

**MANAGEMENT OF ACUTE BRONCHIOLITIS:
CAN EVIDENCE-BASED GUIDELINES ALTER CLINICAL PRACTICE?**

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ABSTRACT

Background: Acute bronchiolitis is the most common lower respiratory tract infection in infants and there is no evidence that drug treatment alters its natural course. Despite this, most Swiss paediatricians reported in 2001 to prescribe bronchodilators and inhaled corticosteroids (ICS). This situation led to the creation of national guidelines followed by a tailored implementation program. The aim of this study was to examine if treatment practices changed after the implementation of the new guidelines.

Methods: We sent a questionnaire on treatment of bronchiolitis to all Swiss paediatricians before (2001) and after (2006) creation and implementation of national guidelines (2003-2005). Guidelines were created in collaboration between all paediatric pulmonologists and implemented carefully using a multifaceted approach.

Results: Questionnaires were returned by 541 paediatricians (58%) in 2001, and 639 (54%) in 2006. While both surveys showed a wide variation in the treatment of bronchiolitis between physicians, reported drug prescription decreased significantly between the two surveys. For outpatients, general use (for all patients) of bronchodilators dropped from 60% to 23%, and general use of ICS from 34% to 6%. For inpatients, general use of bronchodilators and ICS dropped from 55% to 18% and from 26% to 6% respectively (all $p < 0.001$). The decrease was evident in all regions, among hospital and primary care physicians, and among general paediatricians and paediatric pulmonologists.

Conclusions: National guidelines together with a tailored implementation program can have a major impact on medical management practices in a country.

INTRODUCTION

Healthcare professionals are increasingly urged to base clinical practice on scientific evidence, but the implementation of research findings into routine daily practice is a major challenge.[1-3] So far, most dissemination and implementation strategies resulted in small to moderate improvements.[4] Some strategies to change practices of health care professionals have been successful while others were not.[5,6] Evidence-based guidelines, published by many medical organizations, are often not very effective on their own.[7,8] Instead it has been suggested to design tailored interventions in order to implement these guidelines and change behaviour in daily practice.[9]

Acute bronchiolitis is the most common lower respiratory tract infection in infancy, with a typical clinical presentation with respiratory distress, crackles and wheezing.[10] Its treatment is largely supportive, including oxygen therapy, fluid management, avoidance of unnecessary handling and respiratory support.[10] Systematic reviews suggest that available therapies will not shorten its natural course nor provide clinically relevant improvements in symptoms. This is true for β_2 -agonists, epinephrine, anticholinergics and both inhaled and oral corticosteroids.[11-16] Nevertheless, all these agents are used widely for treatment of bronchiolitis.[17,18] In Switzerland, a survey in 2001 showed that almost all paediatricians prescribed bronchodilators and inhaled corticosteroids (ICS) for outpatients and inpatients suffering from bronchiolitis.[19] To change this situation, the Swiss Association of Paediatric Pulmonology (SAPP/SGPP) developed national guidelines for the management of acute bronchiolitis and viral-induced wheeze in 2003 and 2004,[20] and took a range of measures to implement these. Both guidelines discouraged the use of any pharmaceutical agents or physiotherapy in previously healthy infants with bronchiolitis.

The aim of our study was to determine the effect of the new guidelines and their implementation by comparing self-reported management practices of all Swiss paediatricians before and after the introduction of the new guidelines.

METHODS

Study design and subjects

We performed two cross-sectional questionnaire surveys of all Swiss paediatricians in 2001 and 2006. The names and addresses of all paediatricians were provided by the Swiss Society of Paediatrics. We received a complete list of all qualified paediatricians in Switzerland, irrespective of their place of work (primary paediatric practice, hospital). Paediatric trainees were not included in the list, but a small number of retired colleagues may have been. A subgroup of these paediatricians, organised in the SAPP/SGPP, had formal subspecialty training or a special interest in paediatric pulmonology. Depending on the region, questionnaires were sent in French or German. To improve response rate and minimise selection bias the questionnaires were returned anonymously in a prepaid envelope, and did not include information on sex, age and position of the physicians. For the same reason it was impossible to send reminder letters to non-responders.

