

**BEST PRACTICE EVIDENCE BASED  
GUIDELINE**

**WHEEZE AND CHEST INFECTION  
IN INFANTS UNDER 1 YEAR.**

**2005**



**PAEDIATRIC SOCIETY OF NEW ZEALAND**

**HEALTH OF OUR CHILDREN: WEALTH OF OUR NATION**

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## **STATEMENT OF INTENT**

*Clinical guidelines are produced to assist health professionals and consumers make decisions about health care in specific clinical circumstances. Research has shown that if properly developed, communicated and implemented, guidelines can improve care. While guidelines represent a statement of best practice based on the latest available evidence (at the time of publishing), they are not intended to replace the health professional's judgment in each individual case.*

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**This Guideline has a currency of 3 years from date of publication unless superseded.**

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As this guideline was developed by the Paediatric Society under contract with the Ministry of Health the review of the guideline remains the responsibility of the Ministry.

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## ENDORSEMENTS

Endorsements for this guideline were received from:



Endorsed by NZGG as an evidence-based guideline



## ACKNOWLEDGEMENTS

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The guideline team thanks Susan Bidwell of NZHTA for her work and advice. Thanks also to Catherine Marshall and Rowena Cave of NZGG for their support and advice in developing this guideline and to Professor David Holdaway and Carolyne Smith for their assistance with editing.

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## **PURPOSE**

This guideline addresses lower respiratory tract infection, pneumonia, bronchiolitis, and persistent and recurrent wheeze in infants over one month and aged less than 1 year.

The guideline summarises the latest international literature and combines this with New Zealand expertise. The purpose is to assist informed decision making by parents/caregivers and their health care providers in order to improve the health outcomes for infants with wheeze and chest infection.

Excluded from the guideline are croup and whooping cough.

The guideline does not address:

- respiratory disorders in neonates
- the management of infants with chronic lung disease
- other chronic cardio-respiratory conditions
- immunodeficiency
- high dependency unit management.
- intensive care management

## **ABOUT THE GUIDELINE**

### **FOREWORD**

The Paediatric Society of New Zealand Inc (PSNZ) is a not-for-profit charitable organisation. It was founded in 1947 in recognition of the special developmental and health needs of children. Until 2000 it remained largely a professional support organisation for paediatricians. In 2000 it moved to become a multidisciplinary organisation in recognition of the crucial role played by all groups of child health professionals in achieving its mission. PSNZ is committed to improving the health of children and young people. As a multi-disciplinary Society we are able to develop and influence pathways for improvement.

#### **“HEALTH OF OUR CHILDREN: WEALTH OF OUR NATION”**

#### **The PSNZ is a national organisation working to:**

- be consistent with the UN Convention on the Rights of the Child
- advocate for the health, well-being and social environment of children and young people
- plan for the development of all aspects of child and young person’s health care and consider how services inter-link with each other
- promote quality health care and disease prevention initiatives for children and young people
- establish standards, guidelines and position statements
- provide and publish information for health care professionals and the public on matters that concern the health and welfare of children and young people

## INTRODUCTION

Lower respiratory tract infection is the commonest reason for consultation and admission for the under 1 year old<sup>5</sup>. It usually presents as cough and/or wheeze and occurs most frequently in the winter months. Diagnosis and assessment of severity are more difficult in this age group. There is evidence that there is extensive use of inappropriate medications (particularly asthma medications). The majority of infants are cared for by primary care, a significant number are managed by secondary care and a small number by tertiary care.

A comparison of the management of bronchiolitis across 5 New Zealand hospitals found significant variation in practice. Overall, 34% of admitted infants were prescribed antibiotics, 42% received bronchodilators and 60% had a chest radiograph. There is the potential for significant cost savings by reducing the number of chest radiographs and the unnecessary prescribing of antibiotics and bronchodilators<sup>24</sup>.

Criteria for diagnosis, referral and investigation are not agreed on or readily available for this age group, although some services have guidelines for the inpatient management of bronchiolitis and guidelines for the management of asthma in older children. It is acknowledged that in this age group there is a difficulty of diagnostic certainty and there is an imperative for the early treatment of bacterial infections, which is why we chose to tackle this problem by a symptom rather than a diagnosis approach.

### Gaps between Current Practice and Evidence

<b>Current Practice</b>	<b>Guideline-identified Best Practice</b>
Inadequate recording of severity.	Consistent documentation.
Frequent use of bronchodilators for bronchiolitis.	Bronchodilators not indicated.
Antibiotic use in bronchiolitis.	Antibiotics not indicated.
Overuse of CXR in bronchiolitis and pneumonia.	Routine CXR not indicated for bronchiolitis and community acquired pneumonia.
High use of inhaled cortico steroids for infants with recurrent wheeze.	Inhaled cortico-steroids not indicated in infants < 1 year.

Thus some aspects of current practice are not supported by our review of the evidence. Changes in prescribing patterns after the publication of this guideline could be measured and provide a partial basis for the evaluation of the implementation of this guideline.

### How much effort will it take to close the gap?

A major difficulty for practitioners is that there is no specific effective treatment for viral respiratory illness. To assist practitioners and increase parental awareness, a multi-dimensional educational programme for health professionals to encourage appropriate evidence-based practices for diagnosis, treatment and referral of infants who wheeze will be required, along with the development of parental education packages.

**Is there a reasonable likelihood that the recommended changes could be implemented?**

The recommendations in this guideline represent a significant change in practice. Their successful implementation will result in a reduction in:

- chest x-rays
- blood testing including blood cultures
- use of drugs

Health education measures which lead to an increase in breast feeding and in smoke free environments will provide protection against lower respiratory tract infections.

The guideline development team believes that the recommendations in this guideline can bring about a significant improvement in the care and treatment of infants with wheeze and/or chest infection. This confidence is supported by our previous experience with the planned, evidence-based implementation programme in both community and hospital care of the Guideline for the Management of Cough and Wheeze in the First Year of Life. (South Auckland Health and South-Med Independent Practitioners Association Auckland 2001)

The South Auckland experience was an example of a successful integrated care project. (Appendix B)

Primary care management changed to follow recommended best practice more closely. This experience also demonstrated the need for specific advice to parents, especially first time parents.

**Suggested measures of best practice include:**

- proportion of infants with bronchiolitis undergoing CXR
- proportion of infants with bronchiolitis receiving bronchodilators
- proportion of infants with bronchiolitis receiving antibiotics
- recording of passive smoke exposure for infants with bronchiolitis and pneumonia

## GUIDELINE DEVELOPMENT PROCESS

In 2001 the PSNZ received a contract from the Ministry of Health requiring various outputs including the development of evidence based guidelines for common conditions. The Society undertook an internal prioritisation process and the guideline for the management of wheezing and chest infection in infancy was identified as one of the five to be developed.

A review of recent guidelines was undertaken for their appropriateness for infants and young people. These included:

Guideline for the Management of Cough and Wheeze in the First Year of Life. South Auckland Health and South-Med Independent Practitioners Association Auckland (2001)

A Clinical Guideline for the Management of Children Presenting with Acute Breathing Difficulty. Paediatric Accident and Emergency Research Group, Nottingham (2001)

Guidelines for the Management of Community Acquired Pneumonia in Childhood, British Thoracic Society (2002) <http://www.brit-thoracic.org.uk/docs/paediatriccap.pdf>

The guideline development group agreed that the South Auckland 2001 Guideline for the Management of Cough and Wheeze in the First Year of Life was the most useful for New Zealand. Permission for its use was sought and granted, and the guideline was reviewed for suitability and any gaps in its applicability for use in New Zealand. Extensive reference was also made to the Guidelines for the Management of Community Acquired Pneumonia in Childhood, British Thoracic Society (2002), and Management of Bronchiolitis in Infants and Children, Agency for Healthcare Research and Quality (2003).

The British Thoracic Society Guideline is based on a comprehensive review of the literature and a grading of recommendations. Where evidence was lacking recommendations were made by consensus from the group. This guideline has been externally reviewed.

A comprehensive review of the evidence relating to the investigation and management of bronchiolitis was published in 2003 by the Agency for Healthcare Research and Quality (AHQR). The AHQR is the lead federal agency in the United States responsible for supporting research to improve health care service quality. The systematic review covers the effectiveness of diagnostic tools, the effectiveness of pharmaceutical therapies for treating bronchiolitis, the role of prophylactic therapy for prevention of bronchiolitis, and cost effectiveness of prophylactic therapy. It includes papers published from 1980 to November 2002. It is available at:

<http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=hstat1a.chapter.24611> as a 323 page document. Summaries of the evidence have been published as two papers in *Archives of Pediatrics and Adolescent Medicine*<sup>1,2</sup>

The guideline group developed questions for a systematic search. Inclusion criteria were studies of infants aged less than 1 year presenting to primary/ emergency care relating to the diagnosis, severity assessment, investigation, management and prevention of:

- i. bronchiolitis
- ii. pneumonia
- iii. recurrent and /or persistent wheeze

The summaries included in the comprehensive AHRQ report on investigation and management of bronchiolitis were used in the review of evidence. Where other evidence was found relevant to the clinical questions this was critiqued, included in summary tables of evidence and considered in the process of formulating recommendations. The group considered draft evidence tables and developed recommendations based on each of the clinical questions by using an NZGG Considered Judgment form available at [www.nzgg.org.nz](http://www.nzgg.org.nz)

### **EVIDENCE AND GRADING RECOMMENDATION**

Each study was assigned an overall level of evidence for validity (+, ~ or x). Study details and levels of evidence were summarised in evidence tables and used for the formulation of recommendations. Studies with an 'x' level of evidence had questionable validity and were not considered relevant to the decision-making

The draft guideline was sent out for consultation in October 2004. Endorsement was sought in April 2005.

