Influenza outbreaks in aged-care facilities: staff vaccination and the emerging use of antiviral therapy

Clinical records

Outbreak 1

In January 2002, an outbreak of influenza A occurred at a Melbourne aged-care facility (ACF) housing 42 residents (median age, 86 years; range, 64–98 years). There were 29 staff working at the facility (median age, 46 years; range, 29–64 years) (Box 1).

The index case (Visitor A) was an 86-year-old woman who regularly visited her husband (Resident A) at the ACF. Visitor A developed respiratory symptoms on 26 Dec 2001 (Day 0), was hospitalised with fever and respiratory symptoms on Day 2, and died of pneumonia on Day 17. Visitor A had a history of emphysema and had received the influenza vaccine in March 2001. On Day 5, Resident A developed respiratory symptoms, and between Days 8 and 13, 15 more residents developed respiratory illness, of whom nine were hospitalised. The hospitalisation of four residents on a single day (Day 13) with suspected pneumonia led to the emergency department manager notifying the Victorian Department of Human Services (DHS) of the outbreak.

On Day 14, DHS staff visited the ACF and collected nose and throat swabs from symptomatic individuals whose onset of respiratory symptoms had occurred less than 5 days earlier (ideally, specimens should be collected within 72 hours of onset). Where possible, acute and convalescent sera were collected.

The Victorian Infectious Diseases Reference Laboratory tested combined nose and throat swabs for influenza virus RNA using a respiratory multiplex polymerase chain reaction (PCR) assay, designed to detect RNA from respiratory syncytial virus; parainfluenza virus types 1, 2, and 3; influenza A virus (subtypes H3N2, H1N1); influenza B virus; and picornaviruses (rhinoviruses, enteroviruses). The reference laboratory also tested acute and convalescent sera for antibodies to influenza A virus, influenza B virus, *Mycoplasma pneumoniae*, *Legionella* spp., and *Chlamydia pneumoniae* antibodies.

On Day 14, the DHS recommended that the ACF implement infection control measures (Box 2). The DHS also gave notification of the outbreak to attending general practitioners and infection control staff at hospitals where patients had previously been admitted.

Thirty-eight of 42 residents, but only two of 29 staff, had received the 2001 influenza vaccine in either February or March 2001. As an outbreak control measure, 22 of 23 unvaccinated staff who were unaffected by illness were vaccinated (the four unvaccinated residents had already developed respiratory symptoms).

On Day 15, 24 hours after collection, PCR test results showed that the samples were positive for influenza A (H3N2). The DHS then recommended antiviral therapy for all residents and all unvaccinated staff: amantadine for prophylaxis and zanamivir for therapy or prophylaxis. Oseltamivir was not recommended at the time, as it was not licensed for prophylaxis. Because of the perceived difficulties in administration and possible gastrointestinal and neurological side effects in elderly and chronically ill people, the facility elected not to use amantadine, and decided on zanamivir for treatment and prophylaxis. However, as the ACF was unable to obtain sufficient stock of zanamivir for these purposes, two residents and four staff members received zanamivir for treatment and 21 unaffected residents received prophylactic oseltamivir (despite its use being outside the licensed indications for the drug at the time). None of the residents who were given prophylactic oseltamivir developed influenza. The latest date of onset of respiratory illness occurred on Day 18 (13 January 2002).

The World Health Organization (WHO) Collaborating Centre for Reference and Research on Influenza (Melbourne) identified the outbreak strain as influenza A/H3N2/Moscow-like and concluded that the H3N2-like strain in the 2001 vaccine protected against infection with this virus.

Outbreak 2

In March 2002, an outbreak of influenza A occurred at a Melbourne ACF housing 32 elderly residents (median age, 84 years; range, 55–91 years). There were 31 staff working at the facility (median age, 42 years; range, 20–55 years) (Box 1).

The first two cases in the outbreak were residents who developed respiratory symptoms on 3 March 2002 (Day 0). Their infection could not be linked with a source case. Between Day 1 and Day 3, 22 more people associated with the ACF developed respiratory symptoms. The DHS was notified of the outbreak on Day 5 by an attending GP.

