Pandemic influenza and renal disease

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CANNT Journal; Apr-Jun 2007; 17, 2; ProQuest Medical Library
pg. 57

Pharmacy news and reviews

Pandemic influenza and renal disease

Question: What is pandemic influenza and how will it affect patients with renal disease?

Definitions

Pandemic
Outbreak of a disease occurring over a wide geographic area and affecting an exceptionally high proportion of the population.

Epidemic
Outbreak of a disease affecting or tending to affect an atypically large number of individuals within a population, community, or region at the same time.

Influenza
Any of several acute, highly contagious respiratory diseases caused by strains of influenza A, influenza B, or influenza C virus.

Avian Influenza
A highly variable mild to fulminant influenza typically of domestic and wild birds that is characterized usually by respiratory symptoms, but sometimes by gastrointestinal, integumentary, and urogenital symptoms, and that is caused by strains of influenza A that do not normally infect humans, but which may mutate and be transmitted to other vertebrates (as humans) causing epidemics (Medline Plus, 2003).

Seasonal Influenza
An infection of the airways caused by an influenza A or B virus that circulates annually in the winter season in Canada. Seasonal influenza is often called "the flu" (Canadian Coalition, 2006).

An influenza pandemic occurs when a new strain of influenza virus spreads rapidly, affecting people worldwide. In order for this to happen, a number of conditions must be met. First, a significant genetic mutation must arise in the virus yielding a virulent strain capable of causing serious illness and death. The population must be susceptible to this virus with little or no pre-existing immunity. Finally, the virus must be able to spread efficiently from person to person (Public Health Agency of Canada, 2006).

It is impossible to accurately predict the severity of pandemic influenza or when the novel virus will begin to spread. The clinical syndrome that it will cause is also unknown. However, it is expected that people suffering from chronic illness such as kidney disease will be at high risk of a negative outcome (Public Health Agency of Canada, 2006). According to the Canadian National Advisory Committee on Immunization, this population is more susceptible to developing serious influenza complications. They are also susceptible to developing an exacerbation of their underlying disease and experiencing a delayed recovery (Public Health Agency of Canada, 2006). For these reasons, it is crucial that we prepare in advance to minimize the impact of pandemic influenza on people with kidney disease.

History of pandemic influenza

Three outbreaks of pandemic influenza are notable during the past century. The first occurred in 1918 and was known as the Spanish flu (influenza type A, subtype H1N1). Twenty to fifty million deaths occurred worldwide (Centers for Disease Control and Prevention, n.d.), including up to 50,000 Canadians during this crisis (Public Health Agency of Canada, 2006). The next pandemic, the Asian flu (influenza type A, subtype H2N2),

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The CANNT Journal • April – June 2007, Volume 17, Issue 2
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arrived in 1957 and was followed by the mildest of all three pandemics, the Hong Kong flu (influenza type A, subtype H3N2) in 1968 (National Institute of Allergy and Infectious Disease, 2007).

A number of new strains of influenza virus have surfaced since the last pandemic, however, none have reached pandemic status to date (National Institute of Allergy and Infectious Disease, 2007). Historically, influenza pandemics have occurred three or four times per century and experts believe that once the next pandemic emerges, it will arrive in Canada within three months (Public Health Agency of Canada, 2006).

**Types of influenza**

**Seasonal influenza**

Seasonal influenza is an acute respiratory illness caused by a virus that is carried and spread among humans. This infection peaks during the winter months and spreads when oropharyngeal secretions from an infected individual come into contact with the oral, nasal, or conjunctival mucous membranes of another person. It may also be transmitted indirectly via hands or inanimate objects soiled with these secretions. Seasonal influenza causes mild to severe illness, depending on pre-existing medical conditions (Public Health Agency of Canada, 2006).

Influenza type A or B may be implicated in seasonal influenza infection (Public Health Agency of Canada, 2006). The specific viral strains that cause seasonal influenza are different each year, and seasonal influenza vaccination must be updated annually to maintain the same level of protection (Public Health Agency of Canada, 2006). Vaccination helps to prevent seasonal influenza infection and reduce the severity of illness if infection does occur (Public Health Agency of Canada, 2006).

