

**A
FRAMEWORK
FOR AN
AUSTRALIAN
INFLUENZA
PANDEMIC PLAN**

June 1999

Technical Report Series No. 4
From the Influenza Pandemic Planning Committee of the
Communicable Diseases Network Australia New Zealand
Version 1, June 1999

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Acknowledgements

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Terms of Reference

The Influenza Pandemic Planning Committee has been established by the Communicable Diseases Network Australia New Zealand (CDNANZ) to develop a contingency plan for pandemic influenza in Australia. The aim of the plan is to reduce the mortality, morbidity, social disruption and economic losses associated with an influenza pandemic.

The committee will report to the CDNANZ and will present a report for endorsement by 26 May 1999.

Terms of reference:

1. To develop a contingency plan for Australia in consultation with New Zealand in preparation for an influenza pandemic and make recommendations on the necessary infrastructure development for the implementation of the strategy. The aim of the plan is to minimise the mortality, morbidity, social disruption and economic losses associated with an influenza pandemic.
2. Key elements of the plan should include:
 - i) Surveillance for the detection of a novel strain of influenza virus;
 - ii) Surveillance to monitor the impact of a pandemic strain on the population, including the evaluation of antiviral drug resistance in the event of a pandemic;
 - iii) Preventive measures to reduce the impact of the spread of the pandemic strain;
 - iv) A communication strategy for the rapid dissemination of information; and
 - v) Promotion of planning for the provision of medical care and the maintenance of essential community services.

Summary of Recommendations

Chapter 1: Introduction

- 1.1 The Communicable Diseases Network Australia New Zealand (CDNANZ) should maintain the Influenza Pandemic Planning Committee (IPPC) as a permanent subcommittee, to continue the ongoing development and updating of the national pandemic preparedness plan.

Chapter 2. The Epidemiology of Influenza

- 2.1 Modelling of the health and economic impact of epidemic and pandemic influenza should be undertaken.
- 2.2 Investigations and modelling exercises should be undertaken to determine the effects on mortality, morbidity and social disruption of different patterns of vaccination and prophylaxis during a pandemic.

Chapter 3. WHO levels of alert

- 3.1 Australia should adopt the World Health Organization definitions for levels of alertness and preparedness for an influenza pandemic, for reasons of clarity and consistency.

Chapter 4. Animal Influenza in Australia

- 4.1 Membership of Agriculture on CDNANZ should be maintained to ensure the urgent notification of the Commonwealth Department of Health in the event of an outbreak of influenza A in animals, in Australia and overseas, that could be perceived as having an impact on public health. Surveillance following an outbreak in animals in Australia should follow the procedures set by the Surveillance Subcommittee of the IPPC (see Appendix D).
- 4.1 A national policy should be developed for the action to be taken should swine influenza be introduced into the country. (Infection from humans to pigs is possible.)

Chapter 5. Influenza and Public Health Law

- 5.1 In the event of a pandemic, the Governor General should proclaim influenza to be a quarantinable disease and in so doing, enable the Commonwealth Minister for Health to give directions and take actions deemed necessary for control of the pandemic.

Chapter 6. Surveillance

- 6.1 A coordinated national surveillance system should be established 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 community-based surveillance of influenza based on sentinel practices during the interpandemic period, complemented by institutional surveillance, with enhanced measures during a pandemic. It should be conducted following the procedures set by the Surveillance Subcommittee of the IPPC (see Appendix D).

- 6.2 Laboratory systems and capacity should be enhanced to ensure comprehensive and consistent support for national influenza surveillance. All laboratories involved in influenza surveillance should comply with the procedures set by the Surveillance Subcommittee of the IPPC (see Appendix D).
- 6.3 Australian production of seed lots from a new pandemic strain would be possible if a C3+ biocontainment facility were linked to the WHO collaborating centre for influenza reference and research. This would enhance the local capability for vaccine manufacture in the event of a pandemic. Efforts to promote this capability are supported by the IPPC.

Chapter 7. Vaccines

- 7.1 A concerted effort should be sustained to increase the uptake of influenza vaccine, in particular, the uptake of influenza vaccine and pneumococcal vaccine in high risk groups. The Commonwealth should give consideration to providing free immunisation (both influenza and pneumococcal) in all defined high risk groups.
- 7.2 Long-term contingency arrangements for provision of vaccine in the event of a pandemic should be established. This should include:
- dialogue with commercial manufacturers of syringes and containers; and
 - funding of studies aimed at producing vaccine seeds of candidate pandemic strains, from avian and animal sources.
- 7.3 A mechanism for the distribution and security of vaccine and antivirals should be developed, in consultation with medical disaster coordination groups.
- 7.4 There should be a single system for reporting and monitoring adverse events related to vaccination.
- 7.5 Investigation should continue into the method of delivering the vaccine during a pandemic (ie. 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 8. Antivirals

- 8.1 Australia should stockpile a quantity of antivirals as a first line of response to an influenza pandemic threat. The quantities to be stockpiled need to be further determined, as does the ongoing cost of such an action. Currently these antivirals would include amantadine, rimantadine and zanamivir.
- 8.2 The PBS listing of amantadine should be changed to include use as a treatment for influenza during a pandemic.
- 8.3 A limited stock of rimantadine should be made available in Australia under special provisions of the Therapeutic Goods Act. These stocks should be on hand for inter-pandemic prophylaxis, for example when there has been laboratory exposure or for use in emergency personnel going into a high risk area.
- 8.4 Criteria should be developed for the use of drugs during a pandemic.
- 8.5 Supplies of antibiotics and ancillary drugs identified as being in high demand during a pandemic should be frequently reviewed and estimations of requirements during a pandemic regularly reassessed.

Chapter 9. Provision of Medical Care and Essential Services

- 9.1 Each State and Territory should convene an influenza pandemic planning group, to develop a pandemic contingency plan that addresses the capacity of the States and Territories to respond to a pandemic. Ideally the group should include an Australian Medical Disaster Coordination group representative, a National Emergency Media Relation Network representative, a public health medical officer, a Chief Quarantine Officer and a CDNANZ member.

Chapter 10. Communications

- 10.1 The Commonwealth, States and Territories should forge strong links between the National Emergency Media Relations Network, the Public Health media officers, and the DISPLAN media officers.

Abbreviations

ADRAC	Adverse Drug Reactions Advisory Committee
ASPREN	Australian Sentinel Practice Research Network
ATAGI	Australian Technical Advisory Group on Immunisation
BSC	Biological safety cabinet
CDC	Centers for Disease Control and Prevention (Atlanta, US)
CDNANZ	Communicable Diseases Network Australia New Zealand
EMA	Emergency Management Australia
IPPC	Influenza Pandemic Planning Committee
NCDC	National Centre for Disease Control
NEMRN	National Emergency Media Relations Network
NHMRC	National Health and Medical Research Council
NIC	National Immunisation Committee
PBS	Pharmaceutical Benefits Schedule
PCR	polymerase chain reaction
RNA	ribo-nucleic acid
RT-PCR	reverse transcriptase - polymerase chain reaction
SAEFVSS	Serious Adverse Events Following Vaccination Surveillance Scheme
WHO	World Health Organization

1. Introduction

The world will experience another influenza pandemic in the foreseeable future. It could occur at any time, with the potential to cause major and perhaps catastrophic effects across the globe – death, illness, and massive social and economic disruption.

Influenza pandemics occur capriciously and unpredictably, when a major genetic shift in the influenza virus throws up a new subtype to which the world population has little or no immunity. There have been three this century, and the most devastating, the “Spanish ‘flu” of 1918-19, killed at least 20 million people.

Forward planning can go some way to minimising or mitigating the effects. All pandemic threats need to be treated with the same high level of concern and strategies for control and response need to be activated as early as possible. The Influenza Pandemic Planning Committee (IPPC) has therefore been established by the Communicable Diseases Network Australia New Zealand (CDNANZ) to develop a preparedness plan for pandemic influenza in Australia.

A Framework for an Australian Influenza Pandemic Plan (the Plan) provides a strategic framework for the detection and management of pandemic influenza in Australia. It provides a national framework for policy, and direction for the development of plans at the State/Territory and local level, enabling States and Territories to link their own pandemic contingency plans (either existing or future) to the national plan.

1.1. Development of the Plan

The Committee has worked under the chairmanship of Dr Graham Rouch to oversee development of the Plan, which involves a two-stage consultation process. Since the first round of consultation, two sub committees have been established to develop aspects of the plan pertaining to surveillance and the provision of vaccines and antiviral drugs. Committee and subcommittees members are listed in Appendix A.

Contributions from the first round of consultation have been considered by the Committee and have provided additional substance and breadth to the original draft document. In the second stage of consultation, further comments were invited from identified key stakeholders and other interested parties (see Appendix B).

The strong cooperation that exists between Australia and New Zealand in the area of communicable diseases is embodied in the CDNANZ. New Zealand is represented on the IPPC and on both its sub-committees, and each of these bodies has benefited significantly from New Zealand’s experience and expertise. It is anticipated that the Australian and New Zealand preparedness plans will complement and enhance each other, particularly in the area of surveillance.

It must be emphasised that this Plan is a working document rather than a final solution. It is Australia’s first national preparedness plan, and its strengths and weaknesses will emerge over time with continuing debate and experience. It will continue to be revised, added to, altered and refined as knowledge grows and changes.

1.2. Scope and structure of this document

Chapters 2 to 5 provide background information. Chapter 2 briefly describes the structure and typing of the influenza virus, to explain the emergence and behaviour of epidemic and pandemic strains; and it provides an overview of recent epidemic influenza in Australia, and the pandemics of this century, including patterns of morbidity and mortality. Chapter 3 sets out the World Health Organization “levels of alert”, which provide an international system for structuring preparation for and responses to a pandemic.

New pandemic viruses derive from aquatic birds, largely ducks, which act as the asymptomatic reservoir for a large number of influenza subtypes. Chapter 4 summarises what is known of avian influenza in Australia, and the policy for dealing with outbreaks. Chapter 5 describes the legislative framework for a pandemic response, including law relating to quarantine and declaration of a pandemic.

Chapters 6 to 10 consider in detail various aspects of a pandemic response. Surveillance is vital to track patterns of influenza infection, and to provide early warning of the threat of a pandemic, to maximise forward planning and preparedness (Chapter 6). Vaccines and antiviral drugs (both for treatment and prophylaxis) are a crucial aspect of response, and Chapters 7 and 8 respectively cover their role, supply, strategies to maximise supplies during a pandemic, and setting priorities for use in the likely occurrence of vaccine and drug shortages. Chapter 9 considers briefly the allocation of responsibilities during a pandemic, and some of the logistics of response.

Recommendations are provided at the end of each chapter, along with a list of priority actions and a bibliography that also serves to direct readers to more detailed information. The recommendations range from broad policy and planning to specific steps and guidelines for action, particularly in the area of surveillance.

The Plan provides the context within which States and Territories need to develop their own contingency plans for the delivery of health and medical services during a pandemic. Appendix I provides an example of such a plan. The appendices also include drug schedules, laboratories to perform influenza subtyping, and scenarios to be used as part of the planning exercise.

1.3. Who will use the Plan?

The Plan targets a wide range of people who will be involved in planning and responding to an influenza pandemic: health planners, clinicians, public health laboratories, State and Territory health departments, and those involved in the media and communications, the manufacture, registration and supply of pharmaceuticals, the application of quarantine law, and essential services. The coordinating body for all these groups, in relation to planning for a pandemic, is CDNANZ.

Recommendation

- 1.1 The CDNANZ should maintain the Influenza Pandemic Planning Committee as a permanent subcommittee, to continue the ongoing development and updating of the national pandemic preparedness plan.

Bibliography and recommended reading

Each chapter of this document contains a specific reading list and bibliography. The following, however, are recommended as general reading:

European Journal of Epidemiology. Volume 10; 19 part 4. 1994.

Influenza Pandemic Preparedness Plan for the United States. Working group on Influenza Pandemic Preparedness and Emergency Response. February 1998, Version 9.1.

Journal of Infectious Diseases. Volume 176; Supplement 1. 1997.

Nicholson KG, Webster RB, Hay AJ. Textbook of Influenza. Blackwell Science Ltd, Oxford 1998. A readable book with chapters on epidemiology, pandemics, laboratory testing etc.

UK Health Department. Multiphase Contingency Plan for Pandemic Influenza. March 1997.

World Health Organization. Influenza Pandemic Preparedness Plan. WHO, Geneva. 1999.

2. The Epidemiology of Influenza

2.1. The relationship between influenza virus structure and disease

2.1.1. Typing and structure of the influenza virus

Influenza viruses are classified into types, subtypes and strains. Two types of influenza virus, A and B, are responsible for epidemic disease, while a third type, influenza C, is of little epidemiological significance.

Influenza virus particles, or virion, are roughly spherical structures with an approximate diameter of 100nm. They consist of the virus genetic material (ribonucleic acid [RNA]) wrapped in two major inner proteins (*nucleoprotein* and *matrix protein*) within a lipid envelope, on the surface of which are two proteins (*haemagglutinin* and *neuraminidase*). Each of the three types of influenza virus is characterised by its nucleoprotein and matrix protein, and these can be distinguished by immunological tests.

The two surface proteins, haemagglutinin and neuraminidase, are the antigens recognised by the body's immune system when infection or vaccination takes place. This causes antibodies to be formed against the two proteins, particularly the haemagglutinin, thereby protecting the person against infection and disease.

These two surface proteins are involved in infection and production of new virus: haemagglutinin is involved in attaching the virus to the cells it infects, while the enzyme neuraminidase assists the virus to escape from the cell in which it is produced by digesting the receptor which binds to the haemagglutinin.

For influenza A, 15 distinct forms of haemagglutinin have been identified and these are the basis of the 15 subtypes of influenza A, designated H1 to H15. In addition, the neuraminidase exists in 9 distinct forms, designated N1 to N9. All of these influenza A surface antigens have been identified in aquatic birds, particularly ducks, and various combinations of H and N antigens are found. A small number of these subtypes have become adapted to mammalian hosts, including humans, horses and pigs. Since 1977, two influenza A subtypes, designated H3N2 and H1N1, have circulated in the human population.

2.1.2. Emergence of new strains and subtypes

Epidemics

The surface proteins and nucleoproteins of influenza viruses are encoded in the viral genome, which is made up of eight segments of negative sense, single stranded RNA. With each replicative cycle of the virus, very high mutation rates occur and the surface haemagglutinin and neuraminidase antigens are prone to variation. Small mutations give rise to "antigenic drift" which results in the emergence of new strains of influenza A and B.

This emergence of new strains of influenza A and B predisposes to epidemics. If a new strain differs only marginally from a previous strain, there is likely to be some community immunity. The greater the variation, the greater the capacity of the virus to escape recognition by the immune system and therefore the greater the epidemic potential. Epidemics of influenza usually occur between late autumn and early spring and endure for up to 2 months in individual regions but may occur progressively across the country.

Pandemics

Occasionally, major changes in the haemagglutinin and neuraminidase antigens occur such that one or more subtypes of influenza A present in the population are substituted by a novel subtype. This is known as “antigenic shift.” When such a major antigenic shift occurs, most of the human population is presumed to be immunologically naïve and therefore susceptible and widespread severe infections may occur. For example, in 1957 a new influenza A subtype designated H2N2 replaced the H1N1 subtype that had been in the human population for almost four decades.

Antigenic shift is the basis for human pandemics. A necessary precondition for an influenza pandemic is the emergence of a new viral subtype coupled with a capacity for the virus to spread efficiently from person to person and to be virulent enough to cause disease.

Pandemics, as opposed to epidemics, occur globally at unpredictable intervals, are trans-seasonal, and endure for up to 2 to 3 years. This century has seen three true pandemics as well as a further antigenic shift that resulted in the return of a subtype previously experienced by many people. The first and most devastating pandemic occurred in 1918-1919, followed by the pandemics of 1957-58 and 1968-69. In 1977, the influenza H1N1 subtype reappeared after an absence of 20 years.

2.2. Inter-pandemic influenza: characteristics and impact

Influenza constitutes an ongoing and worldwide threat to public health. The ability of influenza viruses to change by mutation results in altered viruses which cause regular epidemics, and these are often responsible for significant levels of severe disease and mortality.

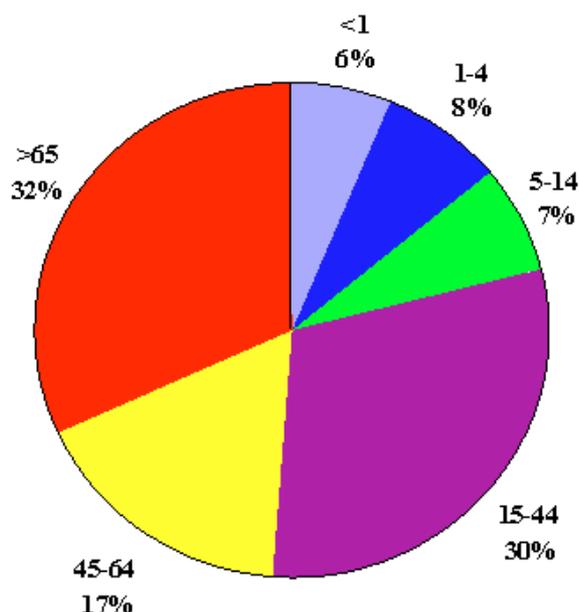
In the southern parts of Australia epidemic influenza most commonly peaks in the winter months of July and August. Earlier activity is commonly reported in the tropical north. Over the last decade, seasonal epidemics in Australia have mostly been related to a series of strains of influenza A (H3N2), although in 1988 and 1995, strains of the H1N1 subtype predominated. Epidemics of influenza B have occurred on alternate years, the last outbreak having occurred in 1997.

Recent strains of influenza A that have been implicated in Australian epidemics include:

Influenza	Subtype	Strain
Influenza A	(H3N2)	Guangdong/25/93
Influenza A	(H1N1)	Texas/35/91
Influenza A	(H3N2)	Wuhan 359/95
Influenza A	(H3N2)	Wuhan 359/95
Influenza A	(H3N2)	Sydney/ 5/97

In Australia there are an estimated 2,300 hospital admissions due to influenza per year. Influenza and all types of pneumonia account for approximately 1% of all hospital admissions. One third of influenza hospitalisations occur in those over 65 years of age (see Figure 1). This does not include the unrecognised influenza infections that precipitate cardiac and respiratory admissions to hospital over the winter months. The average length of stay for influenza and pneumonia is 7 days, which gives an indication of the significant morbidity associated with this illness.

Figure 1: Influenza hospital admissions for Australia, June 1993 to July 1997, by age group: n = 8999. Source: AIHW Hospital Separation Data



The social burden of influenza is increased by its capacity to affect those with underlying cardiac, respiratory or immune disorders. The elderly are particularly vulnerable to influenza and secondary bacterial pneumonia.

In the inter-pandemic periods, influenza and pneumonia account for 1500 to 2000 deaths per year which exceeds deaths from motor vehicle accidents. Over the last decade 87% of reported deaths have been in those over the age of 65 years. Age-specific mortality rates in the elderly are 20-fold greater than those in younger age groups.

2.3. Pandemic influenza

At irregular intervals totally new subtypes of influenza appear in the human population. In the absence of immunity to these new virus subtypes they rapidly spread around the globe causing worldwide epidemics or “pandemics”. New pandemic viruses are derived from aquatic birds, principally ducks, which harbour many novel types of influenza viruses that have not yet infected humans. For an avian influenza virus to initiate a human pandemic, the virus must undergo certain adaptive changes.

Possible mechanisms to explain how new influenza subtypes emerge include:

- *genetic reassortment between animals and humans*
It is believed that this usually occurs by genetic mixing between an avian and a human influenza virus in an intermediate species, such as the domestic pig. Pandemics originate most frequently, but not exclusively, in Asia, probably because of agricultural practices. This is the likely basis for the Asian and Hong Kong influenza pandemics of 1957 and 1968 respectively;
- *direct transmission from animals to humans*
Subtypes with pandemic potential can spread directly between animals, such as swine, and humans. Whether these subtypes go on to cause pandemics is determined by the efficiency with which they spread from person to person. Swine-to-human transmission may have been the basis for the 1918 pandemic. Its devastating impact

on the global population was largely due to the efficiency of person-to-person transmission and the virulence of the prototype strain. In 1997, a cluster of human cases due to an avian influenza virus, H5N1, occurred in Hong Kong, raising concerns that this foreshadowed a pandemic; however the virus, whilst transmitted from birds to humans, did not acquire an effective ability to spread directly from person to person. Elimination of the infected birds appears to have averted any immediate pandemic threat;

- *reappearance of a previously circulating subtype*
In 1977 a H1N1 subtype reappeared in the human population in Russia after not being observed for two decades. The reasons for this are uncertain. Dormancy or a laboratory leak have been postulated as possible causes.

Pandemic influenza is characterised by high levels of infection, more severe disease and increased mortality. The deaths that occur with both epidemic and pandemic influenza are frequently associated with an underlying risk condition or secondary bacterial infection. The complication of secondary bacterial pneumonia is therefore likely to result in increased morbidity, mortality, and demand for adjunctive antibiotic therapy. In 1918 and 1919 many deaths were attributable to both primary viral and secondary bacterial pneumonia.

2.4. Influenza pandemics in the 20th century

During this century there have been three pandemics and one “pseudopandemic”. All three pandemics were associated with increased mortality rates in Australia.

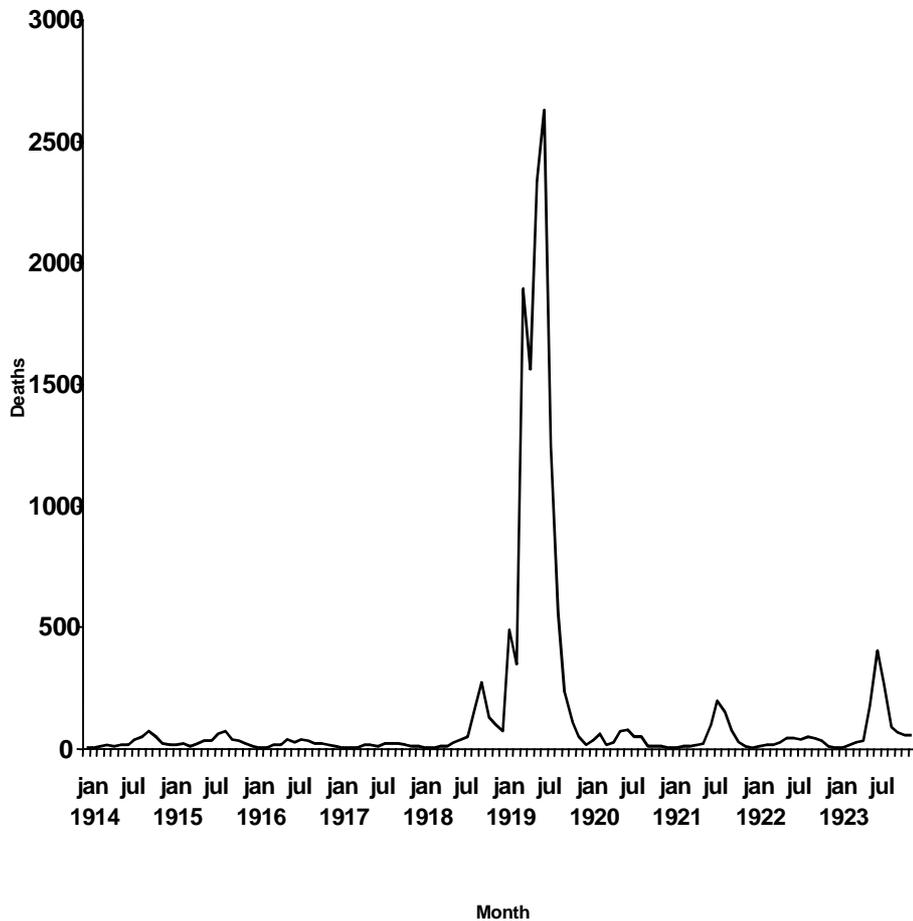
2.4.1. Spanish influenza, 1918-1919

The influenza pandemic of 1918-1919 was unprecedented in terms of loss of human life. The illness was notorious for its rapid onset and progression to respiratory failure and death, and it is estimated that between 20 and 40 million people died worldwide, with the highest numbers of deaths among those aged 20 to 40 years. Approximately 25% of the population in the United Kingdom and United States developed clinical illness.

“Spanish influenza” is a misnomer, as it is likely that the H1N1 subtype that caused the pandemic originated in the USA. The pandemic occurred in three waves, the first two waves in the Northern hemisphere spring and fall of 1918 and the third, which affected Australia, in the first months of 1919.

New Zealand and South Africa were affected before Australia. In 1918 maritime quarantine measures were invoked to prevent ships bringing the disease into Australia. Nevertheless, the first case of Spanish influenza was notified in Victoria in January 1919, and followed shortly thereafter by New South Wales. In the first month, the disease claimed 74 lives across the nation. Six months later, in July, the monthly death toll peaked at 2600 (Figure 2). Hospitalisation rates also increased exponentially, climbing from 12 reported admissions per week for influenza in Sydney in early February, 1919 to 765 per week eight weeks later.

Figure 2: Influenza deaths by month, 1914 to 1923, in Australia. Source: Commonwealth Demography 1914-1923

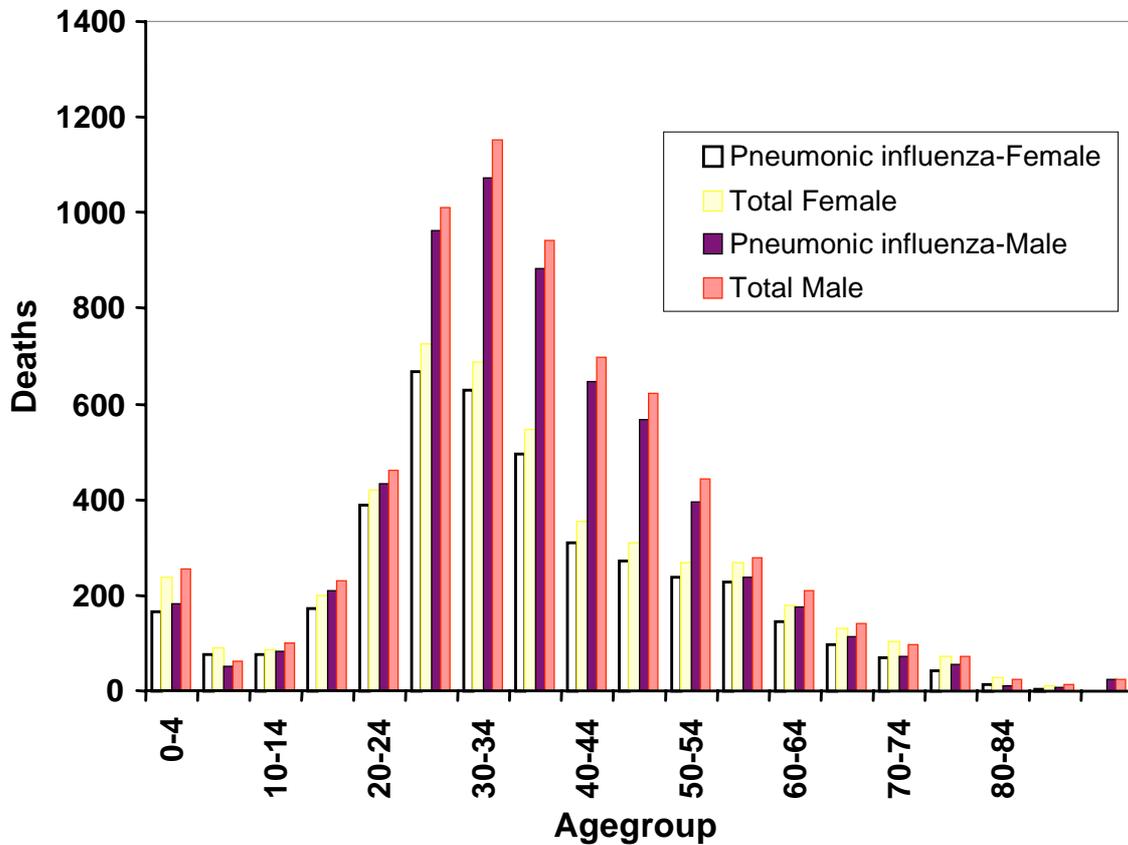


By the end of 1919, 11,500 people in Australia had died of influenza, with 60% of deaths in people aged 20 to 45 years. In these same age groups the male rates were 1.5 to 2-fold higher than in females (Figure 3).

This translates to an age-adjusted mortality rate of 2.24 per 1,000 population, using a 1996 population standard. Based on the current Australian population of 18.5 million, this influenza mortality rate would be expected to result in around 42,000 excess deaths per year. This would represent a 30% increase in overall mortality rates for Australia.

Spanish influenza was a H1N1 subtype that was unusually virulent. In Australia, 88% of all deaths were classified as influenza pneumonia, though it is possible that many of these were secondary bacterial infections.

Figure 3: Influenza and pneumonic influenza deaths by age and sex, 1919. Source: Commonwealth Demography 1919



2.4.2. Asian influenza, 1957-1958

In May 1957 the World Health Organization (WHO) reported a new H2N2 subtype from Singapore. By May 1958 the virus had spread throughout the globe. Infection rates were reported to range from 20% to 70%, but case fatality rates were low, ranging from 1 in 2,000 to 1 in 10,000 infections (Payne, 1958). In Australia mortality rates were 2 to 5-fold greater than in non-pandemic years. The first increases in mortality rates occurred in 1957, with a second wave in 1959 (Figure 4). Age-specific mortality rates showed that those aged over 65 years were most affected (Figure 5).

Quarantine measures were not implemented as the virus had already been seeded widely over a short period of time. Moreover, an estimated 10% to 20% of infections were subclinical, making detection difficult.

