Coordination of education of health professionals, the public and the media regarding pandemic influenza
- Preparation and distribution of educational materials (leaflets, media advertising etc.) to health professionals, the public and the media
- Creating and maintaining lines of communication between DOHC, Pandemic Command Centre, Health Boards, other health professionals, the public and the media
- Maintaining a list of professional bodies and other organisations to whom educational material should be distributed and that should be part of the communication loop in the event of a pandemic

8.9.5 The Irish Medicines Board

The principal roles of the Irish Medicines Board with regard to influenza are:

- Licensing of new influenza vaccine(s) or antivirals for use during an influenza pandemic
- Considering the use of antiviral agents for prophylaxis during a pandemic
- Monitoring adverse events related to influenza vaccination and antiviral therapy

8.9.6 Local and Regional Laboratories

These laboratories should refer relevant clinical specimens to the VRL for influenza diagnostics and should identify and assess antimicrobial sensitivities of bacteria giving rise to complications of influenza.

8.9.7 The Irish College of General Practitioners (ICGP)

- Through its sentinel practice scheme, the ICGP provides weekly new GP consultations for influenza-like illness
- Disseminate information to its members
- Continuing medical education of general practitioners in the management and prevention of influenza and pandemic preparedness

8.9.8 Health Boards

Health boards are responsible for planning and implementation of local contingency arrangements. In this, they will need to liaise closely with local authorities, social services and other local organisations. The following people may need to be involved in the development of local plans: the Director of Public Health, Health Board administrators, local medical committees, local infection control committee (which may need to be expanded to cover primary care concerns), microbiologist, immunisation coordinator, nurses, pharmacists, local authority representatives (for issues such as handling bodies, local authority workers in 'care in the community' work, residential care homes etc), Gardai, education authorities and all other relevant groups. Regional pandemic planning committees should include one or more members of Health Board senior management and the chair of the committee should be appointed by the Health Board CEO.

Local pandemic plans should be adapted from the national plan and incorporated into the regional emergency plan for each Health Board.

Local plans must clearly delegate responsibilities and include:

- A named coordinator
- Membership of a pandemic coordinating committee consisting of key officials from the Health Board, local authorities, local medical committees, voluntary sector etc, to be convened in the event of a possible pandemic
- An estimate of local vaccine needs for the nationally agreed priority groups in their population
- Arrangements for ensuring vaccine is distributed and administered to priority groups
- Arrangements for issuing protocols and maintaining supplies of antibacterial and antiviral therapy
- Contingency staffing arrangements for primary and secondary health care
- Contingency arrangements for coping with the burden of illness such as provision of extra hospital beds, commissioning beds from nursing homes, hotels etc., cancellation of routine surgery etc.
- Mortuary arrangements
- Communication arrangements for health professionals, the public and the media, particularly for region-specific health information
- Setting up and running regional telephone helplines
- Arrangements for advising on management of local outbreaks and problems
- Training

Local plans also need to consider the needs of immigrants, travellers, ethnic minorities, and faith groups.

In adapting the national plan to regional needs each Health Board will need to determine the resource implications (financial, personnel etc.) of their regional plan.

8.9.10 Individual hospitals

Individual hospitals are responsible for organisation of their own units to accommodate the increased patient loads and staff absenteeism and for immunisation

and provision of antiviral prophylaxis to essential staff according to nationally agreed guidelines.

8.10 Role of organisations at each stage of the pandemic response

8.10.1 Phase 0 - inter-pandemic period

8.10.1.1 DOHC

- Maintain close links with NDSC, VRL, Health Boards and other key organisations
- Advise on use of current vaccines and develop strategies to ensure compliance with recommendations on use
- Make plans for buying and supplying influenza vaccine in the event of a pandemic through Central Purchasing at ERHA, acting on behalf of all health boards
- Advise Health Boards and hospitals on the need for local contingency plans
- Nominate a pandemic co-ordinator, in conjunction with the National Influenza Pandemic Committee
- Nominate the members of the Pandemic Command Centre, in conjunction with the National Influenza Pandemic Committee
- Prepare provisional priority groups for influenza vaccine and anti-viral chemotherapy
- Should these be limited estimate vaccine requirements and plan distribution network
- Prepare contingency outline press briefings and advice to the health professions and the public for use in the event of phases 1-4
- Estimate costs of implementing contingency plans
- Regular review of the pandemic plan (every 1-2 years)
- Regular testing of the pandemic plan, using simulations/"desk-top" exercises (every 2-4 years)

8.10.1.2 NDSC

- Collects, interprets and distributes surveillance data from a variety of sources including WHO
- Collates reports from laboratories on the nature and antibiotic sensitivities of bacteria causing infectious complications of influenza
- Undertakes clinical surveillance of influenza (in conjunction with ICGP and Health Board Departments of Public Health)

8.10.1.3 VRL

- Investigate 'flu-like illness, isolate strains, report to clinicians and NDSC
- Characterises influenza strains and assesses antibody status of population in relation to current strains
- Liase with overseas laboratories, WHO etc.

8.10.1.4 Health Board Executive

- Prepare educational material for distribution to health professionals, the public and the media
- Ensure that an effective communication structure is in place with DOHC, NDSC, Health Boards etc.

8.10.1.5 Irish Medicines Board

- Monitor adverse reactions to vaccine and antivirals
- Ensure that a system for the rapid licensing of new vaccines or antivirals is in place

8.10.1.6 Local and regional laboratories

- Plan for increased demands on diagnostic services during a pandemic and ensure that sufficient staff and other resources will be available
- Ensure that specimens for influenza diagnostics can be rapidly transferred to the VRL

8.10.1.7 Health Boards

- Prepare pandemic action plans
- Identify a co-ordinator for their pandemic action plan
- Test run local pandemic plan

8.10.1.8 Hospitals

- Prepare pandemic action plans
- Identify a coordinator for their response
- Test run local pandemic plan

8.10.2 Phase 1 - emergence of a new influenza virus outside Ireland

When a new virus with pandemic potential has been isolated in another country, WHO informs DOHC and NDSC

8.10.2.1 DOHC

- Within a few days of being informed, DOHC convenes the Pandemic Command Centre to receive all information related to the pandemic and advise on the response
- Start liaison with manufacturers of vaccines, antimicrobials and other essential drugs
- Start negotiation for central purchase of vaccine
- Issue initial information to professionals (medical, nursing, pharmacists etc.) with an assessment of its significance
- Prepare statement for the press

Note: If it subsequently becomes apparent that the new virus is not spreading widely in the world, the Pandemic command Centre would be stood down and the relevant organisations informed accordingly.

8.10.2.2 NDSC and VRL

- Implement their own pandemic plan to coordinate surveillance and laboratory activity

8.10.2.3 Health Board Executive

- Distribute educational material to health professionals, public and the media
- Ensure that Health Boards, other health professionals, local authorities and other relevant groups are informed of the possibility of an impending pandemic

8.10.2.4 Health Boards and hospitals

- Implement their own pandemic plans

8.10.3 Phase 2 - outbreaks caused by new virus outside Ireland

8.10.3.1 DOHC/Pandemic Command Centre

- Review available clinical data on age-specific attack rates and complications
- Liase with manufacturers and distributors to ensure supplies of antibiotics and other essential drugs in conjunction with Central Purchasing at ERHA, on behalf of all health boards
- Warn health boards and hospitals of the possibility of a pandemic, reminding them that a plan should be in place and may need revising (depending on when it was written)
- Finalise prepared press briefing and advice for the public, in conjunction with HeBE

8.10.3.2 NDSC

- Collects influenza indices and informs DOHC, VRL, Health Boards and laboratories (by fax or other electronic means if appropriate)
- Publishes weekly statement on NDSC website and printed updates, if required

8.10.3.3 Local and regional laboratories

- Increase laboratory investigation of 'flu-like illness, in conjunction with VRL

8.10.3.4 VRL

- Characterises influenza strains isolated in Ireland
- Obtains information from overseas colleagues.

8.10.3.5 Health Board Executive

- Issue further information to health professionals, public and the media
- Consider advice to the public about foreign travel to known affected areas

8.10.3.6 Irish Medicines Board

- Advises DOHC on licensing
- Processes licensing applications for new vaccines
- Batch releases vaccines.
- Liase with manufacturers and WHO over clinical studies of immunogenicity of vaccine

8.10.3.7 Health Boards and hospitals

- Establish local vaccine, antiviral and other drug requirements
- Continue implementation of local pandemic plans

8.10.4 Phase 3 - first isolates of new virus in Ireland – pandemic imminent

8.10.4.1 DOHC/Pandemic Command Centre

- Request Health Boards and hospitals to activate their influenza action plan
- Review latest surveillance data
- Finalise advice on the priority groups to be vaccinated
- Advise on use of vaccine and antivirals, including dose and number of doses and how to handle those who are not to be immunised
- Advise, after consultation with NDSC and expert groups, on the most appropriate treatment of pneumonia
- Remind Health Boards and hospitals of the need for restriction of hospital admissions to meet the expected increased demand for hospital beds and that some contracts may need to be suspended

8.10.4.2 NDSC (through its own influenza action plan)

- Increases surveillance (influenza monitoring will require careful interpretation of observations to exclude spurious outbreaks)
- Considers increasing monitoring to include information from other sources such as hospital bed management departments, undertakers, benefit payments, absenteeism in some large organisations etc.
- Distributes information weekly through the NDSC website and printed material, as required
- Collates antibiotic sensitivity and resistance patterns of bacteria causing secondary pneumonia
- Maintains communications with WHO, EU and other international groups, including surveillance centres in other affected countries

8.10.4.3 VRL

- Characterises new isolates
- Determines sensitivity of virus strains to antiviral agents
- Investigates local outbreaks/sporadic cases
- Keeps Health Boards, hospitals, microbiologists and local authorities informed

8.10.4.4 Health Board Executive

- Distributes information to Health Boards, hospitals, GPs, nurses, pharmacists and other professional groups
- Distributes package of advice to the general public, including explicit information about priority groups for vaccine to avoid a rush for vaccine
- Cooperate with DOHC and Health Boards to set up designated public enquiry and press lines and considers daily updated recorded message.

8.10.4.5 Health Boards and hospitals

- Activate their Pandemic Influenza Plans
- Arrange administration of vaccine or antivirals, if available

8.10.4.6 Irish Medicines Board

- Monitors adverse reactions to vaccine/antiviral agents
- Liaises with DOHC and vaccine manufacturers
- Batch releases vaccine

8.10.5 Phase 4 - pandemic influenza in Ireland

8.10.5.1 DOHC/Pandemic Command Centre

- Identifies and responds to particular problems, eg disruption of essential services, availability of vaccine/antivirals etc.
- Hold regular press briefings and give advice to professional groups
- Consider if and when to advise that a national emergency situation be declared

8.10.5.2 NDSC

- Monitors the course of the outbreak within Ireland
- Reports usual indices of influenza activity including geographical and demographical data
- Collates antibiotic sensitivity data from laboratories
- Continues to monitor course of pandemic outside Ireland
- Monitors weekly death rates

8.10.5.3 VRL

- Characterises recently isolated influenza strains in particular for antigenic changes and antiviral sensitivity

8.10.5.4 Health Board Executive

- Continue telephone enquiry lines
- Maintain lines of communication

8.10.5.5 Local and regional laboratories

- Report on bacterial pathogens and antibiotic sensitivity associated with severe/fatal infections to NDSC

8.10.5.6 Health Boards and hospitals

- In accordance with their local influenza action plan consider bed and staffing availability
- Administer vaccine (if available), advise on antiviral use, and liaise with local authorities.