Questionnaires

For both surveys we used an identical standardised questionnaire on management practices of bronchiolitis in infants.[19,21] All paediatricians were asked to complete at least the first question (Do you treat children with bronchiolitis - yes or no?). For those currently treating patients, the questionnaire contained two further sections relating separately to the management of outpatients and inpatients. We asked if they used the following drugs: bronchodilators (salbutamol, ipratropium bromide, adrenaline), corticosteroids (systemic, inhaled), chromoglycates, antibiotics, nasal drops, theophylline, ribavirin and physiotherapy. Answer categories for all questions were:

“always”, “sometimes”, “only for high risk children” (children with underlying diseases including bronchopulmonary dysplasia, cystic fibrosis, heart diseases, immunodeficiency and neurological disorders), and “never”. In addition, we asked if they performed virological examinations of nose or throat swabs.

Development and implementation of national guidelines

In 2003 and 2004, the Swiss Association of Paediatric Pulmonology (SAPP/SGPP) developed and published two guidelines. The first one focused on the distinct disease phenotype ‘bronchiolitis in infants’.[22] The second one, published a year later, was more comprehensive and contained guidelines on the treatment of different phenotypes of obstructive airway disorders in infants and children, including bronchiolitis but also viral wheeze in older children, and atopic asthma.[23] Both guidelines were based on available evidence, mainly systematic reviews and meta-analyses, and were developed in several steps involving a large group of interested paediatric pulmonologists in Switzerland. Efforts were made to involve both hospital physicians and those working in primary practice, and we made sure that representatives from all regions and languages were included in the guideline development group. Both guidelines recommend abandoning all pharmacological and non-pharmacological therapies of bronchiolitis for which scientific evidence is clearly missing. The only treatment recommended by the guidelines was the use of nasal drops to optimize nasal breathing, although it was admitted that the evidence to support this recommendation was insufficient.

A multifaceted implementation strategy was developed. The official guidelines and several commentaries were published between 2003 and 2005 in German and French in all major official journals for paediatricians and general practitioners in Switzerland, including official publications of the Swiss Medical Association and the Swiss Society of Paediatrics (SSP), but also a number of other scientific and popular medical journals.[20,22-26] Furthermore, the guidelines were presented by a number of dedicated speakers of the SAPP/SGPP at the main national meetings and annual conferences (SAPP/SGPP, SSP, Swiss Society of Pulmonology and Paediatric FORUM, the organization of paediatricians working in private practice) and at local teaching rounds in university hospitals and regional hospitals (advanced training and continuing education for practitioners) targeting registrars and paediatricians working in primary, secondary and tertiary care all over Switzerland. In addition, a parent information leaflet was created in German and French (<http://www.sgpp-schweiz.ch/go2/de/publikationen>) and sent to all Swiss paediatricians for distribution to parents. The leaflet explained the disease in a simple language, highlighted that drug treatment usually did not help and counselled parents how to treat their babies. Guidelines and information leaflets can be downloaded on the official website of the SAPP/SGPP (www.sgpp-schweiz.ch) and the SSP(www.swiss-paediatrics.org).

Statistical analysis

The data were analysed using Stata, version 9.2 (Stata Corporation, Austin, Texas). We tabulated frequency of reported use for the different drugs, comparing the two surveys in 2001 and 2006. Chi2 tests, Chi2 tests for trend and Fisher’s exact tests were performed as appropriate to assess statistical significance in comparison of proportions. Binary logistic regression and ordered logistic regression models were used to compare treatment frequency between the two surveys, adjusting for the covariates language, physician subspecialty, place of work (hospital, private practice) and number of patients treated annually. Results were expressed as odds ratios (OR) with 95% confidence intervals; likelihood ratio tests were performed to compare different models. Effect modification was tested by comparing models with and without inclusion of interaction terms.

RESULTS

Response rates and characteristics of participating physicians

In 2001, 937 questionnaires were posted and 541 (58%) returned. In 2006, the response rate was 639/1188 (54%). Among these questionnaires, 119 (22%) in 2001 and 150 (23%) in 2006, respectively, came from physicians who did not treat children with acute bronchiolitis, leaving 422 (2001) and 498 (2006) for analysis.

In both years, about one third of respondents were French and two thirds German speaking (**Table 1**). Twenty-four percent (2001) and 31% (2006) worked in hospitals, the others in private practice. About 9% in 2001 (6% in 2006) were qualified paediatric respiratory physicians or had a special interest in paediatric respiratory medicine.

