Influenza outbreak preparedness: lessons from outbreaks in residential care facilities in 2014

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Abstract

This report describes 6 influenza outbreaks in residential care facilities during the 2014 influenza season in the Sydney Local Health District. Vaccination rates were high among residents (95%) and low among staff (39%). The majority of residents with laboratory confirmed influenza (67%) did not meet the influenza-like illness case definition. Positive influenza specimens were subtyped as H3N2 (40%), H1N1 (5%) or not subtyped (55%). We illustrate the implications of low vaccine effectiveness and antigenic drift, and provide recommendations for the effective management of future influenza outbreaks. *Commun Dis Intell* 2015;39(2):E204–E207.

Keywords: influenza A virus, H3N2 subtype, residential care facility, vaccine effectiveness, antigenic drift, outbreak preparedness

Introduction

Influenza can spread rapidly through residential care facilities (RCFs) resulting in significant morbidity and mortality.[1,2,3] Nationally, 2014 was notable for the highest number of influenza notifications since the 2009 pandemic.[4] New South Wales experienced a more severe season than other states, characterised by higher prevalence of influenza A(H3N2) than the nationally predominant A(H1N1) subtype.[5] One hundred and eleven influenza outbreaks in RCFs were reported in New South Wales in 2014, the highest number in the past decade.[5,6]

Influenza A(H3N2) is associated with a higher burden of disease in elderly populations, and also affects highly vaccinated populations.[1,7] Vaccine effectiveness against H3N2 ranges from 13% to 26%,[8,9] and protection against H3N2 wanes significantly both from the time of vaccination and within single influenza seasons.[8,10] RCFs are thus at high risk of influenza outbreaks and require robust prevention and control measures.

This report describes the management of influenza outbreaks in RCFs by the Sydney Local Health District Public Health Unit (PHU) during the 2014 influenza season (May to October). We discuss the importance of outbreak preparedness by RCFs, and the implications of low vaccine effectiveness and antigenic drift on effective outbreak response.

Methods

Influenza is a scheduled medical condition in New South Wales, and RCF outbreaks are notifiable to the NSW Ministry of Health.[11] The Communicable Diseases Network Australia (CDNA) guidelines define influenza–like illness (ILI) as a triad of fever ≥38°C, respiratory symptoms and systemic symptoms, and a potential outbreak as 'three or more cases of ILI in residents or staff of the facility within a period of 72 hours'.[12]

RCFs contacted the PHU according to the above definition, or when a large number of residents were hospitalised with ILI. RCFs provided a cumulative record of resident and staff symptoms, testing, hospitalisation and deaths on a daily basis using electronic line lists. Information regarding hospital presentations was obtained from the New South Wales electronic medical records system (PowerChart).

The PHU monitored outbreak progression and provided recommendations on infection control, laboratory testing and use of antivirals. Two RCF site visits were conducted where local resources were inadequate; the PHU performed point of care testing, specimen collection, staff vaccination, and delivered antivirals.

Nasopharyngeal swabs were collected from symptomatic individuals for nucleic acid testing. Complement fixation testing was performed on one pre–mortem specimen. Four swabs were sent for strain detection to the World Health Organization Collaborating Centre for Reference and Research on Influenza.

Outbreak description and results

Six influenza outbreaks were notified to the PHU between 4 July and 8 September 2014 affecting 90 residents and 43 staff. The median vaccination rate was 95% among residents and 39% among staff (Table 1). The median influenza attack rate among residents was 24% and median outbreak

duration was 16 days. The median delay in notification to the PHU was 3 days. The proportion of symptomatic residents and staff meeting the ILI case definition was low (median 8% and 10% respectively). The majority of residents with laboratory confirmed influenza did not meet the ILI case definition (median 67%). Among the 3 ILI criteria, fever was least often recorded and respiratory symptoms (cough, coryza or sore throat) were most often recorded.

All laboratory confirmed cases were typed as influenza A. Fifty–five per cent of specimens were not subtyped, 40% were subtyped as H3N2 and 5% as H1N1 (Table 2). Results of specimens sent for strain detection were not available for this report. The majority of residents received the influenza vaccine in March (range January to April), with a maximum interval of 8 months between vaccination and influenza outbreak.

Discussion

Our experience during the 2014 influenza season demonstrates the importance of robust outbreak preparedness in the context of low vaccine effectiveness and antigenic drift.

