The management of community-acquired pneumonia

Pneumonia is a significant cause of mortality in children and older people, particularly among Māori and Pacific Peoples. In New Zealand, Māori are six times more likely to die from pneumonia than non-Māori. Prompt identification and treatment will enable patients with less-severe community-acquired pneumonia to be managed at home, reducing hospitalisation and mortality.

Waiho i te toipoto, kaua i te toiroa

Let us keep close together, not wide apart – MĀORI

The prevalence of community-acquired pneumonia

Community-acquired pneumonia is a common cause of hospital admission in adults in New Zealand, and has a reported mortality between 6.5% – 8%.[1] Pneumonia is three times more prevalent in Māori than in non-Māori, and Māori have a mortality rate (deaths per 100,000 population) from pneumonia six times greater than non-Māori.[1,2] Pacific peoples are also at an increased risk from pneumonia, compared to European New Zealanders.[3] Vaccines are available to prevent some forms of pneumonia, such as the Pneumovax 23 vaccine. However, the incidence of vaccine-preventable pneumococcal pneumonia in Māori and Pacific peoples is approximately three times higher than in other ethnicities, suggesting that access to these vaccines, or vaccine uptake, is lower in Māori and Pacific peoples.[1]

Certain risk factors for pneumonia are of importance in the New Zealand setting, particularly in children, when compared to other developed nations. Such factors include low socioeconomic status, poor nutrition, low birth weight, reduced rates of breastfeeding, exposure to tobacco smoke, lower housing quality (i.e. lack of insulation and heating, damp, mould, overcrowded conditions) and reduced access to primary healthcare.[4,5]

Hospital or community- acquired?

If a person has features that indicate pneumonia, and has been hospitalised for more than two days in the previous 90 days, they can be classified as having hospital-acquired pneumonia.[6] Depending on the clinical findings and the co-morbidities of the patient, referral to hospital may be indicated, for IV antibiotics and the identification of antibiotic-resistant organisms. The threshold for referral of a patient with hospital-acquired pneumonia should be considerably lower than for community-acquired pneumonia.

Pneumonia in children

The signs and symptoms of pneumonia in children

Children and infants with pneumonia present with a range of symptoms and signs, including:[7]

- Fever
- Tachypnoea (Table 1)
- Increased respiratory effort (e.g. in-drawing, accessory muscle use, grunting)
- Irritability, fatigue
- Difficulty feeding (infants)
- Dyspnoea, stridor or wheeze
- Cough (less common in infants)
- Pleuritic chest pain

Auscultatory signs are less frequently found in young children with pneumonia than in adults – a high fever, tachycardia, increased respiratory effort and rate may be the only signs.

Consider the possibility of alternative diagnoses, such as an inhaled foreign body in younger children.

Table 1: Tachypnoea in children based on age[8]

Age	Tachypnoea (breaths/minute)	Severe tachypnoea (breaths/minute)
< 2 months	> 60	> 70
2 – 12 months	> 50	> 60
> 12 months	> 40	> 50

Further investigations are not usually required in community care

Chest x-ray, laboratory investigations (e.g. full blood count and CRP), and microbiological testing are not routinely recommended for the investigation or confirmation of uncomplicated pneumonia in children in primary care.[8–10] Chest x-ray may be considered where a clinical diagnosis is difficult or unclear, the history is suggestive of foreign body aspiration or there are chest signs (e.g. dullness to percussion) that may suggest pleural effusion or collapse.[7]

When to refer children to hospital

The decision to refer children with pneumonia to hospital should be based on the history, clinical features, age and the presence of co-morbidities. Referral to hospital should be strongly considered for any child with one or more of the following:[8,10]

- Aged less than six months
- Drinking less than half their normal amount
- Oxygen saturation ≤92% on pulse oximetry
- Severe tachypnoea (Table 1), apnoea
- Increased respiratory effort
- Signs of fatigue
- Temperature < 35°C or >40°C
- Decreased breath sounds or dullness to percussion
- Where there is a concern that home-based care will not provide careful observation, compliance with treatment recommendations or follow-up if symptoms worsen

Management of community-acquired pneumonia at home

Pneumonia is usually caused by inhalation of micro-organisms from the upper respiratory tract.[1] *Streptococcus pneumoniae* is the most frequently identified pathogen in community acquired pneumonia world-wide and in New Zealand.[1–3] Other organisms include viruses (particularly respiratory syncytial virus, RSV, in infants), *Chlamydia pneumonia*, *Mycoplasma pneumoniae*, *Haemophilus influenza* and *Staphylococcus aureus*.