Figure 4: Influenza mortality rates per 100,000 population in Australia

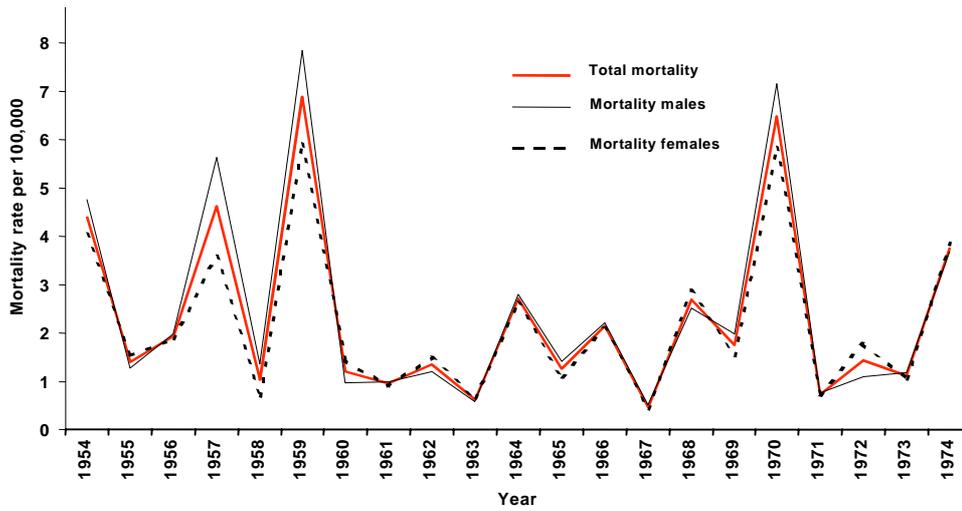
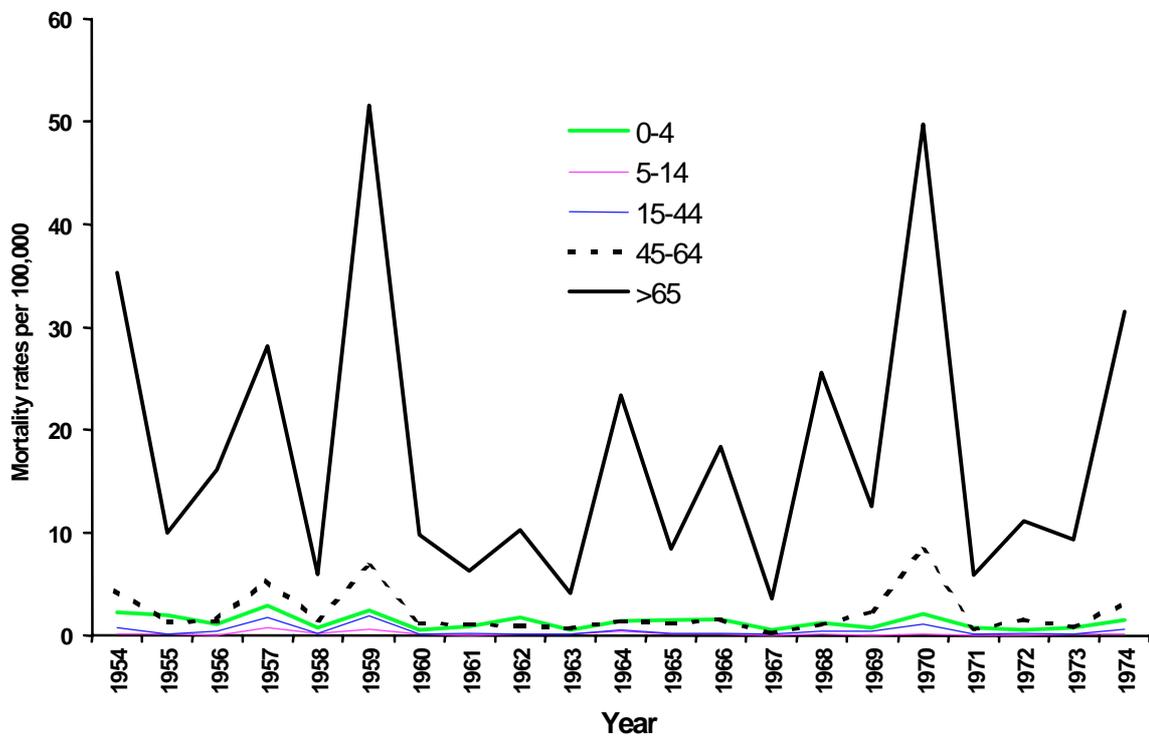


Figure 5: Age-specific mortality rates due to influenza 1954 to 1974. Source: Australian Bureau of Statistics mortality data by ICD-9 code, 1954-1974



2.4.3. Hong Kong influenza, 1968

In mid July 1968 a new subtype, H3N2 emerged in Hong Kong. The first cases of the new subtype reported in Australia were in Darwin in September of the same year. Mortality rates were similar in magnitude to those caused by Asian influenza (Figure 5). Age-specific mortality rates peaked in 1970 and were highest for those over the age of 65 years. Serological studies in blood donors suggested that infection rates were in the order of 25% to 30% (Murphy, 1970).

2.4.4. Russian influenza (pseudopandemic), 1977

The Russian influenza “pseudopandemic” of 1977 occurred when an H1N1 subtype re-emerged in the human population. The epidemiology and behaviour of this subtype were not typical of a pandemic.

The H1N1 subtype had been in the human population until the 1950s, and the subtype that re-emerged in 1977 was antigenically and genetically similar to its predecessor. This meant that people who had had the benefits of exposure were relatively immune. In 1957, however, the H1N1 subtype had been replaced by the Asian influenza subtype, H2N2, and those born after this time had no exposure and therefore no immunity to the H1N1 strains. Children, adolescents and young adults were thus particularly susceptible to the Russian influenza.

The re-emergence of the H1N1 subtype is still a mystery. The global epidemic that occurred was a “pseudopandemic” in that the disease was mild in nature and tended to affect the younger population.

It has, however, had ramifications for vaccine formulation. Unlike previous subtypes, it did not succeed in displacing the existing H2N3 subtype from the human population. As a result, the two subtypes, together with influenza B, have co-circulated since 1977. Vaccine formulations have therefore had to incorporate strains of each.

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, globally, nationally and at State level. There must, therefore, be commitment to undertaking modelling exercises to identify and quantify the potential impact, not only on the health of the population, but in social and economic terms. Modelling is also needed to look at the differential effects on mortality, morbidity and social disruption of different patterns of vaccination and prophylaxis, given the inevitable shortages of drugs and vaccines that will occur (see section 7.4, page 33).

Table 1, Table 2 and Table 3 present range estimates of the potential impact of an influenza pandemic for Australia, using published population-based data from the literature, international expert opinion (Meltzer et al 1999) and 1996 Australian Bureau of Statistics Census data. The assumptions made in these calculations are detailed in Appendix H. The increase in the number of hospitalisations and deaths is expected to occur over a period of two months.

THE FOLLOWING NUMBERS (SEE TABLES 1,2,3) HAVE BEEN EXTRAPOLATED FROM OVERSEAS DATA. ALTHOUGH THEY PROVIDE SOME INDICATION OF THE POTENTIAL IMPACT OF AN INFLUENZA PANDEMIC ON MORBIDITY AND MORTALITY, CONTEMPORARY MODELLING APPROPRIATE FOR THE AUSTRALIAN CONTEXT WILL PROVIDE MORE ACCURATE ESTIMATES

Table 1: Estimates of the excess number of persons hospitalised secondary to influenza or its complications in Australia

Attack Rate	Range	
0.10	8,455	33,353
0.15	12,683	50,029
0.20	16,911	66,705
0.25	21,138	83,382
0.30	25,366	100,058
0.35	29,594	116,735
0.40	33,821	133,411
0.45	38,049	150,087

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

Table 2: Estimates of the excess number of persons dying secondary to influenza or its complications in Australia

Attack rate	Range	
0.10	3,036	13,901
0.15	4,554	20,852
0.20	6,072	27,802
0.25	7,590	34,753
0.30	9,108	41,704
0.35	10,626	48,654
0.40	12,144	55,605
0.45	13,662	62,555

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

Table 3: Estimates of the excess number of persons visiting as outpatients secondary to influenza or its complications in Australia

Attack rate	Range	
0.10	838,958	991,068
0.15	1,258,437	1,486,602
0.20	1,677,916	1,982,136
0.25	2,097,395	2,477,670
0.30	2,516,874	2,973,204
0.35	2,936,353	3,468,738
0.40	3,355,832	3,964,272
0.45	3,775,311	4,459,806

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

Recommendations

- 2.1 Modelling of the health and economic impact of epidemic and pandemic influenza should be undertaken.
- 2.2 Investigations and modelling exercises should be undertaken to determine the effects on mortality, morbidity and social disruption of different patterns of vaccination and prophylaxis during a pandemic.

Bibliography and recommended reading

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3. WHO Levels of Alert

The WHO definitions for the different phases of a pandemic preparedness provide a generic system of alert and preparedness that all countries are being encouraged to consider.

3.1. Phase 0: The inter-pandemic period

During the inter-pandemic period – the period between one pandemic and the next – occasional outbreaks raise concern about the possibility of a pandemic. The most recent was in Hong Kong in 1997, when H5N1 avian influenza caused 18 cases of human infection and 6 deaths. While the H5N1 subtype was not easily transmitted from person to person, there was concern that it could become better adapted to human hosts and spread more efficiently if it was not eradicated from the bird population.

For incidents similar to this, the following levels of preparedness are proposed, to give an indication of the thresholds for activation of different aspects of a national pandemic plan.

3.1.1. Phase 0: Preparedness Level 1

Preparedness Level 1 will exist following the first 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 will exist 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 rapidly spread from person to person and cause multiple outbreaks of disease leading to epidemics remains questionable.

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

3.1.3. Phase 0: Preparedness Level 3

Preparedness Level 3 will exist when human transmission of the new virus subtype has been confirmed through:

- evidence of person-to-person spread in the general population; or
- secondary cases resulting from contact with an index case, with 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. This may also be used as evidence for significant human transmission.

Before announcing Preparedness Level 3, WHO will have held international consultations to ensure that no other explanation is being overlooked in the assessment of the pandemic potential of the new virus, and to be assured that the potential of the virus to cause lower respiratory tract disease or other complications is evident.

During pandemic Preparedness Level 3, surveillance will be enhanced. Plans for the manufacture of vaccines and provision of antivirals to susceptible groups will need to be activated in tandem with an effective communication strategy.

3.2. Phase 1: Confirmation of the onset of pandemic

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

Onset shall be defined as that point in time when WHO has confirmed that a virus with a new haemagglutinin subtype compared to recent epidemic strains is beginning to spread from one or more initial focus.

Depending on the amount of early warning, this phase may or may not be preceded by the series of increasing levels of preparedness described above.

3.3. Phase 2: Regional and multi-regional epidemics

Outbreaks and epidemics are occurring in multiple countries, and spreading region-by-region across the world.

3.4. Phase 3: End of the first pandemic wave

The increase in outbreak activity in the countries or regions initially affected has stopped or reversed, 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 experience, at least a second severe wave of outbreaks caused by the new virus would be expected within 3-9 months of the initial outbreak in many countries.

In addition to an announcement from WHO, it would be expected within Australia and New Zealand that the national sentinel surveillance scheme would identify the start of a second wave of outbreaks. The national control centre would:

- continue to coordinate surveillance activities and report to jurisdictions 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 pandemic will be declared over when the indices of influenza activity have returned to essentially normal inter-pandemic levels, and immunity to the new virus subtype is widespread in the general population. Major epidemics would not be expected again until antigenic variants begin to emerge from the prototype pandemic strain. Surveillance activities and special control measures will return to inter-pandemic levels unless, on the basis of experience gained during the pandemic, it is deemed advantageous to retain these measures.

3.7. Post-pandemic phase

After the pandemic has been declared to be over, the Commonwealth will work with the different jurisdictions (through CDNANZ) to assess the overall impact of the pandemic. This information will be relayed to any international assessment carried out by WHO.

Recommendation

- 3.1 Australia 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>

4. Animal Influenza in Australia

4.1. Avian influenza

4.1.1. Prevalence

It is widely accepted that wild (particularly aquatic) birds act as an asymptomatic reservoir for a wide range of avian influenza subtypes and strains, and that a spillover of virus from the wild to the domestic avian populations is the initial source of outbreaks of influenza in commercial poultry.

Influenza viruses have been isolated from a diverse range of apparently healthy wild birds in Australia. Sampling has been concentrated in northern Australia, from wild birds associated with the migratory flyways. In a major study 0.65% of 7193 samples from 116 species demonstrated haemagglutinating agents, and 6,500 cloacal swabs resulted in isolation of 45 influenza viruses. Moreover, these results demonstrated a wide range of virus subtypes (but not H5). In Victoria 16 avian influenza viruses have been isolated from wild ducks.

Other surveys in Australia have given negative results. At the time of the 1976 and 1985 outbreaks of avian influenza in Victoria, sampling of over 600 commercial poultry flocks failed to detect any infection. The results of surveillance undertaken during other outbreaks of avian influenza in commercial birds have produced similar results.

A 1996 study undertaken in Queensland indicated that exposure to avian influenza virus had occurred in duck and waterbird populations, but not in a pigeon population.

Sampling for avian influenza is part of the Northern Australian quarantine strategy. During 1997 samples from 48 birds were collected, and positive serology was found in 3 whistling ducks trapped at Cape York Peninsula.

The surveys indicate that a wide range of influenza type A subtypes may be circulating in the wild bird population at any one time, although the difficulties in collecting sufficient samples make it hard to know the actual prevalence of infection with any confidence.

Since 1976 there have been five serious outbreaks of avian influenza in commercial poultry. There are two hypotheses on the source of infection: either avian influenza is endemic in Australia and under certain rare environmental conditions, sporadic epizootics occur that result in a spillover into commercial flocks; or avian influenza infections in resident Australian birds are due to occasional spillovers from international avian migrants.

4.1.2. Eradication policy

When the Consultative Committee on Exotic Animal Diseases determines that an infection is caused by a virulent avian influenza virus, the policy is to eradicate the disease from commercial birds in the shortest possible time while limiting economic impact. A combination of strategies is used, including:

1. *stamping out*, which involves quarantine and slaughter of infected and exposed poultry on infected premises and sanitary disposal of destroyed poultry and contaminated poultry products, to remove the source of infection. Clinically normal flocks on an infected premises may be commercially processed under supervision as soon as practicable;
2. *quarantine and movement controls* on poultry, poultry products and other things in declared areas to prevent spread of infection;

3. *decontamination* of facilities, products and other things to eliminate the virus on infected premises and prevent spread in declared areas;
4. *tracing and surveillance* to determine the source and extent of infection and provide proof of freedom from the disease;
5. *zoning* to define infected and disease-free areas; and
6. *a public awareness campaign* to promote cooperation from industry and the community.

An uncontrolled outbreak of virulent avian influenza would cause severe production losses, leading to dislocation and financial losses in the poultry industry and the associated service and sales industries. It is therefore necessary to act immediately and effectively to control and then eradicate the disease.

Some strains of avian influenza are of low virulence and cause negligible (or no) production loss. If such a strain were to be identified in Australia, a modified policy would be applied.

4.2. Equine influenza

4.2.1. Prevalence

While equine influenza is endemic in continental Europe and North America, the disease is exotic to Australia.

Equine influenza A viruses are classified as subtypes equine 1 (or H7N7 viruses) and equine 2 (H3N8) viruses.

Animals other than equines, including humans, do not appear to be important in the spread of equine influenza. The potential for spread of infection via human nasal secretions from persons exposed to infected horses is unknown but is assumed to be minimal.

4.2.2. Eradication policy

Equine influenza has the potential for very rapid spread, to cause illness and loss of performance, and influences the international movements of horses.

The overall policy in Australia is to control and then eradicate equine influenza by:

- *quarantine and movement controls* on animals and other things in declared areas to prevent spread of infection;
- *decontamination* of facilities and other things to eliminate the spread of virus from infected premises;
- *tracing and surveillance* to determine the source and extent of infection;
- *mass vaccination* of equines in defined areas to protect animals against infection; and
- *an awareness campaign* to facilitate cooperation from industry and the community.

Equine influenza would result in serious economic loss within the equine industry due to the constraints placed on the movements of animals, the cancellation of horse gatherings for an unknown period, and the on-going costs of a vaccination program.

4.3. Swine influenza

Swine influenza does not occur in Australia, but is endemic in the United States. A serological survey of Australian pigs failed to reveal any evidence of infection by influenza A viruses. No clinical evidence of the disease has occurred since this time.

4.4. Links between animal and human disease: implications for control

It is extremely unusual for human disease to be directly linked to livestock infection. The 1918 influenza pandemic may have arisen from pigs. If this link were demonstrated in a future outbreak then animal surveillance would be implemented.

Widespread human infection is extremely unlikely to be paralleled with exactly the same virus causing widespread animal disease. An animal virus may re-assort into a type infectious to humans, but this is a very rare event. Consequently, animal control measures such as vaccination will not be required if the only purpose is to reduce human infection.

Recommendations

- 4.1 Membership of Agriculture on CDNANZ should be maintained to ensure the urgent notification of the Commonwealth Department of Health in the event of an outbreak of influenza A in animals, in Australia and overseas, that could be perceived as having an impact on public health. Surveillance following an outbreak in animals in Australia should follow the procedures set by the Surveillance Subcommittee of the IPPC (see Appendix D).
- 4.1 A national policy should be developed for the action to be taken should swine influenza be introduced into the country. (Infection from humans to pigs is possible.)

Bibliography and recommended reading

AUSVETPLAN: Disease Strategy for Virulent Avian Influenza. Commonwealth and States of Australia 1996. (Both are also available on the internet at: <http://www.brs.gov.au/aphb/aha/ausvet/htm>)

Geering, WA, Forman AJ, Nunn MJ. Exotic Diseases of Animals: A Field Guide for Australian Veterinarians. Australian Government Publishing Service 1995.

5. Influenza and Public Health Law

5.1. The Quarantine Act

The *Quarantine Act 1908* states that the scope of quarantine is:

Quarantine has relation to measures for the inspection, exclusion, detention, observation, segregation, isolation, protection, treatment, sanitary regulation and disinfection of vessels, installations, persons, goods, things, animals or plants, and having as their object the prevention of the introduction of spread of disease or pests affecting man animals or plants.

Quarantine is of only limited usefulness. The rapid and frequent transit of people between countries makes it very difficult to restrict movement or detain people at national ports of entry, while influenza may simultaneously affect populations from many different geographic areas. At the same time, clinical diagnosis is often non-specific, particularly where symptoms are mild.

Under the Quarantine Act the Governor General could proclaim influenza to be a quarantinable disease. The Act, under certain conditions may be used to control the movement of people between States and Territories or within areas of each jurisdiction, in the event of an epidemic threat. The Commonwealth Minister of Health and Aged Care would be able to take what measures were necessary to eradicate or control the spread of disease. Such measures could include:

- prohibitions or restrictions on migration between States and Territories of the Commonwealth;
- prohibitions or restrictions on public assembly;
- the compulsory notification of new cases of disease;
- the control of Commonwealth facilities for quarantine purposes, such as vaccination, treatment, drug stockpiling and dispensing; and
- superseding quarantine measures prescribed under or by State Acts.

5.2. State and Territory legislation

In Queensland, New South Wales, Victoria, South Australia, Tasmania and the Northern Territory, legislation provides for the declaration, in certain specified circumstances, of a “state of emergency” or “state of disaster.” Under each of these Acts, wide-ranging powers that can be exercised during a “state of disaster” or “state of emergency” are conferred on specified persons for the abatement or containment of the disaster or emergency, or for the protection of life or property. The special powers include, for example, the power to direct the evacuation or exclusion of persons and the power compulsorily to take possession of and use property.

The Queensland, Victorian, South Australian and NSW Acts expressly contemplate that a “state of disaster” or “state of emergency” may be declared as a result of the existence or threat of an epidemic within the State. The Tasmanian and Northern Territory Acts are expressed in terms that make such a declaration possible in connection with a pandemic, under some circumstances. The criteria for a “state of disaster” vary from one jurisdiction to another; for example, in some jurisdictions a disaster is declared only if the emergency is beyond the capacity of counter-disaster services normally available to deal with such occurrences.

In Western Australia and the Australian Capital Territory there is no general disaster or emergency legislation equivalent to that described above. The WA Act allows for

regulations to be created in response to an “emergency or necessity” and while these terms are not defined, the legislation would embrace a pandemic. In the ACT the declaration of a public health emergency is left to the discretion of the Commonwealth Minister of Health and Aged Care. The ACT confers on the Chief Health Officer wide-ranging powers for the alleviation of the emergency, including the power to direct the segregation or isolation of persons.

Recommendation

- 5.1 In the event of a pandemic, the Governor General should proclaim influenza as a quarantinable disease, and in so doing, enable the Commonwealth Minister for Health to give directions and take actions deemed necessary for control of the pandemic.

Bibliography and recommended reading

Bidmeade I, Reynolds C. Public Health Law in Australia: Its current state and future directions. Commonwealth of Australia 1997.

McMillan J. The Commonwealth Constitutional Power Over Health. Consumers' Health Forum of Australia Inc.

6. Surveillance

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

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.

6.1. International and regional surveillance

Australia hosts one of the four WHO Collaborating Centres for Reference and Research on Influenza, and this laboratory participates in international and regional influenza surveillance including Oceania and South East Asia. The laboratory:

- has the expertise for rapid definitive identification of influenza viruses, including new pandemic subtypes;
- can evaluate drug resistance of isolates;
- prepares reagents for influenza diagnosis and identification, and distributes them to national and regional laboratories. This will include distribution of 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;
- is one of the few (approximately five) laboratories worldwide able to prepare and characterise high-yield reassortants of influenza A for use in vaccine production. This provides Australia with a potential advantage in response time for vaccine production.

Currently this laboratory is the only Collaborating Centre for Influenza which does not have a C3+ containment facility. This can substantially limit its activities, as occurred during the 1997 Hong Kong “chicken influenza” incident.

6.2. 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 “flu-like” illnesses in the community, and the use of laboratory confirmation of influenza infection to estimate the proportion of these cases that are due to influenza. A high rate of viral isolation from cases 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. It also needs to be adaptable to the different epidemiology of influenza in northern and southern Australia;
- 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 overseas that may pose a threat to humans;

- detect and identify in a timely manner new strains that arise within Australia and New Zealand;
- rapidly disseminate surveillance results;
- be upgraded in the event of the appearance of a pandemic strain outside or within Australia and New Zealand;

All elements of the surveillance required during a pandemic period need to be operational during the inter-pandemic period, although at a lower level. It would be extremely difficult to establish new surveillance activity during a pandemic (rather than enhancing existing activities and infrastructure), due to the load that would be placed on all resources.

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

6.3. Current surveillance systems in Australia/New Zealand

Influenza is not a notifiable disease in either Australia or New Zealand, though it could be added to the list if necessary during a pandemic period. Current surveillance activities therefore rely either on other routine systems for collecting infectious disease data, or on systems specifically set up for influenza.

6.3.1. New Zealand

Data on influenza are collected by:

- year-round reporting of influenza isolates from hospital inpatients and primary care patients;
- sentinel general practitioners who, from May to September each year, report influenza-like illnesses via local Public Health Unit Influenza Surveillance Coordinators and collect samples for virus culture. These practices are distributed throughout the country with approximately one practice for each 50,000 population. Each practice takes a swab for influenza culture from the first patient with a influenza-like illness seen each Monday, Tuesday and Wednesday. This allows samples to reach the laboratories and be processed before the end of the working week. Influenza isolates are typed in one of the New Zealand reference laboratories and referred to the WHO Collaborating Centre in Melbourne. Untypable strains are referred immediately;
- hospital discharge and mortality data, which are accumulated and reviewed by the New Zealand Health Information Service.

6.3.2. Australia

Currently Australia does not have a single national influenza surveillance but rather a number of independent schemes with differences in case definitions and surveillance methods. While data from the various schemes are collected nationally, these differences limit its value for providing a comprehensive national picture.

Data on influenza are generated in the following ways:

- A number of laboratories report influenza cases (based on virus detection or serology) to the Commonwealth Department of Health via the Lab-Vise system. This provides an indication of seasonality, but reporting is incomplete and there are no agreed reporting criteria. Diagnosis, reporting and feedback is not quick enough to identify the early stages of an epidemic. Most laboratories that isolate influenza

forward isolates to the WHO Collaborating Centre in Melbourne, although the frequency at which this is done varies between laboratories.

- A number of general practice surveillance systems operate. The largest is the Australian Sentinel Practice Research Network (ASPREN) run by the Royal Australian College of General Practitioners. However this reports only influenza-like illness without laboratory confirmation and its geographic distribution is restricted, being mainly metropolitan and mainly in South Australia, Victoria, New South Wales and, to a lesser extent, Queensland. Other smaller schemes also operate in Victoria, NSW and the Northern Territory, with differing case definitions and data collection, and with generally poor non-metropolitan representation. Information generated from these different schemes is not centrally accumulated or analysed.
- Pharmaceutical company-sponsored GP surveillance operated during the 1998 influenza season in capital cities in NSW, Victoria, Queensland, SA and WA. This provided some national data, but population representation was uneven and funding is dependent upon the companies.
- Various other smaller schemes operate based on either laboratory diagnosis or clinical illness.
- Absenteeism data from some national organisations are reported to the Commonwealth Department of Health.

6.4. Inter-pandemic surveillance

Inter-pandemic surveillance should provide a comprehensive survey of influenza activity in all groups within the community, including metropolitan and non-metropolitan populations, measuring the incidence and the impact of influenza. The impact can be estimated from hospital admissions, mortality rates, and work and school absenteeism.

This requires a national and representative community-based surveillance system that documents and reports influenza-like illnesses to a central facility.

6.4.1. Definition of illness

To date, a variety of definitions of “influenza-like illness” have been used in Australia, including the following :

ASPREN: An influenza epidemic plus four of the following criteria, or six of these criteria in the absence of an epidemic:

- onset within 12 hours
- cough
- rigors or chills
- fever
- prostration or weakness
- myalgia, widespread aches and pains
- no significant respiratory signs other than redness of the throat and nasal mucous membranes
- influenza in close contacts

World Health Organization: A person with sudden onset of fever of $>39^{\circ}\text{C}$, respiratory symptoms, myalgia and headache:

Suspected: a case that meets the clinical case definition

Probable: a case that meets the clinical case definition and is epidemiologically linked to a laboratory-confirmed case

Confirmed: a case that meets the clinical case definition and is laboratory-confirmed

Pharmaceutical-sponsored surveillance 1998: Presence of at least one respiratory (runny nose, cough, or sore throat) and at least one systemic (fever, myalgia, or lethargy) symptom.

New Zealand national surveillance: Acute upper respiratory tract infection characterised by abrupt onset and two of the following: fever, chills, headache and myalgia.

Recent experience in Australia is that influenza will be laboratory confirmed in less than 50%, and usually around 20%, of cases using any of these definitions.

Optimally, surveillance will be based on a single agreed case definition. This needs to be broad enough to ensure adequate surveillance of children.

6.4.2. Testing for influenza virus

Clinical case definitions are of little value in distinguishing influenza from other similar respiratory illnesses: a representative proportion of these patients need to be tested for influenza virus.

Nose and throat swabs are adequate for influenza detection if collected within 96 hours of the onset of the illness. Nasopharyngeal swabs should also be collected where possible to provide a more comprehensive picture. Most laboratories now use one of the rapid antigen detection methods (immunofluorescence or enzyme immunoassay) or a rapid culture method. Nucleic acid amplification methods, particularly the polymerase chain reaction (PCR), are also coming into use in reference laboratories. All are good tests for detecting influenza, but they do not provide isolates of the virus for serotyping. It is therefore essential that the surveillance system include collection of specimens which can be cultured if the rapid test is positive. It is also not certain that the antigen detection methods or the rapid culture methods would necessarily detect a new influenza strain with major antigenic changes. Therefore conventional culture methods (and possibly PCR) would need to be used if that possibility arose.

Rapid bedside tests for influenza have recently become available, but there is limited information to date about their performance, particularly in a general practice setting. They cannot therefore be recommended for surveillance purposes, but they may have some application in helping to determine patient management. If used, patients who test positive should also have a nose/throat swab or a nasopharyngeal aspirate/swab sent to the laboratory for viral culture.

6.4.3. Period of operation of the surveillance system

The surveillance system should operate throughout the local influenza risk period. In the southern half of Australia, this is usually May to September. In the tropical north, which lacks the same seasonality, influenza may appear at almost any time and year-round surveillance is necessary.

6.4.4. Sentinel systems

Population ratio

Surveillance in New Zealand involves one sentinel general practitioner for every 50,000 population and it is intended to maintain that ratio.

In Australia, it is unlikely that ratio could be achieved, at least in the early years of the surveillance system. Initially, urban areas should aim for one sentinel practice for every 200,000 population. Outside the metropolitan areas the ratio will need to be higher to obtain a good geographical representation, and a ratio of one practice for every 50,000 to 100,000 population, depending on population density, is suggested. In remote areas the ratio may be even higher. Sampling of remote tropical populations is important as new influenza strains may first appear in these areas.

Sentinel nursing homes may be used in addition to the general practitioners to enhance surveillance.

Sampling

In New Zealand, each practice samples the first patient with an influenza-like illness seen each Monday, Tuesday and Wednesday. This allows samples to reach the laboratory and be processed before the end of the week. A similar process would be suitable for Australia with the exception of remote areas where transport of samples is likely to be significantly delayed. In these areas the frequency and pattern of sampling will need to be determined by local circumstances. The use of PCR may also be valuable in these populations to provide a sensitive and robust detection method that may also be able to provide typing information, in a situation where survival of the virus for cell culture is unlikely.

Reporting and feedback

Data collected on patients with influenza-like illnesses should include age, gender, locality and vaccination status, in order to assess adequately the spread of the disease and the value of vaccination.

To provide rapid feedback on influenza activity, surveillance data should be collated and reported weekly, and should include data up to the time of reporting.

Feedback to contributing practitioners is important in ensuring ongoing participation. It should be provided on a fortnightly basis and include a summary of each practitioner's own data as well the local and national data.

6.4.5. Routine monitoring of other indicators

Routine monitoring and reporting of other indicators within the health care system offer a way of monitoring more serious cases of influenza infection, particularly those leading to hospital attendance. The routine diagnostic system also provides a mechanism for detecting out-of-season cases. Sources of information include:

- children presenting to paediatric hospitals and having samples collected for respiratory viruses. Experience in Australia/New Zealand has shown that this population is a good indicator of community influenza activity;
- routine laboratory detection of influenza viruses from other community and institutional sources;
- the incidence and outcome of respiratory disease in institutions. While nursing homes are the most likely sentinel institutions, this could include others such as boarding schools or prisons;
- adults presenting to Accident and Emergency departments with a diagnosis of lower respiratory tract infection.

Detection of influenza in paediatric and other routine laboratory diagnostic settings is already in place and only requires a comprehensive reporting and collating system. Respiratory infection in institutions and Accident and Emergency departments is currently not widely monitored.

