POSITION STATEMENT

Bronchiectasis in Indigenous children in remote Australian communities

Anne B Chang, Keith Grimwood, E Kim Mulholland, Paul J Torzillo, for the Working Group on Indigenous Paediatric Respiratory Health

Bronchiectasis is a progressive disease process characterised by dilated, thick-walled bronchi caused by chronic bacterial or viral infection and inflammation. It is now rarely encountered in developed countries, except in patients with cystic fibrosis (CF), or in association with other underlying causes such as ciliary dyskinesia, immune deficiency or focal lung abnormalities. In contrast, bronchiectasis remains common among Indigenous populations, involving 1%–2% of all children, with symptoms frequently dating back to infancy.1,2

The burden of ill-health from respiratory disease among Indigenous Australians is significant.3 Respiratory disease is the commonest preventable, defined cause of infant deaths,4 the most common disorder in children aged under 5 years in Northern Territory hospital morbidity data,5 and the second-highest cause of death among adults. The true prevalence of bronchiectasis and associated respiratory illness in Indigenous children in Australia is unknown, but is likely to be disproportionately high in rural and remote communities. A recently completed central Australian study estimated the rate of bronchiectasis (confirmed by high-resolution computed tomography [HRCT])6,7 in children aged under 15 years as 147 per 10 000 Aboriginal children (unpublished data), a rate 40-fold greater than that for CF in non-Indigenous populations (35 per 100 000).8 However, there are no programs or resources to manage these patients, and even a perception that “nothing can be done” — similar to the situation that existed for patients with CF several decades ago.

Consequently, the Working Group on Indigenous Paediatric Respiratory Health developed consensus recommendations. The consensus process is summarised in Box 1, our recommendations are listed in Box 2 and research goals in Box 3. The recommendations were conditioned by the current incomplete knowledge of the aetiology and disease mechanisms of bronchiectasis, and a lack of large randomised-controlled trials able to detect clinically significant differences for interventions in non-CF bronchiectasis. These limitations were most apparent in children. For these reasons, the consensus recommendations are based on the best available evidence, including extrapolation from studies in CF patients.

Early detection (Box 2, Objective A) Diagnosis

The clinical case definition of bronchiectasis is imprecise and its severity and extent is highly variable, ranging from mild respiratory morbidity to death. Symptoms suggestive of the disease are listed in Box 2. Chest radiographs are relatively insensitive, one study detecting fewer than 50% of patients with bronchography-proven bronchiectasis.9 Peribronchial fibrous thickens bronchial walls so that they are seen as
The principal aims of investigations in children with suspected bronchiectasis are to confirm the diagnosis, to define the distribution and severity of airway involvement, and to identify familial and treatable causes of bronchiectasis. Chest HRCT should identify congenital lesions and determine the extent and severity of disease. Lung function tests are non-specific, but in older children provide a measure of functional impairment and small-airways involvement. Other investigations include sputum culture for bacteria and mycobacterial species, sweat testing (although CP is extremely rare in Aboriginal children), Mantoux testing, immune function assessment (differential white-cell count, HIV, immunoglobulins G, A, M, E and IgG subclasses, antibody responses to protein and polysaccharide antigens) and nasal cilia biopsy (C2) (although transient abnormalities). The nasopharyngeal spaces of Indigenous Australian children are heavily colonised by potential respiratory tract bacterial pathogens, and the attack rates of recurrent bronchitis or pneumonia, atelectasis is present in the initial radiograph, or a chronic cough (>4–6 weeks) is suspected, a chest radiograph is performed 6–8 weeks after treatment to ensure complete radiological resolution (C2).

2: Recommendations

Objective A: To encourage early diagnosis of bronchiectasis

- Bronchiectasis should be suspected in any child with recurrent lower respiratory tract infection, prolonged moist-sounding cough, exertional dyspnoea, symptoms of reactive airways disease, growth failure, hypertension of lungs, chest deformity or digital clubbing (C1).

- For prompt detection of bronchiectasis, all Indigenous children with radiologically proven pneumonia should undergo clinical review (C1). If the child is aged 2 years, has a history of recurrent bronchitis or pneumonia, atelectasis is present in the initial radiograph, or a chronic cough (>4–6 weeks) is suspected, a chest radiograph is performed 6–8 weeks after treatment to ensure complete radiological resolution (C2).

- When, despite treatment, radiological changes persist for more than 3 months, or when symptoms and/or signs suggest the presence of bronchiectasis, chest high-resolution computed tomography scans should be performed in the non-acute state (C1).