On Day 5, the DHS recommended infection control measures (as with outbreak 1), and nose and throat swabs and acute and convalescent sera were collected. Infection with influenza A (H3N2) was confirmed on Day 8, but, by that stage, most affected individuals had recovered and antiviral therapy was not recommended.

Although 30 out of 32 residents had received the 2001 influenza vaccine, only three of the 31 staff members had been vaccinated in 2001. Because the outbreak occurred in March, all staff and residents received the influenza vaccine as part of the 2002 influenza vaccination program.

The WHO laboratory determined that the outbreak strain was influenza A/H3N2/Moscow-like and concluded that the H3N2-like strain in the 2001 vaccine protected against infection with this virus. However, the infecting viruses in outbreaks 1 and 2 were genetically different, suggesting they were not directly linked.

1: Timeline for influenza A outbreaks in two aged-care facilities (confirmed and probable cases)

Outbreak 1

Day	Number of people with onset of respiratory symptoms and major events (*action taken/findings*)
0	1 visitor
5	1 resident
8	1 resident
10	1 resident
11	4 residents
12	5 residents
13	4 residents
	DHS notified of outbreak
14	1 resident, 4 ACF staff members
	Laboratory specimens collected. ACF advised to implement infection control measures
15	1 resident, 1 ACF staff member
	Specimens confirmed positive for influenza A (H3N2) by PCR assay. Antiviral therapy recommended
16	1 DHS staff member
17	2 residents
	Antiviral therapy implemented
18	1 ACF staff member

Summary. Residents (n = 42): 20 Inf (19 C, 1 P); 10 H; ACF staff (n = 29): 6 Inf (4 C, 2 P); Visitors: 1 Inf (1 C); 1 H; 1 D; DHS staff: 1 Inf (1 C).*

Outbreak 2

Day	Number of people with onset of respiratory symptoms and major events (*action taken/findings*)
0	2 residents
1	5 residents
	1 ACF staff member
2	2 residents
	5 ACF staff members
	2 visitors
3	3 residents
	4 ACF staff members
4	2 residents
	1 visitor
5	1 ACF staff member
	DHS notified of outbreak. Laboratory specimens collected. ACF advised to implement infection control measures
6	1 ACF staff member
8	1 ACF staff member
	Specimens confirmed positive for influenza A (H3N2) by PCR assay
9	2 residents

Summary. Residents (n = 32): 16 Inf (15 C, 1 P); 8 H; 1 D; ACF staff (n = 31): 13 Inf (3 C, 10 P); 3 H; Visitors: 3 Inf (3 P).*

ACF = aged-care facility. DHS = Victorian Department of Human Services. PCR = polymerase chain reaction.
* Inf = developed influenza A (C = confirmed; P = probable); H = hospitalised; D = died.

Preventing and controlling influenza outbreaks in ACFs

Vaccination

In Australia, influenza vaccination is recommended and funded annually for people aged 65 years and over and recommended, but not publicly funded, for healthcare workers in ACFs.[1] Elderly residents may have an impaired response to the vaccine because of age or comorbidities.[2,3] Outbreaks have been reported in ACFs, despite high vaccination coverage rates (> 85%) in residents using a vaccine that matches the circulating strain.[4,5] This was the case in the outbreaks described here, in which at least 90% of residents had received the influenza vaccine.

In view of this, the priority for preventing influenza outbreaks in ACFs should be to prevent individuals introducing the virus into the facility. The key way to do this is to ensure that ACF healthcare workers (including attending GPs) are vaccinated. Educating visitors about vaccination and instructing them to stay away from the ACF when unwell is less likely to be successful. In both outbreaks, there was low staff vaccination coverage, and in outbreak 2, staff appeared to contribute to ongoing transmission.

Diagnosis and infection control

The current non-systematic method of notification of influenza outbreaks in Melbourne ACFs is inadequate. Facilities should be encouraged to establish a sentinel surveillance system to recognise, notify and diagnose early cases of respiratory illness to allow timely outbreak control measures to be implemented.[2,6] The response to influenza outbreaks in ACFs should be a collaborative effort between the ACF, the attending GPs and the DHS.