The search strategy and the summary evidence tables for the guideline are available online at: [www.paediatrics.org.nz](http://www.paediatrics.org.nz) – click on Guidelines: *Wheeze and Chest Infection in Infants under One year* then 'Search Strategy' and "Evidence Tables".

## EVIDENCE GRADING SYSTEM

The Guideline group agreed to use the New Zealand Guidelines Group grading system for recommendations. More information on the grading system can be found on: [www.nzgg.org.nz](http://www.nzgg.org.nz)

**TABLE 1: NZGG Levels of Evidence**

<b>NZGG Levels of Evidence</b>	
+	assigned when all or most of the criteria are met.
∅	assigned when some of the criteria are met and where unmet criteria are not likely to affect the validity, magnitude or applicability of the results markedly.
-	assigned when few or none of the criteria are met.

**TABLE 2: NZGG grading of recommendations**

<b>Grade</b>	<b>Details</b>
<b>A</b>	<b>The recommendation is supported by good evidence.</b>
<b>B</b>	<b>The recommendation is supported by fair evidence.</b>
<b>C</b>	<b>The recommendation is supported by expert opinion only and or limited evidence.</b>
<b>I</b>	<b>No recommendation can be made because the evidence is insufficient</b> Evidence is lacking, of poor quality or conflicting and the balance of benefits and harms cannot be determined.

<b>Good Practice Points</b>	
<input checked="" type="checkbox"/>	Recommended best practice based on the clinical experience of the guideline development group and where guidance is needed.

**GUIDELINE TEAM:**

A multidisciplinary group of professionals was convened as the guideline development team. The team included representation from the College of Practice Nurses, Royal New Zealand Plunket Society, New Zealand Nurses Organisation Neonatal Nurses and Child Health Interest Groups, Royal New Zealand College of General Practitioners, Rural General Practice, Maori and Pacific Island Community Nurses and the Paediatric Society of New Zealand.

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## DEFINITIONS

### Bronchiolitis:<sup>3</sup>

An acute inflammatory disease of the lower respiratory tract, resulting from obstruction of the small airways.

Caused by a viral infection, most commonly respiratory syncytial virus (RSV). Affects infants usually less than 12 months of age who present with cough, tachypnoea, hyperinflation and wheeze.

Preceded by upper respiratory tract infection (URTI) symptoms. Accompanied by a low-grade fever. Widespread wheeze and/or fine crackles are heard on auscultation.

### Pneumonia:<sup>4</sup>

Inflammation of the lung tissue due to an infectious agent stimulating an inflammatory response which results in damage to lung tissue

### Tachypnoea:<sup>3</sup>

Less than 2 months of age: respiratory rate > 60 breaths/minute.

Aged 2 to 12 months: > 50 breaths/minute. (WHO)

- Respiratory rate should be counted over 60 seconds, or by taking the average of two 30 second counts
- Respiratory rates counted over 30 seconds are 2-4 breaths/minute higher than those counted over one minute
- An infant's respiratory rate increases by 10 breaths/minute per degree centigrade in febrile infants without pneumonia
- The effects of fever on respiratory rate in the febrile infant with pneumonia have not been studied.
- It is preferable, while counting the respiratory rate, to observe chest wall movement without disturbing the infant. Ideally, the infant should be awake and not crying.

### Chest indrawing or retraction:<sup>3</sup>

Retraction of the lower chest wall (i.e. ribs) on inspiration

### Signs of increased work of breathing:<sup>4</sup>

Chest wall indrawing indicates severe respiratory illness  
Retraction (supraclavicular, intercostal, subcostal) Nasal flaring

### Hypoxia

Cyanosis or oxygen saturations  $\leq$  92%

### Wheeze:<sup>3, 4</sup>

A high-pitched, musical, continuous sound that results from small airway obstruction (i.e. bronchioles). Usually heard in expiration and often also on inspiration

### Persistent Wheeze:<sup>5</sup>

Wheezy most days for six weeks.

### Recurrent Wheeze:<sup>5</sup>

More than two separate episodes of wheeze with period of good health between.

# 1. LOWER RESPIRATORY TRACT ILLNESS IN THE FIRST YEAR OF LIFE

## 1.1 INTRODUCTION

The three lower respiratory tract disorders that cause the greatest morbidity in children are:

- bronchiolitis (the most common lower respiratory tract infection in infants less than 12 months of age),
- pneumonia
- asthma (uncommon under 12 months of age).

Acute respiratory illnesses are extremely common in infants. Although most respiratory illnesses involve the upper respiratory tract, many infants will experience a lower respiratory illness (LRI) (defined as infections below the level of the vocal cords<sup>6</sup> in the first year of life<sup>5</sup>. Approximately 30% of infants with LRI visit a physician and about 2% are hospitalised. Twenty percent of all children have at least one episode of lower respiratory infection with wheeze in the first year of life<sup>4</sup>. Up to 70% of these infections are associated with documented viral infection<sup>5</sup>.

Over 3000 infants are admitted to hospital each year with bronchiolitis. Hospitalisation rates for bronchiolitis have approximately doubled over 10-15 years, both internationally and in New Zealand<sup>7,8,9,10,11</sup>. New Zealand admission rates are about twice those in the United States. Pacific infants are admitted almost 3.5 times more often and Maori infants 2.5 times more often than other infants. Mortality rates for bronchiolitis are static at around 2 per 100,000 infants<sup>7,12</sup>.

Pneumonia is more common and more severe in younger children than in older children and adults. A study published in 1998 reported that the hospitalisation rate for children in Auckland with pneumonia was 3–10 times higher than that reported from other Pacific and Anglo-American nations<sup>13</sup>. Younger children were more likely to be hospitalised for pneumonia than the older group of children – the hospitalisation rate for infants under 2 years of age was 11 times higher than for children aged 4 years and older. The study also found that when compared to European children, 2.4 times more Maori children and 5.1 times more Pacific Island children were admitted to hospital with pneumonia<sup>13</sup>.

## 1.2 PREVENTION OF LOWER RESPIRATORY TRACT INFECTIONS

The benefits of breast feeding and the risks of cigarette smoke have long been recognised.

A large body of evidence has confirmed the protective effect of breastfeeding and the risks of smoke exposure for infants<sup>14,15,16,17</sup>. There is a strong correlation between exposure to cigarette smoke and the incidence of lower respiratory tract infection. Studies in which the father smokes and the mother does not have confirmed the importance of post natal passive cigarette smoke exposure<sup>18,19,20,21,22</sup>.

### 1.2.1 Recommendations:

Breast feeding strongly protects against lower respiratory tract infection.	A
Sustained breastfeeding longer than 4 months of age provides greater protection.	A
Mothers should be encouraged to breastfeed their infants.	<input checked="" type="checkbox"/>
Cigarette smoke exposure increases hospital admissions for lower respiratory tract infection.	A
Parents should be strongly encouraged to provide a smoke-free environment for infants.	<input checked="" type="checkbox"/>

## Assessment of infant with respiratory symptoms

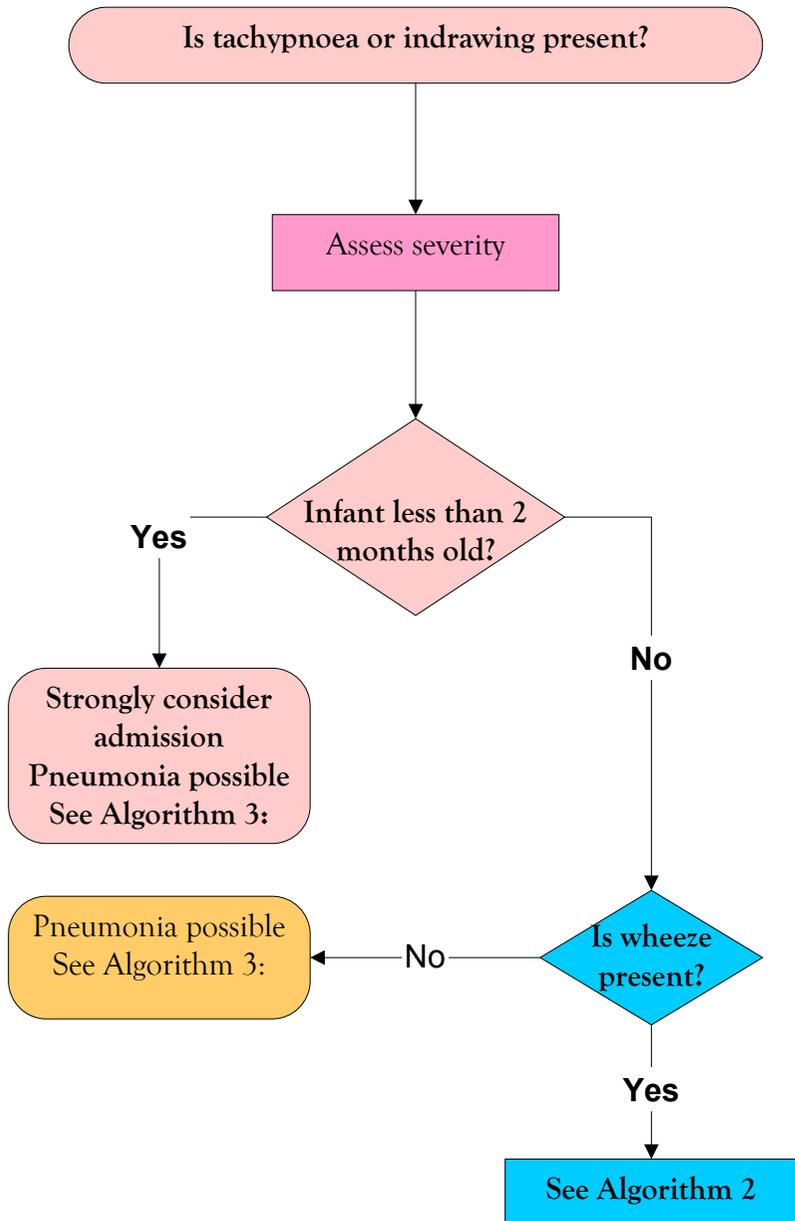


Table 1		Assessment of Severity	
Symptom	Mild	Moderate	Severe
Respiratory Rate	< 2 months > 60/min 2-12 months >50/min		>70/min
Chest wall indrawing	None/mild	Moderate	Severe
Nasal Flare &/or grunting	Absent	Absent	Present
Feeding	Normal	Less than usual Frequently stops Quantity > half normal	Not interested Choking Quantity <half normal
History of behaviour	Normal	Irritable	Lethargic
Cyanosis	Absent	Absent	Present

