Decongestants, antihistamines and nasal irrigation for acute sinusitis in children (Review)

Shaikh N, Wald ER

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Decongestants, antihistamines and nasal irrigation for acute sinusitis in children

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ABSTRACT

Background
The efficacy of decongestants, antihistamines and nasal irrigation in children with clinically diagnosed acute sinusitis has not been systematically evaluated.

Objectives
To determine the efficacy of decongestants, antihistamines or nasal irrigation in improving symptoms of acute sinusitis in children.

Search methods
We searched CENTRAL (2014, Issue 5), MEDLINE (1950 to June week 1, 2014) and EMBASE (1950 to June 2014).

Selection criteria
We included randomized controlled trials (RCTs) and quasi-RCTs, which evaluated children younger than 18 years of age with acute sinusitis, defined as 10 to 30 days of rhinorrhea, congestion or daytime cough. We excluded trials of children with chronic sinusitis and allergic rhinitis.

Data collection and analysis
Two review authors independently assessed each study for inclusion.

Main results
Of the 662 studies identified through the electronic searches and handsearching, none met all the inclusion criteria.

Authors’ conclusions
There is no evidence to determine whether the use of antihistamines, decongestants or nasal irrigation is efficacious in children with acute sinusitis. Further research is needed to determine whether these interventions are beneficial in the treatment of children with acute sinusitis.
**PLAIN LANGUAGE SUMMARY**

**Decongestants, antihistamines and nasal irrigation for acute sinusitis in children**

**Review question**

The goal of this review was to determine whether there is any evidence in the medical literature for or against the use of decongestants, antihistamines and nasal irrigation for acute sinusitis in children.

**Background**

Young children experience an average of six to eight colds per year. Out of every 10 children with a cold, one develops sinusitis. Sinusitis occurs when the sinuses, which do not drain properly during a cold, become secondarily infected with bacteria. Instead of getting better, children with sinusitis often have worsening or persistent cold symptoms. In order to alleviate the symptoms of sinusitis, parents and physicians often resort to using decongestants, antihistamines and nasal irrigation. These treatments are available without requiring a prescription and are widely used.

Previous studies have shown that the use of antihistamines and decongestants in children is associated with significant side effects.

**Search date**

The evidence is current to June 2014

**Study characteristics**

After a comprehensive review of the literature, we failed to identify any trials that evaluated the efficacy of these interventions (compared to no medication or placebo) in children with clinically diagnosed acute sinusitis.

**Study funding sources**

Not applicable.

**Key results**

No data are available to determine whether or not antihistamines or decongestants should be used in children with acute sinusitis.

**Use of statistics**

Not applicable.

**Quality of evidence**

Not applicable.

---

**BACKGROUND**

**Description of the condition**

Sinusitis is inflammation of the mucosal lining of one or more of the paranasal sinuses, secondary to bacterial infection (Meltzer 2004). Viral upper respiratory tract infection (URTI) and allergic rhinitis are risk factors for the development of secondary bacterial infection. Uncomplicated viral URTIs generally last five to seven days and although respiratory symptoms may not have completely resolved by the 10th day, they have almost always peaked in severity and begun to improve (Pappas 2008; Wald 1991). The occurrence of a secondary bacterial infection usually manifests as a persistence or worsening of nasal and respiratory symptoms beyond what would be expected from a simple URTI. When symptoms have been present for more than 10 but fewer than 30 days, and are not improving, the term acute bacterial sinusitis (ABS) is used (AAPPG 2001).

Young children experience an average of six to eight viral URTIs per year of which 6% to 13% are complicated by sinusitis (Wald 1991).
Sinusitis accounts for 4% of all pediatric visits to primary care physicians (Nash 2002), and results in 7.9 million prescriptions annually. The maxillary and ethmoid sinuses are present at birth and expand rapidly by four years of age. The frontal sinuses develop from the anterior ethmoidal cells and become pneumatized beyond the 6th birthday. The sphenoid sinuses show aeration between three to five years of age. The peak incidence of sinusitis in children occurs between two to six years of age and among children attending daycare (Wald 1988).

