INFLUENZA: INFECTION PREVENTION AND CONTROL

In this second article, Robert Pratt describes the current status of the A (H1N1) 2009 influenza pandemic and outlines clinically effective infection prevention and control approaches in primary care settings

Summary

By understanding and consistently adhering to infection prevention and control guidance, primary care practitioners can make a defining contribution to reducing the risk of pandemic influenza. The threat from pandemic A(H1N1) 2009 influenza virus is unique and deadly. All healthcare providers need to ensure that they have the necessary confidence and competence to protect members of the public and their clients and patients.

Keywords
Swine flu, pandemic (H1N1) 2009 influenza, swine flu vaccination, infection control, transmission-based precautions

IN THE early months of 2009, influenza outbreaks in the United States and Mexico caused by a novel strain of swine-origin influenza A virus quickly gained epidemic strength and rapidly surged around the world as the first wave of a global influenza pandemic (Centers for Disease Control and Prevention 2009a, 2009b, 2009c). Within just six months, this new and highly infectious viral variant swept through countries in the northern and then southern hemispheres causing millions of cases of 'swine flu,' now more correctly referred to as 'Pandemic (H1N1) 2009 Influenza'.

It is estimated that during this first pandemic wave in the US, 1.8 million to 5.7 million cases occurred during April through July 2009, including 9,000 to 21,000 hospitalisations (Reed *et al* 2009). During the same period in the UK, cases peaked at 100,000 a week before the first wave slowly subsided during late summer. However, due in part to children returning to school after the summer vacation, the incidence of pandemic (H1N1) 2009 influenza once again steadily increased in England during the early autumn. By the beginning of November 2009, it was estimated that 84,000 new cases had occurred during the last week of September (an 8 per cent increase on the previous week) and that there had been an estimated cumulative total of 621,000 cases since the pandemic began (Health Protection Agency 2009). The anticipated second pandemic wave had materialised.

Second wave

The world is now experiencing the second pandemic wave and although most people who become infected have a relatively benign illness, recovering in a week or two, a significant number of people will develop life-threatening complications. This is particularly so in the poorer regions of the world where poverty, malnutrition and chronic diseases and infections (especially human immunodeficiency virus infection) conspire to significantly depress the protective effect of the immune system, rendering these people more liable to a worsening clinical course with an increased risk of serious complications and death.

Many countries in these regions will have inadequate pandemic preparedness strategies and will struggle to implement effective prevention and containment measures. Most will find it difficult to obtain sufficient supplies of antiviral drugs and vaccines and personal protective equipment needed for infection prevention and control in healthcare settings. In addition, inefficient, under financed

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Stay at home and keep away from work, school or crowds if suffering from influenza symptoms

Table 1 UK pandemic 2009 A(H1N1) influenza (swine flu) vaccination programme 2009-2010

Pandemrix® (manufactured by GlaxoSmithKline)	
All children aged from six months of age to less than ten years of age	Two half doses (0.25ml each) of Pandemrix® should be given with a minimum of three weeks between doses.
Aged from ten years to less than 60 years of age	One dose (0.5ml) of Pandemrix®.
Pregnant women (at any stage of pregnancy)	One dose (0.5ml) of Pandemrix®.
Aged 60 years and over	One dose (0.5ml) of Pandemrix® (this advice will be reviewed when more data become available).
Immunocompromised individuals aged ten years and over	Two doses (0.5ml each) of Pandemrix® should be given with a minimum of three weeks between doses
Celvapan® (manufactured by Baxter)	
Children from 6 months of age and adults (including pregnant women at any stage of pregnancy)	Two doses (0.5ml each) of Celvapan® should be given with a minimum of three weeks between doses.

Pandemrix® is the vaccine of choice for children and young people and for pregnant women. However, Pandemrix® should not be given to people, including children, with a history of severe anaphylactic reaction (shock or acute difficulty in breathing) after egg-containing products; they should receive Celvapan®.