### Note: Assessment of Severity

1. Respiratory rate and retractions are reliable indicators for assessing the severity of lower respiratory tract infections
2. Presence of wheeze in addition to respiratory rate and retractions differentiate between pneumonia and bronchiolitis
3. Not all criteria in the severe category need to be met in order to assess an infant as "severe"
4. In infants less than 2 months of age wheeze with severe pneumonia may be seen.

### INDICATORS FOR ADMISSION

#### A. ABSOLUTE INDICATORS

*Refer ALL children with*

- history of apnoea
- oxygen saturation <92% or clinical concern of hypoxia
- dehydration
- grunting
- severe illness

### INDICATORS FOR ADMISSION

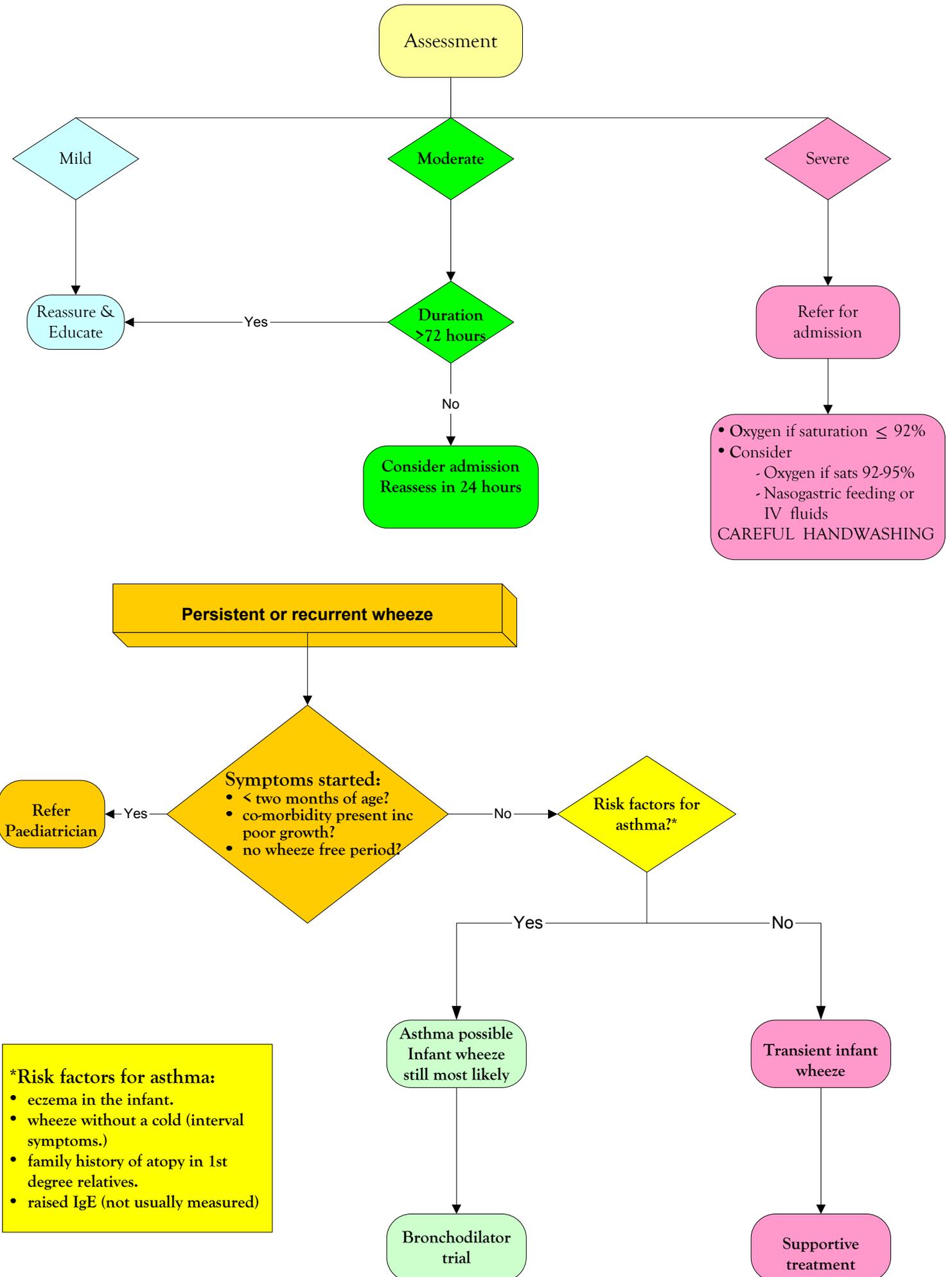
#### B. OTHER FACTORS FOR CONSIDERATION

*Consider referral if one or more indicators are present:*

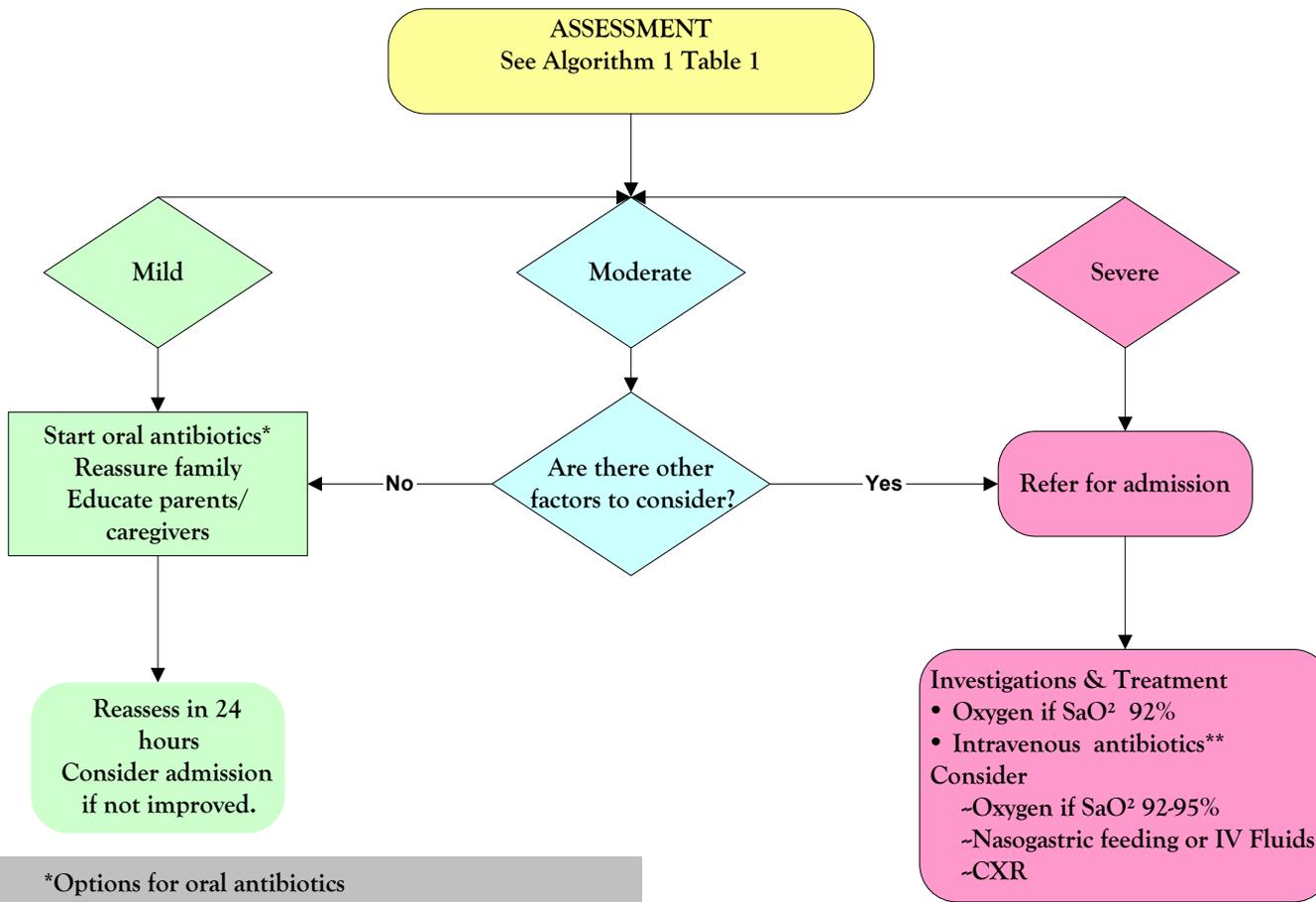
- underlying medical condition
- prematurity
- infants younger than 2 months of age
- duration of illness
- distance to hospital
- social concerns
- car or phone availability
- home environment
- parental exhaustion or inability to cope

Severely ill infants should be given oxygen and transported to hospital by ambulance.