The diagnosis of sinusitis is made using clinical criteria, and although imaging can be used to confirm the diagnosis, its routine use is not recommended (AAPPG 2001). The majority of children with persistent (more than 10 days) nasal symptoms (anterior or posterior nasal discharge, obstruction, congestion) with or without cough (not exclusively nocturnal), that have not improved, have a bacterial superinfection of their sinuses (Wald 1981).

**Description of the intervention**

The treatment of sinusitis in children remains controversial. Only four RCTs have examined the efficacy of antibiotics in the treatment of sinusitis and their results were conflicting (Garbutt 2001; Kristo 2005; Wald 1986; Wald 2009). In this review we focus on the efficacy of decongestants, antihistamines and nasal irrigation, with or without antibiotics, in improving the symptoms of sinusitis.

**How the intervention might work**

Antihistamines work by modifying the systemic histamine-mediated allergic response and decongestants work by constricting the blood vessels within the nasal cavity. Nasal irrigation loosens crusted secretions, mechanically removes them from the nasal cavity and may improve ciliary function (Talbot 1997). Antihistamines, decongestants and nasal irrigation may be effective in:

1. reducing the overall burden of symptoms; and/or
2. speeding up resolution of symptoms by promoting sinus drainage.

On the other hand, the use of antihistamines and decongestants, especially in young children, has been associated with significant adverse effects (somnolence, irritability, insomnia, rhinitis medicamentosa, prolonged middle ear effusion, death) (CDC 2007; Meltzer 2004; Scadding 2008; Shefrin 2009). Irrigation with hypertonic solution, although generally well tolerated, can be associated with local irritation, burning and itching.

**Why it is important to do this review**

Decongestants, antihistamines and nasal irrigation are frequently used for the management of acute rhinitis. These treatments are widely available without requiring a prescription. Accordingly, it is important to review the evidence regarding the efficacy of these interventions.

**OBJECTIVES**

To determine the efficacy of decongestants, antihistamines or nasal irrigation in improving symptoms of acute sinusitis in children.

**METHODS**

Criteria for considering studies for this review

**Types of studies**

Randomized controlled trials (RCTs) and quasi-RCTs.

**Types of participants**

We included trials that evaluated children 0 to 18 years of age with acute sinusitis, defined as 10 to 30 days of rhinorrhea, congestion or daytime cough. We included only trials that used imaging to diagnose sinusitis if children also met the above clinical criteria. We excluded trials in which the target population consisted of children with chronic sinusitis (symptoms for more than 30 days), allergic rhinitis or URTIs. We did not exclude trials in which the target population consisted of children with acute sinusitis (as defined above), even if some of the included children had a history of allergic rhinitis. We excluded several studies in which the inclusion criteria were not adequately described. We excluded these studies because we could not determine the symptoms of children enrolled in the study and therefore we could not assess whether they would have been appropriate for this review.

**Types of interventions**

We considered studies examining the following interventions:

1. decongestants (oral or intranasal) versus placebo or no medication;
2. antihistamines (oral or intranasal) versus placebo or no medication;
3. decongestant and antihistamine combination versus placebo or no medication;
4. nasal irrigation versus no irrigation.

We did not consider nasal steroids as decongestants. Use of other concurrent medication, such as antibiotics and antipyretics, was allowed. We excluded trials involving surgery or sinus puncture because these interventions may significantly alter response to therapy.
Types of outcome measures
We focused the review on outcomes of importance to patients.

Primary outcomes
Theoretically, decongestants and antihistamines may be effective in promoting faster resolution of symptoms and reducing overall symptom burden. Accordingly, we examined both symptom resolution (improvement in symptom score from enrolment to day five) and overall symptom burden (as measured by average symptom scores while on therapy). Based on our clinical experience, most children remain highly symptomatic during the first 48 hours of treatment and most children become asymptomatic after eight days of therapy. Accordingly, we chose five days as the point in time at which the treatment effect, if any, would be most easily measurable.

