# Chest physiotherapy for acute bronchiolitis in paediatric patients between 0 and 24 months old (Review)

**Perrotta C, Ortiz Z, Roque M**


This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2006, Issue 4

http://www.thecochranelibrary.com

## TABLE OF CONTENTS

# Chest physiotherapy for acute bronchiolitis in paediatric patients between 0 and 24 months old (Review)

**Perrotta C, Ortiz Z, Roque M**

**This record should be cited as:**
Perrotta C, Ortiz Z, Roque M. Chest physiotherapy for acute bronchiolitis in paediatric patients between 0 and 24 months old. *Cochrane Database of Systematic Reviews* 2005, Issue 2. Art. No.: CD004873. DOI: 10.1002/14651858.CD004873.pub2.

**This version first published online:** 20 April 2005 in Issue 2, 2005.
**Date of most recent substantive amendment:** 18 February 2005

## ABSTRACT

**Background**
Acute bronchiolitis is the leading causes of medical emergencies during winter in children younger than two years of age. Chest physiotherapy is thought to assist infants in the clearance of secretions and decrease ventilatory effort.

**Objectives**
To determine the efficacy and safety of chest physiotherapy in infants aged less than 24 months old with acute bronchiolitis.

**Search strategy**
We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* Issue 2, 2004) which contains the Acute Respiratory Infection Group's specialised register; MEDLINE (January 1966 to June 2004); EMBASE (1990 to June 2004); PASCAL; SCISEARCH; LILACS; and Cumulative Index to the Nursing & Allied Health Literature (CINAHL) (1982 to May 2004).

**Selection criteria**
Randomised controlled trails (RCTs) in paediatric patients younger than twenty four months old in which chest physiotherapy was compared against no intervention or against another type of physiotherapy.

**Data collection and analysis**
Two independent reviewers extracted the data. Primary outcome was a severity clinical score. Secondary outcomes were length of hospital stay, duration of oxygen supplementation, and the use of bronchodilators and steroids.

**Main results**
Three clinical trials met the inclusion criteria. All evaluated vibration and percussion techniques in postural drainage positions compared to no intervention. The study population were hospitalised infants with a clinical diagnosis of acute bronchiolitis, although one study included only infants who required nasogastric tube feeding or intravenous fluids. None of the other included trails observed any differences in the severity of the clinical score at day five or during each of the five days of the trial or until discharge, length of hospital stay, or oxygen requirements between chest physiotherapy group and control.

**Authors' conclusions**
Based on the results of three RCTs, chest physiotherapy using vibration and percussion techniques does not reduce length of hospital stay, oxygen requirements, or improve the severity clinical score in infants with acute bronchiolitis that are not under mechanical ventilation, and who do not have any other co-morbidity. Chest physiotherapy using forced expiratory technique needs to be evaluated by clinical research.

## PLAIN LANGUAGE SUMMARY

Acute bronchiolitis is a frequent viral respiratory infection in children younger than two years old

Most children have a mild disease and do not require hospitalisation. Those who need to be hospitalised sometimes have difficulties clearing their respiratory secretions. Chest physiotherapy is used to assist in the clearance of secretions and helps them to breathe and this review looked at the effectiveness of chest physiotherapy in acute bronchiolitis. Chest physiotherapy does not reduce the length of hospital stay in acute bronchiolitis. There is no good evidence for or against the improvement of clinical scores. Further research is needed to assess the efficacy of chest physiotherapy in this condition.

## BACKGROUND

Acute bronchiolitis is the leading cause of medical emergencies during winter in children younger than two years of age. It results in high utilisation of health care resources, overcrowding of hospitals during epidemic seasons and significant morbidity to infants. Infant mortality rates vary, depending upon the population. In the USA between 1996 and 1998, the incidence was reported as 2.0 per 10,000 live births (Holman 2003).

Criteria for diagnosing acute bronchiolitis vary greatly. Most doctors agree that the case definition for an episode of acute bronchiolitis should include the first episode of acute wheezing to occur at 24 months or younger, plus accompanying physical findings of viral infection (for example coryza, cough and fever) (González 2001; Videla 1998; Wainwright 2003). Some doctors add to this definition that pneumonia or atopy was ruled out as the cause of wheezing (Mc Millan 1994), while other doctors cite only the first episode of acute wheezing as diagnostic criteria for acute bronchiolitis (Roosvelt 1996).

The most common virus identified with the disease is respiratory syncytial virus (RSV). Other pathogens frequently identified are parainfluenza virus, adenovirus, *Mycoplasma pneumoniae (M. pneumoniae)*, influenza virus, and human metapneumovirus (Galiano 2004; Videla 1998). Pathological changes in acute bronchiolitis are necrosis of the respiratory epithelium with destruction of ciliated epithelial cells followed by peri-bronchial infiltration with lymphocytes. The consequences are bronchial wall oedema, mucous production and the impairment of clearance of mucous leading to obstruction of small airways with dense plugs of mucous, fibrin and alveolar debris (Welliver 2003).