## Algorithm 2: Management of first time and recurrent wheeze in infants



# Algorithm 3: Management of pneumonia in infants



## INDICATORS FOR ADMISSION

### A. ABSOLUTE INDICATORS

*Refer ALL children with*

- history of apnoea
- oxygen saturation <92%  
or clinical concern of hypoxia
- dehydration
- grunting
- severe illness

### B. OTHER FACTORS FOR CONSIDERATION

*Consider referral if one or more indicators is present:*

- underlying medical condition
- prematurity
- infants younger than 2 months of age
- duration of illness
- distance to hospital
- social concerns
- car or phone availability
- home environment
- parental exhaustion or inability to cope

### \*Options for oral antibiotics

- Amoxicillin 15-30mg/kg/dose three times daily for 3-5 days. Use the higher dose if severe infection or any risk factors for resistant streptococcus i.e. day-care attendance, previous antibiotics in the past three months
- Erythromycin 10mg/kg/dose four times daily is recommended in infants with:
  - suspected Chlamydia (10-14 days)

OR

- suspected pertussis (10-14 days)

OR

- if there is an allergy to penicillin (5-7 days) Rare in infants less than 1 year of age.

### \*\*Options for intravenous antibiotics

- IV Benzylpenicillin 30mg/kg/dose every 4 hours
- IV Gentamicin 7.5mg/kg/dose once daily OR IV Gentamicin 2.5mg/kg/dose three times per day AND Flucloxacillin 50mg/kg/dose every 6 hours
- IV Amoxicillin 50mg/kg/dose every 6 hours

**NOTE:** IV Cefuroxime 30-50mg/kg/dose every 8 hours can be used for children who have had no vaccinations against haemophilus influenza

## 2. BRONCHIOLITIS

Bronchiolitis is a virally induced acute bronchiolar inflammation that is associated with the signs and symptoms of airway obstruction<sup>23</sup>.

Bronchiolitis is most commonly caused by Respiratory Syncytial Virus (RSV), but can also be caused by parainfluenza, adenovirus, influenza a and b, metapneumovirus, rhinovirus, enterovirus or mycoplasma pneumoniae<sup>24,25,26</sup>.

Most infants that present with wheeze in the first year of life have bronchiolitis<sup>27,28,29,30,31</sup>. Bronchiolitis is a seasonal disease. The RSV season in New Zealand extends from June to October with the peak for bronchiolitis admissions occurring in July and August<sup>11</sup>. Bronchiolitis is usually seen in infants < 1 year of age. The peak age incidence is 3-6 months. It starts with a 2 to 3 day prodromal phase with coryzal symptoms. Other clinical signs include: cough, tachypnoea, hyperinflation and wheeze. Auscultatory findings include widespread wheeze and crackles. Usually fever is low grade (less than 39°C) if present<sup>32</sup>. Infants with bronchiolitis may initially get worse in the first 72 hours of the illness before starting to improve. Re-infections occur commonly. This may be due to the circulation of different strains<sup>33</sup>.

### 2.1 ASSESSMENT OF SEVERITY

<b>TABLE 1: ASSESSMENT OF SEVERITY</b>			
	<b>Mild</b>	<b>Moderate</b>	<b>Severe</b>
Respiratory rate	< 2 months > 60/min 2-12months 50/min		>70/min
Chest wall indrawing	▪ None/mild	▪ Moderate	▪ Severe
Nasal flare &/or grunting	▪ Absent	▪ Absent	▪ Present
Feeding	▪ Normal	▪ Less than usual ▪ Frequently stops ▪ Quantity > half normal	▪ Not interested ▪ Choking ▪ Quantity < half normal
History of behaviour	▪ Normal	▪ Irritable	▪ Lethargic
Cyanosis	▪ Absent	▪ Absent	▪ Present

<sup>31, 34, 35, 36, 37</sup>

#### NOTE:

Any criteria in the severe category designates the infant as severely ill.

Respiratory rate and indrawing are reliable clinical indicators for assessing the severity of lower respiratory tract infections.	<b>A</b>
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Presence of wheeze in addition to respiratory rate and indrawing indicates bronchiolitis rather than pneumonia.	<b>A</b>
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## 2.2 ADMISSION GUIDELINES FOR BRONCHIOLITIS

### Refer ALL infants with:

- history of apnoea
- oxygen saturation <92% or clinical concern about hypoxia
- dehydration
- severe illness (see above table)

### 2.2.1 Other Factors to Consider:

- underlying medical condition
- prematurity (born < 32 weeks gestational age).
- infants younger than two months of age
- duration of illness – Infants with bronchiolitis may initially get worse in the first 72 hours of the illness, before starting to improve<sup>30</sup>
- distance to base hospital or medical help if infant should suddenly deteriorate
- social concerns
- car or phone availability
- home environment
- parental exhaustion or inability to cope

## 2.3 INVESTIGATIONS

Bronchiolitis is a clinical diagnosis.

Investigations, with the exception of oximetry, are rarely useful in the diagnosis or in determining the severity of bronchiolitis.

### 2.3.1 Oximetry

Studies have shown that lower oximetry readings (set at different levels in different studies) have a high specificity for predicting deterioration Intensive Care admission<sup>38</sup> and for detecting pneumonia<sup>39</sup>. There is one study which shows that knowing the oximetry reading was low subsequent to clinical evaluation led to an alteration of management (further investigations, oxygen therapy, commencement of antibiotics) in children in whom the low reading was unexpected<sup>40,41,42,43</sup>.

One retrospective study suggested that knowing and treating a low oximetry prolonged hospitalisation in children “that would have been discharged on other criteria<sup>44</sup>.”

### 2.3.2 Chest radiography

Several studies have examined the usefulness of chest xrays in determining severity and in differentiating between bronchiolitis and pneumonia, and between viral or bacterial infection. Most have found a wide variation in both intra observer and inter observer agreement. Xrays have not been useful in predicting bacterial versus viral infection with the exception of lobar collapse being viewed as more consistent with pneumonia<sup>45,46,47,48,49,50,51,52</sup>.

### 2.3.3 Blood tests

There have been a large number of largely retrospective studies of the results of blood and urine cultures of infants with bronchiolitis. These have consistently found low rates of positive culture with pathogenic organisms<sup>53,54,55,56,57,58,59,60,61,62, 63</sup>.

### 2.3.4 Viral testing

There is a large body of evidence on specificity of different RSV tests but little evidence related to clinical utility. The applicability may vary depending on the need to cohort infants (i.e. access to single rooms). The evidence indicates RSV testing does not decrease other laboratory testing. RSV positivity does not effect treatment<sup>53,54,57,64</sup>.

### 2.3.5 Recommendations about investigations in bronchiolitis

Access to oximetry is desirable and does provide additional information about the severity of bronchiolitis.	<b>B</b>
Routine chest xray is not recommended for infants presenting with bronchiolitis.	<b>B</b>
Chest xray is not useful for differentiating between bacterial and viral infection.	<b>B</b>
Routine blood and urine cultures are not recommended for infants presenting with uncomplicated bronchiolitis.	<b>A</b>
Laboratory parameters (FBC, ESR, CRP) are not reliable predictors of the severity of bronchiolitis, and are not useful for differentiating between bacterial and viral infection.	<b>C</b>
RSV testing does not affect treatment. There is no evidence to support routine RSV testing in the community and it is considered impractical to do so. Routine RSV testing is not useful to reduce other laboratory investigations.	<b>C</b>
Nasopharyngeal aspirates may be appropriate in the context of cohorting infants because of limited hospital space.	<b>C</b>

## 2.4 MANAGEMENT OF AN ACUTE EPISODE OF WHEEZE

As the majority of wheezy infants will have a viral illness, the emphasis of treatment in most is supportive.

### 2.4.1. Supportive treatment and education

There are no randomised control trials on which to base a recommended target oximetry<sup>28,30,31</sup>.

There are no randomized controlled trials of different methods of fluid supplementation. There are no clinical trials that evaluate the effect of nasogastric feeds given continuously versus those given as bolus feeds.

## Good Practice Points

Supplemental oxygen is required to maintain oxygen saturation above 92%. If an oximeter is not available, give oxygen for infant with severe illness.	✓
Infants on oxygen therapy should have at least 4 hourly observations including oxygen saturation.	✓
For infants with severe bronchiolitis or a history of apnoea, or ex-premature infants, apnoea or cardio respiratory monitoring would be appropriate.	✓
In infants with lower respiratory tract infection minimal handling is recommended.	✓
Small frequent feeds should be encouraged.	✓
Normal saline nasal drops may be used before feeding.	✓
If infant is not feeding well and is taking less than half of normal feeds refer for admission.	✓
Nasogastric feeding may be an option where infants are at risk of dehydration.	✓

## 2.4.2 MEDICATION

### 2.4.2.1 Bronchodilators including adrenaline

There is a systematic review of bronchodilators in bronchiolitis in the AHQR report and there are Cochrane meta-analyses of bronchodilators and specifically of adrenaline<sup>64,65,66</sup>.