1. Symptom resolution - improvement in symptom score from enrolment to day five (+/- three days).
2. Symptom burden - average symptom score while on therapy.

Secondary outcomes
1. Early clinical failure (at day five +/- three days).
2. Clinical cure at the end of therapy (at day 14 +/- four days).
3. Clinical failure at the end of therapy (at day 14 +/- four days).
4. Time to clinical cure.
5. Proportion of participants with progression or extension of disease resulting in additional medical therapy (complications).
6. Proportion of participants with adverse effects attributed to the treatment.

Search methods for identification of studies

Electronic searches
We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (2014, Issue 5) (accessed 12 June 2014), which includes the Acute Respiratory Infections Group's Specialized Register, MEDLINE (1950 to June week 1, 2014) and EMBASE (1950 to June 2014). We searched CENTRAL and MEDLINE using the search strategy in Appendix 1. We combined the search terms with a sensitive search strategy for identifying child studies based on the work of Boluyt 2008. We combined the MEDLINE search with the Cochrane Highly Sensitive Search Strategy for finding randomized trials in MEDLINE: sensitivity- and precision-maximizing version (2008 revision); Ovid format (Lefebvre 2011). We adapted the search strategy for EMBASE (see Appendix 2). There were no language or publication restrictions. We used only English-language search terms.

Searching other resources
We reviewed the reference lists of the included studies and references cited in previously published Cochrane Reviews examining the efficacy of antihistamines, decongestants and irrigation in other populations (Harvey 2007).

Data collection and analysis

Selection of studies
Two review authors (NS, MP) independently determined which studies satisfied the inclusion criteria. We resolved differences by discussion.

Data extraction and management
We planned to abstract the following information for trials satisfying the inclusion criteria: study setting; source of funding; number of eligible children; clinical criteria used for inclusion or exclusion (minimum duration of symptoms, worsening or persistence of symptoms, history of asthma, history of allergic rhinitis, otitis media); types of outcome measure used (and maximum score if it was a symptom scale); time point(s) when outcome was measured; risk of bias (see below); numbers of participants randomized; dose and type of decongestant and/or antihistamine; method of irrigation; duration of therapy; co-interventions; reasons for withdrawals from study protocol (clinical, side effects, refusal and other); intention-to-treat (ITT) analyses and side effects of therapy.

Assessment of risk of bias in included studies
We planned to use the criteria listed below to determine trial quality and whether any of these components may have resulted in a high risk of bias (Higgins 2011).

1. Sequence generation.
2. Allocation concealment.
3. Blinding of participants, care providers and outcome assessors (for each outcome).
4. Incomplete outcome data.
5. Selective outcome reporting.

Measures of treatment effect
We planned to normalize symptom scores by dividing them by the maximum score for that scoring system. We had planned to
calculate summary weighted risk ratios (RR), 95% confidence intervals (CI) and number needed to treat to benefit (NNTB) for dichotomous outcomes (for example, clinical failure).

**Unit of analysis issues**
We planned to use individual clinical trials as unit of analysis.

**Assessment of heterogeneity**
We planned to assess heterogeneity between studies by using the Chi² test for heterogeneity.

**Assessment of reporting biases**
We planned to use funnel plots to assess the potential for reporting bias.

**Data synthesis**
We planned to use the following analysis steps (subject to finding an adequate number of studies):

1. Pool normalized symptom scores using standardized mean difference.
2. Calculate summary-weighted RR and 95% CI for dichotomous secondary outcomes using the inverse variance method.
3. Calculate the numbers needed to treat to benefit using the summary odds ratio and the average control event rate.
4. Estimate the mean difference in outcomes.

**Subgroup analysis and investigation of heterogeneity**
We planned a priori subgroup analysis according to the following three variables:

1. age (less than two years);
2. history of allergic rhinitis;
3. type of intervention (i.e. specific medication).

**Sensitivity analysis**
We planned sensitivity analyses to assess the impact on the overall outcomes of the following potentially important factors:

1. risk of bias;
2. clinical criteria used for inclusion (whether symptoms of children in the trial were 'not improving' at the time of diagnosis);
3. other criteria used for inclusion (imaging tests);
4. analysis limited to participants managed 'per protocol'.