8.10.6 Phase 5 - end of pandemic

A pandemic will be deemed to have ceased when the epidemiological indices have returned to background levels.

The Pandemic Command Centre will prepare a report, reviewing the effectiveness of and lessons learned from the plan. The Chairman will then decide if the Command Centre should be stood down.

Health Board, hospital, NDSC and VRL contingency plans should be reviewed in the light of experience during the pandemic.

Recommendation

- 8.1 Each health board must convene an influenza pandemic group to develop a pandemic contingency plan that addresses the response of the health board to a pandemic.

Chapter 9 Communications

9.1 Introduction

An influenza pandemic will affect very large numbers of people and not only those normally considered to be in a high-risk group. Regardless of planning by health authorities, there will be concern and confusion amongst the general public. Steps that may be necessary, and may cause alarm, include rationing of vaccine, restricting public gatherings or the closure of public facilities in order to contain the spread of the virus. In order to minimize panic and alarm, the public must be kept well informed with factual and up to date information.

The way in which information is imparted to the public at this time could have a significant impact on the success or otherwise of a national pandemic plan. A workable communications strategy is crucial.

The source of information must be credible for the general population to take heed of advice and be given by person/ persons associated with authority. The media also need to be briefed on the situation so that sensible and non-sensational messages are printed and broadcast. Where appropriate negative reporting should be addressed directly.

All health professionals will require accurate data regarding the following:

- Infectivity levels of the virus;
- Epidemiology of the pandemic strain;
- Vaccine availability;
- Assignment to priority groups;
- Distribution and administration of the vaccine;
- Use of antiviral medications;
- Information and advice for non-priority groups;
- Other available resources.

9.2 Prepared public and health professionals.

It is essential that the national influenza preparedness plan include a media strategy.

The first step will be to prepare the public in advance on what to expect if a new strain of influenza reaches Ireland. These should include development of a fact sheet detailing measures that may be needed and their rationale in the event of a pandemic. The fact sheet should outline who should be vaccinated, appropriate infection control procedures that may be warranted (such as isolation of patients, cancellation of elective surgery etc.) and advice on what to do if a person becomes infected.

The media have a key role in imparting factual information, given their ability to reach a large audience rapidly. It is vital that the media feel part of the emergency response and that reporters can trust the information given to them. The media need

assistance to understand the medical details of the pandemic and to be convinced of the usefulness and fairness of any extraordinary measures taken.

Running in parallel with the public communications strategy will be an intensive information campaign for health care professionals including:

- Fact sheets to be distributed to all Health Boards, Departments of Public Health, hospitals, clinics, general practitioners, etc.
- Regular communication bulletins to Irish College of General Practitioners, medical, nursing and health care associations.
- Articles published in medical magazines and health publications.

9.3 Interpandemic period

In the inter-pandemic period emphasis should be placed on promoting the benefits of influenza vaccination and encouraging annual vaccination in all those at risk. In September 2000, a prominent campaign was launched to increase the uptake of both influenza vaccine and pneumococcal vaccine.

Overall, there are a number of issues that will ensure good communication. These include:

- Uniformity of information supplied
- Information gathered and processed must be precise and accurate
- Public priorities must be identified prior to the pandemic in order to address these comprehensively.
- Knowledge of the media industry
- Ensuring that the documentation and information supplied suits the various end –users eg public, health professionals, the media.

9.4 During a pandemic

In the event of an influenza pandemic, information needs to be coordinated on a large scale both nationally and internationally. Guidelines must be set for the dissemination of information so that the information is communicated to the appropriate authorities. Information will have been received from WHO, through the EU Network Committee, EU Rapid Alert Response Network, VRL, and the European Influenza Surveillance Scheme (EISS) of the impending pandemic.

It is vital that the information provided is timely, accurate, appropriate and updated regularly. Imparting this information to a wide audience will require a team of spokespersons. The aim is for a coordinated message, which could be delivered by a number of different authoritative and credible voices.

A communications subcommittee will be established during the interpandemic period with representation from the Department of Health and Children, the National Disease Surveillance Centre, the Virus Reference Laboratory, Health Boards, HeBE and the National Influenza Pandemic Plan Committee.

Involvement of elected spokespersons from the communications subcommittee must begin at phase 0, preparedness level 1 and 2, when a new virus has been identified by WHO but the potential for human transmission has not yet been established. (cf. Chapter 3)

It will be necessary to supply information to Health Boards, health professionals, medical and nursing associations.

Measures to be considered include:

- A free telephone help-line should be organized, providing constant information and general advice for the public.
- A separate free phone number playing a recorded message, which is regularly updated, should be established.
- Advertisements should be prepared setting out the measures to be taken in response to the pandemic, and should include the free phone numbers.
- Information should also be made available on various websites such as those of the Department of Health and Children, Health Boards, HeBE and the National Disease Surveillance Centre.
- Newspaper articles that are factual and up to date
- Posters displaying information in surgeries, health centres etc with a poster campaign.
- Radio and televised broadcasts at regular intervals.

Health Boards will need to organize individual systems to suit their needs, particularly for dissemination of region-specific information.

Recommendations

9.1 The National Influenza Pandemic Plan Committee should establish links with the media industry.

9.2 A co-ordinated message must be produced to impart information to health authorities, health professionals, the media and the general public. This co-ordinated message will need to be delivered by a number of credible voices from the medical and nursing professions.

Reference

- 1) Saliou P. Crisis communication in the event of a flu pandemic. Eur J Epidemiol. 1994; 10:515-517

Chapter 10 Influenza and Public Health Law

In the context of an influenza pandemic, certain emergency measures will have to be taken. These will include:

- Compulsory reporting of the incidence of a novel virus for the purposes of national and international surveillance;
- Vaccination for treatment and prophylaxis of the pandemic virus strain;
- Isolation measures such as quarantine, closure of schools and other public places;
- Cancellation of public gatherings;
- Possible prohibition on travel both domestic and international.

The Irish Constitution provides for declaration of a state of emergency in specified circumstances. It is unlikely that a state of emergency could be declared in the context of a pandemic without constitutional amendment. Current Irish public health legislation will provide a framework to implement some of the emergency measures needed. However, any legislative measures will have to be within the parameters of constitutional and human rights law. Detailed legal analysis will be needed to identify the extent to which citizens' rights could be suspended in order to deal with an emergency such as an influenza pandemic. This must be undertaken as a matter of priority to ensure that appropriate legislative amendments are enacted to provide the maximum level of preparation prior to the onset of a pandemic.

10.1 Current Irish legislation and spread of infectious disease.

Public health measures in relation to infectious disease control overall in Ireland is currently governed by the following:

- 1) The Health Act, 1947 Part IV.
- 2) SI 99/48 Infectious Diseases Regulations.
- 3) The Health Act, 1953, Part IV
- 4) SI No. 390 of 1981 Infectious Diseases Regulations, 1981.

This body of legislation makes provision for ministerial regulation in respect of treatment, prevention and control of infectious diseases.

At present influenza is not a specified infectious disease. Influenza or a specified viral subtype could, however be declared an "infectious disease" under the Health Act, 1947. Section 31 of the Act permits the Minister to make Regulations to deal with the investigation, control and treatment of scheduled infectious diseases. The type of regulation envisaged by the Act are set out in the second schedule and include;

- 1) Compulsory notification of all suspected cases of the virus
- 2) A requirement for adults and children to submit to examination, vaccination, immunisation, including the taking of bloods and other specimens for examination and investigation in the context of the pandemic.
- 3) Requiring adults and children to stay in their homes
- 4) Prohibition of sending children to school

10.2 Notifiable disease

At present as influenza is not a specified infectious disease there is no legal reporting requirement in respect of the Infectious Disease Regulations, 1948 and Sections 14-19 of the Infectious Diseases Regulations, 1981.

The current schedule of disease specified to be infectious diseases as per the Infectious Diseases Regulations, 1981 is under review. Inclusion of influenza as a notifiable disease on this schedule is under consideration.

Any notification procedure will need to comply with the provisions under the Data Protection Act, 1988.

10.3 Examination and Immunisation in a pandemic.

Under the provisions of the Health Act, 1947 Regulation may be made requiring adults to submit themselves and their children to “specified measures” in relation to the control of an infectious disease. The Health Act also provides for the right to object to treatment by a patient or by a parent on behalf of a child. This right to object may be overridden in an emergency by virtue of measures contained in Section 32(b). The constitutionality of compulsory examination/vaccination needs further legal investigation.

10.4 Quarantine Laws

Section 38 of the Health Act, 1947 provides for the quarantine of a person who is a “probable source of infection.” The medical officer must form the view that the isolation of the carrier is “necessary as a safeguard against the spread of infection”.

The person can be detained under the Act either in their home or in a hospital or a place of detention until they are “no longer a source of infection”.

Any emergency quarantine regulations will have to contain checks and balances respecting the rights of the detainee under the Constitution and the European Convention on Human Rights. Again the legal parameters of action in this respect ought to be explored as a matter of priority.

10.5 Closure of schools/ cancellation of public events

Whilst there is no direct power under the health legislation to close schools in the event of a pandemic the second Schedule to the 1947 Act envisages regulations prohibiting parents from sending children suffering from an infectious disease to school. The cancellation of a public event and/or the closure of a public place such as a school would fall under the ambit of Article 11 of the Infectious Diseases Regulations, 1981.

10.6 Prohibition on Travel

The 1947 Act provides for Regulations requiring members of the public to “ stay in their homes”. In addition the Minister could make regulations restricting the use of public transport by infected persons. Restrictions on the movement of persons may offend against EU law particularly if this were to extend to a prohibition on persons including non-nationals from entering or leaving the country. As restrictions on movement of the influenza virus will be central to break the chain of infection, legislative parameters in this regard ought to be established as a matter of priority.

10.7 Compensation for damage caused by special measure

Section 108 of the Health Act, 1947 provides for compensation to be paid to anybody who suffers damage to property or injury due to negligent exercise of any measures under the act. This includes any measures in connection with the control of an infectious disease.

10.8 Emergency Powers Legislation

Irish law does not have a general provision for the declaration of a state of general emergency. The introduction of specific emergency legislation will require a constitutional amendment.

10.9 Other issues

Other issues that may arise include:

- 1) Emergency licensing of vaccines
- 2) Temporary suspension of employment statutes such as the Working Time Act 1997
- 3) General public order provisions
- 4) Allocation of statutory responsibility to health authorities at local level may need to be revised in the context of a pandemic.
- 5) Temporary employment of supplemental medical staff, which may entail employment of persons not licensed to carry out functions which may be necessary.
- 6) The role of the Emergency Response Unit in civil protection

Recommendations

- 10.1 In the event of a pandemic, influenza or an identified viral sub-type, ought to be scheduled as an “infectious disease”. This will facilitate regulations providing for public health measures.
- 10.2 Any secondary legislation made in the context of a national influenza pandemic plan will have to be carefully analysed in the context of constitutional and human right parameters.
- 10.3 Further legal opinion ought to be sought to establish the exact boundaries of legislation in the context of an extreme emergency such as the pandemic.
- 10.4 Consideration should be given to the possibility of a Constitutional amendment in order to provide for the declaration of a general state of emergency if it is the case that the Constitution does not already provide for this.
- 10.5 Consideration should be given to a general review and revision of existing legislation in order to alter the existing penalties to provide a more coercive deterrent to non compliance with public health law.