Bronchodilators in bronchiolitis do not improve oximetry, or reduce rates of hospitalisation. In studies of infants <24 months which included recurrent wheezers there may be a small improvement in clinical scores. However, the magnitude of the difference is of questionable clinical significance. A recent Cochrane review analysed all studies of adrenaline and found there was no evidence of benefit in inpatients. There is some evidence to suggest that adrenaline may be favourable compared to salbutamol and placebo among outpatients, but these findings are based on a limited number of trials with mostly small numbers and of variable quality. Further assessment of possible benefit is needed<sup>67,68,69,70,71,72,73,74</sup>.

Bronchodilators (salbutamol, terbutaline) are not recommended for use in infants with bronchiolitis.	A
Adrenaline nebulisers are not recommended for routine use in the management of infants with bronchiolitis.	B
Ipratropium is not recommended for use in infants with bronchiolitis.	B

### 2.4.2.2 Steroids

Evidence is reviewed in the AHQR<sup>64</sup> and in a recent Cochrane review<sup>75</sup>. There is no consistent proven benefit for the use of steroids in infants with bronchiolitis.

The Cochrane review found no evidence of benefit of systemic steroids in terms of length of stay or clinical score. The effects of inhaled steroids were reviewed in the AHQR report. The studies used variable doses and duration of treatment ranging from 1-8 weeks. While some reported long term symptom improvement, two studies found worse outcomes in those on treatment. Side effects have not been well studied<sup>64,76,77</sup>.

Steroids (inhaled or systemic) are not recommended for use in the management of infants with bronchiolitis.	<b>B</b>
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### 2.4.2.3 Antibiotics

There is no evidence for the use of antibiotics in the treatment of bronchiolitis. There are two early randomised control trials, one of which included some patients with pneumonia. Both studies showed no benefit from the use of antibiotics<sup>141</sup>. Bronchiolitis is caused by viruses, most commonly RSV. Antibiotics do not prevent the development of a subsequent pneumonia<sup>78</sup>. Antibiotics should be reserved for infants who develop complications related to bacterial infection<sup>28,30,31</sup>.

Antibiotics are not recommended for infants with bronchiolitis	<b>B</b>
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### 2.4.4.4 Montelukast

One study in the hospitalised 3-36 month age group showed that giving Montelukast 5mg chewable tablet for four weeks reduced day time cough in infants with RSV bronchiolitis. Montelukast is only available in New Zealand as a chewable tablet and therefore would be difficult to use in this age group. It is not funded by Pharmac<sup>79</sup>.

There is insufficient evidence for the use of Montelukast in infants following bronchiolitis.	<b>I</b>
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## 2.5 NOSOCOMIAL INFECTION

Transmission of RSV occurs by direct inoculation of contagious secretions from the hands or by large aerosol particles into the eyes or nose<sup>80</sup>. Other viruses such as influenza virus spread via droplets.

Preventing nosocomial infection is vital in the management of bronchiolitis. Hand washing is the most effective preventive measure<sup>81</sup>.

There are a number of uncontrolled studies but no randomised controlled trials evaluating the role of gowns, gloves, goggles, masks<sup>82,83,84,85,86,87,88,89,90</sup>.

## Recommendations

Hand washing is the most reliable means of preventing nosocomial RSV infection.	✓
Fragile infants should not be admitted to shared rooms with children with lower respiratory tract infection.	✓
Cohorting may assist in preventing nosocomial RSV infection.	✓
There is insufficient evidence to determine the role of gowns, gloves, goggles masks etc in preventing cross infection.	I

## 2.6 REASSURANCE AND ADVICE

The infant that is seen early on in the illness and who is assessed as being moderate in severity should be reassessed within 24 hours as deterioration could occur. Parents/caregivers of infants who have been assessed with mild or moderate illness where symptoms have been present for more than 72 hours need only reassurance. Treatment in these infants is solely supportive.

The parents/caregivers should be given information on how to recognize any deterioration in their infant's condition and asked to bring the infant back for reassessment should this occur. Parents of first infants usually need more reassurance than those with other children	✓
The parents/caregivers should be given clear instructions on alternative assistance available in their area for after hours care (e.g. emergency department at the hospital if child's condition becomes severe).	✓
Where infants reside some distance from the base hospital consultation with the paediatrician on call is advised.	✓

### 2.6.1 Expected duration of illness

One study has prospectively followed children presenting to ambulatory care with bronchiolitis. The median duration of illness was 12 days. After 21 days 18% were still ill, and after 28 days 9% were still ill<sup>91</sup>.

#### Recommendation

<p>Teach parents about:</p> <ul style="list-style-type: none"> <li>• signs of deterioration and when to seek medical help: eg increasing respiratory rate and effort for breathing, poor feeding, worsening general appearance</li> <li>• the condition and its usual clinical course</li> <li>• appropriate feeding techniques</li> </ul>	✓
Parents should be informed that resolution of bronchiolitis may take several weeks.	B

### **2.6.2 Risk of subsequent wheezing**

Up to 40% of infants who have been hospitalized with bronchiolitis may have subsequent wheezing episodes up to age 5<sup>5</sup> and approximately 10% will have wheezing episodes after age 5<sup>33,92,93</sup>. The increased risk of wheeze following RSV infection in a large population based study dissipated by the age of 13 years<sup>94</sup>. One prospective study found reduced lung function both before and after bronchiolitis. This implies that the mechanism for wheeze and reduced lung function after bronchiolitis may relate to premorbid lung function and not to bronchiolitis per se<sup>95</sup>.

#### **Summary**

Unfortunately no investigation or medication has been found to be effective in the management of infants with bronchiolitis. Those with moderate to severe illness may require supportive treatment such as oxygen, nasogastric feeding or intravenous fluids.

Parents of infants with first time wheeze require support and education. First time parents are especially concerned and require specific instructions about recognising worsening illness and when to return for further assessment.

### **3. RECURRENT EPISODES OF WHEEZE**

The major differential diagnoses are:

- transient infant wheeze - small airways
- asthma – less common in this age group
- other less common causes

#### **3.1 TRANSIENT INFANT WHEEZE**

80% of infants who start wheezing in the first two years of life do not go on to have asthma. This group has been found on pulmonary function tests to have diminished airway function. These findings are present prior to the onset of wheeze. The infants are born with small airways and tend to have acute wheezing episodes with viral upper respiratory tract infections and do not have interval symptoms. There is no increased incidence of atopy in these infants. These infants are well despite the presence of wheeze. Wheezing often ceases around the age of 3 to 5 years<sup>5,28,29,96,97,98</sup>.

##### **3.1.1 Risk factors for transient infant wheeze**

- male gender.
- antenatal and postnatal exposure to smoking.
- early viral infections.
- low socio-economic status.
- number of siblings – 2 or more siblings.
- day-care centre attendance – with 3 or more children.

#### **3.2 ASTHMA IN THE FIRST YEAR OF LIFE**

Only a minority of infants who wheeze in the first year of life have asthma. Asthma can however be present in a small number of infants even at this early age. The diagnosis of asthma can often only be made with certainty after a period of 18 months to 2 years, even in those infants where the diagnosis of asthma is thought to be likely in the first year of life<sup>5,28,29,99</sup>.

##### **3.2.1 Risk factors for asthma are:**

- eczema in the infant.
- wheeze without a cold (interval symptoms)
- increased frequency of episodes (>3)
- family history of atopy in 1st degree relatives.
- raised IgE (not usually measured)

#### **3.3 ASSOCIATED MORBIDITY:**

In wheezy infants with any of the following signs or symptoms referral for a paediatric assessment should be considered:

- poor growth - weight crossing centiles, discrepancy between weight and height centiles or failure to thrive.
- symptoms and signs commencing from birth

- persistent crackles
- focal signs on auscultation.
- cardiac signs e.g. heart murmur, hepatomegaly, cyanosis
- difficulty feeding.
- frequent vomiting.
- recurrent infections elsewhere.
- severe wheezing
- cyanosis

### 3.4 OTHER CAUSES OF WHEEZE

- congenital airway narrowing
  - Infants with wheeze due to non-infectious causes may have exacerbations of the wheeze during episodes of upper respiratory tract infection.
    - tracheomalacia and bronchomalacia.
    - bronchial compression e.g. vascular rings.
- Chronic Lung Disease of Prematurity (bronchopulmonary dysplasia)
  - this diagnosis is made before the infant's discharge from the neonatal unit. These infants may be responsive to bronchodilators
- foreign body aspiration:
  - positive history is not always present
  - when considering the possibility of foreign body aspiration take the infant's developmental milestones into account as well as the presence of older siblings. 80% of foreign bodies are nuts or vegetable matter<sup>100</sup>.
- aspiration
- gastro oesophageal reflux
- bronchiectasis
- cardiac conditions
- cystic fibrosis - uncommon in Maori and Pacific Island communities. 6% of infants with cystic fibrosis can be missed on neonatal screening<sup>101</sup>.
- tuberculosis – high risk groups i.e. Asian, Pacific Island, and Maori
- tracheo oesophageal fistula
- primary ciliary dyskinesia.