Table 1: Characteristics of participating physicians in 2001 and 2006

	2001 survey		2006 survey		p
	n	%	n	%	
Language					
German	279	66.1	331	66.5	0.90
French	143	33.9	167	33.5	
Physician specialty					
Paediatric Pulmonologist (qualified)	16	3.8	18	3.6	0.34
Paediatric Pulmonologist (interest)	21	5.0	13	2.6	
General paediatrician and other subspecialist	385	91.2	467	93.8	
Work place					
Hospital	102	24.2	153	30.7	0.05
Private practice	301	71.3	331	66.5	
Unclear	19	4.5	14	2.8	
Number of bronchiolitis patients treated/year					
< 10	133	31.5	125	25.1	0.15
10 to 50	241	57.1	306	61.5	
>50	37	8.8	55	11.0	
missing	11	2.6	12	2.4	
Total	422	100.0	498	100.0	

The practice used to identify the causative viral agent remained stable over the observed period. In 2001, 44 (10%) physicians performed nose or throat swabs in all outpatients to identify respiratory viruses, 163 (39%) performed them sometimes, 90 (21%) only for high risk children and 197 (25%) never (with 18 (4%) missing answers). In 2006, the respective numbers were: 28 (6%) always, 202 (41%) sometimes, 109 (22%) only for high risk children and 135 (37%) never (with 24 (5%) missing).

Reported drug prescription for acute bronchiolitis in 2001 and 2006

A wide variation in reported treatment of bronchiolitis was found in both surveys, for in- and outpatients. For outpatients (**Table 2**), salbutamol, ICS and nasal drops were the most commonly prescribed drugs. The frequency of salbutamol and ICS use decreased steeply between the two surveys: general use (for all children) of salbutamol from 60% in 2001 to 23% in 2006 ($p < 0.001$), and general use of ICS from 34% to 6% ($p < 0.001$). Use of antibiotics ("sometimes") in outpatients decreased from 35% to 17% ($p < 0.001$). Nasal drops was the only medication that was more

frequently prescribed between the two surveys, with 45% of physicians prescribing them for all children in 2001, and 60 % in 2006 ($p < 0.001$).

Table 2: Reported management of outpatients with acute bronchiolitis in 2001 and 2006

	2001 survey (N=422)					2006 survey (N=498)					p
	always	sometimes	high risk	never	missing	always	sometimes	high risk	never	missing	
Salbutamol	254	149	1	2	16	117	314	8	32	27	<0.001
	60.2	35.3	0.2	0.5	3.8	23.5	63.1	1.6	6.4	5.4	
Ipratropium bromide	9	108	4	162	139	2	98	2	273	123	0.004
	2.1	25.6	1.0	38.4	32.9	0.4	19.7	0.4	54.8	24.7	
Chromoglycates	10	62	1	289	60	10	37	1	405	45	0.002
	2.4	14.7	0.2	68.5	14.2	2.0	7.4	0.2	81.3	9.0	
Steroids (any)	148	207	10	31	26	40	257	26	139	36	<0.001
	35.1	49.1	2.4	7.4	6.2	8.0	51.6	5.2	27.9	7.2	
inhaled	143	197	9	35	38	32	205	24	171	66	<0.001
	33.9	46.7	2.1	8.3	9.0	6.4	31.2	4.8	34.3	13.3	
systemic	14	142	13	137	116	12	163	19	238	66	0.769
	3.3	33.7	3.1	32.5	27.5	2.4	32.7	3.8	47.8	13.3	
Antibiotics	6	148	75	157	36	3	85	59	302	49	<0.001
	1.4	35.1	17.8	37.2	8.5	0.6	17.1	11.9	60.6	9.8	
Nasal drops (any)	189	204	0	10	19	298	169	1	8	22	<0.001
	44.8	48.3	0.0	2.0	5.0	59.8	34.0	0.0	2.0	4.4	
Xylometazoline	58	268	3	38	55	135	291	2	31	39	<0.001
	13.7	63.5	0.7	9.0	13.0	27.1	58.4	0.4	6.2	7.8	
NaCl 0.9%	176	169	0	12	65	278	159	1	10	50	0.001
	41.7	40.1	0.0	2.8	15.4	55.8	31.9	0.2	2.0	10.0	
Physiotherapy	-	-	-	-	-	20	184	43	185	66	NA
	-	-	-	-	-	4.0	36.9	8.6	37.1	13.2	

Data are presented as n (first line) and row % (second line for each treatment). The table includes data from hospital-based and primary care physicians. P values are derived from Fisher's exact test.

