

# Current management of acute bronchiolitis in Switzerland

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## Summary

**Introduction:** Acute bronchiolitis is the most common lower respiratory tract infection in the first year of life. Current expert opinion and scientific data suggest that pharmaceutical agents have little impact on the natural course of the disease.

**Methods:** Postal questionnaires were sent to all Swiss paediatricians to assess their current practice for treating acute bronchiolitis in children.

**Results:** Of a total of 937 questionnaires, 541 (58%) were returned. Of the respondents, 422 (78%) treat children with acute bronchiolitis. Up to 99% of paediatricians used bronchodilators in the outpatient and inpatient management, either routinely (up to 62%) or occasionally (37%). Steroids were used by 41% of the respondents in outpatient management and by 57% in inpatient management. The paediatric respiratory physi-

cians tended to use bronchodilators and corticosteroids less frequently than the general paediatricians.

**Conclusions:** A wide variation in the treatment of bronchiolitis was noted. Despite lack of evidence of benefit most Swiss paediatricians use pharmaceutical agents in the management of acute bronchiolitis. In particular, bronchodilators and corticosteroids were used in inpatient management in Switzerland much more frequently than recently reported for Australian paediatricians. National guidelines could be helpful in reducing the variations in the management of acute bronchiolitis in our country.

**Key words:** acute bronchiolitis; bronchodilators; corticosteroids

## Introduction

Acute bronchiolitis is the most common lower respiratory tract infection in infants and continues to be one of the main reasons for paediatric hospital admissions in winter [1]. Several viral agents have been identified as causing bronchiolitis, Respiratory Syncytial virus (RSV) being the most prevalent. Almost all children will have been infected with RSV by the age of 2 years but only 1 to 2% of infected infants require hospitalisation [2]. The need for hospitalisation is higher in children born prematurely and those with bronchopulmonary dysplasia [3]. Death from bronchiolitis is extremely rare (<0.01%) and occurs predominantly in children with underlying cardiac, respiratory or immunological diseases. Despite signifi-

cant advances in pharmacotherapy, the treatment of infants with bronchiolitis has remained largely supportive with attention to oxygen therapy, fluid management, avoidance of unnecessary handling and respiratory support as needed [4]. The supplemental use of pharmaceutical agents has been debated for many years [5]. However systematic reviews suggest that no treatment shortens the natural course of acute bronchiolitis or provides clinically relevant improvements in symptoms [6–9].

The purpose of this study was to examine the current management practice of acute bronchiolitis by Swiss paediatricians and to compare this with the management reported internationally and in the current literature.

## Methods

A standardised questionnaire was sent to all paediatricians registered with the Swiss Society of Paediatrics in October 2001 – including all members of the Swiss Paediatric Pulmonology Group (SAPP). All members were asked to complete at least the first question (Do you treat children with bronchiolitis – yes or no?) and return the questionnaire in a prepaid envelope.

Statistical analysis was performed using SPSS v 8.0 (SPSS Inc., Chicago, IL, USA). Comparisons of medication usage between general paediatricians and paediatric respiratory physicians were performed using trend analysis based on ridit scores [10] in Epi Info 6.04d (Center for Disease Control and Prevention, Atlanta, GA, USA).

## Results

Nine hundred and thirty seven questionnaires were distributed and 541 were returned (response rate 58%). The response rate for the paediatric respiratory physicians was slightly higher (67%). One hundred and nineteen (22%) responders reported that they did not treat children with acute bronchiolitis. Of the remaining 422 paediatricians, 59% reported that they treated 10–50 children with bronchiolitis per year; 9% treated more than 50 and 32% less than 10 children per year. A wide variation in the current treatment of bronchiolitis was noted.