Appendix A National Influenza Pandemic Committee and Subcommittees

National Influenza Pandemic Committee

Professor W W Hall, Virus Reference Laboratory, UCD (Chairman)

Ms Sally Campbell, Assistant Director of Nursing, North-Eastern Health Board
Mr. Stephen Cusack, Accident and Emergency Consultant, Southern Health Board,
Mr. Joe Foy, Chief Ambulance Officer, Western Health Board
Mr. Kieran Hickey, Director, Office for Health Gain. St. Mary's Hospital, Dublin
Dr. Phil Jennings, Specialist in Public Health, Midland Health Board
Mr. Tom Kelly, Assistant Chief Executive Officer- Community Services, North-Western Health Board
Mr Michael Lyons, CEO, Adelaide and Meath Hospital incorporating the National Children's Hospital, Tallaght, Dublin 24
Ms Mary Mahon, Director of Public Health Nursing, South-Eastern Health Board
Dr. Darina O'Flanagan, Director, National Disease Surveillance Centre, Sir Patrick Dun's Hospital Dublin 2
Dr. Tom Peirce, Consultant Respiratory Physician, Mid Western Health Board, Limerick
Dr. John Devlin, Deputy Chief Medical Officer, Department of Health and Children
Ms Dora Hennessy, Principal Officer, Community Health Division, Department of Health and Children
Mr Fergal Goodman, Assistant Principal, Community Health Division, Department of Health and Children
Mr. Tom McGuinn, Chief Pharmacist, Department of Health and Children
Mr Tony Morris, Principal Officer, Secondary Care Division, Department of Health and Children
Prof. Brian Keogh, Royal College of Physicians
Dr Elizabeth Mitchell, Northern Ireland Health Board
Mr Seamus Dooley, Laboratory Manager, Virus Reference Laboratory, Belfield
Dr. Dermot Nolan, Irish College of General Practitioners
Dr. Niamh Mullins, Medical Officer, National Disease Surveillance Centre
Dr. Robert Cunney, Clinical Microbiologist, National Disease Surveillance Centre
Ms Mary Dowling, Office for Health Gain, St. Mary's Hospital

Surveillance Subgroup

Dr Darina O'Flanagan
Mr Stephen Cusack
Mr Seamus Dooley
Dr Phil Jennings
Dr Thomas Peirce
Dr Dermot Nolan
Dr Niamh Mullins

Vaccination Subgroup

Mr Kieran Hickey
Mr Tom Kelly
Mr Michael Lyons
Prof. Brian Keogh
Mr Tony Morris
Mr Tom McGuinn
Ms Mary Mahon
Ms Sally Campbell

Appendix B Surveillance and Laboratory Procedures

Surveillance procedures

Detection of influenza in the community

1. Community-based surveillance of influenza should be conducted between October (week 40) to May (week 20) each year in the Northern Hemisphere.

The surveillance is conducted by sentinel general practices distributed throughout the health boards. These should report, on a weekly basis, the number of flu-like illnesses seen and include date of birth, sex, general practice identifier number and the date of consultation. Virological confirmation is sought by supplying combined nasopharyngeal and throat swabs on any two patients in whom influenza-like illness was diagnosed from each practice per week.

2. Year-round monitoring in Ireland is provided by the Virus Reference Laboratory in the form of routine detection of influenza viruses.

3. The National Disease Surveillance Centre is the coordinating centre for all data. A weekly report is provided by the NDSC to all parties concerned in the surveillance.

4. The surveillance system should also monitor admissions due to respiratory diseases over the same period. Ideally sampling for influenza virus should also be carried out in these populations.

5. Where possible, sentinel nursing homes should be included in the surveillance.

6. Weekly data for absenteeism of more than 10% of school's population on any one day in the week for any cause should be collected and combined with data from hospitals and nursing homes in each health board region to allow assessment of the impact of influenza on the community and the health services.

Surveillance when pandemic influenza is present overseas

7. Influenza should be added to the list of notifiable diseases in Ireland.

8. All travellers returning from areas with pandemic activity should be provided with information and advised to seek medical attention if they become unwell.

9. All doctors should be advised to ask about overseas travel from patients presenting with respiratory illnesses. Samples should be collected for influenza detection (including viral culture) from all patients who have:

- been hospitalised with viral pneumonia;
- travelled to areas of known or potential influenza activity in the week preceding onset of illness;
- a flu-like illness and are family members or other close contacts of either of the above.

10. Regional Departments of Public Health must immediately be notified of:
- all cases who have been hospitalised with viral pneumonia; and/or
 - people who have travelled to areas of known or potential influenza activity in the week preceding onset of illness; and
 - those who have a flu-like illness and are family members or other close contacts of a person in either of these categories.

Surveillance when pandemic influenza has appeared in Ireland

The interpandemic surveillance system should be augmented by the following measures:

11. Regional Departments of Public Health/ Community Care Areas should be notified of all cases fulfilling the agreed case definition.
12. Local and national data should be accumulated and reported on a weekly basis by the Departments of Public Health, who are responsible for further dissemination of the information on to the National Disease Surveillance Centre.
13. As many patients as possible who present with an influenza-like illness or pneumonia should immediately have throat/nose swabs and/or a nasopharyngeal swab collected. This should be sent promptly to the Virus Reference Laboratory. If bedside diagnostic tests have been validated for the detection of the pandemic strain, then these tests should also be performed either at the bedside or by the first laboratory receiving the sample. Samples must also be sent to the Virus Reference Laboratory for confirmation.

Laboratory capacity and procedures

Influenza detection capacity

1. "Bedside" diagnostic tests for influenza detection must be evaluated.
2. The Laboratory capacity must be established to provide rapid antiviral susceptibility testing.
3. Nucleic acid amplification methods already in place in VRL should be developed and the service expanded to provide adequate diagnostic output. This will also entail comparison of the new methods with conventional methods for both detection and serotyping.
4. All laboratories must refer respiratory samples received for influenza detection as quickly as possible to the Virus Reference Laboratory.
5. Aliquots of samples submitted for antigen detection, PCR, culture or rapid culture methods should be retained if positive for further analysis at an independent reference laboratory. If the specimens are not suitable for culture, then appropriate duplicate samples must be collected. The aliquot or duplicate samples should preferably be stored at -80°C; if that is unavailable, storage at 4°C is acceptable provided the sample reaches the reference laboratory within 48 hours of

collection.

6. All staff must adhere to level 2 biosafety requirements in processing of all routine samples. In particular, any aerosol-producing procedures must be carried out in a Biological Safety Cabinet (BSC) class 1, 2 or 3. Any isolates of influenza virus must be handled within a BSC class 1, 2 or 3.

7. Samples referred for further testing must be securely packaged for transport according to the Transport of Dangerous Goods Regulations, with appropriate absorbent material and protection against breakage.

8. The Virus Reference Laboratory (based on the patient's history, clinical illness, or initial typing results) should immediately contact WHO Collaborating Centre in London if a new strain of influenza is suspected.

- Ideally these samples or isolates should be handled in a BSC Class 3 or in a biosafety level 3 laboratory. If that is not available, then conditions must be strictly biosafety level 2, a BSC class 1 or 2 must be used and the operator must wear a gown, gloves and mask.
- BSCs must be cleaned after spills and at the end of the day. They must be wiped over with 1% glutaraldehyde and left to dry with the extraction system running. The room will need to be vacated until the odour has dissipated.

9. Where an influenza isolate is known to be a new strain or where it is associated with an outbreak of severe illness, specimens must be processed with high level precautions. The laboratory should immediately contact WHO Collaborating Centre in London for advice. Tests that can be done on inactivated material (eg. an antigen detection or PCR-based method) can be carried out.

10. Laboratories with conventional cell culture capabilities should routinely culture all respiratory samples for influenza and other viruses.

11. The Virus Reference Laboratory should type isolates as influenza A H1, influenza A H3 or influenza B as quickly as possible and refer all influenza isolates, plus any possible influenza isolates that fail to type, to the WHO Collaborating Centre in London. Isolates must be sent at least fortnightly and any that fail to type as influenza A H1, influenza A H3 or influenza B must be referred urgently. If available, RT-PCR of the haemagglutinin gene and typing should be performed on suspicious isolates.

Procedure when pandemic influenza is present overseas

12. Samples should be collected for influenza detection (including viral culture) from all patients who have been hospitalised with viral pneumonia; traveled to areas of known or potential influenza activity in the week preceding onset of illness; or have a flu-like illness and are family members or other close contacts of either of the above.

13. The antigen detection methods or other rapid detection methods may not reliably detect new influenza strains. Therefore ALL respiratory specimens from highly suspicious clinical cases must be promptly referred to Virus Reference Laboratory for conventional tissue culture.

15. All samples from “highly suspicious cases” must be processed urgently using conventional cell culture and PCR methods. All isolates should be typed urgently and referred urgently to the WHO Collaborating Centre in London for confirmation and sub typing.

16. PCR-based genotyping of the haemagglutinin gene should be carried out as quickly as possible on all samples that are positive for influenza A by antigen detection, culture or PCR.

Procedure when pandemic influenza has appeared in Ireland.

The systems described above should be augmented by the following measures:

17. As many patients as possible who present with an influenza-like illness or pneumonia should immediately have throat/nose swabs and/or a nasopharyngeal aspirate or swab collected. This must be sent promptly to the Virus Reference Laboratory. If bedside diagnostic tests have been validated for the detection of the pandemic strain, then these tests should also be performed either at the bedside or by the first laboratory receiving the sample and samples sent to the VRL for confirmation.

18. Isolates should be typed urgently and referred to the WHO Collaborating Centre, as above.

Appendix C Dosage Regimens for Antiviral Drugs

Zanamivir

Marketed as Relenza. Supplied by Glaxo Wellcome Ireland Limited.
Licensed for the treatment of influenza A and B infections in adults
And adolescents (= 12 years) when influenza is circulating.

Available as a metered dose diskhaler, 10 mg per dose.

Dosage:

Treatment 10 mg bd by diskhaler for 5 days

Prophylaxis not approved for use in Ireland.

Oseltamavir

Marketed as Tamiflu. Supplied by Roche Pharmaceuticals.
Not Licensed in Ireland.
Available as 75 mg capsule and oral suspension.

Dosage:

Treatment 75 mg bd orally for 5 days, within 48 hours of onset of
Symptoms of influenza.

Prophylaxis 75mg once daily for at least 7 days. Therapy to begin within 48
Hours of exposure.
Not approved for use in Ireland.

