Guidance for Pandemic Influenza: Infection Control in Hospitals and Primary Care Settings

Department of Health, England
Health Protection Agency

Prior to WHO's declaration that a pandemic has started hospitals and practitioners should be alert for cases of influenza caused by a novel virus which has not yet fully adapted to humans to become a pandemic virus. The number of such cases is expected to be small and most likely to occur in travellers returning from affected parts of South East Asia. The infection control guidance in this document does not apply to the management of these cases and practitioners should follow current guidance as issued by the Health Protection Agency.

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EXECUTIVE SUMMARY

Guidance for Pandemic Influenza: Infection Control in Hospitals and Primary Care Settings has been developed to facilitate planning by National Health Service (NHS) Trusts in advance of the emergence of the next influenza pandemic. Acute and Primary Care Trusts will form the vanguard of the NHS response to pandemic influenza. However, an influenza pandemic will not be "business as usual" and the way the NHS functions will need to be altered to accommodate exceptional infection control arrangements. This *Guidance* provides specific recommendations, planning strategies, and tools for local public health and healthcare officials who are the front line for managing and containing an influenza pandemic. Planning now will minimize the need to make unplanned decisions and improve those made at the time of the pandemic.

The *Guidance* includes detailed sections on preparedness planning, occupational health, infection control precautions, and environmental infection control. Additional sections focus on hospital and primary care specific-issues separately.

For planning purposes it is assumed that a pandemic strain of influenza will have similar transmission, communicability, and inactivation properties as "routine" seasonal influenza. Influenza is well established to be transmitted from person-to-person through close contact. **The balance of evidence points to large droplet and direct and indirect contact as the most important routes of transmission**. Airborne, or fine droplet transmission, may also occur. In view of this, **Standard Infection Control Principles and Droplet Precautions** are the principal infection control strategies which should be rigorously followed. In certain circumstances these control measures may need to be augmented with higher levels of respiratory protection. Scrupulous attention to **handwashing** and **containment of respiratory secretions** produced by coughing and sneezing are the cornerstones of effective infection control. Other key recommendations include **separation or cohorting of patients** with pandemic influenza from those who have other medical conditions; prompt identification of health care workers with pandemic influenza; **restriction of ill workers and visitors** from healthcare settings; and **education of staff, visitors, and patients** about the transmission and prevention of influenza that is understandable and applicable to their particular situation.

During the initial stages of a pandemic, there may be limited supplies of antiviral drugs and an effective vaccine. Thus, attention to non-pharmaceutical methods of control as outlined in this *Guidance* will be particularly important.

This *Guidance* will be updated if epidemiologic and virologic information on the eventual pandemic virus indicates that adjustments in approach to infection control are necessary. Users are strongly urged to refer to the most up-to-date version of this *Guidance* from web-based access points.

1. OVERVIEW OF THE GUIDANCE DOCUMENT

1.1. Scope and purpose

This document provides guidance and information on infection control procedures to inform and advise local NHS planning for pandemic influenza. It is issued jointly by the Department of Health (DH) in England and the Health Protection Agency (HPA) as official guidance.

Health is a devolved responsibility in the UK and each country has its own Chief Medical Officer. Whilst this guidance seeks to ensure a consistent and resilient UK wide approach, some differences in operational details and organisational responsibilities apply in Northern Ireland, Scotland and Wales.

It is intended for use on a UK-wide basis in the event that the World Health Organization (WHO) declares that an influenza pandemic has started,[1] and the Department of Health has declared "UK Pandemic Alert Level 2"[2] (i.e., cases of pandemic influenza identified within the UK).[a]

This *Guidance* should be read in conjunction with the Department of Health's *UK Pandemic Influenza Contingency Plan*,[2] *Operational Guidance for Health Service Planner*s,[3] and the *UK Operational Framework for Stockpiling, Distributing and Using Antiviral Medicines in the Event of Pandemic Influenza*.[4] Relevant Health and Safety Executive (HSE) legislation and guidance, including the *Control of Substances Hazardous to Health (COSHH) Regulations 2002* (as amended), [5] *Biological Agents: Managing the Risk in Laboratories and Healthcare Premises*, [6] and *Respiratory Protective Equipment at Work*, [7] should also be consulted.

To facilitate preparedness planning this document has been written in advance of the emergence of the next influenza pandemic, at a time when the identity of the causative virus remains unknown. It is based on the best evidence available from previous pandemic and interpandemic periods. Thus the G*uidance* may evolve as information on the eventual pandemic virus emerges. **Users are strongly urged to refer to the most up-to-date version of this *Guidance* from web-based access points**.

1.2. Organisation of the guidance document

The document is divided into levels of increasingly detailed information:

- an executive summary
- an overview to pandemic influenza and core principles of containment and infection control (section 2)
- detailed guidance applicable to both hospital and primary care settings

a Prior to WHO's declaration that a pandemic has started hospitals and practitioners should be alert for cases of influenza caused by a novel virus which has not yet fully adapted to humans to become a pandemic virus. The number of such cases is expected to be small and most likely to occur in travellers returning from affected parts of SE Asia. The infection control guidance in this document does not apply to the management of these cases and practitioners should follow current guidance as issued by the HPA.

- on preparedness planning (section 3) occupational health (section 4), infection control precautions (section 5) and environmental infection control (section 6)
- sections on hospital (section 7) and primary care (sections 8) specific issues including key infection control issues for specialised settings within these domains
- appendices (section 9) that provide the detailed evidence-base underpinning this *Guidance* and references and tools to aide local-level preparedness.

Using this *Guidance* Acute and Primary Care Trusts and other community healthcare settings can develop operational pandemic influenza response plans that utilize consistent infection control principles and practices.

1.3. Key terms used

Healthcare worker: Refers to **all** workers employed in healthcare settings. It is used in an inclusive context and is **not** restricted to those professions traditionally regarded as healthcare workers (e.g., doctors, nurses, and the allied health professionals (AHP)).

Influenza: Refers to cases of pandemic influenza either confirmed by laboratory test(s) or based on clinical signs and symptoms. A laboratory-confirmed diagnosis of influenza is most likely to be obtained during the early stages of a pandemic. As the number of patients rapidly increases and health professionals become more proficient at making a clinical diagnosis, confirmatory laboratory testing is likely to diminish significantly and almost all patients will be diagnosed on clinical grounds alone.

2. OVERVIEW OF PANDEMIC INFLUENZA AND INFECTION CONTROL[b]

KEY POINTS

Health impacts of a pandemic in the UK

- The elderly, young adults, and children may be particularly affected
- Clinical and serological attack rates may be 25% and 50%, respectively
- 50,000 or more deaths are possible
- Substantial demand for health care services in both primary care and hospital settings is likely

Clinical features of influenza

- Fever, dry cough, and abrupt onset
- Headache, sore throat, runny or stuffy nose, aching muscles and joints, and extreme tiredness also possible
- Adults can be infectious from a day before symptoms begin through about 5 days after illness onset. Children can be infectious for about 7 days; young children can shed virus for several days before becoming ill

How influenza is spread

- Transmitted from person-to-person through close contact. Balance of evidence points to large droplet and direct and indirect contact transmission as the most important routes
- Airborne or fine droplet transmission may also occur, especially during aerosol generating procedures

Prevention of influenza transmission

- Strict adherence to infection control practices especially hand hygiene, containment of respiratory secretions and the use personal protective equipment (PPE)
- Adherence to Standard Infection Control Principles and Droplet Precautions
- Administrative controls e.g., separation or cohorting of patients with pandemic influenza.
- Restriction of symptomatic workers and visitors
- Education of staff, patients and visitors

2.1. Emergence of a pandemic

Seasonal influenza is a familiar infection in the UK, especially during winter. Every year strains of influenza (type A or B) circulate, giving rise to clinical consultations in primary care (age-specific impact varies by season), episodes

[b] Consult Appendices 9.1, 9.2, and 9.3 for more detailed information.

of hospital treatment (mainly in older persons and young children, but occasionally in working age adults), and deaths (mainly in the elderly).

Pandemic influenza occurs when a new influenza A virus subtype emerges which is markedly different from recently circulating subtypes and strains, and is able to:

- infect humans
- spread efficiently from person to person
- cause significant clinical illness in a high proportion of those infected.

Since late 2003 a massive and unprecedented outbreak of highly pathogenic influenza (A/H5N1) affecting poultry has spread throughout much of East and South East Asia. This outbreak has so far been associated with a small number of human cases but a high proportion of deaths. Recently, epidemiological and virological changes have been reported from northern Viet Nam which may indicate that the virus is beginning to adapt to humans.[8] Although the emergence of an A/H5N1 strain with capacity to spread efficiently between humans is neither inevitable nor imminent, international concern has increased regarding the possibility that avian influenza A/H5N1 may evolve to produce the next pandemic.

Modelling studies based on the 1968/69 pandemic and more recent international air-traffic data indicate that the approximate delay between a first case in Hong Kong and the initial introduction into the UK might be in the order of 2-4 weeks. Past experience of pandemics suggests that it would take only a few weeks from the initial introduction(s) to widespread influenza activity across the country. It is also possible that more than one wave of influenza will occur within a few months of the emergence of a pandemic virus and a subsequent wave could be worse than the first. The health impacts of a pandemic are likely to be significant including excess morbidity and mortality, especially among the elderly, young adults, and children. Depending on its severity, a pandemic may generate unprecedented demands for healthcare which may saturate or overwhelm normal NHS acute and primary care settings for several weeks or months.

2.2. Influenza: clinical features and transmission

Influenza is a respiratory illness characterized by fever, cough, headache, sore throat, aching muscles and joints. There is a wide spectrum of illness ranging from minor symptoms through to pneumonia and death. The most common complications of influenza are bronchitis and secondary bacterial pneumonia.

The typical incubation period for non-pandemic influenza is 1–4 days, with an average of 2-3 days. Adults can be infectious from the day before symptoms begin through approximately 5 days after illness onset. Children can be infectious for 7 or more days, and young children can shed virus for several days before their illness onset. Severely immunocompromised persons can shed virus for weeks or months.

Influenza is well established to be transmitted from person-to-person through close contact with a coughing sneezing infected person. Transmission almost certainly occurs through multiple routes including large droplets and direct and indirect contact. Airborne or fine droplet transmission may also occur in certain situations. There is no evidence which establishes a clear hierarchy for modes of transmission. However, the patterns of transmission observed during nosocomial outbreaks frequently point to large droplet and contact transmission as the most important and the most likely routes.

Experimental studies of influenza virus survival suggest that the virus can survive for limited periods of time in the environment, be transferred from contaminated surfaces onto hands, and is easily inactivated by commercially available alcohol hand disinfectant. Thus, contact spread is likely to be important unless controlled by careful and frequent handwashing and environmental cleaning.

2.3. Core principles of containment and infection control

During a pandemic healthcare workers can be exposed to persons with influenza both through their normal daily lives (outside of work) and in healthcare settings. Limiting transmission of pandemic influenza in the healthcare setting requires application of tried and tested principles including:

- timely recognition for cases of influenza. In the current pre-pandemic period, having a high index of suspicion for possible rare cases of influenza caused by a novel strain of virus such as avian H5N1 is particularly critical
- consistent and correct implementation of appropriate infection control precautions to limit nosocomial transmission. Standard Infection Control Principles and Droplet Precautions are applicable in most circumstances. In certain situations these control measures may need to be augmented with higher levels of respiratory protection
- administrative controls, such as the segregation or cohorting of patients with pandemic influenza from those who have other medical conditions
- use of auxiliary measures such as restricting ill workers and visitors from the facility and posting of pertinent signage in clear and unambiguous language
- education of staff, patients, and visitors about the transmission and prevention of influenza that is understandable and applicable
- treatment of patients and staff with antivirals which can reduce infectiousness and the duration of illness
- vaccination of patients and staff.

During the initial stages of a pandemic there may be limited supplies of antiviral drugs and a specific pandemic vaccine will be largely unavailable. Both interventions will therefore be prioritised, in accordance with Department of Health policy. Thus, attention to non-pharmaceutical methods of control as outlined in this *Guidance* will be particularly important to reduce exposure.

3. PREPAREDNESS PLANNING FOR PANDEMIC INFECTION CONTROL

KEY POINTS

- An influenza pandemic will not be 'business as usual' for the NHS
- The way in which the NHS functions will have to be altered to accommodate exceptional infection control arrangements
- Staff will be required to work flexibly to meet high demand
- Planning in advance and stockpiling of personal protective equipment (PPE) will be necessary
- Local risk assessment to determine available control measures.

