Antiviral prophylaxis in the management of an influenza outbreak in an aged care facility

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Abstract

Influenza in persons aged ≥ 65 years is associated with an increased risk of severe complications. Residents in aged care facilities have a higher proportion of chronic illnesses and within closed settings there is an increased risk of transmission. In July 2002, a 50 bed aged care facility reported an influenza-like illness (ILI) among residents and staff despite over 90 per cent influenza vaccine coverage among residents. A total of 17 of 49 residents and 9 of 43 staff met the case definition for ILI with onset on or after 26 June 2002. Seven people required hospitalisation and two died. Nasopharyngeal swabs were collected from symptomatic residents and staff, and influenza A was detected in six residents and two staff. Five unimmunised residents and 33 unimmunised staff were offered influenza vaccine and all residents and staff were offered oseltamivir prophylaxis of 75mg daily for 10 days. Subsequently, of 41 residents tested, seven demonstrated a fourfold or greater rise in antibody titres specific to H3N2 yet reported no symptoms. All seven had been immunised at least eight weeks previously, and had taken oseltamivir prophylaxis. This outbreak was characterised by a high attack rate of ILI in a well-immunised community. The ability to access rapid diagnostic testing enabled the prompt initiation of antiviral prophylaxis, which may have a role in controlling influenza in this setting. *Commun Dis Intell* 2004;28:396–400.

Keywords: influenza A, outbreak, aged care facility, oseltamivir prophylaxis

Introduction

Influenza A and B outbreaks are a major cause of serious illness, hospitalisation and death in elderly persons. Outbreaks in aged care facilities have resulted in attack rates of 10 per cent to 70 per cent, with up to 55 per cent of ill residents requiring hospitalisation or as many as 30 per cent dying from complications.[1–5]

In early July 2002 the director of a 50 bed aged care facility reported an influenza-like illness (ILI) among residents and staff. A coordinated response was undertaken by the Southern New South Wales Public Health Unit (SNSWPHU) initially to determine the cause of the illness and to design control measures.

The facility has an influenza immunisation program and 90 per cent of residents had been immunised in late March/early April 2002 with vaccine from three different manufacturers. Only 28 per cent of staff had been immunised. The composition of the influenza vaccine used in Australia in the 2002 season was A/New Caledonia/20/99 (H1N1)-like virus, A/Moscow/10/99 (H3N2)-like virus and B/Sichuan/379/99-like virus.

Aims

We conducted a study into this outbreak to determine its cause and extent, and the feasibility and effects of providing staff and residents of the institution with preventive antiviral therapy.

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Methods

ILI was defined as the onset of fever or cough or rhinitis and at least one secondary symptom such as sore throat, myalgia, headache, malaise, poor appetite and chills with onset on or after 26 June 2002. Data were collected from a review of the notes of the residents.

Combined nose and throat swabs were collected in a viral transport medium from symptomatic residents and staff, and couriered to the reference laboratory, where they were examined by direct immunofluorescence (DIF) and viral culture. Isolates were further subtyped by the WHO Collaborating Centre for Influenza Reference and Research in Melbourne.

Consent was obtained from all residents to have serum collected for acute and convalescent (4 weeks later) influenza serology in order to assess the effectiveness of the prophylaxis. Acute and convalescent sera were tested in parallel for antibodies to influenza A and B using complement fixation (Virology Department, Institute of Clinical Pathology and Medical Research) and haemagglutination inhibition against A/Brisbane/6/2002 and B/Brisbane/32/2002 (WHO Collaborating Centre for Influenza Reference and Research). Individuals with a fourfold or greater rise in influenza-specific antibody titre were considered as being recently infected.

The attack rate was calculated by dividing the number of confirmed cases by the total number of residents and staff.

A questionnaire was developed and administered to all staff members to provide information on compliance and side effects of antiviral prophylaxis. Patient notes were reviewed for reported side effects in residents.

Results

Epidemiological investigation

At the time the facility had 49 residents including 22 males and 27 females who resided in single rooms between three single storey wings (A, B and C). All wings were connected by corridors and opened onto a common dining area. Most residents requiring minimal care were located in A and B wings, whereas C wing was for residents with dementia who required closer attention to their daily living needs. There were 42 staff working at the facility during the outbreak including one volunteer and the local pathology collector.

Medical records for all 49 residents were reviewed and questionnaires were completed by 32 (76%) of the 42 staff. The first two cases in the outbreak became sick on the same day: one was a resident and the other a staff member. The average age of the residents and staff was 81 years (SD ± 10) and 48 years (SD ± 10) respectively. The most common symptoms are outlined in Table 1.

Residents

Seventeen (35%) of 49 residents met the case definition for an ILI. The male to female ratio was 1:1.1. Three hospitalised case-residents (6%) were diagnosed with pneumonia by their general practitioners, and confirmed by chest x-ray. Five case-residents were hospitalised (10%) and one of these case-residents died 14 days after the onset of illness. Onset of illness occurred between 26 June and 18 July 2002 with a peak of 13 case-residents in the week 29 June to 5 July (Figure).The attack rates in case-residents were highest in A and C wings, and lowest in B wing (45%, 38% and 25% respectively).