Amantadine

Marketed as Symmetrel. Supplied by Novartis Pharmaceuticals
Ireland, Limited.
Not licensed in Ireland for the treatment and/or
Prophylaxis of influenza A virus infections.
Available as 100 mg capsules.

Dosage:

Treatment 100 mg 12 hrly po for 5-7 days
100 mg 24 hrly po in renal impairment, 10-15 years or
over 65 years
2-4mg/kg in children 1-9 years, maximum 100 mg
daily.

Prophylaxis 100 mg 12 hrly po for period of time during which
protection is required, or 10 days after vaccination.

Rimantadine

Marketed as Flumadine. Supplied by Forest Laboratories Inc, US.

Not registered in Ireland

Available as 100 mg tablets and as a syrup 50mg/ml.

Dosage

Treatment 100 mg 12 hrly po for 5 days
100 mg 24 hrly po in hepatic or renal impairment
or over 65 years for children less than 10 years of age,
dose is 5 mg/kg/day (not to exceed 150 mg daily)

Prophylaxis 100 mg 12 hrly po for period of time during which
protection is required, or 10 days after vaccination
Not licensed in Ireland.

Other drugs

These include drugs likely to be used for the treatment of influenza, secondary pneumonia, and other associated conditions, in an epidemic or pandemic situation. At the onset of the epidemic or pandemic, treatments may need to be reviewed, according to the situation and the drugs and drug information available at the time. The choice of drug may depend on availability and the setting in which it is to be used.

Oral Agents	Inhaled Agents	Parenteral Agents
Antivirals Amantadine	Zanamivir	
Antibiotics Co-amoxiclav Clarithromycin Cefaclor Cefixime Flucloxacillin		Co-amoxiclav Cefotaxime Ceftriaxone Flucloxacillin
Bronchodilators	Salbutamol Salmeterol Terbutaline Ipratropium	
Antipyretics Aspirin Paracetamol Paracetamol/codeine		
Other agents Prednisolone Theophylline Codeine Morphine	Beclomethasone Budesonide Sodium chromoglycate	Adrenalin Aminophylline Dexamethasone Hydrocortisone Methylprednisolone

Appendix D Estimates of the number of excess Hospitalisations and Deaths due to influenza and its complications

Planning for the next pandemic should include modelling of the potential health and economic impact of a novel virus. Meltzer et al studied the economic effects of the next influenza pandemic in the United States¹. Estimates of the potential impact on death rates, hospitalisation rates and outpatient visits rates in Ireland have been calculated using this overseas data and the 1996 census data.

Age group distribution of number of cases

The Irish population for 1996 was categorised into 3 age groups, 0-19, 20-64 and 65 years and older (Table 1) for the purpose of modelling². Using only the three age groups simplifies modelling and the oldest age groups matches the defined target group for vaccination during interpandemic years.

Table 1: Estimated age distribution of Irish population²

<i>Age group (years)</i>	<i>Numbers (Thousands)</i>	<i>Percentage of total (%)</i>
0-19	1199	33.1
20-64	2013	55.5
65+	414	11.4
Total	3626	100.0

Percentage of high-risk cases

There are a proportion of persons who, because they have a pre-existing medical condition, are deemed at being at a higher risk of contracting influenza related illness with a serious health outcome (Table 2). The percentages of age groups at high risk were obtained from the Working Group on Influenza Pandemic Preparedness and Emergency Response (GrIPPE, unpublished data). The two scenarios were calculated using upper and lower estimates of age-specific attack rates from 1918, 1928-29 and 1957 epidemics and pandemics.³

Table 2: Two scenarios of distribution of the assumed percentage of high-risk people in the Irish population according to age group used to examine the impact of pandemic influenza¹

<i>Age Group (years)</i>	<i>Distribution A % of population at high risk in scenario A</i>	<i>Distribution B % of population at high risk in scenario B</i>
0-19 yrs old	6.4	11.1
20-64 yrs old	14.4	25.0
65+ yrs old	40.0	55.0
Assumed age-weighted Irish average	15.4	24.8

The lower and upper age-weighted averages of 15.4% and 24.8% were used in the US model. The estimate used are similar to the 22.5% figure quoted by Schoenbaum et al (1976) and the 19.6% for the 1970-1978 used by the US Office of Technology Assessment Study.⁴ To our knowledge there is no equivalent comparable Irish data.

Health Outcomes

Hospitalisations

The excess hospitalisations due to influenza were obtained from US data (Table 3)¹. Some of these estimates were based on hospitalisations from the 1968-69 and 1972-73 epidemic excess hospitalisation rates in Oregon for standard and high-risk groups.

Deaths

The excess deaths due to influenza were obtained from US data (Table 3)¹. Some of these estimates for the standard risk groups were based on the lowest and average age-weighted death rates in the 1957-58, 1960 and 1963 influenza A epidemics. Data from Oregon was used to estimate death rates for the 20 – 64 years and the 65 years and older age groups. As data regarding the death rate among the 0-19 year old age group with high-risk conditions is scarce it was assumed that their rate of death was 9 times greater than the rates used for the standard risk population of the same age.^{1,4}

Table 3: Variables used to define the distribution of health outcomes of those with clinical influenza (Rates per 1000 symptomatic cases, each case requiring at least half a day off work)¹

Variable	Lower estimate	“most likely”	Upper estimate
Hospitalisations (per 1000)			
<i>Standard risk</i>			
0-19 yrs old rate	0.57		6.9
20-64 yrs old rate	1.5		12.0
65+ yrs old rate	12.5		15.8
<i>High risk</i>			
0-19 yrs old rate	6.0		21.4
20-64 yrs old rate	6.9		22.3
65+ yrs old rate	33.3		68.4
Deaths (per 1000)			
<i>Standard risk</i>			
0-19 yrs old rate	0.041	0.07	0.30
20-64 yrs old rate	0.21	0.31	0.41
65+ yrs old rate	2.3	3.51	4.52
<i>High risk</i>			
0-19 yrs old rate	0.4	0.6	21.9
20-64 yrs old rate	0.8		24.9
65+ yrs old rate	23		29.6

For each variable (hospitalisation rates and death rates), there is an upper and lower estimate (Table 3). These are applied to both scenarios, Distribution A and B, across a range of gross attack rates. The number of excess hospitalisations (Table 4) and deaths (Table 5) for the various gross attack rates are presented below. The gross attack rate was defined as the number of symptomatic cases of illness (severe enough to take at least half a day off work) caused by influenza per unit population.

Table 4: Estimates of the excess number of persons hospitalised secondary to influenza or its complications in Ireland

<i>Attack Rate</i>	<i>Distribution A lower estimate</i>	<i>Distribution B lower estimate</i>	<i>Distribution A higher estimate</i>	<i>Distribution B higher estimate</i>
0.10	1430	1705	5178	5806
0.15	2146	2558	7766	8709
0.20	2861	3411	10355	11612
0.25	3576	4264	12944	14515
0.30	4292	5116	15533	17418
0.35	5005	5696	18121	20321
0.40	5720	6822	20710	23224
0.45	6435	7673	23299	26127

Attack rate is the proportion of the Irish population with symptomatic influenza (severe enough to take at least half a day off work)

Table 5: Estimates of the excess number of persons dying secondary to influenza or its complications in Ireland.

<i>Attack rate</i>	<i>Distribution A lower estimate</i>	<i>Distribution B lower estimate</i>	<i>Distribution A higher estimate</i>	<i>Distribution B higher estimate</i>
0.10	505	645	1597	2397
0.15	758	967	2395	3595
0.20	1010	1289	3193	4794
0.25	1263	1611	3991	5992
0.30	1515	1934	4790	7190
0.35	1768	2256	5588	8389
0.40	2020	2578	6386	9587
0.45	2273	2900	7184	10786

Attack rate is the proportion of the Irish population with symptomatic influenza (severe enough to take at least half a day off work)

References:

1. Meltzer MI, Cox NJ, Fukuda K. The economic impact of pandemic influenza in the United States: priorities for intervention. *Emerging Infectious Diseases* 1999;5:659-671
2. Central Statistics Office. 1996 Population Census.
3. Glezen PW. Emerging infections: pandemic influenza. *Epidemiol Rev* 1996;18:64-76.
4. Office of Technology Assessment, U.S. Congress. Cost effectiveness of influenza vaccination. Washington: Government Printing Office; 1981.

**Appendix E Influenza Pandemic Contingency Plan
for Health Care Institutions**

**AN INFLUENZA PANDEMIC
CONTINGENCY PLAN
FOR
HEALTH CARE INSTITUTIONS**

Section 1.1 Recognition and Potential Impact of a Pandemic: Implications for Planning.

Timing

It is certain that another pandemic will occur, although it is impossible to predict when. There may, however, be very little warning. Influenza pandemics begin abruptly and spread rapidly.

While influenza virus characteristically causes infection during the winter months, influenza due to a new strain could present at any time as a result of infected passengers arriving in Ireland from the Southern Hemisphere.

Recognition of a pandemic

The World Health Organization has defined levels for declaring a pandemic alert and a pandemic (cf. Chapter 3). A pandemic:

- Is imminent when there are reports of a new and significantly different virus strain to which most people are susceptible, and which is associated with unusually high rates of morbidity and /or mortality;
- Exists when there is evidence of rapid international spread of disease due to the new virus;
- Reached Ireland when sentinel practices and/or hospitals report increased frequency of respiratory disease and /or pneumonia
- Confirmed in Ireland when the virus has been isolated from patients.
-

Magnitude of Past Pandemics

The Spanish Flu Pandemic of 1918 caused an estimated 40 million deaths worldwide. In 1918 and in 1919 6,788 and 7,468 deaths were attributed to influenza in Ireland.

How many beds will be needed?

The WHO suggests that plans should be in place against a pandemic causing illness in 25% of the population. In the worst-case scenario, there will be insufficient time to develop, acquire, distribute and administer the pandemic strain vaccine to the population. This could lead to an attack rate of 100%.

Even if the vaccine against the new strain is available, two doses may be required in order to produce an effective immune response, which may not be achieved until 6 weeks after the first dose. The vaccine is typically 70 – 90% effective, but potentially 30% of those vaccinated may be unprotected.

The effective use of antivirals for prophylaxis also presumes sufficient quantities of effective drugs and sufficient time to distribute them widely and continually. Although antivirals have been shown to be effective in controlling institutional outbreaks of influenza it should be noted that these drugs have not been evaluated to date in a pandemic situation.

Section 1.2 Meeting bed requirements

Determining current bed capacity

Public Sector

A review of the current public bed capacity in Irish hospitals has recently been published¹. The total acute hospital bed compliment in 2000 was 11,832. In addition to these there are a further 420 non-acute hospital beds (includes psychiatric beds, hospice beds etc). Measures to improve the efficiency of bed usage, such as increased use of day surgery and measures to reduce delayed discharge of patients from acute hospitals, should make a further 1,495 beds available within the current system. The national review of acute hospital bed capacity estimates that a further 2,840 inpatient beds are required. Even with the addition of these extra beds an influenza pandemic would place enormous demands on bed capacity.

Private Sector

The combined total of medical and surgical private beds is 5,000. Of these, in reality only 1,800-1,900 are active medical beds. The purchasing or leasing of beds from the private sector will need to be considered.