Acute and Primary Care Trusts will form the cornerstone of the NHS response to pandemic influenza. The NHS will face pressure to deal with large numbers of patients with pandemic influenza in addition to "routine" medical emergencies and, where capacity exists, the continuation of non-emergency care.

The NHS must plan for the implementation of infection control measures that can accommodate the exceptional circumstances of a pandemic. For example:

- Healthcare workers who may be unfamiliar with Droplet Precautions may be asked to manage patients with influenza.
- hospitals do not normally operate in a manner where large areas of the facility are segregated from others.
- Similarly, General Practice surgeries and other PCT premises are not usually designed or configured to permit patient segregation in waiting rooms
- PPE may quickly become in short supply; therefore, advance planning will be required to build up and manage adequate stock.

In addition, because every hospital and primary care setting is configured differently in terms of size and layout, the generic guidance provided in this document will need to be tailored and operationalised to the particular setting or facility. Planning during the interpandemic period will decrease the need to make unplanned decisions and improve those made at the time of the pandemic.

Most NHS Trusts already have a number of policies and plans in existence including *Major Incident Plans*, *Escalation Policy*, Winter *Pressures Plan* and *Outbreak of Infection Policy*. Some of these are designed to deal with "big bang" (sudden impact) incidents whereas a pandemic will be a "rising tide" (gradual escalation) scenario in which pressure builds more slowly but sustainability of response becomes a key issue. Most existing emergency plans assume that routine infection control measures will be in place, but do not address the likelihood of implementing augmented infection control

measures and sustaining these for a period of 3-4 months. Finally, most Acute and Primary Care Trusts function independently, but mutual assistance between Trusts will become important.

Under COSHH, [5] all employers, including NHS institutions, are required to undertake local risk assessments to inform decisions on choice of control measures. The COSHH guidance can be viewed as a generic assessment designed to ensure that infection control measures across the NHS are implemented in a consistent manner. It reflects published evidence on influenza transmission and control, and the exceptional circumstances of a pandemic, where there may be:

- potential for a large number of patients
- greater number of healthcare workers potentially exposed to the pandemic virus; and where the
- availability of control measures may vary.

The local COSHH risk assessment should identify any local circumstances which should also be taken into account.

To assist in this effort, specific preparation “checklists” for infection control related issues are included in the hospital and primary/community care sections.

4. OCCUPATIONAL HEALTH AND STAFF DEPLOYMENT

KEY POINTS

- Prompt recognition of healthcare workers with influenza is essential to limit the spread of the pandemic
- Healthcare workers with pandemic influenza should be excluded from work; exceptions may be necessary
- As a general principle, healthcare workers who care for pandemic influenza patient areas should not care for other patients; exceptions may be necessary
- Healthcare workers at high-risk for complications from pandemic influenza should not provide direct patient care
- Bank and agency staff should follow the same deployment advice as permanent staff.

The Occupational Health Department/Provider should lead on the implementation of systems to monitor for illness and absence, implement vaccination and antiviral therapy programmes for the healthcare workforce (as specified by the Department of Health), and liaise with the Infection control team to give general advice on the management of staff with pandemic influenza.

4.1. Who should work?

Healthcare workers will be at risk of acquiring pandemic influenza through both community and healthcare-related exposures and staff should be aware of the symptoms of pandemic influenza. Before commencing duty all staff must report any symptoms of pandemic influenza to their line manager who will then advise accordingly. Similarly, if a member of staff develops such symptoms whilst on duty he/she must report to their line manager immediately.

As a general principle, all healthcare workers who have symptoms of pandemic influenza should be excluded from work to avoid infecting patients, colleagues, and others. However, in exceptional circumstances where staff shortages are extreme, line managers may allow symptomatic staff to work. Healthcare workers who feel well enough to work and are beginning to experience symptoms of pandemic influenza or are recovering and have residual symptoms may do so provided they work in parts of the facility segregated for the care of influenza patients and avoid contact with non-influenza patients and staff who remain well. This means for example that staff must stay in the segregated patient area of the facility throughout their shift (including rest periods).

All healthcare workers who have recovered from pandemic influenza should report to their line manager before resuming clinical duties because their illness needs to be recorded and it may also affect future deployment. This group of healthcare workers can care for people with influenza. Line

managers, in turn, should ensure that sickness/absence is recorded and this information is sent to the local Occupational Health Department/Provider.

4.2. Staff deployment

Healthcare workers assigned to care for patients with pandemic influenza or who work in areas of a facility segregated for patients with pandemic influenza should not be assigned to care for non-influenza patients or work in non-influenza areas. Exceptions to this include:

- in hospitals, occupations with a limited number of staff; e.g., medical staff, Allied Health Professionals (AHP), although segregation of staff should be maintained as much as practically possible
- situations when the care and management of the patient would be compromised
- staff who have fully recovered from pandemic influenza.

In some primary care work settings this may not be feasible. Nevertheless, consideration should be given to developing approaches comparable to hospital settings; for example, one General Practitioner (GP) or District Nurse can be designated to see all the patients with symptoms of influenza on the morning list.

In hospitals, a healthcare worker from a non-influenza area can be redeployed to an area segregated for the care of influenza patients. However, once deployed a worker cannot return to their original non-influenza area for the duration of the pandemic.

Healthcare workers who have recovered from pandemic influenza or have received a full course of vaccination against the pandemic strain and therefore considered unlikely to develop or transmit influenza should be prioritised for the care of patients with pandemic influenza. In exceptional circumstances these workers can be moved within a period of duty, but this is not desirable. These workers may also be placed in units where the introduction of influenza would have serious consequences for patients (e.g., transplant units, special care baby units, renal units in community hospitals). These workers should not be moved within a period of duty.

4.3. Bank and agency staff

Bank and agency staff are traditionally employed by Trusts to complement staffing levels on a day-to-day basis across the Trust. For example, over five consecutive working days they may work in five different clinical environments. During a pandemic, this form of work allocation must be avoided. **Bank and agency staff should follow the same deployment advice as permanent staff.**

4.4. Workers at risk for complications from pandemic influenza

Healthcare workers who are at high risk for complications of pandemic influenza (e.g., pregnant women, immunocompromised workers) should be

considered for alternate work assignment, away from direct patient care for the duration of the pandemic or until vaccinated. At the very least they should not provide care to patients known to have influenza nor enter parts of the hospital segregated for the treatment of patients with influenza.

5. INFECTION CONTROL PRECATUTIONS

KEY POINTS

- Hand hygiene and containment of respiratory secretions are essential
- Signage and posters should be displayed prominently to raise awareness of these basic and critical infection control measures
- The use of PPE should be informed by the available evidence, proportional to the risk of contact with respiratory secretions and other body fluids, and type of work/procedure being undertaken.

5.1. Hand hygiene

Hand hygiene is the single most important practice to reduce the transmission of infectious agents in healthcare settings and is an essential element of Standard Infection Control Principles. During outbreaks of pandemic influenza strict adherence to hand hygiene recommendations should be enforced.

The term “hand hygiene” includes hand washing with soap and water and thorough drying, and the use of alcohol-based products (i.e., gels or foams) containing an emollient that do not require the use of water. If hands are visibly soiled or contaminated (for example, contaminated with respiratory secretions), they should be washed with soap and water and dried. When decontaminating hands using an alcohol rub, hands should be free of dirt and organic material. The handrub solution must come into contact with all surfaces of the hand.

Hands should be decontaminated before and after all patient contact with an infected patient or their bed area, removal of protective clothing, and cleaning of equipment. Following hand washing, hands should be dried thoroughly using paper towels that are then discarded in the nearest waste receptacle. Waste bins with foot-operated lids should be used whenever possible.

In addition to the placement of alcohol rub at the point of use (e.g., patient’s beds/exam rooms and lockers), consideration should also be given to distributing personal carried alcohol rub to certain groups of transient/migratory staff (e.g., medical staff in hospitals and community staff performing home visits).

All staff, patients and visitors entering and leaving areas where care is delivered should perform hand hygiene with either soap and water followed by drying, or alcohol hand rub.

5.2. Management of the coughing and sneezing patient

Patients, as well as staff, and visitors, should be encouraged to minimise potential influenza transmission through good hygienic measures as follows:

- cover nose and mouth with disposable single-use tissues when sneezing, coughing, wiping and blowing noses
- dispose of used tissues in nearest waste bin
- wash hands after coughing, sneezing, using tissues, or contact with respiratory secretions and contaminated objects
- keep hands away from the mucous membranes of the eyes and nose
- certain patients (e.g., the elderly, children)may need assistance with containment of respiratory secretions; those who are immobile will need a receptacle (e.g., a plastic bag) readily at hand for immediate disposal of tissues and a supply of hand wipes and tissues.

Patient masking: Where possible, in common waiting areas or during transport (e.g., from the community to an acute hospital or from one area of the hospital to another), coughing/sneezing patients should wear surgical masks to assist in the containment of respiratory secretions and to reduce environmental contamination.

5.3. Personal protective equipment (PPE)

Overview
PPE should be worn to protect staff from contamination with body fluids and thus reduce the risk of transmission of pandemic influenza between patients and staff and from one patient to another. Appropriate PPE for care of patients with pandemic influenza is summarised in Table 1. Care in the correct donning and removal of PPE is essential to avoid inadvertent contamination. All contaminated clothing must be removed before leaving a patient care area. Disposable or surgical masks being removed last.

PPE should comply with the relevant BSEN standards.

Surgical masks
A surgical mask should be worn by health care workers for close patient contact (e.g., within 3 feet). This will provide a physical barrier and minimize contamination of facial mucosa by large particle droplets, one of the principal ways influenza is transmitted.

If pandemic influenza patients are cohorted in one area and multiple patients must be visited over a short time or in rapid sequence (e.g., cohorted areas of a hospital or nursing home, an “influenza clinic,” or GP surgery session for influenza patients), it may be practical to wear a single surgical mask upon entry to the area and to keep it on for the duration of the activity or until the surgical mask requires replacement. **However, other PPE (e.g. gloves, gown) must be removed between patients and hand hygiene performed.** All contaminated PPE must be removed before leaving a patient care area. **Surgical masks or FFP3 respirators should be removed last, followed by thorough hand hygiene.**

Surgical masks should:
- cover both the nose and the mouth and not be allowed to dangle around the neck after usage

- not be touched once put on
- be changed when they become moist
- be worn once and discarded in an appropriate receptacle as clinical waste; Hand hygiene must be performed after disposal is complete.

Respirators
A disposable respirator providing the highest possible protection factor available (i.e., an EN149:2001 FFP3 disposable respirator) should be worn by health care workers when performing procedures which have the potential to generate aerosols (see below). If an EN149:2001 FFP3 disposable respirator is not immediately available, the next highest category of respirator available should be worn (e.g., FFP2).

Fit testing: As per HSE requirements, every user should be fit tested and trained in the use of the respirator. Fit is critically important and a fit check should be carried each time a respirator is worn. The respirator must seal tightly to the face or air will enter from the sides. A good fit can only be achieved if the area where the respirator seals against the skin is clean-shaven. Beards, long moustaches, and stubble may cause leaks around the respirator.

Other types of respiratory protective equipment (e.g., hoods/helmets) are available if the local risk assessment indicates that they would also reduce the risk of exposure. This is particularly important if the wearer is not suitable for a half-mask respirator because of fit issues and also when the respiratory protective equipment must be compatible with other PPE (e.g., safety glasses) required for a procedure/process.

Changing and disposal: If breathing becomes difficult, the respirator becomes damaged or distorted or contaminated by body fluids, or if a proper face fit cannot be maintained, the wearer should go to a safe area and change the respirator immediately.

FFP3 respirators should be replaced after each use. If, during the process of providing care, respirators become contaminated with a patient's respiratory secretions they should be disposed of immediately. Respirators should be disposed of as clinical waste according to local infection control policy.

Aerosol-generating procedures: include intubation, nasopharyngeal aspiration, tracheostomy care, chest physiotherapy, bronchoscopy, nebulizer therapy. The performance of aerosol-generating procedures should be minimized as is feasible without compromising patient care. **To avoid unnecessary exposures, only those health care workers needed to perform the procedure should be present.** In addition to respirators, eye protection must be worn to prevent eye contact with infectious material during such procedures.

Gloves
Gloves are not required for the routine care of patients with pandemic influenza *per se.* Standard Infection Control Principles require that gloves be worn for invasive procedures, contact with sterile sites, non-intact skin, and mucous membranes, during all activities that carry a risk of exposure to blood, body fluids, secretions (including respiratory secretions) and excretions, and when handling sharp or contaminated instruments.

