**Watching brief**

<table>
<thead>
<tr>
<th><strong>Date of report</strong></th>
<th>16/09/2017</th>
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<tbody>
<tr>
<td><strong>Disease</strong></td>
<td>Influenza (seasonal)</td>
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<td><strong>Location</strong></td>
<td>Australia</td>
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<td><strong>Suspected Source</strong></td>
<td>Seasonal influenza</td>
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<td><strong>Date of outbreak beginning</strong></td>
<td>Influenza documented since January (internal-seasonal period), with the season beginning in May and a rapid rise in cases in early June 2017.</td>
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<td><strong>Date outbreak declared over</strong></td>
<td>A severe influenza season is continuing in Australia but reduced notifications trends with decreasing flu activity reported nationally towards the end of August and early September. The peak was in August (week 32).</td>
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<td><strong>Affected countries &amp; regions</strong></td>
<td>Australia, New Zealand and Asia-Pacific region</td>
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| **Number of cases** | The Australian influenza season in 2017 began earlier than 2016, with higher notifications compared to the average observed since early June. Flu activity varied across jurisdictions, and increased seasonal activity was notified in the country from June to August. Peak flu activity was reached around mid August (weeks 32-33), with 69% being influenza A virus (majority A/H3N2), followed by influenza B (31%).(1) Nationally, influenza surveillance reports indicated a total of 137,566 notifications as of 1st September (compared to 53,159 notifications received for the same period in 2016); with NSW (69,999) and QLD (35,360) reporting higher number of notifications to the National Notifiable Diseases Surveillance System (NNDSS) compared to other jurisdictions in the country. The highest age-specific notification rate was seen in older adults aged ≥80 years, followed by a secondary peak was seen in children aged 5 -9 years old in the season to date.(1) Influenza A has comprised 63-83% of all cases, varying by State, and influenza B up to 30%. The predominant A strain has been H3N2, the most severe seasonal strain. |
| **Clinical features** | Common clinical symptoms for both influenza A and B may present with fever, cough, sore throat, myalgia/myositis, fatigue, and gastrointestinal (GI) presentations such as vomiting and diarrhoea. Although clinical presentations are indistinguishable between influenza A and B infections, some studies |
### Influenza – September 2017

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<th>Mode of transmission</th>
<th>Influenza can be transmitted through droplets, aerosol and direct contact with infected person. Whilst droplet is the main mode of spread, numerous studies have documented airborne transmission. In one US study, viable influenza virus was detected in the air of the emergency department 3 hours after the infected patient had left.</th>
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<tr>
<td>Demographics of cases</td>
<td>Age group: all ages, with peaks in older adults &gt;80 years and over and children 5-9 years. Influenza typically has peaks of incidence and complications at the extremes of age. Sex: males and females are equally affected. State: Flu activity varied between states and territories; among them the highest number of lab-confirmed influenza notifications were detected in NSW and QLD, followed by SA and VIC.</td>
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<td>Case fatality rate</td>
<td>Since April 2017, although there were higher numbers of hospital admissions (2,020) but lower ICU admissions (166, 8.2%) reported to the sentinel hospital surveillance system compared to last year. A total of 72 influenza-associated deaths were reported to NNDSS for the year till September 1, including 1 paediatric death, and this compares to 33 deaths in 2016 for the same period. From NSW, the estimated rate of deaths from influenza and pneumonia is 1.9/100,000 NSW population, which is lower than the peak in 2016. There have been a number of serious and fatal outbreaks in aged care facilities (ACF) in 2017. A total of 461 outbreaks occurred in institutions as of 10 September in NSW, the majority due to influenza A. Among those affected in aged-care facilities, 533 people (9.6%) required hospitalisation among the residents reported with ILI during the year to date, and 215 deaths occurred in people with significant other comorbidities. To date, 94 deaths were reported in aged-care facilities in Victoria, and also a number of influenza-related deaths were reported in aged-care facility outbreaks in Tasmania. These fatality numbers are higher than the total deaths reported to the NNDSS.</td>
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<td>Complications</td>
<td>Influenza can result in primary viral pneumonia, which occurs early in the course of illness, or secondary bacterial pneumonia, with onset later (1-2 weeks after initial symptoms). Bacterial pneumonia is the most common influenza-associated complication, especially in children and the elderly. Other complications can be worsening of asthma and respiratory diseases and exacerbation of underlying comorbidities in persons who are at-risk of the infection. Heart failure, precipitation of heart attacks and sinusitis may also occur. Occasionally encephalitis and complications of other organ systems may occur. Of seasonal influenza, influenza A results in the most complications and fatalities, and of A strains, H3N2 is the most severe. Notable exceptions are H1N1pdm09, of which a distinct lineage in South Asia has been causing severe disease and an apparent case fatality rate of 6% or higher. Past severe H3N2 years occurred in 2003, 2007 and 2012.</td>
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<td>Available prevention</td>
<td>Primary prevention: vaccination with influenza vaccine annually</td>
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Influenza – September 2017