Most cases of acute bronchiolitis are mild and can be treated on an outpatient basis; one to three per cent (depending on the seriousness) will require hospitalisation (Mc Millan 1994). Risk factors associated with hospitalisation and more severe disease are premature birth; chronic lung disease; congenital heart disease; and a deficient immune system (Wallis 1999). In developing countries the most frequent risk factors associated with hospitalisation and severe disease are: living in a low income family; malnourishment; low birth weight; age of the mother; education level of the mother; being bottle-fed and premature birth (Spencer 1996).

The standard treatment of acute bronchiolitis is to assure adequate oxygen exchange, fluid intake and feeding of the infant. Pharmacological strategies used in acute bronchiolitis are bronchodilators and steroids. However, at present the effectiveness of these interventions remains uncertain. A Cochrane review concluded that bronchodilators produce modest short-term improvement in clinical scores of mild or moderately severe bronchiolitis (Kellner 1998). Another Cochrane review assessed the benefits of steroids in patients with acute bronchiolitis and found that most well-designed studies showed no benefit with either inhaled or systemic corticosteroids (Patel 2004).

Chest physiotherapy in paediatric respiratory diseases has been used to assist in the clearance of tracheo-bronchial secretions. The main goal is to clear the airway obstruction, reduce airway resistance, enhance gas exchange and reduce the work of breathing. Different techniques are used in paediatric patients: chest percussion, vibration in postural drainage positions, chest shaking, directed coughing and slow passive forced exhalation. Its utilisation varies between countries and regions. In France, the passive forced exhalation techniques are widely used with an 82.5% to 99% utilisation per centrage and are recommended by consensus panel (Beauvois 2001; Consensus 2001). In other countries the utilisation is lower and the most common techniques performed are vibration and chest percussion (Beauvois 2001). Chest physiotherapy has been linked to adverse events and some concerns have arisen in the literature about the safety of the procedure especially in relation to rib fractures (Beeby 1998; Chalumeau 2002). The aim of reviewing clinical research was to help to clarify the evidence.

## OBJECTIVES

The objective of this review was to determine the effectiveness and safety of chest physiotherapy in infants aged less than 24 months old with acute bronchiolitis.

## CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

### Types of studies

We included randomised controlled trials (RCTs) evaluating chest physiotherapy in acute bronchiolitis.

### Types of participants

Infants younger than 24 of age with acute bronchiolitis as defined by the studies' authors and in all settings.

**Types of intervention**

We included trials that compared any type of chest physiotherapy (postural drainage, chest percussion, vibration, chest shaking, directed coughing or forced exhalation technique) versus standard care (excluding chest physiotherapy); or other drainage or breathing techniques.

**Types of outcome measures**

**Primary outcomes**
(1) Change in the severity status of bronchiolitis
(2) Oxygen saturation levels
(3) Transcutaneous PCO2

**Secondary Outcomes**
(1) Oxygen supplementation duration.
(2) Length of hospital stay
(3) Use of bronchodilators and steroids

**Adverse events**
These were defined as any injury resulting from chest physiotherapy, for example rib fractures, and long term neurological outcomes. All the outcomes were taken into consideration. We described the method used to measure them.

## SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: Acute Respiratory Infections Group methods used in reviews.

We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* Issue 2, 2004) which contains the Acute Respiratory Infection Group's specialised register; MEDLINE (January 1966 to June 2004); EMBASE (1990 to June 2004); PASCAL; SCISEARCH; LILACS; and Cumulative Index to the Nursing & Allied Health Literature (CINAHL) (1982 to May 2004).

The following search strategy was run over CENTRAL. The highly sensitive search strategy filter (Dickersin 1994) was combined with the following search strategy and run over MEDLINE. The disease and intervention terms were adapted for searching the other electronic databases:

MEDLINE (OVID)

1 exp BRONCHIOLITIS
2 exp Bronchiolitis, Viral/
3 bronchiolitis.mp.
4 exp Respiratory Syncytial Viruses/
5 exp Respiratory Syncytial Virus Infections/
6 respiratory syncytial virus$.mp.
7 exp Physical Therapy Techniques/
8 chest physiotherapy.mp.
9 exp Drainage, Postural/
10 postural drainage.mp.
11 chest percussion.mp.
12 exp VIBRATION/
13 vibration.mp.
14 chest shaking.mp.
15 directed coughing.mp.
16 forced exhalation.mp.
17 exp Breathing Exercises/
18 breathing exercise$.mp.
19 or/1-6
20 or/7-18
21 19 and 20

Searches was limited to human studies and there were no language restrictions. We examined reference lists of general paediatric, infectious diseases, pneumatology and physiotherapy textbooks. We reviewed reference lists of all selected articles and recent review articles, and also examined published abstracts from the Pediatric Academic Societies' Annual Meeting (US) 1999 to 2003. We hand searched the French journals: Journal Pédiatrie Puériculture (1999 to May 2004) and Archives de Pédiatrie (1994 to 1997; 2000 to May 2004).