Objective B: To optimise medical management to reduce morbidity and preserve lung function

- Management following CF models of care is recommended (C2). Exacerbations are treated with antibiotics determined by sputum bacteriology (E3). Treatment duration of 2–6 weeks is defined by the child’s general health, the amount of sputum and the pathogen cultured (E3). When respiratory secretion collection is not possible, empirical antibiotic therapy is directed at pathogens commonly associated with bronchiectasis (C2).

- Children with bronchiectasis should be reviewed 3-monthly by the most appropriate local doctor, in consultation with other healthcare providers, and have a minimum 6-monthly review by a paediatrician or respiratory physician (C2).

- Immunisation status should be reviewed and updated (C1).

Objective C: To promote public health issues and healthcare delivery

- Exposure to wood smoke and environmental tobacco smoke should be minimised (E3).

- A culture- and expertise-appropriate healthcare delivery model and a coordinated approach among various healthcare providers should be used (C1).

- The socioeconomic determinants of health must be recognised (C1).

Position Statement

1: Consensus process

The working group comprised 44 representatives from Australian and New Zealand medical schools, secondary and tertiary paediatric centres (see Acknowledgements). Collectively, the group possessed expertise in Indigenous health, paediatric and respiratory medicine, microbiology, infectious diseases and public health. MEDLINE databases were searched from January 1966 to November 2001 for subject headings (bronchiectasis, bronchitis, suppurative lung, suppurative respiratory disease) and the Cochrane database was also accessed using these headings. Review of references led to identification of relevant articles published before 1966, while experts in the working group identified unpublished data. The first draft of the working group’s consensus statement followed a two-day meeting in Alice Springs in August 2001, where the available evidence was presented and reviewed. Suggested revisions were incorporated into subsequent drafts, so that the final draft represents all relevant evidence obtained by the literature search, in conjunction with final consensus recommendations annotated to reflect the level of consensus among the entire group.

- **C1:** Complete consensus of entire working group
- **C2:** Near-complete consensus (95% or more of working group)
- **C3:** No consensus

C3: No consensus
C2: Near-complete consensus (95% or more of working group)
C1: Complete consensus of entire working group

Position Statement

2: Recommendations

Objective A: To encourage early diagnosis of bronchiectasis

- Bronchiectasis should be suspected in any child with recurrent lower respiratory tract infection, prolonged moist-sounding cough, exertional dyspnoea, symptoms of reactive airways disease, growth failure, hyperventilation of lungs, chest deformity or digital clubbing (E3). Under-reporting of cough is common and obtaining additional medical information from the local community (clinic staff, notes, carers, health workers) is important (C1).

- For prompt detection of bronchiectasis, all Indigenous children with radiologically proven pneumonia should undergo clinical review (C1). If the child is aged 2 years, has a history of recurrent bronchitis or pneumonia, atelectasis is present in the initial radiograph, or a chronic cough (>4–6 weeks) is suspected, a chest radiograph is performed 6–8 weeks after treatment to ensure complete radiological resolution (C2).

- When, despite treatment, radiological changes persist for more than 3 months, or when symptoms and/or signs suggest the presence of bronchiectasis, chest high-resolution computed tomography scans should be performed in the non-acute state (C1).

Objective B: To optimise medical management to reduce morbidity and preserve lung function

- Management following CF models of care is recommended (C2). Exacerbations are treated with antibiotics determined by sputum bacteriology (E3). Treatment duration of 2–6 weeks is defined by the child’s general health, the amount of sputum and the pathogen cultured (E3). When respiratory secretion collection is not possible, empirical antibiotic therapy is directed at pathogens commonly associated with bronchiectasis (C2).

- Children with bronchiectasis should be reviewed 3-monthly by the most appropriate local doctor, in consultation with other healthcare providers, and have a minimum 6-monthly review by a paediatrician or respiratory physician (C2).

- Immunisation status should be reviewed and updated (C1).

Objective C: To promote public health issues and healthcare delivery

- Exposure to wood smoke and environmental tobacco smoke should be minimised (E3).

- A culture- and expertise-appropriate healthcare delivery model and a coordinated approach among various healthcare providers should be used (C1).

- The socioeconomic determinants of health must be recognised (C1).
examination for aspiration, are recommended (C1). The extent of investigations has to be considered on an individual basis for children from remote communities (C1).