Options for increasing bed capacity

The widespread occurrence of influenza will in itself limit elective admissions to public and private hospitals. Appendix F provides an optional survey form to aid hospitals in estimating their maximum capacity, taking into account factors such as the availability of oxygen outlets.

To create further medical beds health boards and hospitals should follow the recommendations given in section 7 of the national review of acute hospital bed capacity¹ and should consider the following:

1. Utilise reserve capacity in public hospitals.
2. Selectively reduce elective admissions in public hospitals.
3. Purchase (lease) private hospital beds (non-intensive care) for public patients.
4. Selectively reduce elective admissions in the private sector.
5. Create emergency hospital capacity by using rehabilitation facilities, community centres, military hospitals, hotels etc.
6. Temporarily rationalise acute specialist services between networks.
7. Recommission identified closed facilities

To create further critical care beds (intensive care, coronary care, ventilated), consider the following (listed in order of priority):

1. Utilise reserve critical care capacity in public hospitals
2. Selectively reduce elective admissions in public hospitals (reduces intensive care/ high dependency bed requirement)
3. Utilise emergency ventilation facilities, eg recovery and operating rooms.
4. Purchase (lease) private hospital critical care beds for public patients

5. Selectively reduce elective admissions in the private sector (reduces intensive care unit, high dependency unit bed requirement).

Rationalisation of acute hospital specialist services

Some services could be consolidated in the short term, to maximise the use of all hospital beds, eg obstetric services. Considerations include:

- Some hospitals have high dependency units but no intensive care facilities.
- Staff and equipment may need to be transferred
- Such factors will limit the complexity and risk of urgent surgical cases.
- Patients, friends and relatives may have to travel longer distances.

Rehabilitation facilities

As many as possible of those admitted for rehabilitation should be discharged home with increased home support services.

Rehabilitation places may provide a similar level of care as in hotels. Oxygen cylinders will need to be provided, as oxygen outlets are unlikely to be available.

Hotels, Hospital in the home, Community halls

These could be used as alternative step down facilities for people who do not require intensive medical care but who are not capable of caring for themselves in their homes. Public Health Nurses and General Practitioners could staff these facilities. The main function of hospital in the home during a pandemic is to facilitate early discharge. It will be logistically difficult to expand the service rapidly as it is resource-intensive. Voluntary organisations, such as the Order of Malta or the St. John's Ambulance Brigade, could be asked to provide temporary home care staffing.

Closed hospitals

Several hospitals have been closed over recent times. The status of these hospitals and suitability for use in a pandemic needs to be investigated.

Section 1.3 Health Care Staffing

Staffing issues

There will be a marked increase in demand for health care workers. At the same time 40- 70% of the workforce may be unable to attend work for a period of time through illness. Others may need to look after sick family members or young children at home.

Parents may be reluctant to send children to day care for fear that they will catch influenza. Day care centres may close because of staffing shortage. There is a possibility that schools and day care centres will be closed as a public health measure.

Consideration should be given to issuing a directive that workers in non-essential occupations should stay at home to look after family members, to allow workers in essential occupations to continue to work.

Potential sources of Labour:

Medical students

In Ireland, there are currently 587 final year medical students for the academic year 2000/2001 in the combined universities. Under the current Medical Practitioners act 1978 there is no allowance for the registration of individuals who do not hold a primary medical degree. Therefore, current legislation will need to be reviewed or else the introduction of “ good Samaritan” legislation must be considered to allow individuals to act within a reasonable set of competencies without fear of future repercussions.

Fourth and fifth year students (totalling 1,169) could be used for hospital duties such as porters etc.

Nursing students

In Ireland approximately 1,556 nursing students are due to graduate in academic year 2000/20001. Student nurses must work under the supervision of a registered nurse and cannot perform the duties normally carried out by registered nurses. Indemnity cover is the responsibility of health care providers.

Registered Nurses.

An Bord Altranais is the agency with responsibility for education, examination, registration and discipline of the nursing profession. Registered members include:

- Practising members
- Non-practising members
- Overseas members

- Retired members.

In 1999, there were 61,329 fully registered nurses. From this figure, a total of 50,940 stated that they were in active practice in Ireland. The remaining 10,389 were not practicing in Ireland. The latter figure will include nurses who are not working or who are working occasional shifts or are working abroad.

Specialist physicians in adult and paediatric medicine

Specialist physicians currently practicing in approved posts total 149. In addition to this, there are 73 Paediatricians and Neonatologists.

General Medicine	149
Accident and Emergency Physicians	16
Anaesthetists	209
Geriatric Medicine	33
Infectious Diseases	3
Paediatricians and Neonatologists	73
Microbiologists	17
Total	500

Non Consultant Hospital Doctors

The Number of NCHDs employed by in the public sector as of 1st October, 2000:

<i>Grade</i>	<i>Total</i>
Intern	401
House Officers	1,433
Registrar	966
Senior/Specialist Registrar	419
Total	3,220

Staffing of hotel hospitals needs to be considered with experienced medical practitioners. Adequate supervision and support from a designated hospital and consultant physician will need to be made available.

Allied health professionals and support staff

Trainees in the following professional groups could be considered to supplement the workforce: physiotherapy, pharmacy, radiography, and pathology services.

Volunteers

The following established volunteer organisations should be considered to help out in hospitals (eg serving meals, porters) and to support persons sick at home.

St. John Ambulance Brigade of Ireland

Section 1.4 Hospital Action Plan

Hospitals must review the following areas as part of their disaster planning for an influenza pandemic.

Airflow

As influenza can be spread by droplet, it is highly advisable to determine in advance the airflow between different floors, wards, rooms, corridors, radiology, operating and recovery rooms, critical care areas and the Accident and emergency department. Check and document that negative pressure rooms are indeed at negative pressure.

Oxygen supply

- Does each bedside have an oxygen supply and suction?
- How many beds can be supplied with oxygen at a flow rate of 15-20 litres per minute simultaneously?
- What are the logistics of obtaining oxygen cylinders and portable suction?
- Is it possible to regulate the flow of oxygen?
- Is it possible to augment the oxygen supply using methods other than oxygen cylinders for individual patients?

Medical air supply for ventilators

- What is the upper limit of ventilators that can be simultaneously supported by the current medical air supplies?
- Is it possible to augment this air supply?

Evaluation of ventilatory capacity

- Calculate the maximum number of patients that your intensive care unit can ventilate concurrently if you have sufficient staffing. Take into account the physical number of beds, equipment, ventilators, oxygen, suction and gas supply.
- If all elective surgery (including cardiac surgery) was stopped, how many extra beds (ventilated and non-ventilated) would become available in your intensive care unit?
- What proportion of total ventilated intensive care bed days are made up of elective surgical patient (including cardiac surgery in your hospital)?
- If there was a major public health emergency how many extra emergency ventilatory beds could your hospital create?

Patient accommodation

- What space for beds exists in the hospital (consider closed wards, day care)
- How many physical beds are available?
- Which floors would be designated influenza confirmed/ suspected and influenza free zones? Take into account airflow patterns and availability of specialist equipment
- Which separate area should be designated for the admission and assessment of those with influenza?

Staffing

- How will you provide staffing for increased number of medical patients and an increased ventilatory capacity?
- Consider redeployment of current staff, the use of retired and semi-retired staff, volunteers and auxiliaries.
- How up to date is your staff list and staff contact details in the case of an emergency?

Patient admission

Admission pro-forma should be developed and completed for each patient admitted with influenza (Appendix G).

Consumables

Note the availability and storage location of the following:

Oxygen delivery

Oxygen tubing

Facemasks

Nebulizers

Nasal prongs

Oxygen humidification and warming

Oxygen cylinders

Oxygen flow metre/regulators

Oximeter

Arterial blood gas syringes

Bulk liquid oxygen

Infection control

Gloves

PFR 95 masks

Surgical masks
Alcohol based hand rub
Antiseptic hand wash
Gowns/ Plastic aprons

Parenteral therapy

Intravenous cannulae
Central lines
Peripherally inserted central catheters
Intravenous tubing
Needles
Syringes
Water for injection
Saline for injection
5% dextrose for injection
Method of securing intravenous cannula
Three way taps
Bungs
Skin preparation
Intravenous fluids (normal saline, 5% dextrose, Hartmann's) in 1000 mls, 500 mls, 100 mls.

Radiology services

Review work flow patterns to minimise contact between infected people and others.
Ensure adequate supply of films, solutions and monitoring tags for extra staff.

Microbiology

Ensure the availability of :
Culture media
Blood culture bottles
Sputum and nasopharyngeal aspirant containers
Viral transport medium
Antibiotic sensitivity testing
Tests for determining level of penicillin resistance for *Streptococcus pneumoniae*
Rapid results on sputum gram stain
Appropriate referral of viral culture specimens

Pharmacy

Consider dispensing antibiotics and antivirals to the wards, fully labelled with all instructions and premixing of antibiotics.
Review security arrangements for storage within pharmacy and on the wards.

Hospital operating structures

There are a number of departments/ services that are essential to the running of a hospital. Due to the increase in hospital capacity during a pandemic, there will be a marked increase in demand on services.

Engineering (essential for dealing with breakdowns, maintenance, checking airflow)

Sewerage
Water supply
Medical gasses (essential for provision of oxygen, medical air, suction, nitrous oxide)
Natural gas supply
Electricity
Security (antivirals and vaccine will be in short supply, adequate security is essential)
Air-conditioning/ airflow (essential for air flow. Preventing spread of influenza)
Maintenance services
Vehicles and transport
Motor vehicles fuels

Central sterilisation
Infection control
Pharmacy
Information technology
Pathology services
Radiology
Nuclear medicine
Purchasing
Warehouse/stores
Linen services
Food services
Environmental/ cleaning services
Mortuary space

Section 2.1 Infection Control Measures

Infectivity

The incubation period for influenza is short, typically 1-3 days. Spread of influenza virus is by droplet. Transmission may also occur by contact with contaminated environmental surfaces and hands as the virus may persist for hours, especially in cold dry conditions.

Viral shedding precedes the onset of symptoms by 1-2 days, and continues for 3-5 days after clinical onset. Viral shedding may be prolonged up to 7 days after clinical onset in children.

Infection Control Measures

On arrival at the Accident and Emergency Department, patients with influenza-like illness should be:

1. Directed promptly to a designated influenza assessment / admission area.
2. Classified into one of the following categories:
 - Infected- Confirmed
 - Infected- Suspected
 - Exposed- potentially infected
 - Uninfected
3. Assign patients to single rooms or cohort with other patients with similar infection. Otherwise separate infected patients in a ward/area as far as possible from uninfected patients. Use negative pressure rooms for isolation, if available.

Observe standard precautions and droplet precautions. Standard precautions involve hand hygiene, wearing of gloves and protective clothing, hygiene and decontamination. Prevention of sharps and other injuries is also now included as part of standard precautions.

- Wear gloves for patient contact, patient-related procedures and handling all equipment, including all contact with items likely to be contaminated with respiratory secretions (e.g. masks, oxygen tubing etc.). Change gloves **between** patients.
- Wash hands immediately with soap and water after removal of gloves and **between** patient contacts. If hand-washing facilities are not readily available use an alcohol based hand rub (provided hands are not heavily soiled), followed by hand-

washing as soon as possible.