The DHS is currently developing guidelines to manage outbreaks of respiratory virus infection in ACFs and will be piloting a system of ACF respiratory diseases surveillance for the 2004 respiratory virus season.

Antiviral therapy

Antiviral agents available in Australia include amantadine, zanamivir and oseltamivir.

2: Infection control measures for influenza A outbreaks in aged-care facilities (ACFs)*

- Restrict visitors from entering the ACF.
- Isolate sick residents in their rooms until 5 days after the onset of illness or until symptoms have completely resolved.
- Exclude sick staff from work for 5 days from the onset of symptoms of a respiratory illness or until symptoms have resolved.
- Restrict all admissions of new residents during the outbreak;
- Cancel daily activities programs.
- Instruct staff to increase hand washing, wear masks while providing care to symptomatic residents and enhance environmental cleaning.

* Recommended by the Victorian Department of Human Services to control the outbreaks described here.

Lessons from practice

- Even when vaccination coverage is high among residents, influenza outbreaks (with a strain covered by the vaccine) can still occur in aged-care facilities (ACFs), including during the summer months.
- Because of the poor health status of many residents, influenza outbreaks in ACFs can cause significant morbidity and mortality.
- When influenza vaccine coverage among residents is high, coverage in ACF healthcare workers is a priority for preventing outbreaks.
- If an influenza outbreak is suspected, this should be confirmed using nasopharyngeal aspirates or nose and throat swabs tested by a polymerase chain reaction assay. Serological testing may also be useful when symptoms have been established for longer than 72 hours.
- When influenza outbreaks occur in ACFs, antiviral therapy should be considered as an outbreak control measure.

Amantadine has been shown to be 70%–90% effective in preventing illness caused by naturally occurring strains of influenza A virus[7] and has been successful in controlling 60%–80% of influenza A outbreaks.[8] In Australia, amantadine is approved for prophylaxis of influenza A virus but not treatment. Amantadine has several disadvantages, including lack of activity against influenza B, the potential for the occurrence of adverse side effects (despite individualised dosing based on renal function), and the rapid emergence of resistance to the drug.[9] Spread of amantadine-resistant viral strains has been associated with simultaneous prophylaxis and treatment in the same facility.[8]

Zanamivir and oseltamivir are a newer class of antiviral agents (neuraminidase inhibitors) that are effective against both influenza A and B and have less serious side effects. Initial reports indicate that the frequency of emerging resistance to these agents is low during clinical use.[9] In Australia, both agents have been recently licensed for prophylaxis. Neuraminidase inhibitors are 74% effective (95% CI, 50%–87%) in preventing illness caused by naturally occurring strains of influenza viruses in healthy adults.[10] From the few available published reports of the use of these antiviral agents for chemoprophylaxis in outbreaks, both appear to be effective in stopping outbreaks in ACFs.[9,11]

When ACF staff and attending GPs are making decisions about antiviral treatment and prophylaxis in outbreak situations, they should take into account the influenza strain, the health status of the residents, the dosage schedules required, the potential side effects of the drug and the cost (antiviral drugs are not covered by the Pharmaceutical Benefits Scheme). The following recommendations for the use of antiviral agents to control influenza outbreaks will be detailed in guidelines being developed by the DHS:

- To be effective, treatment with zanamivir or oseltamivir must be started within 48 hours of symptom onset and continued for 5 days;
- Antiviral prophylaxis should be offered to all residents (whether vaccinated or unvaccinated) and to all unvaccinated staff members and should continue for 10 days or until the outbreak is declared over;
- If the outbreak is caused by a strain of influenza not covered by the vaccine, prophylaxis should be considered for all staff members, regardless of their vaccination status;
- To limit the potential transmission of drug-resistant virus during outbreaks, measures should be taken to reduce contact as much as possible between people taking antiviral drugs for treatment and those taking them for prophylaxis; and
- ACF staff should make arrangements with attending GPs to ensure residents can be prescribed antiviral treatment and prophylaxis rapidly and efficiently.

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