Antibiotics should always be prescribed to children with community-acquired pneumonia, even if a viral infection is suspected, as differentiating the pathology of pneumonia is difficult and a bacterial component may still be present even where a virus is the primary causative agent.[8] Treatment is empiric and not usually tailored to a specific organism. There are a wide range of pathogens responsible for community-

acquired pneumonia in children, so laboratory investigation is not routinely recommended as it isolates the pathogen in 2–50% of infections only.[8]

For children, first-line antibiotic choice is:[8]

- Amoxicillin 25 mg/kg, three times daily, for seven days

Atypical infections are uncommon in children aged under five years, but erythromycin may be used as an alternative in children aged over five years if treatment fails or if the infection is suspected to be atypical:

- Erythromycin 10 mg/kg, four times daily, for seven days

Maintaining adequate hydration is important and parents/caregivers should be instructed on how to do this (i.e. frequent intake of small amounts). Paracetamol may be used for analgesia particularly if there is pleuritic chest pain that may result in shallow breaths or prevent coughing.

Follow-up after treatment

Most children with pneumonia show improvement within 24 – 48 hours of antibiotic treatment and continue to improve over time. Children who have persistent symptoms should, however, be reviewed as cough and mild shortness of breath on exertion may persist for several weeks. Children who had atelectasis on a chest x-ray at the time of initial diagnosis should have a follow-up chest x-ray at six weeks and be referred to a paediatrician if the collapse has not resolved.[8]

Pneumonia in adults

The signs and symptoms of pneumonia in adults

Although adults with pneumonia may often present with symptoms and signs specific to the chest, they may also present with less specific and more varied respiratory and systemic symptoms. Symptoms and signs can therefore include:[7]

- Cough
- Fever (>37.8°C)
- Tachypnoea (>25 breaths/minute)
- Tachycardia (>100 beats/minute)
- Dyspnoea
- Sputum production
- Pleuritic chest pain
- Focal signs on auscultation such as bronchial breathing, coarse crepitations and vocal fremitus, and dullness to percussion
- Rigors, night sweats
- Myalgia, fatigue
- Confusion
- Gastrointestinal symptoms, e.g. nausea

In the absence of sore throat and rhinorrhoea, symptoms such as fever, cough, sputum production, dyspnoea and pleuritic chest pain are strongly suggestive of pneumonia, however, older patients have an increased likelihood of presenting with confusion and a reduced likelihood of fever and cough.[9, 11]

Also consider the possibility of alternative diagnoses such as lung cancer, bronchiectasis, COPD, pleural effusion and tuberculosis.

Further investigations are not usually required in community care

Chest x-ray, laboratory investigations (e.g. full blood count and CRP) or microbiological testing is not routinely required in a community-care setting.[9, 10, 12] Chest x-ray is recommended when: the diagnosis is unclear or difficult, there is dullness to percussion or other signs of an effusion or collapse and when the likelihood of malignancies is increased, such as in a smoker aged 55 years.[9]

When to refer to hospital

The decision to refer patients to hospital should be based on their clinical features and the presence of co-morbidities. There is a lower threshold for referral for patients aged over 65 years. Referral to hospital should be strongly considered for any patient with one or more of the following features:[11]

- Co-morbidities, such as cardiac failure, renal or hepatic impairment
- Altered mental state (confusion)
- Pulse rate > 125 beats per minute
- Respiratory rate > 30 breaths per minute
- Oxygen saturation level ≤ 92%
- Systolic blood pressure < 90 mmHg or diastolic blood pressure <60 mmHg
- Temperature < 35°C or >40°C
- Where there is a concern that home-based care will not provide careful observation, compliance with treatment recommendations or follow-up if symptoms worsen

The decision to refer can be aided by pneumonia-specific algorithms, such as the CRB-65 score. The score is based on the presence of confusion, raised respiratory rate, low blood pressure and the age of the patient.[10]

For further information on pneumonia algorithms visit: **www.brit-thoracic.org.uk/guidelines/pneumonia-guidelines.aspx**

The management of pneumonia in adults

All people with suspected pneumonia should be prescribed antibiotic treatment, even where viral aetiology is suspected.