- Wear a mask to protect when splashing with respiratory secretions or other body fluids is anticipated, or when coughing or sneezing are likely.
- Wear a disposable waterproof apron during procedures and patient activities that are likely to generate splashes or sprays of respiratory secretions. **Remove apron** promptly and wash hands immediately.
- As part of standard precautions, cover cuts and abrasions with a waterproof dressing, avoid injury and wear protective clothing (e.g. visors, goggles) if deemed necessary to prevent splashing.
- Handle used patient care equipment avoiding contamination of skin, clothing and other patients. Ensure that reusable equipment is cleaned and decontaminated appropriately before use again.
- Dispose of waste carefully, as per Healthcare Risk Waste Policy
- Restrict patient and staff movement between wards as much as possible.
- Ensure that the hospital has adequate procedures for the routine care, cleaning and disinfection of the environment, including surfaces, beds, bedrails, bedside equipment and other frequently touched surfaces. After cleaning, decontaminate with hypochlorite (1000 ppm available chlorine)
- Ensure mattresses and pillow covers are intact and in good condition. After use and between patients, if laundering is unsuitable, wash with detergent and water, followed by decontamination with a hypochlorite solution (1000 ppm available chlorine).
- Clean up spills, vomit, secretions etc. with a disinfectant, such as hypochlorite 1000 ppm available chlorine, using disposable materials and protective wear (disposable gloves, plastic aprons). Rinse area after use of bleach disinfectants.
- Wear gloves when handling disinfectants. Ensure adequate ventilation (e.g. open windows) as disinfectants may produce toxic fumes.
- Visitors must be strongly discouraged from visiting confirmed and suspected cases. Close relatives of terminally ill patients

and parents of children can be exempt, but should be advised to wear a mask when visiting, wash hands on leaving and not visit any other patients in the hospital.

- To reduce nosocomial transmission to patients, eliminate or curtail elective medical and surgical admissions, and restrict cardiovascular and pulmonary surgery to emergency cases only.
- Staff who have symptoms of influenza-like illness must be assessed and removed from duties that involve direct patient contact. Staff with acute febrile illness who have been caring for a patient with suspected or confirmed influenza 2-5 days prior to onset of symptoms, should be excluded from all duty until acute symptoms resolved.

Criteria for cohorting or isolating patients

For the purposes of cohorting and/or isolating patients, in the setting of only one influenza virus strain circulating, the following criteria can be used:

1. Confirmed infection- either by viral detection from a nasopharyngeal aspirate or swab using:
 - Polymerase chain reaction (PCR) testing
 - Direct antigen testing -includes immunofluorescence (IF)
 - Culture positive (picks up some samples that IF will miss)Or detection of a diagnostic rise in antibodies on serology.
2. Patients assigned to infected-suspected category, but do not develop symptoms of influenza-like illness, can be moved into a “non-infected” room after the incubation period of 5 days.
3. The following criteria can be used for placing a patient or staff member into a “protected or unlikely to get ill with influenza” category:
 - Documented influenza infection and now recovered.
 - Clinically suspected influenza infection, but not confirmed, no alternate diagnosis, now recovered and too early for positive serology or equivocal serology result. This may vary case by case.
 - Vaccinated and antibody titre level high.
 - On prophylactic antiviral therapy with neuraminidase inhibitor.

Staff education

The following topics should be covered:

- Epidemiology of influenza
- Modes of transmission
- Means of preventing the spread of influenza, e.g isolation, segregation, use of protective clothing, decontamination, vaccination and staff health.

Educational materials such as fact sheets, transparencies and videos should be prepared.

The logistics of ensuring that education reaches all staff in a timely manner should be addressed.

Staff vaccination

Each institution must prepare a priority list of staff to be vaccinated in the event that vaccine against the pandemic strain is available for only 10%, for 30% and for 60% of staff.

Particular groups to be considered are:

- Personnel at increased risk of exposure and involved in direct patient care: staff from emergency departments, intensive care units, and medical wards; any other staff in direct contact with known or suspected cases.
- Essential support staff including, but not limited to, the following: information technology, telecommunications, engineering, maintenance, administration, mortuary attendants, laboratory, and radiology.

As it may not be possible to vaccinate everyone in each of the identified areas, a minimum number for each service area must be identified, if the institution has sufficient vaccine for 10%, for 30%, and for 60% of its staff.

Routine vaccination of staff against influenza viruses must be emphasised and the appropriate infrastructure in place to achieve this. Issues to take into consideration include:

- Who vaccinates
- Where
- When
- Consent
- Documentation of refusal?
- Method of including new staff or staff who initially refused
- Method of tracing staff for second doses of vaccine
- Documentation of vaccination status of staff for deployment

Vaccination of patients

Priority groups for vaccination during a pandemic may be quite different from those during interpandemic seasons. The National Influenza Pandemic Planning Committee is developing guidelines for influenza vaccine use in consultation with other institutional bodies and will advise health authorities regarding priority groups should a pandemic occur.

Health care institutions should consider the potential benefits of identifying specific high priority patients and addressing the logistics of contacting these people to administer the vaccine (pandemic strain).

During interpandemic period at risk groups for influenza and its complications should be actively encouraged to receive pneumococcal vaccination. There is considerable overlap between the priority groups for influenza vaccination and pneumococcal vaccination. This can be achieved by increasing public awareness of the benefits

through promotional campaigns. *Streptococcus pneumoniae* is the most common bacterial super-infection in influenza.

Section 2.2 Assessment in the Emergency Department

The following are general guidelines that may be useful in the event of a pandemic.

Triaging at the influenza assessment / admissions area

- Patients requiring immediate resuscitation should be diverted to the emergency department as per standard practice.
- Separate areas should be designated for assessment and/or admission of patients with suspected influenza. At least one nurse and one senior medical staff member should staff this area.
- Patients referred with “flu” or those with symptoms of influenza should proceed directly to this area to minimise transmission.
- Oxygen saturation should be measured using pulse oximetry during triaging.

Admission pro-forma

An admission pro-forma should be completed. Appendix G provides a sample form. Care should be taken to consider the differential diagnosis. There is an increased incidence of meningococcal septicaemia while influenza is circulating.

Risk Assessment

During a pandemic, time for clinical examination will be limited in the Accident and Emergency Department, such that triaging of patients will be essential to determine whether patients require admission for treatment of influenza or are deemed clinically stable/ uncomplicated cases and can be managed at home.

There are no guidelines at present regarding the management of patients with influenza infection that identifies certain risk factors/ characteristics that determines whether in-patient treatment versus home treatment is more appropriate. Studies conducted on assigning risk group status to patients with community-acquired pneumonia do exist and provide possible guidelines that could be adapted and applied to patients with influenza.^{2,3} Pathogens commonly implicated in community-acquired pneumonias include *Streptococcus pneumoniae*, *Haemophilus influenza* and *Staphylococcus aureus*. These infections are known to cause secondary bacterial pneumonia in patients with influenza infection and to worsen prognosis.

The main aim of initial clinical evaluation is to determine whether a patient can be managed at home, or whether there is evidence that suggests potential or immediate severity, or that the illness will follow a complicated course thereby warranting admission.

Referral to hospital

In addition to the above list, symptoms and signs that would suggest hospital referral is warranted are set out in figure 1.²

Fig 1. Criteria for Hospital Referral

Symptoms:

Chest pain
Confusion
Drowsiness
Vomiting

Signs:

Cyanosis
Heart rate =125/minute
Respiratory rate =30 breaths/min
Blood pressure = 90/60 mmHg
Temperature =35°C or = 40 °C
Suspected pleural effusion

Home management appears impossible:

Extreme poverty
Social isolation- eg. elderly living alone
Poor likelihood of compliance
Altered mental status

There are a number of risk factors that can complicate the clinical course of community-acquired pneumonia that increases the probability of requiring in-patient treatment such as:²

Underlying diseases

- Chronic Obstructive Pulmonary Disease;
- Cardiovascular disease;
- Neurological diseases;
- Diabetes mellitus;
- Chronic liver failure;
- Chronic renal failure;
- Malignancy;

Alcoholism;

Recent Hospital Admission;

Age >65 years.

Following referral to hospital, there are a number of clinical and laboratory findings that suggest admission is necessary.⁵

Table 1. Clinical and Laboratory features of community-acquired pneumonia associated with an increased risk of death.

<i>Clinical Features</i>	<i>Laboratory Features</i>
Respiratory rate = 30/minute	Serum urea = 7mmol/litre
Diastolic blood pressure = 60 mmHg	Serum albumin =35g/litre
Age = 60 years	Hypoxaemia: pO ₂ = 8 kPa or O ₂ Saturation of < 90% on room air
Underlying disease	Leucopenia: WBC = 4000 x 10 ⁹ /litre
Confusion	Leucocytosis: WBC = 20 000 x 10 ⁹ /litre
Atrial fibrillation	Bacteraemia
Multilobar involvement	

Criteria for admission to the Intensive Care Unit

Further deterioration in a patient's clinical condition may warrant admission to the intensive care unit. Persistence or worsening of at least one of the conditions shown in table 2 justifies consideration of admission to an ICU according to guidelines produced by the European Study on community-acquired pneumonia (ESOCAP) for the management of adult community-acquired pneumonia.³

Other studies by Farr et al showed a 21-fold increase in the risk of death or the need for intensive care unit management when two or more of the following three factors are present:⁵

1. Respiratory rate =30 /minute
2. Diastolic blood pressure =60 mmHg
3. Serum urea =7 mmol/litre

Table 2 Intensive Care Unit Admission

Severe respiratory failure

Respiratory frequency =30 breaths /minute

p O₂ = 8 kPa

Need of mechanical ventilation

Radiographic spread of pneumonia (increase in size of opacity by 50% or greater within 48 hr of admission)

Severe haemodynamic instability:

Systolic blood pressure =90 mmHg or = diastolic 60 mmHg

Need of vasoactive drugs for more than 4 h

Urine output = 20 ml per hour

Metabolic or haematological criteria

Severe acidosis (pH = 7.30)

Severe disseminated intravascular coagulation
Acute renal failure requiring dialysis
Other severe organ failure

References:

- 1) Department of Health and Children. Acute hospital bed capacity: a national review. The Stationer Office, Dublin, 2002 (www.doh.ie).
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- 4) British Thoracic Society. Guidelines for the management of community-acquired pneumonia in adults admitted to hospital. Br J Hosp Med 1993;49: 346-350
- 5) Farr BM, Solman AJ, Fisch MJ. Predicting death in patients hospitalized for community-acquired pneumonia. Ann Intern Med 1991;115:428-36
- 6) Fine MF, Auble TE, Yealy DM, Hanusa B, Weissfeld LA, Singer DE et al. A prediction rule to identify low-risk patients with community-acquired pneumonia. N Engl J Med 1997;336:243-50

Section 2.3 Investigations and Management

This section outlines investigations and management protocols that may be adapted as necessary.

Investigations

On admission

The following investigations should be considered on admission to hospital. Clinical judgement, however, should always inform decisions.