Changes in reported drug treatment of inpatients were similar (**Table 3**). In 2001, 55% of paediatricians always used salbutamol, and 26% ICS for inpatients. In 2006, these proportions dropped to 18% and 6%, respectively ($p<0.001$). The number of physicians always prescribing physiotherapy dropped from 42% in 2001 to 14% in 2006 ($p<0.001$). Theophylline and ribavirin were prescribed for very few patients at both surveys.

Table 3: Reported management of inpatients with acute bronchiolitis in 2001 and 2006

	2001 survey (N=102)					2006 survey (N=153)					p
	always	sometimes	high risk	never	missing	always	sometimes	high risk	never	missing	
Salbutamol	56	43	1	2	0	27	110	5	11	0	<0.001
	54.9	42.2	1.0	2.0	0.0	17.7	71.9	3.3	7.2	0.0	
Ipratropium bromide	5	49	2	37	9	4	45	3	98	3	0.006
	4.9	48.0	2.0	36.3	8.8	2.6	29.4	2.0	64.1	2.0	
Adrenaline	1	35	3	51	12	1	33	4	107	8	0.100
	1.0	34.3	2.9	50.0	11.8	0.7	21.6	2.6	69.9	5.2	
Steroids (any)	28	53	6	15	0	11	69	12	61	0	<0.001
	27.5	52.0	5.9	14.7	0.0	7.2	45.1	7.8	39.9	0.0	
inhaled	27	51	4	20	0	10	60	9	74	0	<0.001
	26.5	50.0	3.9	19.6	0.0	6.5	39.2	5.9	48.4	0.0	
systemic	5	51	11	35	0	3	58	11	81	0	0.020
	4.9	50.0	10.8	34.3	0.0	2.0	37.9	7.2	52.9	0.0	
Theophylline	1	13	4	81	3	0	8	6	138	1	0.074
	1.0	12.8	3.9	79.4	2.9	0.0	5.2	3.9	90.2	0.7	
Ribavirine	0	2	6	92	2	0	1	12	139	1	0.599
	0.0	2.0	5.9	90.2	2.0	0.0	0.7	7.8	90.9	0.7	
Physiotherapy	43	48	4	6	1	22	90	10	30	1	<0.001
	42.2	47.1	3.9	5.9	1.0	14.4	58.8	6.5	19.6	0.7	

Data are presented as n (first line) and row % (second line for each treatment). This table includes only questionnaires from hospital-based physicians, therefore numbers are lower than in table 2. P values are derived from Fisher's exact test.

Determinants of reported drug use in 2001 and 2006

In 2001, salbutamol, ICS and antibiotics for outpatients were prescribed more often by physicians living in the French-speaking part of Switzerland (**Table 4**). The same was true for the other drugs not shown in the table. This difference had narrowed or disappeared in 2006. In both surveys, all drugs tended to be prescribed less often by paediatric pulmonologists compared to general paediatricians, by hospital physicians compared to those working in private practice, and by doctors treating more than 50 children per year compared to those treating fewer cases.

Table 4: Determinants of reported frequency of use of salbutamol, inhaled steroids and antibiotics in outpatients with acute bronchiolitis
(unadjusted and adjusted* odds ratios derived from ordered logistic regression)