### Outpatient management

The results of the outpatient management questions are detailed in table 1. Ninety nine per-

cent of paediatricians reported that they use salbutamol in outpatient management of acute bronchiolitis, 62% routinely and 37% occasionally. Thirty percent of paediatricians reported that they used ipratropium bromide, the majority of them (27%) sometimes and only 2% always. Only two paediatricians did not use ipratropium bromide in combination with salbutamol. Three hundred and sixty five (90%) reported that they used corticosteroids in outpatient management. Inhaled corticosteroids were used more often than systemic corticosteroids (85% versus 41%). One hundred and forty five (35%) used inhaled steroids always and 197 (48%) sometimes. Seventy three (18%) paediatricians used cromoglycates and 229 (56%) used antibiotics, 6 (1.5%) always and 148 (36%)

**Table 1**

Outpatient management.

	always	sometimes	only high risk	never	not answered
<b>Bronchodilators</b>					
Salbutamol	62%	37%	0%	0.5%	0.5%
Ipratropium bromide	2%	27%	1%	40%	30%
<b>Steroids</b>					
Systemic	3%	35%	3%	34%	25%
Inhaled	35%	48%	2%	9%	6%
Any steroid	36%	51%	3%	8%	2%
<b>Cromoglycates</b>	3%	15%	0.2%	71%	11%
<b>Antibiotics</b>	2%	36%	18%	38%	6%
<b>Nasal drops</b>					
Xylometazoline	14%	66%	1%	9%	10%
NaCl 0.9%	43%	50%	0%	3%	4%

**Table 2**

Inpatient management.

	always	sometimes	only high risk	never	not answered
<b>Bronchodilators</b>					
Salbutamol	55%	40%	1%	2%	2%
Ipratropium bromide	5%	46%	2%	32%	15%
Adrenaline	2%	32%	4%	42%	20%
Any bronchodilator	57%	42%	0%	1%	0%
<b>Steroids</b>					
Systemic	4%	44%	9%	29%	14%
Inhaled	30%	45%	3%	16%	6%
Any steroid	31%	49%	5%	13%	2%
<b>Theophylline</b>	1%	13%	3%	71%	12%
<b>Ribavirin</b>	0%	2%	6%	82%	10%

sometimes. Eighty one percent of the paediatricians reported that they use nasal drops, 46% always and 50% sometimes. Normal saline was used more often than xylometazoline. Forty four (11%) paediatricians always tried to identify the virus responsible, 162 (40%) sometimes and 89 (22%) only in high risk children.

**Inpatient management**

The results of the inpatient management questions are presented in table 2. Ninety six percent of the paediatricians reported that they use salbutamol for inpatients with bronchiolitis, 55% always and 40% sometimes. Only 2% never used salbutamol in inpatient management. Fifty five percent reported that they used ipratropium bromide, most of them sometimes. All but one paediatrician used ipratropium bromide in combination with salbutamol. Eighty five percent of paediatricians used corticosteroids, mainly by inhalation. Thirty percent of paediatricians used inhaled steroids for every child with acute bronchiolitis. Theophylline and ribavirin are used far less often. Thirty six percent prescribed chest physiotherapy on a regular basis for treatment of acute bronchiolitis, 49% sometimes and 4% only for high risk children.