Monitoring of absenteeism at work and schools helps gauge the morbidity and economic impact of influenza. Work surveys should preferably involve a national employer and provide a regional breakdown of figures. Schools should be chosen at a State level to represent a wide geographic area. Measuring absenteeism for periods of three or more days helps separate influenza from other common illnesses.

6.4.6. Laboratory systems

Laboratory systems are an integral part of community and institutional surveillance, to provide prompt detection and characterisation of influenza viruses. Identifying influenza strains requires viral cultures and serotyping of isolates: laboratory systems must therefore ensure that samples for culture are obtained whenever possible. Each State or Territory should maintain, through its reference laboratory, the capacity to determine whether an influenza isolate is one of the currently circulating haemagglutinin types (ie. influenza B and influenza A types H1 and H3). The reference laboratory would then be able to identify and urgently refer isolates with possible new haemagglutinin types. Further serological characterisation of the virus would be done at the WHO Collaborating Centre in Melbourne.

Amplification of viral RNA by reverse transcriptase - polymerase chain reaction (RT-PCR) provides a potentially powerful tool for early recognition of new strains and this capability should also be available to each State reference laboratory as soon as possible. These techniques should be viewed as an addition to, not a replacement for, viral culture.

6.5. 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 Australia/New Zealand. This will be directed at returning travellers, patients with severe viral pneumonia, and close contacts of these two groups.

As new variants may not be reliably detected by the antigen detection or rapid culture systems (and it is unlikely that this will have been tested early in a pandemic), conventional cell cultures need to be performed on all patients. This will ensure the maximum chance of detecting new strains, and provide viral isolates for serotyping.

There are published PCR-based methods for typing the influenza A haemagglutinin gene that have the potential to provide presumptive identification of new strains within 2-3 days of sample collection. These tests should be developed and validated within Australia and New Zealand to ensure their availability; however, they will provide only presumptive results, which should be confirmed by conventional serotyping methods whenever possible.

Antiviral therapy may be introduced for patients with severe influenza or for those with influenza due to the pandemic strain. A system for monitoring of antiviral susceptibility should be established at the WHO Collaborating Centre in Melbourne, and possibly at the State reference laboratories. The number of sites providing this will depend upon the demand, the testing protocols used, and the expertise and facilities available. Susceptibility testing both by conventional tissue culture methods and by sequencing of the relevant genes is likely to be required.

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

6.6. Surveillance when pandemic influenza has appeared in Australia or New Zealand

When pandemic influenza has appeared in Australia or New Zealand, surveillance systems will be essential to track the spread of the virus and direct the allocation of resources and preventive measures. In the early stages, it will be important to sample as many patients with an influenza-like illness as possible, however the number of samples could 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; however this would depend on whether they had been shown to detect the new strain reliably. PCR-based testing will be extremely important as a rapid method

for testing large numbers of samples and providing rapid characterisation of the strains. Access to reagents for detection of the new strain is likely to be restricted and may only be available to reference laboratories.

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, which is likely to be available in the reference laboratories.

In order to meet the demands for rapid characterisation, appropriate containment, and judicious use of the diagnostic reagents, virus detection and identification may need to be confined to the reference laboratories. This would also allow other laboratory services to concentrate on providing all the other testing that is likely to be required for the patients.

Antiviral therapy is likely to be in widespread use and there will be an associated need to monitor antiviral susceptibility.

Surveillance procedures are detailed in Appendix D.

6.7. Surveillance when a new influenza strain occurs in animals in Australia or New Zealand

Occasional outbreaks of influenza occur in poultry within Australia. Rarely, these may infect humans in close contact with the animals and, as happened in Hong Kong in 1997, this may result in serious human disease (see Chapter 1, page 17).

Whenever such outbreaks occur active surveillance is needed to determine whether there has been any spread to humans. Currently there is an informal mechanism for making the human health authorities aware of outbreaks in animals.

Recommendations

- 6.1 A coordinated national surveillance system should be established 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 community-based surveillance of influenza based on sentinel practices during the interpandemic period, complemented by institutional surveillance, with enhanced measures during a pandemic. It should be conducted following the procedures set by the Surveillance Subcommittee of the IPPC (see Appendix D).
- 6.2 Laboratory systems and capacity should be enhanced to ensure comprehensive and consistent support for national influenza surveillance. All laboratories involved in influenza surveillance should comply with the procedures set by the Surveillance Subcommittee of the IPPC (see Appendix D).
- 6.3 Australian production of seed lots from a new pandemic strain would be possible if a C3+ biocontainment facility were linked to the Australian WHO Reference Laboratory. This would enhance the local capability for vaccine manufacture in the event of a pandemic. Efforts to promote this capability are supported by the IPPC.

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7. Vaccines

7.1. The role of vaccines

The current inactivated virus influenza vaccines provide a high level of protection against epidemic influenza. However they must be regularly reformulated to contain the currently circulating influenza virus strains.

Whole virus inactivated vaccines are no longer available in Australia and the currently registered vaccines are inactivated split product (virus disrupted with solvent or detergent) or subunit (purified surface antigen) vaccines containing strains of the two current influenza A subtypes and type B influenza. These vaccines offer equivalent immunogenicity and protection to whole virus vaccines in people who have already experienced related strains of virus, but produce less side-effects. They have not been fully evaluated in a pandemic situation.

At present approximately 16% of the Australian population is vaccinated annually, mostly those in high-risk groups. A public education and awareness campaign should be developed to increase the uptake of influenza vaccine to improve the baseline level of immunity of the population to circulating influenza viruses and to increase vaccine production capacity in Australia. During vaccination programs, health care workers need to comply with infection control guidelines to minimise ongoing transmission during vaccination programs.

Manufacture of the vaccine has a relatively long lead-time, with production beginning in October for administration in the following autumn, starting in March. This timeframe does not necessarily reflect the potential rate or volume of production that might be achieved in the event of a pandemic, when some steps in the process may be able to be expedited.

7.2. Vaccine supply

Most of the influenza vaccine currently administered in Australia is produced by CSL Limited, based in Melbourne, although some is imported and supplied by international pharmaceutical companies. In 1999, three other influenza vaccine suppliers were involved: Pasteur-Merieux Connaught, distributed by CSL Ltd; SmithKline Beecham and Medeva Pharma Ltd, distributed by Ebos Health and Science Pty Ltd. Some Australian-manufactured vaccine is distributed internationally, to South Africa, which does not have vaccine manufacturing capacity, and to the European Union.

Planning needs to address the sources of vaccine that would be available for use in Australia during a pandemic and the basis for purchase of vaccine.

Previous experience suggests that demand for vaccine during a pandemic may far exceed supply. Vaccine production could not proceed until the specific virus responsible had been grown in the laboratory and then adapted for use in the manufacturing process. Other aspects of production and standardisation may also lead to delays in vaccine availability (see section 7.2.1). It is therefore likely that only limited quantities of vaccine specific to the pandemic virus would be available before the first wave of infection.

7.2.1. Factors influencing manufacturing lead time

Current influenza vaccines are manufactured in embryonated hens' eggs using a representative virus isolate of the actual epidemic or pandemic strain. The ability to manufacture adequate quantities of influenza vaccine is influenced by a range of factors, including:

- *availability of suitable embryonated eggs*
If it is necessary to manufacture vaccine outside the normal production season, egg production, or the ability to divert eggs from other uses, may be a limiting factor;
- *obtaining and suitably modifying the pandemic virus strain (seed lot) for vaccine manufacture*
This was highlighted by the difficulties posed by the virus strain involved in the 1997 Hong Kong outbreak. It has been proposed that representative viruses from bird populations should be isolated and prepared as candidate vaccine strains in an attempt to anticipate evolution of pandemic viruses and to minimise delays, but this work has not begun, nor has it attracted funding either within Australia or internationally. The ability of the virus strain to grow in embryonated eggs also influences production, with some strains growing better than others;
- *composition of the vaccine*
It may be considered desirable to include viruses other than the pandemic strain in the vaccine. The need to grow several virus strains would limit the speed of production; many more doses could be prepared in a given time if the vaccine contained only a single strain;
- *vaccine manufacturing capacity*
Incubation capacity and cold room space will limit the quantity and speed of production;
- *development of standards*
A standard must be prepared for the selected vaccine strains in order to standardise the vaccine dose. This may take a number of weeks, but it could occur in parallel with vaccine manufacture;
- *sterility testing and batch release*
Regulatory processes in the testing and approval/batch release of vaccines may also cause delays;
- *availability of adequate quantities of final dose containers*
These include syringes, ampoules and vials.

7.2.2. Other factors influencing supply

Other factors that are likely to influence vaccine supply include national priorities for manufacturers, causing international pharmaceutical companies to withhold vaccine supplies from overseas during a pandemic. Canada, for example, was denied supply from their regular US sources during the “swine influenza” vaccination campaign and was forced to source vaccines from elsewhere. This would probably not have been possible had other countries followed the US lead of mass vaccination against the new strain, as would certainly occur in a true pandemic.

This highlights the importance of maintaining a strong national vaccine production capacity in Australia. Increasing the inter-pandemic use of influenza vaccines, and therefore the manufacturer’s production capacity, has been seen as not only an important and cost-effective health care strategy but also as a key element in responding at the time of a pandemic. Local manufacturing capability would be enhanced if Australia could produce seed lots from a new pandemic strain. This would require a C3+ biocontainment facility linked to the Australian WHO Reference Laboratory (see Recommendation 6.3, page 29).

7.3. Vaccine dosage

As noted above, influenza vaccines currently registered in Australia are inactivated split product or subunit vaccines containing two influenza A subtypes and one influenza B subtype. The vaccines contain 15µgm haemagglutinin antigen for each constituent strain.

For adults and children previously exposed to viruses of similar antigenic composition to those present in the vaccine, a single vaccine dose is recommended. In children lacking in such experience (age not specified in the Australian recommendations, age <9 years specified in the US recommendations), two doses separated by an interval of at least four weeks are recommended.

Currently it must be assumed that in a pandemic situation all vaccinees will lack previous exposure and will require two doses of vaccine each containing 15µgm 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 15µgm 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.

Studies are required to define the formulation and dosage regimens which will make the best possible use of available vaccine antigen at the time of a pandemic. It is understood that some studies of this type are proposed in the United Kingdom using vaccines formulated from H5N1 virus.

7.4. Setting priorities for vaccination

7.4.1. Inter-pandemic influenza

The National Health and Medical Research Council currently recommends annual vaccination for those people considered to be at high risk of severe infection and death. The Australian Technical Advisory Group on Immunisation (ATAGI) is currently considering changes to existing guidelines. The revised guidelines are due to be published in 1999.

7.4.2. Pandemic influenza

Priorities during a pandemic may differ from the recommendations for vaccination in the inter-pandemic period. 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 any of these groups. While priorities may be established on the basis of historical information, they may need to be reviewed in the light of the epidemiology of the particular virus strain; for example, a virus might have greatest mortality in the younger adult group (as occurred with the 1918 pandemic strain).

Priorities will need to be based on clear assumptions regarding the outcomes to be achieved and on the best available evidence on effective ways to achieve these outcomes. In the event of an influenza pandemic, the clear and desirable outcomes are minimising mortality, minimising human suffering, and minimising social disruption. Where there is conflict between these three aims, choices will need to be made.

There is unequivocal evidence that the highest mortality and morbidity occurs in the high risk groups. There is conflicting evidence, however, on the relative impact on both mortality and morbidity of immunising all those in high risk groups, or, for those

in institutional care (eg nursing homes), immunising only health care workers caring for these people.

Social disruption may result during a pandemic due to a high degree of absenteeism among those in essential services. A cut-off point has not been identified, however, between disruption that is merely inconvenient and disruption that seriously threatens lives (directly or indirectly) and/or the structure of society.

A modelling exercise is needed to determine the effects of varying levels of absenteeism, in the short and longer term, on the function of a range of essential services, including police, fire, security, communications, utilities, undertakers, State Emergency Services (SES), and armed forces. A further point to be considered is the potential for essential services personnel to transmit infection.

There is clear agreement that first priority, in vaccination and prophylaxis, is the protection of health care workers: during a pandemic, they will make the greatest contribution to minimising mortality, morbidity and thereby, social disruption; and their work will place them at high risk both of infection themselves, and of transmitting infection to others. Beyond doctors, nurses, ambulance staff, and those working in aged residential care, however, the priority ranking among other health disciplines and workers (eg physiotherapists, orderlies), and their ranking in relation to others in the community, also needs further investigation.

Flexibility will be needed to ensure the ability to respond to patterns of disease and disruption that emerge during a pandemic.

7.4.3. Indigenous Australians

Indigenous Australians suffer significantly higher rates of respiratory disease than the non-indigenous Australian population, and they are at increased risk of the serious consequences of influenza during the inter-pandemic period. In addition, their access to health care is limited due to a range of social, cultural and geographic factors.

The pandemic response must include an appropriate, adequate and equitable response to the needs of indigenous Australians (and other smaller population groups). This includes recognition that current vaccination or prophylactic strategies target the indigenous population aged over 50 years (rather than over 65 years as in the general population).

Influenza and pneumococcal vaccination of the indigenous population should be retained as a primary public health strategy during the interpandemic period.

7.5. Monitoring adverse events related to vaccination

Currently two parallel and independent surveillance systems monitor adverse events following vaccination in Australia: the Serious Adverse Events Following Vaccination Surveillance Scheme (SAEFVSS), and the Adverse Drug Reactions Advisory Committee (ADRAC).

7.5.1. Serious Adverse Events Following Vaccination Surveillance Scheme

Initiated through the National Childhood Immunisation Program, SAEFVSS is a national surveillance scheme that aims to identify and report in a timely fashion all serious adverse events which follow childhood vaccination. It has the advantage that local immunisation program directors are able to monitor reports and offer expert advice.

SAEFVSS commenced on 1 March 1995, with retrospective reports backdated where possible to 1 January 1995. Reports on serious adverse events are collected by State and Territory health authorities, forwarded to the Department of Health and Aged Care, collated by the National Centre for Disease Control (NCDC) and reported in the

Communicable Disease Intelligence. Information collected on each case includes the vaccine(s) temporally associated with the event, possible risk factors in the child's medical history, and details about the nature, timing and outcome of the event.

7.5.2. Adverse Drug Reactions Advisory Committee

ADRAC has the responsibility of post-marketing surveillance of all drugs including vaccines. It receives reports from private practitioners, State and local public health clinics, hospitals, vaccine manufacturers, and vaccinees themselves (or their parents). The ADRAC database holds reports of suspected reactions to vaccines that it has received since 1972. It is a passive drug surveillance program which relies upon "spontaneous" reports using a standardised postcard.

An agreement has been reached between ADRAC and the National Centre for Disease Control (NCDC) to move towards one system for reporting and monitoring adverse events related to vaccination. ADRAC's form will be modified to meet State and Territory requirements. Under the revised system, it is proposed that the reports will be sent to ADRAC and forwarded to the NCDC. In States where adverse events are notifiable, the reports will be made to the State Health Department and then forwarded electronically to NCDC and ADRAC. The revised system will be publicised in the next issue of the Immunisation Handbook after it has been reviewed and accepted by National Immunisation Committee (NIC) and Australian Technical Advisory Group on Immunisation (ATAGI).

7.6. Pneumococcal vaccination

Many of the deaths and severe infections precipitated by influenza are due to secondary infection with bacterial pathogens including *S. pneumoniae*. Vaccination of the "at risk" population with pneumococcal vaccine is therefore an important contribution to pandemic preparedness. Those at increased risk of pneumococcal pneumonia, for whom vaccination is currently recommended, include:

- people over the age of 65 years;
- indigenous Australians over the age of 50 years;
- individuals with asplenia, either functional or anatomical, including sickle cell disease in those aged over 2 years;
- immunocompromised individuals (eg. through HIV infection, nephrotic syndrome, multiple myeloma, lymphoma, Hodgkin's disease, organ transplantation);
- people who, although immunocompetent, are at increased risk of complications from pneumococcal disease because of chronic illness (eg. diabetes, alcoholism, chronic cardiac, renal or pulmonary disease);
- people with a cerebrospinal fluid leak.

Recommendations

- 7.1 A concerted effort should 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. The Commonwealth should give consideration to providing free immunisation (both influenza and pneumococcal) in all defined high risk groups.
- 7.2 Long-term contingency arrangements for provision of vaccine in the event of a pandemic should be established. This should include:
- dialogue with commercial manufacturers of syringes and containers;
 - funding of studies aimed at producing vaccine seeds of candidate pandemic strains, from avian and animal sources.

- 7.3 A mechanism for the distribution and security of vaccine and antivirals should be developed, in consultation with medical disaster coordination groups.
- 7.4 There should be a single system for reporting and monitoring adverse events related to vaccination.
- 7.5 Investigation should continue into the method of delivering the vaccine during a pandemic (ie. 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.

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8. Antivirals

8.1. Current antiviral drugs: characteristics, indications and supply

There are currently three 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 and zanamivir. Only amantadine and zanamivir are registered for supply in Australia.

Unlike vaccines there is an opportunity to stockpile antiviral products ahead of a pandemic. However, like vaccines, 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 will be developed.

8.1.1. Amantadine

Marketed as Symmetrel; supplied by Novartis Pharmaceuticals Australia Pty Ltd

Amantadine is active only against type A influenza viruses. When used as treatment it does not prevent the host immune response to influenza A infection. Prophylactic administration has no effect on the host immune response to vaccination with the current inactivated influenza virus vaccines.

The drug has a number of disadvantages. It has significant side-effects, and influenza A virus rapidly develops resistance to it.

Amantadine must be imported, as it is not manufactured in Australia. Little is used here for the prevention and treatment of influenza, and in a pandemic, supplies would be very limited unless a decision were made to purchase and stockpile it. Shelf-life is up to 5 years. Currently, Australian stocks fluctuate between 1,000-3,000 units, with a lead-time for orders of 10 weeks (Dr Andrew Gardiner, Novartis Pharmaceuticals: personal communication). Excess production capacity for all manufacturers needs to be determined.

Although amantadine is approved for the prevention and treatment of influenza, it is not currently listed on the Pharmaceutical Benefits Schedule for subsidy for this indication.

Individuals already on amantadine for other conditions (eg. Parkinson's disease) will need to have their supply maintained during the increased demand in an influenza pandemic.

8.1.2. Rimantadine

Marketed as Flumadine; supplied in the US by Forest Laboratories Inc

Rimantadine has the same antiviral action as amantadine but causes fewer side-effects. It is not currently registered for supply in Australia and the US-based Forest Laboratories Inc has no plans to seek Australian registration. Rimantadine is approved in the US and restricted access could be obtained under special provisions of the *Therapeutic Goods Act 1989* to allow supply in Australia of unregistered products.

8.1.3. Zanamivir

Marketed as Relenza; supplied by Glaxo Wellcome Australia Limited

Neuraminidase inhibitors, a recently developed class of anti-influenza drugs, inhibit a critical enzyme, neuraminidase, that is present in influenza viruses A and B, thereby reducing the ability of the virus to proliferate and spread in an infected person.

One neuraminidase inhibitor, zanamivir, has been approved for treatment in Australia (submitted in New Zealand) and at least one European country. Zanamivir can reduce the period of illness caused by current epidemic strains when administered early in the infection. It is not registered at present for prophylaxis but clinical studies suggest it provides short-term prophylaxis against influenza if taken prior to infection. Zanamivir is administered via oral inhaler.

Studies indicate that when taken therapeutically to treat an existing influenza infection, it does not interfere with the development of immunity. Based on human challenge studies, in successful prophylaxis most individuals do not develop immunity to influenza and remain fully susceptible to infection when the drug is ceased. It remains to be determined whether the drug is equally effective under pandemic conditions. It would be expected (although untested) that zanamivir would be active against any strain of influenza virus and, therefore, could be stockpiled. Data on zanamivir's shelf-life and alternative formulations are unavailable.

It is planned to manufacture Relenza Rotadisks (zanamivir) in Australia from imported active substance.

A second neuraminidase inhibitor, oseltamavir (Roche Products Pty Ltd) has undergone extensive clinical trials and the sponsor will be applying for registration in Australia and elsewhere in the near future. Oseltamavir is administered as an oral capsule.

8.2. Treatment and prophylaxis during a pandemic

A range of guidelines exist for the treatment and prophylaxis of influenza, including guidelines covering the drugs currently registered in Australia (Antibiotic Guidelines 1998/99, MIMS Annual 1999, Australian Medicines Handbook 1998 etc.) and overseas. Indications for use of the new neuraminidase inhibitors in treatment and prophylaxis of influenza are being developed. Dosages for current anti-influenza agents are listed in Appendix F.

It is likely that the dosages required during a pandemic will be similar to those used in inter-pandemic periods for treatment and prophylaxis. Ideally, these drugs should only be used where there is surveillance evidence or laboratory confirmation of influenza.

It is highly unlikely, however, that sufficient antiviral drugs will be available in the event of a pandemic. Further work is required regarding the stockpiling of these drugs (or the raw products needed for manufacture), including issues such as length of storage, responsibility, location, liability, security, cost, activation, and transport.

During a pandemic, ongoing flexible recommendations for antiviral treatment and prophylaxis will be made by the CDNANZ both at a national and State level.

8.2.1. Infection control

Antiviral treatment and prophylaxis will need to be accompanied by infection control measures to minimise transmission from clinical cases to others, to minimise transmission from clinical cases to others, including health care workers, immunosuppressed individuals and other groups at risk of severe influenza. Infection control should be applied to individuals, small groups (eg. families), larger groups (eg. nursing homes, school, 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 markedly insufficient quantities of vaccine or antiviral drugs, these measures may well be the main public health intervention.

8.2.2. 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 would be reserved for those presenting early (eg. within 30-48 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 members, staff and visitors. Data on the role of the new neuraminidase inhibitors in these situations are not yet available.

Drugs for treatment and prophylaxis are likely to be required over an 8-12 week period, although there may be regional variation in the timing of a pandemic.

Assessing antiviral requirements

Models are under development to help assess antiviral requirements during the various phases of a pandemic, but the issue is problematic. Kainer has estimated that, based on an Australian population of 20 million (of whom 15.4% to 24.8% are at high-risk), a pandemic that caused symptomatic influenza (ie. severe enough to take at least half a day off work) in 10% of the Australian population would result in:

- an excess number of outpatient visits nationally due to influenza of between 838,958 and 991,068;
- an excess number of deaths due to influenza or its complications ranging from 3,036 to 13,901;
- excess hospitalisations secondary to influenza or its complications ranging from 8,455-33,353 respectively.

(See section 2.5, page 10)

If only hospitalised patients were treated with antivirals (2 doses of amantadine or zanamivir daily for 5 days, ie. 10 doses per patient), then up to 330,350 doses of drug would be required. A higher influenza attack rate (likely during a pandemic, and reported with many influenza epidemics) would necessitate proportionately more doses: for example, with an attack rate of 30%, 253,660 to 1,000,580 doses of amantadine or zanamivir would be needed to treat hospitalised patients. The higher the attack rate, the greater the potential disruption to antiviral supply and community services.

This calculation does not take into account a range of other considerations, including:

- treatment of less severe influenza in essential workers to enable them to keep working (1996 census data indicate that at least 871,484 workers are employed in essential services in Australia. An attack rate of 10%, at 10 doses per patient, would necessitate at least 871,484 treatment doses for this population);
- regional or age variation in attack rates;
- epidemiologically evident “waves” of infection;
- severe outbreaks with high attack rates in closed communities;
- reasons for hospital admission not directly related to influenza (eg. delayed bacterial pneumonia, cardiac failure).

Over the same relatively short pandemic period that treatment is required, antiviral prophylaxis will also be required (see below).

Current local, State and national distribution mechanisms need review to ensure the ability to rapidly distribute drugs (antivirals, antibiotics, cardiac and respiratory support drugs etc.) and vaccines to affected individuals and institutions.

8.2.3. Prophylaxis

Setting priorities for prophylaxis

Use of antiviral agents for prophylaxis of influenza during a pandemic is likely to be limited to approximately the same high priority groups for whom vaccination is indicated. 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; and
- 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.); and
- the availability and possible variable efficacy of vaccines.

A number of scenarios are currently in preparation to determine the likely numbers of people requiring prophylaxis. High priority groups include:

- staff involved in vaccine and antiviral production and distribution;
- people responsible for community safety and security (eg. police, military, firefighters);
- providers of other skilled services (eg. communications, electricity suppliers);
- those traditionally at increased risk of severe influenza illness and mortality (the NHMRC already recommends annual influenza vaccination for this group);
- staff caring for immunocompromised patients, and staff of nursing homes and other chronic care facilities.

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

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 a vaccine is available, then prophylaxis may be given for at least the first 10 days (or longer if more than one vaccine dose is required for efficacy) until the vaccine becomes protective. 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 1996 census data, at least 871,484 individuals are employed Australia-wide 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

8,714,840 doses of amantadine would be needed. If no vaccine was available and prophylaxis was required for throughout the pandemic, the quantity of amantadine needed would increase between 4-fold and 7-fold.

Similar calculations (based on Australian Bureau of Statistics estimates) can be made on:

- the total numbers of Australians over 65 years – 2,245,068;
- those in institutions (ie. public and private hospitals, psychiatric hospitals and institutions, hostels for the disabled, nursing homes, and retired or aged care accommodation) – 218,496;
- indigenous Australians aged 50-65 years – 24,593;

and other groups. It has been estimated that between 15.4% and 24.8% of Australians are at high-risk of influenza complications (note that this does not include every person over the age of 65) (Kainer: see Appendices H and I).

8.3. Monitoring adverse events related to antivirals

As with vaccination, adverse events with widespread use of antiviral agents in a pandemic will need monitoring, particularly if accelerated approval for previously unregistered drugs (eg. rimantadine) is given, or currently available drugs are used outside their approved indications. This includes use of the blue “Report of Suspected Adverse Drug Reactions including Birth Defects” ADRAC forms. Methods used to monitor antiviral resistance, which has already been described with amantadine (see page 37), will be required. *In vivo* resistance to zanamivir is rare (see page 37), but with its increased use in inter-pandemic influenza, monitoring of drug resistance using *in vitro* methods will be important.

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

8.4. Drug resistance

If antiviral agents are used either prophylactically or therapeutically during an influenza pandemic, surveillance for development of antiviral resistance will be essential. Strict infection control measures will also be imperative when amantadine and rimantadine are used for treatment of infected individuals, to prevent the spread of drug resistant viruses.

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 drug resistance *in vitro* and resistant viruses demonstrate similar transmissibility and virulence to non-resistant viruses.

Resistance to amantadine and rimantadine can be readily measured by standard viral inhibition tests in cell culture. The genetic changes associated with development of resistance are well characterised and may also be detected by sequence analysis of the viral M protein.

Zanamivir

Although field use of zanamivir has been quite limited to date, only one instance has been recorded of the emergence, in an infected individual, of a virus resistant to this drug (in a chronically infected immunosuppressed child). Laboratory experiments demonstrate a low level of development of drug-resistance *in vitro* and there are

reasons to doubt that these resistant strains would be clinically significant. Currently there are no contraindications on the grounds of drug resistance to the therapeutic use of zanamivir during a pandemic.

Currently there are no generally accepted methods for detecting resistance to zanamivir. Inhibition in cell culture may produce spurious results and *in vitro* neuraminidase-inhibition tests are considered a better indicator. Genetic changes associated with certain resistant strains developed *in vitro* have been characterised but these do not necessarily represent all possibilities.

8.5. Other drugs

Other drugs that are likely to be used in an influenza pandemic to treat secondary pneumonia and other associated conditions include antibiotics, bronchodilators, cardiac drugs, antipyretics, analgesics and oral rehydration fluids solutions. A list of these drugs and drug products is included in Appendix F.

Recommendations

- 8.1 Australia should stockpile a quantity of antivirals as a first line of response to an influenza pandemic threat. The quantities to be stockpiled need to be further determined, as does the ongoing cost of such an action. Currently these antivirals would include amantadine, rimantadine and zanamivir.
- 8.2 The PBS listing of amantadine should be changed to include use as a treatment for influenza during a pandemic.
- 8.3 A limited stock of rimantadine should be made available in Australia under special provisions of the Therapeutic Goods Act. These stocks should be on hand for inter-pandemic prophylaxis, for example when there has been laboratory exposure or for use in emergency personnel going into a high risk area.
- 8.4 Criteria should be developed for the use of drugs during a pandemic.
- 8.5 Supplies of antibiotics and ancillary drugs identified as being in high demand during a pandemic should be frequently reviewed and estimations of requirements during a pandemic regularly reassessed.

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9. Provision of Medical Care and Essential Services

9.1. Responsibilities during a pandemic

Each player in an emergency response must have a clear understanding of their own and others' roles and responsibilities. In the event of a pandemic these roles and responsibilities may differ from those during the inter-pandemic period.

In the event of an influenza pandemic being declared by WHO, the following would occur:

- **Quarantine:** the CDNANZ would seek to have influenza declared a quarantinable disease. The Commonwealth government has responsibility for the Quarantine Act and the Commonwealth Department of Health and Aged Care determines the action to be taken to protect the population from a quarantinable disease.
- **Delivery of medical services** would remain with the States and Territories unless these services could not cope, when DISPLAN mechanisms would need to be brought into play.
- **A pandemic command centre** would be established by the Commonwealth, operating from the Commonwealth Department of Health and Aged Care in Canberra. The command centre would be managed by an appointed executive of the CDNANZ, which has representation from each jurisdiction. The centre would be responsible for:
 - coordinating all levels of surveillance;
 - providing information to the public through the National Emergency Media Relations Network (representatives in all jurisdictions);
 - managing vaccine and drug supply and distribution;
 - identifying priority groups for vaccination and antiviral treatment; and
 - measuring the impact of the pandemic on the nation.

On the advice of the CDNANZ, implementation of State and Territory pandemic plans would be signalled.

- **Monitoring of the impact on essential services** would be undertaken by the Commonwealth in conjunction with the Australian Medical Disaster Coordination Group and Emergency Management Australia.
- **DISPLAN:** An influenza pandemic plan sits within a jurisdiction's DISPLAN. Where indicated, States and Territories would initiate their DISPLAN to ensure that essential services are maintained.
- **Monitoring of global spread:** The Commonwealth would collaborate with WHO in the assessment of global spread of the virus and global impact of the pandemic.