For adults first-line antibiotic choice is:[13]

- Amoxicillin 500 mg – 1 g, three times daily, for seven days

For suspected atypical infections, or if the patient has not improved within 24 – 48 hours, erythromycin (or roxithromycin), or doxycycline should be added to amoxicillin:

- Erythromycin ethyl succinate 400 mg, four times daily, for seven days (twice daily dosing may also be used– half the daily dose is given every twelve hours)
- Roxithromycin 300 mg, as a single daily dose or 150 mg twice daily, for seven days
- Doxycycline 200 mg stat then 100 mg once per day

For people with an allergy to penicillin, erythromycin or roxithromycin can be used first-line.

Doxycycline or amoxicillin clavulanate are appropriate choices if post viral/influenza pneumonia is suspected, to provide coverage for *S. aureus*.

Patients should be advised to stay hydrated and to use analgesia for chest pain or sore throat, as required. Antitussive preparations are unlikely to be beneficial.[15]

Follow-up after treatment

Patients with pneumonia who do not show signs of improvement within 48 hours of beginning treatment should have their antibiotic treatment broadened or be referred to hospital.

Adults should ideally be reviewed six weeks after treatment. In patients with poor clinical recovery, chest x-ray should be considered to rule out underlying malignancy.[11] People with pneumonia aged over 50 years who smoke should also be assessed for the possibility of underlying malignancies. This includes assessment for any clinical features of lung cancer, arranging a chest x-ray once antibiotic treatment has been initiated and a follow-up x-ray at six weeks.[7] Smoking cessation advice should be offered.

Immunisation should be offered to people at risk of pneumonia

Three vaccines are available in New Zealand to prevent some forms of pneumonia.

All children should receive four funded doses of the 10-valent pneumococcal vaccine PCV10 Synflorix at ages six weeks and three, five and fifteen months, as per the New Zealand Immunisation Schedule.[15] The 13-valent vaccine, PCV13 Prevenar 13, is used for children at high-risk of complications, followed by the 23-valent vaccine, 23PPV Pneumovax 23, after age two years.[15] Vaccination with PCV13 and 23PPV is funded for high-risk children aged under five years and for all people with functional or anatomic splenectomy. For all other high-risk people, vaccination is recommended, but not funded.[15] N.B. South Canterbury DHB is offering funded pneumococcal vaccine to people aged over 65 years at high risk.

Children at high risk include those with the following conditions:

- On immunosuppressive treatment or radiation therapy
- Primary immune deficiencies
- HIV
- Renal failure or nephrotic syndrome
- Organ transplants
- Cochlear implants or intracranial shunts
- Chronic CSF leaks
- On corticosteroid therapy for more than two weeks, at daily prednisone dose of ≥2 mg/kg or a total dose ≥ 20mg
- Pre-term infants, born at under 28 weeks gestation
- Chronic pulmonary disease (including asthma treated with high dose corticosteroid therapy)
- Cardiac disease with cyanosis or failure
- Insulin dependent diabetes
- Down syndrome

Adults aged over 65 years and those at increased risk of complications from pneumonia should receive the vaccine Pneumovax 23. The duration of effectiveness is not known for Pneumovax 23, although seroconversion is likely to be less in people with immune deficiencies and some co-morbidities. Healthy people aged over 65 years generally only require a single dose but those at high risk should receive a second dose three to five years after their first dose*.

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Adults at a higher risk of pneumococcal disease include those:[15]

- With functional or anatomic asplenia, e.g. sickle cell disease, splenectomy
- With a chronic illness, e.g. congestive heart failure, cardiomyopathies, chronic obstructive pulmonary disease, asthma, bronchiectasis, diabetes, chronic liver disease, or nephrotic syndrome
- Who are immunocompromised or are taking immunosuppressive treatment, e.g. HIV infection, congenital immunodeficiency, haematologic and solid tumors, radiation therapy, and organ or bone marrow transplantation
- With a cerebrospinal fluid leak
- With cochlear implants or intracranial shunts

For further information see: "Pneumococcal vaccine for adults: Pneumovax 23", BPJ 35 (April, 2011).

The seasonal influenza vaccine is also recommended for people at high risk, to help to prevent post-viral pneumonia or pneumonia secondary to influenza. Funded vaccination for eligible people has now been extended to 31 August, 2012.