Gloves should be removed immediately after use, disposed of as clinical waste, and hand hygiene performed. **No attempt should be made to wash gloves for subsequent reuse.**

If glove supplies become limited during a pandemic priorities for glove use may need to be established. In this circumstance, gloves should always be prioritised for contact with blood and bloody fluids, invasive procedures, and contact with sterile sites.

Aprons
Disposable plastic aprons should be worn whenever there is a risk of personal clothes or uniform coming into contact with a patient's blood, body fluids, secretions (including respiratory secretions) and excretions or during activities that involve close contact with the patient (e.g., examining the patient).

Plastic aprons should be worn as single use items for one procedure or episode of patient care and then discarded and disposed as clinical waste. In cohorted areas, aprons need to be changed between patients.

Gowns
Gowns are not required for the routine care of patients with influenza. However gowns should be worn if extensive soiling of personal clothing or uniform with respiratory secretions is anticipated, or there is risk of extensive splashing of blood, body fluids, secretions, and excretions onto the skin of the healthcare worker. Procedures such as intubation and activities that involve holding the patient close (e.g. in paediatric settings) are examples of when a gown may be needed.

Fluid-repellent gowns are preferable, but if non fluid-repellent gowns are used a plastic apron should be worn beneath.

Gowns should:

- fully cover the area to be protected
- be worn only once and then placed in a waste or laundry receptacle as appropriate, and hand hygiene performed immediately after removal.

Eye protection
The use of eye protection should be considered when there is a risk of contamination of the eyes by splashes and droplets e.g., blood, body fluids, secretions, and excretions generated through patient care. This should be an

individual risk-assessment at the time of providing care. **Eye protection should always be worn during aerosol-generating procedures.**

Eye protection can be achieved by the use of any one of the following:

- surgical mask with integrated visor
- full face visors
- polycarbonate safety spectacles or equivalent.

Of note, non-disposable eye protective equipment (e.g., polycarbonate safety spectacles issued as personal equipment to staff on a long-term basis) pose a potential cross-infection risk. It is important that any such items are decontaminated after soiling using agents recommended by the manufacturer, and when leaving an influenza patient segregated area prior to performing final hand hygiene.

Table 1. Personal protective equipment for care of patients with pandemic influenza [a]

	ENTRY TO COHORTED AREA BUT NO PATIENT CONTACT[a]	CLOSE PATIENT CONTACT (<3 FEET)	AEROSOL GENERATING PROCEDURES[b,c]
Hand hygiene	✓	✓	✓
Gloves	×[d]	✓[e]	✓
Plastic apron	×[d]	✓	×
Gown	×	×[f, g]	✓[g]
Surgical mask	✓	✓	×
FFP 3 respirator	×	×	✓
Eye protection	×	Risk Assessment	✓

a Standard Infection Control Principles apply at all times

b Examples of aerosol-generating procedures include intubation, nasopharyngeal aspiration, tracheostomy care, chest physiotherapy, bronchoscopy, nebulizer therapy, and autopsy of lung tissue

c. Wherever possible, aerosol-generating procedures should be performed in side rooms or other closed single-patient areas with minimal staff present

d. Gloves and apron should be worn during certain cleaning procedures; consult section 6

e Gloves should be worn in accordance with Standard Infection Control Principles. If glove supplies become limited or pressurised, this recommendation may need to be relaxed. Glove use should be prioritized always for contact with blood and body fluids, invasive procedures, and contact with sterile sites

f Consider in place of apron if extensive soiling of clothing or contact of skin with blood and other body fluids is anticipated (e.g., during intubation or caring for babies)

g If non-fluid repellent gowns are used a plastic apron should be worn underneath.

6. ENVIRONMENTAL INFECTION CONTROL

6.1. Clinical and non-clinical waste *

No special handling procedures beyond those for Standard Infection Control Principles are recommended for clinical and non-clinical waste that may be contaminated with influenza virus. Waste generated within the clinical setting should be managed safely and effectively, with attention paid to disposal of items that have been contaminated with secretions/sputum (e.g., paper tissues) in addition to other routine and domestic waste management. Refer to local waste policy as needed.

Liquid waste such as urine and faeces can be safely disposed of into the sewerage system.

All waste collection bags should be tied and sealed before removal from the patient area. Gloves should be worn when handling ALL waste and hand hygiene performed after removal of gloves.

* Guidance on the safe disposal of healthcare waste has been developed by the Department of Health and others as a result of a number of changes in legislation regarding the management of waste. This will be the subject of a formal public consultation.

6.2. Linen and laundry

Linen used during the patient's care should be managed safely as per Standard Infection Control principles.

Linen should be categorised as "Used" or "Infected" per the NHS Executive Guidance (1995) on *Hospital Laundry Arrangements for Used and Infected Linen.* Both "Used" and "Infected" linen must be handled, transported and processed in a manner that prevents skin and mucous membrane exposures to staff, contamination of their clothing and the environment, and infection of other patients.

- Linen should be placed in appropriate receptacles immediately after use and bagged at the point of use
- Linen bags must be tied and sealed before removal from the influenza patient care area
- Gloves and aprons should be worn for handling all contaminated linen
- Hand hygiene should be performed after removing gloves that have been in contact with soiled linen and laundry.

Hospitals: Bed curtains should be changed following patient discharge.

Primary care: Paper sheeting is a good alternative for use on patient examination couches and should be changed after each patient.

Laundry workers: Guidance on laundry worker protection is described in HSG (95) 18 – Hospital Laundry arrangements for used and infected linen. Staff should be fully trained in all laundry operations, including hand hygiene and the correct use of protective clothing.

6.3. Staff uniforms

The appropriate use of PPE will protect uniforms from contamination in most circumstances. During a pandemic, healthcare workers should not travel to and from work or between hospital residences and place of duty in uniform. Hospitals and other healthcare facilities should provide changing rooms/areas where staff can change into uniforms upon arrival at work.

Hospital/facility laundry services should be used to launder uniforms if they are available. If there are no laundry facilities available then uniforms should be laundered in a domestic washing machine in water as hot as the fabric will tolerate, then ironed or tumbled-dried. Uniforms should be transported home in a sealed plastic bag, washed separately from other linen, in a load not more than half the machine capacity, in order to ensure adequate rinsing and dilution.

Trusts should consider the use of theatre type greens for staff who do not usually wear a uniform.

6.4. Crockery and utensils

No special precautions, beyond those for Standard Infection Control Principles, are recommended for dishes and eating utensils used by a patient with pandemic influenza. Wash dishes and eating utensils in a dishwasher with a hot rinse. Do not hand wash these items. There is no need to use disposable plates and cutlery.

6.5. Environmental cleaning and disinfection

Patient cohorted areas (including acute hospitals, nursing homes, and prison medical units) and clinical rooms (including GP consulting and treatment rooms) should be cleaned daily at a minimum. Cleaning schedules may vary by setting.

- Hospitals: as a minimum, daily and after patient discharge
- Clinical rooms (including GP consulting and treatment rooms): as a minimum, daily (preferably at the end or the beginning of the day) and in-between influenza and non-influenza sessions if the same clinical room is used
- Frequently touched surfaces (e.g., medical equipment, door knobs): at least twice daily and when known to be contaminated with secretions, excretions or body fluids.

Freshly prepared neutral detergent and hot water should be used.

Damp rather than dry dusting should be performed to avoid generating dust particles. During wet cleaning a routine should be adopted that does not redistribute micro-organisms. This may be accomplished by cleaning less heavily contaminated areas first and by changing cleaning solutions and cloths frequently. The use of vacuum cleaners should be avoided.

Dedicated or single-use/disposable equipment should be used. Non-disposable equipment, including mop heads, should be laundered after use.

Any spillage or contamination of the environment with secretions, excretions or body fluids should be treated in line with the local spillage policy.

Domestic staff should be allocated to specific areas and not moved between influenza and non-influenza areas. They must be trained in the correct methods of wearing PPE and the precautions to be taken when cleaning cohorted areas. Domestic staff should wear gloves and aprons; in addition a surgical mask should be worn when cleaning in the immediate patient environment in cohorted areas.

6.6. Patient care equipment

Effective cleaning of patient care equipment is an essential prerequisite to both disinfection and sterilisation. Standard practices for handling and reprocessing used and soiled patient-care equipment, including re-usable medical devices, should be followed for both influenza and non-influenza areas of hospital and primary care settings:

- prevent exposure of the skin and mucous membranes and contamination of clothing and the environment. Gloves should be worn when handling and transporting used patient-care equipment
- clean heavily soiled equipment with neutral detergent and hot water before removing from the patient's room or consulting room
- reusable equipment (e.g., stethoscopes, patient couch in treatment and consulting rooms) must be scrupulously decontaminated between each patient; equipment that is visibly soiled should be cleaned promptly. If applicable, follow local and manufacturers recommendations for cleaning and disinfection or sterilization of reusable patient-care equipment
- wipe external surfaces of portable equipment for performing x-rays and other procedures in the patient's room with neutral detergent and hot water upon removal from the patient's room or consulting room.

Whenever possible, non-critical patient equipment should be dedicated for use by pandemic influenza patients only.

Use of equipment that recirculates air (e.g. fans,) should be avoided.

6.7. Furnishings

Remove all non-essential furniture, especially soft furnishings from reception and waiting areas in hospitals and GP consulting and treatment rooms including A&E and day rooms/lounges. The remaining furniture should be easy to clean and should not conceal or retain dirt and moisture. Toys, books, newspapers, and magazines should be removed from the waiting area.

7. SUPPLEMENTAL GUIDANCE FOR HOSPITALS

This supplement contains specialized information related to the development of operational policies and implementation of infection control guidance in acute hospital settings.

7.1. Preparedness checklist for pandemic infection control

Trusts need to consider a number of key issues related to hospital infection control during a pandemic and find the best way of integrating/embedding these into their organisational processes:

Overall coordination

- ✓ Identify a lead member of hospital staff (e.g., Director of Infection Prevention and Control (DIPC) who will take responsibility for coordinating infection control during a pandemic

- ✓ Ensure that the Trust Boards and Senior Managers are fully informed of the critical infection control issues in relation to pandemic influenza

- ✓ Identify if there are existing forums within the hospital trust that can address the issues and actions required towards preparation for a pandemic (including performing local risk assessments). If not, form a local Hospital Pandemic Action Group/Sub-Groups consisting of membership from the following:
  - o Executive Board member/Director of Infection Prevention and Control
  - o Nursing Executive
  - o Medical Staff
  - o Senior representative from each clinical division
  - o Occupational Health Dept
  - o Infection Control Team
  - o Health and Safety Team
  - o Bed Manager
  - o Public Relations/Communications Manager
  - o Estates/Facilities Dept
  - o Housekeeping
  - o Supplies
  - o Consultant in Communicable Disease Control (CCDC) or other member of Local Health Protection Unit
  - o Pharmacy
  - o Human Resources
  - o Others as appropriate

Infection control issues

- ✓ Identify suitable staff (e.g., Infection Control Link Nurses/Persons) who can supplement the existing team if needed
- ✓ Prepare strategy to communicate infection control information to staff

Triage and patient placement

- ✓ Establish procedures and test a plan for pandemic triage and rapid separation of patients with influenza from other patients
- ✓ Identify areas for segregating/cohorting large numbers of patients with pandemic influenza with engineering staff
- ✓ Identify a designated room in the radiology department that can be used for influenza patients only

Occupational health

Develop plans and procedures to:

- ✓ Assess staff with respiratory symptoms
- ✓ Supervise and monitor staff deployment, including bank and agency staff
- ✓ Track and document staff sickness absence
- ✓ Provide psychological and social support to staff
- ✓ Administer antiviral therapy as may be specified by the DH
- ✓ Vaccinate staff as may be specified by the DH

Staffing

Ensure that plans are in place to address:

- ✓ Staff allocations to pandemic/non-pandemic areas, considering skill-mix and the likelihood of sickness and absence
- ✓ Tracking and coordination of staff movements (including agency staff)
- ✓ When an emergency staffing crisis would be declared
- ✓ Possible use of family members and lay volunteers in an ancillary capacity
- ✓ Staff working outside their usual area of practice (e.g., medical and nursing students working as health care assistants)

Bed management

Is the following addressed in the existing *Escalation Policy*?