**Management (Box 2, Objective B)**

Without adequate data to guide management of non-CF bronchiectasis, a similar approach to the management of CF21,22 (and ciliary dyskinesia23) is recommended (C2). However, it is uncertain whether CF patients, with their multiorgan involvement, exaggerated airway inflammatory responses and accelerated disease progression, serve as the best model of care for those with bronchiectasis from other aetiologies. In addition, the respiratory pathogens involved only partially overlap.21

Management of bronchiectasis involves aggressive treatment of recurrent exacerbation, promotion of mucociliary clearance (chest physiotherapy, exercise, etc), a vigilant approach to reduce lung damage from other causes (eg, aspiration), promotion of normal growth, management of psychosocial aspects, and identification and treatment of complications as they arise.21,25 Other aspects include regular review, optimising nutrition, maintenance of immunisation and avoidance of environmental toxins, including passive smoke exposure.

**Treatment of infection**

**Mechanism of bronchial injury**

It is hypothesised that, in some children, impaired mucociliary clearance after severe or recurrent acute lower respiratory tract infection allows development of endobronchial infection by microaspiration of nasopharyngeal bacteria,24 inflammation and progressive bronchial wall injury. Recurrent inflammation may impair lung growth as well as accelerate respiratory function decline.26,27

**Infective organisms**

There are no published data on organisms that colonise and cause exacerbations in Indigenous Australian children with bronchiectasis. Haemophilus influenzae, Stenotrophomonas maltophilia and Moraxella catarrhalis, bacteria that colonise the nasopharynx, cause lower respiratory tract infections and are associated with bronchiectasis in other Indigenous populations.5,13 Unlike in CF,28 Staphylococcus aureus is uncommon, and opportunistic pathogens like Pseudomonas aeruginosa are usually only found in the sputum of older patients with advanced disease.29,30 Sputum cultures may be contaminated by upper-airway organisms and antibiotics should be directed against anticipated pathogens. More invasive testing, for example by induced sputum or bronchial lavage, should be considered if symptoms persist (C2).

**Antibiotic therapy**

When bronchiectasis is mild, antibiotics may eradicate the infection, and lung defences keep the airways sterile or bacterial numbers low for prolonged periods.21 If airway injury is more severe, the bronchi are chronically infected and symptoms may rapidly return. However, apart from studies on chronic P. aeruginosa infection in adults with CF, there are no studies to show that long-term antibiotics prevent disease progression.28 It is for this reason, and the risk of selecting resistant organisms, that interval rather than suppressive antibiotic therapy is recommended (C1).

Children with a chronic moist-sounding cough should receive antibiotics such as amoxycillin–clavulanate (or high dose amoxycillin, co-trimoxazole, cefalexin) for 2–6 weeks or until the cough resolves (C1). If the cough does not improve, the patient requires specialist reassessment or hospitalisation, particularly if there is a deterioration in general health, weight loss, reduced lung function or new radiographic infiltrates (C2). Inpatient management includes parenteral antibiotics, such as ampicillin, cefotaxime or ceftriaxone, and intensive physiotherapy (C1). When P. aeruginosa is present, ciprofloxacin or combined therapy with an antipseudomonal β-lactam and an aminoglycoside is preferred (C1). Given the lack of resources in their communities, Indigenous children with moderate or severe bronchiectasis are more likely to require hospitalisation (C2).

Antibiotics in adults with bronchiectasis significantly improve quality-of-life measures,31,32 and airway and systemic inflammatory profiles13,33 Similar information in children is lacking, and there are no data evaluating the effects of long-term antibiotics on acquisition of antibiotic-resistant pathogens.

**Other measures**

Reactive airways disease can be present in children with bronchiectasis,19 and the use of asthma medications should
be individualised (C1). There are insufficient data to recommend the regular use of inhaled or oral corticosteroids, β₂-agonists, mucolytics or methylxanthines in patients with bronchiectasis.

Chest physiotherapy

Chest physiotherapy improves airway clearance, but the best method is yet to be defined. Although there are no controlled studies, it may be recommended in those who have passed puberty when bronchiectasis is focal and medical therapy has failed47 (C1).

Regular review

Regular review aims to optimise lung growth, minimise respiratory decline, improve quality of life and provide health education (C1). The review should include measurement of pulmonary function (for children aged 6 years or over), assessment and management of pulmonary deterioration and infective exacerbations (spurt and cough changes, exertional dyspnoea), management of complications of bronchiectasis (pulmonary hypertension, chronic hypoxaemia, poor growth, sleep disturbance, reactive airways disease, haemoptysis) and a review of contributory factors (eg, gastro-oesophageal reflux, asthma, environmental smoke exposure). As with successful COPD models,32,33 a multidisciplinary approach with nursing and allied health expertise (social work, physiotherapy, dietitian) is used.34 This requires appropriate health resources and adequate systems that support specific management plans for children and carers (C2). If individualisation of management protocol is important, with a leader selected from the team to take responsibility for each child (C2).