### 3.5 MANAGEMENT OF RECURRENT WHEEZE

There are different patterns of wheezing in infancy ranging from persistent wheezing (wheezing most days) to episodic viral induced wheeze with minimal or no wheeze between acute exacerbations. More than 75% of infants admitted to hospital with bronchiolitis in the first 4 months of life will have subsequent wheezing with viral infections. 60% of infants who wheeze in the first three years of life do not go on to have ongoing episodes of wheeze at 6 years of age<sup>29,102</sup>. Most infants in the first year of life wheeze because of small airway calibre and do not have asthma. There is no convincing evidence that any treatment results in short or long term improvements in most infants with recurrent or persistent wheeze<sup>103</sup>.

### 3.5.1 Trial of bronchodilator

If asthma is suspected in infants in 6-12 months (see risk factors pg 27) a trial of bronchodilator could be considered at the time of wheeze. A salbutamol metered dose Inhaler (MDI) via spacer and mask should be used. The new spacer needs to be primed with 10 puffs of ventolin into the spacer before doing the bronchodilator response in order to reduce the static electricity and loss of dose. The infant needs to have the mask on the face, or the mouth piece in the mouth, before the first of the test dose for responses is given. For efficient drug delivery from a spacer shake the MDI.

The spacer should be loaded with one puff at a time and the child should take 4-6 tidal breaths per puff with no delay. Six separate puffs should be delivered in succession in this manner. Assess clinical response twenty minutes later. A positive response would be a significant reduction in wheeze and work of breathing. Repeated positive response to salbutamol increases the possibility of asthma. The Guideline on the Management of Asthma 1-15 Years [www.paediatrics.org.nz/guidelines/asthma](http://www.paediatrics.org.nz/guidelines/asthma) provides information on the use of spacers and the approach to asthma management.

#### Recommendation

There is insufficient evidence for the ROUTINE use of short acting bronchodilators in infants with recurrent wheeze a trial of inhaled short acting bronchodilators may be considered to assess individual responsiveness.	<b>I</b>
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### 3.5.2 Corticosteroids.

Studies of interventions with corticosteroids vary in the corticosteroid used, as well as the form (inhaled, oral or parenteral) and include infants with varying patterns of wheeze. The age range extends beyond one year old in most studies and it is often difficult to determine exactly how many infants are included. Few studies provide specific subgroup analyses. There is a Cochrane review of inhaled steroids for episodic viral wheeze of childhood<sup>104</sup>. The studies reviewed included children up to the age of 17 years and only one of the five studies included any subjects under the age of one year. High dose inhaled corticosteroids at the start of an acute exacerbation of episodic viral induced wheeze improved symptom scores but no subjects in these 3 studies were under one year of age. A recent study (not included in the McKean review) of oral prednisone for 3 days for virally induced wheeze showed benefit in reduction of disease severity, length of hospital stay and duration of symptoms but is difficult to generalise to infants as it included children aged 6 months to 3 years, with no subgroup analysis for infants<sup>105</sup>. There is one small RCT specifically addressing infants under one year of age with risk factors for asthma. This found reduced daily symptom scores and an increase in symptom free days in infants receiving 150 micrograms fluticasone twice daily via spacer<sup>6</sup>.

There is insufficient evidence to recommend the use of REGULAR DAILY inhaled or oral corticosteroids in infants with recurrent or persistent wheeze.	<b>I</b>
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There is limited evidence that regular daily inhaled corticosteroids improve symptom scores in infants considered to have asthma.	<b>C</b>
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### 3.5.3 Sodium cromoglycate and nedocromal sodium

The literature, including a 2000 systematic review, shows heterogenous results with only small numbers of infants less than one year of age included in the studies<sup>106</sup>. The majority of the studies were undertaken more than 10 years ago. They show a small benefit from the use of sodium cromoglycate but it is difficult to tease out the benefits for infants less than 1 year of age.

There is insufficient evidence for the routine use of sodium cromoglycate in the management of recurrent wheeze.	<b>I</b>
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### 3.5.4 Montelukast

In this age group montelukast has only been used in RSV positive infants with bronchiolitis and while it was found to reduce day time cough it is only available in New Zealand as a chewable tablet and therefore would be difficult to use in this age group<sup>79</sup>. It is not funded by Pharmac.

There is insufficient evidence for the use of montelukast in infants with recurrent wheeze.	<b>I</b>
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### 3.6 Summary

Few infants who wheeze have asthma (see risk factors pg 27). Transient wheeze of infancy is common and is due to small airway calibre for which there is no specific treatment (see risk factors). There are other less common causes of recurrent or persistent wheeze that need to be considered in individual cases.

During acute episodes supportive treatment should be provided as described under management of acute wheeze. In individual cases a trial of bronchodilators may be considered. Inhaled corticosteroids may be indicated for the small group of infants considered to have asthma.

## 4. PNEUMONIA IN THE FIRST YEAR OF LIFE

### 4.1 AETIOLOGY

The specific cause of pneumonia in the first year of life could be identified in 40% to 80% of cases in studies that have been done<sup>107</sup>. Viruses have been implicated most frequently as a cause of pneumonia during the first two years of life<sup>108</sup>.

#### 4.1.1 Predominant organisms

The following outlines the predominant organisms found from most to least frequent, in different age groups<sup>109,110,111</sup>.

0 to 1 month	<ul style="list-style-type: none"><li>• group B streptococcus</li><li>• gram negative organisms</li><li>• cytomegalovirus</li><li>• listeria monocytogenes</li></ul>
1 to 3 months	<ul style="list-style-type: none"><li>• respiratory syncytial virus (RSV)</li><li>• parainfluenza 1,2,3</li><li>• chlamydia trachomatis</li><li>• streptococcus pneumoniae</li><li>• bordetella pertussis</li><li>• staphylococcus aureus</li></ul>
3 to 24 months	<ul style="list-style-type: none"><li>• RSV</li><li>• other respiratory viruses: parainfluenza, influenza and adenovirus, metapneumovirus</li><li>• mixed viral and viral/bacterial infections</li><li>• streptococcus pneumoniae</li><li>• haemophilus influenzae (less common in immunised infants)</li><li>• mycoplasma pneumoniae</li><li>• staphylococcus aureus</li><li>• mycobacterium tuberculosis</li></ul>

#### 4.1.2 Chlamydia trachomatis pneumonia

- Infants (1-3 months) may present with cough, tachypnoea and progressive respiratory distress
- The infant is usually afebrile<sup>112</sup>.
- The infection is acquired from the mother's genital tract. Approximately 50% of infants born vaginally to infected mothers acquire a chlamydial infection and of these 5-20% will develop pneumonia. Infection can occur in some infants born via caesarean section with intact membranes. A diagnosis of chlamydia in the infant should prompt investigation and treatment for the mother and her sexual partner(s)
- Conjunctivitis is present in about 50% of infants
- Inspiratory crackles are often heard on chest auscultation, but wheezing is very uncommon<sup>108,112</sup>.

**Note:** In the event that chlamydia is considered a possible diagnosis the laboratory should be contacted to determine which specimens should be collected.

## 4.2 CLINICAL DIAGNOSIS OF PNEUMONIA

The majority of infants with pneumonia present with cough and/or difficulty in breathing, but only a small number of infants with these symptoms have pneumonia.<sup>113</sup> The majority of the others have bronchiolitis.

The World Health Organisation (WHO) has defined 3 key signs that should be used when deciding whether or not a young child with cough and/or difficulty in breathing has pneumonia.

These clinical signs are:

- tachypnoea
- chest indrawing
- absence of wheeze<sup>3</sup>.

### Fever

- in infants less than 2 months of age however, the presence of a fever ( $\geq 38^{\circ}\text{C}$ ) or of hypothermia ( $< 35.5^{\circ}\text{C}$ ) is more significant and is likely to be due to a bacterial infection<sup>39</sup>.
- the presence or absence of fever is not useful in the assessment of an older infant with pneumonia.

### Focal Chest Signs

Infants in this age group commonly develop a bronchopneumonia and it is unusual to find persistent focal signs on chest examination. Finding focal signs suggests the presence of a lobar pneumonia or other localised lung pathology.

**Pneumonia** is **likely** if infant has **tachypnoea** with any of the following:

- chest wall indrawing
- nasal flaring
- grunting
- crackles

**Pneumonia** is **unlikely** in the **absence** of:

- respiratory distress
- tachypnoea
- crackles

In the first 3 days of illness tachypnoea has a lower sensitivity and specificity in predicting the presence of pneumonia, but was still better than any of the other parameters<sup>114</sup>.

## 4.3 ASSESSMENT OF SEVERITY

The following should be assessed when deciding on severity of illness<sup>4</sup>

- general appearance
- oxygen requirement
- respiratory rate
- evaluation of work of breathing
- chest auscultation – crackles increase the likelihood of pneumonia
- pyrexia or hypothermia in infant  $< 2$  months of age

**TABLE 1: ASSESSMENT OF SEVERITY**

	Mild	Moderate	Severe
Respiratory Rate	< 2 months > 60/min 2-12 months >50/min		>70/min
Chest wall indrawing or Indrawing	• None/mild	• Moderate	• Severe
Nasal Flare &/or Grunting	• Absent	• Absent	• Present
Feeding	• Normal	• Less than usual • Frequently stops • Quantity > half normal	• Not interested • Choking • Quantity < half normal
History of Behaviour	• Normal	• Irritable	• Lethargic
Cyanosis	• Absent	• Absent	• Present

4,34,36,37,45,114,115,116,117

**NOTE:**

1. Any criteria in the severe category designates the infant is severely ill.
2. In infants less than 2 months of age with pneumonia, wheeze may occasionally be seen.