- ✓ Procedures for reviewing and revising admission criteria
- ✓ Policies for expediting discharge of patients in conjunction with PCTs and local services
- ✓ Adequate transportation arrangements for discharged patients
- ✓ Plans for tracking bed occupancy during a pandemic
- ✓ Cancellation of elective admissions at short notice
- ✓ Plans to convert surgical wards into medical wards

Supplies of consumables

- ✓ Evaluate current stock of essential equipment
- ✓ Assess anticipated demand for consumables and determine trigger point for ordering extra supplies
- ✓ Determine feasibility of ordering and storing extra PPE
- ✓ Direct supplies managers to establish contingency plans in the event that primary sources of supplies become limited or exhausted

Mortuary issues

- ✓ Plan for mass fatalities.
- ✓ Assess capacity for refrigeration

- ✓ Define overflow arrangements

Education and training

- ✓ Brief senior medical and nursing staff on pandemic infection control procedures (from Trust Board to Consultant/Ward Manager level)
- ✓ Brief managers of other departments (including Estates, Porters, Radiology, Physiotherapy, Occupational Health)
- ✓ Test local response capabilities; a tabletop exercise is strongly recommended
- ✓ Plan for additional training and fit-testing for staff likely to use FFP3 respirators
- ✓ Provide general training for all staff on the infection control implications of pandemic influenza
- ✓ Consider how the hospital intranet could be utilised for training, education and communication on infection control issues during a pandemic to minimise face-to-face meetings during a pandemic

7.2. Patient placement, segregation and cohorting

KEY POINTS

- In all health care settings, patients with symptoms of pandemic influenza should be segregated from non-influenza patients as rapidly as possible
- Whenever possible, different teams of staff should care for influenza and non-influenza patients. The segregation of symptomatic patients is important in the containment of pandemic influenza.
- This requires careful consideration of flexible accommodation and staffing arrangements
- Patients with pandemic influenza should be managed separately until discharged.

Selection of segregated areas for cohorting patients

To achieve the desired goal of separating patients with pandemic influenza from those without, a designated self-contained area/wing of the hospital should be used for the treatment and care of patients with pandemic influenza whenever possible. Ideally, this area should:

- include a reception area separate from the rest of the hospital.
- if feasible, have a separate entrance/exit from the rest of the hospital.
- not be used as a thoroughfare by other patients, visitors or staff. This includes patient transfers, staff going for meal breaks, and staff and visitors entering and exiting the building.

To control entry, signage should be displayed warning of the segregated pandemic influenza area.

Whilst there is no specific concern for long-range airborne transmission of pandemic influenza, when selecting possible areas to segregate patients the

local hospital engineering department should be consulted regarding design considerations and to also ensure that mechanical ventilation systems do not dilute from cohorted to non-cohorted areas. At a minimum, doors should be closed between the two areas.

Ward level

Cohorting of patients in segregated areas of the hospital should be carried out from the outset of the pandemic to help contain influenza within one part of the hospital and reduce the risk to other patients. Side rooms in non-influenza areas should be reserved for patients requiring isolation for other (non-influenza) reasons; side rooms in influenza segregated areas should be reserved for performing aerosol-generating procedures whenever possible.

Consideration should be given to cohorting separately patients infected with pandemic influenza and another pathogen (e.g., MRSA) to minimise hospital transmission of other infectious pathogens. This will be dependent on availability of rooms and staff and the number of patients who are infected with both influenza and another pathogen requiring isolation.

Patients should remain in the designated segregated area until discharged to the community and not allowed to be transferred to other areas purely for bed management purposes. However, if there is extreme pressure for beds in the segregated area of the hospital, convalescing patients with residual, non-respiratory problems (i.e., who are unlikely to be secreting virus in large quantities), but who require hospitalisation for other reasons (e.g., poor mobility, non-respiratory complications) may need to be moved to another area of the hospital, an intermediate care facility, or a nursing/residential home. Such convalescing patients should, where possible, be accommodated together and away from other patients (see Community Guidance).

Infection control measures for segregation and cohorted care

Entry procedures: Place a recording sheet at the entrance of the cohorted area. All healthcare workers and visitors should sign in so that if follow up/contact tracing is required details are readily available. The number of personnel should be limited to those necessary for patient care and support. Place a sign at the entrance alerting all to the precautions to be adopted.

Infection control precautions: Standard Infection Control Principles must be strictly applied in conjunction with Droplet Precautions. Droplet Precautions for all patients should be maintained in the segregated area.

Ward furnishings: For 4 – 6 bedded bays, set up an equipment station outside the entrance to hold PPE. For Nightingale-style wards, identify strategic points for equipment stations to facilitate access and encourage use. Remove all non-essential furniture, especially soft furnishings. Remaining furniture should be easy to clean and should not conceal or retain dirt and moisture.

Patient area:

In accordance with Droplet Precautions, the distance between beds should be more than 1 metre. Beds should be separated, preferably by a physical barrier (e.g., curtain). Keep the patients' personal belongings to a minimum. Provide water jug and glass, tissue wipes and suitable disposable containers (e.g., plastic bags), and all other items necessary for personal hygiene within the patients reach.

Patient equipment: Where feasible allocate each patient their own non–critical items of patient equipment (e.g., stethoscope, thermometer) or use disposable items. Clean re-usable equipment between patients.

Day rooms/lounges: Consider closing day rooms/lounges if there is a risk that these might be used by both influenza and non-influenza patients or if the location of these rooms presents a problem for limiting patient movements.

Cleaning: Areas should be scrupulously cleaned as a minimum at least once a day. Close liaison with housekeeping/domestic services will be required.

7.3. Patient transfer/transport/hospital day care procedures

Hospital transfers

Patients must not be automatically admitted to hospital if they have pandemic influenza. However, it can be anticipated that some patients who are initially managed in the community will require hospital admission. Patients must not be transferred from one hospital to another for routine care related to pandemic influenza, including mechanical ventilation. However, some patients may require transfer for specialist care arising out of complications or concurrent medical events (e.g., cardiac angioplasty, renal dialysis). If transfer is essential, the Infection Control Team and Bed Manager at the receiving hospital and the ambulance staff must be advised in advance. Patients with influenza should not be admitted or transferred to specialist units for vulnerable patients (e.g., transplant units) where if influenza is introduced, mortality is likely to be very high.

Intra-hospital transfers

Where possible allocate dedicated equipment such as X-ray equipment and ECG recorders to the segregated area so that all procedures and investigations can be carried out in the area.

Patients with pandemic influenza should leave the segregated care area for only urgent and essential procedures. If a patient requires transfer to another department the following procedures must be followed:

- the department must be informed in advance
- the patient must be taken straight to and return from the department and must not wait in a communal area
- patients should be placed at the end of a list to allow appropriate decontamination after any procedure.
- in some settings (e.g., radiology departments) a separate room should be set aside for patients with influenza segregated areas of the hospital and this room should be cleaned regularly

- influenza patients should wear a surgical mask while in transit to help prevent large droplets being expelled in to the environment. If a surgical mask cannot be tolerated (e.g., due to the patient's age or deteriorating respiratory status) apply the most practical measures (e.g., tissues) to contain respiratory secretions. Where possible the patient should also perform hand hygiene before leaving their room or cohorted area.

Hospital day care procedures

For patients who develop influenza and have chronic conditions that require attendance at hospital regularly for day care procedures, options may include:

- deferring the procedure and re-scheduling the next appointment
- transfer to a designated hospital with isolation or cohorted facilities
- introduction of barriers in special units to separate patients with symptoms of pandemic influenza.

7.4. Special settings: accident and emergency

During the peak of a pandemic, hospital accident and emergency (A&E) departments and outpatient departments may be overwhelmed with patients seeking care. Alternative approaches to triage and initial assessment will be required to:

- rapidly screen and identify persons who have symptoms of pandemic influenza upon their arrival
- separate symptomatic patients from others to reduce the risk of disease transmission
- determine as early as possible the type of care patients will require (i.e., "see and discharge" or admit for treatment).

Screening and triage

Signage should be displayed prior to and on entry to the A&E Department instructing patients with respiratory symptoms to inform the reception immediately on their arrival.

A triage practitioner should be based in the reception for managing patient flow, including deferral of patients who do not require emergency care.

Patients calling for medical appointments for pandemic influenza should be discouraged from making unnecessary visits to clinical facilities.
Screening for signs and symptoms of pandemic influenza in all persons entering the hospital may escalate from passive (e.g., signs at the entrance) to active (e.g., direct questioning) on the advice of the Department of Health and the HPA.

Reception area/layout

Patients with symptoms of pandemic influenza should be triaged to a segregated waiting and assessment area immediately. Patients should be instructed to stay in this waiting area and not wander around the department, hospital, or go to the public cafeteria. Signage and physical barriers should be used as appropriate.

If separate areas for patients with symptoms of pandemic influenza cannot be established, at a minimum, an alternate site should be set up for those at highest risk of complications from influenza infection (e.g., outpatients presenting for dialysis, patients with a history of organ transplantation, chemotherapy, or who are immunocompromised for other reasons).

Patients who do not have symptoms of pandemic influenza but require acute care assessment promptly should be triaged to a specific waiting and examining area, physically separate from the influenza waiting and assessment area.

Attention to respiratory hygiene should be reinfored by displays of posters and provision of hand washing facilities, tissues, and waste bins.

All non-essential soft furnishings and items such as books and magazines and toys should be removed.

Infection control measures for waiting rooms

Patients, staff, and visitors should be encouraged to minimise potential transmission of influenza through good hygienic measures as follows:

- cover nose and mouth disposable one-use tissues when sneezing, coughing, wiping and blowing noses
- dispose of used tissues in nearest waste bin
- wash hands after coughing, sneezing using tissues or contact with respiratory secretions and contaminated objects
- keep hands away from the mucous membranes of the eyes and nose
- certain patients (e.g., the elderly, children) may need assistance with containment of respiratory secretions; those who are immobile will need a receptacle (e.g., a plastic bag) readily at hand for immediate disposal of tissues and a supply of hand wipes and tissues

Patient masking: As waiting rooms can become crowded, it is preferable that symptomatic persons wear surgical masks. This will assist with the containment of respiratory secretions and minimise environmental contamination.

Infection control procedures in rooms/cubicles

Room layout: all non-essential equipment from the examination room/cubicle should be removed. Stocks of consumables should be stored near to the examination rooms and not inside them.

Patient masking: Coughing and sneezing patients should wear surgical masks to minimize environmental contamination of the cubicle. Patients should be confined to their rooms/cubicles and only moved outside for essential procedures.

Cleaning: hand contact surfaces must regularly cleaned while room is in use.

7.5. Special settings: children

Children's wards present special challenges due to the difficulties experienced with younger children adhering to respiratory hygiene. In addition, children usually shed virus longer than most adults and in some settings shedding may be prolonged for weeks.

Patient placement

The following points need to be taken into consideration when cohorting children:

- different age groups (e.g., infants, toddlers, adolescents)
- routine childhood vaccination status of children.
- presence of immunocompromising conditions
- co-infection with another pathogen (e.g. RSV); such children may be cohorted separately. However, this will be dependent upon the availability of rooms, staff and the number of patients who are infected with both influenza and another pathogen requiring isolation.

Respiratory hygiene

It is important to educate and encourage children and their families to adopt good hygiene measures to minimise potential transmission including use of disposable tissues for wiping noses; covering nose and mouth when sneezing and coughing; washing hands after coughing, sneezing or using tissues; and keeping hands away from the mucous membranes of the eyes and mouth.

Personal protective equipment

Gowns may be required when caring for babies and neonates due to the close contact required. An overview of the type of what circumstances PPE should be worn can be found at Table 1.

Environmental issues

Communal areas such as play rooms and schoolrooms should be closed. Toys should not be shared. All toys must be cleanable and should be cleaned regularly (preferably when the environment is cleaned). Cleaning of the environment should be increased.

7.6. Special settings: intensive care units

Unit layout/patient placement

If the unit does not have side rooms, the main unit should be divided into two separate areas for care of patients with and without pandemic influenza. Whenever possible, staff teams should be dedicated to one area.

Respiratory care issues

Respiratory equipment

- Disposable patient respiratory equipment must be used wherever possible. Reusable equipment must be disinfected in accordance with local policy and manufacturers guidelines

- Closed systems should be used wherever possible (e.g., suction, closed nebuliser delivery)
- All respiratory equipment used on patients must be protected with a filter
- The ventilatory circuit should not be broken unless absolutely necessary
- The use of open non invasive positive pressure ventilation equipment should be avoided
- Water humidification should be avoided.