**General paediatricians vs. paediatric respiratory physicians**

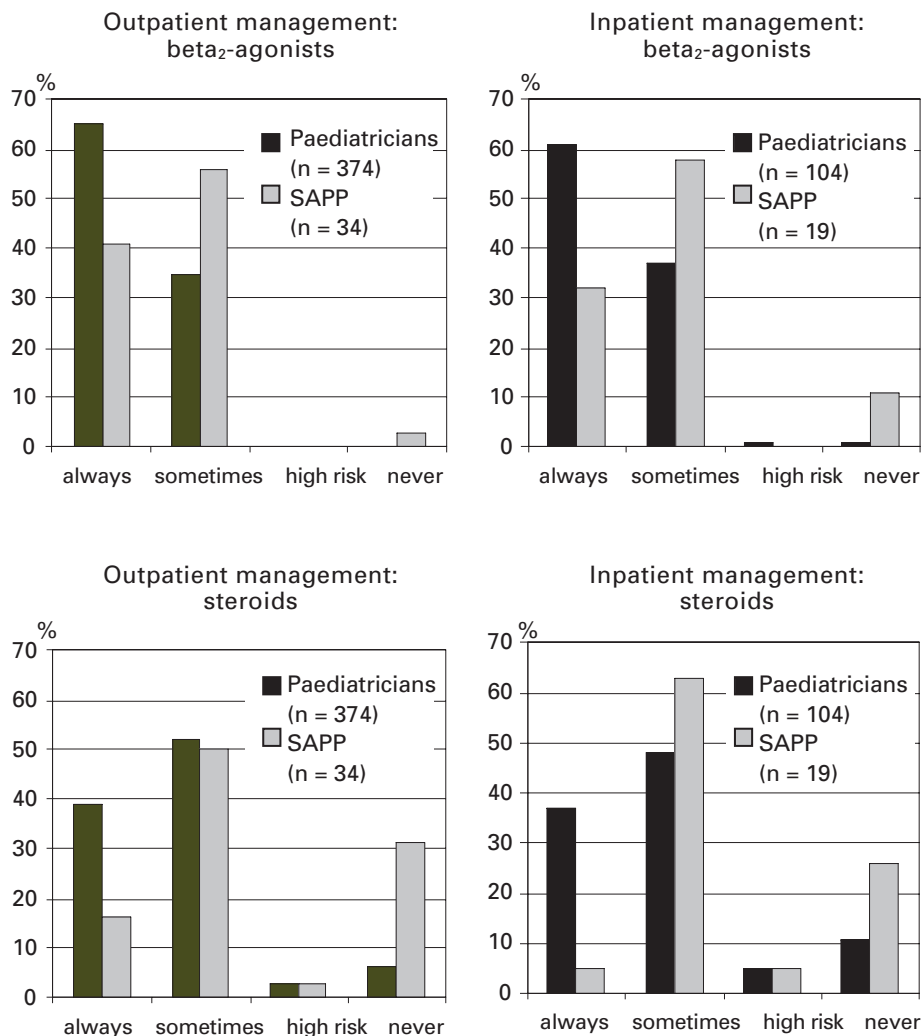
The paediatric respiratory physicians tend to use bronchodilators and corticosteroids as well as antibiotics and chest physiotherapy less frequently than the general paediatricians (fig. 1 and 2). This difference was highly significant ( $p < 0.001$ ) for the use of salbutamol and steroids in both outpatient and inpatient management as well as for antibiotics and physiotherapy. The difference was also significant for the outpatient use of ipratropium bromide ( $p = 0.003$ ) but not for the inpatient use ( $p = 0.3$ ). There was no difference in the use of aminophylline ( $p = 0.06$ ) and ribavirin ( $p = 0.7$ ) in the inpatient management, however the percentage of use was low in both groups. In the outpatient setting, paediatric respiratory physicians are significantly more likely to perform diagnostic viral studies than general paediatricians ( $p = 0.001$ ).

**Comparison to international management**

Only a few published reports detailing the management of acute bronchiolitis in other countries are available (table 3). In 1995 the European Society for Paediatric Infectious Disease (ESPID) published the results of a survey of their society (88 centres in 19 European countries) [11]. Fifty five centres (61%) reported the use of bronchodilators