**Recommendations**

Respiratory rate and indrawing are reliable clinical indicators for assessment of severity of lower respiratory tract infections, bronchiolitis and pneumonia.	<b>A</b>
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Presence of wheeze in addition to respiratory rate and indrawing indicates bronchiolitis rather than pneumonia.	<b>A</b>
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## 4.4 INDICATIONS FOR ADMISSION

### Refer ALL infants with:

- history of apnoea
- oxygen saturation <92% or clinical concern about hypoxia
- dehydration
- grunting
- severe illness (see table)

### Other Factors to Consider:

- underlying medical condition
- prematurity: (born < 32 weeks gestational age)
- infants younger than two months of age.
- distance to base hospital or medical help if infant should suddenly deteriorate.
- social concerns
- car or phone availability
- home environment
- parental exhaustion or inability to cope
- no response to appropriate oral antibiotics within 48-72 hours
- deterioration in spite of antibiotics

### Good practice point:

Severely ill infants should be given oxygen and transported to hospital by ambulance	✓
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## 4.5 INVESTIGATIONS

### 4.5.1 Chest radiographs

Chest xrays have not been found to be useful in diagnosing pneumonia in infants with respiratory symptoms - inter-observer agreement has been poor<sup>46,118</sup>. Findings do not differentiate between infants who have a proven viral or bacterial aetiology for their pneumonia<sup>46,47,49,50,51,112,118,119,120,121</sup>. One randomised controlled trial has found that chest Xrays in infants with mild pneumonia did not influence clinical outcome<sup>52</sup>.

### Recommendations

Routine chest xray is not recommended for infants presenting with uncomplicated clinically diagnosed pneumonia. Chest xray is not useful for differentiating between bacterial and viral infection.	B
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Chest xray is indicated where clinical findings are ambiguous, a complication such as pleural effusion is suspected, or when pneumonia is prolonged and unresponsive to antibiotics.	✓
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## 4.5.2 Blood cultures

Blood cultures are insensitive tests for bacterial pneumonia and not useful<sup>113,122</sup>. Studies have found less than 6% positive blood cultures in infants with pneumonia. In most studies all pathogens identified were pneumococci or haemophilus influenzae (prior to vaccination) and would be covered by routinely used antibiotics.<sup>107,112,123,124,125,126,127</sup>

### Recommendations

Routine blood cultures are not recommended for infants presenting with uncomplicated community acquired pneumonia.	<b>B</b>
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## 4.5.3 Blood tests

Neither total white cell count, differential white cell count, sedimentation rate nor C reactive protein have been found to be of value to differentiate viral from bacterial pneumonia<sup>47,63,112</sup>.

Laboratory parameters (FBC, ESR, CRP) are not useful for the prediction of the severity of, or for differentiating between bacterial and viral lower respiratory infection.	<b>C</b>
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## 4.6 TREATMENT

### 4.6.1 Antibiotics

Antibiotics should be prescribed in infants in whom pneumonia has been diagnosed clinically as up to half have been found to have either bacterial or concurrent viral and bacterial infection<sup>128</sup>. Investigations do not help to differentiate a viral from bacterial cause for the pneumonia. Where antibiotics are indicated because of a high index of suspicion of mild to moderate pneumonia the oral route will suffice in the majority<sup>129,130,131</sup>. Most clinical trials of antibiotics have been conducted in infants with clinically diagnosed pneumonia in developing countries without chest xray confirmation of diagnosis<sup>132,133</sup>. Two large trials have investigated the use of 3 day courses of antibiotics and found a 3 day course as effective as 5 days<sup>134,135</sup>. There is inadequate data on which to recommend a preferred antibiotic although a number of small pharmaceutical company sponsored trials have compared alternative antibiotics in developed countries- mainly comparing newer macrolides with erythromycin or penicillins<sup>112,126,132,133,136,137,138,139,140</sup>.

There are no good quality studies comparing treatment with antibiotics with non treatment in pneumonia. One randomised controlled trial published in 1984 compared treatment versus non treatment in Danish infants aged 1 month to 6 years. Diagnosis of pneumonia was based on clinical findings of fine crackles or chest xray findings of consolidation. Over half had laboratory findings of viral infection, mostly RSV. Severely ill infants were excluded. The infants received ampicillin or penicillin V or no antibiotic. There were no differences found in the course of the illness, but 15/64 allocated to no treatment did eventually receive antibiotics. About half the patients in this study were regarded as having a clinical diagnosis of bronchiolitis.<sup>141</sup> A multicentre retrospective study found no difference in clinical presentation or outcome related to whether pneumococci were susceptible or non susceptible to penicillin<sup>142</sup>.

## SUGGESTED ANTIBIOTIC TREATMENT FOR PNEUMONIA IN THE COMMUNITY

### 4.6.1.2 Recommendations

**Note:** these recommendations are for infants over the age of one month. Neonates under one month should be referred to paediatric services and antibiotic regimens appropriate for neonates should be used.

#### Mild or Moderate Pneumonia

Amoxicillin 15-30mg/kg/dose three times daily for 3-5 days. Use the higher does if severe infection or any risk factors for resistant streptococcus i.e. day-care attendance, previous antibiotics in the past three months	<b>B</b>
Erythromycin 10mg/kg/dose <sup>a</sup> four times daily is recommended in infants with: suspected chlamydia <sup>b</sup> (10-14 days) <b>OR</b> suspected pertussis (10-14 days) <b>OR</b> if there is an allergy to penicillin (5-7 days) Rare in infants less than 1 year of age.	<b>B</b>

#### Note:

An association has been noted between the use of oral erythromycin and infantile hypertrophic pyloric stenosis in infants younger than 6 weeks of age. Parents should be informed of the signs and potential risks of developing pyloric stenosis. Where chlamydia is diagnosed parents should be referred for assessment and treatment.

<b>Options for Intravenous (IV) Antibiotics</b> IV Benzylpenicillin 30mg/kg/dose every 4 hours IV Gentamicin 7.5mg/kg/dose once daily <b>OR</b> IV Gentamicin 2.5mg/kg/dose three times per day <b>AND Flucloxacillin</b> 50mg/kg/dose every 6 hours IV Amoxicillin 50mg/kg/dose every 6 hours <b>NOTE:</b> IV Cefuroxime 10-30mg/kg/dose every 8 hours can be used for children who have had no vaccinations against haemophilus influenza	<b>C</b>
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### 4.6.2 Oxygen

Administer oxygen when the oxygen saturation is below 92%.

If oximetry cannot be done, give oxygen if the following signs are present:

- restlessness
- severe chest indrawing
- respiratory rate >70/min
- cyanosis

#### Recommendation

Access to oximetry is desirable and provides additional information about severity.	<b>B</b>
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### 4.6.3 Fluids

One systematic review suggests that giving increased fluids to infants with respiratory infections may cause harm<sup>143</sup>. The studies reviewed were all observational case series and involved hospitalised infants in developing countries. They found evidence of hyponatraemia in up to 30%. There are no RCTs to provide definitive evidence, and caution is advised about universally recommending increased fluids to infants, especially those with infections of the LRT.

#### Recommendation

Increased fluid intake is not recommended for infants with lower respiratory tract infection unless dehydration is present.	C
Supplemental oxygen is required to maintain oxygen saturation above 92%. If an oximeter is not available, give oxygen for infant with severe illness	✓
Infants on oxygen therapy should have at least 4 hourly observations including oxygen saturation	✓
In infants with lower respiratory tract infection minimal handling is recommended	✓
Small frequent feeds should be encouraged Normal saline nasal drops may be used before feeding If infant is not feeding well and is taking less than half of normal feeds refer for admission Nasogastric feeding may be an option where infants are at risk of dehydration	✓

### 4.6.4 Summary

Presence of tachypnoea, indrawing and the absence of wheeze are the most reliable signs for indicating pneumonia and severity of disease. Oral antibiotics are adequate for most infants with mild to moderate community acquired pneumonia. Routine chest xray and blood cultures are not indicated. Infants less than two months of age are particularly vulnerable and perinatally acquired infections need to be considered in this group. Despite these recommendations many pneumonias are viral but it is not possible to clinically differentiate these from bacterial pneumonia.

## **APPENDIX A**

### **Sources of funding and editorial independence**

This guideline was developed by the Paediatric Society of New Zealand and funded through its contract with the Ministry of Health. Participants who developed evidence tables were paid an allowance. Travel was paid to attend meetings: no meeting attendance fee was paid.

### **Declarations of Competing Interests.**

#### **Cass Byrnes: (Co-Chair)**

- Asser Trust: donation for TB research 2001 and for nitric oxide research 1999
- Auckland Asthma Association: donation for nitric oxide research 1999
- Australian Health Research Council: Funding for Cystic Fibrosis Bronchoalveolar research project 2001-2004
- Auckland Medical Research Foundation: Project manager for study 2 days/week from mid 2004-mid 2006
- Boehringer Ingelheim: National Respiratory Meeting July 2000- On organizing committee
- Child Health Research Foundation: research fellow project sponsorship 2002-2004
- Enterprise Scholarship Foundation: part salary for supervised research fellow 2005, 2006
- Fisher & Paykel: supervised research fellow part salary 2005, 2006
- Fisher & Paykel: Research project funding for fellow 2004-2006
- Fisher & Paykel: American Thoracic Society meeting May 2004
- GlaxoSmithKline: supervised research fellow salary 1998-2000
- GlaxoSmithKline: sponsorship of Respiratory Committee of Paediatric Society annual meeting - Chair 2001-
- GlaxoSmithKline: Part sponsor annual Australasian Paediatric Respiratory Group June held in Australia – 1998 on, Convenor 2000-2004
- Joan Mary Reynolds Starship fellowship: supervised research fellowship 2002, 2003
- Lottery Health Commission: donation for nitric oxide research 1999
- NZ Health Research Council: Training fellowship for respiratory fellow 2000-2002
- NZ Health Research Council: Sponsor for project manager 1 day/week 2001-2003
- NZ Muscular Dystrophy Association: sponsored summer studentship 1999-2001

#### **Alison Vogel: (Co-Chair)**

- Abbott Pharmaceuticals: Funding for Masters Economics student to assist in cost benefit analysis of Palivizumab (non-directive)
- Nondirective funding of meeting to develop consensus recommendation for use of Palivizumab

Other group members reported no competing interests.