## METHODS OF THE REVIEW

**Study selection**
Two independent reviewers (CP and MR) screened the initial search of all the databases and references lists to identify citations which seemed relevant to this review. Once pertinent abstracts or titles were identified, the full text articles were obtained. Two reviewers independently decided on which trials to include using a standard form (CP and MR). There were no disagreements in relation to the included trials.

**Assessment of quality**
The assessment of quality included the analysis of allocation, performance bias, analysis of losses to follow up or withdrawals and analysis of outcome assessment (whether the person who performed the outcome assessment was blinded or not to the intervention).
Two reviewers assessed the studies (CP and MR). Each RCT was rated according to the quality of allocation concealment categories.
Category A: adequate concealment
Category B: uncertain, indication of adequate
Category C: inadequate concealment

**Data extraction**
Two reviewers extracted the data (CP and MR).
A standard form was used to extract data:
- characteristics of the study (design, method of randomisation, withdrawals, drop outs);
- participants (age, gender, low birth weight or normal weight, ambulatory or hospital patient, disease severity, nutritional status);

- intervention (type of chest physiotherapy, administration, co-interventions), and its comparison;
- outcomes: (types of outcome measures, timing of outcomes, adverse effects);
- results.

**Data analysis**
The extracted data were insufficient to perform a meta-analysis. We described the individual results with the effect measures described in the original trials.

## DESCRIPTION OF STUDIES

The search strategies identified six studies that evaluated chest physiotherapy for acute bronchiolitis. Three studies were excluded as they were not RCTs (*see* Characteristics of excluded studies). Bernard-Narbone (Bernard-Narbone 2003) was a before and after study conducted in mechanically ventilated infants in a intensive care unit in France, and the end points were short term oxygenation parameters. Belcastro (Belcastro 1984) was an open pilot study with 12 patients and did not meet the quality criteria for inclusion. Finally, Quitell (Quitell 1988) was a before and after study which measured physiological parameters.

The included studies were RCTs, two studies were carried out in the UK (Nicholas 1999; Webb 1985), and one in Argentina (Bohe 2004). All three evaluated the efficacy of chest physiotherapy in hospitalised infants with a clinical diagnosis of acute bronchiolitis. Nicholas (Nicholas 1999) included more seriously ill infants who required nasogastric feeding or intravenous fluid.

Webb (Webb 1985) recruited 90 infants with a mean age of 4.6 months (range 0 months to 15 months). Forty-four infants were allocated to physiotherapy and forty-six infants to the control group. The two groups were similar with regard to age; sex; severity score on admission; proportion who were respiratory syncytial virus positive (overall proportion 69%); proportion with a first degree family history of atopy (overall proportion 36%); and those participants with smokers in the household (overall proportion 66%). The intervention tested consisted of "chest percussion with a cupped hand for three minutes in each of five postural drainage positions followed by assisted coughing" or "gentle oropharyngeal suction performed twice each day while in the hospital". Three independent medical doctors made clinical assessments of the severity of the illness at a fixed time every day. A score of 0 to three was allocated for each of ten clinical signs: heart rate, respiratory rate, hyperinflation, use of accessory muscles, recession, rhinitis, wheeze, cough, crepitations and rhonchi, giving a total severity clinical score of a maximum of thirty points. At hospital discharge, parents were asked to maintain a symptom record diary, and children were reviewed in outpatient clinics after two weeks. The main outcomes were: clinical score on admission, every day, and after five days, length of hospital stay, and total length of illness. Results were expressed as median and range. The study author was unable to provide the mean and standard deviation of each parameter because the row data were no longer available.

In the other included trial, Nicholas (Nicholas 1999) randomly allocated 50 infants to control or treatment groups, their mean age of 2.8 months (range 0.4 months to 7.6 months). The physiotherapy protocol established manual techniques of percussion and vibrations performed in postural drainage positions, and possible modifications required in relation to infant tolerance. The main outcomes were clinical status and length of hospital stay. Secondary end points were oxygen requirements and change in oxygen saturation levels after physiotherapy. (These outcomes were measured only in the intervention arm). The physiotherapy protocol was described in terms of the infant general position, the postural drainage, the technique used (percussion or vibration according to the infant distress), the frequency of suction, and oxygen supply during treatment. Results were expressed using mean, but standard deviations were not reported. The study author could not provide clarification as she was no longer in possession of the complete database.

In Bohe (Bohe 2004) 16 infants were randomly allocated to the physiotherapy group and 16 to the control group. Patients were included if they had clinical diagnosis of acute bronchiolitis defined by an acute upper respiratory infection plus fever, tachypnoea or increase of the respiratory effort. The intervention was percussion, postural drainage, vibration and nasopharyngeal aspiration twice a day. The control group received only nasopharyngeal aspiration. The end points were length of hospital stay and a severity score constructed out of five clinical variables: respiratory rate, heart rate, lung auscultation and accessory muscles use. A physiotherapist unaware of the intervention evaluated each participant. The mean age of the participants was 2.8 months, 65.5% were boys and 34.4% girls. Overall 78.1% were positive with RSV.