- Chest radiograph
- Full blood count
- Urea electrolytes
- Blood gas
- Pulse oximetry
- Combined nasopharyngeal and throat swab
- Serology for influenza and causes of atypical pneumonia
- Blood culture
- Creatinine kinase (total)
- Sputum Gram stain plus culture
- Electrocardiograph in patients with ischaemic heart disease, or older or sicker.

Routine investigations during the course of illness

- Chest radiograph
- Urea, Creatinine and electrolytes
- Full blood examination

Non-routine investigations

Indications for the following non-routine investigations need to be considered:

- Request for influenza strain typing
- Bronchoscopy
- Lung biopsy

Symptom management

For otherwise healthy people with influenza, management should be directed at ameliorating symptoms, mainly through bedrest and analgesics such as paracetamol. Guidelines for patients are included in Appendix H, and can be copied and distributed as needed. Antiviral drugs may be useful in severe cases.

There is a danger of Reye's syndrome developing in children and adolescents when given aspirin.

Patients must be monitored for complications throughout the illness.

Fluid intake

- Ensure increased fluid intake
- Fluid management in those with primary influenza (viral) pneumonia must be judicious and requires frequent evaluation and close monitoring.

Antivirals

Chapter 7 of “A Model Plan for Influenza Preparedness” deals exclusively with antiviral drugs. Recommendations regarding their use and priority group settings are discussed. Currently only zanamivir is licensed for use in Ireland as a treatment of influenza A and B infections.

Antibiotics

Antibiotics should only be used when a bacterial infection has been confirmed or is strongly suspected. There is no place for prophylactic antibiotics in patients with influenza infection as this only increases the risk of adverse reaction and may select for resistant organisms. Antibiotics should be allowed a reasonable time to be effective.

Indications

Antibiotics should be considered in the following situations:

- *Clinical and chest radiography findings of pneumonia*: Especially if the onset of pneumonia symptoms occurs after a period of clinical improvement.
- *Expectoration of purulent sputum* with a normal chest radiograph concomitantly or even up to 14 days after the onset of influenza. This suggests bacterial bronchitis. Use antibiotics if severe, or in those vulnerable to bacterial superinfection.
- *In patients vulnerable to secondary bacterial lung infection*, antibiotic therapy should be considered as soon as bacterial infection is suspected:
 - Pre-existing lung disease such as bronchiectasis, cystic fibrosis, chronic obstructive airways disease or broncho-pulmonary dysplasia
 - The elderly
 - The very young
 - Pre-existing cardiac disease
 - Late pregnancy
 - Immunosuppression/transplant patients
 - Influenza pneumonitis.

Antibiotic choice for secondary bacterial pneumonia

See adjoining table 1 for empiric antibiotic choice in the treatment of secondary bacterial pneumonia. When the diagnosis can be confirmed microbiologically and the results of culture and sensitivity tests are available, more specific therapy should be initiated.

Rationale

The commonest organisms causing secondary bacterial pneumonia include *Streptococcus pneumoniae*, *Staphylococcus aureus* and *Haemophilus influenzae*.

Parenteral antibiotics

Administration of antibiotics intravenously is preferable to intramuscular administration when a patient is critically ill. The latter are more painful and tissue levels are variable depending on muscle mass. Oral antibiotics should be initiated once the patient is improving (i.e. temperature normalised, respiratory status stable etc.) and is able to absorb oral medications.

Side effects

Antibiotic induced diarrhoea is likely to be a significant problem. Discontinuation of the offending antibiotic is recommended as soon as possible. If this is not possible, changing from a broad-spectrum antibiotic to a narrow-spectrum antibiotic is warranted. The most commonly implicated antibiotics include the broad-spectrum penicillins such as amoxycillin and co-amoxiclav, and the cephalosporins.

Table 1. Antibiotics of choice for treatment of Secondary Bacterial Pneumonia

Antibiotic	Route	Doses	<i>Streptococcus pneumoniae</i>	<i>Haemophilus influenzae</i>	<i>Staphylococcus aureus</i>
Co-amoxiclav	oral/iv	TDS	YES	YES	YES
Clarithromycin	oral	BD	Occasional resistance	YES	YES
Cefaclor	oral	BD/TDS	YES	YES	YES
Flucloxacillin	oral/iv	QDS	NO	NO	YES

Note:

Iv=intravenously

BD= twice daily doses

TDS= three times a day

QDS= four times a day

Clinical Stability and Discharge

Defining clinical stability

Given the anticipated demand for hospital beds, it is important to define clearly those who are clinically stable and can be discharged home or to step down facilities, and at what stage it is appropriate to change from intravenous to oral antibiotic therapy.

Patients are generally regarded as clinically stable when, for the preceding 24 hours:

- Their mental state has returned to normal (or baseline) and
- They are able to eat and
- Their vital signs have remained within a specified threshold.

Once patients have become clinically stable, clinicians should consider:

- Discharge from the current site of care, when the patient has been clinically stable for 48 hours and has maintained oxygen saturation >90% on room air
- Change from intravenous to oral antibiotic therapy.

Time to reach clinical stability

Resolution of vital signs are important determinants of the discharge decision. The median time to reach clinical stability of all vital signs including return to baseline mental status was 3 days, in a study by Fine et al in patients admitted with a community-acquired pneumonia.¹ Patients with the most severe pneumonia at the time of admission took the longest time to reach stability. Other studies have also found that day 3 and day 4 of hospital admission as the critical time to convert patients diagnosed with community-acquired pneumonia to oral antibiotics and plan their discharge home shortly after.²

References

- 1) Halm ET, Fine MJ, Marrie TJ, Coley CM, Kapoor WN, Obrosky S, Singer DE. Time to clinical stability in patients hospitalized with community-acquired pneumonia. JAMA 1998;279:1452-1457.
- 2) Weingarten SR, Riedinger MS, Varis G et al. Identification of low-risk hospitalised patients with pneumonias. Chest. 1994;105:1109-1115

Appendix F Evaluation Of Bed Capacity

To assist the National Influenza Pandemic Plan Committee to plan for an influenza pandemic, please could you complete the following bed survey.
Please exclude the number of beds in the emergency department.

- 1) If a directive came to stop all elective surgery:
 - How many beds (with oxygen supply) would become available? _____
 - How soon could they be ready for the admission of patients? _____
- 2) What is the total number of non-ventilated beds, with oxygen supply, which can be provided by your hospital?
 - Assuming current staffing levels?
 - If extra resources were available in the short term?
 - What are the limiting factors (staffing, equipment, physical space)?
- 3) If a major influenza pandemic affected many young persons who require ventilation, how many extra emergency ventilatory beds could your hospital create? Consider the use of all ventilator capacity and the availability of oxygen/ suction and air-supply and areas such as recovery and operating rooms.
 - Assuming unlimited resources for staffing
 - Assuming current staffing levels
 - If extra resources were available short term, how many extra ventilatory beds could our hospital create?
 - What are the limiting factors
- 4) Does your hospital have any excess capacity to assist other health care facilities or the community, such as provision of meals, sterilization capacity?

Inventory of beds

	NO. OF PHYSICAL BEDS	NO. OF PHYSICAL BEDS WITH OXYGEN	ELECTIVE EMERGENCY BEDS	NO. OF BEDS STAFFED AT CURRENT LEVELS	SPACE FOR BEDS, WITH OXYGEN , BUT NO PHYSICAL BED	SPACE FOR BEDS, NO OXYGEN, NO PHYSICAL BED	COMMENTS
MEDICAL							
SURGICAL							
CORONARY CARE							
INTENSIVE CARE							
HIGH DEPENDENCY							
PAEDIATRIC							
OBSTETRIC							
NICU							
5 DAY WARD							
RECOVERY ROOM							
CLOSED WARDS							

Inventory of ventilators

TYPES OF VENTILATORS	INTENSIVE CARE	CORONARY CARE	HIGH DEPENDENCY	RECOVERY ROOM	OPERATING THEATRES	A/E DEPARTS.	STORAGE/ REPAIR	OTHER
CPAP								
BiPAP								

Inventory of emergency ventilatory capacity

PROPERTY	INTENSIVE CARE	CORONARY CARE	HIGH DEPENDENCY	RECOVERY ROOM	OPERATING THEATRE	A/E DEPTS.	OTHER
Suction							
Oxygen Outlet							
Medical air outlet							
Airflow (negative pressure)							
Airflow (positive pressure)							
Physical bed							
Space, but no physical bed							

Appendix G Admission Pro-Forma

IDENTIFICATION DETAILS *(Attach Hospital ID Sticker if available)*

First name _____ Last Name _____

Sex _____

Age ____ (yrs) DOB _____

Date of admission ____/____/____

Hospital record number _____

RISK ASSESSMENT FOR COMPLICATIONS OF INFLUENZA

Does this patient fall into a “high risk group” for complications of influenza? **Y / N**

Tick all relevant conditions

Adult with

- ☐ Chronic cardiac disease (hypertension is not enough)
- ☐ Chronic pulmonary disease – asthma
- ☐ Chronic pulmonary disease – COAD or emphysema
- ☐ Chronic pulmonary disease – not asthma, COAD or emphysema
- ☐ Chronic renal disease
- ☐ Non insulin dependent diabetes mellitus
- ☐ Insulin dependent diabetes mellitus

- ☐ Child with cyanotic congenital heart disease
- ☐ Adult/child receiving immunosuppressive therapy
- ☐ Resident of nursing home
- ☐ Resident of other chronic care facility
- ☐ >65 year old

Details of vaccination

	Yes	No	N/A	Batch No.	Date given	Tick if given >14 days ago
Has this patient received influenza vaccine within the last 12 months?						
Has this patient received pneumococcal vaccine within the last 5 years?						

Details of antivirals

	Yes	No	N/A	Date commenced	Date ceased	Tick if still taking	Dose
Has the patient taken antivirals in the last 3 months?							
Amantadine							
Rimantadine							
Zanamivir							
Oseltamavir							

History

Date and time of onset of first symptoms _____

Clinical features on history	YES	NO	N/A	DETAILS: date of onset, etc
In contact with someone with influenza in the last 3 days?				
Fever				
Cough				
Myalgia				
Headache				
Arthralgia				
Rigors				
Runny/stuffy nose				
Fatigue				
Purulent sputum				
Pleuritic chest pain				
Substernal soreness				
Breathlessness				
Anorexia				
Diarrhoea				

Fluid intake				
Rash				

Examination findings

Date_____ Time _____

Vital signs

Description	Vital signs	Threshold for high risk
Temperature		<35°C or =40°C
Respiratory rate		= 30/ minute
Heart Rate		= 120/ minute
Blood pressure		Systolic BP<90 mmHg
Oxygen saturation		<90% on room air
Altered mental status		

Respiratory examination

	Left	Right
	Yes/No	Yes/No
Reduced chest expansion		
Wheezes		
Crackles		
Bronchial Breathing		
Increased vocal resonance		

Investigations

Description	Detailed findings	Threshold for high risk
Chest Radiograph		Pleural effusion
Arterial Blood Gas (on % O ₂)	pH pO ₂ pCO ₂ HCO ₃	pH < 7.35
U& E's	Na K Creat Urea	Na < 130 mmol/l
Liver Function tests	Pr Alb ALT AST GGT	Urea > 10.7 mmol/l
Glucose		Glucose > 13.9 mmol/l
Full Blood Count	Hb WCC Plat	Haematocrit < 30%

Other investigations

Investigation	Requested Y/N	Request card Written Y/N	Specimen collected	Result
Sputum				
CK total				
Blood Serology				
Blood Culture x 1				
Blood culture x 2				
Blood culture x 3				
Viral culture Nasopharyngeal aspirate				
Viral culture nasal swab				
ECG				

PROVISIONAL DIAGNOSIS

PLEASE TICK ALL THAT APPLY

Influenza

- ☐ confirmed (by viral culture or antigen testing)
- ☐ suspected
- ☐ not likely but recent contact (could be incubating)
- ☐ unlikely but at risk of complications and not immunised
- ☐ unlikely but at risk and immunised
- ☐ unlikely (recovered from documented influenza)

Bacterial pneumonia

- ☐ confirmed (by chest radiograph)
- ☐ suspected
- ☐ unlikely

Influenza viral pneumonitis

- ☐ confirmed (by chest radiograph and oxygen transfer)
- ☐ suspected (by oxygen transfer)
- ☐ unlikely

Pregnant or breastfeeding?