Respiratory procedures

- Only essential staff should be in a patient's room when airway management, cough inducing activities or nebulisation of drugs is being carried out
- PPE must be worn when giving care, especially during procedures involving airway management (See Table 1).

7.7. Special settings: the dying/deceased patient

Ministers of religion

Ministers of religion should be instructed to wear PPE as per Standard Infection Control Principles and Droplet Precautions.

Last offices

When performing last offices for deceased patients, healthcare workers must follow Standard Infection Control Principles; surgical masks should be considered if there is a risk of splashes of blood and body fluids, secretions (including respiratory secretions), and excretions onto the facial mucosa.

The body should be fully wrapped in a sheet. Transfer to the mortuary should occur as soon as possible after death. If the family wishes to view the body, they may be allowed to do so and instructed to wear PPE as per Standard Infection Control Principles.

Post mortem examinations

During a pandemic questions may arise about the need for post-mortems examinations. Where clinically indicated, such exams will yield vital clinico-pathological information which may be of vital importance in refining recommendations related to prevention and treatment of infection. The post-mortem should be conducted in a high risk post-mortem room and a powered respirator and full PPE should be worn.

Mortuary and funeral staff

The mortuary staff or funeral director should be informed that the deceased had pandemic influenza. Standard Infection Control Principles should be followed; there is no further risk of droplet spread.

7.8. Special settings: visitors

Family visitors

During a pandemic, visitors to all areas of the hospital should be kept to a minimum. On arrival to influenza segregated wards all visitors should report to the ward reception. Signage should be displayed informing visitors of the ward's current segregated status and procedures that need to be undertaken prior to entering the ward.

Visitors entering a cohorted area must be instructed on hand hygiene practice and the wearing of protective clothing as appropriate.

The use of family members and volunteers to assist in patient care during a pandemic may be considered if staff shortages are extreme. When visitors become carers they will need to be instructed on the use of PPE.

Others

Works department technicians should not be allowed entry into influenza segregated areas unless undertaking essential maintenance work. If this is necessary, PPE must be worn as detailed for healthcare workers.

Medical sales representatives should not be allowed entry into influenza segregated areas including patient waiting or reception areas designated for patients with symptoms of pandemic influenza.

8. SUPPLEMENTAL GUIDANCE FOR PRIMARY CARE SETTINGS

As there is a wide spectrum of healthcare delivery in the community, planning is essential. Each Primary Care Trust (PCT) care setting is managed differently in terms of staff and population and the generic guidance provided in this document will need to be operationalised slightly differently in each primary care setting, after a local risk assessment has been performed. This supplement covers the following main care settings:

- General Practice premises
- Primary Care Teams making home visits
- Primary Care Clinics
- Community Hospitals
- Ambulance Trusts
- Nursing Homes
- Prison Medical Units

8.1. Preparedness checklist for pandemic infection control

Trusts need to consider a number of key issues related to infection control in primary care settings during a pandemic and find the best way of integrating/embedding these into their organisational processes.

Overall coordination

- ✓ Identify a lead member of staff (e.g., Director of Infection Prevention and Control (DIPC) who will take responsibility for coordinating infection control during a pandemic.

- ✓ Ensure that the Trust Boards and Senior Managers are fully informed of the critical infection control issues in relation to pandemic influenza.

- ✓ Identify if there are existing forums within the Trust that can address the issues and actions required towards preparation for a pandemic (including performing local risk assessments). If not, form a local Pandemic Action Group/Sub-Groups. This Group may be comprised of a number of PCTs covered by the same local Health Protection Unit (HPU) consisting of membership from the following:
    - o Executive Board/DIPC
    - o Nursing Executive
    - o Medical Staff
    - o Senior representative from each clinical team (e.g., District Nurse, Senior Physiotherapist, Occupational Therapist, Podiatrist)
    - o Occupational Health Provider
    - o Infection Control Team
    - o Health and Safety Team
    - o Bed Manager
    - o Public Relations/Communications Manager
    - o Estates/Facilities Dept
    - o Domestic Services/Housekeeping
    - o Supplies

- Consultant in Communicable Disease Control (CCDC) or other member of local HPU
- Community pharmacist
- Human Resources
- Others as appropriate

Infection control issues

- ✓ Identify suitable staff (e.g., Infection Control Link Nurses/Persons) who can supplement the existing team if needed
- ✓ Prepare strategy to communicate infection control information to staff

Triage and patient placement

- ✓ Establish procedures and test a plan for "pandemic configuration" of healthcare settings and premises, including where possible the rapid separation of patients with influenza from other patients
- ✓ Identify areas for segregating/cohorting large numbers of waiting patients with pandemic influenza

Occupational health

Develop plans and procedures to:

- ✓ Ensure managers know how to assess staff with respiratory symptoms
- ✓ Supervise and monitor staff deployment, including bank and agency staff
- ✓ Track and document staff sickness/absence
- ✓ Provide psychological and social support to staff.
- ✓ Administer antiviral therapy as may be specified by the DH
- ✓ Vaccinate staff as may be specified by the DH

Staffing

Ensure that plans are in place to address:

- ✓ Staff allocation considering skill-mix and the likelihood of sickness/ absence
- ✓ Tracking and coordination of staff movements (including agency staff)
- ✓ When an emergency staffing crisis would be declared
- ✓ Possible use of family members and lay volunteers in an ancillary capacity
- ✓ Staff working outside their usual area of practice (e.g., medical and nursing students working as health care assistants)

Bed management

Is the following addressed in the existing *Escalation Policy*?

- ✓ Procedures for reviewing and revising admission criteria to acute hospital care as admission thresholds are likely to be higher
- ✓ Policies for expediting discharge of patients in conjunction with acute Trusts and local services
- ✓ Adequate transportation arrangements for discharged patients
- ✓ Establishment of an intermediate care facility to free-up hospital beds
- ✓ Plan for frequent liaison with Bed Mangers in acute Trusts.

Supplies of consumables

Evaluate current stock of essential equipment

- ✓ Assess anticipated demand for consumables and determine trigger point for ordering extra supplies
- ✓ Determine feasibility of ordering and storing extra PPE
- ✓ Direct Supplies Managers to establish contingency plans in the event that primary sources of supplies become limited or exhausted

Mortuary issues

In conjunction with Local Resilience Forum:

- ✓ Plan for mass fatalities.
- ✓ Assess capacity for refrigeration
- ✓ Define overflow arrangements

Education and training

- ✓ Brief senior PCT staff (including Practice Managers, District Nurse managers, GPs, Ambulance managers) on pandemic infection control procedures
- ✓ Brief managers of other departments (including Estates, Practice Nurses, Physiotherapy, Occupational Health)
- ✓ Test local response capabilities; a tabletop exercise is strongly recommended
- ✓ Plan for additional training and fit-testing for the small number of staff likely to use FFP3 respirators
- ✓ Provide general training for all staff on the infection control implications of pandemic influenza
- ✓ Liaise with others who may require training on infection control precautions as appropriate to their respective roles (e.g., ministers of religion and funeral directors)
- ✓ Consider how the PCT intranet could be utilised for training, education and communication on infection control issues during a pandemic to minimise face-to-face meetings during a pandemic

8.2. Patient placement, segregation and cohorting

KEY POINTS

- In all community healthcare settings, patients with pandemic influenza should be kept separate from non-influenza patients
- This requires careful consideration and flexibility in accommodation and staffing arrangements.

To achieve the desired goal of separating patients with influenza from those without, a designated self-contained area within each premise should be used for the treatment and care of patients with pandemic influenza whenever possible. *Ideally* this area should:

- be fully self-contained

- include reception and waiting areas separated from non-influenza patients
- have a separate entrance/exit door
- not be used as a thoroughfare by other patients, visitors or staff. This includes patient transfers, and staff and visitors entering and exiting the building.

To control entry, signage should be displayed warning of the segregated pandemic area.

While such arrangements may not be possible in some premises within a PCT, innovative solutions should be sought which incorporate the above principles, e.g., no "mixed" (influenza and non-influenza patients) surgeries to be carried out.

Configuration of community care premises

Once a pandemic is established, segregation principles should be applied to address the dual aims of handling a large number of patients with influenza whilst minimising transmission to others.

GP surgeries/ community outpatient settings: Where possible, part of the surgery (at a minimum a consulting room) should be designated for the duration of the pandemic.

Community in-patient settings (including community hospitals, nursing homes, and prison hospitals): See section 7.2.

Temporary care settings: Pandemic influenza arrangements at the PCT level should plan for high numbers of patients being discharged from hospital into the community. Plans should be in place to provide accommodation for segregated intermediate care (e.g., in a designated nursing home). As the incidence of pandemic influenza increases locally, there may be a need to establish temporary care facilities. These are likely to be situated in establishments which are not designed or optimised for the delivery of clinical care (e.g. sports halls, schools, town halls);

Key points for infection control practice in community inpatient areas

See section 7.2.

Key points for infection control practice for general practices

Telephone triage: Patients with symptoms of pandemic influenza who are not seriously ill should be encouraged to telephone NHS Direct or the GP surgery for advice and consultation to minimize crowding in reception areas. GPs may wish to consider home visits in lieu of surgery visits in such instances.

Entry procedures: If it is possible to designate a segregated area of the GP premises for influenza patients, practice staff should be limited to those necessary for patient care and support. Records should be kept of staff

working in the designated area. Place a sign (not breaching patient confidentiality) at the entrance alerting staff to the precautions to be adopted.

Infection control precautions: Standard Infection Control Principles and Droplet Precautions should be maintained both in the surgery and during home visits.

Patient equipment: Clean re-usable equipment (e.g. ECG machine, stethoscope) between patients. If it is not possible to identify a segregated area in the GP surgery ensure that all staff are aware of Standard Infection Control Principles and Droplet Precautions, paying particular attention to hand hygiene and the additional cleaning of consulting and treatment rooms required after being used for seeing patients with influenza. (See section 6.4.)

Cleaning: Cleaning of the consulting, treatment and waiting areas should be done as a minimum, daily and after being used for an influenza session.

Key points for infection control practice in temporary care settings

Preparation and planning: Advice must be sought from the Community Infection Control team for the Primary Care Trust and the Local Environmental Health Department so that areas are suitable. For example, access to hand washing facilities should be made available; if there is a shortage of sinks, temporary sinks should be installed (liaise with local council). Supplies of PPE, hand hygiene products and cleaning materials must be secured before the facility begins accepting patients.

Hand hygiene: Alcohol hand rub should be available at all points of patient care and entrance and exit points of the building. Personal carried alcohol rub may be issued to staff if hand hygiene facilities may be suboptimal.

Layout and configuration: The distance between the beds should be at least 1 metre. Beds should be separated by a physical barrier (e.g. curtains or screens).

8.3. Patient transfer/transport/hospital day care procedures

See section 7.3

8.4. Special settings: ambulance services

KEY POINTS

- Where practical designate an ambulance(s) for influenza patients
- Standard Infection Control Principles and Droplet Precautions are applicable in most circumstances
- Crew members should wear FFP3 respirators if critically ill patients require aerosol-generating procedures (e.g., intubation, nasopharyngeal aspiration).
- Equipment carried should be kept to a minimum

Where practical and possible designate an ambulance(s) for transfer of patients with pandemic influenza for the duration of each shift.

The immediate environment i.e., trolley and patient equipment must be decontaminated between patients. Upon completion of transfer of patients with influenza (e.g., at the end of a shift) the vehicle must be thoroughly cleaned and decontaminated using detergent and hot water before further use. All disposable materials must be disposed of as clinical waste. Waste bags must be sealed, labelled and sent for incineration

Coughing and sneezing patients should be transported on their own whenever possible. However, if pressure upon the service occurs, two patients with symptoms of pandemic influenza may be transferred together. Symptomatic patients should be encouraged to wear a surgical mask to assist in the containment of respiratory secretions and reduce environmental contamination of the ambulance (see section 5.2).

8.5. Special settings: general practices

Organisation of work flow and appointments

The principal GP, together with the Practice Manager, are responsible for clinical and administrative infection control issues to prevent the spread of influenza in the practice. Procedures should be established to test the practice's plan, including a "dummy run" of converting the premises to a pandemic configuration.

Procedures for making appointments should be reviewed. All non essential clinics should be cancelled, including routine baby clinics. Babies needing treatment and essential childhood immunisations should be seen singly in the part of the Health Centre or surgery designated for non-influenza patients.