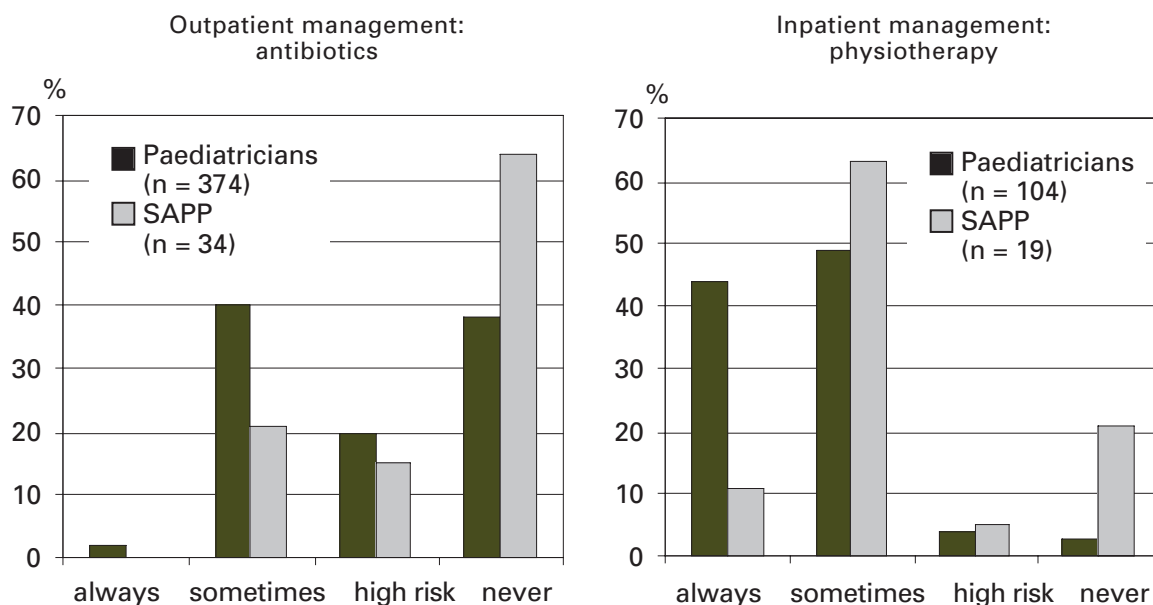
**Figure 1**

Comparison of prescribing habits for beta<sub>2</sub>-agonists and corticosteroids between general paediatricians (■) and members of the Swiss Paediatric Pulmonology Group (SAPP) (▨).



**Figure 2**

Comparison of prescribing habits for antibiotics and physiotherapy between general paediatricians (■) and members of the Swiss Paediatric Pulmonology Group (SAPP) (▨).



on a regular basis and in 30 centres (34%) they were only used in high risk children. The same study showed that corticosteroids were used in every child with bronchiolitis by 10 centres (11%) whereas 61 centres (69%) only used steroids for high risk patients. However, the members of this group were specialised paediatric infectious disease physicians and thus the results do not reflect the daily management of infants with bronchiolitis by general paediatricians.

The Paediatric Investigators Collaborative Network on Infections in Canada (PICNIC) collected data retrospectively from nine tertiary care

hospitals, which also showed a high use of pharmaceutical agents. 85% used bronchodilators in every child and 28% used steroids on a regular basis with a higher percentage of their use in compromised patients [12].

The published data, which best allow a comparison to our study are from a similar survey in Australia where the same questionnaire was used [13]. In contrast to most European countries, only 5% of the Australian paediatricians always used bronchodilators in the inpatient management of bronchiolitis and only 1% reported the use of steroids on a regular basis.

## Discussion

This survey has demonstrated a wide variation in the treatment practices for both the outpatient and the inpatient management of acute bronchiolitis by Swiss paediatricians. Most Swiss paediatricians use supplementary drugs despite the lack of scientific evidence for any benefit of pharmaco-

logical interventions on the natural course of this disease. In particular, almost all Swiss paediatricians report using bronchodilators (62% always and 37% sometimes) and 80% use steroids (33% always).

In 1963 Reynolds and Cooke summarised the

**Table 3**

Comparison of the international hospital management of acute bronchiolitis.

		Switzerland *	Europe * [11]	Canada ** [12]	Australia * [13]
Bronchodilators	all patients	57%	61%	85%	7%
	sometimes	42%		69%	
	only high risk patients	0%	34%	12%	
	never	1%	5%		9%
Steroids	all patients	31%	11%	28%	1%
	sometimes	49%		35%	
	only high risk patients	5%	69%		22%
	never	13%	19%		38%
Ribavirin	all patients	0%	0%	6%	0%
	sometimes	2%			1%
	only high risk patients	6%	57%		11%
	never	82%	43%		83%

\* Questionnaire survey

\*\* Retrospective study

then current status of therapy in bronchiolitis as “oxygen is vitally important in bronchiolitis and there is little convincing evidence that any other therapy is consistently or even occasionally useful” [5]. After a further 40 years of research and development of potential therapeutic agents (e.g. ribavirin and inhaled corticosteroids), there is still little evidence that any medication is effective in this condition. Systematic reviews of the literature suggest that pharmacological agents do not influence the natural history or progression of the disease.