The influenza A (H1N1) vaccines can be given at the same time as other vaccines including the seasonal influenza vaccine. The vaccines should be given at separate sites, preferably in different limbs

(Department of Health 2009b)

and inadequate healthcare infrastructures common in many countries in the resource-poor regions of the world, including an insufficient number of well-trained healthcare workers make it clear that this is where the most severe impact of the 2009 (H1N1) influenza pandemic will be experienced.

Although countries in the European Union and in the richer nations of the world are not anticipating the same level of health and social repercussions from this pandemic, they are none-the-less fully aware of the pandemic's potential impact on healthcare systems, and on the institutions and infrastructures of the state and civil society and have prepared accordingly.

In last month's article (Pratt 2009a), UK government pandemic influenza planning assumptions were described indicating that 30 per cent of the UK population would develop pandemic (H1N1) 2009 influenza (18.4 million) and an estimated 1 per cent of these (184,000) may require hospitalisation with 25 per cent of them (46,000) potentially requiring intensive care. These assumptions estimated that 18,415 people in the UK would die from pandemic (H1N1) 2009 influenza and its complications (Department of Health (DH) 2009a). Although this is thought to be a 'worst case scenario', with NHS hospitals and intensive care units operating at near capacity during the best of times, any significant increase in demand will seriously stress all primary and secondary health and social care facilities.

Box 1 National Pandemic Flu Service (England)

- www.direct.gov.uk/pandemicflu
- Information: 0800 1 513 513
- Treatment: 0800 1 513 100

Prevention

As the second pandemic wave of influenza matures during this winter and early spring of next year, the principal primary means available to contain and ameliorate the pandemic is an effective vaccination programme as described in last month's article (Pratt 2009a). Since then, the DH has updated its pandemic (H1N1) 2009 influenza vaccination guidelines (Table 1) (DH 2009b). In the UK, a strategic implementation plan for prioritising and then incrementally immunising the most vulnerable groups of people, for example, people aged six months and up to 65 years with chronic diseases or impaired immunity, pregnant women, and front-line health and social care staff is now well advanced. Over the winter, the vaccine will eventually be available to the entire UK population.

Infection control in primary care

In addition to vaccination, the UK pandemic disease preparedness strategy (DH 2007a) and the associated and more detailed guidance for infection control in hospitals and primary care settings issued by the DH in England (2007b) and Health Protection Scotland (2008) describe effective infection prevention and control measures that can be effectively used in a range of primary care agencies (Box 1).

As discussed in last month's article (Pratt 2009a) and in more detail elsewhere (Pratt 2009b), influenza viruses are easily transmitted during close personal contact by large virus-laden respiratory droplets generated by an infected person during

talking, coughing or sneezing, or by hand-to-face contact if the hands are contaminated with virus.

Airborne transmission via small particle aerosols is generally only thought to be associated with influenza viral transmission during aerosol generating procedures (AGPs), such as bronchoscopy, endotrachael intubation, suctioning and nebuliser treatments (Brankston *et al* 2007, Lemieux *et al* 2007). In primary care settings, it is important to remember that many dental procedures would qualify as AGPs. The consistent and appropriate use of transmission-based infection prevention and control precautions by healthcare workers can minimise the risk to both themselves and to their patients and clients of becoming exposed to and infected with influenza viruses during episodes of health care.

Transmission-based precautions

National infection prevention and control guidance in England for minimising the risk of healthcare-associated infections in primary and community care environments describe a set of standard principles that need to be applied at all times and with all patients (Pellowe *et al* 2003). These focus on hand hygiene, the safe use and disposal of sharps, and the correct use of personal protective equipment. However, to reliably interrupt the transmission of influenza viruses in primary care settings, more detailed additional transmission-based precautions are used in conjunction with the application of standard principles.