Where practical a work flow should be developed so that GPs and Practice Nurses are designated to care for either influenza or non-influenza patients and "mixed care" is avoided. For example, one GP would be designated for the morning surgery to see all patients with influenza in a designated area; at then end of surgery the same GP would make house calls to patients with influenza. Other GPs within the practice would see non-influenza patients in separate areas of the surgery. Environmental cleaning should be carried out, prior to using the same facilities for non-influenza patients.

Checklist for pandemic infection control

Layout/configuration of the practice

- ✓ Create separate waiting areas for influenza and non-influenza patients
- ✓ Designate clinical rooms/doctors' offices for influenza and non-influenza patients
- ✓ Remove extraneous items (e.g., toys, soft furnishings, magazines) from waiting areas

- ✓ Display clear signage at surgery entrances and clinical rooms/doctors' indicating influenza/non-influenza areas

Staff assignments

- ✓ Assign GPs, Practice Nurses, and other Primary Care staff to see either influenza patients or non-influenza patients on a daily basis

Infection control issues

- ✓ Ensure that hand hygiene facilities (e.g., sinks, soap, alcohol hand gel, paper towels) are available for staff and patient use
- ✓ Consider use of hand carried alcohol rub for GPs and practice staff when making community/home visits
- ✓ Ensure that tissues and waste bins are available for patients and staff
- ✓ Monitor adherence to hand hygiene and other infection control measures

Personal protective equipment

- ✓ Ensure that supplies of gloves, surgical masks, aprons and any other items that may be needed
- ✓ Ensure that eye protection is available if needed
- ✓ Perform local risk-assessment to review potential for performing aerosol-generating procedures; order FFP3 disposable respirators and fluid repellent gowns if this is likely

Environmental cleaning

- ✓ Ensure that an environmental cleaning rota is in place and domestic staff have been trained in cleaning and decontamination procedures
- ✓ Ensure that there are adequate supplies of cleaning materials

Education and training

- ✓ Provide all staff with training in pandemic influenza infection control procedures
- ✓ Ensure that any potential users of FFP 3 disposable respirators have been fit tested and trained in their proper use and care

Record keeping

- ✓ Track and document staff sickness and absence
- ✓ Track and document staff assignments

Patient information

- ✓ Provide information sheets, pamphlets etc. for patients

8.6. Special settings: single-handed GPs

Single-handed GPs may encounter a number of difficulties related to implementation of pandemic influenza infection control measures:

- creation of separate waiting areas for influenza and non-influenza patients
- designation of clinical rooms for influenza and non-influenza patients

- segregation of influenza and non-influenza patient care activities due to small team size
- limited resilience due to staff sickness and absence.

Single-handed GPs should seek help and advice from the PCT to help ensure that they can function effectively during a pandemic without increasing the potential for spread of influenza in their practice. PCTs may need to consider how local services provided by single-handed GPs can be amalgamated with those provided by larger team practices for the duration of the pandemic.

8.7. Special settings: district nursing teams

Team Leaders should carefully manage nursing team workflow and consider flexible and innovative approaches such as "cross working." For example, district-nursing teams or PCTs might consider sharing staff or a designated District Nurse could visit multiple patients in one care home.

District nurses should be designated to care for either influenza or non-influenza patients whenever possible. All non-influenza visits/appointments should continue as long as possible. However, it may be necessary to cancel routine appointments and clinics.

8.8. Special settings: health visitors

Close liaison with other members of the Primary Care Team is essential. Health Visitors may be requested to work outside their normal duties and managers should ensure that training is provided to facilitate this need.

Home visits should continue as long as possible to patients without influenza. However, it may be necessary to cancel routine appointments and baby clinics.

Health Visitors should not routinely visit families affected by influenza. However, they must ensure alternative arrangements (e.g., telephone liaison) are in place to maintain contact. Health Visitors performing non-deferrable essential visits (e.g., child protection) to households with influenza should follow the infection control precautions detailed in this Guidance.

8.9. Special settings: allied health professionals (AHP)

Close liaison with the PCT is essential. AHPs may be requested to work outside their normal duties and managers should ensure that training is provided to facilitate this need.

It may be necessary to cancel non-essential clinics/appointments. AHPs performing non-deferrable essential visits to households with influenza should follow the infection control precautions detailed in this Guidance.

See Section 4 for further information regarding staff deployment and occupational health issues.

8.10. Special settings: dentists

Patient visits: It may be prudent to cancel routine dental visits during the pandemic period. At a minimum, dental practices should put in place active screening of all patients for symptoms of influenza prior to entering the clinical area. Patients with symptoms of pandemic influenza should not be seen at all, unless a dental emergency is suspected.

Performance of procedures on patients with pandemic influenza: Emergency patients should be treated at the end of a surgery session when all other patients have left. Staff in attendance should be kept to a minimum and all should wear PPE in accordance with an aerosol generating procedure (Table 1).

Infection control and environmental cleaning procedures: See sections 5 and 6).

8.11. Special settings: the dying/deceased patient

See section 7.7

8.12. Special settings: visitors

The only visitors to healthcare centres, GP surgeries, and nursing/residential care settings should be patients and a guardian or care giver if truly essential. See section 7.8 for further details.

9. APPENDICES

Appendix 9.1. Background on pandemic influenza: epidemiology and health impact

Emergence of a pandemic

Seasonal influenza is a familiar infection in the UK, especially during winter. Every year strains of influenza (type A or B) circulate, giving rise to clinical consultations in primary care (age-specific impact varies by season), episodes of hospital treatment (mainly in older persons and young children, but occasionally in working age adults), and deaths (mainly in the elderly). Treatment in primary care and hospital may be required due to the direct effects of influenza virus infection or its possible complications, most commonly secondary bacterial pneumonia. Increases in GP consultations for influenza-like illness and winter bed pressures are frequently associated with periods of known community influenza activity.[8]

Pandemic influenza occurs when a new influenza A virus subtype emerges which is markedly different from recently circulating subtypes and strains, and is able to:

- infect humans
- spread efficiently from person to person
- cause significant clinical illness in a high proportion of those infected.

Because the virus is novel in humans, a high proportion of the population will have little or no immunity, producing a large pool of susceptible persons; accordingly the disease spreads widely and rapidly.

Influenza pandemics occur sporadically and unpredictably. In 1918 a devastating and unusual pandemic caused by influenza A/H1N1 ('Spanish flu') killed between 20 and 40 million people worldwide. Other pandemics that followed had a less devastating impact but were nevertheless severe. Influenza A/H2N2 ('Asian flu') emerged in 1957 and H3N2 ('Hong Kong flu') in 1968; both produced roughly 1 million excess deaths worldwide.[9]

The circumstances still exist for a new influenza virus with pandemic potential to emerge and spread, and the longest interval so far recorded between pandemics is 39 years (1918-1957). The unpredictability of the timing of the next pandemic is underlined by the occurrence of several large outbreaks of highly pathogenic avian influenza associated with epizootic transmission to humans.[10] By far the most serious has been the massive and unprecedented outbreak of highly pathogenic influenza (A/H5N1) affecting poultry in East and South East Asia in late 2003, which is still continuing. This outbreak has so far been associated with a small number of human cases but a high proportion of deaths. Recently, epidemiological and virological changes have been reported from northern Viet Nam which may indicate that the virus is beginning to adapt to humans.[11] Although the emergence of an A/H5N1 strain with capacity to spread efficiently between humans is neither inevitable nor imminent, international concern has increased regarding the possibility that avian influenza A/H5N1 may evolve to produce the next pandemic.

Health consequences

When an influenza pandemic occurs, a substantial proportion (possibly all) of the population is likely to be non-immune, producing a large pool of susceptible persons. In past pandemics, the scale and severity of illness (and hence consequences) have been variable but broadly of a higher order than even the most severe winter epidemics. It is reasonable to expect this to be the case with the next pandemic as well.

Excess mortality

Excess mortality due to influenza occurs in most winter seasons but is especially marked during epidemics. The average annual excess mortality attributable to influenza in recent years is around 12,000 deaths per annum in England and Wales,[12] although there is considerable yearly variation and some years are notably much higher than the average (est. 26,000 in 1989/90 epidemic). Excess mortality in England and Wales associated with the three pandemics of the 20th century has also varied widely; this was estimated at 198,000 in 1918/19, and 37,500 in 1957/58. In 1968/69 and 1969/70 (both seasons considered to be associated with the influenza A/H3N2 pandemic) there were an estimated 31,000 and 47,000 deaths respectively.[6] Therefore the extent of mortality associated with the next pandemic cannot be reliably predicted although it is reasonable to plan for a scenario worse than a severe winter epidemic of normal influenza.

Age distribution of morbidity and mortality

Typically, there are changes in the age-distribution of cases compared with seasonal influenza. Mortality, which in typical seasonal influenza is usually confined to age groups over 65 years, tends to be increased in younger age groups. The size of any increase in morbidity and mortality and the extent to which a shift in age distribution occurs depends on a variety of factors including the nature of the pandemic virus and pre-existing immunity but appears to be a consistent phenomenon.[13] Therefore clinicians can expect to see relatively larger amounts of influenza-related illness in younger adults compared with normal winter activity.

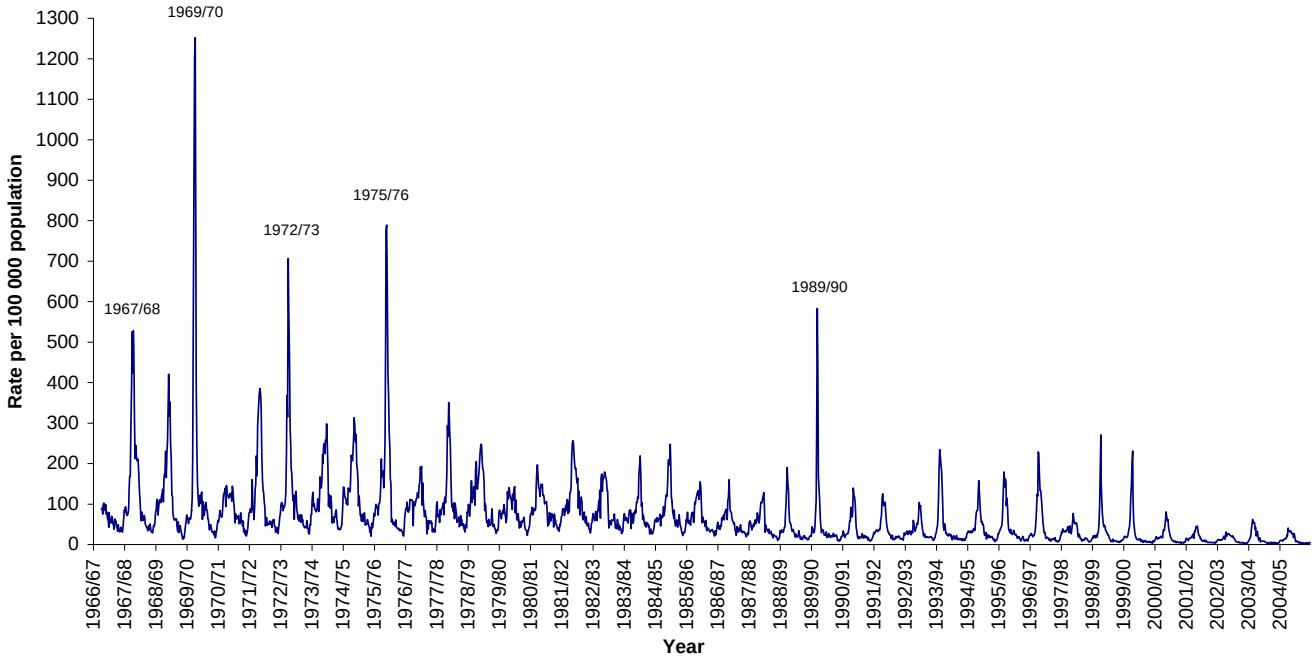
Geographical and temporal spread

Virological and clinical surveillance of influenza have improved markedly since the last pandemic in 1968. However the extent of international travel has also grown. Recent modeling studies suggest that a combination of antivirals and social distancing measures could slow or stop a pandemic that began in SE Asia. However, the likelihood of success would be increased if the virus was not highly contagious; the initial cases were limited to a small geographic area and rapidly detected; antivirals could be rapidly mobilized and distributed; and movement in and out of the are could be largely restricted. [14,15] Modelling studies using transmission characteristics based on the 1968/69 pandemic and international air-traffic data from 2002 indicate that the approximate delay between a first case in Hong Kong and first introduction to UK might be in the order of 2-4 weeks.[16] In terms of the spread within the UK, past experience of pandemics suggests that it would only take a few weeks from the initial introduction(s) to widespread influenza activity across the country. Modelling

further suggests that it would only take a further 7-9 weeks before peak influenza activity was in all regions of the UK.