Forty-three (88%) residents had two or more chronic medical conditions. Forty-four residents (90%) were immunised prior to this outbreak with the trivalent vaccine between March and April 2002. One resident was immunised at the beginning of the outbreak and the remaining four residents declined immunisation. All cases of pneumonia, hospitalisation and death were among residents who were immunised. None of the unimmunised residents became sick.

Table 1. Symptoms experienced by residents and staff

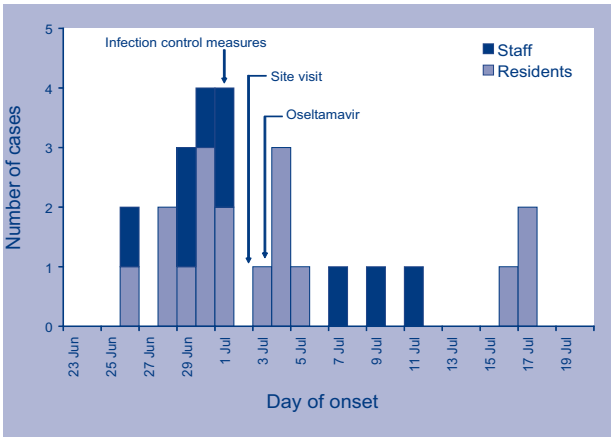
Cases	Fever (%)	Myalgia (%)	Head-ache (%)	Severe malaise (%)	Non productive cough (%)	Sore throat (%)	Rhinitis (%)	Chills (%)	Productive cough (%)	Poor appetite (%)
Residents (n=17)	100	23	18	23	29	12	29	12	53	35
Staff (n=9)	44	33	66	22	44	66	77	22	55	22

Staff

Nine (21%) of 43 staff met the case definition for an ILI. This included a staff member who died after hospitalisation on 29 June 2002 following a 3-day history of influenza-like illness, with the cause of death at autopsy given as bilateral pneumonia. One staff case was diagnosed with bronchitis. Onset of illness occurred between 26 June and 11 July 2002 with a peak of six staff cases in the week 26 June to 2 July (Figure). Six (67%) of the staff cases were in roles that required direct contact with the residents. The remaining three staff cases were not in direct contact with residents.

Prior to this outbreak, 13 of 46 (28%) staff had been immunised, with a further 11 (24%) immunised after the onset of the outbreak.

Figure. Cases of ILI by day of onset, June to July 2002



Laboratory investigations

Influenza A H3N2 was detected in eight combined nose and throat swabs taken from either case-residents or staff cases. Seven were detected by DIF and eight were culture positive. One influenza isolate was later further subtyped as A/Moscow/10/99 (H3N2)-like, and thus covered by the 2002 influenza vaccine.

Overall, 41 paired sera from residents who had oseltamivir chemoprophylaxis and seven acute sera were tested. A fourfold rise or persistently elevated antibody titres for influenza were seen in 14 of 41 paired sera including 10 influenza A and four influenza B; three of seven single sera had elevated influenza A antibody titres. There were 16 individuals who had both DIF and antibody testing—eight were negative by both assays, four had influenza A infection detected by both methods, three had serological evidence of influenza A but negative DIF, and one had influenza A on DIF and negative serology on a single acute serum sample. Laboratory test results by immunisation status are outlined in Table 2.

Public health interventions

The SNSWPHU initially ensured that infection control measures were implemented to minimise transmission and that combined nose and throat swabs were collected immediately from sick residents and staff. Information was given to all staff, residents and their consulting general practitioners detailing the illness.

Although it may have been too late to avert illness in this outbreak, those residents and staff who were not immunised were offered influenza vaccine. In addition, all residents and staff who were not confirmed cases of influenza, were offered antiviral prophylaxis with oseltamivir. A media release was also distributed locally to raise community awareness of an increase in influenza activity.

Infection control measures

Droplet precautions and environmental cleaning measures were advised.[8] As all residents had single rooms in this facility, those who became sick were asked to remain in their rooms and refrain from using the communal dining room until they had recovered or for at least five days after the onset of symptoms. This practice was challenging for staff when residents from the dementia wing became sick. Any sick staff or volunteers were excluded from the facility for five days from the onset of symptoms or until the symptoms resolved. Unimmunised staff were also advised not to work at other health care

Table 2. Immunisation status and confirmed influenza A

Influenza-like illness	With influenza-like illness and immunised		Tested		Tested with confirmed influenza A	
	n	%	n	%	n	%
Residents (n=17)	16	94	17	100	6	35
Staff (n=9)	3	33	4	44	2	50

facilities until after four days had elapsed from their last shift at this facility. The manager of the facility was advised to restrict visitors to residents and to defer new admissions or transfers of residents for the duration of the outbreak. All non-urgent medical appointments were rescheduled and if a resident required hospitalisation the health service manager was to be made aware of the illness at the facility.