**Avian influenza**

Avian influenza accounts for a variety of type A influenza viruses primarily affecting domestic fowl. Rarely, these viruses may infect humans, causing serious illness. People may contract an avian influenza virus by handling infected birds or by coming in contact with contaminated bird feces. Avian influenza is not easily spread between human beings (Public Health Agency of Canada, 2006).

**Pandemic influenza**

Pandemic influenza occurs when a particularly virulent new strain of influenza virus spreads rapidly across the globe. Only influenza type A has been implicated in pandemics (World Health Organization, 2005). This virus may or may not originate from birds.

**Preparing for a pandemic**

Since people with renal disease are especially vulnerable to influenza, it is important that we are prepared in advance for a pandemic. Prevention strategies for the spread of pandemic influenza are the same as those recommended for seasonal flu. Stringent infection control measures, seasonal and pandemic influenza vaccination and early detection and treatment with antiviral medications should all be incorporated into a pandemic influenza plan for the renal population (Centers for Disease Control and Prevention, n.d.).

**Infection control measures**

During a pandemic, all non-emergency medical appointments should be rescheduled or cancelled. However, for people receiving hemodialysis, this may not be feasible. The Centers for Disease Control and Prevention recommends that hemodialysis units implement infection control measures similar to those recommended for outpatient physician offices (Centers for Disease Control and Prevention, n.d.). Patients should be screened for illness before they leave home and visual alerts should be posted at the facility’s entrance instructing people with respiratory symptoms to inform reception and health care personnel upon their arrival. Individuals with signs or symptoms of influenza should be segregated in separate waiting and treatment areas (Centers for Disease Control and Prevention, n.d.).

Personal protective equipment will also play a role in minimizing the spread of infection. The Canadian Pandemic Influenza Plan for the health sector advises that surgical masks be worn during the early phases of the pandemic when face-to-face with coughing individuals. However, wearing masks may be impractical and of questionable value once the virus has entered the community (Public Health Agency of Canada, 2006).

Gloves are unnecessary during routine care of people suspected or confirmed to have influenza. On the contrary, they should be worn if the health care provider expects to come in contact with blood, body fluids, secretions or mucous membranes to decrease transmission of the virus, or if the health care provider has open lesions on his or her hands (Public Health Agency of Canada, 2006). Gloves should never be substituted for thorough hand hygiene.

Signage should also be used in common areas to promote good hygiene (e.g., frequent hand washing, covering the mouth when coughing, etc.). Plenty of tissues, no-touch receptacles, alcohol-based hand rub and soap and disposable towels for hand washing should be available.

**Vaccination**

Vaccination is the first line of defence against pandemic influenza. However, the process of developing a vaccine cannot be initiated until the specific strain of virus causing the pandemic has been identified, meaning it could take up to six months to produce the vaccine (Public Health Agency of Canada, 2006). Due to this delay, it is unlikely to be available before the first wave of influenza arrives in Canada (Public Health Agency of Canada, 2006).

Fortunately, Canada is prepared to produce enough vaccine to immunize all Canadians as soon as a new strain is identified. Two doses of the vaccine will likely be required to achieve an adequate immune response. Production will occur in batches, so a preliminary plan has been developed to prioritize vaccine distribution. The Canadian Pandemic Influenza Plan recommends that people at high risk of severe or fatal outcomes following influenza infection, such as those with kidney disease, be placed in priority group three, following health care workers and essential community ser-
There is some debate whether people with kidney disease develop immunity in response to vaccination since they are immuno-compromised. Intact B cell and T cell response are necessary for vaccination to be effective and studies have shown a decrease in the number of B cells and the IgG production among patients undergoing hemodialysis (Chatenoud, Herbelin, Bourain, & Descamps-Latscha, 1990). Nonetheless, a retrospective review of American Medicare billing data from 1997 to 1999 revealed that the odds of hospitalization and death were lower in hemodialysis patients who received influenza vaccination compared to unvaccinated individuals (Gilbertson et al., 2003). The likelihood of death was also lower among patients receiving peritoneal dialysis (Gilbertson et al., 2003).