The 2017 Australian Influenza Vaccine contained:

- A/Michigan/45/2015, (H1N1) pdm09-like virus;
- A/Hong Kong/4801/2014, (H3N2)-like virus;
- B/Brisbane/60/2008-like virus, Victoria lineage;
- B/Phuket/3073/2013-like virus, Yamagata lineage.

The influenza B match should be adequate, given less genetic diversity in B strains compared to influenza A. The match of the A strains is reportedly good, but field effectiveness particularly against H3N2, needs to be determined. Field-testing of vaccine effectiveness is required. So far, a good match with circulating strains and vaccine viruses have been reported for the season in 2017 in the country. However, a number of reports in the media suggest “rapid mutation”, infection in vaccinated elderly, and poor match, but data to support these assertions are unavailable at this time.

Other prevention & control measures: Neuraminidase inhibitors (NAIs) can be used as prophylaxis or treatment, and when used as prophylaxis can curtail outbreaks. Cough etiquette, hand hygiene and infection control measures are also vital to prevent further spread of infection. Personal protective equipment such as masks are recommended for healthcare workers. Guidelines recommend “droplet precautions” for seasonal influenza, however, airborne transmission is well documented for influenza.

Available treatment

NAIs known as antivirals are recommended for prophylaxis and treatment of influenza infection, and are most effective if they are taken within 48 hours after the onset of illness. Antivirals can reduce severe complications of influenza infection and can also shorten the duration of illness. They are also proven to mitigate severe, hospitalised cases of influenza, and should be given even after the 48 hours window for patients in intensive care. Recently ECDC expert opinion also confirmed the use of NAIs in prevention and treatment of severe influenza during seasonal flu outbreaks, pandemic and zoonotic outbreaks with susceptible influenza viruses, and reported that stockpiling of NAIs should be considered in preparedness plan during the flu outbreaks. The circulating strains of influenza in 2017 were largely sensitive to NAIs. Antibiotics are available to treat bacterial secondary infections complicating influenza.

Comparison with past outbreaks

Influenza notifications observed as of August 2017 is approximately 2.5 times higher than same period last year. Surveillance reports indicated that influenza outbreaks in institutions in NSW were 4.2 times higher than the past 5 year average. Severe outbreaks have occurred in residential aged care facilities. While total notified cases are higher, intensive care admissions and estimated population mortality rates are lower than 2016. Past severe H3N2 epidemics, which featured deaths in healthy children, include 2003 and 2007 seasons.

Unusual features

In Australia, high seasonal activity was observed throughout the country with early onset of flu season. In the month of May (beginning of the season) and August (peak), the ratio of number of notifications were 2.1 and 1.5 times higher respectively, compared to past 5 year average in the same months. The surveillance data may have been influenced by variation in testing practices across jurisdictions, and introduction of rapid testing in NSW hospitals. Deaths have been reported in a child and a healthy adult in 2017, and severe infection in a pregnant woman. Child deaths are often reported during severe H3N2 seasons, notably in 2003 and 2007.

Critical analysis

**Epidemic pattern:** H3N2 has been the dominant strain in 2017, and is...
Influenza – September 2017

associated with the most severe seasonal epidemics, often with paediatric deaths. Deaths in a healthy young adult and a child have occurred in 2017, along with a large number of deaths of elderly people. The 2017 epidemic has featured severe outbreaks in aged care facilities, in several states. The epidemic pattern needs to be analysed, accounting for variation in testing practices in the country and introduction of rapid testing in July 2017 in NSW hospitals. Rapid influenza diagnostic testing is useful in decision making for treatment purposes, but has limitations with test sensitivity compared to other standard methods of testing such as using RT-PCR or culture.(18)

Historically, more testing for influenza is conducted in Queensland, and there are differences in testing policies in paediatric hospitals between states, which could also bias surveillance data. There are some discrepancies such as higher notified deaths in the NNDSS data compared to 2016, but a lower estimated rate of death from influenza and pneumonia, as well as lower admission rates to ICU. The relative morbidity and mortality impact needs to be determined.