9.2. Preparedness strategies

9.2.1. Enhanced surveillance

At WHO Phase 0: Preparedness level 1 (see page 13), enhanced sentinel surveillance will be initiated. General practitioners participating in the sentinel surveillance scheme will adopt the agreed case definition (see page 25) for the specific influenza virus causing the pandemic. This case definition will be retained and used by all medical officers during the course of the pandemic. (See Chapter 6, Recommendation 6.1, regarding sentinel surveillance.)

9.2.2. Notification

At WHO Phase 0: Preparedness level 3 (when human-to-human transmission has been confirmed; see page 13), influenza and influenza-like illness will become a notifiable disease and remain so until WHO announces that the pandemic is over. This action may involve legislative changes for the duration of the pandemic.

9.2.3. Involvement of the AMDCG

At Phase 0: Preparedness Level 1, at the CDNANZ teleconference to determine outbreak potential, the Australian Medical Disaster Coordination Group (AMDCG) would be involved and informed.

At Phase 0: Preparedness Level 3, the AMDCG would be informed to advise their membership to be on alert.

When the pandemic is announced and the national and state pandemic preparedness plans activated, the AMDCG would concurrently activate medical disaster plans.

9.3. Vaccination: identifying priorities

Australia will act on advice from the WHO Influenza Collaborating Centre as to the appropriate vaccine composition and drug treatment to be used in the pandemic (see Chapters 7 and 8).

Identification of high risk groups and priority groups for vaccination will be guided by WHO, but CDNANZ will make the final decisions in ranking identified vulnerable groups, traditional high risk groups, and providers of essential services (see section 7.4, page 33).

Until the new influenza subtype actually exists there is no way of determining other groups that it may place at high risk. Traditional high risk groups comprise:

- indigenous Australians over 50 years of age (approximately 24,000);
- indigenous Australians and non-indigenous people over 65 years of age (2.3 million); and
- those with chronic illness.

High priority groups would also include essential services personnel (1996 census indicates at least 871,484 people) and the volunteer work force (estimated to be around 650,000), who would provide a significant proportion of the emergency service personnel.

9.4. Treatment and hospitalisation

Criteria for diagnosis, methods of treatment (eg. use of scarce drug resources for prophylaxis or therapy), and hospital admission will be developed at a national level between the CDNANZ, the Divisions of General Practice, the College of Emergency Medicine, the Public Health Laboratory Network and sentinel surveillance networks.

Kainer has estimated the number of excess hospitalisation, death and outpatients visits due to influenza and its complications, in a pandemic with a 45% attack rate, 38,000-150,000 excess hospitalisations and 13,500-62,500 excess deaths may be expected on a national level (see section 2.5, page 10).

Planning to manage this situation will need to include consideration of:

- home versus hospital care. This needs to be considered against the capacity of community nursing services and community health centres to respond. Groups such as St John's Ambulance and Red Cross could be used to supplement this workforce;

- contingencies at State and Territory level to address the potential shortage of general practitioners, hospital doctors, nursing staff and allied health staff to meet the sustained demands.

Maintenance of laboratory services and the determination of a standard sequence of laboratory confirmation tests will be essential (See Chapter 6).

9.5. Rural and remote communities

People in rural districts and remote communities frequently have limited access to health care services. These population groups have the same right to medical and other care as the rest of the population, and all aspects of pandemic planning must address their needs in a way that is fair and equitable.

9.6. Projected time frames

In a best case scenario, a new subtype would emerge during the influenza season in the Northern Hemisphere, giving Australia some time to prepare and, optimistically, move through the earlier levels of the plan. Based on previous pandemics, the second wave of outbreaks would be expected to occur within 3-9 months of the initial outbreak.

The WHO will report when the pandemic period has ended, which is likely to be after 2-3 years. The indications will be that indices for influenza activity have returned essentially to inter-pandemic levels, and immunity to the new virus subtype is widespread.

9.7. Development of State/Territory pandemic plans

Each State and Territory is responsible for developing an influenza pandemic plan that is aligned with the national pandemic plan and addresses that State/Territory's capacity to deliver the health and medical services required during an influenza pandemic. Appendix I provides an example of such a plan.

State and Territory pandemic plans need to be developed within the framework of existing disaster management 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, which has a localised source, and a medical disaster such as a pandemic, where the source is global.

9.8. Field testing of pandemic plans

Emergency Management Australia has indicated that a coordinated field exercise to test draft pandemic plans within each jurisdiction is essential to identify strengths and weaknesses of the plans.

9.9. Use of scenarios

Scenarios can be used in table-top or field exercises to identify "what if" situations and stimulate discussion and identification of options. Examples of scenarios are included in Appendix G.

Recommendation

- 9.1 Each State and Territory should convene an influenza pandemic planning group, to develop a pandemic contingency plan that addresses the capacity of the States and Territories to respond to a pandemic. Ideally the group should include an Australian Medical Disaster Coordination group representative, a National Emergency Media Relation Network representative, a public health medical officer, a Chief Quarantine Officer and a CDANZ member.

10. Communications

10.1. Introduction

An influenza pandemic will affect very large numbers of people, not only those who are normally considered to be in a high risk group, but possibly thousands of young, normally healthy people. Regardless of planning by health authorities, the general public will be concerned, confused and possibly in a state of panic. Measures that may be necessary, such as rationing vaccinations, restricting freedom of movement, or closures of public facilities, are bound to cause alarm.

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.

Australia has a high level of expertise available through the CDNANZ, the WHO Collaborating Centre on Influenza in Melbourne, and the National Centre for Disease Control (NCDC) in the Commonwealth Department of Health. This communications strategy is designed to support and complement the actions of these bodies during a pandemic.

10.2. Advance preparations

10.2.1. National Emergency Media Relations Network

The National Emergency Media Relations Network (NEMRN), formed in 1997 following the first *Emergency Under Control* Conference for media relations (public affairs) officers, brings together media relations officers from a wide range of fields including human and animal health organisations; agriculture and primary industries departments; public and private sector food industry; scientific, medical and environmental organisations; and meat, poultry, egg, fish and farmer organisations.

The purpose of the NEMRN is to ensure that the media receives a consistent, coordinated message in an emergency situation, disseminating information rapidly to members. Its value was demonstrated in relation to the avian influenza in Hong Kong, when it helped to deflect unwarranted concern in Australia and, in particular, to limit any adverse impact on the Australian poultry and egg industry.

The NEMRN will play an important role in communicating with the public during a national pandemic.

10.3. Prepared public and health professionals

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

The media strategy should be implemented immediately. The first step will be to prepare the public in advance on what to expect if a new strain of influenza reaches Australia. This should include:

- development and widespread dissemination of a brochure outlining the roles and responsibilities of the CDNANZ, to promote confidence that Australia and New Zealand are well prepared to deal with a pandemic. Target audiences include the public, medical and scientific community and the media;
- a fact sheet outlining:
 - measures that may be needed, and their rationale; eg. who should be vaccinated and why others are excluded, procedures for isolation of patients, cancellations of elective surgery to provide more beds, etc;

- actions people can take to cope with the physical effects of influenza.
- enlisting the assistance of the media: in particular, calling together key news editors and medical writers for a day or half-day discussion with CDNANZ members, to enlist their support for:
 - publicising the availability of the fact sheets and the Influenza Plan (in advance of a pandemic); and
 - a commitment to non-sensational, responsible reporting of the Australian response when the pandemic actually occurs.

The media can be the most valuable link between health authorities and the public during a pandemic, especially as members can rapidly disseminate vital information around Australia in minutes. 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 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 hospitals, clinics, general practitioners, consulting rooms etc. via State and Territory Health Departments;
- regular communication bulletins to Divisions of General Practice, Colleges, medical, nursing and health care associations;
- articles in medical magazines and health publications.

10.4. Immediate action in the event of a pandemic

The following are guidelines for media management activity in the event of a pandemic. Individual actions will be determined by the NEMRN as situations develop.

PHASE 0: PREPAREDNESS LEVELS 1 & 2

(see page section 1, page 13, for definition of WHO Preparedness Levels)

STEP ONE: Involve the Media Adviser, appoint official spokespeople

The Media Adviser to the CDNANZ (Director of the Public Health Media Unit, NCDC) must be involved from the first CDNANZ meeting to co-ordinate a national response to the pandemic.

At the first meeting, a spokesperson/s to the media and hence the public should be designated. This will probably be a shared responsibility between:

- Chair of the CDNANZ,
- Head of the NCDC,
- Chief Medical Officer for Australia, and
- if the influenza strain emanates from animals, Chief Veterinary Officer for Australia.

STEP TWO: Inform the National Emergency Media Relations Network

Following CDNANZ's initial meeting, the NEMRN will hold a teleconference to discuss tactics, and will then invoke its information strategy.

Note: NEMRN members are keyed into a dedicated fax stream in the NCDC in Canberra and many are on an email distribution list.

State and Territory Health and Animal Health media relations people will be responsible for keeping public relations officers at hospitals and medical and animal health facilities informed on the latest developments.

STEP THREE: Prepare and disseminate Fact Sheets

The NCDC, in consultation with the CDNANZ, should immediately prepare one or two Fact Sheets for dissemination to the public via State and Territory Health Departments and other government departments; and to media nationally, in New Zealand, and overseas. The Fact Sheets should include:

- nature of the new disease, symptoms, dangers, and how individuals should care for their health; including contact numbers for State and Territory Health Departments;
- any unusual measures to be implemented, including emergency powers under the law, and the rationale for such measures.

**PHASE 0: PREPAREDNESS LEVEL 3
AND SUBSEQUENT PHASES**

STEP FOUR: The hot line - keeping the public informed

The NCDC media unit will immediately set up a national Hotline for individuals wanting information. Telephone staff will be given a set of questions and answers, and a doctor will be called in to answer other queries.

Note: The Department of Health and Aged Care in Canberra has a dedicated phone line for such emergencies, which can be put into action within a few hours.

STEP FIVE: Recorded message - update regularly

A separate 1800 phone line should be established immediately, updated daily or as necessary, with a recorded message on what the public should be doing.

STEP SIX: Print advertising - getting the facts

A half-page or full-page print advertisement should be prepared, setting out the measures being taken to respond to the pandemic, and hotline phone numbers. Advertisements will be co-ordinated from the NCDC, in consultation with the CDNANZ, and placed in all daily metropolitan newspapers throughout Australia.

STEP SEVEN: Indigenous and ethnic media - spreading the word

Indigenous media and ethnic media, both print and electronic, should be targeted with publicity and advertisements (translated), to ensure that the messages are spread to the whole Australian community.

STEP EIGHT: The Internet

Internet communications will play an important role in advising the public. Information on the internet should include fact sheets, phone-in numbers, media releases, updates etc. The website of the Public Health Division, Commonwealth Department of Health could be used, or a separate dedicated site established.

STEP NINE: Daily news conferences

The media should have daily access to an authoritative spokesperson. To avoid continual interruption to key workers, a media conference should be called each day at a time convenient for media. Spokespeople should be available at other times as much as possible for current affairs TV and talkback radio.

The daily news conferences will be co-ordinated by the NCDC Public Health Media Unit in Canberra, but as some spokespersons are based in State or Territory Departments, the media relations officers in those States will conduct the conferences.

STEP TEN: Politicians - keep the press secretaries informed

In general, it is best if Ministers do not comment publicly on the pandemic to ensure a co-ordinated, apolitical national response. At times, it may be appropriate or expedient for politicians to take the lead: eg. to announce the invoking of emergency powers. It is imperative, therefore, that Ministerial press secretaries be included on the information network system through the NEMRN.

Recommendation

- 10.1 The Commonwealth, States and Territories should forge strong links between the NEMRN, the Public Health media officers, and the DISPLAN media officers.

Appendix A Influenza Pandemic Planning Committee and Subcommittees

Influenza Pandemic Planning Committee Membership

Dr Graham Rouch (Chair)	Department of Human Services, Victoria
Mr Jonathon Abrahams	Emergency Management Australia
Dr Chris Bunn	Agriculture, Fisheries and Forestry – Australia
Ms Margaret Campbell	Commonwealth Department of Health and Aged Care
Dr John Carnie	Department of Human Services, Victoria
Ms Claire Caesar	Director Surveillance and Management, Commonwealth Department of Health and Aged Care
Prof Bob Douglas	National Centre for Epidemiology and Population Health
Prof Lyn Gilbert	Influenza Pandemic Planning Committee Public Health Laboratory Network
Dr Nicole Gilroy	Commonwealth Department of Health and Aged Care
Dr Gary Grohmann	Therapeutic Goods Administration
Dr Alan Hampson	WHO Collaborating Centre for Influenza Reference and Research
Dr Ana Herceg	Office of Aboriginal and Torres Strait Islander Health
Dr Lance Jennings	ESR Health, New Zealand
Dr Fay Johnston	Territory Health Services, Northern Territory
Dr Doug Lush	Ministry of Health, New Zealand
Dr Jeremy McAnulty	New South Wales Health
Ms Kay McNiece	Director Public Health media Unit
Ms Deborah Monk	Australian Pharmaceutical Manufacturers Association
Dr Eddie O'Brien	Medical Advisor, Commonwealth Department of Health and Aged Care,
Dr David Smith	Public Health Laboratory Network
Dr John Watson	Visiting UK expert on influenza pandemic planning

Surveillance sub group

Dr Graham Rouch
 Dr David Smith
 Dr Alan Hampson
 Dr Lance Jennings
 Dr Heath Kelly
 Dr Nicole Gilroy
 Mr Ross Andrews
 Ms Margaret Campbell
 Dr Ian Wilson
 Dr John Litt
 Dr Fay Johnson

Vaccine/anti viral sub group

Dr Graham Rouch
 Dr Alan Hampson
 Dr Dominic Dwyer
 Dr Lance Jennings
 Ms Deborah Monk
 Dr Nicole Gilroy
 Mr Greg Sam
 Dr Gary Grohmann
 Ms Margaret Campbell

Appendix B Key Stakeholders

Australasian College for Emergency Medicine
 Australia Post
 Australian Animal Health Laboratory
 Australian Association of Consultant Physicians Ltd
 Australian Chinese Medical Association Inc.
 Australian College of Paediatricians
 Australian Faculty of Public Health Medicine
 Australian Healthcare Association
 Australian Lung Foundation
 Australian Medical Association
 Australian Medical Council
 Australian Medical Disaster Coordination Group
 Australian Nursing Council
 Australian Nursing Federation
 Australian Pharmaceutical Manufacturers Association
 Australian Private Hospitals Association
 Australian Society for Infectious Diseases
 Australian Society for Microbiologists
 Carers Association of Australia
 Communicable Diseases Network Australia New Zealand
 Consumer Health Forum of Australia
 CSL Ltd
 Department of Foreign Affairs and Trade
 Emergency Management Australia
 Glaxo Wellcome Australia Ltd
 Medeva Pharma Ltd (UK)
 Novartis Pharmaceuticals Australia Pty Ltd
 Rhone-Poulenc Rorer Australia
 Pharmaceutical Society of Australia
 Pharmacy Guild of Australia
 Proprietary Medicine Association of Australia
 Public Health Association of Australia
 Public Health Laboratory Network
 Royal Australasian College of Physicians
 Royal Australian College of General Practitioners
 Royal Australian College of Medical Administrators
 Royal College of Nursing
 Royal College of Pathologists of Australasia
 SmithKline Beecham
 State Reference Laboratories
 Thoracic Society of Australia and New Zealand
 State/Territory Chief Health Officers
 State/Territory Chief Quarantine Officers

Interested parties:

Roche Products Pty Ltd
 National Aboriginal Community Controlled Health Organisation

Appendix C National Emergency Media Relations Network

The National Emergency Media Relations Network (NEMRN) comprises public affairs managers of the following related organisations:

- all Commonwealth public affairs officers
- all State and Territory Health Department public affairs officers
- all Commonwealth Department of Agriculture public affairs officers
- all State and Territory Department of Agriculture public affairs officers
- the Chief Medical Officer's office
- the Chief Veterinarian Officer's office
- Communicable Diseases Network Australia New Zealand
- National Centre for Disease Control
- Australian Animal Health Laboratory
- CSIRO
- Australia New Zealand Food Authority
- Defence Forces
- Emergency Management Australia
- Australian Meat Council
- Australian Dairy Corporation
- National Farmers Federation
- Australian Medical Association
- Sheepmeat Council of Australia
- Meat and Livestock Council
- Australian Supermarkets Institute
- Food Safety Group
- Animal Health Council
- Public Health Association
- Australian Consumers Association
- Australian Institute of Health and Welfare
- Local Government Association
- Prime Minister and Cabinet Olympics Committee
- Sydney Olympics Organising Committee
- State Emergency Services nationwide
- Ambulance Services nationwide
- Office of Aboriginal and Torres Strait Islander Health
- National Aboriginal Community Controlled Health Organisation
- Australian Red Cross
- Australian Nurses Federation
- Australian Federal Police
- State and Territory Police forces

Appendix D Surveillance and Laboratory Procedures

Surveillance procedures

Detection of influenza in the community

1. Community-based surveillance of influenza should be conducted between May 1 and September 30 each year in the southern half of Australia and throughout the year in northern Australia.

It should consist of sentinel general practices (or similar health care providers) at a ratio, initially, of one per 200,000 metropolitan Australian population; a ratio of one per 50,000-100,000 rural Australian population; and a ratio of one per 50,000 population in New Zealand; or other ratios appropriate for remote area populations.

These should report, on a weekly basis, the number of flu-like illnesses seen and include age, gender, locality and vaccination status.

The first patient with a flu-like illness seen each Monday, Tuesday and Wednesday (or other times appropriate for remote area populations) should have nose and throat swabs collected for detection of influenza virus. Either the specimens collected should be suitable for cell culture in addition to the rapid tests, or duplicate samples should be collected for culture.

2. Where possible, sentinel nursing homes (as well as other institutions or closed communities) should be included in the surveillance.
3. The surveillance system should also monitor lower respiratory tract infection in nursing homes (with associated mortality or hospitalisations) and adults presenting to teaching hospitals with lower respiratory tract infection. Ideally sampling for influenza virus should also be carried out in these populations.
4. Year-round monitoring in each State should consist of virus detection in children presenting to paediatric hospitals, and routine detection of influenza viruses in diagnostic laboratories.
5. All data should be accumulated by reference centres in each State and forwarded to a national centre on a weekly basis. State centres should provide feedback to sentinel practices on a fortnightly basis.
6. Weekly data for absenteeism of 3 or more consecutive days should be collected throughout the year from national employers, with a breakdown by State and region. Similar information should be collected for geographically representative schools in each State and accumulated by the State reference centre. The data should be forwarded weekly to a national centre.

Surveillance when pandemic influenza is present overseas

7. Influenza should be added to the list of notifiable diseases in each State and Territory.
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 for 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. Local public health authorities should 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 Australia or New Zealand

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

11. Local public health authorities 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 public health authorities, who are responsible for further dissemination of the information.
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 aspirate or swab collected. This should be sent promptly to the 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.

Surveillance when a new influenza strain occurs in animals in Australia or New Zealand

29. Public health authorities must be notified urgently in the event of an outbreak of influenza A in animals.
30. Serosurveys should be carried out of all personnel involved in the regular care of the infected animals and of those involved in culling the infected animals.
31. Personnel in contact with infected animals should be warned of possible symptoms and advised to present to their doctor promptly in the event of a flu-like illness. They should be provided with written information to pass to the doctor requesting that samples for serology and for virus isolation be collected and referred urgently to the State reference laboratory.

Laboratory capacity and procedures

Influenza detection capacity

1. "Bedside" diagnostic tests for influenza detection should be evaluated.
2. The laboratory capacity should be established to provide rapid antiviral susceptibility testing.
3. Nucleic acid amplification methods should be developed and validated in a sufficient number of laboratories to provide the service required. This will entail comparison of the new methods with conventional methods for both detection and serotyping.
4. A quality assurance program should be developed and implemented for influenza virus detection, serotyping, genotyping and antiviral susceptibility testing to ensure that the participating laboratories are performing adequately, and to provide a mechanism for rapidly assessing new tests and determining how tests perform in detecting new influenza strains.

State/Territory laboratory systems for detecting influenza virus

5. All laboratories should process or refer respiratory samples received for influenza detection as quickly as possible.
6. Laboratories using antigen detection or rapid culture methods should retain an aliquot of the original sample, to be sent to a reference laboratory for conventional tissue culture if their test is positive. If the specimens are not suitable for culture, then appropriate duplicate samples should 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.
7. Each State must ensure that its health care providers have rapid access to a laboratory that is able to culture the virus.
8. All staff must adhere to level 2 biosafety requirements in processing of all routine samples. In particular, any aerosol-producing procedures must be done in a Biological Safety Cabinet (BSC) class 1, 2 or 3. Any isolates of influenza virus should be handled within a BSC class 1, 2 or 3.
9. Samples referred for further testing should be securely packaged for transport according to IATA guidelines, with appropriate absorbent material and protection against breakage.
10. Any laboratory that suspects a new strain of influenza (based on the patient's history, clinical illness, or initial typing results) should immediately contact either their State reference laboratory or the WHO Collaborating Centre in Melbourne.
 - 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 should be strictly biosafety level 2, a BSC class 1 or 2 should be used and the operator should wear a gown, gloves and mask.
 - BSCs must be cleaned after spills and at the end of the day. They should 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.
11. Where an influenza isolate is known to be a new strain or where it is associated with an outbreak of severe illness, specimens should be processed with high level precautions. The laboratory should immediately contact their State reference laboratory and the WHO Collaborating Centre in Melbourne for advice. Tests that can be done on inactivated material (eg. an antigen detection or PCR-based method) may be able to be done on site.
12. Laboratories with conventional cell culture capabilities should routinely culture all respiratory samples for influenza and other viruses.
13. Reference laboratories (and others carrying out viral culture) 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 Melbourne, c/- CSL Limited, 45 Poplar Road, Parkville, VIC 3052 (further enquiries can be directed to Mr Alan Hampson on 03-9389 1340). This can be done directly or via a reference laboratory. Isolates should be sent at least fortnightly and any that fail to type as influenza A H1, influenza A H3 or influenza B should 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

13. 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; or have a flu-like illness and are family members or other close contacts of either of the above.

14. The antigen detection methods and rapid culture methods may not reliably detect new influenza strains. Therefore ALL respiratory specimens from highly suspicious clinical cases should be promptly referred to a reference laboratory for conventional tissue culture.
15. All samples from “highly suspicious cases” should be processed urgently, including conventional cell culture. All isolates should be typed urgently and referred urgently to the WHO Collaborating Centre in Melbourne for confirmation and subtyping. If RT-PCR is available, isolates should also be sent for genotyping to assist early identification of pandemic strains.
16. If available, RT-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 Australia or New Zealand

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 should be sent promptly to the 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.
18. Isolates should be typed urgently and referred to the WHO Collaborating Centre, as above.
19. If possible, susceptibility to amantadine and to the neuraminidase inhibitors should be monitored in a representative sample of primary isolates and tested in all isolates from patients receiving antiviral therapy.

Appendix E Laboratories Able to Provide Influenza Subtyping

State	Laboratory	Address	Contact	Telephone	Fax	e-mail
NSW	Virology Department, CIDMLS, ICPMR	Westmead Hospital, Westmead, NSW 2145	Dr Dominic Dwyer Dr Alistair McKenzie	02-98456255	02-96335314	dominicd@westgate.wh.usyd.edu.au
NSW	Virology Department, SEALS	The Prince of Wales Hospital Randwick, NSW 2031	A/Prof William Rawlinson	02-93829113	02-93984275	w.rawlinson@unsw.edu.au
Vic	VIDRL	10 Wreckyn St North Melbourne, Victoria 3051	Dr Michael Catton	03-93422637	03-93422666	mike.catton@nwhcn.org.au
Vic	WHO Collaborating Centre for Influenza Reference and Research	c/- CSL Limited, 45 Poplar Road, Parkville, VIC 3052	Mr Alan Hampson	03-9389-1340	03-93891881	Ahampson@csl.com.au
WA	Division of Microbiology PathCentre	Hospital Ave Nedlands WA 6009	Dr DW Smith	08-93463122	08-93463960	david.smith@health.wa.gov.au
SA	Department of Virology IMVS	Frome Rd, Adelaide	Dr Geoffrey Higgins	08-82223000	08-82223543	geoff.higgins@imvs.sa.gov.au
Qld	Queensland Health Scientific Services	39 Kessels Rd Coopers Plains, Qld 4108	Mr Greg Smith	07-3274-9151	07-32749074	smithga@health.qld.gov.au

Appendix F Dosage Regimens for Antiviral Drugs

Amantadine

Marketed as Symmetrel. Supplied by Novartis Pharmaceuticals Australia Pty Ltd

Registered for supply in Australia

Available as 100mg capsules

Dosage:

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

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

(Reference: Therapeutic Guidelines 1998-99, Australian Medicines Handbook 1998, WHO Influenza Pandemic Preparedness Plan 1999)

Rimantadine

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

Not registered in Australia

Available as 100mg tablets and a syrup 50mg/5mL

Dosage:

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

Prophylaxis 100mg 12 hrly po for period of time during which protection is required, or 10 days after vaccination (licensed for prophylaxis in children in USA, not treatment)

(Reference: Guide to Antimicrobial Therapy, 1998)

Zanamivir

Marketed as Relenza. Supplied by Glaxo Wellcome Australia Limited

Registered in Australia

Available as a metered dose diskhaler, 10mg per dose

Dosage:

Treatment 10mg bd by diskhaler 5 days

Prophylaxis Recommendations cannot be made at this stage, but likely to be 10mg 24hrly for period of time during which protection is required, or 10⁺ days after vaccination

Data for treatment in children, pregnancy, underlying diseases etc. not yet available.

GS4104 (Oseltamavir)

Supplied by Roche Products Pty Ltd

Clinical trials in progress - data on dosing schedules etc. not yet available.

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 ¹⁹	Zanamivir ¹⁴	
Antibiotics Amoxicillin ^{2,8,10,25,26,27} Amoxicillin/clav. ^{2,8,27} Cefaclor ^{2,11,12} Cefuroxime ¹⁴ Ciprofloxacin ⁵ Clindamycin ^{16,21} Dicloxacillin ^{2,7} Doxycycline ^{2,9,10,12,20,24,25,26} Erythromycin ^{2,3,11,12,21} Flucloxacillin ^{2,8,27} Roxithromycin ^{15,26} Trovaflaxacin Meropenem ⁴ Cefepime ⁷ Ofloxacin ¹⁵ Metronidazole		Amoxicillin ^{8,23,27} Ampicillin ^{8,23} Benzylpenicillin ⁸ Cefotaxime ¹⁵ Ceftriaxone ²² (with lignocaine) Cephalothin ¹¹ Cephamandol ¹¹ Cephazolin ^{11,12,26} Cefpirome ¹⁵ Dicloxacillin ^{2,7} Erythromycin ^{3,9} Flucloxacillin ^{2,8,9,23} Imipenem ¹⁸ Meropenem ⁴ Piperacillin/tazobactam ¹⁷ Procaine penicillin ²⁶ Ticarcillin/clav. ²⁷ Vancomycin ^{3,9,11,17,26} Trovaflaxacin
Bronchodilators	Salbutamol ^{2,11,28, 15} Salmeterol ¹ Terbutaline ⁴ Ipratropium ^{2,6}	
Antipyretics Aspirin Codeine Morphine Paracetamol Paracetamol/codeine		Morphine Pethidine
Other agents Prednisolone ²³ Theophylline ^{12,28} Sustained release ⁴	Beclomethasone ^{1,28} Budesonide ⁴ Sodium chromoglycate ^{21,23}	Adrenaline ^{4,8,26} Aminophylline ^{9,26} Dexamethasone ^{9,18,23} Hydrocortisone ^{9,21} Methylprednisolone ⁹

1.Alan&Hanburys, 2.Alphapharm, 3.Abbott, 4.Astra Zeneca, 5.Bayer, 6.Boehringer-Ingelheim, 7.Bristol Myers Squibb, 8.CSL, 9.David Bull, 10.Douglas, 11.EliLilly, 12.Faulding, 13.Fawns & McAllan, 14.GlaxoWellcome, 15.Hoechst Marion Roussel, 16.Kenral, 17.Lederle, 18.Merck Sharp & Dohme, 19.Novartis, 20.Pfizer, 21.Pharmacia&Upjohn, 22.Roche, 23.Rhone-Poulenc Rorer, 24.Roerig, 25.Schein Bayer, 26.Sigma, 27.Smith Kline Beecham, 28.3M Pharmaceuticals

Appendix G Scenarios

These scenarios are intended as planning exercises. Given the events described, what actions need to follow, immediately and over the following weeks and months, at national, state or local level?

Scenario One

This example is taken from the US draft influenza pandemic plan.

An outbreak of unusually severe respiratory illness is identified in a small village in South China. At least 25 cases have occurred, affecting all age groups; 20 patients required hospitalisation at the local provincial hospital, 5 of whom died from fulminant pneumonia and acute respiratory failure.

Surveillance in surrounding areas increases, and new cases begin to be identified throughout the province. Viral cultures collected from several of the initial patients are positive for type A influenza virus, but cannot be further subtyped by the provincial or national laboratory with available reagents. The isolates are sent for further characterisation to the WHO Reference Center for Influenza, at the Center for Disease Control and Prevention (CDC), Atlanta. The CDC determines, using special reagents, that the isolates are type A H7N1, a subtype never before isolated from humans. Gene sequencing studies indicate that haemagglutinin and neuraminidase genes are avian in origin, with the remaining genes derived from a human H3N2 virus.

This information is immediately transmitted back to the Chinese Ministry of Health and throughout the WHO network. The CDC dispatches a team of epidemiologists and laboratory personnel to study further the epidemiological and clinical features of the disease, and notifies quarantine stations and large hospitals at major US ports of entry to be on the alert for arriving passengers with severe respiratory illness. Isolates of the new H7N1 strain are sent to the FDA to begin work on producing a reference strain for vaccine production, and influenza vaccine manufacturers are placed on alert.

The novel influenza virus begins to make headlines in every major newspaper, and becomes the lead story on major news networks. Key US government officials are briefed on a daily basis as surveillance is intensified throughout Southeast Asia and the Pacific Rim.

Over the next two months, outbreaks begin to appear in Hong Kong, Singapore, South Korea and Japan. Although cases are reported in all age groups, young adults appear to be the most severely affected, and case-fatality rates approach 5%. Widespread panic begins because vaccine is not yet available and supplies of antiviral drugs are severely limited. Several weeks later, the CDC reports that H7N1 virus has been isolated from ill airline passengers arriving from Hong Kong and Tokyo in Los Angeles, Honolulu, Chicago and New York. States and local areas are asked to intensify influenza surveillance activities and vaccine manufacturers are requested to go into full production.