**R E S U L T S**

**Description of studies**

**Results of the search**
For this 2014 update we retrieved 136 records from the searches of the electronic databases. We identified no relevant articles. The result of our cumulative search was 662 studies of which we retrieved and reviewed 44 full-text articles (Figure 1).
Figure 1. Study flow diagram.

790 records identified through database searching

29 additional records identified through other sources

662 records after duplicates removed

662 records screened

615 records excluded

47 full-text articles excluded
- 12 studies with data on adults only
- 11 studies with no relevant data
- 8 studies with data on chronic sinusitis
- 7 studies not controlled
- 4 studies could not be retrieved
- 2 studies children did not meet criteria for acute sinusitis
- 1 study of children with allergic rhinitis
- 1 study of children during the postoperative period
- 1 study not a randomized controlled trial

47 full-text articles assessed for eligibility

0 studies included in qualitative synthesis

0 studies included in quantitative synthesis (NMa-analysis)
Included studies
No studies met all our inclusion criteria.

Excluded studies
Twelve studies contained data regarding the use of antihistamines or decongestants in adult participants (Adam 1998; Braun 1997; Inanli 2002; Luchikhin 1999; Meltzer 2000; Meltzer 2005; Murray 1971; Nayak 2002; Rabago 2002; Sederberg-Olsen 1989; Tesche 2008; Wiklund 1994).

Eleven studies did not use decongestants, antihistamines or irrigation (Barlan 1997; Careddu 1993; Fujihara 2004; Hynes 1989; Mann 1982; Meltzer 2000; Ovchinnikov 2009; Schmidt 1984; Simon 1997; Simon 1999; Tutkun 1996).

Eight studies enrolled children with chronic sinusitis (Bachmann 2000; Cuenant 1986; Culig 2010; Friedman 2006; Hearley 2001; Ottaviano 2011; Shoseyov 1998; Wei 2011).

Four studies could not be retrieved despite numerous attempts to locate them (Ozsoylu 1983; Seppey 1995; Topal 1990; Topal 2001).

One study enrolled children with allergic rhinitis who did not have acute sinusitis (Ciofalo 1991), and one study examined the efficacy of saline irrigation during the postoperative period (Maes 1987).

Seven studies were not controlled (i.e. there was no comparison group) (Businco 1981; Georgalas 2005; Michel 2005; Nefsson 1968; Semczuk 1970; Vogt 1966; Yilmaz 2000), and one study was not randomized (Bogomil’skii 2004).

We excluded two studies because the children did not meet the clinical definition for acute sinusitis (McCormick 1996; Wang 2009). In both studies, the minimum duration of symptoms was seven days. All enrolled children had radiographic changes (mucosal thickening). However, because X-rays are frequently positive in children with simple upper respiratory tract infections, many of the children included in these trials likely had a resolving upper respiratory infection.

The study by McCormick was a randomized, investigator- and participant-blinded, placebo-controlled trial that sought to evaluate the change in symptom scores of children with acute sinusitis treated with antihistamines and decongestant as compared to children treated with placebo (McCormick 1996). Sinusitis was defined by the presence of at least seven but less than 30 days of sinusitis symptoms in a child with radiological abnormalities of the maxillary sinus, defined as ≥ 3 mm of mucosal thickening on at least one maxillary sinus. All 68 participants received oral antibiotics (amoxicillin at 40 mg/kg in three daily doses) for 14 days. The outcome was a non-validated symptom scale consisting of 12 symptoms. At entry, two points were assigned for each symptom present and the total score was obtained by summing the score for individual symptoms. Outcome was assessed on days three (by phone) and 14 (at the follow-up visit); three points were assigned for each symptom that had worsened, two points if the severity had remained the same, one point if it had improved, and 0 points if the symptom had resolved.