	2001 survey (N=422‡)						2006 survey (N=498‡)									
	unadjusted			adjusted*			unadjusted			adjusted*						
	OR	95CI	p	OR	95CI	p	OR	95CI	p	OR	95CI	p				
Salbutamol																
French (vs. German)	2.00	1.28	3.10	0.002	2.55	1.54	4.22	<0.001	0.87	0.59	1.30	0.508	0.90	0.60	1.36	0.63
Paediatric Pulmonologists	0.37	0.18	0.76	0.007	0.69	0.32	1.52	0.360	0.31	0.13	0.75	0.009	0.43	0.18	1.03	0.06
Hospital based vs. practice	0.46	0.29	0.74	0.001	0.41	0.25	0.70	0.001	0.44	0.28	0.69	<0.001	0.54	0.34	0.87	0.01
>50 patients vs. less	0.43	0.22	0.87	0.019	0.53	0.25	1.13	0.101	0.41	0.22	0.77	0.006	0.60	0.31	1.15	0.13
Inhaled steroids																
French (vs. German)	2.15	1.43	3.24	<0.001	2.14	1.37	3.34	0.001	1.36	0.94	1.97	0.107	1.40	0.95	2.07	0.09
Paediatric Pulmonologists†	0.17	0.08	0.36	<0.001	0.24	0.11	0.55	0.001	0.34	0.15	0.77	0.01	0.46	0.20	1.08	0.08
Hospital based vs. practice	0.29	0.18	0.47	<0.001	0.25	0.15	0.42	<0.001	0.44	0.30	0.65	<0.001	0.46	0.30	0.70	<0.001
>50 patients vs. less	0.81	0.42	1.59	0.548	1.60	0.78	3.30	0.203	0.62	0.36	1.08	0.091	0.86	0.47	1.57	0.63
Antibiotics																
French (vs. German)	2.62	1.76	3.90	<0.001	2.83	1.84	4.35	<0.001	1.41	0.95	2.11	0.09	1.41	0.94	2.13	0.10
Paediatric Pulmonologists	0.36	0.18	0.74	0.006	0.63	0.29	1.36	0.242	0.50	0.19	1.35	0.173	0.53	0.19	1.47	0.23
Hospital based vs. practice	0.71	0.46	1.10	0.125	0.67	0.42	1.07	0.094	1.33	0.88	2.02	0.181	1.48	0.95	2.30	0.08
>50 patients vs. less	0.68	0.35	1.30	0.246	0.76	0.38	1.50	0.426	0.82	0.44	1.53	0.53	0.73	0.38	1.41	0.35

* adjusted for all variables in the list; †vs.general paediatricians and other paediatric subspecialists; ‡ regressions are based on 406 (2001) and 471 questionnaires (2006) for salbutamol, on 384 (2001) and 449 questionnaires (2006) for ICS and on 386 (2001) and 449 questionnaires (2006) for antibiotics.

The decrease in the prescription of salbutamol for outpatients between the two surveys was seen in all subgroups: French and German speaking, hospital-based and primary care physicians, paediatric pulmonologists and generalists (**Figure 1**, p value (for trend) ≤ 0.002 for all subgroups). The same was true for the decrease in reported use of other drugs (data not shown).

DISCUSSION

This is, to our knowledge, the first study that could demonstrate a clinically relevant change in the management of acute bronchiolitis before and after introduction of national guidelines. We found a large reduction in the reported prescription for most drugs, most prominently for bronchodilators, inhaled steroids and antibiotics, and among all paediatricians (hospital and practicing paediatricians, paediatric pulmonologists and generalists/other subspecialists). The simple but labour-intensive interventions taken to implement these new guidelines, tailored to the needs of hospital based- and primary care paediatricians, have proved highly effective.

Methodological considerations

The effect of the new guidelines was assessed by nationwide surveys of all qualified paediatricians in Switzerland before and after their introduction, using the same methodology. The questionnaire, although not formally validated, had been used in previous surveys.[21] The response rates of 58% and 54% are relatively good for a survey among physicians using only a single mailing. Also, the group of non-responders is likely to include colleagues not treating children with bronchiolitis at the time of the survey (e.g. retired colleagues, physicians temporarily out of work and subspecialists working in other fields). It is likely that non-responders differed from responders, for instance by age, gender and awareness of new medical literature, but it seems unlikely that the characteristics of non-responders had changed substantially between the two surveys. Given the similar response rates and similar characteristics of respondents in the two surveys, we do not think that the change between the two surveys could be explained by response bias. Also, the differences were so large that only a very strong bias could have reversed our results.

Our strategy to implement the new guidelines targeted paediatricians, and only these were included in the survey. We do not know if treatment practices also changed among general practitioners. Although general practitioners treat a significant proportion of older children in Switzerland, they see only a minority of infants. We are therefore confident that these surveys reached the majority of physicians treating infants with bronchiolitis in Switzerland.

The main limitation of our study is that we assessed self-reported prescription of drugs and not the actual behaviour of physicians in daily practice. Data of actual drug sales would be helpful to support our findings. Unfortunately, in Switzerland, available data on drug sales are not broken down by age. The use of inhaled corticosteroids via nebulisers in the paediatric hospital setting has certainly decreased dramatically in the past years (personal communication of hospital based pharmacists and drug company salespersons). Therefore, although it is likely that the new guidelines have reduced costs in treatment of bronchiolitis in infants and preschool children, which together with other wheezing disorders account for a considerable proportion of total health care costs,[27] the current study is not designed to prove this assumption.