A few more weeks pass and focal outbreaks begin to be reported throughout the United States. Rates of absenteeism in schools and businesses begin to rise. Phones at physicians' offices and health departments begin to ring constantly. Exaggerated accounts of illness are reported by the media. Citizens begin to clamour for vaccine, but only 10% of the estimated need is available. Police departments, local utility companies and mass transit authorities begin to have severe personnel shortages, resulting in severe disruption of routine services. Hospitals and outpatient clinics become severely short-staffed when the majority of physicians, nurses and other health-care workers become ill. Elderly patients with chronic, unstable medical conditions are afraid to venture out for fear of becoming seriously ill with influenza. Intensive care units at local hospitals become overwhelmed, and soon there are widespread shortages of mechanical ventilators for treatment of patients with

pneumonia. Family members are distraught and outraged when loved ones die within a matter of a few days. Looting becomes a serious problem in major metropolitan areas due to shortages of police officers. Several major airports close because of high absenteeism among air traffic controllers. Further deterioration in health and other essential community services occurs over the next 6-8 weeks as illness sweeps across the country....

Scenario Two

On 3 March, 2000, an item on the Internet communicable diseases information line reports an influenza death in Southern China attributed to a new sub type. On 6 March, a further Internet news item reports that the new sub type (H7N1) has been confirmed by the WHO reference laboratory in Atlanta. The following day, 7 March, a WHO media release reports that district medical services in rural and township areas of Southern China have reported increased cases of influenza-like illness, with the incidence increased in comparison with all years back to 1986. According to the report, one in three hospital admissions to two university teaching hospitals is for influenza.

In the same week, the 5th International Congress on Trade and Development is being held at Uluru Convention Centre, with 2000 international delegates. Twenty (1%) delegates are hospitalised with pneumonia, and 400 (20%) have influenza-like illness. Initially, legionella is suspected. Anecdotal evidence also suggests an increase in influenza-like illness in local communities, who have unrestricted access to the Uluru area.

At the regular CDNANZ teleconference, held on 7 March, the Northern Territory reports increased influenza activity in the Top End, but this is later identified as influenza type A (H3N2) by the WHO reference laboratory in Melbourne – not the subtype reported in China.

Southern China, Korea, Japan and Hong Kong, however, are all now reporting increased influenza activity and deaths. CDNANZ advises the Minister for Health that Australia should be placed on “National Alert”. The Influenza Preparedness plan is activated.

Advice from Darwin and Adelaide contradicts the earlier laboratory finding and confirms that the illness among the delegates at the convention is in fact influenza from the new subtype.

Appendix H Estimates of the Number of Excess Hospitalisation, Death and Outpatient Visits Due to Influenza and its Complications

The following tables and explanations are largely based on the work of Meltzer et al (1999).

Age group distribution of number of cases

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

Table 1: Australian population estimates used to define impact of influenza

Age group	Numbers (thousands)	Percentage of total (%)
0-19 yrs old	5,500	27.5
20-64 yrs old	12,000	60.0
65+ yrs old	2,500	12.5
Total	20,000	100.0

Note, the 1996 Census counted 17.892 million persons and 12.1% were aged 65 and above.

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. The lower and upper age-weighted averages of 15.4% and 24.8% were used in the US model. The estimates used are similar to the 22.5% figure quoted by Schoenbaum et al (1976) and the 19.6% for 1970-1978 used by the US Office of Technology Assessment Study (Table 2) (Office of Technology Assessment US Congress 1981). To our knowledge, there are no equivalent comparable Australian data. The lower and upper estimates of 6.4 and 11.1% for the 0 to 19 year olds and the lower estimate of 14.4% for the 20 to 64 year olds were obtained from the Working Group on Influenza Pandemic Preparedness and Emergency Response (GRIPPE, unpublished data). The upper limit for the 20 to 64 years old and the lower and upper estimates for the 65 years and older were obtained from expert opinion. Note that the NHMRC categorises all persons 65 years and older as “high risk”. This categorisation, however, is more to indicate high priority targets for interpandemic vaccination as opposed to describing the numbers of persons in that age group who are at higher risk of contracting an influenza related illness with a serious health outcome.

Table 2: Two scenarios of distribution of the percentage of high risk population used to examine the impact of pandemic influenza in Australia

Assumed percentage at high risk	Distribution A % of all cases	Distribution B % of all cases
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 Australian average	15.4	24.8

Health outcomes

Hospitalisations

The excess hospitalisations due to influenza were obtained from US data (Table 3) (Meltzer et al 1999). Some of these estimates were based on excess hospitalisation from the 1968-69 and 1972-73 epidemic excess hospitalisation rates in Oregon for standard and high risk groups.

Outpatient (ambulatory care)

The excess rates of medically attended illnesses were obtained from US data (Table 3) (Meltzer et al 1999). Excess outpatient visits were defined as the increased visits due to the 1968-69 and 1972-73 epidemics compared to the 1970-71 period. As there were no studies that considered outpatient (ambulatory care) visits by risk category, it was decided to calculate the rates by multiplying all the rates used for the standard risk groups by an arbitrarily defined figure of 1.75. It was found by trial and error, that any factors noticeably higher than that (eg 2.0), resulted in more than 100% of the high risk population requiring outpatient care.

Deaths

The excess deaths due to influenza were obtained from US data (Table 3) (Meltzer et al 1999). Some of these estimates for the standard risk groups were based on the lowest and average age weighted death rates in the 1957-1958, 1960 and 1963 influenza A epidemics. Data from Oregon was used to estimate death rates for the 20 to 64 years and the 65 years and older age groups. As data regarding the death rate among the 0 to 19 year old age group with high risk conditions are 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 (Meltzer 1999, Office of Technology Assessment US Congress 1981).

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) (Meltzer 1999)

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
Outpatient visits (per 1000)			
<i>Standard risk</i>			
0-19 yrs old (rate)	471		548
20-64 yrs old (rate)	333		370
65+ yrs old (rate)	375		389
<i>“High risk”</i>			
0-19 yrs old (rate)	825		958
20-64 yrs old (rate)	583		647
65+ yrs old (rate)	656		682

The number of excess hospitalisations (Table 4), deaths (Table 5) and outpatient visits (Table 6) for 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. Within each gross attack rate, the lower range estimate is calculated using distribution A (Table 2) and the lower estimates from Table 3. Distribution B (Table 2) and the higher estimates from Table 3 result in the upper range estimate.

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

Attack Rate	Distribution A lower estimates	Distribution B lower estimates	Distribution A higher estimates	Distribution B higher estimates
0.10	8,455	10,050	29,796	33,353
0.15	12,683	15,075	44,694	50,029
0.20	16,911	20,100	59,592	66,705
0.25	21,138	25,125	74,490	83,382
0.30	25,366	30,150	89,388	100,058
0.35	29,594	35,175	104,286	116,735
0.40	33,821	40,200	119,184	133,411
0.45	38,049	45,225	134,082	150,087

Attack rate is the proportion of the Australian 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 Australia

Attack rate	Distribution A lower estimate	Distribution B lower estimate	Distribution A higher estimate	Distribution B higher estimate
0.10	3,036	3,895	9,291	13,901
0.15	4,554	5,842	13,936	20,852
0.20	6,072	7,789	18,581	27,802
0.25	7,590	9,737	23,227	34,753
0.30	9,108	11,684	27,872	41,704
0.35	10,626	13,632	32,517	48,654
0.40	12,144	15,579	37,163	55,605
0.45	13,662	17,526	41,808	62,555

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

Table 6: Estimates of the excess number of persons visiting as outpatients secondary to influenza or its complications in Australia.

Attack rate	Distribution A lower estimate	Distribution B higher estimate	Distribution A lower estimate	Distribution B higher estimate
0.10	838,958	887,649	937,356	991,068
0.15	1,258,437	1,331,474	1,406,033	1,486,602
0.20	1,677,916	1,775,298	1,874,711	1,982,136
0.25	2,097,395	2,219,123	2,343,389	2,477,670
0.30	2,516,874	2,662,948	2,812,067	2,973,204
0.35	2,936,353	3,106,772	3,280,745	3,468,738
0.40	3,355,832	3,550,597	3,749,422	3,964,272
0.45	3,775,311	3,994,421	4,218,100	4,459,806

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

Below is a summary of the excess hospitalisations, deaths and outpatient visits due to influenza or its complications in the Australian population. The figures quoted are the lower estimate of distribution A and the higher estimate of distribution B.

Table 7: Estimates of the excess number of persons hospitalised secondary to influenza or its complications in Australia

Attack Rate	Range	
0.10	8,455	33,353
0.15	12,683	50,029
0.20	16,911	66,705
0.25	21,138	83,382
0.30	25,366	100,058
0.35	29,594	116,735
0.40	33,821	133,411
0.45	38,049	150,087

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

Table 8: Estimates of the excess number of persons dying secondary to influenza or its complications in Australia

Attack rate	Range	
0.10	3,036	13,901
0.15	4,554	20,852
0.20	6,072	27,802
0.25	7,590	34,753
0.30	9,108	41,704
0.35	10,626	48,654
0.40	12,144	55,605
0.45	13,662	62,555

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

Table 9: Estimates of the excess number of persons visiting as outpatients secondary to influenza or its complications in Australia

Attack rate	Range	
0.10	838,958	991,068
0.15	1,258,437	1,486,602
0.20	1,677,916	1,982,136
0.25	2,097,395	2,477,670
0.30	2,516,874	2,973,204
0.35	2,936,353	3,468,738
0.40	3,355,832	3,964,272
0.45	3,775,311	4,459,806

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

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

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

DRAFT

**Prepared on behalf of the
Standing Committee on Infection Control
Department of Human Services, Victoria
Australia**

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DISCLAIMER

The current document has been endorsed by the Standing Committee for Infection Control as a draft document to be released for public comment as an appendix to the Australian National Influenza Pandemic Preparedness Plan.

This document has not yet been formally endorsed by the Department of Human Services, Victoria. Consequently, comments about the document are encouraged, and should be addressed to:

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While all advice and recommendations are made in good faith, neither the Department of Human Services, Victoria, nor any other person associated with the preparation of these guidelines accepts legal liability or responsibility for such advice or recommendations.

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ABBREVIATIONS

AIDS	Acquired immunodeficiency syndrome
BD	Twice a day
BiPAP	Biphasic positive airway pressure
CNS	Central nervous system
CPAP	Continuous positive airway pressure
DHS	Department of Human Services, Victoria
DISPLAN	Victorian Medical Disaster Plan
Flu	Influenza
<i>H. influenzae</i>	<i>Haemophilus influenzae</i>
HIV	Human immunodeficiency virus
IF	Immunofluorescence
IM	Intramuscular injection
IPPC	Influenza Pandemic Planning Committee (National, Australian)
IPPV	Intermittent positive pressure ventilation
IV	Intravenous injection
MC&S	Microscopy, culture and sensitivity testing
NHMRC	National Health and Medical Research Council (Australia)
NPA	Nasopharyngeal aspirate
PCR	Polymerase chain reaction
PHLN	Public Health Laboratory Network
QID	Four times a day
q4h	Every four hours
SCIC	Standing Committee on Infection Control, DHS VIC.
<i>S. aureus</i>	<i>Staphylococcus aureus</i>
<i>S. pneumoniae</i>	<i>Streptococcus pneumoniae (pneumococcus)</i>
TDS	Three times a day
WHO	World Health Organization
Y2K	Year 2000 (millennium bug).

INTRODUCTION

Another influenza pandemic is a certainty. A new sub-type of the influenza virus will emerge to which the population has little or no immunity, and it will spread rapidly throughout the world. We cannot, however, predict *when* this will occur. There may be very little warning: characteristically, influenza pandemics begin suddenly and because a pandemic is likely to appear simultaneously throughout the country, each region will, to a large extent, have to rely on its own resources¹.

The impact on the health of Victorians could be devastating: within a 6 to 8 week period, up to 20,000 persons may require hospitalisation and there may be up to 7,200 excess deaths.

Major disruption of critical community services can also be expected, with 40-70% of the workforce unable to attend work for some period of time due to illness. Critical community personnel such as police, firemen, transportation and utility workers may suddenly be in short supply. Health care workers are likely to be at even higher risk of exposure and illness, further impeding the care of patients, while effective preventive and therapeutic measures, including vaccines (against the pandemic strain) and antiviral agents are likely to be in short supply.

Contingency planning is crucial to contain and manage, as effectively as possible, the effects for the next influenza pandemic. This needs to occur *now*, and be undertaken by all health care institutions, to anticipate and put in place strategies to meet a greatly increased demand for services compounded by staff shortages. Not only will planning facilitate an effective response when a pandemic occurs, it will also provide tangible benefits in the interim such as improvements in infrastructure, health care worker vaccination, and Y2K (millennium bug) planning¹.

The aim and scope of this document

This contingency plan provides guidelines to help hospital management, health care service planners and clinicians to cope with large numbers of patients, many with severe disease or life-threatening complications, at home and in hospital. Whilst primarily designed for hospitals, the principles of the plan could be applied in other health care settings.

The document is divided into two parts.

Part One is concerned with the clinical management of influenza, particularly within the hospital situation, including clinical diagnosis, risk assessment in individual patients, management of complications, use of antivirals and antibiotics, the clinical aspects of infection control, and indications for discharge.

Part Two is concerned with health service planning. It discusses the possible magnitude of a pandemic, strategies to increase bed capacity and recruit the necessary extra staff, and the issue of infection control. The guidelines have been written largely as general principles, to enable each health care institution to develop a contingency plan to meet its own specific needs. These plans should be "road tested" to ensure, so far as possible, the institution's response capability. To achieve this, the final section of Part Two sets out a suggested action plan for hospitals, to ensure readiness in the event of a pandemic.

It will be essential, during a pandemic, to inform the public and general practitioners on the management of influenza, and when to seek advice and refer. Appendix G therefore contains

fact sheets for the general community and guidelines for general practitioners that can be copied and distributed as needed.

The Contingency Plan is linked with DISPLAN (Victorian Medical Disaster Plan). It should also supplement and be integrated with the Victorian and National Public Health Contingency Plans for Influenza, which should be referred to for important information on influenza surveillance, vaccination against influenza and pneumococcal infection and the use of antiviral drugs.

Designation of key personnel for the coordination and direction of Statewide responses mentioned in the plan will be the responsibility of the Department of Human Services and DISPLAN.

These plans require updating on a regular basis, at least every 2 years, because of

- changes in antibiotic resistance patterns (up-date every 12 months)
- changes in demographics
- changes in the availability of beds
- developments with antibiotics and antiviral drugs (up-date every 6-12 months).

The guidelines should also be revised after an influenza pandemic/severe epidemic, to incorporate lessons learnt.

PART ONE

CLINICAL MANAGEMENT OF PANDEMIC INFLUENZA

SECTION 1.1.

CLINICAL FEATURES & COMPLICATIONS

Outbreaks of influenzal disease occur in Australia annually, and their extent is determined largely by local susceptibility to antigenic drifts in the existing strains. The last two influenza pandemics occurred 42 and 31 years ago– the “Asian flu” and the “Hong Kong flu”, respectively. Most current hospital clinicians would therefore not have experienced pandemic influenza disease and would not be aware of the vagaries of its presentation.

The diagnosis of influenza on clinical grounds may be very difficult, particularly in the very young and the aged².

Frequency of disease and age

Those normally at highest risk of influenza are the very young, the elderly, and the immunocompromised. These patterns may vary during a pandemic. In the 1918-1919 “Spanish flu” pandemic, for instance, the highest death rates were among those aged 20 to 40 years, while during the 1957 pandemic, in the United Kingdom the highest attack rates were in school children and young adults³ (see Table 1). Up to 50% of UK school children developed influenza, with attack rates of 90% in residential schools.

Table 1: Attack rates per age group during the 1957 influenza pandemic in the UK³

Age (years)	Attack rate (%)
0-4	31
5-14	49
15-39	27
40-59	25
60+	12

Similarly, in Melbourne in 1957, the numbers of infants and young children infected were unexpectedly high⁴. A serological survey epidemic confirmed that symptomatic attacks were more frequent in younger than older subjects, and this was further supported by case notifications. In a sample of subjects aged 18 to 60 years, the proportions developing antibodies were the same across all ages (28- 32%)⁵.

Clinical presentations

These presentations were derived from a Melbourne study of the clinical features of 333 patients admitted to Fairfield Hospital between January 1969 and December 1972, in whom influenza infection was confirmed by viral culture².

Babies and children

Babies and children often present with a severe, non-specific febrile illness. The major features are:

- **fever and cough**, sometimes with
- **rhinorrhoea or croup** (laryngo-tracheo-bronchitis).

In the 1957 pandemic, the number of infants and young children in Melbourne with croup was unexpectedly high⁴. Croup is also a recognised presentation in older children.

Children may also present with:

- **symptoms suggestive of meningitis**: fever, convulsions, vomiting, irritability and photophobia.
- **fever alone**, sometimes associated with vomiting or diarrhoea of short duration.
- **poor feeding**, as a result of nasal obstruction.

Subclinical infection may occur in the very young.

Pneumonia due to secondary bacterial infection occurs in about 10% of hospitalised children under the age of four years.

In adolescent age groups, the more classical features of influenza become a feature. These respiratory manifestations are indistinguishable from those caused by other respiratory viral infections in these age groups.

Younger adults (20 to 49 years)

Classical features of influenza are usually present: various combinations of malaise, fever, cough, sore throat, headache, muscular aches and sometimes blood-tinged sputum, retro-sternal chest pain due to tracheitis, vomiting and laryngitis^{2,4}.

Frequently one feature such as headache or fever predominates, leading to an initial consideration of a diagnosis of meningitis or septicaemia.

Primary influenza pneumonitis can be a presenting diagnosis (see page 7).

Older adults

The clinical diagnosis of influenza is often overlooked because symptomatology is usually overshadowed by lung complications. Clinical histories may be unreliable because patients are often confused due to fever and pre-existing cardiovascular disease.

Major presentations are pneumonia or bronchitis in association with chronic obstructive lung disease.

Complications of influenza

Influenza virus can be isolated from the blood and many organs outside the respiratory tract, and in addition to pneumonia and pneumonitis, a wide range of less common complications have been described. Sudden deaths have also been observed during epidemics⁶.

Because of its severity, influenza can exacerbate pre-existing chronic respiratory, cardiac or renal disease, particularly in the elderly and the very young.

Potential complications include:⁷

- Respiratory
 - respiratory failure

- bacterial superinfection
- viral pneumonia
- Central nervous system
 - encephalitis (rare)
 - transverse myelitis (rare)
 - Guillain-Barre syndrome
- Cardiac
 - atrial fibrillation (common, especially in older people)
 - heart failure (left and right heart failure)
 - myocarditis (rare)
 - pericarditis (rare)
- Myositis (severe leg pain and tenderness for 1 to 5 days)
- Rhabdomyolysis/myoglobinuria
- Reye's syndrome (an acute and often fatal encephalopathy associated with liver failure due to fatty infiltration; especially in children, occasionally in adolescents, rare in adults)

Pneumonia

Disruption of the respiratory defence mechanisms in influenza predisposes to the development of secondary bacterial bronchitis and pneumonia. While the disruption of normal host respiratory defence mechanisms is probably multifactorial, there is some evidence for direct viral injury to alveolar macrophages, and widespread damage to the respiratory epithelium is characteristic.

During the 1957 pandemic, experience in Melbourne⁴ and the USA⁸ was that most cases of bacterial pneumonia secondary to influenza were pneumococcal in type, with lesser causes being *Staphylococcus aureus* and *Haemophilus influenzae*. The predominant pathogen in more recent cases of post-influenzal bacterial pneumonia has been *Streptococcus pneumoniae*.

Of 672 patients admitted to Fairfield Hospital, Melbourne, in 1957 with disease attributable to infection with Asian type A influenza, 366 had pneumonia, of whom 38 died⁴. Experience in the USA during the same period suggested that pulmonary symptoms due to influenza in young and older adults may present in four ways⁸:

- **upper respiratory tract symptoms** within 48 hours of onset, sometimes with pleuritic pain and mild dyspnoea. Chest signs may be present, but the chest radiograph is normal – this was attributed to influenza bronchiolitis;
- **secondary bacterial pneumonia following influenza:** after some period of improvement, 2 to 14 days later pulmonary infection presents which is confirmed radiologically;
- **concomitant viral and bacterial pneumonia:** symptoms of lower pulmonary tract disease blend with the original influenzal symptoms, and it is impossible to determine the point at which the pulmonary involvement occurs. The chest radiograph shows pneumonia;
- **influenza virus pneumonitis:** severe and often fatal disease occurs, with onset 24 hours after “flu” symptoms, resulting in respiratory distress with dyspnoea and bloody sputum.

In the USA during the 1957-58 pandemic, a high proportion of people with one of these forms of pneumonia had pre-existing rheumatic heart disease. This was not the experience in Melbourne⁴.

Pneumonitis

Severe influenza virus pneumonitis occurred in Melbourne during the 1957 epidemic (5 cases) and later^{4,9}. The main features of the condition are:

- influenzal illness accompanied within three days of onset by dyspnoea and haemoptysis;
- hyperventilation and marked central cyanosis, often with symptoms of cerebral anoxia;
- clinical and radiological evidence of bilateral diffuse lung disease;
- failure to respond to antibiotics given early in the course of the disease;
- failure of oxygen administration to reduce hypoxia;
- peripheral circulatory failure with azotaemia and oliguria.

Of the 10 patients described, 8 died⁹. Severe interstitial non-bacterial pneumonitis with extensive disruption of respiratory epithelium was demonstrated at autopsy.

Differential diagnosis of influenza

During an influenza epidemic, there are nevertheless many people with fever who do *not* have influenza. It is important not to miss, for example, the returned traveller with malaria or the person with staphylococcal septicaemia. Table 2 illustrates some of the conditions commonly misdiagnosed as influenza. It is *not* intended to be all inclusive.

Table 2: Conditions which may mimic influenza

Differential Diagnosis	“Clues”	Investigations
INFECTIOUS		
Malaria	Travel history	Thick and thin film
Typhoid	Travel history	Blood culture
Meningococcal septicaemia	Any rash (not just petechial)	Blood cultures
Staphylococcal septicaemia		Blood cultures
Bacterial meningitis		Lumbar puncture: do <i>not</i> rely on bacterial antigen testing
Other respiratory viruses, eg adenovirus, parainfluenza	Concurrent epidemic	Viral culture: nasopharyngeal aspirate or nasal swab
NON-INFECTIOUS		
Subarachnoid haemorrhage	Very sudden onset of headache	CT scan Lumbar puncture
Heat stroke		
Carbon monoxide poisoning		

A rapid bedside diagnostic test (combined with viral culture to ensure tracking of influenza strains) has been developed, but is not yet widely available in Australia.

The **Public Health Laboratory Network (PHLN)** of Australia will provide detailed guidelines regarding:

- the rapid bedside diagnostic test: including sensitivity, specificity, positive and negative predictive values in different sub-populations, and whether all positive rapid diagnostic tests should be accompanied by a viral culture;
- where the viral culture should be sent and details of transportation requirements
- the indication for submission of a viral culture sample.

Other possible indications for submission of a viral culture sample are:

- all patients who are hospitalised
- all persons with an influenza like illness who have returned from overseas in the last seven days
- contacts of persons diagnosed with influenza who have been commenced on antiviral agents
- all health care workers with an influenza like illness.

SECTION 1.2.

INFECTION CONTROL: CLINICAL CONSIDERATIONS

Infection control measures are discussed in Part Two of this document, for hospital and health service planners (see Section 2.4). This section provides information of particular relevance in the clinical setting.

Infectivity

The incubation period for influenza ranges from 24 hours to 5 days. Spread of influenza is by aerosol, and by contamination of the hands (by contact with skin or fomites) and then intranasal or conjunctival inoculation. Aerosol is 10 times more infectious than nasopharyngeal inoculation.

Survival is 24-48 hours on hard, non-porous surfaces; 8-12 hours on cloth, paper and tissue; and 5 minutes on hands¹⁰. Survival is enhanced under conditions of low humidity (typical in the winter months in Victoria).

In the absence of antiviral therapy, viral shedding occurs until 5 days after the onset of illness, but can occur for more than 7 days, especially in children¹⁰. For those receiving antiviral therapy, duration of shedding is likely to be shorter.

Infection control measures

The following measures should be taken:

- Classify patients as one of the following:
 - infected – confirmed
 - infected – suspected
 - exposed (potentially infected)
 - uninfected
 - uninfected and at very high risk of complications, eg. bone marrow transplant recipients.
- On arrival at Emergency, direct patients with influenza-like illness promptly to a separate designated influenza assessment/admission clinic.
- Accommodate patients with confirmed or suspected influenza as follows, in descending order of preference:
 1. a negative pressure room
 2. single rooms (not positive pressure)
 3. cohort in an area with an independent air supply and exhaust system
 4. separate infected patients and other visitors by at least one metre.

If possible, separate those with confirmed influenza from those with suspected influenza. Criteria for cohorting or isolating patients are set out below.

- Wear gloves:
 - for all patient handling. Change gloves between patients; and

- for all contacts with items likely to be contaminated with respiratory secretions (eg masks, oxygen tubing, nasal prongs, tissues).
- Wash hands immediately after removal of gloves. If hand-washing facilities are not readily available, use an alcoholic based handrub (provided hands are not too heavily soiled), followed by hand-washing as soon as possible.
- Wear gowns (waterproof aprons) during procedures and patient activities that are likely to generate splashes or sprays of respiratory secretions.
- All visitors, staff, students and volunteers should wear a N95 mask on entering the room of a patient with influenza (confirmed or suspected). The N95 mask is often used to protect against tuberculosis. Surgical masks do not compare in effectiveness; however they may be required if there are insufficient N95 masks.
- Limit patient movement as much as possible. Patients being moved should wear a surgical mask to minimise dispersal of droplets (patients with significant respiratory disease are unlikely to tolerate the N95 mask).
- Visitors with febrile respiratory illness should be strongly discouraged from visiting. Close relatives of terminally ill patients and parents of children can be exempt, but should wear a mask. Visitors who are asymptomatic should be discouraged from visiting confirmed and suspected cases.
- To reduce nosocomial transmission to patients, eliminate or curtail elective medical and surgical admissions, and restrict cardiovascular and pulmonary surgery to emergency cases only.

Criteria for cohorting or isolating patients

Where only one influenza virus is circulating

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

1. Confirmed infection
 - Nasopharyngeal aspirate (NPA) or nasal swab. In order of decreasing sensitivity:
 - PCR positive
 - Antigen test positive– includes immunofluorescence (IF) (slightly more sensitive than viral culture: some viruses die in transit to the laboratory)
 - Culture positive (picks up some samples that IF will miss)
 - Serology rise (results take too long to inform decision-making)
2. If no-one in the suspected influenza room develops symptoms of influenza-like illness, this person can be moved into a “non-infected” room after the incubation period of 5 days.
3. 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.
 - Suspected clinically but not confirmed, no alternate diagnosis, now recovered and too soon for serology. This may vary case by case.

- Suspected clinically but not confirmed (serology equivocal), no alternate diagnosis, and now recovered. This may vary case by case.
 - Vaccinated and antibody level high.
 - On prophylactic antiviral therapy with neuraminidase inhibitor.
4. It has yet to be determined when people on the newer antivirals (eg zanamivir) stop shedding virus and can be considered “non-infectious”.

Where more than one influenza virus is circulating

In addition to the above criteria, type-specific confirmation would be required where two influenza viruses are circulating, if the level of co-circulation is 10% or more.

PCR is probably the most efficient method: if reagents are available, results can be provided by the next day. PCR primers are quicker, less work to design, and less prone to unwanted cross reaction than antibodies. Type-specific immunofluorescence and other antigen tests, once developed, provide results the same day. However, it is more difficult to produce these specific antibodies. Culture and typing requires one to two weeks; it takes time develop type specific reagents.

SECTION 1.3.

ASSESSMENT WITHIN THE EMERGENCY DEPARTMENT

Triaging at the influenza assessment/admission area

- Designate a separate assessment/admission clinic for patients with suspected influenza. The area should be staffed by at least one nurse and one senior medical staff member.
- Patients referred with “flu” should proceed directly to this area, and those with symptoms of influenza should be rapidly diverted here to minimise transmission to others in the waiting room.
- Measure oxygen saturation at the point of triage.
- Divert patients requiring resuscitation to the usual emergency department area.

Admission pro-forma

An admission pro-forma should be completed. Appendix B provides a sample form, which can minimise paper handling by fulfilling multiple roles: the emergency department assessment form, admission record and data sheet for information required by the Department of Human Services, Victoria. The pro-forma includes:

- a risk assessment (classifying patients as Risk Class I, II, III, IV or V) (see page 12)
- time and date of onset of symptoms
- essential epidemiology (including vaccination history– pneumococcal, influenza)
- history and examination findings
- results of investigations, eg oxygen saturation/arterial blood gases, chest radiograph
- details regarding admission to critical care, general ward and “hospital in the hotel”, and referral to a general practitioner (plus increased home support).

Cautions

Not all that appears to be “flu” is influenza: consider the differential diagnoses (Table 2). For example:

- Person presenting multiple times to the emergency department: Consider meningococcal septicaemia. Rates of this disease may increase during heightened influenza activity¹¹.
- Young person with an oxygen saturation of 95%: Have they increased their respiratory rate to compensate? If in any doubt, perform arterial blood gases and calculate the A-a gradient (Alveolar-arterial gradient).
- Person with poor oxygen saturation and a clear chest radiograph: Consider primary influenza pneumonitis.

Risk assessment in adults

Risk assessment is dependent on the clinician’s judgement, particularly if the person is known or has been reviewed recently. While time available for risk assessment may be limited during

a pandemic, it is vital, given the potentially massive demand for beds, that a form of triage be developed to determine whether patients can be managed at home or need admission to an institution.

A study by Fine et al of community acquired pneumonia¹², although not specifically designed for patients with influenza, provides a possible guide to risk assessment in adults with influenza. Figure 1 presents the algorithm for risk assessment; Table 3 demonstrates the scoring system used to group adults into risk class II, III, IV and V; and Table 4 converts the points derived from the scoring system into risk categories and draws out the implications for mortality and site of care.