Individuals with hypersensitivity to eggs should not receive the influenza vaccine.

**Antiviral therapy**

Canada aims to create a 55-million-dose National Antiviral Stockpile for influenza prophylaxis and treatment. At present, plans are in place to use these agents for treatment of influenza, but their role in prophylaxis has yet to be determined. These drugs will be especially valuable before a vaccine is developed, but will also be used throughout a pandemic (Public Health Agency of Canada, 2006). They inhibit viral replication. Two classes of antiviral drugs exist in Canada: M2 ion channel inhibitors (amantadine) and neuraminidase inhibitors (oseltamivir and zanamivir).

Amantadine is not available in the National Antiviral Stockpile and its use is not recommended during a pandemic. Resistance to this agent develops quickly. If amantadine does become available during a pandemic, it should only be used for prophylaxis and only if the virus is known to be susceptible to this drug (Public Health Agency of Canada, 2006). Dosage must be adjusted based on the individual's creatinine clearance (Micromedex, 2007) (See Table One).

Oseltamivir is indicated for both prevention and treatment, whereas zanamivir is only indicated for treatment of influenza. The current national plan suggests both agents should be

| Table One: Antiviral dosage recommendations for adults with influenza A and B |
|---------------------------------|-----------------|-----------------|-----------------|
| Drug                            | Creatinine Clearance | Prophylaxis Dose       | Treatment Dose       |
| Oseltamivir**                    | > 30 ml/min        | 75 mg OD           | 75 mg BID for 5 days |
|                                 | 10 – 30 ml/min     | 75 mg every other day | 75 mg OD for 5 days |
|                                 | < 10 ml/min        | No data available   |                  |
| Zanamivir**                     | No dosage adjustment required | 2 inhalations (5 mg/inhalation) OD | 2 inhalations (5 mg/inhalation) BID for 5 days |
| Amantadine***                   | ≥ 80 ml/min/1.73 m² | 100 mg BID         | 100 mg BID*       |
|                                 | 60 – 79 ml/min/1.73 m² | Alternating daily doses of 100 and 200 mg | Alternating daily doses of 100 and 200 mg* |
|                                 | 40 – 59 ml/min/1.73 m² | 100 mg OD          | 100 mg OD*        |
|                                 | 30 – 39 ml/min/1.73 m² | 200 mg twice weekly | 200 mg twice weekly* |
|                                 | 20 – 29 ml/min/1.73 m² | 100 mg thrice weekly | 100 mg thrice weekly* |
|                                 | 10 – 19 ml/min/1.73 m² | Alternating weekly doses of 100 and 200 mg | Alternating weekly doses of 100 and 200 mg* |
| Hemodialysis                    | 200 mg every 7 days | 200 mg every 7 days* |

* Until 24 to 48 hours after symptom resolution (Micromedex, 2007).
** (Micromedex, 2007).
*** (Repchinsky, Welbanks, Bhalla, Fortin, Jarvis, Jovaisas, & Acharya, 2007).
used for early treatment of influenza only. Zanamivir is preferred over oseltamivir for early treatment in pregnant and nursing women (Public Health Agency of Canada, 2006). These drugs are most effective when they are administered within two days of the onset of illness (Aoki et al., 2003). Neuraminidase inhibitors appear to reduce the duration of clinically significant influenza syndrome by about 20% or one day in healthy adolescents and adults (Schmidt, 2004). More research is needed to assess the efficacy of antiviral therapy in people with kidney disease.

The dosage of neuraminidase inhibitors must also be adjusted for impaired renal function (see Table One).

Conclusion

Individuals with kidney disease are highly susceptible to complications from pandemic influenza infection. A comprehensive plan is imperative to protect these individuals when a pandemic strikes. Infection control measures, vaccination programs and strategic use of antiviral agents are integral to the success of pandemic influenza planning for the renal population.

References


Greenwood Village, CO: Thomson Micromedex.