## METHODOLOGICAL QUALITY

Webb (Webb 1985) performed a random allocation of the intervention. The physicians that assessed clinical outcomes were intended to be blinded to the treatment status. The clinical assessment was made at a fixed time each day. Sample size was not described.

Nicholas (Nicholas 1999) had also randomly allocated patients to the intervention. The original paper did not state if the clinical status was assessed in a blinded fashion, and sample size was not calculated.

Bohe (Bohe 2004) was similar to the other two studies. Patients were randomly allocated, clinical status was assessed in a blinded fashion and assessment was made at a fixed time each day - at least one hour after the chest physiotherapy.

The overall quality in relation to randomisation, allocation and outcome assessment was good. The main flaws of the studies were inadequate reporting of results, lack of estimation of sample size and the use of clinical scores that were not properly validated.

## RESULTS

### Primary Outcomes

***Respiratory parameters***

Studies did not evaluate oxygen saturation levels or transcutaneous PCO2 as an outcome measure between intervention and control group.

***Change in status of severity of bronchiolitis***

Nicholas and Webb (Nicholas 1999; Webb 1985) assessed this outcome using the clinical score described above. In the Webb (Webb 1985) study the clinical score was similar in both groups at baseline and in each of the first five days of assessment at the hospital. In the control group the median score on admission was 12 (range 4 to 24) in 46 patients and in the physiotherapy group the median score was 10 (range 4 to 22) in 44 patients. On the fifth day, 18 patients remained in hospital with a median score of five (range 1 to 11) in the control group, and 11 patients in the physiotherapy group, with a median score of six. There were no statistically significant differences between groups in relation to the clinical score to the proportion who remained in hospital at day five.

Nicholas (Nicholas 1999) expressed clinical scores using means, but did not report standard deviations. There were no differences in the admission mean clinical score (intervention group = 9.1 versus control group = 10.86) between groups. The authors reported that clinical scores did not show any statistically significant difference between groups during the five day trial. Data were provided on a graph, but it could not be extracted. Authors described this data in a figure where it was not possible to extract means and standard deviation. Bohe (Bohe 2004) used a different severity clinical score to the one use in the other two trials. The score was similar at baseline between the two groups and at day five or day of discharge the score was 3.25 (standard deviation (SD) 1.27) in the physiotherapy group and 3.12 (SD 1.15) in the control group (WMD = 0.13, 95% CI -0.71 to 0.97) .

### Secondary Outcomes

***Duration of oxygen supplementation***

Nicholas (Nicholas 1999) found that the mean hours with supplemental oxygen in the control group was 63 (range 2.3 hours to 128 hours) and 86 (range 36 hours to 148 hours) in the physiotherapy group. Differences were reported as not significant using a non-parametric test.

***Length of hospital stay***

Webb (Webb 1985) showed a median length of hospital stay of four days (range 1 day to 15 days) in the control group and a median of four days (range 2 days to 11 days) in the physiotherapy group, with no statistical differences between groups.

In the Nicholas (Nicholas 1999) study the mean length of hospital stay was 6.6 days (range 2.3 days to 11.5 days) in the control group and 6.7 days (range 3 days to 9.5 days) in the physiotherapy arm. Authors did not find any statistically significant differences.

In the Bohe (Bohe 2004) study the mean length of hospital stay was 4 days (SD 2) in the treatment group and 3.87 days (SD 1.3) in the control arm. There were no statistically significant differences between them (WMD = 0.13; 95% CI -1 to 1.26).

***Use of bronchodilators and steroids***

This outcome was not reported in the trials.

***Adverse events***

None of the trials reported adverse events. Bohe (Bohe 2004) reported that one child in the control group was withdrawn from the study because he developed a basal atelectasia.

***Sub-group analysis***

Nicholas (Nicholas 1999) performed a sub-group analysis between patients who had more than 10 points on the baseline clinical score and those with a baseline clinical score below 9.5. There were no differences between the physiotherapy and control groups in this sub-group analysis in each of the end points.

## DISCUSSION

The rationale for the use of chest physiotherapy in infants with acute bronchiolitis is that it will enhance clearance of secretions and improve oxygenation parameters. Those who are against its routine use claim that it might cause distress to the infant and the benefits are not substantial. The use of chest physiotherapy in the treatment of acute bronchiolitis varies among countries and institutions. While in some countries it is a standard practice and doctors feel unethical if they do not provide this practice, in other countries it is not standard practice and physiotherapists are not part of the regular staff taking care of these infants. The evidence for and against its use is weak. The three trials we analysed in this systematic review did not support the use of chest physiotherapy in acute bronchiolitis. The question is whether these trials are robust enough to address this question or whether further research is needed.