Figure 1: Algorithm for risk assessment in adults with community acquired pneumonia¹²

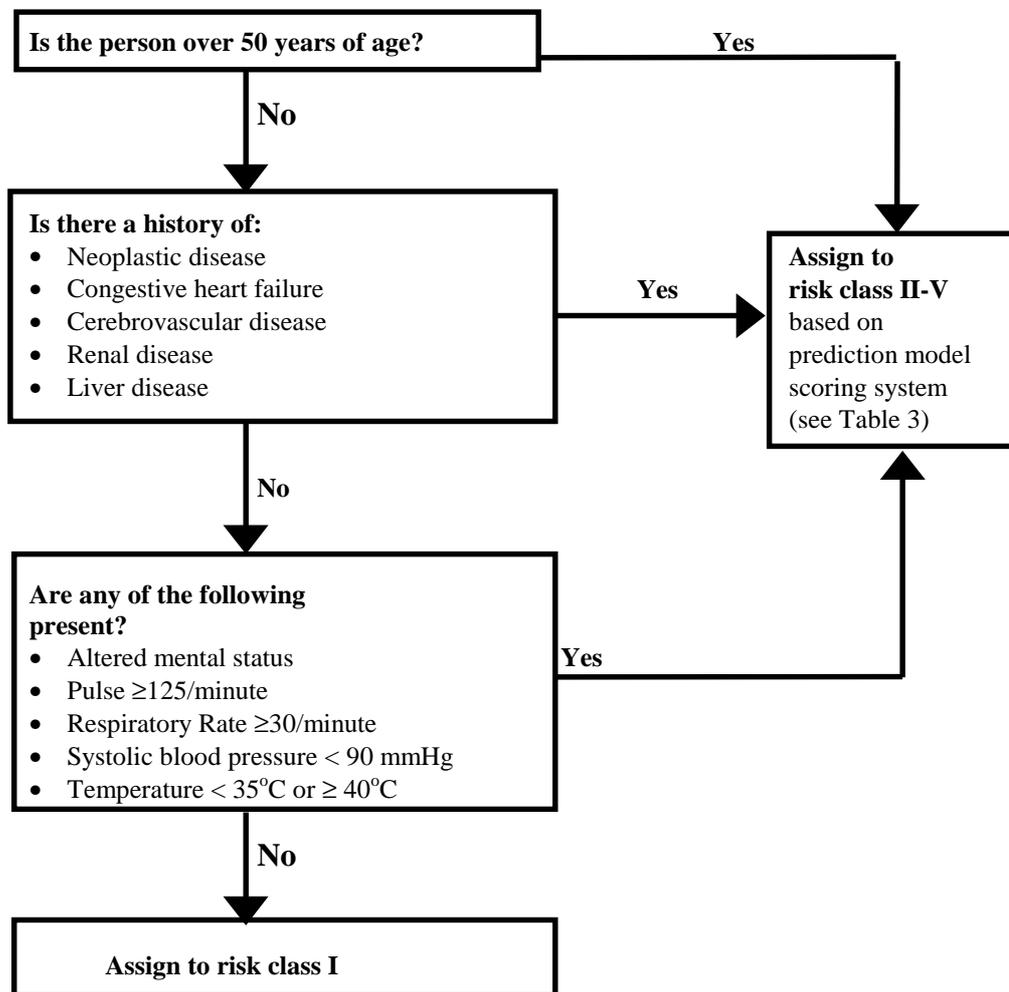


Table 3: Scoring system for risk classification in adults with community acquired pneumonia¹²

Patient Characteristics	Points assigned
Demographic factors	
• Age: males	Age (in yrs)
females	Age (in yrs) -10
• Nursing home resident	+10
Co-morbid illness	
• Neoplastic disease	+30
• Liver disease	+20
• Congestive heart failure	+10
• Cerebrovascular disease	+10
• Renal disease	+10
Physical examination findings	
• Altered Mental Status	+20
• Respiratory rate ≥ 30 /minute	+20
• Systolic Blood Pressure < 90 mmHg	+20
• Temperature $< 35^{\circ}\text{C}$ or $\geq 40^{\circ}\text{C}$	+15
• Pulse ≥ 125 /minute	+10
Laboratory findings	
• pH < 7.35	+30
• Urea > 10.7 mmol/l	+20
• Sodium < 130 mEq/l	+20
• Glucose > 13.9 mmol/l	+10
• Haematocrit $< 30\%$	+10
• $\text{pO}_2 < 60$ mmHg (on room air) or O ₂ Saturation $< 90\%$ (on room air)	+10
• Pleural effusion	+10

Table 4: Risk class according to points scored, with associated mortality and need for hospitalisation and intensive care, for adults with community-acquired pneumonia¹²

Risk class	Number of points	Mortality (%)	Initial site of care	Subsequent hospitalisation (if initially treated as outpatient) (%)	Inpatients admitted to ICU (resp./circ. failure) (%)
I	No predictors	0.1	Outpatient/home	5.1	4.3
II	≤ 70	0.6	Outpatient/hotel	8.2	4.3
III	71-90	2.8	Inpatient (brief) then hotel	16.7	5.9
IV	91-130	8.2	Inpatient	20	11.4
V	> 130	29.2	Inpatient	NA	17.3

SECTION 1.4.

INVESTIGATION AND MANAGEMENT

Investigations

On admission

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

- Chest radiograph
- Full blood examination
- Urea, creatinine and electrolytes
- Nasopharyngeal aspirate– viral culture and antigen detection
- Blood culture
- Creatinine kinase (total)
- Sputum Gram stain plus culture (Note: these are an imperfect reflection of the process within the lungs. Findings should be interpreted with caution, unless the quality of the specimen and the experience of the person interpreting the Gram stain are known.)
- Electrocardiograph in patients with ischaemic heart disease, or older, or sicker.

Routine investigations during the course of the illness

- Timing of 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 or gene sequencing
- 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 G, and can be copied and distributed as needed. Antiviral drugs may be useful in severe cases (see below).

There is a danger in giving aspirin to children and adolescents because this drug can act as a cofactor with influenza to cause Reye's syndrome (an acute, often fatal encephalopathy associated with liver failure due to fatty infiltration).

Patients should be monitored for complications throughout the illness (see page 5).

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. These people often behave in a similar way to those with ARDS (Adult Respiratory Distress Syndrome)– they should be kept relatively “dry”.

Antivirals

This section should be read in conjunction with the Australian National Influenza Pandemic Contingency Plan, chapter on antiviral drugs, for discussion on setting priorities for antivirals. Antivirals may be recommended for:

- All confirmed and suspected cases of influenza *or*
- All confirmed and suspected cases of influenza in the following groups:
 - in risk class IV and V (and consider those in risk class III)
 - all essential workers (including health care workers).

Antibiotics

The symptoms of uncomplicated influenza – fever, mild dyspnoea, pleuritic pain, blood tinged sputum, scattered lung crackles – all suggest possible bacterial lung involvement. *Antibiotics, however, should be avoided except for the clinical situations described below. Nevertheless, the decision will always depend on the clinical judgement of the treating medical practitioner.*

For patients with primary influenzal pneumonitis, the main aim is to maintain tissue oxygenation. Because of the high mortality of this complication, early institution of antibiotics for treatment of bacterial superinfection should be considered.

There is no place for prophylactic antibiotics, as this will only cause the selection of 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:** Be particularly suspicious 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 (see below).
- **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, chronic obstructive airways disease or broncho-pulmonary dysplasia
 - The elderly
 - The very young
 - Pre-existing cardiac disease
 - Late pregnancy
 - Immunosuppression/transplant patients
 - Influenzal pneumonitis.

- Other respiratory tract complications when severe and thought to be bacterial; eg sinusitis, otitis media and tracheo-bronchitis.

Antibiotic choice for secondary bacterial pneumonia

Table 5 presents guidelines for empiric antibiotic choice in secondary bacterial pneumonia. Note that the recommendations differ from those for people with community-acquired pneumonia.

Rationale

The commonest bacterial pathogen complicating influenza is the pneumococcus. In Australia in 1998, 18% of pneumococci were resistant to erythromycin and thus cross-resistant to roxithromycin, azithromycin and clarithromycin¹³. However, penicillin is still effective against strains of pneumococci with decreased susceptibility to penicillin if given in high doses parenterally¹⁴.

Atypical pathogens such as mycoplasma, chlamydia and legionellae are uncommon.

Oral antibiotics

The major considerations are absorption, compliance, adverse events and spectrum.

Parenteral antibiotics

Antibiotics with a long half-life need less frequent administration:
eg procaine penicillin, ceftriaxone.

Intramuscular antibiotics avoid intravenous lines and their associated complications:
eg ceftriaxone (with lignocaine), procaine penicillin,.

Side effects

Antibiotic-induced diarrhoea is likely to be a significant problem. Oral rehydration solution (ORS) and oral metronidazole should be instituted early.

Table 5: Antibiotics, in order of preference, for mild/moderate bacterial pneumonia in persons with influenza (March 1999)

Note: These recommendations differ from those for community-acquired pneumonia.

Age	Normal host	Underlying pulmonary disease ^c	Long term care facility ^d	Immune impairment ^e (admit all transplant patients to parent unit)
0-12 mths ^a	ORAL amoxicillin [erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY ----- PARENTERAL IM procaine penicillin or IV penicillin G	Admit to parent unit IV antibiotics	Not applicable	Admit to parent unit IV antibiotics
1-15 years	ORAL amoxicillin or amoxicillin/clavulanate or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY ----- PARENTERAL IM procaine penicillin or IV penicillin G or IV cephazolin	Admit and contact parent unit IV antibiotics	ORAL amoxicillin or amoxicillin/clavulanate or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY ----- PARENTERAL IM procaine penicillin or IM ceftriaxone	Admit and contact parent unit IV antibiotics
16- 64 years	ORAL amoxicillin or amoxicillin/clavulanate or cefuroxime or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY ----- PARENTERAL IM procaine penicillin or IV penicillin G or IV cephazolin	ORAL amoxicillin/clavulanate or cefuroxime or cefaclor <i>PLUS CONSIDER</i> ORAL doxycycline or erythromycin (<i>atypical pathogens</i>) ----- PARENTERAL IV/ IM ceftriaxone <i>PLUS CONSIDER</i> IV erythromycin (<i>to cover legionella</i>)	ORAL amoxicillin/clavulanate or cefuroxime or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY ----- PARENTERAL IM procaine penicillin or IM ceftriaxone	<i>Diabetes mellitus & mild pneumonia consider</i> ORAL amoxicillin/clavulanate or cefuroxime or cephalexin or cefaclor & review daily Otherwise admit & contact parent unit
65+ years ^b	ORAL amoxicillin/clavulanate or cefuroxime or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY ----- PARENTERAL IM procaine penicillin or IV penicillin G or IV cephazolin	ORAL amoxicillin/clavulanate or cefuroxime or cefaclor <i>PLUS CONSIDER</i> ORAL doxycycline or erythromycin (<i>atypical pathogens</i>) ----- PARENTERAL IV/ IM ceftriaxone <i>PLUS CONSIDER</i> IV erythromycin (<i>to cover legionella</i>)	ORAL amoxicillin/clavulanate or cefuroxime or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY ----- PARENTERAL IM procaine penicillin or IM ceftriaxone	<i>Diabetes mellitus & mild pneumonia consider</i> ORAL amoxicillin/clavulanate or cefuroxime or cephalexin or cefaclor & review daily Otherwise admit & contact parent unit

Footnotes to Table 5

- a. Age: 0-12 months: Neonatal chronic lung disease (broncho-pulmonary dysplasia) can cause problems with gas exchange. Super-infection is usually hospital acquired.
- b. Age: 65+ years: Increased risk of Gram negative bacterial infection, in particular *H. influenzae*.
- c. Pulmonary disease includes severe asthma, chronic obstructive airways disease.

For cystic fibrosis, contact parent unit. Recent sputum cultures may help to direct therapy appropriately. Physiotherapy may be important due to tenacious secretions.

Consider Pseudomonas cover. Trovafloxacin has better cover for Gram positive bacteria than ciprofloxacin. Ceftazidime, ciprofloxacin and aminoglycosides do not have sufficient or any activity against *S. pneumoniae* and *S. aureus*.

- d. For patients in long-term care facilities, consider whether hospital therapy is appropriate.
- e. Immune impairment differs between diseases and age groups:
 - Includes adults on prednisolone (or equivalent) 5mg/day for >14 days or children on 0.5mg/kg/day.
 - Diabetic children are not considered immune impaired.
 - Diabetic adults are at increased risk of staphylococcal pneumonia. For mild pneumonia, use amoxicillin/clavulanate or cefuroxime orally. Review patients daily.
 - Contact should be made with the parent unit or physician, eg HIV infected patients—consider *Pneumocystis carinii* (PCP).
 - Admit all transplant patients. Contact the parent unit as prescribing is complex (drug interactions, local antibiotic sensitivity profiles, other diagnostic possibilities such as cytomegalovirus (CMV) pneumonitis, PCP and aspergillus).

Antibiotic substitution

Increased demand for antibiotics may result in supply difficulties. Table 6 sets out antibiotics that may be substituted for others where necessary, and Table 7 summarises the activity of a range of antibiotics against bacterial superinfection in influenza.

Table 6: Antibiotics which may be substituted where supplies are limited

Original antibiotic	Possible substitute	Comments
Cephazolin (TDS)	Cephalothin (QID)	
Cefuroxime (BD)	Cefaclor (TDS, BD)	<ul style="list-style-type: none"> • Cefuroxime has better anti-staphylococcal cover than cefaclor • Cefuroxime is only licensed in Australia for adults
Ceftriaxone (DAILY)	Cefotaxime (BD, TDS)	<ul style="list-style-type: none"> • Intramuscular injection: ceftriaxone can be given intramuscularly (with lignocaine).
Roxithromycin (DAILY, BD)	Erythromycin (QID)	
Doxycycline (DAILY, BD)	Tetracycline (QID)	
Flucloxacillin	Dicloxacillin, Cloxacillin	<ul style="list-style-type: none"> • Dicloxacillin is thought to be associated with a lower incidence of cholestatic jaundice, while flucloxacillin causes less thrombophlebitis • Cloxacillin is only available intravenously
Ticarcillin/clavulanate (timentin™)	Piperacillin/tazobactam (tazocin™)	<ul style="list-style-type: none"> • Pseudomonas cover varies – check sensitivity profile of institution and previous isolates

Table 7: Antibiotics and their activity against bacterial superinfection in influenza^{13,15}

This table was compiled as increased demand for antibiotics may result in supply difficulties (prepared March 1999).

Antibiotic	route	dosing interval	preg **	lactation	<i>Streptococcus pneumoniae</i>	<i>Haemophilus influenzae</i>	<i>Staphylococcus aureus (methicillin sensitive)</i>
amoxicillin	ORAL IV	TDS	A	Yes	YES (not if high level resistance)	28% RESISTANT (1996) effective if β lactamase negative	NO
amoxicillin/clavulanate	ORAL	BD	B1	Insuff. data	YES (not if high level resistance)	YES	YES
ampicillin	IV	TDS	A	Yes	YES (not if high level resistance)	28% RESISTANT (1996) effective if β lactamase negative	NO
azithromycin	ORAL	DAILY	B1	Insuff. data	18% RESISTANT (1998)	YES	?? YES
aztreonam	IV	TDS/QID	B1	Yes	NO	YES RESERVED	NO
benzyl penicillin	IV	QID/Q4H	A	Yes	YES (not if high level resistance)	NO	NO
cefaclor/cefaclor CD	ORAL	TDS/BD	B1	Yes	YES	YES	YES
cefotaxime	IV	BD/TDS	B1	Yes	YES	YES	Effective for the first 24 hours -unless very ill
ceftazidime	IV	TDS	B1	Yes	NO	YES RESERVED	NO
ceftriaxone	IM/IV	DAILY	B1	Yes	YES	YES	Effective for the first 24 hours - unless very ill
cefuroxime	ORAL	BD	??	??	YES	YES	YES
cephalexin	ORAL	QID	B1	Yes	[YES] (not first choice)	NO	YES (not first choice)

Antibiotic	route	dosing interval	preg **	lactation	<i>Streptococcus pneumoniae</i>	<i>Haemophilus influenzae</i>	<i>Staphylococcus aureus (methicillin sensitive)</i>
cephalothin	IV	QID	A	Yes	YES	YES	YES
cephazolin	IM/IV	TDS	B1	Yes	YES	YES	YES
chloramphenicol	ORAL IV	TDS/QID	A	Avoid if <1month or prem.	3% RESISTANT (1996)	3% RESISTANT (1996)	YES
ciprofloxacin	ORAL IV	BD	B3	Avoid	NO	YES RESERVED	NO
clarithromycin	ORAL	BD	B3	Avoid	18% RESISTANT (1998)	YES RESERVED	?? YES
clindamycin	ORAL IV	QID/TDS	A	Avoid	18% RESISTANT (1998)	NO	YES
cloxacillin	IV	QID	A	Yes	NO	NO	YES
cotrimoxazole	ORAL IV		C	Avoid if <1month or prem.	80% RESISTANT (1996)	YES	26% RESISTANT (1996)
dicloxacillin	ORAL IV	QID	B2	Yes	NO	NO	YES
doxycycline	ORAL	BD DAILY	D	Avoid	13% RESISTANT (1996)	5% RESISTANT (1996)	5% RESISTANT (1996)
erythromycin	ORAL IV	QID/TDS	A	Yes	18% RESISTANT (1998)	YES	13% RESISTANT (1996)
flucloxacillin	ORAL IV	QID	B1	Yes	NO	NO	YES
gentamicin	IM/IV	DAILY BD	D	Yes	NO	YES	NO
imipenem	IV	TDS	B3	Insuff.	YES RESERVED	YES RESERVED	YES RESERVED

Antibiotic	route	dosing interval	preg **	lactation	<i>Streptococcus pneumoniae</i>	<i>Haemophilus influenzae</i>	<i>Staphylococcus aureus (methicillin sensitive)</i>
				data			
meropenem	IV	TDS	B2	Insuff. data	YES RESERVED	YES RESERVED	YES RESERVED
metronidazole	ORAL/ IV	TDS	B2	Avoid	NO	NO	NO
penicillin G	IV	QID/Q4H	A	Yes	YES (not if high level resistance)	NO	NO
penicillin V	ORAL	QID	A	Yes	YES (poor absorption) (not if high level resistance)	NO	NO
piperacillin	IV	QID/Q4H	B1	Yes	YES RESERVED	NO	NO
piperacillin/tazobactam	IV	TDS	B1	Insuff. data	YES RESERVED	YES RESERVED	YES RESERVED
procaine penicillin	IM	DAILY	A	Yes	YES (not if high level resistance)	NO	NO
roxithromycin	ORAL	BD	B1	Yes	18% RESISTANT (1998)	YES	18% RESISTANT (1998)
teicoplanin	IM/IV	DAILY	B3	????	YES RESERVED	NO	YES RESERVED
ticarcillin	IV	QID/Q4H	B2	Yes	YES RESERVED	NO	NO
ticarcillin/clavulanate	IV	QID/Q4H	B2	Insuff. data	YES RESERVED	YES RESERVED	YES RESERVED
tobramycin	IM/IV	DAILY	D	Yes	NO	YES RESERVED	NO
trovafloxacin	ORAL IV	DAILY	??	????	YES RESERVED	YES RESERVED	YES RESERVED
vancomycin	IV	BD DAILY	B2	Yes	YES RESERVED	NO	YES RESERVED

Notes to Table 7

IV = intravenous. IM= intramuscular

preg = risk categorisation of antibiotic in pregnancy.

Insuff. data = Insufficient data to be sure of safety in lactation.

Risk categorisation:

** The risk categorisation used for drugs in pregnancy, detailed below, has been abstracted from Therapeutic Guidelines- Antibiotic, Edition 10, 1998-9¹³. For drugs in the B1, B2 and B3 categories, human data are lacking or inadequate and subcategorisation is therefore based on available animal data. The allocation of a B category does not imply greater safety than the C category. Drugs in category D are not absolutely contraindicated in pregnancy. Moreover, in some cases the D category had been assigned on the basis of suspicion.

Category A: *Drugs taken by a large number of pregnant women and women of childbearing age without any proven increase in the frequency of malformations or other direct or indirect harmful effects on the foetus having been observed.*

Category B1: *Drugs which have been taken by only a limited number of pregnant women and women of childbearing age, without an increase in the frequency of malformations or other direct or indirect harmful effects on the foetus having been observed. Studies in animals have not shown evidence of an increased occurrence of foetal damage.*

Category B2: *Drugs which have been taken by only a limited number of pregnant women and women of childbearing age, without an increase in the frequency of malformations or other direct or indirect harmful effects on the foetus having been observed. Studies in animals are inadequate or may be lacking, but available data show no evidence of an increased occurrence of foetal damage.*

Category B3: *Drugs which have been taken by only a limited number of pregnant women and women of childbearing age, without an increase in the frequency of malformations or other direct or indirect harmful effects on the foetus having been observed. Studies in animals have shown evidence of an increased occurrence of foetal damage, the significance of which is considered uncertain in humans.*

Category C: *Drugs which, owing to their pharmacological effects, have caused or may be suspected of causing, harmful effects on the human foetus or neonate without causing malformations. Accompanying texts should be consulted for further information.*

Category D: *Drugs which have caused, are suspected to have caused or may be expected to cause, an increased incidence of human foetal malformations or irreversible damage, owing to their pharmacological effects. Accompanying texts should be consulted for further details.*

Lactation and antibiotics:

Breastfeeding should only be discontinued or discouraged when there is substantial evidence that the drug taken by the mother will be harmful to the infant and no therapeutic equivalent can be given¹³. Most drugs are only excreted to a minimal extent in breast milk, and in most cases the dosage to which the infant is ultimately exposed is very low and is below the therapeutic dose level for infants¹³.

SECTION 1.5. CLINICAL STABILITY AND DISCHARGE

Defining clinical stability (adults)

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 a “hospital in the hotel”, 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.

There is little consensus regarding cut-off values or parameters for oxygen saturation, respiratory rate and temperature.

Table 8 sets out four definitions of clinical stability for patients with community-acquired pneumonia, and the median time taken to achieve each parameter. The definitions of clinical stability will require validation in people with influenza. 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.

Table 8: Definitions of clinical stability for adults with community acquired pneumonia¹⁶

Variable	Definition 1 [median, days] (interquartile range)	Definition 2 [median, days] (interquartile range)	Definition 3 [median, days] (interquartile range)	Definition 4 [median, days] (interquartile range)
Mental Status	Normal/ Baseline [3 days] (2-3)	same	same	same
Ability to Eat	Able to eat [3 days] (2-8)	same	same	same
O₂ saturation on room air	≥ 90% [3 days] (2-6)	≥ 90% [3 days] (2-6)	≥ 92% [3 days] (2-6)	≥ 94% [4 days] (2-8)
Heart rate	≤ 100/minute [3 days] (2-3)	same	same	same
Blood pressure systolic	≥ 90 mmHg [3 days] (2-3)	same	same	same
Respiratory Rate	≤ 24/minute [3 days] (2-3)	≤ 24/minute [3 days] (2-3)	≤ 24/minute [3 days] (2-3)	≤ 20/minute [4 days] (3-7)
Temperature	≤ 38.3°C [2 days] (2-3)	≤ 37.8°C [3 days] (2-4)	≤ 37.2°C [3 days] (2-6)	≤ 37.2°C [3 days] (2-6)

Adapted with permission from Halm E, Fine M, Marrie T, Coley C, Kapoor W, Obrosky S, et al. Time to clinical stability in patients hospitalized with community-acquired pneumonia. *JAMA* 1998;279(18):1452-1457. Copyrighted 1998, American Medical Association.

Time to reach clinical stability: implications for bed days

The time to reach clinical stability will determine the number of bed days needed for each patient during a pandemic. No appropriate data have been published for hospitalised patients with influenza; however Table 9 sets out, for adults with community-acquired pneumonia, the median time (days) and the interquartile range to reach clinical stability in all seven defining parameters (mental status, ability to eat, temperature, blood pressure, heart rate, respiratory rate and oxygen saturation), stratified by risk class and definition. This time varies according to the precise definition used for clinical stability and the risk class (according to Fine et al)^{12,16,17}.

Table 9: Number of days to reach clinical stability by risk class and definition in adults with community acquired pneumonia^{12,16}

	Definition 1	Definition 2	Definition 3	Definition 4
Risk Class I-III				
median (interquartile range)	3 days (2-4)	3 days (2-5)	6 days (3-12)	6 days (4-15)
Risk Class IV				
median (interquartile range)	3 days (2-7)	4 days (2-7)	7 days (3-16)	9 days (4-17)
Risk Class V				
median (interquartile range)	5 days (3-9)	6 days (3-9)	10 days (6-17)	13 days (7-17)
Admission to ICU after reaching clinical stability	1%	1%	0.6%	0.3%

Adapted with permission from Halm E, Fine M, Marrie T, Coley C, Kapoor W, Obrosky S, et al. Time to clinical stability in patients hospitalized with community-acquired pneumonia. *JAMA* 1998;279(18):1452-1457. Copyrighted 1998, American Medical Association.

PART TWO:

HOSPITAL PLANNING FOR AN INFLUENZA PANDEMIC

SECTION 2.1.

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. Should the next pandemic originate in South East Asia, as has happened before, Australia could be one of the first countries involved.

While epidemics of influenza characteristically occur in Melbourne during the winter months, influenza due to a new strain could present in our summer as a result of infected passengers arriving in Australia by air from the Northern Hemisphere.

Recognition of a pandemic

The World Health Organization (WHO) has defined a process for declaring both a pandemic alert and a pandemic.⁷ In brief, 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;
- **has probably reached Victoria** when sentinel practices and/or hospitals report increased frequency of respiratory disease and/or pneumonia. This may be accompanied by progressive work and school absenteeism—very few other viruses or infections result in this.
- **is confirmed in Victoria** when the virus is isolated from patients. Without this confirmation, the possibility still exists that other respiratory viruses (even existing influenza strains) could be responsible for the increase in respiratory disease.

Duration

Epidemics of influenza characteristically occur in Melbourne from mid May until late October, with peak numbers of cases for a period of 6 to 8 weeks in July and August^{5,7}. Secondary waves of influenza often occur 6 to 9 months after an initial epidemic⁷.

Magnitude of past pandemics

The “Spanish influenza” pandemic of 1918-19 caused at least 20 million deaths worldwide. In Australia, interstate borders and schools were closed. Twelve emergency hospitals were set up in Sydney for patients with respiratory diseases. In Melbourne the Homeopathic Hospital (later Prince Henry’s Hospital, now demolished) was taken over by the Health Department,

and an emergency hospital was set up in the Exhibition Building. By the end of 1919 the death toll due to influenza in Australia was 12,000¹⁸.

During the 1957 pandemic, in Melbourne:

- In the months of July and August 672 patients with disease attributable to infection with the Asian influenza A strain were admitted to Fairfield Hospital (closed in 1996)⁴.
- Admissions to other Melbourne hospitals also increased greatly as influenza exacerbated pre-existing chronic disease.
- The 33,720 cases of influenza notified in Victoria between July 13 and August 24 represented possibly only 5-10% of all cases, suggesting that the total may have been more than 300,000^{4,5}.
- A serological study in Melbourne showed that, before the pandemic, only a negligible proportion of the population possessed antibody to the Asian type virus, while at its close, approximately 42% had antibody⁵.

How many beds will be needed?

The WHO suggests that plans should be in place against a pandemic causing illness in 25% of the population⁷. In the worst-case scenario, there would be insufficient time to develop and distribute a vaccine and immunise the population (or high risk or high priority groups), and the whole population of Victoria would be at risk of infection with the new influenza A strain, which, at worst, could result in a 100% attack rate³.

Even with vaccine against the new strain, two doses may be required and effective immunity may not be obtained until 6 weeks after the first dose. Vaccine efficacy is normally around 70%, leaving at least 30% of those vaccinated unprotected.

The effective use of antivirals for prophylaxis also presumes sufficient quantities of effective drugs and sufficient time to distribute them widely and continually. Antiviral drugs have not yet been demonstrated to be of value in a pandemic.

The following implications regarding the impact of a new pandemic can be drawn from the 1957 pandemic:

- The 672 patients (including approximately 10% children) admitted to Fairfield Hospital over 2 months in 1957 represented 0.4 per 1000 of population (based on 1951 Census data).

***Implication for today:** Expected equivalent numbers, using 1996 census figures, would indicate 1,742 extra patients within 2 months.*

- Estimated influenza infection in 1957 was 42% of population.

***Implication for today:** Using 1996 census data, the estimated number of persons expected to be infected in Victoria is 1.83 million.*

- There was a 12-16% increase in the number of public patients treated at four major metropolitan hospitals (Royal Melbourne, St Vincent's, Alfred, and Prince Henry's).
- At least 10 cases of influenza virus pneumonitis occurred, probably a marked underestimate, as this disease was only widely recognised after 1957.

Implication for today: Assuming that the actual number with influenza pneumonitis was 20 in 1957, at least 40 extra intensive care beds would be required for influenza virus pneumonia (using 1996 census data).

Table 10 presents range estimates of the potential impact of an influenza pandemic for Victoria, using published population-based data from the literature, international expert opinion and 1996 Australian Bureau of Statistics Census data . No adjustment has been made for subsequent population growth. The assumptions made in these calculations are detailed in Appendix D. The increase in the number of hospitalisations and deaths is expected to occur over a period of two months.

Table 10: Estimated number of excess hospitalisations and deaths over a 6 to 8 week period in Victoria

Region	Excess hospitalisations: lower and higher estimates	Excess deaths: lower and higher estimates
Victoria	2,600 - 18,450	870 - 7,180
Metropolitan Melbourne	1,800 - 13,250	590 - 5,170
Gippsland Region	140 - 970	50 - 380
Hume Region	140 - 970	50 - 380
Loddon-Mallee Region	160 - 1,030	60 - 390
Grampians Region	130 - 840	50 - 330
Barwon South West Region	210 - 1,370	70 - 530

SECTION 2.2. MEETING BED REQUIREMENTS

Determining current bed capacity

Bed capacity in Victorian is likely to fluctuate markedly and needs to be surveyed every 2 to 3 years, and at the start of a pandemic (ie Phase 1 as defined in the WHO Alert Levels)⁷.

Appendix B provides a survey form to aid hospitals in estimating their maximum bed capacity, taking into account factors such as the availability of oxygen outlets.

The most recent assessment of bed capacity in Victorian hospitals was in 1996, by the Office of the Coordinator of Emergency & Critical Care Services.