- ☐ pregnant
- ☐ breastfeeding

The following conditions are unlikely

- ☐ meningitis
- ☐ septicaemia
- ☐ encephalitis
- ☐ carbon monoxide poisoning

ADMISSION

Hospital Admission

- ☐ Suspected Flu ward
- ☐ Confirmed Flu ward
- ☐ Reverse Barrier ward
- ☐ General ward

- ☐ ICU Admission
- ☐ CCU Admission

Treatment:

- ☐ IPPV
- ☐ CPAP
- ☐ Oxygen therapy
- ☐ Antibiotic
- ☐ Antiviral
- ☐ Bronchodilator
- ☐ Paracetamol
- ☐ Aspirin (NO ASPIRIN for adolescents or children)

If not admitted

Discharged to:

- ☐ Hospital in the Home
- ☐ Hotel or other special site
- ☐ Home without special care

Provide copy of:

- ☐ assessment sheet
- ☐ instruction sheet
- ☐ emergency contact names/ numbers (if get more breathless/ deteriorate)

Appendix H Influenza fact sheets and GP guidelines

Adults and Influenza

What is influenza?

Influenza is a common respiratory illness caused by the influenza virus.

What are the symptoms?

Influenza is characterized by the sudden onset of the following symptoms:

- Fever, temperature of 38° C or more
- Aches and pains
- Dry cough
- Headache
- Sore throat
- Severe fatigue

How does it spread?

Influenza is highly infectious and can spread by droplets from a person infected with influenza through:

- Coughing or sneezing
- Contact with contaminated surfaces such as hands, work surfaces.

Adults are infectious for 5 days after the symptoms appear and for 7 days or longer in children.

How to avoid spreading influenza?

- Do not go to work
- Do not go shopping
- Do not go to school or university
- Do not share eating or drinking utensils
- Don't get close to uninfected friends or relatives

How long does it last?

Usually the symptoms start to clear after about 5 – 7 days.

Do antibiotics help?

Antibiotics do not work against viruses, so they have no effect on influenza itself. Some people may require antibiotics because they have a secondary bacterial infection as well as influenza.

Contact a doctor as soon as possible if you have symptoms of influenza and any one of the following:

- Aged 65 years or more
- Pregnant
- Underlying medical condition such as:
 - Asthma- severe enough to need oral steroids, or to have been admitted to hospital
 - Emphysema or chronic obstructive airways disease
 - Diabetes- unstable or brittle diabetes mellitus or insulin dependent diabetes
 - Heart failure
 - Organ transplant

Look after yourself

- Get plenty of rest
- Drink plenty of fluids
- For aches and pains, simple pain relief such as paracetamol taken as per label's instructions (two 500mg tablets every 4 hours, maximum of 8 tablets in a day).
- Keep taking your usual medications
- Avoid aspirin if you are aged 15 or younger, or if you are taking the drug Warfarin

See a doctor if despite these instructions you

- Develop a rash
- Become drowsy
- Get worse
- Become short of breath
- Get sharp pains in your chest when you breathe in deeply

Children and Influenza

What is influenza?

Influenza is a common respiratory illness caused by the influenza virus.

What are the symptoms?

Influenza in children usually causes at least two or three of the following symptoms:

- Sudden onset of fever
- Aches and pains
- Severe fatigue
- Headache
- Dry cough
- Sore throat
- Noisy breathing
- Not eating enough
- Not drinking enough
- Ear ache

Contact your doctor if your child has any of these symptoms *and*

- is under one year old
- was born prematurely and is now less than two years old
- has been in hospital within the last three months
- needs to see a doctor often for :
 - Asthma- especially if the child has needed oral steroids, or hospital or emergency treatment
 - Cystic fibrosis or other chronic lung condition
 - Diabetes
 - Organ transplant
 - Cancer or leukemia
- Develops a rash
- Becomes more drowsy than usual
- Has trouble feeding
- Does not drink enough
- Develops noisy breathing or breathing difficulties
- Complains of pains in the chest
- Gets worse

What can you do for the child with influenza?

- Do not send the child to school or day care
- Encourage the child to drink more fluids
- Use paracetamol for pain or discomfort as per drug label instructions
- Continue usual medications
- Do NOT give aspirin
- Antibiotics do NOT work against viruses and are NOT effective against influenza.

How does it spread?

Influenza is highly infectious and can spread by droplet from a person infected with influenza through:

- Coughing or sneezing
- Contact with contaminated surfaces such as hands, work surfaces.

What can you do to prevent others from catching influenza?

- Do not send your child to day care
- Do not send the child to school
- Do not share eating or drinking utensils
- Minimise close contact with uninfected friends and family.

How long does the disease last?

Usually the symptoms of influenza start to clear up after about 5-7 days.

Is your baby seriously ill?

A fact sheet for infants under 12 months

A for arousal, alertness and activity

Your baby could be seriously ill if it is ...

- **More drowsy than usual**, can't wake properly, doesn't respond to you normally, and is less active. The more drowsy, the more likely the illness is serious. Periods of normal activity and alertness are a good sign.

B for breathing difficulty

Your baby could be seriously ill if it has...

- **A heaving chest**, drawing in its ribs and breastbone, or grunting with breathing.

C for circulation

Your baby could be seriously ill if it ...

- **Suddenly becomes pale** all over, or its legs feel cold up to the knees.

Fluids in:

Your baby could be seriously ill if it

- **Feeds less than half the normal amount over 24 hours**. If your baby is breast fed, keep note over 24 hours of how often it feeds and for how long. If bottle-fed, count up the volume of milk taken over 24 hours and compare it to your baby's normal intake.

Fluids out:

Your baby could be seriously ill if it....

- **Has less than 4 wet nappies per 24 hours**, in a baby under 6 months of age.

See a doctor *immediately* if your baby

- **Is pale, drowsy and hot**
- **Is pale, inactive and cries**
 - **Vomits green fluid**
 - **Has a convulsion**
- **Stops breathing for more than 15 seconds**

The more warning signs the greater the danger.

Guidelines for General Practitioners

Clinical Features

Babies and Children

Often present with a severe, non-specific febrile illness. The major features are fever and cough, sometimes with rhinorrhoea or croup. Symptoms may also be:

- Fever, convulsions, vomiting, irritability and photophobia.
- Fever alone: sometimes associated with vomiting or diarrhoea of short duration
- Poor feeding

Signs of serious illness in young babies:

- Drowsiness: doesn't wake properly or respond normally to mother.
- Breathing difficulty: heaving chest, drawing in of ribs and sternum, grunting with breathing
- Poor circulation: sudden pallor, delayed capillary filling time
- Fluids in: feeds less than half the normal amount over 24 hours
- Fluids out: less than 4 wet nappies per 24 hours in a baby under 6 months of age

In adolescents, the more classical features of influenza are present.

Younger adults

Classical features of influenza are usually present: various combinations of malaise, fever, cough, sore throat, headache, myalgia and sometimes blood tinged sputum. One feature may predominate eg headache or fever leading to an initial consideration of meningitis or septicaemia. Primary influenza pneumonitis can be a presenting diagnosis.

Older adults

Influenza is often overlooked because symptomatology is usually overshadowed by lung complications. Clinical histories may be unreliable where patients are confused secondary to fever and pre-existing diseases.

Pneumonia due to secondary bacterial infection may occur at any age.

Consider pneumonia if any of the following are present:

- Increasing breathlessness
- Pleuritic chest pain
- Productive cough
- Heart rate = 120 per minute in adults
- Respiratory rate = 20 per minute in an adult
- Looks "sick"

Focal chest signs may not be present

Management of influenza infection

Take a full history and general examination

Assess the degree of illness

Note the presence of complications such as pneumonia or otitis media

Note the presence of underlying conditions

Consider differential diagnosis: meningitis, septicaemia, other respiratory virus, subarachnoid haemorrhage, carbon monoxide poisoning.

Treatment

If otherwise healthy and no complications advise bedrest, increased fluid intake and use of antipyretics such as paracetamol, as per label's instructions.

Prophylactic antibiotics should not be commenced. Antibiotics to be used only when there is evidence of bacterial complication.

Adjust regular medications if required

Commence antivirals pending pandemic guidelines and antiviral availability.

Consider influenza and pneumococcal vaccination if patient is within at risk groups as per Immunisation guidelines for Ireland produced by the National Immunisation Committee of the Royal College of Physicians of Ireland, 1999.

Provide information leaflets on influenza in adults, children and how to recognize serious illness in young babies.

Arrange for follow up as required. Ensure the patient knows who to contact if condition deteriorates. Monitor patients for complication throughout the illness.

Refer to Accident and Emergency Department if:

- Rapid deterioration over 6- 12 hours
- Deterioration in pre-existing medical condition eg asthma, heart failure or diabetes.
- Doubt about the diagnosis
- Bacterial pneumonia in an adult at increased risk eg altered mental status, respiratory rate ≥ 30 per minute, systolic BP ≤ 90 mmHg, temp $\geq 35^{\circ}\text{C}$ or $\geq 40^{\circ}\text{C}$
- Suspicion of pneumonia in a child
- Suspicion of primary influenzal pneumonitis
- Poor oxygen exchange

Pneumonia

Focal chest signs may not be present. Consider pneumonia if any of the following are present:

- Increasing breathlessness
- Pleuritic chest pain
- Productive cough
- Heart rate = 120 per minute in adults
- Respiratory rate = 20 per minute in an adult

Chest radiograph should be performed if pneumonia is suspected. Before referring for radiograph consider future action, if hospital admission is warranted on the basis of clinical assessment alone, refer directly to the Accident and Emergency department.

NB: Radiological changes may not become apparent for 2-3 days in pneumococcal lobar pneumonia.

If investigations show:

- Bilateral interstitial changes on chest x-ray: refer to A/E department for admission
- Relatively clear chest x-ray and unwell: Refer to A/E. Consider primary influenzal pneumonitis
- Relatively clear chest x-ray and looks well, observe

Lobar or patchy consolidation: Refer to the A/E if patient is over 65, deterioration in pre-existing disease, altered mental status, respiratory rate = 30 per minute