It could be argued that the time trends in drug prescription were not a response to the new Swiss guidelines but rather a consequence of the accumulating evidence on this topic in general, including other reviews and guidelines. There are three arguments against this. First, the scientific evidence that no drug changes the natural course of acute bronchiolitis had been available for decades, and was reflected in the scarce use of drugs in Australian paediatricians nearly 10 years ago (**Table 5**), maybe because of their published guidelines in 1993.[21]

Table 5: International comparison of inpatient management for infants with acute bronchiolitis

	Canada 1994*	Europe 1995†	Australia 1998‡	Switzerland 2001§	Switzerland 2006§	Belgium 2003**
Salbutamol						
All patients	85%	61%	7%	55%	18%	NA
Sometimes	NA	NA	69%	42%	72%	NA
Only high risk patients	NA	34%	12%	1%	3%	NA
Never	NA	5%	9%	2%	7%	11%
Steroids						
All patients	28%	11%	1%	27%	7%	2%
Sometimes	NA	NA	35%	52%	45%	32%
Only high risk patients	NA	69%	22%	6%	8%	20%
Never	NA	19%	38%	15%	40%	46%
Ribavirin						
All patients	6%	0%	0%	0%	0%	NA
Sometimes	NA	NA	1%	2%	1%	NA
Only high risk patients	NA	57%	11%	6%	8%	NA
Never	NA	43%	83%	90%	91%	NA

* Retrospective study in hospitals [18]

† Questionnaire survey with specialised paediatric infectious disease physicians [17]

‡ Questionnaire survey with paediatricians - response rate 62% [21]

§ Current study

** Questionnaire survey with paediatricians – response rate 40% [28]

Because the Swiss had not implemented this evidence by 2001, it is unlikely that such a huge change would have occurred without an intervention within the short period of five years. Second, at the time of our first survey, Australia was the only country with published guidelines [21], and the American Academy of Pediatrics have published their recommendations not until October 2006,[10] shortly after our second survey has taken place. Third, the decrease was seen for all drugs except for nasal drops which were the only medications recommended in the new guidelines. However, we can not definitely exclude that other publications have contributed to the observed change in behaviour of Swiss paediatricians.

Comparison with other studies

There are only a few published reports on management practices of acute bronchiolitis in other countries (Table 5).[17,18,21,28] Compared to the survey among the European Society for Paediatric Infectious Disease [17] and the Canadian retrospective study in nine tertiary hospitals [18] the Swiss paediatricians have improved their management towards a more evidence-based treatment. However, they still prescribe more drugs than their colleagues in Australia.[21] The Irish

study [29] presenting a clinical scenario of a 3-month-old infant with severe RSV-infection, is not directly comparable.

The findings, that hospital physicians prescribed less drugs than practitioners, and paediatric pulmonologists less than general paediatricians is not surprising. In a study about determinants of health costs and patterns of care in asthmatic patients in Switzerland,[30] Szucs and colleagues found that total direct costs were higher among general practitioners compared to specialists. They also showed, that French-speaking physicians prescribed more drugs than doctors in the German-speaking part of the country resulting in a higher economic burden. This is true for other disorders and is reflected by higher premiums for medical insurance in the French speaking part of Switzerland. In addition, the French speaking part of Switzerland is strongly influenced by French language scientific literature. For instance, publications on chest physiotherapy in children with bronchiolitis from a Belgian kinesiologist, published in French,[31] seem to have had a large impact on French-speaking paediatricians in Switzerland (personal communication of French speaking colleagues). It is important to note that this gap between the French and German-speaking part of Switzerland narrowed or disappeared after the implementation of the new guidelines (Figure 1).

Even though drug use decreased enormously between the two surveys, we need to say that a large number of Swiss paediatricians continued to use supplementary drugs for both outpatients and inpatients. More than 90% of the paediatricians still indicated to use bronchodilators, but mainly for the purpose of a treatment trial (“sometimes” users) due to the clinical difficulties of differentiating acute bronchiolitis from viral-induced obstructive bronchitis (wheezing) and the first episode of asthma in older infants, respectively.[32]

How to implement change in clinical practice?