The only flexibility within existing capacity lies in the cancellation of elective surgical cases. Currently about 40% of beds are elective (the remainder are emergency admissions). Elective surgery makes up approximately 20% of Weighted Inlier Equivalent Separations (WIES), and emergency admissions just over 50% of WIES.

Over the last five years, the number of emergency admissions has increased by 4% per annum. Ambulance utilisation has increased by 7-11% per annum due to increased retrieval from smaller hospitals and increased demand .

Options for increasing bed capacity

The widespread occurrence of influenza will in itself limit elective admissions to public and private hospitals.

To create further medical beds, 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 and hotels.
6. Temporarily rationalise acute specialist services between networks.
7. Recommission identified closed facilities.
8. Utilise Australian Defence Force field hospital capacity.

To create further critical care beds (intensive care, coronary care, ventilated), consider the following:

These strategies are 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).

Private sector

A system is currently in place for the Office of the Coordinator of Emergency & Critical Care Services to purchase critical care beds from the private sector. These contractual arrangements can probably be expanded beyond critical care capacity to include general beds, if necessary.

The main limitation on expansion is financial– funding arrangements would need to take into account that a large proportion of intensive care unit bed days in the private sector are utilised for coronary artery bypass surgery. Appropriate funding arrangements would need to be made.

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:

- Staff and equipment may need to be transferred.
- Some hospitals have high dependency units, but no intensive care facilities. 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 support services. Rehabilitation places may provide a similar level of care as in “hotels” (see below). Oxygen outlets are unlikely to be available, so oxygen cylinders will need to be provided.

Hotels

These could be used for “hospital in the home”-type and recovering patients. The Emergency Management Act 1986 and/or Health (Infectious Diseases) Regulations 1990 should provide the necessary power to permit the use of hotels for this purpose.

To ensure that nurses and other employees are covered by employers’ insurance, hotels would need to be under the auspices of a specific hospital. Previous contractual arrangements could act as a prototype or model, eg Geelong Hospital used a hotel for its obstetrics during renovations, Albury-Wodonga uses a hotel on a regular basis.

Hospital in the home

The main function of hospital in the home during a pandemic is to facilitate early discharge. It would be logistically difficult to expand the service rapidly, as it is resource-intensive (staff spend a lot of time travelling).

Community halls

With toilets and cooking facilities, community halls are probably much easier to convert into a “semi-hospital” (compared to setting up a completely new army field hospital).

Closed hospitals

Several hospitals have been closed over recent times, which could potentially provide some basic infrastructure (ie toilets, cooking facilities). The status of these hospitals and suitability for use in a pandemic needs to be investigated.

Recently closed hospitals include:

- Werribee District Hospital (January 1994)
- Heatherton Hospital (August, 1995)
- Fairfield Hospital (June 1996)
- Mordialloc Cheltenham Community Hospital (October 1996)
- Altona Hospital (December 1996)
- Burwood and District Community Hospital (December 1996)
- Preston and Northcote Community Hospital (February 1998)
- Essendon Campus of the Royal Melbourne Hospital (July 1998)
- Latrobe Regional Hospital (August 1998)
- Altona.

Australian defence force field hospitals

These are very labour intensive and expensive to set up. To generate 60 extra beds would require 26 semitrailers and three days of labour²¹.

Establishment of a central bed bureau

Critical care beds (intensive care and coronary care) are normally coordinated by the Office of the Coordinator of Emergency & Critical Care Services, which is colocated with Victorian Medical Disaster Plan in Victoria Parade, Fitzroy.

Under pandemic conditions, the Office could accommodate up to 12 operators and manage general beds in addition to critical care beds. If more operators are required, 555 Collins Street or 120 Spencer Street could become the base. Currently the Office has 3 telephone lines, but this could be expanded by TelstraTM. Mobile phones do not require telephone lines. TelstraTM can transfer phone extensions to allow the telephone number to remain the same. The database template for critical care beds could be used.

At the start of pandemic, the Office of the Coordinator of Emergency & Critical Care Services should ask hospitals to fill out a form (Appendix B) detailing how much capacity can be generated. The form should be sent to the Chief Executive Officer of the hospitals. It would be useful to trial this survey form in a few hospitals.

Throughout the pandemic, information should be updated on a regular basis, using phone, e-mail and fax. A pro-forma is needed to guide hospitals as to what information will be required from them on a daily basis. A decision needs to be made how often updates are required (once, twice, three or four times a day). "Real-time" information will be critical to the functioning of the ambulance service.

Consideration should be given to using a semi-automated method of updating the database—for example the use of TeleformTM. This can retrieve information via the internet/fax machine or scanning forms and transports this information directly to a database following data verification.

Close liaison with the ambulance service will be essential.

The Office of the Coordinator of Emergency & Critical Care Services should perform an inventory of current resources and indicate what further resources would be required (space/telecommunications/hardware/software/personnel).

SECTION 2.3. HEALTH CARE STAFFING

Staffing Issues

An influenza pandemic is likely to stretch the resources enormously. 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 (defined as the list of occupations identified to receive vaccine against the pandemic strain) to continue to work.

Potential sources of labour:

Medical students

In Victoria, about 310 medical students graduate each year from the University of Melbourne and Monash University. Final year medical students could be utilised for simple patient management.

If medical students obtain registration in Victoria (at no cost to the student), this would provide them with a legal status and may facilitate actions such as limited prescribing in the event of a pandemic (eg small range of antibiotics, antivirals, vaccines against the pandemic strain). Discussions regarding the registration of medical students are in progress.

4th and 5th year medical students could be used for hospital duties such as porters, linen etc.

Nursing students

In Victoria, 1,200-1,300 nursing students graduate each year. Indemnity is arranged between a specific university and a specific hospital. Generally only larger hospitals have nursing students.

Registered nurses

In July 1998, 48,990 nurses (Division One) were registered with the Nurses Board of Victoria²². It is unclear how many of these are currently not working, or only working occasional shifts. To be on the register, nurses must have worked within the last five years. The Nurses Board is also able to confirm whether a person is a *bona fide* nurse.

According to a forthcoming nurses' work-force report, approximately 6,000 nurses work in perioperative, intensive care, coronary care and emergency departments. The critical care nurse labourforce report is due to be updated (last released in 1993).

Specialist physicians

The number of consultant physicians in adult and paediatric medicine in 1997, the type of practice, and the number of physician per specialty in Victoria is presented in Appendix F²⁶.

Fellows of the Royal Australasian College of Physicians (RACP) were asked to estimate the total hours per week devoted to professional activities (excluding time on-call but not working):

- The average working week was 55 hours, with a standard deviation of 13 hours. The distribution was approximately normal with slight negative skewness (-0.3) indicating a tendency for more Fellows to work above the weekly mean than below.
- 23% of Fellows worked more than 60 hours per week and 7% more than 70 hours per week.
- If full-time work is defined as 35 hours per week, and given that Fellows spent an average of 54.8 hours per week on professional activities, the full-time equivalent workforce in Victoria was 1525, compared to an actual workforce of 974.

Interns and hospital medical officers

It is preferable not to assign interns to “hotel hospitals”, unless adequate supervision can be ensured. The Intern Training Advisory Committee may need to be consulted.

Allied health professionals and support staff

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

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. The State Emergency Recovery Team has the contact details of volunteer organisations:

- State Emergency Service
- St Johns Ambulance
- Red Cross
- Salvation Army
- Brotherhood of St Lawrence
- Scouts
- Women’s auxiliaries

“Train-the-trainer modules” should be considered to achieve a rapid increase in the number of skilled workers: one trainer teaches 10 trainees at one time, each trainee teaches a further 10 trainees. These modules could be used to teach volunteers to provide basic care and/or take basic observations, eg heart rate and respiratory rate, thereby identifying people who require more skilled assessment. Modules can be prepared and trialed in advance with the assistance of volunteer organisations and institutions such as the Royal Children’s Hospital, which has considerable experience in the development and use of train-the-trainer modules.

SECTION 2.4.

INFECTION CONTROL: PLANNING CONSIDERATIONS

Infection control in the clinical setting is discussed in Part One of this document (Section 1.2). This section also covers broader infection control measures. Information from Section 1.2 is repeated here for convenience, other than the criteria for cohorting or isolating patients.

Infectivity and spread of the influenza virus

Incubation and spread

The incubation period for influenza ranges from 24 hours to 5 days. Spread is by aerosol, and by contamination of the hands (by contact with skin or fomites) and then intranasal or conjunctival inoculation.

Infectivity

Aerosol is 10 times more infectious than nasopharyngeal inoculation. Ferrets have been infected by aerosol at a distance of 1.5 metres (5 feet)¹⁰; however influenza can spread much further than this by this mode, as demonstrated by an experiment conducted in the English House of Parliament. A scientist gargled *Serratia marcescens* and then spoke to an audience of agar plates, and showed serratia landing all over the House. The experiment was done because of an influenza epidemic amongst the parliamentarians.

Survival of the influenza virus

Survival on surfaces is as follows:

- 24-48 hours on hard, non-porous surfaces;
- 8-12 hours on cloth, paper and tissue;
- 5 minutes on hands (post transfer from environmental surfaces)²³.

Survival is enhanced at the low relative humidity encountered during winter in temperate zones.

In the absence of antiviral therapy, viral shedding occurs until 5 days after the onset of illness in adults, but can occur for more than 7 days, especially in children²³. For those receiving antiviral therapy, the duration of shedding is likely to be shorter. Studies are currently examining this.

Infection control strategies

The following strategies will be influenced by a number of factors, such as the size, specialty and geographical location of the institutions involved. Each institution should consider and evaluate each of the following issues and adapt the recommendations.

Laboratory confirmation of influenza infection

A rapid turn around time from the laboratory provides valuable assistance in streamlining the accommodation requirements of patients. The recommendations from the Public Health Laboratory Network (PHLN) should be followed.

Staff education

The following topics should be covered:

- epidemiology;
- transmission modes;
- means of preventing the spread of influenza.

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

The logistics of ensuring that education reaches all staff (including night-staff, students and volunteers) in a timely manner should be addressed.

Staff vaccination

Each institution should 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 (including any services that are out-sourced).

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, medical wards;
- essential support staff including, but not limited to, the following: information technology, telecommunications, engineering, maintenance, administration, mortuary attendants, laboratory, radiology. The CHOC document (Critical Hospital Operating Characteristics) distributed by the Department of Human Services, Victoria as part of Y2K planning provides a framework which will help in the identification of critical and important support services²³.

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

The logistics of rapid vaccine (against the pandemic strain) administration should be considered and the basic infrastructure surrounding hepatitis B and influenza vaccination to health care workers strengthened. Attention should be paid to the following

- Who vaccinates
- Where
- When
- Consent
- Documentation of refusal
- Method of providing catch-up for new staff or staff members who initially refused
- Method of tracking staff to receive second dose of vaccine (if two doses are required)
- Documentation of vaccination status of staff for deployment (eg non-immunised staff should not to look after bone marrow transplant patients).

Vaccination of patients

Priority groups for vaccination during a pandemic may be quite different from those during interpandemic seasons. The Australian Influenza Pandemic Planning Committee (IPPC) is developing guidelines for influenza vaccine use (pandemic strain) 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).

Pneumococcal vaccination for these high risk patients during interpandemic periods has been recommended by most authorities involved in influenza pandemic planning. *Streptococcus pneumoniae* is the most common bacterial super-infection in influenza. The current pneumococcal vaccine provides protection for at least five years and has been shown to reduce bacteraemia and mortality.

Interruption of patient-to-patient transmission

Designation of an influenza assessment area

Hospitals should designate a separate assessment/admission clinic within the Emergency Department, for patients with suspected influenza. The area should be staffed by at least one nurse and one senior medical staff member. Patients referred with influenza should proceed directly to this area, and those with symptoms of influenza should be rapidly diverted here to minimise transmission to others in the waiting room.

Accommodation

For the purpose of infection control, patients should be classified as one of the following:

- infected – confirmed
- infected – suspected
- exposed (potentially infected)
- uninfected
- uninfected and at very high risk of complications, eg. bone marrow transplant recipients.

For those patients with confirmed or suspected influenza, accommodate as follows, in descending order of preference:

1. negative pressure room
2. single rooms, but not positive pressure rooms
3. cohort in a hospital area with an independent air supply and exhaust system (document which rooms have separate air supply and exhaust systems, and up-date this documentation after any renovations);
4. separate infected patients from other visitors by at least one metre.

If possible, separate patients with confirmed influenza from those with suspected influenza. It may be prudent to designate a floor or ward to each of the above categories (ie infected, potentially infected, uninfected or at very high risk of complications).

Criteria for cohorting or isolating patients are included in Part One of this document (see Section 1.2. Infection Control: Clinical Considerations, page 10).

Gloves, hand-washing and alcoholic handrubs

Gloves should be worn:

- for all patient handling, and should be changed between patients.
- for all contacts with items likely to be contaminated with respiratory secretions (eg masks, oxygen tubing, nasal prongs, tissues).

Hands should be washed immediately after removal of gloves. If hand-washing facilities are not readily available within a short distance, an alcoholic based handrub should be used (provided hands are not too heavily soiled). This should be followed by hand-washing as soon as possible.

Masks (for visitors, staff, students and volunteers)

Masks are worn to reduce transmission from people with influenza (confirmed and suspected) to the wearer of the mask. All visitors, staff, students and volunteers should wear a N95 mask on entering the room of a patient with influenza (confirmed or suspected). The N95 mask is often used to protect staff and visitors from tuberculosis.

Surgical masks are not appropriate, as they do not compare in effectiveness; however they may be required if there are insufficient supplies of N95 masks.

Gowns

Gowns (waterproof aprons) should be worn by staff during procedures and patient activities that are likely to generate splashes or sprays of respiratory secretions.

Movement of patients

Limit the movement and transport of patients as much as possible.

If transport or movement is necessary, the patient should wear a surgical mask (to minimise dispersal of droplets). N95 masks are unlikely to be tolerated by a patient with significant respiratory disease or involvement.

Admission of patients other than influenza

To reduce nosocomial transmission of influenza to patients:

- eliminate or curtail elective medical and surgical admissions as far as possible;
- restrict cardiovascular and pulmonary surgery to emergency cases only.

Management of staff with possible influenza

If staff have symptoms of an influenza like illness, they will need assessment and possible removal from duties that involve direct patient contact (consider re-deploying to another area if well enough). These guidelines need to be more stringent for staff who work in:

- intensive care
- nurseries
- units with severely immunosuppressed patients, ie transplant recipients, haematology/ oncology patients or patients with HIV/AIDS

Exclude staff with an acute febrile respiratory illness from all duty until acute symptoms resolve, if the worker has cared for a patient with suspected or confirmed influenza 2 to 5 days prior to onset of symptoms.

Visitors

Visitors with febrile respiratory illness should be strongly discouraged from visiting. Close relatives of terminally ill patients and parents of children can be exempt, but should wear a mask.

For visitors who are asymptomatic (no symptoms of febrile respiratory illness):

- Visits to confirmed and suspected cases should be discouraged where possible.
- All those visiting patients with confirmed or suspected influenza should put on an N95 mask before entering the room.

SECTION 2.5. HOSPITAL ACTION PLAN

Hospitals should review the following areas as part of their disaster planning for an influenza pandemic. This list is not intended to be comprehensive, but illustrates some of the issues to be considered.

Airflow

Key staff: engineering, infection control

As influenza can be spread by aerosol, 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 emergency department. This information will be most helpful in determining the accommodation of patients with influenza.

- Check and document that negative pressure rooms are indeed at negative pressure.
- Check airflow to highly immunosuppressed patients (eg bone marrow transplant recipients).
- Note that airflow can change when renovations are undertaken.

Oxygen supply and suction

Key staff: ward staff, engineering, medical gases

- Does each bedside have an oxygen supply and suction?
- How many beds can be supplied with oxygen at a flow rate of 15 to 20 litres per minute simultaneously?
- What are the logistics of obtaining oxygen cylinders and portable suction?
- Are you able to regulate the flow of oxygen? Do you have enough flow metres?
- What are the dimensions of the pipe supplying oxygen?
- Are you able to augment the oxygen supply using methods other than oxygen cylinders for individual patients?

Medical air supply for ventilators

Key staff: engineering, critical care staff

- 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? If so, what materials and equipment are needed to do this?

Evaluation of ventilatory capacity

Key staff: critical care, operating room staff, physiotherapy, respiratory medicine

The Pro-forma for evaluation of bed capacity included as Appendix B includes documentation 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? Assume enough staff and unlimited resources in the short term.
- What proportion of total intensive care bed days is made up of elective surgical patients (including cardiac surgery) in your hospital?
- What proportion of total ventilated intensive care bed days is made up of elective surgical patients (including cardiac surgery) in your hospital?
- If there was a major public health emergency (eg an influenza pandemic affecting a lot of young people, who require ventilation) how many extra emergency ventilatory beds could your hospital create? Consider the use of all ventilator capacity, including time-cycled ventilators, anaesthetic machines, CPAP, BiPAP and the availability of oxygen, suction and air-supply, and areas such as recovery and operating rooms, neuroscience beds.

Patient accommodation

Key staff: ward staff, nursing and medical administration, emergency department staff

The Pro-forma for evaluation of bed capacity (Appendix B) can be used.

- What space for beds exists in the hospital? (consider closed wards, day care, short stay)
- How many physical beds are available? (including those in storage, emergency bedding)
- Which floors would be designated “influenza confirmed/suspected” and “influenza free” zones? Take into account air flow patterns and availability of specialist equipment (eg for dialysis).
- Which separate area should be designated for the admission and assessment of those with influenza? Take into account availability of pathology, radiology and resuscitation equipment.

Staffing

Key staff: medical and nursing administration, human resources

- How would 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 DISPLAN staff list and the contact details of your staff?

Patient admission

Key staff: emergency department, medical and nursing ward staff, medical records

An admission pro-forma needs identified or developed in advance, to be completed for each patient admitted with influenza. Appendix C provides a sample form, which can serve as the emergency department assessment form, admission record and data sheet for information required by the Department of Human Services, Victoria. The pro-forma should be approved in advance by the Medical Records Committee of the hospital.

Consumables

Key staff: ward staff, purchasing and supply, stores

Note availability and storage location of the following:

Oxygen delivery

- Oxygen tubing (standard and high flow)
- Face masks (various types)
- Nebulizers
- Nasal prongs
- Oxygen humidification and warming
- Oxygen cylinders
- Oxygen flow meters/regulators
- Oximeter
- Arterial blood gas syringes
- Bulk liquid oxygen

Infection control

- Gloves (sterile and non-sterile)
- N95 masks (duckbill masks) for staff and visitors
- Surgical masks for patients
- Alcohol based hand rub
- Antiseptic handwash
- Plastic aprons

Parenteral therapy

- Intravenous cannulae (various sizes)
- Central lines
- PICC (peripherally inserted central catheters)
- Intravenous tubing
- Needles
- Syringes
- Water for injection
- Saline for injection
- 5% dextrose for injection
- Method of securing intravenous cannula (opside/tegaderm)
- Three-way taps
- Bungs
- Skin preparation (chlorhexidine/alcohol/povidone-iodine)

- Intravenous fluids (normal saline, 5% dextrose, Hartmann's) in 1000mL, 500mL, 100mL.

Radiology services

Responsibility: radiology, infection control, engineering

Review:

- work flow patterns, to minimise contact between infected people and others;
- consumables such as films, solutions;
- monitoring tags for extra staff.

Microbiology

Responsibility: laboratory manager, bench staff, director of microbiology

Consumables

Ensure the availability of:

- culture media
- blood culture bottles
- sputum and nasopharyngeal aspirant containers
- viral transport medium
- antibiotic sensitivity testing (including amoxycillin/clavulanate, cefuroxime, cefaclor)
- E-tests for determining level of penicillin resistance for *Streptococcus pneumoniae*.

Work flow patterns and timely reporting of results

- Sputum Gram stain (rapid results should be available)
- Influenza antigen testing and appropriate referral of viral culture specimens.

Staffing and experience

- Ensure that multiple staff members are confident and competent in the interpretation of the tests above (eg Gram stain of sputum).
- To cope with increased demand and staff shortages, consider the use of students and retired, semi-retired and part-time laboratory workers.

Pharmacy

Responsibility: pharmacy, security, nursing administration, ward nursing staff

- Consider changes in work practice that may facilitate rapid discharge of patients, such as dispensing antibiotics and antivirals to the wards, fully labelled with all instructions (apart from the patient's name), and premixing of antibiotics.
- Review security arrangements for storage within pharmacy and on the wards. Antivirals and influenza vaccine (against the pandemic strain) may be in very short supply, making these very valuable. In Hong Kong, during the "bird flu" outbreak, hospital supplies of antivirals were rapidly depleted by panicking hospital staff members.

Education of staff

Key staff: infection control, nursing and medical administration

See page 38.

Vaccination: priorities and logistics

Identification of high risk patients

Key staff: medical and nursing staff, medical records, information technology

See page 38 regarding identification of high risk patients for pneumococcal and influenza vaccination

Vaccination of staff

Key staff: staff health, infection control, nursing and medical administration, information technology

See page 38 for logistics.

Identification and listing of priority staff for influenza vaccination

Key staff: medical and nursing administration, staff health, infection control, information technology

See page 38.

Critical Hospital Operating Characteristics

It may also be helpful to consider the following headings from the Critical Hospital Operating Characteristics (CHOC) document²³. The list has been annotated to denote areas which will experience a marked increase in demand. In addition, the breakdown of some services could result in inter-hospital spread of influenza.

Hospital-wide resources

- Engineering (*essential for dealing with breakdowns, maintenance, checking airflow*)
- Sewerage
- Water supply
- Medical gases (*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/air flow (*essential for air flow, preventing spread of influenza*)
- Maintenance services
- Vehicles and transport
- Motor vehicle fuels

Hospital critical support services

- Central sterilisation
- Infection control (*increased demand*)
- Pharmacy (*increased demand*)
- Information technology

- communications (*increased demand*)
- bureau systems
- desktop services
- Pathology services (*increased demand*)
- Radiology (*increased demand*)
- Nuclear medicine
- Purchasing (*increased demand*)
- Warehouse/stores (*increased demand*)
- Linen services
- Food services
- Environmental/cleaning services
- Mortuary (*increased demand*)

Hospital units

- General wards (*increased demand*)
- Emergency department (*increased demand*)
- Operating theatre
- Intensive care (*increased demand*)
- High dependency (including coronary care, cardiothoracic) (*increased demand*)
- Medical wards (*increased demand*)
- Surgical wards
- Children's ward/paediatrics (*increased demand*)
- Obstetrics/maternity
- Special care nursery
- Oncology
- Renal care (*increased demand*)

Mortuary space

Responsibility: mortician

- How much storage capacity does the mortuary have?
- Does the hospital mortuary provide space for those who died outside the hospital?

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APPENDICES

APPENDIX A

WORKING PARTY AND ACKNOWLEDGMENTS

Working Party

The Standing Committee on Infection Control decided that there was a need for practical guidelines appropriate for health care workers in the event of an influenza pandemic. For this purpose, a working party was set up which included relevant experts from other fields.

Members of the Working Party were as follows:

Dr Noel McK. Bennett

Chairman

Infectious Diseases Physician, Chair Standing Committee of Infection Control (SCIC)

Dr Marion A. Kainer

Coordinator and Editor

Infectious Diseases Physician, Department of Human Services, Member of SCIC

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Mrs Ann Turnbull

Australian College of Nurse Management, Victorian representative

Relocation Coordinator, Mercy Hospital for Women

Dr Arlene Wake

College of Medical Administrators, Victorian Representative

Deputy Director of Medical Services, The Alfred Hospital, Inner and Eastern Health Care Network

Consultation and additional advice

The working party sought and received expert advice from the following people:

- Dr Michael Ackland (Head, Epidemiology, Public Health and Development, DHS)
Mr Ross Andrews (Infectious Diseases Surveillance, Public Health and Development, DHS)
Dr Andrew Bacon (Medical Coordinator, Victorian Medical Disaster Plan Victoria)
Dr Margaret Beavis (General Practitioner, Antibiotic subcommittee, Victorian Drug Usage Advisory Committee)
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Ms Sue Brennan (Manager, Access Unit, Quality Branch, Acute Health, DHS)
Ms Rosemary Bryant (Health Workforce, Public Health and Development, DHS)
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Mr Philip Buckle (State Emergency Recovery Program, DHS)
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Mr Kevin Moon (Engineer, Standing Committee on Infection Control, DHS)
Mr Keith Moyle (Drugs and Poisons Unit)
Dr Mary O' Reilly (Infectious Diseases Physician, Victorian Drug Usage Advisory Committee working group)

Dr Megan Robertson (Intensive Care Physician, Royal Melbourne Hospital)
Dr Graham Rouch (Chief Health Officer, DHS, Chairman of the National IPPC)
Dr Alan Sandford (Manager Health Workforce, Public Health and Development, DHS)
Dr Michael South (Head, General Paediatrics, Royal Children's Hospital)
Dr Fred Tosolini (Microbiologist, Standing Committee on Infection Control, DHS)
Ms Elizabeth Virtue (Secretary, Emergency Nurses Association, Victoria)
Dr Simon Young (Director, Emergency Department, Royal Children's Hospital)
Dr Allen Yung (Infectious Diseases Physician, Victorian Infectious Diseases Service)

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APPENDIX B:

EVALUATION OF BED CAPACITY

To assist Medical DISPLAN Victoria in planning for a major public health emergency, such as an influenza pandemic, we ask that you complete the following 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** (re-deployment of staff permitted)? _____
- If **extra resources** were available in the short term? _____
- What are the **limiting factors** (staffing, equipment, physical space, other)?

(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**, including time-cycled ventilators, anaesthetic machines, CPAP, BiPAP and the availability of oxygen/suction and air-supply and areas such as recovery and operating rooms, neuroscience beds.

- Assuming **unlimited (in short term) resources for staffing**: _____
- Assuming **current staffing levels** (re-deployment of staff permitted) _____
- If **extra resources** were available in the short term, how many **extra ventilatory beds** could your hospital create? _____
- What are the **limiting factors** (staffing, equipment, physical space, other)?

(4) Does your hospital **have any excess capacity to assist** other health care facilities or the community, such as provision of meals, sterilisation capacity?

Inventory of beds (work-sheet)

This work-sheet is **NOT** required by DISPLAN, however it may assist you in answering the above questions. Please feel free to customise it.

	Number of physical beds	Number of physical beds with oxygen supply	Estimate the proportion of elective vs emergency cases	Number of beds able to be staffed using current resources	Space for beds available, with oxygen outlet, but no physical bed available	Space for beds available, no oxygen outlet, but no physical bed available	Comments (eg unique equipment, special purpose)
Medical							
Special medical							
Surgical							
Special surgical							
Coronary care*							
Intensive care*							
High dependency*							
Paediatric							
Obstetric							
Special Care Nursery							
NICU							
5 day ward							

	Number of physical beds	Number of physical beds with oxygen supply	Estimate the proportion of elective vs emergency cases	Number of beds able to be staffed using current resources	Space for beds available, with oxygen outlet, but no physical bed available	Space for beds available, no oxygen outlet, but no physical bed available	Comments (eg unique equipment, special purpose)
Day ward							
Recovery room*							
Sleep laboratory							
Closed wards							

* denotes areas currently used for ventilation or which could be used for emergency ventilation.

Inventory of ventilators (worksheet)

This work-sheet is **NOT** required by DISPLAN, however it may assist you in answering question 3. The number of different types of ventilators and their location can be recorded.

Types of ventilators	Intensive care	Coronary care	High depend-ency	Recovery room	Operating theatre	Emergency department	Storage	In repair	Sleep study laboratory	Physio-therapy	Other
Oxylog											
Bird											
CPAP spontan. breathing											
BiPAP spontan. breathing											

Emergency ventilatory capacity considerations (worksheet question 3)

This work-sheet is **NOT** required by DISPLAN, however it may assist in answering question 3, by identifying locations which could be used for emergency ventilation.

Property	Intensive care	Coronary care	High dependency	Recovery room	Operating theatre	Emergency department	Neuro-science	Sleep study laboratory	Other
Suction									
Oxygen outlet									
Medical air outlet									
Airflow (negative pressure)									
Airflow (positive pressure)									
Room Monitoring									
Physical bed									
Space, but no physical bed									

Details of vaccination

	Yes	No	N/A	Batch number	Date given DD/MM/YYYY	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 DD/MM/YYYY	Date ceased DD/MM/YYYY	Tick if still taking	Dose
Did this patient take the antiviral AMANTADINE in the last 3 months?				/ /	/ /		
Did this patient take the antiviral RIMANTADINE in the last 3 months?				/ /	/ /		
Did this patient take the antiviral ZANAMAVIR in the last 3 months?				/ /	/ /		
Did this patient take the antiviral OSELTAMAVIR in the last 3 months?				/ /	/ /		

History

Date and time of onset of first symptoms _____

Clinical features on history	YES	NO	N/A	DETAILS: eg. date of onset, symptoms that predominate
In contact with someone with influenza in the last 3 days?				
Fever				
Rigors				
Myalgia				
Arthralgia				
Headache				
Runny/ stuffy nose				
Fatigue				
Cough				
Purulent sputum				
Pleuritic chest pain				
Substernal soreness (tracheitis)				
Breathlessness				
Anorexia				
Diarrhoea				
Fluid intake				
Rash				
Overseas travel to Africa, S.America or Asia within last 3 months?				

EXAMINATION FINDINGS

Date / /
 DD MM YYYY

Time: :
 HH MM

Vital signs

Description	Vital signs for this patient	Threshold for Risk class score	Score* points	Score for this patient *
Temperature		<35°C or ≥40°C	+ 15	
Respiratory Rate		≥ 30/minute	+ 20	
Heart rate		≥ 120/minute	+ 10	
Blood pressure		Systolic BP < 90 mmHg	+ 20	
Altered mental status			+ 20	
Oxygen saturation		< 90% on room air	+ 10	
Total score				

* See attached risk assessment algorithm and classification

Respiratory examination

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

Investigations

Description	Detailed findings	Threshold for risk* class score	Score* points	Score for * this patient
Chest radiograph		Pleural effusion	+ 10	
Arterial Blood Gas	pH pO ₂ pCO ₂ HCO ₃ (on % O ₂)	pH < 7.35	+ 30	
U & E's	Na K Creat Urea	Na < 130	+ 20	
Liver function tests	Pr Alb ALT AST GGT	Urea >10.7	+ 20	
Glucose		Glucose >13.9	+ 10	
Full blood examination	Hb WCC Plat PMN (L)	Haemato-crit < 30%	+ 10	
Total risk score				

* See attached risk assessment algorithm and classification

Other investigations

Investigation	Requested Y/N	Request card written Y/N	Specimen collected Time/date	Result
Sputum gram stain				
CK total				
First bleed serology (to hold)				
Blood culture X 1				
Blood culture X 2				
Blood culture X 3				
Viral culture NPA				
Viral culture nasal swab				
Electrocardiograph				

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

Risk assessment grade for bacterial pneumonia (circle)

1 2 3 4 5

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
- malaria
- heat stroke
- carbon monoxide poisoning

ADMISSION?