Unfortunately, it was not possible to pool the data from the trials since they were summarised using different central tendency measures. Pooling the data would have added sample size, diminishing the probability of a type II error. There were two main outcomes evaluated in the three trials: length of hospital stay and clinical scores. The length of hospital stay is unlikely to be the cause of a lack of power since Nicholas (Nicholas 1999) and Webb (Webb 1985) have adequate sample sizes to find at least one day's difference between the groups. In the case of the change of clinical score, lack of power could be a possible explanation, considering

that the authors did not clearly state the magnitude of effect they looked for in this outcome. Outcome selection is a key issue when addressing the efficacy of chest physiotherapy. Length of hospital stay is unlikely to be decreased by the use of chest physiotherapy. Bronchiolitis is a self-limiting disease and usually the patient is discharged between day three and day four. It is unlikely that chest physiotherapy will change its evolution. The clinical status assessment, using well validated instruments, seems a more valid outcome.

Another important flaw of the trials was the lack of a valid placebo. Since the trials had a non-intervention group, the researchers would have been expected to establish an outcome assessment procedure that prevented bias. The main outcomes in the three trials were clinical status, length of hospital stay and, in the case of Nicholas (Nicholas 1999), oxygen requirements. However, clinical assessment blinding was not clearly described. Although the selection of an appropriate placebo is an important point for future research, it does not seem to have a relevant impact on the results observed in the included trials.

An important issue in any intervention assessment is safety. None of the trials included in this review reported adverse events. Bohe (Bohe 2004) reported that one patient in the control arm withdrew from the study because he developed an atelectasia. Adverse events reported in the literature are a brain lesion, namely encephaloclastic porencephaly (ECPE), in extremely pre-term infants and rib fractures. This lesion was suggested in a retrospective case control study by Harding (Harding 1998), but in later larger studies (Beeby 1998; Knight 2001) this was not found to be the case. Some observational studies in the literature that suggest an association between rib fractures and chest physiotherapy (Chalumeau 2002). Until more evidence arises from the association of chest physiotherapy and rib fractures, it would be advisable that those centres that use chest physiotherapy regularly perform a surveillance study in vulnerable infants.

Currently, there are two different approaches to physiotherapy: one relies on percussion and vibration techniques, and the other acts through the passive acceleration of expiratory flux, with the goal to trigger coughing and help to move secretions. This last technique is widely used in France. It is to be noted that all the trials included in this review applied percussion and vibration techniques, and thus the conclusions derived from this review may not be applicable to gentler approaches to physiotherapy. At present there are two on-going trials to assess the efficacy of chest physiotherapy in acute bronchiolitis (one in France and one in Spain, *see* Characteristics of ongoing studies). Both of these trials are evaluating the expiratory forced technique. The results of the two on-going trials could cast some light on the efficacy and safety of these techniques.

The use of chest physiotherapy is not recommended in published clinical guidelines (González 2001; Perlstein 1999). These clinical guidelines are based on the first two trials (Nicholas 1999; Webb 1985) and expert recommendations. The University of Cincinnati developed and tested a clinical guideline for the treatment of bronchiolitis where chest physiotherapy was not recommended for acute bronchiolitis. The use of chest physiotherapy (among others therapies) was reduced after the implementation of the guideline, while outcomes (length of hospital stay, mortality, oxygen requirements, admission to intensive care units) remained unchanged (Perlstein 1999). In France, the use of chest physiotherapy in acute bronchiolitis is recommended by expert consensus (Beauvois 2001; Consensus 2001; Delauna 1998).

In conclusion, vibration and percussion techniques have not shown to reduce length of hospital stay in acute bronchiolitis or to improve a severity clinical score. Further research is needed to evaluate other types of physiotherapy and it would be essential that authors choose their outcome measures accurately and state in advance the benefits they expect to gain with the intervention.

## AUTHORS' CONCLUSIONS

### Implications for practice

Based on these three trials, chest physiotherapy using percussion and vibration techniques, could not be recommended for hospitalised infants with acute bronchiolitis.

### Implications for research

For future research several issues would need to be addressed. Firstly, which type of physiotherapy (if indeed there is one) is effective. The acceleration of expiratory flux deserves further clinical research. The use of chest physiotherapy in an outpatient basis also needs to be evaluated. Another important concern is the lack of a valid placebo for chest physiotherapy. In cases where the use of placebo is complex, outcome assessments need to be as unbiased as possible and clearly reported. The best way to do this is to use a blinded observer.

Outcome selection also deserves further thought. Length of hospital stay does not seem to be an appropriate end point. Bronchiolitis is a self-limiting disease and usually the patient would be discharged between day three and four. It's unlikely that chest physiotherapy will change its evolution. However, we would expect the infant to go through the process as undisturbed as possible. The way in which discomfort is measured is the key issue. The most useful clinical severity scores are probably those that measure respiratory effort, oxygen saturation and oxygen requirements (Wainwright 2003) and those that can have prior psychometric validation data.

Finally, adverse events such as rib fractures need to be surveyed in centres where chest physiotherapy is a common procedure.

## POTENTIAL CONFLICT OF INTEREST

None known.

## ACKNOWLEDGEMENTS

Iberoamerican Cochrane Center and "Centro de Investigaciones Epidemiológicas"- Academia Nacional de Medicina de Buenos Aires, Argentina. Partial funding by The Child Health Field, Cochrane Collaboration. We also acknowledge Dr Mariano Gallo's contribution to the protocol development.