### Bronchodilators

The use of bronchodilators in the management of acute bronchiolitis has been debated for 40 years [5] and still remains controversial [14–20]. Some of the controversies are related to the difficulties in differentiating RSV-induced obstructive bronchitis (wheezing) from a first episode of asthma in young children. The term RSV bronchiolitis refers (in our country) to infants with clinical signs of viral lower respiratory tract infection with tachypnoea, hypoxaemia, expiratory crackles and wheezing. The diagnosis of asthma is very rare in the infant age group, but this is different in older children where the term obstructive bronchitis is used if wheezing has an infectious origin. In contrast to obstructive bronchitis or asthma, the main cause of airway obstruction in bronchiolitis is airway inflammation and airway narrowing by mucosal oedema and mucus plugs and collapse of the very small and compliant airways. This has been shown to be unresponsive to bronchodilator therapy [21]. A recent Cochrane review could find no benefit on oxygen saturation or the rate or duration of hospitalisation [6]. The only significant benefit was a modest short-term improvement in the pooled estimate of the clinical score. The authors noted that the clinical importance of the magnitude of these differences was questionable and was possibly due to the inclusion of children with recurrent wheezing and bronchial hyperreactivity. It was concluded that bronchodilators, given their cost – in the USA estimated to be US\$ 37.5 million annually – and their minimal benefit, could not be recommended for routine management of bronchiolitis [6].

There is some evidence for the usefulness of nebulised adrenaline (racemic epinephrine) with its  $\alpha$ - and  $\beta$ -adrenergic activities in the therapy of bronchiolitis, as mucosal swelling and oedema of the small airways are an important component of the underlying pathophysiology. A number of recent studies have demonstrated greater improvements in clinical scores with nebulised adrenaline than with Salbutamol [22–25]. There are, however, conflicting data about the value and danger of using nebulised adrenaline in the management of acute bronchiolitis [26, 27].

As demonstrated in our survey, almost all Swiss paediatricians use bronchodilators in acute bronchiolitis, most of them  $\beta_2$ -agonists. Bronchodilator therapy is also widely used in the United

States [28] and Canada [12, 29]. Similarly, the ESPID survey showed, that bronchodilator therapy is prescribed by nearly all members of their society [11]. Bronchodilators are used less frequently in the UK [30] and in Australia [13], where only 7% of paediatricians always use bronchodilators in the inpatient management of bronchiolitis. Part of the international difference in bronchodilator therapy usage may be related to differences in the definition of acute bronchiolitis. However, the low usage of supplemental pharmaceutical agents in Australia may also be attributable to a published consensus view of the Australian Paediatric Respiratory Group (APRG) in 1993 [31]. They recommended avoiding bronchodilators in young infants in the management of acute bronchiolitis. The impact of an evidence-based clinical practice guideline in reducing the use of bronchodilator therapy has recently been reported in several U.S. hospitals [32].

### Corticosteroids

Although airway inflammation is one of the pathological cornerstones of acute bronchiolitis, the efficacy of corticosteroids is not established [4]. Neither the Committee on Infectious Diseases of the American Academy of Pediatrics [33] nor the APRG [31] recommend the use of corticosteroids in previously healthy infants with bronchiolitis. There is no evidence of the efficacy of corticosteroids either oral [34–38] or inhaled [39, 40] in the management of acute bronchiolitis. No single study found a significant benefit for steroids regarding the length of hospital stay or duration of symptoms. Interestingly, a recent meta-analysis of all randomised, double blind studies described a small, but significant reduction of the length of hospital stay in steroid-treated infants [9].

Despite a lack of evidence for their efficacy, corticosteroids are prescribed very often by Swiss paediatricians in both the outpatient (36% always and 51% sometimes) and inpatient management (31% always and 49% sometimes) of bronchiolitis. In contrast, only 1% of paediatricians in Australia use corticosteroids routinely in inpatient management of bronchiolitis. This difference may also be attributed to the recently published guidelines [31].

### Aminophylline

Aminophylline therapy is commonly prescribed for apnoea of prematurity. However, there are only a few uncontrolled descriptive studies of the use of aminophylline in infants with bronchiolitis [41–43]. The precise mechanism of action in bronchiolitis remains unclear. In Switzerland, only a few paediatricians use theophylline in inpatient management. While there may be a role for theophylline in the management of apnoea in premature infants with acute bronchiolitis, no randomised placebo controlled study has been performed.