Yes

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

- ICU Admission
- CCU Admission
- IPPV
- CPAP

- Oxygen therapy
- Antibiotic
- Antiviral
- Bronchodilator
- Paracetamol
- Aspirin (NO ASPIRIN for adolescents and kids)

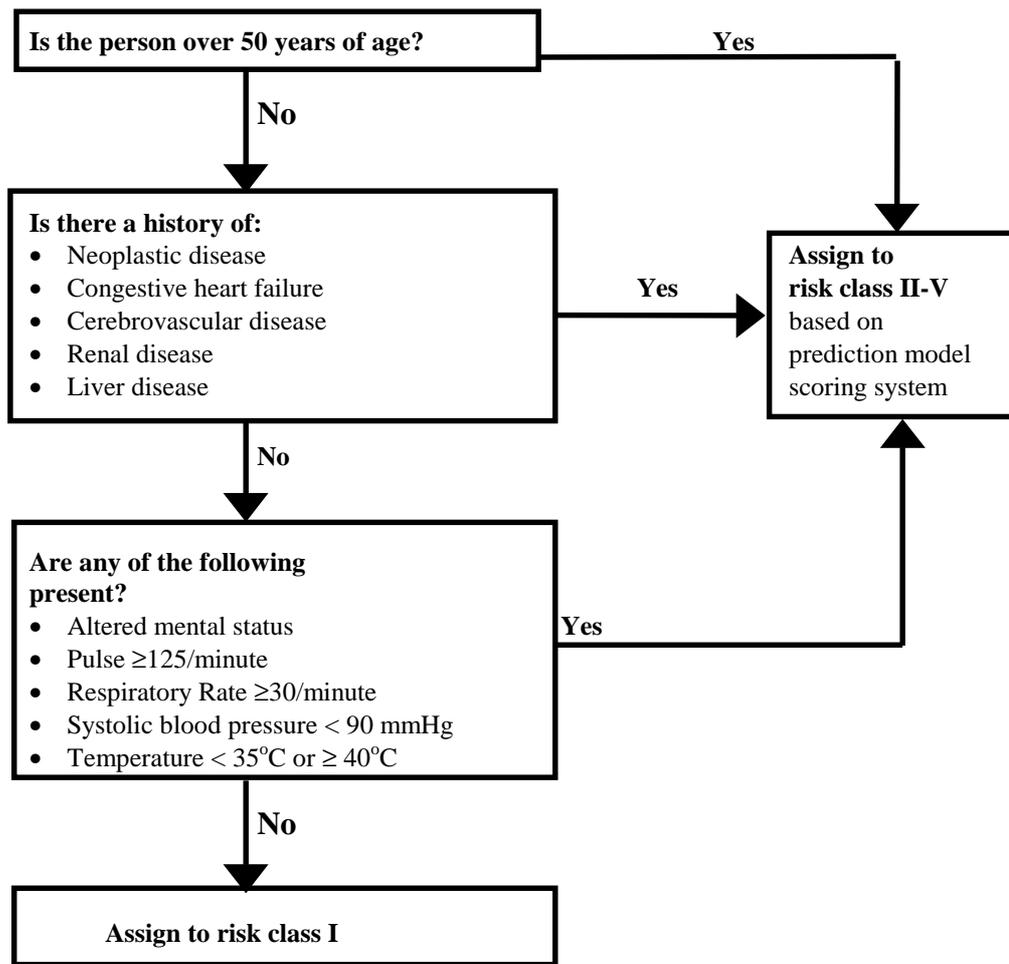
If not admitted

Provide copy of

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

- Hospital in the Home
- Royal District Nursing Service
- volunteer
- Hotel
- nil

Algorithm for risk assessment*



Risk class according to points scored*

Risk class	Number of points
I	No predictors
II	≤ 70
III	71-90
IV	91-130
V	> 130

*** This risk assessment algorithm and classification was originally designed by for use in adults with community acquired pneumonia, by Fine M, Auble T, Yealy D, Hanusa B, Weissfeld L, Singer D, et al. A prediction rule to identify low-risk patients with community-acquired pneumonia. *N Engl J Med* 1997;336(4):143-250.**

APPENDIX D:

EXCESS HOSPITALISATION, DEATH AND OUTPATIENT VISITS DUE TO INFLUENZA AND ITS COMPLICATIONS

The estimates presented in this section are based largely on the work of Meltzer et al²⁰.

Age group distribution of number of cases.

The Victorian population for 1996 was categorised into 3 age groups, 0-19 years, 20-64 years and 65 years and older (Table D1). No adjustment has been made for subsequent population growth and ageing. The use of only three age groups simplifies modelling, and the oldest age group matches the defined target group for vaccination during interpandemic years.

Table D1: Victorian population estimates used to define impact of influenza¹⁹.

Age group	Numbers (thousands)	Percentage of total (%)
0-19 yrs old	1,262	27.5
20-64 yrs old	2,729	60.0
65+ yrs old	569	12.5
Total	4,560	100.0

Percentage of high risk cases

A proportion of people, because they have a pre-existing medical condition, are deemed as being at a higher risk of contracting influenza-related illness with a serious health outcome. The lower and upper age-weighted averages of 15.4% and 24.8% were used in the US model. The estimates used are similar to the 22.5% figure quoted by Schoenbaum et al and the 19.6% for 1970-1978 used by the US Office of Technology Assessment Study (Table D2)^{24,25}.

To our knowledge, there is no equivalent comparable Australian or Victorian data. The lower and upper estimates of 6.4 and 11.1% for the 0-19 year olds and the lower estimate of 14.4% for the 20-64 year olds were obtained from the Working Group on Influenza Pandemic Preparedness and Emergency Response (GRIPPE, unpublished data). The upper limit for the 20-64 years age group and the lower and upper estimates for the 65 years and older age group were obtained from expert opinion. The NHMRC categorises all persons 65 years and older as "high risk"; however this is more to indicate high priority targets for interpandemic vaccination, rather than describing the numbers of persons in that age group who are at higher risk of contracting an influenza related illness with a serious health outcome.

Table D2: Two scenarios of the distribution of population at high risk used to examine the impact of an influenza pandemic in Australia²⁰

Assumed percentage at high risk	Distribution A % of all cases	Distribution B % of all cases
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 Australian average	15.4	24.8

Health outcomes

Hospitalisations

The excess hospitalisations due to influenza were obtained from US data (Table D3)²⁰. Some of these estimates were based on excess hospitalisation from the 1968-69 and 1972-73 epidemic excess hospitalisation rates in Oregon for standard and high risk groups.

Outpatient (ambulatory care)

The excess rates of medically attended illnesses were obtained from US data (Table D3)²⁰. Excess outpatient visits were defined as the increased visits due to the 1968-69 and 1972-73 epidemics compared to the 1970-71 period. As there were no studies that considered outpatient (ambulatory care) visits by risk category, the rates were calculated by multiplying all the rates used for the standard risk groups by an arbitrarily defined figure of 1.75. It was found by trial and error that any factor noticeably higher than this (eg 2.0), resulted in more than 100% of the high risk population requiring outpatient care.

Deaths

The excess deaths due to influenza were obtained from US data (Table D3)²⁰. Some of these estimates for the standard risk groups were based on the lowest and average age weighted death rates in the 1957-1958, 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 are scarce regarding the death rate among the 0-19 year olds with high risk conditions, 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^{20, 24}.

Table D3: 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)²⁰

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
6+ 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)	23.0		29.6
Outpatient visits (per 1000)			
<i>Standard risk</i>			
0-19 yrs old (rate)	471		548
20-64 yrs old (rate)	333		370
65+ yrs old (rate)	375		389
<i>“High risk”</i>			
0-19 yrs old (rate)	825		958
20-64 yrs old (rate)	583		647
65+ yrs old (rate)	656		682

The number of excess hospitalisations (Table D4), deaths (Table D5) and outpatient visits (Table D6) for 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. Within each gross attack rate, the lower range estimate is calculated using distribution A (Table D.2) and the lower estimates from Table D.3. Distribution B (Table D.2) and the higher estimates from Table D.3 result in the upper range estimate.

Table D4: Estimates of the excess number of persons hospitalised secondary to influenza or its complications in Victoria

Attack rate*	Distribution A lower estimates	Distribution B lower estimates	Distribution A higher estimates	Distribution B higher estimates
0.10	1,926	2,289	6,788	7,598
0.15	2,889	3,433	10,182	11,397
0.20	3,852	4,578	13,576	15,196
0.25	4,814	5,722	16,970	18,995
0.30	5,777	6,867	20,364	22,795
0.35	6,740	8,011	23,758	30,393
0.40	7,703	9,156	27,151	30,393
0.45	8,666	10,300	30,545	34,192

*The attack rate is the proportion of the Victorian population with symptomatic influenza (severe enough to take at least half a day off work)

Table D5: Estimates of the excess number of persons dying secondary to influenza or its complications in Victoria

Attack rate*	Distribution A lower estimates	Distribution B lower estimates	Distribution A higher estimates	Distribution B higher estimates
0.10	691	887	2,116	3,166
0.15	1,037	1,331	3,174	4,749
0.20	1,383	1,774	4,232	6,332
0.25	1,729	2,218	5,290	7,915
0.30	2,074	2,661	6,348	9,498
0.35	2,420	3,105	7,406	12,664
0.40	2,766	3,548	8,464	12,664
0.45	3,112	3,992	9,522	14,247

*The attack rate is the proportion of the Victorian population with symptomatic influenza (severe enough to take at least half a day off work)

Table D6: Estimates of the excess number of persons visiting as outpatients secondary to influenza or its complications in Victoria

Attack rate*	Distribution A lower estimates	Distribution B lower estimates	Distribution A higher estimates	Distribution B higher estimates
0.10	191,374	202,469	213,841	226,080
0.15	287,061	303,703	320,761	339,121
0.20	382,748	404,937	427,681	452,161
0.25	478,434	506,172	534,602	565,201
0.30	574,121	607,406	641,522	678,241
0.35	669,808	708,641	748,442	904,322
0.40	765,495	809,875	855,362	904,322
0.45	861,182	911,109	962,283	1,017,362

*The attack rate is the proportion of the Victorian population with symptomatic influenza (severe enough to take at least half a day off work)

APPENDIX E:

COMMUNICATION

Dissemination of information to medical practitioners

Medical Practitioners' Board of Victoria

The Medical Practitioner's Board of Victoria has the mailing addresses of all currently registered medical practitioners. As of December 1998, there are approximately 14,000 registered medical practitioners in Victoria.

The Board makes available to the public the names and public listed addresses. This list can be used for mail-outs (Medical Practitioners' Board of Victoria uses a mailing centre). About 50 medical practitioners in Victoria are not on the above list and do not have a publicly listed address. The Medical Practitioners' Board of Victoria is probably willing to perform a limited mail-out to these medical practitioners.

Every year, the registration of about 500 medical practitioners lapses (due to failure to pay the annual registration fee or change of address). About 150 of these medical practitioners have moved overseas. Most of the others will be made aware that they are not registered, as payment (from the Health Insurance Commission) will cease. The exception is the medical practitioner working exclusively in public hospitals, who does not get paid via the Health Insurance Commission; however, public hospitals usually check that registration is current. Therefore, it is not likely to be cost effective to mail out to the archived addresses. Dr J Katsoris from the Medical Practitioner's Board of Victoria estimates this response to be less than 20% (January 1999).

The Medical Practitioners' Board of Victoria does not have telephone, facsimile or e-mail contacts for any medical practitioners.

Although the Board collects information on the number of hours medical practitioners work, and which specialty they practice in, this information is only available as aggregate data (not doctor identifying data). Hence mailing lists cannot be directed to a specific specialty.

Specialist Societies and Colleges

The following specialist societies could be contacted: Royal Australasian College of General Practitioners, Royal Australasian College of Obstetrics and Gynaecology, Royal Australasian College of Surgeons, Royal Australasian College of Physicians, Australian and New Zealand Intensive Care Society, Australasian Society for Infectious Diseases, Thoracic Society of Australia and New Zealand.

These bodies may be willing to supply mailing labels and other details, including the number of general practitioners (part time vs full time), and a listing of specialists who could be redeployed as a result of cancellation of elective admissions.

Department of Human Services

The immunisation section of the Victorian Department of Human Services has an accurate and up-to-date list of the address of practices of general practitioners. Vaccines in Victoria are

distributed centrally with the aid of this database. The database could be gradually expanded to include other contact details such as phone, facsimile and e-mail contacts.

Dissemination of information to nurses

The Nurses Board of Victoria newsletter “Nexus” is sent out twice a year to all nurses. It is possible to write a short feature article *re* influenza pandemic planning, to raise awareness amongst nursing staff. Contact person is Barbara Carter ph 03 9613 0333.

General communication strategies

- Newspapers
- Television
- Radio– talk-back shows, news, health report
- Internet sites, eg
 - Department of Human Services home page
 - professional organisation home page
 - links to WHO, CDC (US Centers for Disease Control), NEMRN (National Emergency Media Relations Network)
- Leaflets to
 - shopping centres
 - chemists
 - post office
 - schools
 - councils
 - general practitioners
- Mail-out via Medical Practitioners’ Board of Victoria.
- Newsletters for professional organisations, eg
 - Nursing staff– contact Barbara Carter (Victorian Nurses Board)
- Professional journals, eg
 - Medical Journal of Australia.
 - Australian Family Physician.

APPENDIX F:

MEDICAL WORKFORCE

The following information is abstracted from the Royal Australasian College of Physicians Clinical Workforce in Internal Medicine and Paediatrics in Australia, 1997 Report²⁶. The number of consultant physicians in adult and paediatric medicine in 1997 is shown in Table F1. Table F2 gives an indication of the type of practice that physicians in Australia are engaged in. The number of physicians per specialty in Victoria are shown in Table F3.

Table F1: Number of consultant physicians and paediatricians in Victoria²⁶

	General Consultant	Specialist Consultant	All Physicians
Adults medicine:			
Number of consultants	130	658	788
Ratio of population aged 15+ in thousands per consultant	28.1	5.6	4.6
Paediatrics:			
Number of consultants	93	93	186
Ratio of population aged 0-14 years in thousands per consultant	10.2	10.2	5.1

Table F2: Type of practice for Australian physicians and paediatricians²⁶

Consultant physician in adult general medicine	3%
Consultant physician in adult general medicine with a specialty interest	8%
Consultant physician in a specialty field in adult medicine	53%
General physician in a specialty field in adult medicine but with general responsibilities	12%
Consultant in general paediatrics	7%
Consultant paediatrician in a specialty field	4%
Consultant paediatrician in a specialty field, but with responsibilities in general paediatrics	9%
Specialist physician (practice includes non-referred patients)	2%
Trainee (admitted to fellowship but engaged in further training)	1%

Table F3: Number of specialist physicians and specialist paediatricians in Victoria: 1997²⁶

	Number of Consultant physicians [ratio of population aged 15+ in thousands per consultant adult physician]	Number of Paediatricians [ratio of population aged 0-14 years in thousands per consultant adult physician]
Cardiology	117 [31.3]	7 [135.4]
Gastroenterology and Hepatology	73 [50.1]	7 [135.4]
Thoracic Medicine	38 [96.2]	7 [135.4]
Endocrinology	62 [59.0]	6 [158.0]
Rheumatology	50 [73.1]	2 [474.0]
Nephrology	38 [96.2]	5 [189.6]
Haematology	33 [110.8]	combined with Medical Oncology
Geriatrics	39 [93.8]	NA
Medical Oncology	40 [91.4]	7 [135.4]
Nuclear Medicine	21 [174.2]	-
Infectious Diseases	29 [126.1]	2 [474.0]
Intensive Care	17 [215.1]	3 [316.0]
Immunology & Allergy	14 [261.2]	4 [237.0]
Rehabilitation	7 [522.5]	-
Radiation Oncology	5 [1219.1]	-
Pain and Palliative Care	1 [3657.2]	-
Clinical Pharmacology	1 [3657.2]	-
Clinical Genetics	1 [3657.2]	3 [316.0]
Neonatology	NA	23 [41.2]
Developmental and Behavioural Paediatrics	NA	4 [237.0]

APPENDIX G:

COMMUNITY FACT SHEETS AND GP GUIDELINES

Three fact sheets have been prepared to help people in the community recognise when they should seek medical attention from their general practitioner:

- Adults and Influenza (Fact Sheet 1)
- Children and Influenza - (Fact Sheet 2)
- Is Your Baby Seriously Ill? (Fact Sheet 3)

The third fact sheet is not specific to influenza and is adapted from Peter Hewson's work^{27,28}.

Guidelines have also been prepared for general practitioners, to assist them in the diagnosis and management of influenza and its complications.

These fact sheets and guidelines should be photocopied and distributed as needed.

Adults and Influenza

What causes influenza?

Influenza is caused by a virus.

What are the symptoms?

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

- Sudden onset of fever
- Aches and pains
- Severe fatigue
- Headache
- Cough
- Sore throat
- Stuffy or runny nose.

How does it spread?

Influenza is very infectious. It spreads

- through the air, by coughing, sneezing, and
- on hands, cups, cutlery, handkerchiefs, or other objects that have been in contact with the mouth or nose.

Adults are infectious for 5 days after the symptoms appear, and children for 7 days.

Don't let others catch it from you

- Do not go to work.
- Do not go shopping.
- Do not go to school or university.
- Do not share eating or drinking utensils (eg cups, cutlery).
- Don't get close to uninfected friends and relatives.

How soon long does it last?

The symptoms usually start to clear up after about 5 to 7 days.

Do antibiotics help?

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

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

- **Aged 65** years or more
- **Pregnancy**
- A chronic condition such as:
 - **asthma**, severe enough to need oral steroids, or to have been in hospital or to a hospital emergency department
 - **emphysema** or chronic obstructive airways disease (COAD)
 - **diabetes** (unstable diabetes needing hospitalisation, or diabetes requiring insulin)
 - **heart failure**
 - **organ transplant** (kidney, liver, lung, heart)
- **Travel** to Asia, Africa or South America within the last 3 months (the symptoms could be due to a tropical disease such as malaria)
- **A rash**
- **You have seen a doctor** or been in hospital during the past 3 months

Look After Yourself

- Get plenty of rest.
- Drink plenty of fluids (the urine should be clear – if it is dark and concentrated, you need to drink more).
- For aches and pains, use paracetamol (PanadolTM) regularly – for adults, two tablets every 4 hours, up to 8 tablets a day
- Keep taking your usual medications (eg for high blood pressure, heart condition, asthma, diabetes), and follow the management plan for these conditions.
- Avoid aspirin if you are aged 15 or younger, or if you take the drug, Warfarin.

See a doctor if, despite these instructions, you

- develop a rash *or*
- become drowsy *or*
- get worse (eg the cough gets worse) *or*
- become short of breath *or*
- get sharp pains in your chest when you breathe in deeply.

Children and Influenza

What is influenza?

Influenza is a highly infectious illness, caused by a 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
- Cough
- Sore throat
- Stuffy or runny nose
- Noisy breathing (croup)
- Not eating enough
- Not drinking enough

Contact a 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 example, for:
 - asthma – especially if the child has needed oral steroids, or hospital, or emergency treatment
 - cystic fibrosis or other chronic lung condition
 - diabetes
 - organ transplantation (kidney, liver, lung, heart)
 - cancer or leukaemia
- has travelled to Asia, Africa or South America within the last 3 months (the symptoms could be due to a tropical disease such as malaria)
- 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 (Panadol™) for pain or discomfort.
- Continue usual medications (eg for asthma, diabetes) and follow the management plan for these conditions.
- Do NOT give aspirin.
- Antibiotics do NOT work against viruses, and are NOT effective against influenza.

How does it spread?

Influenza is very infectious. It spreads

- through the air, by coughing, sneezing, and
- on hands, cups, cutlery, handkerchiefs, or other objects that have been in contact with the mouth or nose.

Adults are infectious for 5 days after the symptoms appear, and children for 7 days.

What can you do to prevent others from catching influenza?

- Do not send the child to day care.
- Do not send the child to school.
- Do not share eating or drinking utensils (eg cups, cutlery).
- Minimise close contact with uninfected friends and family.

How soon long does the disease last?

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

Is Your Baby Seriously Ill?

A Fact Sheet about 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 breast bone, 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 convulsions
- stops breathing for more than 15 seconds.

The more warning signs, the greater the danger.

Influenza in Adults and Children

Guidelines for General Practitioners

- **General observation:** Assess the degree of “sickness”. See below for signs of serious illness in infants.
- **Differential diagnosis** – is it influenza?
In particular, consider meningitis, septicaemia, other respiratory virus, malaria, typhoid (consider travel history), subarachnoid haemorrhage, heat stroke, CO poisoning
- **Assess for complications** (eg pneumonia).
- **Underlying disease:** (eg asthma, diabetes, heart failure): Assess severity.
- **Advise:** If otherwise healthy and no complications, advise bedrest, increased fluid intake, and analgesics (eg paracetamol). NB: Aspirin is contraindicated for children and adolescents
- **Commence antibiotics** if warranted. Prophylactic antibiotics *should not* be given. See next page for indications and antibiotic choice. **Advise on side-effects:** antibiotic-associated diarrhoea, oral rehydration solution.
- **Adjust regular medications.** Refer to other available guidelines on adjusting medications for asthma, heart failure, diabetes mellitus.
- **Commence on antivirals** (pending pandemic guidelines, and antiviral availability)
- **Consider pneumococcal vaccination** (if not given within the last 5 years, and pending availability). This represents “opportunistic vaccination”.
- **Information:** Provide the patient with routine printed information on influenza in adults, children and how to recognise serious illness in young babies. Continue primary advice.
- **Arrange follow-up:** formal follow-up or phone 48 hours later for adults, 24 hours for children, at the GP’s discretion. Ensure the person knows who to contact earlier if they/their child’s condition deteriorates.
- **Monitor** patients for complications throughout the illness, including respiratory, CNS, cardiac, myositis, rhabdomyolysis/myoglobinuria, Reye’s syndrome.

Refer to the emergency department

- A person who is very “sick”
- Rapid deterioration (over 6-12 hours)
- Deterioration in the underlying condition (eg. asthma, diabetes)
- Doubt about the diagnosis
- Bacterial pneumonia in an adult at increased risk, ie
 - aged over 50 years *and/or*
 - history of neoplastic disease, CCF, CVD, renal disease, liver disease *and/or*
 - altered mental status, respiratory rate ≥ 30 /min, systolic BP >90 mmHg, temp $<35^{\circ}$ or $\geq 40^{\circ}$
- Suspicion of pneumonia in a child
- Suspicion of primary influenzal pneumonitis
- Poor oxygen exchange.

Clinical Presentation

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:

- **suggestive of meningitis**: fever, convulsions, vomiting, irritability and photophobia.
- **fever alone**, sometimes associated with vomiting or diarrhoea of short duration.
- **poor feeding**, as a result of nasal obstruction.

In adolescents, the more classical features of influenza become a feature.

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

NB: Signs of serious illness in young babies:

- ◆ **drowsiness**: doesn't wake properly, respond normally to mother, is less active.
- ◆ **breathing difficulty**: heaving chest, drawing in its ribs and sternum, grunting with breathing.
- ◆ **poor circulation**: sudden pallor, cold legs up to the knees.
- ◆ **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.

Younger adults (20 to 49 years)

Classical features of influenza are usually present: various combinations of malaise, fever, cough, sore throat, headache, muscular aches and sometimes blood-tinged sputum, retro-sternal chest pain due to tracheitis, vomiting and laryngitis.

One feature (eg headache, fever) may predominate, 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 due to fever and pre-existing disease. Major presentations are pneumonia or bronchitis in association with chronic obstructive lung disease.

Pneumonia

Consider pneumonia if *any* of the following is present:

- Increasing breathlessness
- Pleuritic chest pain (uncommon in young children)
- Productive cough
- Heart rate >120 per minute in adults (tachycardia in a child)
- Respiratory rate >20 per minute in an adult (tachypnoea in a child)
- Looks "sick".

Focal chest signs may NOT be present.

Chest radiograph and oxygen saturation 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 emergency department.
- Refer all children with suspected pneumonia to an emergency department with a paediatric facility.
- Note: for pneumococcal lobar pneumonia, radiological changes may not become apparent for 2 to 3 days.

If chest radiograph and/or oxygen saturation show

- **Bilateral interstitial changes:** Refer to emergency department for admission and commencement of antivirals and oxygen therapy (primary influenza pneumonitis).
- **Relatively clear chest radiograph and poor oxygenation:** Person usually appears sick. Refer to the emergency department. May indicate primary influenza pneumonitis (may not show on radiograph in the first 7 days)
- **Relatively clear chest radiograph and good oxygenation:** The adult usually appears well and has a respiratory rate < 20/minute. Observe.
- **Lobar or patchy consolidation:** Refer to the emergency department if
 - aged over 65 years *and/or*
 - history of neoplastic disease, CCF, CVD, renal disease, liver disease
 - altered mental status, respiratory rate ≥30/min, systolic BP >90mmHg, temp <35° or ≥40°If none of these groups, treat with antibiotics (see antibiotic grid) and review closely.

Antibiotic Indications

Antibiotics should be considered in the following situations:

- **Clinical and chest radiography findings of pneumonia:** be particularly suspicious if the onset of pneumonia symptoms occurs after a period of clinical improvement.
- **Expectoration of purulent sputum** with a normal chest radiograph, up to 14 days after the onset of influenza (suggests bacterial bronchitis), if severe.
- **Vulnerable groups**, as soon as secondary bacterial lung infection is suspected:
 - pre-existing lung disease, eg bronchiectasis, COAD broncho-pulmonary dysplasia
 - elderly and very young
 - pre-existing cardiac disease
 - late pregnancy
 - immunosuppression/transplant patients
 - influenzal pneumonitis.
- **Other respiratory tract complications** when severe and thought to be bacterial; eg sinusitis, otitis media and tracheo-bronchitis.

See next page for choice of antibiotic.

Antibiotics in order of preference, for mild/moderate bacterial pneumonia in persons with influenza (March 1999) NB: recommendations differ from those for community-acquired pneumonia.

Age	Normal host	Underlying pulmonary disease ^c	Long-term care facility ^d	Immune impairment ^e (refer all transplant patients for admission to parent unit)
0-12 mths ^a	ORAL: amoxicillin [erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY] ----- PARENTERAL: IM procaine penicillin or IV penicillin G	Admit to parent unit IV antibiotics	Not applicable	Admit to parent unit IV antibiotics
1-15 years	ORAL: amoxicillin or amoxicillin/clavulanate or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY] ----- PARENTERAL: IM procaine penicillin or IV penicillin G or IV cephazolin	Admit and contact parent unit IV antibiotics	ORAL: amoxicillin or amoxicillin/clavulanate or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY] ----- PARENTERAL: IM procaine penicillin or IM ceftriaxone	Admit and contact parent unit IV antibiotics
16- 64 years	ORAL: amoxicillin or amoxicillin/clavulanate or cefuroxime or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY] ----- PARENTERAL: IM procaine penicillin or IV penicillin G or IV cephazolin	ORAL: amoxicillin/ clavulanate or cefuroxime or cefaclor <i>PLUS CONSIDER</i> ORAL doxycycline or erythromycin (<i>atypical pathogens</i>) ----- PARENTERAL: IV/ IM ceftriaxone <i>PLUS CONSIDER</i> IV erythromycin (<i>to cover legionella</i>)	ORAL: amoxicillin/ clavulanate or cefuroxime or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY] ----- PARENTERAL: IM procaine penicillin or IM ceftriaxone	<i>Diabetes mellitus & mild pneumonia</i> consider ORAL amoxicillin/clavulanate or cefuroxime or cephalexin or cefaclor & review daily Otherwise admit & contact parent unit
65+ years ^b	ORAL: amoxicillin/ clavulanate or cefuroxime or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY] ----- PARENTERAL: IM procaine penicillin or IV penicillin G or IV cephazolin	ORAL: amoxicillin/ clavulanate or cefuroxime or cefaclor <i>PLUS CONSIDER</i> ORAL doxycycline or erythromycin (<i>atypical pathogens</i>) ----- PARENTERAL: IV or IM ceftriaxone <i>PLUS CONSIDER:</i> IV erythromycin (<i>to cover legionella</i>)	ORAL: amoxicillin/ clavulanate or cefuroxime or cefaclor [roxithromycin or erythromycin 18% R. USE ONLY IF SEVERE β LACTAM ALLERGY] ----- PARENTERAL: IM procaine penicillin or IM ceftriaxone	<i>Diabetes mellitus & mild pneumonia:</i> consider ORAL amoxicillin/clavulanate or cefuroxime or cephalexin or cefaclor & review daily Otherwise admit & contact parent unit

- a. Age: 0-12 months: Neonatal chronic lung disease (broncho-pulmonary dysplasia) can cause problems with gas exchange. Super-infection is usually hospital acquired.
- b. Age: 65+ years: Increased risk of Gram negative bacterial infection, in particular *H. influenzae*.
- c. Pulmonary disease includes severe asthma, COAD. Consider Pseudomonas cover. Trovafloxacin has better cover than ciprofloxacin for Gram positive bacteria. Ceftazidime, ciprofloxacin and aminoglycosides have insufficient or no activity against *S. pneumoniae* and *S. aureus*. Re cystic fibrosis: contact parent unit, recent sputum cultures may help to direct therapy, physiotherapy may be important due to tenacious secretions.
- d. For patients in long-term care facilities, consider whether hospital therapy is appropriate.
- e. Immune impairment differs between diseases and age groups:
 - Includes adults on prednisolone (or equivalent) 5mg/day for >14 days or children on 0.5mg/kg/day.
 - Diabetic children are not considered immune impaired.
 - Diabetic adults are at increased risk of staphylococcal pneumonia. For mild pneumonia, use amoxicillin/clavulanate or cefuroxime orally. Review patients daily.
 - Contact parent unit or physician (eg HIV infected patients– consider *Pneumocystis carinii* (PCP)).