## SOURCES OF SUPPORT

**External sources of support**

- Instituto de Salud Carlos III. Subdireccion General de Investigacion Sanitaria (01/A060) SPAIN

**Internal sources of support**

- Iberoamerican Cochrane Center, Barcelona SPAIN

## REFERENCES

### References to studies included in this review

**Bohe 2004** *{published data only}*
Bohe L, Ferrero ME, Cuestas E, Polliotto L, Genoff M. Indications of conventional chest physiotherapy in acute bronchiolitis. *Medicina de Buenos Aires* 2004;**64**(3):198–200.

**Nicholas 1999** *{published data only}*
Nicholas K J, Dhouieb MO, Marshal TG, Edmunds AT, Grant MB. An evaluation of chest physiotherapy in the management of acute bronchiolitis. Changing clinical practice. *Physiotherapy* 1999;**85**(12): 669–74.

**Webb 1985** *{published data only}*
Webb MSC, Martin JA, Cartlidge PHT. Chest physiotherapy in acute bronchiolitis. *Archives of Disease in Childhood* 1985;**60**:1078–9.

### References to studies excluded from this review

**Belcastro 1984**
Belcastro M, Backes C, Chila A. Bronchiolitis: a pilot study of osteopathic manipulative treatment, bronchodilators and other therapy. *Journal of the American Osteopathic Association* 1984;**83**(9):672–5.

**Bernard-Narbone 2003**
Bernard-Narbonne F, Daoud P, Castaing H, Rousset A. Effectiveness of chest physiotherapy in ventilated children with acute bronchiolitis [Efficacité de la kinésithérapie respiratorire chez des enfants intubés ventilés atteinets de bronchiolite aiguë]. *Archives de Pédiatrie* 2003; **10**:1043–7.

**Quitell 1988**
Quitell LM, Wolfson MR, Schidlow DV. The effectiveness of chest physical therapy in infants with bronchiolitis. *American Review of Respiratory Disease* 1988;**137**:406 A.

### References to ongoing studies

**Gajdos 2004**
Chest physiotherapy for acute bronchiolitis. Ongoing study September 2004
Paris, France.

**Galvany 2004**
Chest Physiotherapy for acute bronchiolitis. Ongoing study November 2003
Pilot study enrolled 30 patients.

### Additional references

**Beauvois 2001**
Beauvois E. Role of physiotherapy in the treatment of acute bronchiolitis in the infant [Place de la kinésithérapie dans le traitement des bronchiolites aiguës du norrisson. Conférence de consensus]. *Archives de Pédiatrie* 2001;**8**(Suppl 1):128–31.

**Beeby 1998**
Beeby PJ, Henderson- Smart, Lacey JL, Rieger I. Short and long term neurological outcomes following neonatal chest physiotherapy. *Journal of Pediatrics and Child Health* 1998;**34**:60–2.

**Chalumeau 2002**
Chalumeau M, Foix-L'Helias L, Scheinmann P, Zuani P, Gendrel D, Ducou-le-Pointe. Rib fractures after chest physiotherapy for bronchiolitis or pneumonia in infants. *Pediatric Radiology* 2002;**Sep 32** (9):644–7.

**Consensus 2001**
Agence nationale d'accréditation d'évaluation en santé. Conférence de consensus sur la bronchiolite du nourrisson. 21 septembre 2000. Consensus Conference for acute bronchiolitis in the infants [Conférence de consensus sur la bronchiolite du norrisson]. *Archives de Pédiatrie* 2001;**8**(Suppl. 1):11S–23S.

**Delauna 1998**
Delaunay JP. Consensus conference in chest physiotherapie. Role of the different non instrumentals techniques to descomprise the bronchies [Conférence de consensus en kinésitherapie respiratoire. Place respective des différentes techniques non instrumentales de désencombrement bronchique]. *Cahiers de Kinesitherapie* 1998;**192** (4):14–22.

**Dickersin 1994**
Dickersin K, Scherer R, Lefebvre C. Identifying relevant studies for systematic reviews. *BMJ* 1994;**309**:1286–9.

**Galiano 2004**
Galiano M, Videla C, Puch SS, Martinez A, Echavarria M, Carballal G. Evidence of human metapneumovirus in children in Argentina. *Journal of Medical Virology* 2004;**72**(2):299–303.

**González 2001**
Gonzalez Caballero D, González Pérez-Yarza E. Acute Bronchiolitis: basics for rational´ s guidelines [Bonquilitis Aguda: bases para un protocolo racional]. *Anales Españoles de Pediatria* 2001;**55**:355–64.

**Harding 1998**
Harding J, Miles F, Becroft D, Allen B, Knight D. Chest physiotherapy may be associated with brain damage in extremely premature infants. *Journal of Pediatrics* 1998;**132**:440–4.

**Holman 2003**
Holman RC, Shay DK, Curns AT, Lingahojr Anderson LJ. Risk factors for bronchiolitis associated deaths among infants in the US. *Pediatric Infectious Diseases Journal* 2003;**22**(6):483–90.