The temporal and spatial spread of a pandemic strain is important, particularly in terms of the demand placed on healthcare services. Pandemic activity taking the form of a brief but severe peak in cases will be more difficult for all services to cope with, compared with an identical number of cases distributed over a longer time course. For example, during the A/H3N2 pandemic a long first wave occurred in the winter of 1968/9 with morbidity and mortality approximately at the same level as the previous seasonal influenza; but in the following winter of 1969/70 a short and more severe epidemic occurred with a three-fold higher peak in general practice consultation rates and a four-fold higher peak in mortality attributed to influenza, bronchitis and pneumonia. The high peak in consultation rates is well illustrated in the figure below.

Figure 1. Royal College of General Practitioners Index for Influenza and Influenza-like Illness, 1966 and 2003*



*Year marked at start of season i.e., Week 40 October

Pandemic waves

In 1918/19 the A/H1N1 pandemic occurred in three distinct epidemic waves: early spring 1918, autumn 1918 and late winter 1919. The second wave was by far the largest and case-fatality rates were also higher than in the first wave. The A/H3N2 pandemic caused an epidemic wave in the winter of 1968/69 but a more severe one in 1969/70. In contrast, the second wave of the 1957/58 pandemic in the UK was very small in comparison to the first.[7] Thus it should be considered a possibility that more than one wave of influenza will occur within a few months of the emergence of a pandemic virus and a subsequent wave could be worse than the first.

Health impact projections

It is impossible to predict with precision the level of excess mortality that will be experienced in the next pandemic. However the table below illustrates the broad range of excess mortality that it is reasonable to consider, based on various realistic combinations of case fatality rate and clinical attack rates derived from previous pandemics and epidemics.

Table 1. Range of possible excess deaths based on various permutations of case-fatality rates and clinical attack rate for the U.K.

Overall case fatality rate	Clinical attack rate		
	10%	**25%**	**50%**
0.37%	21,500	**53,700**	107,500
1.00%	56,700	141,800	283,700
1.5%	85,100	212,800	425,500
2.5%	141,800	354,600	709,300

A case fatality rate of 0.37% corresponds to the aggregate rate observed in recent epidemic seasons (1989/90, 1991/92, 1993/94, 1995/96, 1996/97, 1997/98 and 1998/99), although the overall case-fatality rate observed in the 1918-19 pandemic was in the region of 1-2%. A clinical attack rate of around 25% corresponds to the approximate clinical attack rate seen in all three previous pandemics of the 20th century. Thus, a figure of at least 50,000 excess deaths is likely.

Using mathematical projections it is possible to give illustrations of the potential impact of the next pandemic, but these do not amount to accurate predictions. The table below summarises the number of events that might be expected by a GP with 1,000 patients on his/her list, a PCT serving a population of 100,000 persons

Table 2. Estimated burden of illness attributable to pandemic influenza over the entire pandemic based on a 25% clinical attack rate and illustrative case hopitalisation and case fatality rates of 0.55% and 0.37% respectively. Health Care Contacts represent the equivalent of GP consultations outside the pandemic period. It is envisaged that individuals experiencing symptoms will be diverted away from GPs in a pandemic. GP consultations represent the remaining contacts required to deal with complications and with young children. Figures are rounded and represent work additional to normal background health service activity. (Figures in parentheses illustrate the range from 10% (lower limit) to 50% (upper limit) attack rates.)

Population	People with clinical symptoms/ Health Care contacts	GP consultations	A&E presentations	Minimum excess hospitalisations	Minimum excess deaths
Population of 1,000	**250** (100-500)	**25** (10-50)	**13** **(5-25)**	**1** (0-3)	**1** (0-2)
Population of 100,000	**25,000** (10,000-50,000)	**2,500** (1,000-5,000)	**1,250** (500-2500)	**140** (50-300)	**90** (40-180)

approximate figures

Using the same assumptions, the table below illustrates the number of events by week over an assumed 15-week (single wave) pandemic period in a typical PCT population of 100,000. Most major acute trusts receive patients from a catchment area spanning several PCTs and the figures below require pro-rata adjustment before applying to individual hospitals.

Table 3. Weekly totals for the number of GP consultations, A&E consultations, hospitalisations and deaths, across the UK and by health care unit. The values in the table assume that most heath care contacts are dealt with by special pandemic measures, leaving a residual 10% or 5% who will visit their GP or A&E department respectively (see text for details). The numbers for hospitalisations and deaths are based on case hospitalisation and case fatality rates of 0.55% and 0.37% respectively. They should be considered the minimum expected for pandemic flu.

* Any hospital with a critical care unit ** Assuming, for illustrative purposes only, that all deaths occur in hospital

Period	Cases per 100 000	% of overall total	GP consultations		A&E consultations		Hospitalisations		Deaths	
			UK-wide	per GP	UK-wide	per A&E	UK-wide	per hospital*	UK-wide	per hospital**
Week 1	36	0.1%	2,155	0	1,077	3	119	1	80	0
Week 2	51	0.2%	3,066	0	1,533	5	169	1	113	1
Week 3	205	0.8%	12,291	0	6,146	19	676	3	455	2
Week 4	780	3.1%	46,812	1	23,406	72	2,575	13	1,732	9
Week 5	2,638	10.6%	158,262	4	79,131	243	8,704	43	5,856	29
Week 6	5,388	21.6%	323,295	8	161,648	496	17,781	88	11,962	59
Week 7	5,290	21.2%	317,412	8	158,706	487	17,458	86	11,744	58
Week 8	3,568	14.3%	214,062	6	107,031	328	11,773	58	7,920	39
Week 9	2,428	9.7%	145,707	4	72,853	224	8,014	40	5,391	27
Week 10	1,886	7.5%	113,148	3	56,574	174	6,223	31	4,186	21
Week 11	1,308	5.2%	78,471	2	39,235	120	4,316	21	2,903	14
Week 12	651	2.6%	39,066	1	19,533	60	2,149	11	1,445	7
Week 13	392	1.6%	23,490	0	11,745	36	1,292	6	869	4
Week 14	216	0.9%	12,932	0	6,466	20	711	4	478	2
Week 15	164	0.7%	9,832	0	4,916	15	541	3	364	2
All weeks	**25,000**	**100%**	**1,500,000**	**39**	**750,000**	**2,302**	**82,500**	**409**	**55,500**	**275**

Transmission and communicability of influenza virus

Influenza is well established to be transmitted person-to-person through close contact. Transmission almost certainly occurs through multiple routes including large droplets and direct and indirect contact. Airborne or fine droplet transmission may also occur. Although a human sneeze contains particles 1micron and larger, the vast majority are large droplet particles which fall to the ground after travelling a short distance.

Transmission of influenza has been well-described in hospital, nursing home, and community settings. Epidemiological patterns of disease occurrence in these settings strongly support close contact with an infected individual as being responsible for the vast majority of transmission. However, most of reports, both in clinical and non-clinical settings, do not provide data (e.g., patient bed locations, health-care worker-patient contacts, laboratory evaluation of health-care workers for influenza, and time-space clustering of illnesses in patients and health-care workers) to delineate precisely between droplet, contact and airborne spread. Further, outbreaks in health-care settings are almost always confounded by concurrent community-based epidemics, which make it difficult to pinpoint the exact source of exposure for health-care workers and patients.

Salgado et al. summarized the findings of 12 outbreaks of nosocomial influenza outbreaks and concluded that multiple routes of transmission were probably responsible. [17] In none of these outbreaks were airborne isolation precautions instituted or required to halt transmission; instead droplet and/or contact precautions were usually implemented along with various other approaches (e.g., use of anitivrals and vaccines; limiting visitors, etc.). The author noted that her institution (University of Virginia) had not documented any clusters of influenza among hospitalized patients in 15 years, despite placing most patients with recognized influenza in positive-pressure single rooms and not in airborne negative pressure isolation rooms. Nosocomial transmission of influenza at another U.S. hospital (University of Rochester Medical Center) has been described as occurring principally among paediatric patients who were housed in the same room, especially those in cots adjacent to the index patient. [18] Infection in patients located in separate rooms off the same corridor was rarely observed despite opportunities for airborne transmission to occur (e.g., open doors and housing in positive pressure rooms). Blumenfeld et al. described a nosocomial outbreak of influenza A/H2N2 that occurred at the beginning of the 1958-59 pandemic before evidence of widespread cases in the community. [19] The outbreak was traced to admission of a symptomatic patient subsequently documented to have influenza. Within 48 hours, the patient in the adjacent bed developed symptoms and 12 other cases in health-care workers and patients occurred soon afterwards. Isolation precautions had not been instituted and the pattern of disease was most compatible with a point-source outbreak, propagated by contact and droplet transmission and not an airborne route. Further evidence for a role for contact transmission can be derived from experimental studies of influenza virus survival which suggest that the virus can survive for limited periods of time in the environment. [20]

Data on airborne transmission by small particle aerosols are mainly derived from experimental studies of influenza in animals. In one set of experiments, Schulman and Kilbourne showed that when infected and non-infected mice were housed together in a closed chamber that permitted manipulation of air flow, the rate of transmission increased as the rate of air flow decreased. [21] When air flow was kept constant, the rate of transmission of influenza from infected to uninfected mice did not vary significantly, regardless of whether the two groups of mice were in one cage or physically separated by two wire screens, ¾" apart. [21,22] The authors concluded that these findings were compatible with transmission occurring principally via small airborne droplet nuclei since spread by droplets would have been expected to have been influenced by separation of the two groups and not have been affected by ventilation. However, the experimental design as described would have allowed transmission to have occurred via large droplets as well. In other experiments, fine particle infectious particles (<10 microns in size) were recovered from the air surrounding infected mice. [23] Similarly, studies in ferrets demonstrated transmission despite separating ill from susceptible ferrets by a 9-foot duct with two 90 degree bends, making large droplet transmission unlikely. [24] However, the extent to which these data are generalisable to humans is not known.

More limited data are available to assess the possible role of airborne transmission in humans. One source of information is from human volunteer studies. In these studies, experimental infection by inhalation of virus (aerosol) was observed to induce symptomatic illness far more readily than infection by instillation of nasal drops (direct contact) and at 10-100 fold lower doses. [25]

Observational data derived from a minority of outbreaks of influenza in the literature suggest a possible role for airborne transmission. In one, the rate of serologically-confirmed pandemic influenza A/H2N2 was significantly less among tuberculosis patients housed in a Veteran's Hospital ward equipped with ultraviolet lighting (4 of 209 [2%] compared with patients in a non-radiated ward (75/396 [19%]) suggesting that the ultraviolet radiation had inactivated viral-laden airborne droplet nuclei. [26] Of note, the study lacked suitable controls, which limits firm conclusions.

In a second study, 72% of 53 airline crew and passengers developed an influenza-like illness within 72 hours of sharing a flight with a febrile coughing passenger who was subsequently documented to have influenza A. [27] The flight was delayed more than 4 hours on the ground during which the ventilation system, which normally completely exchanged the air in the passenger cabin every 4.5 minutes, was turned off. The risk of clinical illness among passengers was found to correlate with increasing time spent aboard the grounded aircraft. Two different replacement planes flew passengers to their final destination; interestingly, passengers who flew on the same replacement plane as the ill passenger had the same rate of illness as those who flew on a second plane, suggesting that additional time spent with the ill passenger, albeit under routine air flow conditions, did not increase the risk of transmission. The findings of this outbreak mimic those of Schulman's studies of air flow effect on transmission in mice[21] and suggest that standard air

exchange rates used in hospital rooms would assist in limiting transmission of influenza. In both these studies, however, it was not possible to delineate carefully other routes of exposure and to assess individuals' susceptibility to infection. For example, in the airline study, transmission may also have resulted from droplet or contact spread, as passengers moved freely about the cabin while it was grounded, including in and around the area where the index case was seated.

In summary, although there is no evidence which establishes a clear hierarchy for modes of transmission, the patterns of transmission observed during nosocomial outbreaks frequently point to large droplet and contact transmission as the most important and the most likely routes.