## **Consultation.**

A draft guideline was circulated to approximately 60 organisations and individuals and to all members of the Paediatric Society and was made available on [www.paediatrics.org.nz](http://www.paediatrics.org.nz)

### **Comments were received from:**

Asher Professor Innes, Professor of Paediatrics Auckland University  
Brown Dr Jeff, Paediatrician Mid Central DHB  
Clarke Chris, CEO Hawkes Bay DHB  
Cooke Dr Rob, New Zealand Guidelines Group  
Daniel Dr Alison, Paediatrician Canterbury DHB  
Grimwood Professor Keith, Wellington Medical School  
Millar Dr Nigel, Chief Medical Officer Canterbury DHB  
Moyes Dr Chris, Paediatrician Bay of Plenty DHB  
Merck Sharp & Dohme (NZ) Ltd  
Ministry of Health  
Musa Memo, CEO Wanganui District Health Board  
New Zealand College of General Practice  
New Zealand College of Practice Nurses  
New Zealand Guidelines Group  
New Zealand Nurses Organisation  
Otago Medical School  
Pharmacy Committee PSNZ  
Pharmacy Council  
Voss Dr Lesley, Infectious Disease Specialist, Starship Children's Hospital.

Responses from the consultation were discussed and where deemed appropriate modifications to the document were made in response to feedback.

## **APPENDIX B**

### **Implementation of Guidelines for the Management of Cough & Wheeze in the First Year of Life in General Practice in South Auckland**

#### **Implementation**

- Continuing Medical Education session with South Auckland Health paediatrician - mixture of didactic, case studies and quiz
- Peer review group sessions; didactic and case studies/ role plays
- Lunch launch for non attendees
- 1:1 visits for non attendees
- Laminated algorithm, plus paper copy of full guideline given to all GPs in the IPA
- Reinforcement mail out with 1 page 'key points'
- Article in NZ doctor

#### **Evaluation**

3 components

- GP acceptance and use: telephone questionnaire- all GPs
- Change in practice: pre and post implementation chart audit
- Acceptability to parents: focus group

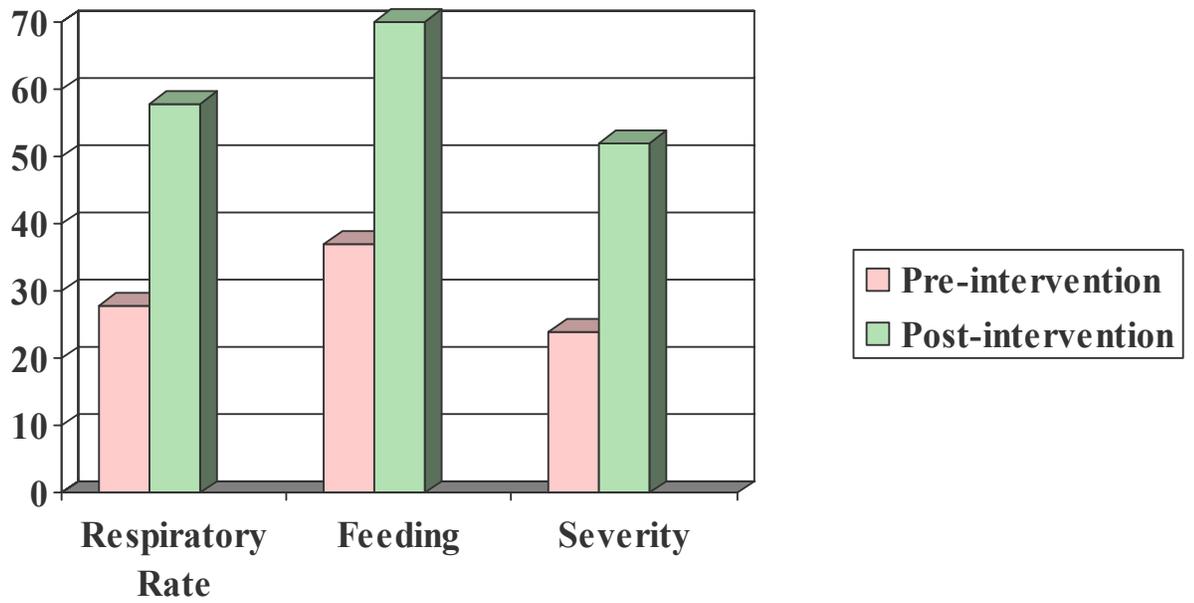
#### **GP Perception of guideline**

- all received it
- 86% used it
- algorithms were most used, but main text also important
- majority were happy with the guideline as is

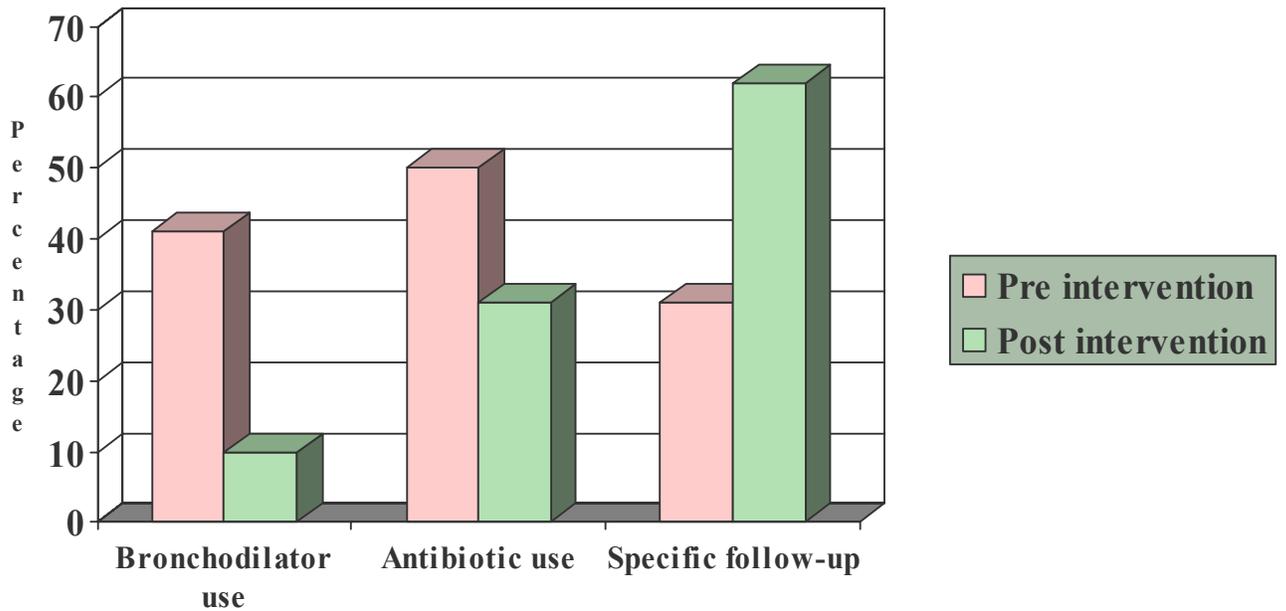
#### **Audit of Practice**

- Undertaken by chart audit searching for children < 1 year of age with cough/wheeze
- Baseline audit involved 8 general practitioners with 65 patients
- Follow up audit involved 13 general practitioners with 87 patients

### Results of Audit Recorded



### Results Management



### Patient Acceptability

- First time mothers attended GP within 12 hours and expected a cure
- Experienced mothers sought someone else's opinion rather than a cure
- First time mothers sought 2nd opinions- 2 from hospital ED
- Reasons for not using antibiotics were well explained
- Parents were not necessarily seeking medication and GPs were able to convince them that they were not required.
- All parents were comforted by the GP's examination of the child

### Recommendations from Parents

- First time parents wanted more specific recommendations
- How much fluid should the infant be drinking
- "What do you mean by get worse?"
- "How long should he cry?"
- "What level of temperature is serious?"
- Suggestions about interventions that parents should try
- What should be expected at 12, 24, 48, 72 hours
- When to take the infant back to the doctor
- Discuss likelihood of future asthma
- Follow up visit with a phone call from GP or practice nurse

### Conclusions

- This is an example of a successful integrated care project
- Primary care management changed to follow recommended best practice more closely
- Specific advice to parents is important, especially focused on first time parents

### Results.

Variable	Pre-intervention (%)	Post-intervention (%)	P Value
Feeding documented	37	71	<0.01
Respiratory rate recorded	28	58	<0.01
Severity recorded	24	52	0.02
Bronchodilator use	41	10	0.001
Antibiotic use	50	31	0.2
Follow-up plan	31	61	<0.01

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