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Pneumonia cluster in a boarding school – implications for influenza control

Patrick Cashman, Peter Massey, David Durrheim, Fakhrul Islam, Tony Merritt, Keith Eastwood

Abstract

Streptococcus pneumoniae is a common cause of community acquired pneumonia (CAP). Influenza infection increases susceptibility to *S. pneumoniae* infection in adults but this link is less well described in children. We report on an outbreak of CAP affecting 25 previously well adolescents in a New South Wales boarding school. *S. pneumoniae* 1 was confirmed in two cases. During this period, the school also experienced an influenza outbreak with an influenza-like illness attack rate peaking at 27% in Year 8 students. A planned school closure may have contributed to controlling the outbreak. Boarding schools are vulnerable to outbreaks of respiratory illness and strategies for limiting this risk are required. *Commun Dis Intell* 2007;31:296–298.

Keywords: *Streptococcus pneumoniae*, influenza, boarding school, school closure

Introduction

Streptococcus pneumoniae is the most common cause of community acquired pneumonia (CAP).[1] Institutionalisation is a risk factor for pneumococcal clusters but these have generally been described in the elderly.[2] Serotype 1 has been associated with severe pneumonia in otherwise healthy children, has a propensity for invasive disease and has caused outbreaks in institutions.[3] This serotype remains highly susceptible to antibiotic therapy.[4]

Influenza infection frequently precedes pneumococcal pneumonia in adults but this relationship is less well documented in children.[3] Influenza virus may increase susceptibility to invasive pneumococcal disease through destroying the physical respiratory barrier, increasing virus adherence, decreasing mucociliary activity and disrupting immune system responses.[5]

Influenza and invasive pneumococcal disease are notifiable by pathology laboratories in New South Wales under the *NSW Public Health Act 1991*.[6]

We report on a cluster of 25 cases of CAP in previously well adolescents attending a boarding school in rural New South Wales and discuss implications for influenza surveillance and control.

Cluster report

In August 2006, Hunter New England Population Health was notified by a paediatrician at a rural referral hospital of the admission of five male students with pneumonia from a secondary boarding school. Three were boarders and two were day students. All had presented with fever, lethargy, chest pain and cough, and had a typical lobar pneumonia on chest X-ray. They responded rapidly to intravenous penicillin. A broad range of zoonotic infections were considered and excluded. *Streptococcus pneumoniae* was identified from one of the student's blood cultures. None of the students reported any recent overseas travel.

Enquiries to local general practitioners and the school sick bay identified a recent large increase in respiratory presentations amongst students from this school. Ongoing surveillance identified a further 20 students with lobar pneumonia. Thus a total of 25 of 600 students at the school were diagnosed with pneumonia, two of whom had *Streptococcus pneumoniae* serotype 1 isolated from blood cultures. Fifteen of these children required hospital admission, eight students were diagnosed clinically by general practitioners and two were treated as outpatients by the hospital emergency department. All hospitalised cases responded rapidly to intravenous penicillin with a median hospital stay of three days.

The pneumonia cases in previously healthy adolescents occurred in an environment of widespread influenza infection. The surveillance identified large numbers of students at the school who were presenting to the school sick bay with upper respiratory tract infection (URTI) and influenza-like illness (ILI). Influenza A H3N2 was isolated from respiratory specimens collected from two hospitalised students with pneumonia and from three students presenting to the sick bay at school with ILI. Two unimmunised hospital staff caring for student inpatients with pneumonia were also subsequently diagnosed with influenza.

Public health responses included implementing a 'testing and treatment algorithm' at the Emergency Department for CAP presentations and involving the local public pathology provider in ensuring prioritisation of investigations related to the outbreak with appropriate referral to reference laboratories. Increased respiratory hygiene measures were implemented throughout the school with students actively encouraged to cover coughs and sneezes with tissues and then dispose of tissues in the garbage after use. Handwashing after coughing, sneezing or nose-blowing was also promoted by the school nurses and staff. Information about the outbreak was distributed to parents in the school newsletter with advice to keep students with symptoms at home. The school nurses facilitated the separation of students with symptoms to their homes.

Structured interviews with students with pneumonia and their parents were conducted to attempt to identify specific common exposures by place, time, recreational or school activity and boarding status. No specific shared risk factor was found other than being a student at the school. Boarding status was not a risk factor as the proportion of boarding and day students with pneumonia was similar to those proportions in the whole school student population. However in the earlier part of the outbreak, more cases of pneumonia were noted amongst boarding students. Students with pneumonia were resident in both school dormitories.

School year-specific attack rates were calculated by examining presentations for URTI and ILI to the school sick bay and general practice, and presentations of pneumonia to general practice and hospitals (Figure, Table). Fifty per cent of all students at the school presented with some form of respiratory symptom. ILI presentations at the school sick bay were highest amongst Year 8 students (27%) but affected all school years.

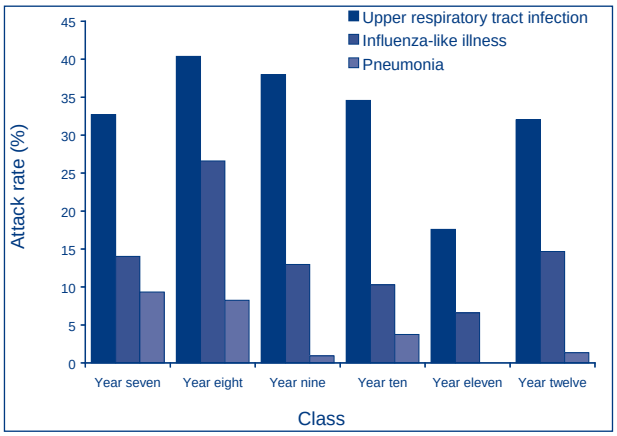
Discussion

Following the introduction of improved respiratory hygiene measures at the school and a pre-scheduled four day school closure, respiratory illness presentations to the sick bay decreased appreciably and returned to pre-outbreak levels within seven days of the school closure. This may indicate the success of social distancing in responding to respiratory outbreaks in institutions or may represent exhaustion of the influenza at-risk population.

Clusters of pneumonia in institutions amongst people of any age should alert clinicians to possible coinfection with influenza virus and *S. pneumoniae* and prompt appropriate laboratory investigations and notification to public health authorities.

Although influenza vaccination should primarily be targeted to traditionally high risk individuals, consideration should also be given to offering it in high-risk environments, including boarding schools.[7] The occurrence of influenza infection in hospital staff who cared for the children in this outbreak,

Attack rates for upper respiratory tract infection, influenza-like illness and pneumonia, August 2006, by year level for all students at the boarding school



	Year seven %	Year eight %	Year nine %	Year ten %
URTI	32.7	40.4	38.0	34.6
ILI	14.0	26.6	13.0	10.3
Pneumonia	9.3	8.3	0.9	3.7

All categories are exclusive.

adds weight to the current emphasis on protecting health staff and their patients with annual influenza immunisation.

Boarding schools, in common with other institutions where people live in close proximity, are vulnerable to outbreaks of respiratory illness. Strategies for limiting this risk are required and may include education on respiratory hygiene, guidelines for limiting overcrowding, consideration of annual influenza vaccination and guidelines for early detection and response to respiratory outbreaks.[8]

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