There are three types of transmission-based precautions. Droplet precautions and contact (direct and indirect) precautions are consistently used at all times to restrict the transmission of influenza viruses and in addition, airborne precautions are added to this infection control regimen when assisting with or undertaking AGPs. A range of detailed guidance from the DH (England) and Health Protection Scotland for the use of standard infection prevention and control principles and transmission-based precautions to interrupt the transmission of influenza viruses in primary care settings is available free online (Box 2). Pertinent recommendations include the following:

Contact precautions Standard principles for hand hygiene are used to prevent exposure by direct and indirect contact with contaminated surfaces and infected patients. The hands of influenza patients are always heavily contaminated because of frequent contact with their nose, mouth and the tissues they have used for respiratory hygiene. This allows the contamination of their immediate

Box 2 Online infection control guidance for primary care settings

- *Pandemic Influenza – Guidance for Infection Control in Hospitals and Primary Care Settings*. (Department of Health England 2007) www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_080771
- *Pandemic Flu – Guidance for Infection Control in Hospitals and Primary Care Settings*. (The Scottish Government and Health Protection Scotland 2008) www.documents.hps.scot.nhs.uk/respiratory/pandemic-influenza/ic-guidance-hospital.pdf
- *Modes of Transmission of Influenza A H1N1v and Transmission Based Precautions (TBPs). Version 1.0* (Health Protection Scotland 2009) www.documents.hps.scot.nhs.uk/respiratory/swine-influenza/influenza-a-h1n1v-transmission-2009-08-27.pdf
- *Checklist of Infection Control Precautions to Minimise Transmission of Influenza A H1N1v in the Primary Care Practice Setting. Version 1.0* (Health Protection Scotland 2009) www.documents.hps.scot.nhs.uk/respiratory/swine-influenza/influenza-a-h1n1v-checklist-primary-care-2009-09-02.pdf
- *Checklist of Infection Control Precautions to Minimise Transmission of Influenza A H1N1v when Providing Care in the Patient's/Client's Home. Version 2.0* (Health Protection Scotland 2009) www.documents.hps.scot.nhs.uk/respiratory/swine-influenza/influenza-a-h1n1v-checklist-social-care-2009-10-02.pdf
- *Checklist of Infection Control Precautions to Minimise Transmission of Influenza A H1N1v in the General Dental Practice Setting. Version 02* (Health Protection Scotland 2009) www.documents.hps.scot.nhs.uk/respiratory/swine-influenza/influenza-a-h1n1v-checklist-dental-2009-10-02.pdf
- *Swine Flu: Preventing Spread in the Home and Community* (International Scientific Forum on Home Hygiene 2009) www.ifh-homehygiene.org/IntegratedCRD.nsf/f5236e2da2822fef8025750b000dc985/d65827d163a02bfb802575a700337c78?OpenDocument
- epic: *Infection Control: Prevention of Healthcare-associated Infection in Primary and Community Care – Clinical Guideline 2 (National Institute for Health and Clinical Excellence 2003) www.richardwellsresearch.com/richardwells/pdfs%20and%20documents/CG2fullguidelineinfectioncontrol.pdf*
- *epic2: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England* (Department of Health 2007) www.richardwellsresearch.com/richardwells/pdfs%20and%20documents/epic2-final%20glines.pdf

In addition to detergents, almost all commercially available disinfectants can inactivate influenza viruses

environment which results in viral transmission to others who come into contact with these surfaces and articles. Consequently, good hand hygiene among health and social care providers and their patients and clients is the single most important practice for reducing the transmission of infection in all healthcare settings. General recommendations for effective hand hygiene (Pellowe *et al* 2003, Pratt *et al* 2007) include:

- Hands must be decontaminated immediately before each and every episode of direct patient/client 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, for example following the removal of gloves, must be washed with liquid soap and water.
- Hands should be decontaminated between caring for different patients or between different care activities for the same patient. For convenience and efficacy, an alcohol-based handrub is preferable unless hands are visibly soiled.
- Hands should be washed with liquid soap and water after several consecutive applications of alcohol hand rub.
- Disposable plastic aprons should be worn if soiling of clothes or uniforms with patient respiratory secretions is anticipated and gloves should be worn if hand contact with respiratory or potentially contaminated surfaces is expected. Hands need to be decontaminated after removing aprons and gloves.

Droplet precautions Protection against exposure to influenza viruses via large respiratory droplets is achieved by the use of fluid repellent surgical masks worn by healthcare workers for any close contact (that is, within one metre) with clients and patients. These masks provide a physical barrier and minimise contamination of the nose and mouth by respiratory droplets from patients (DH 2007a, 2007b).