### Ribavirin

Ribavirin, a synthetic purine nucleoside derivative of guanosine, interferes with viral mRNA expression and inhibits viral protein synthesis. Since its FDA approval in 1985, it has been widely used in high-risk infants with RSV bronchiolitis in North America. The first randomised double-blind study published in 1991 showed that children treated with ribavirin had a significantly shorter duration of mechanical ventilation and hospital stay. However, the validity of these results was questioned because nebulised water was used in the control group. Subsequent studies using normal saline in the control group failed to demonstrate a difference between ribavirin-treated and untreated children [44, 45]. Subsequently, the American Academy of Paediatrics has revised its recommendation for the use of ribavirin from the previous “should be used” to “may be considered” [46]. A recent Cochrane review [8] concluded that the published trials of ribavirin for RSV lack sufficient power to provide reliable estimates of beneficial effects. A large randomised controlled trial for ventilated, high-risk patients is still lacking. In Switzerland only 8% of paediatricians reported the use of ribavirin in inpatients and most of them only in high-risk children.

### Antibiotics

As the disease is viral in aetiology, the routine administration of antibiotics has not been shown to influence the course of bronchiolitis [47] and there is little rationale for their use [33]. The risk of acquiring a secondary bacterial infection is very low [48]. Bacterial otitis media can be a complication of RSV infection and may require antibiotic therapy [49]. As shown in our survey, 2% of Swiss paediatricians prescribe antibiotics on a regular basis in outpatient management and more often for high risk children (36%).

### Physiotherapy

It is generally recommended, that children with acute bronchiolitis should have minimal handling and are not given chest physiotherapy [4]. There are, however, no randomised placebo-controlled studies available. In Switzerland, a third of paediatricians reported prescribing physiotherapy

on a regular basis for inpatients and an additional 49% did so sometimes.

### Nasal drops

As our survey has shown, nasal drops are very widely used for infants with bronchiolitis. Since RSV bronchiolitis is usually accompanied by nasal congestion and upper airway infection, nasal drops may have a role in improving nasal breathing and facilitating oral feeding in small infants. There are, however, no studies available on this important topic.

In summary we have documented a wide variation of prescribing practices in the treatment of acute bronchiolitis by paediatricians in Switzerland. Despite the lack of good clinical evidence from well-designed randomised controlled trials that beta<sub>2</sub>-agonists, anticholinergics, corticosteroids and ribavirin result in clinically significant improvement in symptoms or influence the natural course of the disease, their widespread use continues. The use of these agents results in unnecessary expense for the families and community and the administration of the medication may generate unnecessary distress in the ill child. In the absence of an international consensus view, the management of acute bronchiolitis still differs widely from country to country [11–13, 28, 29, 50]. National and international guidelines based on clinical evidence could be helpful in standardising management. We believe that the data from this survey should be used to strongly encourage the development of evidence-based practice guidelines to reduce the inappropriate variations in the use of specific therapies and resource utilisation caused by “practice styles”.

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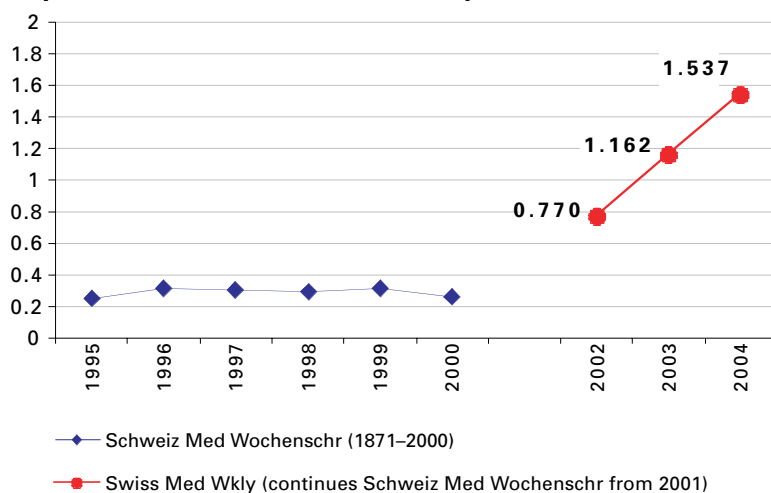
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