**Kellner 1998**
Kellner JD, Ohlsson A, Gadomski AM, Wang EEL. Bronchodilators for bronchiolitis (Cochrane Review). In: *The Cochrane Database of Systematic Reviews*, 4, 1998. Chichester: John Wiley & Sons, Ltd.

**Knight 2001**
Knight DB, Bevan CJ, Harding JE, Teele RL, Kuschel CA, Battin MR, et al. Chest physiotherapy and porencephalic brain lesions in very preterm infants. *Journal of Pediatrics and Child Health* 2001;**Dec 37**(6):554–8.

**Mc Millan 1994**
Mc Millan JA, De Angelis CD, Feigin RD, Warshaw JB. *Oski´ s Pediatrics Principles and Practice*. Third Edition. Philadelphia: Lippincott Williams & Wilkins, 1994.

**Patel 2004**
Patel H, Platt R, Lozano J, Wang E. Glucocorticoids for acute viral bronchiolitis in hospitalized infants and young children (Cochrane Review). In: *The Cochrane Database of Systematic Reviews*, 3, 2004. Chichester: John Wiley & Sons, Ltd.

**Perlstein 1999**
Perlstein P, Kotagal U, Bolling C, Steele R, Schoetker P, Atherton H, et al. Evaluation of an evidence -based guideline for bronchiolitis. *Pediatrics* 1999;**104**(6):1334–41.

**Roosvelt 1996**
Roosvelt G, Sheenan K, Grupp- Phelan J, Tanz RR, Listernick R. Dexamethasone in bronchiolitis: a randomized controlled trial. *The Lancet* 1996;**348**:292–5.

**Spencer 1996**
Spencer N, Logan S, Scholey S, Gentle S. Deprivation and bronchiolitis. *Archives of Disease in Childhood* 1996;**74**:50–2.

**Videla 1998**
Videla C, Carballal G, Misirlian A, Aguilar M. Acute lower respiratory infections due to respiratory syncytial virus and adenovirus among hospitalized children from Argentina. *Clinical and Diagnostic Virology* 1998;**10**:17–23.

**Wainwright 2003**
Wainwright C, Altamirano L, Cheney M, Cheney J, Barber S, Price D, et al. A multicenter, randomized, double-blind, controlled trial of nebulized epinephrine in infants with acute bronchiolitis. *NEJM* 2003;**349**:27–35.

**Wallis 1999**
Wallis C, Prasad A. Who needs Chest physiotherapy? Moving from anecdote to evidence. *Archives of Diseases in Childhood* 1999;**80**(4): 393–7.

**Welliver 2003**
Welliber RC. Review of epidemiology and clinical risk factors for severe respiratory syncytial virus infection. *Journal of Pediatrics* 2003; **143**(Supplement):112–7.

# TABLES

## Characteristics of included studies

| Study | Bohe 2004 |
|---|---|
| Methods | Patients were randomly allocated to control and intervention.<br>Children were assessed every day in the evening. |

**Characteristics of included studies** (*Continued*)

| | |
|---|---|
| Participants | Infants admitted to the hospital with a clinical diagnosis of acute bronchiolitis. 16 were allocated to the control group and 16 to the intervention arm |
| Interventions | Vibration and postural drainage techniques twice a day. |
| Outcomes | Lengh of stay (days): 4 +- 2 (intervention) 3.87 +- 1.3 (control)<br>clinical score |
| Notes | One patient in the intervention group was withdrawn after developing atelectasia. |
| Allocation concealment | D – Not used |

| **Study** | **Nicholas 1999** |
|---|---|
| Methods | Patients were randomly allocated to control and treatment groups using a random sequence number. |
| Participants | Infants admitted to the hospital with a clinical diagnosis of acute bronchiolitis and with respiratory distress severe enough that required nasogastric tube feeding or intravenous fluids. 24 were allocated to control group and 26 to treatment. Mean age: Control group: 3.2 (range 0.4 to 8.3) ; intervention 2.4 (range 0.4 to 6.9) RSV positive control = 79% , intervention: 85%. |
| Interventions | Physiotherapy arm: Patient is treated on physiotherapist´ s knee, percussion and vibration in right side lying, left side lying and sitting; suction performed after each side if necessary until clear; no oxygen required during treatment.<br>Modifications were allowed if patient did not tolerate procedure. Oxygen was allowed depending on infant tolerability. |
| Outcomes | Clinical score: data not reported<br>Lengh of stay (days): mean 6.6 control (2.3 to 11.5) and 6.7 (3 to 9.5) intervention<br>Nasogastric feeds - mean control 92 hours (range 8 to 225) intervention: 86 (range 36 to 148) |
| Notes | The study end at five days.<br>Authors did not report standard deviation. |
| Allocation concealment | B – Unclear |