Vaccination

Immunisation programs should include vaccination against pneumococcus and influenza, in addition to the routine childhood vaccination schedule (C1). Future vaccine development may allow the introduction of vaccines that protect against non-type b and non-typable strains of H. influenzae, M. catarrhalis and respiratory syncytial virus.

Public health issues and healthcare delivery (Box 2, Objective C)

These extremely important topics cannot be adequately covered in this article. In brief, health is closely linked to socioeconomic factors.35 Successful management and prevention of bronchiectasis among Indigenous populations will only be achieved by delivering comprehensive health-care, accompanied by improvements in housing, nutrition and education, and by alleviation of poverty and unemployment (C1).

The effects of in-utero and ex-utero exposure to environmental tobacco smoke on children’s respiratory system include reduced lung function, increased acute lower respiratory tract infection, and middle-ear disease48 (E3). Indoor wood smoke increases acute lower respiratory tract infection, demonstrating an exposure-response effect49 (E3). Interventions to reduce environmental tobacco smoke and biomass smoke exposure are urgently needed. The association between maternal education and childhood health indices in developing nations50 has not been shown to occur in the Australian Indigenous population. An increased risk of acute lower respiratory tract infection is associated with greater numbers of house occupants, damp housing, macronutritional inadequacy, and inadequate water supply51,52 (E3).

No single model of healthcare delivery can be used for all Indigenous communities. A comprehensive and competent primary healthcare service is a prerequisite for the effective delivery of any treatment and disease control program. Education of primary healthcare providers to identify appropriate children for referral and primary management of children with bronchiectasis would be beneficial (C2).

The challenge for health service systems is to find ways to deliver effective, competent and quality healthcare despite problems that include remoteness, endemic poverty, severe educational disadvantage, dysfunctional communities, and extreme comorbidities in both children and their carers.

Conflict of interest

None identified.

Acknowledgements

The workshop was sponsored by the Alice Springs Hospital Management Board, Abbott Australasia, GlaxoSmithKline Australia, Bayer Australia, the Centre for Remote Health, and Flinders University Northern Territory Clinical School. Participating/contributing members of the Indigenous health respiratory workshop were: A Abdo† (Edithvale Private Hospital); B Cranston† (Newcastle Hospital); J Edwards* (Australian Council on Smoking and Health). (Princess Margaret Hospital); D Lehmann* (TVW Telethon Children’s Institute, Perth); R Lim† (general practitioner and member of NT parliament); Auckland: M/ A Horsley; B Wyman (St John’s Children’s Hospital). Darwin: D McQueen (Royal Darwin Hospital). Sydney: J Morton† (Sydney Children’s Hospital); P Bower* (Royal Children’s Hospital). Wellington: K Mulholland*; F O’Phila*, P J Robinson*, J Massey† (Royal Children’s Hospital). Newcastle: J Scott† (John Hunter Hospital). Perth: L Landau*, P Nil Suwał† (University of Western Australia); P Syl*, S Slock† (Princess Margaret Hospital); D Lamell† (TWA Nontion Children’s Inادات, Perth); R Edwards† (Australian Council on Smoking and Health). Sydney: P Mchugh†, E Meldert†, P van Appen† (Children’s Hospital at Westmead, Sydney); J Henderson† (Sydney Children’s Hospital); P J Nicol† (Royal Prince Alfred Hospital); and Rignoysen Health Council). Wellington: K Grimwood* (Wellington School of Medicine and Health Sciences).

*Attended meeting and/or presented data and contributed to document. †Contributed to and/or supported document.

References

20 Common Problems: Geriatrics

This user-friendly guide is packed with practical solutions to the problems you face daily, and answers the most common health problems seen in the elderly from:

• Constipation and skin disorders to memory loss, dizziness, and prostate problems;
• Practical guidance on caregiver issues, polypharmacy, advance directives, end-of-life medicine;
• Illustrated with quick reference charts, useful algorithms and easy-to-digest analyses of diagnostics.

"AMA members receive a 10% discount."

For further information contact AMPCo: Ph 02 9562 6666 • Fax 02 9562 6662
Email: sales@ampco.com.au • www.aims.com.au/public/20rooms/