Disposable respirators are not necessary unless healthcare workers are assisting with or conducting AGPs, as discussed previously.

As influenza viruses can survive on environmental surfaces for several hours, freshly prepared neutral detergent and warm water should be used for cleaning healthcare environments and especially frequently touched surfaces. In addition to detergents, almost all commercially available disinfectants can inactivate influenza viruses, including alcohol, hydrogen peroxide, chlorine (bleach), chlorhexidine gluconate, and iodophors (iodine-based antiseptics). Influenza viruses are also easily destroyed by heat (75º to 100ºC (167º to 212ºF)).

Advice to the general public

There are basic infection prevention and control measures that primary healthcare workers can advise the general public to take to minimise the risk of infection, both to themselves and to others (DH 2007b, Health Protection Scotland 2008, International Scientific Forum on Home Hygiene 2009). To minimise exposure and infection:

- Avoid crowded gatherings where possible, especially in enclosed spaces.
- Abstain from shaking hands with people when you meet with them.
- Refrain from close contact with people who appear unwell and who have fever and cough.
- Treat your hands as potentially contaminated and avoid touching your nose and eyes.
- Frequently wash your hands (especially when outside the home), scrupulously use soap (preferably liquid soap) and running water and dry them thoroughly, or use alcohol hand gels.

If unwell, minimise infecting others:

- Contact the National Pandemic Flu Service (Box 1), either by phone or online if you are worried or have symptoms of influenza.
- Stay at home and keep away from work, school or crowds if suffering from influenza symptoms and keep contact with other people to a minimum until seven days after your symptoms have improved and you have had no fever for at least 48 hours.
- Use a separate room in the house or if this is not possible, keep at least one metre in distance from others.
- Rest and take plenty of fluids.
- Cover the nose and mouth with a tissue when coughing or sneezing.
- Dispose of dirty tissues promptly and carefully, bagging and binning them.
- Remember that you can transmit this virus to other people via computer keyboards, remote controls, telephones, door handles/tap handles, etc.
- Do not share towels, facecloths or toothbrushes with other family members.
- Wash hands frequently with liquid soap and warm water, or use alcoholic hand disinfectants

to reduce the spread of the virus from the hands to the face, or to other people particularly after blowing the nose or disposing of tissues, and make sure children follow this advice.
- Clean frequently touched hard surfaces, such as kitchen worktops, light switches, door handles, regularly using normal cleaning products.
- Wear a disposable face mask to protect others should it become absolutely essential to go out of the house, such as to go to the hospital.

Department of Health (2007a) guidance also provides advice to the general public on the use of face masks and respirators, internal travel restrictions, restrictions on public gatherings, school closures, and pre-pandemic vaccination:

- The general wearing of face masks in public places by those who do not have influenza symptoms is not recommended (and face masks will not be supplied by government).
- Internal travel restrictions will have little positive impact on the total number affected by influenza over the entire course of a pandemic and would exacerbate the economic impact, increasing social disruption and adding to business/service continuity problems. Consequently, the government is unlikely to impose any restrictions on internal travel unless it becomes necessary for public health reasons as the pandemic develops.
- The government is unlikely to issue a blanket ban on public gatherings, however it may do so if the circumstances indicate that it would be prudent to do so to protect the public.
- The government will take decisions on whether or not to advise school closures on the basis of an assessment of the emerging characteristics and impact as the pandemic develops.

Find out more

Further information for the general public in England (and contact details for Pandemic Flu Services in Scotland, Wales and Northern Ireland), including an online/telephone diagnostic facility and authorisation for accessing antiviral medication is available from the National Pandemic Flu Service (Box 1).

Implications for practice

- Primary care practitioners must ensure that they are familiar with and consistently adhere to standard infection prevention and control principles and transmission-based precautions for prevention the transmission of pandemic 2009 A (H1N1) influenza virus during episodes of health care.
- All healthcare service providers and agencies need to effectively communicate sound information to clients and patients on the measures they can take to avoid exposure or, if infected, transmitting influenza to others.
- Practitioners need to use online resources to remain current as the dynamics of the pandemic change to ensure their practice is effective and responsive to the changing needs for prevention and care.

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