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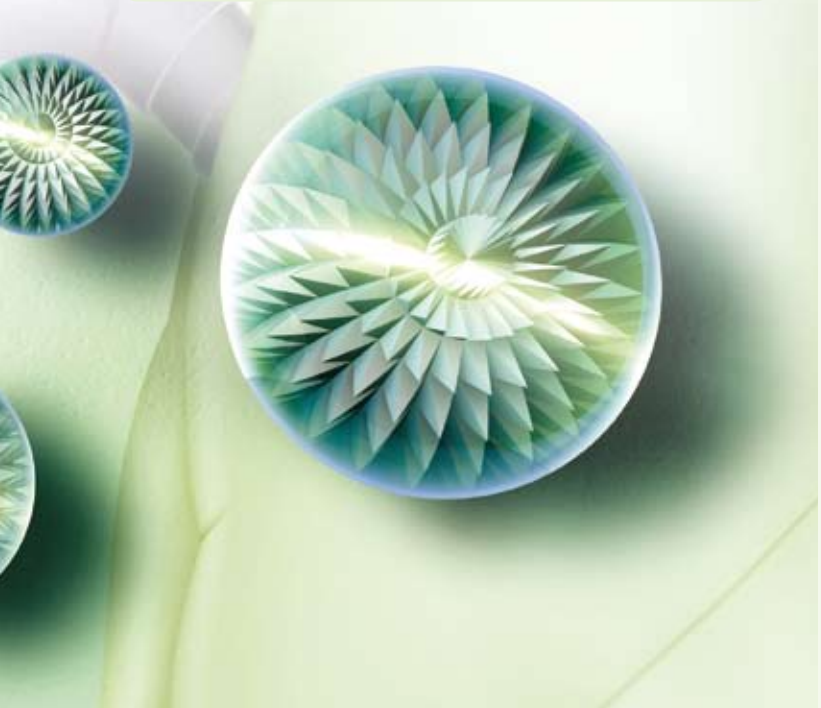

References

1. Chambers S, Laing R, Murdoch D, et al. Māori have a much higher incidence of community-acquired pneumonia and pneumococcal pneumonia than non-Māori: findings from two New Zealand hospitals. NZ Med J. 2006;119(1234):1978.
2. Ministry of Health. Respiratory disease (50 + years). MOH: Wellington, New Zealand; 2012. Available from: www.health.govt.nz (Accessed July, 2012).
3. Drinkovic D, Wong G, Taylor S, et al. Pneumococcal bacteraemia and oppurtunities for prevention. NZ Med J. 2001;114:326–8.
4. Grant C, Pati A, Tan D, et al. Ethnic comparisons of disease severity in children hospitalised with pneumonia in New Zealand. J Pediatr Child Healt. 2001;37:32–7.
5. Grant C. Pneumonia in children: Becoming harder to ignore. NZ Med J. 1999;112:345–7.
6. Falcone M, Venditti M, Shindo Y, Kollef MH. Healthcare-associated pneumonia: Diagnostic criteria and distinction from community-acquired pneumonia. Int J Infect Dis. 2011;15(8):545–50.
7. Clinical Knowledge Summaries (CKS). Chest infections - adult. CKS; 2010. Available from: www.cks.nhs.uk/chest_infections_adult/ (Accessed July, 2012).
8. Harris M, Clark J, Coote N, et al. British Thoracic Society guidelines for the management of community acquired pneumonia in children: update 2011. Thorax. 2011;66(Suppl 2):1 –23.
9. Bradley J, Byington C, Shah S, et al. The management of community-acquired pneumonia in infants and children older than 3 months of age: Clinical practice guideline by the Pediactric Infectious Diseases Society and the Infectious Disease Society of America. IDSA Guidelines; 2011. Available from: www.idsociety.org (Accessed July, 2012).
10. Pogson Z, Lim W. Pneumonia: an update on diagnosis and management. BMJ Learning; 2012. Available from: learning.bmj.com/learning.html (Accessed July, 2012).
11. Stocks N, Turnidge J, Cockett A. Lower respiratory tract infections and community acpuired pneumonia in adults. Aus Fam Physician. 2004;33(5):297–301.
12. Levy M, Jeune I, Woodhead M, et al. Primary care summary of the British Thoracic Society Guidelines for the management of community acquired pneumonia in adults: 2009 update. Primary Care Respir J. 2010;19(1):21–7.
13. New Zealand Formulary. New Zealand Formulary. NZF; Dunedin, NZ; 2012. Available from: nzformulary.org (Accessed July, 2012).
14. Chang C, Cheng A, Chang A. Over-the-coutner (OTC) medications to reduce cough as an adjunct to antibiotics for acute pneumonia in children and adults (Review). Cochrane Database of Syst Rev 2012. 2012;(2):CD006088.
15. Ministry of Health. Immunisation Handbook 2011. MOH: Wellington, New Zealand; 2011. Available from: www.health.govt.nz (Accessed July, 2012).