Insufficient awareness of the CDNA guidelines prevented RCFs from instituting adequate outbreak preparedness measures. A key CDNA recommendation is to ensure a 90% staff vaccination rate;[12] this was not met by our RCFs (median 39%). It is likely that this low vaccination rate was a nidus for ongoing disease transmission. Other authors have also shown that nursing staff contribute to transmission during influenza outbreaks in RCFs.[13] Although there was high vaccine coverage among residents (median 95%), some RCFs vaccinated residents in January 2014. This was prior to the release of the 2014 Southern Hemisphere influenza vaccine in March and is unlikely to have provided effective protection during this season. Better RCF awareness of CDNA guidelines could

Table 1: Summary of influenza outbreaks in residential care facilities, Sydney Local Health District, July to September 2014

	Facility 1	Facility 2	Facility 3	Facility 4	Facility 5	Facility 6
Number of residents	65	101	61	46	68	63
Number of staff	60	100	64	18	90	77
Proportion of residents vaccinated*	95%	38%	98%	91%	100%	95%
Proportion of staff vaccinated*	42%	24%	39%	67%	Unknown†	22%
Outbreak commencement	July 2014	August 2014	August 2014	August 2014	August 2014	September 2014
Duration of outbreak (days)	21	14	18	11	23	14
Delay in notification (days)‡	11	–1	4	7	1	2
Number of symptomatic residents§	28	6	24	17	8	7
Attack rate among residents	43%	6%	39%	37%	12%	11%
Number of symptomatic staff§	10	5	20	1	3	4
Attack rate among staff	17%	5%	31%	6%	3%	5%
Proportion of symptomatic residents meeting ILI case definition	25%	17%	0%	0%	0%	100%
Proportion of symptomatic staff meeting ILI case definition	30%	0%	20%	0%	0%	100%
Proportion of residents with laboratory confirmed influenza not meeting ILI case definition	57%	50%	100%	80%	78%	0%

* Number of residents and staff vaccinated was provided by residential care facilities (RCFs) on line lists.

† This RCF employed regular and casual nursing staff and failed to maintain complete staff vaccination records.

‡ Calculated as time from three or more symptomatic cases noted on line list to public health unit notification. Facility 2 notified the public health unit 1 day prior to 3 symptomatic residents being identified.

§ Symptomatic cases were defined as any residents or staff included on RCF line lists.

Table 2: Laboratory testing results during influenza outbreaks in residential care facilities in Sydney Local Health District, July to September 2014

	Facility 1	Facility 2	Facility 3	Facility 4	Facility 5	Facility 6
Number of specimens collected (staff and residents)	11	9	7	6	11	9
Number of specimens collected (residents only)	11	5	6	6	8	8
Total number of positive influenza specimens	7	6	6	5	9	7
Influenza A, not subtyped	1	4	5	0	8	4
Influenza A, H3N2	4	2	1	5	1	3
Influenza A, H1N1	2	0	0	0	0	0

have improved vaccine coverage among both residents and staff, and thus bolstered outbreak preparedness.

Early outbreak recognition and notification to PHUs is an important outbreak control measure.[12] A very low proportion of symptomatic residents and staff met the ILI case definition (8% and 10% respectively). It is known that elderly populations mount a poor febrile response,[3] and that over half of all influenza infections are asymptomatic.[9] In our outbreaks two–thirds of residents with a positive influenza test result did not have ILI symptoms. It is likely that this led to the use of alternative, late triggers for PHU notification (for example, hospital transfer of symptomatic residents). Thus low sensitivity of the ILI definition and RCFs' difficulty in interpreting CDNA guidelines may have delayed public health action.

The 2014 influenza outbreaks in the Sydney Local Health District occurred during a more severe season and involved highly vaccinated populations where H3N2 was the predominant subtype. This led to the consideration of antigenic drift. H3N2 has been shown to undergo near–constant antigenic drift from season to season.[14,15] In addition to evolutionary drift in the circulating H3N2 virus, it has been suggested that low vaccine effectiveness against H3N2 results from mutations introduced during the egg–based vaccine production process.[16] The World Health Organization confirmed antigenic drift of H3N2 in 2014, and has recommended updating the H3N2 component in the 2015 influenza vaccine.[17] In this context of low vaccine effectiveness and antigenic drift, effective application of outbreak prevention and control measures remains paramount, and requires effective collaboration between RCFs, PHUs, general practice and laboratories. Further intervention research is needed to evaluate stakeholders' understanding of their responsibilities according to CDNA guidelines.

Limitations

Data quality (timely notification and completeness of line lists) remained a problem during the 2014 influenza season. Incomplete data affected the PHU's decision–making ability in the outbreak setting. Laboratories often provided positive influenza results without subtyping results (55% of specimens), resulting in a limited understanding of the extent to which different subtypes contributed to outbreaks.

Conclusion

High vaccine coverage of residents and staff is an important component of influenza preparedness in RCFs. However, low vaccine effectiveness and the potential for antigenic drift highlights the need for greater RCF awareness and application of national guidelines. We recommend the promotion of the CDNA guidelines to RCFs at the start of each influenza season, and interventions to improve RCF staff vaccination rates. Collaboration between key stakeholders to address these limitations will enable more effective management of future influenza outbreaks.

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