Antiviral prophylaxis

Oseltamivir was offered as prophylaxis to all staff and residents at a dose of 75mg daily for 10 days from 4 July 2002 at a cost of $3.48 per dose. The total direct cost of providing oseltamivir prophylaxis was $2,679. All residents (43/49) who did not have confirmed influenza received prophylaxis, as did all staff members (34/42) who did not have either confirmed influenza or a medical contraindication.

One resident did not complete the 10-day course as the general practitioner discontinued treatment because of vomiting. No other adverse effects were reported among residents. Staff questionnaires were distributed to ascertain adverse effects in this group, with a response rate of 76 per cent. Nausea (27%) and headache (19%) were the most common adverse effects followed by individual reports of vomiting, abdominal pain, rash, indigestion and a feeling of being thirsty. Only one staff member discontinued prophylaxis owing to adverse effects.

Four residents (8%) reported ILI consistent with the case definition after the introduction of prophylaxis but did not develop secondary complications nor require hospitalisation. Nose and throat swabs were negative for influenza A and B, and no antibody response to influenza A or B was detected.

Discussion

This influenza outbreak occurred despite over 90 per cent of the residents having received vaccine in recent months. Prompt recognition of the outbreak, its notification to the SNSWPHU and the institution of infection control measures may have limited its progress. Rapid diagnosis of influenza from nose and throat swabs gave the opportunity to administer antiviral prophylaxis to prevent the secondary cases of influenza in this high-risk setting. Oseltamivir is an oral neuraminidase inhibitor whose use leads to viral aggregation at the host cell surface and a reduction in the amount of virus that is released to infect other cells. It has activity against both influenza A and B viruses, and has shown to be effective in both the treatment and prophylaxis of influenza infections.[9]

Whilst the strain identified in a patient in this outbreak was included in the Australian 2002 vaccine, there may have been some patients in this outbreak with influenza caused by different strains not covered by the vaccine. The outbreak occurred at the time that influenza activity, both locally and throughout the State, had begun to increase, and when the majority of influenza strains isolated across Australia were B/Hong Kong/330/2001-like viruses, against which the B/Sichuan-like component of the 2002 vaccine was expected to have reduced effectiveness.[6,7] In addition, it is possible that another respiratory virus was circulating through the aged care facility as four residents on oseltamivir prophylaxis developed an ILI consistent with the case definition but were negative for influenza by antigen, culture and antibody testing. There was increased respiratory syncytial virus activity at this time in 2002 reported to NSW Health Department.[11]

Oseltamivir may have prevented influenza illness in this outbreak, although a randomised control trial would be required to give definitive evidence. Oseltamivir was used as prophylaxis as it was easy to administer, it was readily accessible and has few adverse effects (especially when compared to amantadine, an antiviral sometimes used as prophylaxis or treatment in influenza A outbreaks) or contraindications. Neuraminidase inhibitors are effective against both influenza A and B, unlike amantadine. In Australia, oseltamivir is approved for use as treatment and prophylaxis of both influenza A and B, and should be considered in influenza outbreaks in aged care facilities. The value of antiviral drugs depends on rapid laboratory confirmation of influenza.

Whilst the cost of oseltamivir was not insubstantial, it may have prevented clinical illness in at least seven residents and may have prevented further transmission, hospitalisations and even deaths. Interestingly, four residents had an antibody rise to influenza A and three had antibody rise to influenza B. Sequential outbreaks of influenza A and B have been reported in nursing homes in the United States of America.[10]

Immunisation remains the single most important tool against influenza and is 50–60 per cent effective in preventing hospitalisation or pneumonia and 80 per cent effective in preventing death in aged care facilities. It is widely accepted that when influenza vaccine and epidemic strains are well-matched, achieving increased immunisation rates among staff can reduce the risk for outbreaks by inducing herd immunity.[1,12,13]

The role of health care workers in the introduction and transmission of influenza in these settings, led the National Health and Medical Research Council to recommend annual immunisation of staff employed in health care facilities. Immunisation of health-care workers has been associated with a substantial

decrease in mortality among residents of aged care facilities, however, virological surveillance show no associated decrease in non-fatal influenza infection in residents.[14]

The Canadian National Advisory Committee on Immunization recommends policies to exclude health care workers from direct patient care who develop confirmed or presumed influenza and unimmunised health care workers who are not on antiviral prophylaxis in order to protect vulnerable patients in outbreak situations.[15]

Following the introduction of oseltamivir prophylaxis on 4 July 2002, there were no further laboratory-confirmed cases of influenza A or B, hospitalisations or deaths among residents in this facility despite exposure to influenza A and B viruses. The total cost of providing oseltamivir prophylaxis in comparison to the cost of treating one person in hospital for moderate to severe respiratory infection ($4,040) suggested that prophylaxis may have been cost effective.[16, 17]

Whilst the SNSWPHU has made staff influenza immunisation recommendations to all health care facilities in Southern New South Wales, clinics are commonly poorly attended by staff in direct patient care roles.[18] It is pleasing to note that following this outbreak 40 of 42 (95%) staff at this facility accepted the offer of influenza immunisation in 2003 (C Puckett, personal communication, 18 June 2003).

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