| **Study** | **Webb 1985** |
|---|---|
| Methods | Children with clinical diagnosis of acute bronchiolitis were randomly allocated to chest physiotherapy or control<br>During five days were assessed using a severity clinical score. There was a follow up after two weeks at the outpatient clinic |
| Participants | 90 Infants admitted with clinical diagnosis of acute bronchiolitis. Mean age 46 months (range 0.5 to 15)<br>69% were respiratory syncytial virus.<br>36% had a first degree family history of atopy.<br>66% had smokers in the household. |
| Interventions | Chest physiotherapy comprising standard techniques applied by a trained paediatric physiotherapist.<br>They performed chest percussion with a cupped hand for three minutes in each of five postural drainage positions followed by assisted coughing or gentle oropharyngeal suction twice a day. |
| Outcomes | Lengh of stay (days): control group : 4 (range 1 to 15) intervention 4 (range 2 to 11)<br>Clinical score at day five: control group 5 (range 1 to 11) intervention 6 (range 3 to 10)<br>Clinical score at day one : control group 10 (range 2 to 27) intervention 7 (range 2 to 24) |
| Notes | Authors did not report mean and standard deviation of the mean. Results were expressed as median values and range. |
| Allocation concealment | B – Unclear |

## Characteristics of excluded studies

| Study | Reason for exclusion |
|---|---|
| Belcastro 1984 | Not a randomised clinical trial. This was a pilot study done in 12 patients. Trialists intended to compare osteopathic manipulative treatment against postural drainage but the study was not designed as a clinical trial. |
| Bernard-Narbone 2003 | Before and after study.<br>Twenty infants less than 30 weeks<br>(mean 9 SD 7) Patients were in mechanic ventilation. Intervention: forced expiration technique<br>Short term outcomes: Oxygen saturation rise from 94.5 +- 3.8 to 97.5 +- 10.5<br>Inspiratory tidal volume: 55.4 +- 16 to 63.6 +- 20<br>Expiratory tidal volume. 53.15 +- 16 62.3 +- 21 |
| Quitell 1988 | Before and after study. Thirteen infants between 2 and 6 weeks of age entered in the study. Short term outcomes. |

## Characteristics of ongoing studies

| Study | Gajdos 2004 |
|---|---|
| Trial name or title | Chest physiotherapy for acute bronchiolitis |
| Participants | Patients less than two years old |
| Interventions | Two chest physiotherapy techniques |
| Outcomes | |
| Starting date | September 2004<br>Paris, France |
| Contact information | vincent.gajdos@abc.ap-hop-paris.fr |
| Notes | information by e-mail correspondence. |

| Study | Galvany 2004 |
|---|---|
| Trial name or title | Chest Physiotherapy for acute bronchiolitis |
| Participants | Hospitalised patients.<br>less than two years old. Virus syncytial respiratory positive |
| Interventions | Forced expiratory technique |
| Outcomes | Lengh of stay<br>Severity clinical score |
| Starting date | November 2003<br>Pilot study enrolled 30 patients |
| Contact information | nurialopez@sumi.es |
| Notes | |

# GRAPHS AND OTHER TABLES

This review has no analyses.

## INDEX TERMS

**Medical Subject Headings (MeSH)**

Acute Disease; Bronchiolitis [*therapy]; Drainage, Postural; Infant, Newborn; Oxygen Inhalation Therapy; Percussion [*methods]; Randomized Controlled Trials; Respiratory Therapy [*methods]; Vibration [*therapeutic use]

**MeSH check words**

Humans; Infant

## COVER SHEET

| | |
|---|---|
| **Title** | Chest physiotherapy for acute bronchiolitis in paediatric patients between 0 and 24 months old |
| **Authors** | Perrotta C, Ortiz Z, Roque M |
| **Contribution of author(s)** | Carla Perrotta (CP) wrote the protocol.<br>Zulma Ortiz (ZO) and Marta Roque (MR) both commented on, and corrected the protocol.<br>Dr Mariano Gallo contributed to the protocol development.<br>Marta Roque and Carla Perrotta extracted the data for the review.<br>Carla Perrotta wrote the review. |
| **Issue protocol first published** | 2004/3 |
| **Review first published** | 2005/2 |
| **Date of most recent amendment** | 17 February 2005 |
| **Date of most recent SUBSTANTIVE amendment** | 18 February 2005 |
| **What's New** | Information not supplied by author |
| **Date new studies sought but none found** | Information not supplied by author |
| **Date new studies found but not yet included/excluded** | Information not supplied by author |
| **Date new studies found and included/excluded** | 10 June 2004 |
| **Date authors' conclusions section amended** | Information not supplied by author |
| **Contact address** | Dr Carla Perrotta<br>Woodview House<br>UCD School of Public Health and Population Sciences<br>Belfield<br>Dublin<br>4<br>IRELAND<br>E-mail: carla.perrotta@ucd.ie<br>Tel: +353 1 716 3180<br>Fax: +353 1 716 7407 |
| **DOI** | 10.1002/14651858.CD004873.pub2 |
| **Cochrane Library number** | CD004873 |

| | |
|---|---|
| **Editorial group** | Cochrane Acute Respiratory Infections Group |
| **Editorial group code** | HM-ARI |