Difficulties in implementing evidence-based medicine into clinical practice are well recognized.[1,6,8] The barriers to the adoption of research findings in clinical practice are complex and many theories and a multitude of factors that may affect a successful implementation of evidence have been described.[5,7,21,33] Relying on the passive diffusion of information is doomed to failure in a global environment with about 10'000 new randomised trials published annually.[1] A common approach is to summarise research findings in guidelines and consensus views in medical journals. Evidence-based guidelines can contribute to improved care only if they succeed in changing actual practice.[3] However, many physicians are unaware of the guidelines or, at least, uninfluenced by them because improving knowledge does not necessarily alter behaviour.[6,34] In particular, one has to bear in mind that health professionals have their own experiences, beliefs, and perceptions about appropriate practice; attempts to change practice which ignore these factors are unlikely to succeed. Circulation of guidelines without a tailored implementation strategy may have little impact on the behaviour of health professionals.[6,9]

A systematic review of 235 studies of guideline dissemination and implementation strategies found a small to moderate improvement in care, with an average of 10% improvement across the studies.[4] Most of these studies investigated change in clinical practice in the hospital setting, not daily behaviour of practitioners. For example, in a hospital setting in Cincinnati (USA), an evidence-based clinical practice guideline for managing bronchiolitis was highly successful in its first year of implementation, with significant reductions in the use of all respiratory therapies.[35] The use of β_2 -agonists decreased by 30%, and the mean cost for respiratory care services by 77%. Subsequently, Kotagal and colleagues introduced the same guidelines in seven hospitals, however, with varying success.[36]

To achieve a change in clinical practice we believe that the following points need to be considered: First, there must be a few individuals who are motivated to facilitate the change. Second, national or local guidelines, reflecting the needs of the local population, should be developed from existing

international guidelines and current available literature by a process of consultation with all the relevant medical staff. This process will encourage a sense of “ownership” of the local guidelines. Third, having developed local guidelines, implementation must include interactive educational sessions with all relevant practitioners. Finally, implementation activities should be evaluated to examine their effectiveness and the results disseminated to all relevant practitioners. [21]

Why was the present strategy successful?

We therefore think that the following components of our strategy were crucial to its success: 1) The guidelines were developed in a working group which included representatives from all regions and all languages in Switzerland, hospital physicians as well as respiratory physicians working in private practice. Therefore a broad consensus was reached. 2) The new guidelines were broadly presented by a number of dedicated paediatric respiratory physicians in various national and local meetings, at university hospitals and regional hospitals in advanced training programs for registrars and continuing education for practitioners, and in all relevant medical publications, not only in scientific ones, but also in popular medical tabloids. 3) The implementation package included an information leaflet for distribution to parents which was supported by the Swiss Society of Paediatrics. Under the pressure of demanding or overanxious parents and overcrowded medical practices it is easier for a clinician to prescribe a drug instead of trying to explain parents that no medication would help. This fact is well known by paediatricians who are confronted daily with viral and other self-limited diseases such as coughs or painful middle ear infections. This parental pressure might perhaps explain the increased use of nose drops, which we found in parallel to the decreased use of other medications. The information leaflet might also have helped to signalize to the parents that there is a national consensus for treatment of this condition and there are no evidence to support the use of drugs in the management of bronchiolitis. In addition, Switzerland is a small country with only 7 million inhabitants with a very active and collaborative group of paediatric pulmonologists who have built up a good care and information network.

In summary, we showed that the creation and tailored implementation of new bronchiolitis guidelines in Switzerland was followed by a clinically significant change in the management of acute bronchiolitis in all paediatricians. The relatively simple but labour-intensive measures taken to implement the new guidelines, tailored to the respective needs of hospital based- and primary care based paediatricians, specialists and generalists, have thus proven to be highly effective.

FIGURE LEGEND

Figure 1: Frequency of reported prescription of salbutamol in outpatients with acute bronchiolitis in 2001 and 2006, by groups of participating physicians

■ always ▨ sometimes ▩ high risk ▤ never □ missing

GE: German speaking, FR: French speaking, Pulm: Paediatric Pulmonologists, Gen: General paediatricians and other subspecialists, Hosp: Hospital-based physicians, Pract: physicians working in primary care practices

p values (from trend tests) for differences between the two surveys were ≤ 0.002 in all subgroups

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COMPETING INTERESTS

There are no competing interests.

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prescribing frequency (%)