**Vaccine match and effectiveness:** The Australian influenza vaccine 2017 has a moderate to good match with circulating strains for the season.(1) World Health Organization Collaborating Centre for Reference and Research on Influenza (WHOCC) reported that A/H1N1pdm09 and B lineages have antigenic similarity with the vaccine strains, but there is some uncertainty with A/H3N2 due to technical issues.(1) Media reports suggest poor vaccine match and cite cases of influenza in vaccinated elderly people. It should be noted, however, that explosive outbreaks of influenza in highly vaccinated aged care facility populations have been well documented in the past,(19) and may reflect intensity of transmission within the closed setting of ACF, as well as lower immunity and immunosenescence in the frail elderly.(20) The field vaccine effectiveness for the season is not yet known.

**Antiviral supply and resistance:** During severe flu seasons, demand for antivirals increases, and a shortage of drugs due to increased demand was reported in the season.(21) Circulating strains were largely sensitive to NAIs.

**Health care, aged care and childcare:** Workers in healthcare, aged care and childcare can be a source of transmission of infectious diseases to vulnerable people in their care and to other staff. Immunisation is recommended for these occupational groups to prevent transmission of vaccine preventable diseases. Following a series of fatal aged care outbreaks in 2017, there is discussion about making influenza vaccination compulsory for workers in aged care facilities.(22, 23) Annual influenza immunisation rate in Australian HCWs varies widely,(24) and ranges 22-70%.(25) There are few data on vaccination rates in aged care workers, but rates are lower.(26) Mandating vaccination of ACF workers would be an international precedent. The NSW Ministry of Health introduced mandated health worker vaccination in 2007, with revision of the policy in 2011, but influenza vaccination was not included in this legislation, and remained recommended but not compulsory.(27) A mandated policy in aged care should be considered along with the healthcare and childcare settings, and should be informed by research and surveillance data from these settings. Such a policy should also be systematically evaluated after implementation for effectiveness.
Novel vaccination approaches for the elderly: Immunosenescence is a predictable decline in immunity, which begins around the age of 50 and continues in an exponential fashion with age. This results in lower immunogenicity of all vaccines in older people.(20) Strategies such as novel adjuvants, intradermal vaccination and high dose vaccines could improve immunogenicity in the frail elderly. A study from the United States has shown the effectiveness of high-dose influenza vaccine in adults aged 65 years and over, with approximately 36% reduction of influenza-related mortality in the study during the season where A/H3N2 was in circulation.(28) In aged care, there has been discussion of high dose influenza vaccine as a solution to overcoming immunosenescence.(29) However, until such alternatives are available, vaccinating with the available seasonal vaccine is important, as protection has been demonstrated in aged care even with an incomplete vaccine match.(30)

Key questions

- What is the match of the vaccine in 2017 to circulating strains?
- What is the field effectiveness of the vaccine in 2017?
- How much of vaccine escape (reflected in infections occurring in vaccinated elderly) is explained by immunosenescence and intensified transmission within aged care facilities, as opposed to true vaccine mismatch?
- How do we analyse biases in testing practices across the jurisdictions in the country and how this impacts surveillance data?
- What are the optimal vaccination strategies for preventing influenza in high-risk and vulnerable populations?
- What is the most effective and appropriate use of antivirals drugs for prophylaxis and treatment of infection?
- What are the ongoing policy implications of mandated vaccinations for aged care workers?
- Given bacterial infection is a common cause of death and serious illness following influenza, what more can we do to raise rates of pneumococcal vaccination in the elderly?
- As influenza infection is unpredictable in nature, how can we plan health care services in case of severe season or pandemic?
- Can surge capacity planning benefit from early prediction tools for seasonal severity of influenza?

References

6. THE AGE, Victoria. Calls for elderly to be given extra influenza
Influenza – September 2017


8. MacIntyre C, Moa AM. If there were a vaccine against acute myocardial infarction, would you use it? FUTURE CARDIOLOGY. 2017;13(5):415–8.