Influenza virus survival and inactivation

Studies of mice exposed to aerosols of fine, uniform-sized droplets of influenza virus found that under conditions of low humidity (i.e., 17%-24%) mice could become infected for up to 24 hours after the virus was first aerosolized in a room that was continuously agitated via a slowly rotating fan.[28] Loosli postulated that the low humidity allowed for rapid drying of infectious particles. This was further corroborated by other experiments that found an increased rate of infection in mice following "vigorous sweeping of the floor" 22 hours after the virus had first been sprayed into the experimental room. [28]

Indirect support for the feasibility of contact transmission of influenza virus can be derived from experimental data regarding the survival of influenza A viruses (as judged by the ability to recover and culture virus) on various environmental surfaces at 35-40% humidity. [19] Virus survived on hard non-porous surfaces (e.g., stainless steel counter, plastic washing-up bowl) for up to 72 hours but only small quantities were detectable beyond 48 hours. In contrast, virus was recovered from soft porous items (e.g., pyjamas, handkerchiefs, tissues, magazines) for up to 24 hours, but only small quantities were detectable after 12 hours.

Bean and colleagues also evaluated the transferability of influenza A virus from contaminated surfaces onto hands.[19] Measurable virus could be transferred to hands from hard stainless steel surfaces for up to 24 hours after the surface had been contaminated and from soft tissues for up to 2 hours after, albeit in very low quantities after 15 minutes. Of note, once virus was transferred to hands, it survived for only 5 minutes – albeit long enough for self-inoculation of conjunctiva or mucous membranes to theoretically occur.

At least one study has demonstrated that influenza virus is readily inactivated within 30 seconds by a commercially marketed alcohol hand disinfectant (95% ethanol) following experimental contamination of hands. [29]

Incubation and communicability

Estimates of the incubation period of influenza vary from 1-4 days, with most ranging from 2-3 days.[30]

The period of communicability of influenza virus (i.e., period of viral shedding) can be inferred from the length of time that virus can be recovered from respiratory secretions and is influenced by age, level of immunocompetency, and treatment with antiviral agents.

Live virus challenge studies have shown that adults are typically infectious from the day before symptom onset for 3- 5 days after illness onset, although the level of virus usually subsides to low levels by day five.[30,31] Viral shedding is proportional to severity of illness and temperature elevation.[32] It is estimated that approximately 50% of all influenza infections are asymptomatic.[18] Importantly, infected persons (typically adults) can shed influenza virus yet have no evidence of respiratory symptoms.[33]

Studies of naturally-occurring influenza B infection in children have shown that 93% shed detectable virus during the first 3 days of symptomatic illness, 74% on day 4 and roughly 25% on day 6.[32] In general, young children cease shedding influenza viruses 7-8 days after onset of symptoms, however, they can shed infectious virus several days before onset of illness. [34]

Studies involving hospitalized children with underlying medical conditions who acquired influenza A virus nosocomially have demonstrated isolation of virus 7-21 days after the onset of symptoms.[35, 36] Case reports of severely immunocompromised adults and children indicate that viral shedding can occur for even longer periods of time.[37,38]

Health care delivery during a pandemic

Even though it is impossible to predict the impact of the next pandemic with certainty, based upon the available epidemiological and modelling information, it is clear that it will generate demands for health care which may saturate or overwhelm normal NHS services for a period of time, perhaps several weeks or months. Accordingly, it should be anticipated that the NHS (in common with all health systems around the world) will need to revert to emergency arrangements. These are laid out in further detail in Operational Guidance for Health Service Planners,[3]and the UK Operational Framework for stockpiling, distributing and using antiviral drugs in the event of pandemic influenza.[4]

The special nature of an influenza pandemic, in particular widespread susceptibility of the entire population including healthcare workers, also means that special infection control measures will need to be implemented in all healthcare settings as outlined in this *Guidance.*

Appendix 9.2 Categories of transmission patterns for infectious agents*

Droplet transmission

Droplet transmission involves contact of the conjunctivae or the mucous membranes of the nose or mouth of a susceptible person with large-particle droplets (larger than 5 µm in size) containing microorganisms generated from a person who has a clinical disease or who is a carrier of the microorganism. Droplets are generated from the source person primarily during coughing, sneezing, or talking and during the performance of certain procedures such as suctioning and bronchoscopy. Transmission via large-particle droplets requires close contact between source and recipient persons, because droplets do not remain suspended in the air and generally travel only short distances, usually 3 feet or less, through the air.

Airborne or fine droplet transmission

Airborne transmission occurs by dissemination of either airborne droplet nuclei (small particle residue [5 µm or smaller in size] of evaporated droplets that may remain suspended in the air for long periods of time) or dust particles containing the infectious agent. Microorganisms carried in this manner can be dispersed widely by air currents and be inhaled and may become inhaled by or deposited on a susceptible host within the same room or over a longer distance from the source patient, depending on environmental factors.

Direct contact transmission

Direct contact transmission involves skin-to-skin contact and physical transfer of microorganisms to a susceptible host from an infected or colonized person, such as occurs when personnel turn patients, bathe patients, or perform other patient-care activities that require physical contact. Direct-contact transmission also can occur between two patients (e.g., by hand contact), with one serving as the source of infectious microorganisms and the other as a susceptible host.

Indirect contact transmission

Indirect-contact transmission involves a susceptible host with a contaminated intermediate object, usually inanimate, in the patient's environment.

*

*Adapted from

Garner, J.S. and The Hospital Infection Control Practices Advisory Committee. Guideline for isolation precautions in hospitals. AmJ Infect Control 1996;24:24-52. Available at www.cdc.gov/ncidod/hip/ISOLAT/ISOLAT.HTM

Appendix 9.3. Infection control precautions

Standard infection control principles*

Standard Infection Control Principles are a set of broad statements of good practice to minimise exposure to and transmission of a wide variety of microorganisms. Standard Principles should be applied by all health care practitioners to the care of all patients all of the time. They address the importance of and include:

Hospital environmental hygiene

The hospital environment must be visibly clean, free from dust and soilage, and acceptable to patients, their visitors and staff.

Where a piece of equipment is used for more than one patient, e.g., commode, bath hoist, it must be cleaned following each and every episode of use.

Statutory requirements must be met in relation to the safe disposal of clinical waste, laundry arrangements for used and infected linen, food hygiene and pest control.

All staff involved in hospital hygiene activities must be included in education and training related to the prevention of hospital-acquired infection.

Hand hygiene

Hands must be decontaminated immediately before each and every episode of direct patient contact/care and after any activity or contact that potentially results in hands becoming contaminated.

Hands that are visibly soiled or potentially grossly contaminated with dirt or organic material must be washed with liquid soap and water.

Apply an alcohol-based hand rub or wash hands with liquid soap and water to decontaminate hands between caring for different patients, or between different caring activities for the same patient.

Remove all wrist and ideally hand jewellery at the beginning of each clinical shift before regular hand decontamination begins. Cuts and abrasions must be covered with waterproof dressings.

Effective handwashing technique involves three stages: preparation, washing and rinsing, and drying. Preparation requires wetting hands under tepid running water ***before*** applying liquid soap or an antimicrobial preparation. The handwash solution must come into contact with *all* the surfaces of the hand. The hands must be *rubbed* together vigorously for a minimum of 10–15 seconds paying particular attention to the tips of the fingers, the thumbs and

the areas between the fingers. Hands should be rinsed thoroughly prior to drying with good quality paper towels.

When decontaminating hands using an alcohol handrub, hands should be free of dirt and organic material. The handrub solution must come into contact with all surfaces of the hand. The hands must be *rubbed* together vigorously, paying particular attention to the tips of the fingers, the thumbs and the areas between the fingers, and until the solution has evaporated and the hands are dry.

Apply an emollient hand cream regularly to protect skin from the drying effects of regular hand decontamination. If a particular soap, antimicrobial handwash or alcohol product causes skin irritation, seek occupational health advice.

The use of personal protective equipment

Select protective equipment on the basis of an assessment of the risk of transmission of microorganisms to the patient, and the risk of contamination of health care practitioners clothing and skin by patients' blood, body fluids, secretions, and excretions.

Gloves must be worn for invasive procedures, contact with sterile sites, and non-intact skin, mucous membranes, and all activities that have been assessed as carrying a risk of exposure to blood, body fluids, secretions and excretions; and when handling sharp or contaminated instruments.

Gloves should be worn as single use items. Put gloves on immediately before an episode of patient contact or treatment and remove them as soon as the activity is completed. Change gloves between caring for different patients, or between different care/treatment activities for the same patient.

Gloves must be disposed of as clinical waste and hands should be decontaminated following the removal of gloves.

Gloves conforming to European Community (CE) standards and of an acceptable quality must be available in all clinical areas.

Alternatives to natural rubber latex (NRL) gloves must be available for use by practitioners and patients with NRL sensitivity.

Powdered and polythene gloves should not be used in health care activities.

Disposable plastic aprons should be worn when there is a risk that clothing or uniform may become exposed to blood, body fluids, secretions and excretions, with the exception of sweat.

Full body, fluid repellent gowns should be worn where there is a risk of extensive splashing of blood, body fluids, secretions and excretions, with the exception of sweat, onto the skin of health care practitioners.

Plastic aprons should be worn as single use items for one procedure or episode of patient care and then discarded and disposed of as clinical waste. Face masks and eye protection should be worn where there is a risk of blood, body fluids, secretions and excretions splashing into the face and eyes.

Respiratory protective equipment should be used when clinically indicated.

The safe use and disposal of sharps

Sharps must not be passed directly from hand to hand and handling should be kept to a minimum.

Needles must not be bent or broken prior to use or disposal.

Needles and syringes must not be disassembled by hand prior to disposal.

Needles should not be recapped.

Used sharps must be discarded into a sharps container (conforming to UN3291 and BS 7320 standards) at the point of use. These must not be filled above the mark indicating that they are full. Containers in public areas must not be placed on the floor and should be located in a safe position.

Consider the use of needlestick-prevention devices where there are clear indications that they will provide safe systems of working for healthcare practitioners.

Conduct a rigorous evaluation of needlestick-prevention devices to determine their effectiveness, acceptability to practitioners, impact on patient care and cost benefit prior to widespread introduction.
*

*Taken from
Pratt RJ, Pellowe C, Loveday HP et al. The EPIC project developing national evidence-based guidelines for preventing healthcare associated infections. Phase1 guidelines for preventing hospital- acquired infections. J Hosp Infect 2001; 47: S3-82

NICE (2003) Infection control: Prevention of healthcare associated infection in primary and community care.

DROPLET PRECAUTIONS*

In addition to Standard Precautions, use Droplet Precautions, or the equivalent, for a patient known or suspected to be infected with microorganisms transmitted by droplets (large-particle droplets [larger than 5 µm in size] that can be generated by the patient during coughing, sneezing, talking, or the performance of procedures).

Patient placement

Place the patient in a private room (i.e., isolation room or side room/cubicle). When a private room is not available, place the patient in a room with a patient(s) who has active infection with the same microorganism but with no other infection (cohorting). When a private room is not available and cohorting is not achievable, maintain spatial separation of at least 3 ft between the infected patient and other patients and visitors. Special air handling and ventilation are not necessary, and the door may remain open.

Surgical masks

In addition to wearing a surgical mask as outlined under Standard Precautions (i.e., Standard Infection Control Principles), wear a surgical mask when working in close contact (within 3 ft) of a symptomatic patient. (Logistically, some hospitals may want to implement the wearing of a surgical mask to enter the room.)

Patient transport

Limit the movement and transport of the patient from the room to essential purposes only. If transport or movement is necessary, minimise patient dispersal of droplets by masking the patient, if possible.

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*Adapted from
Garner, J.S. and The Hospital Infection Control Practices Advisory Committee. Guideline for isolation precautions in hospitals. AmJ Infect Control 1996;24:24-52. Available at www.cdc.gov/ncidod/hip/ISOLAT/ISOLAT.HTM

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9.7 ACRONYMS

A&E	Accident and emergency
ACT(s)	Acute care trust
AHP	Allied health professionals
BSEN	British standard
CCDC	Consultant in communicable disease control
CICT	Community infection control team
COSHH	Control of substances hazardous to health
DH	Department of Health
DIPC	Director of Infection Prevention and Control
ECG	Electro cardiograph
GP	General practitioner
HPA	Health Protection Agency
HSE	Health and Safety Executive
HSG	Health service guidelines
MRSA	Methicillin resistant *staphylococcus aureus*
NHS	National Health Service
NRL	Natural rubber latex
PCT	Primary care trust
PPE	Personal protective equipment
RSV	Respiratory syncytial virus
SHA	Strategic health authority
WHO	World Health Organization