Children in the active treatment group received: 1) a nasal decongestant (0.05% oxymetazoline spray or drops depending on age) every 12 hours for three days, and 2) an oral antihistamine-decongestant syrup (brompheniramine-phenylpropanolamine) every eight hours for seven days. Participants randomized to placebo received intranasal saline drops plus an oral placebo. The absolute symptom scores on days three and 14, and the change of symptoms from baseline did not differ between treatment groups. Time to symptom resolution, proportion cured and adverse events were not examined.

The RCT by Wang compared nasal irrigation with normal saline to no irrigation in 69 children three to 12 years of age with acute sinusitis (Wang 2009). Sinusitis was defined as more than seven days of purulent nasal discharge, cough or both in a child with radiographic findings of maxillary sinusitis. Participants with severe symptoms were excluded. Nasal irrigation was conducted using a disposable syringe filled with 15 to 20 mL of normal saline one to three times a day for the three weeks. Compliance was not monitored. Although both groups received standard treatment (antibiotics, mucolytics and nasal decongestants), it is unclear whether a standard regimen was used for the treatment in all participants, or whether the treatment plan was tailored according to the presenting symptoms. Symptoms were measured once a day using a non-validated symptom diary, which asked about the severity of eight symptoms. For each symptom, the burden was calculated by obtaining the mean score for that symptom over the one-week study period. Mean symptom scores for each symptom were compared between the two treatment groups (a total of 48 comparisons were conducted). Children in the irrigation group had less “daytime rhinorrhea,” but more “night-time nasal congestion” than children in the no irrigation group. No data regarding time to symptom resolution, proportion cured and adverse events were presented.

Risk of bias in included studies
No studies fulfilled the criteria for inclusion. We did not exclude any studies on the grounds of poor methodology.

Effects of interventions
The effects of the interventions could not be determined because no studies met our inclusion criteria.
DISCUSSION

Summary of main results

There is no evidence to determine whether the use of antihistamines or decongestants is efficacious in children with acute sinusitis. Similarly, we did not find any evidence documenting the efficacy of nasal irrigation in children with acute sinusitis. The focus of this review was to determine whether decongestants, antihistamines and irrigation are effective in children with acute sinusitis. Whether these interventions are effective in children with viral upper respiratory tract infection has been reviewed elsewhere (De Sutter 2012; Smith 2012). Two studies have attempted to address the question posed by this review (McCormick 1996; Wang 2009). However, because these studies included a large proportion of children with upper respiratory tract infections (URTIs), they were not included. Incidentally, neither study found any evidence to support the efficacy of the interventions of interest.

AUTHORS’ CONCLUSIONS

Implications for practice

We found no evidence supporting the use of antihistamines or decongestants for children with acute sinusitis. Furthermore, there is growing evidence from observational studies and from randomized trials of these medications in children with other upper respiratory tract infections, which shows that the use of antihistamines and decongestants can lead to significant adverse events, especially in young children. Somnolence, irritability, insomnia, rhinitis medicamentosa, prolonged middle ear effusion and death have been associated with the use of these medications (CDC 2007; Chonmaitree 2003; Shefrin 2009). Accordingly, until further data from randomized controlled trials in children become available, the use of these medications is not recommended.

Similarly, there was no evidence to support the use of irrigation in children with acute sinusitis. Although irrigation in general is well tolerated, without data to support its efficacy its routine use cannot be recommended.

Implications for research

Further research is needed to determine whether these interventions are beneficial in the treatment of children with acute sinusitis. Development and validation of a symptom scale that can be used to track the symptoms of children with acute sinusitis will also be an important contribution.

ACKNOWLEDGEMENTS

The review authors wish to thank the following people for commenting on previous review drafts: Rani Abraham, David McCormick, Despina Contopoulos, Rick Shoemaker and Roger Danoiseaux. Mina Pi (MP) was responsible for searching and manuscript preparation and was an author on the previous versions of this review.

REFERENCES

References to studies excluded from this review

Adam 1998 [published data only]

Bachmann 2000 [published data only]

Barlan 1997 [published data only]

Bogomil’skii 2004 [published data only]

Braun 1997 [published data only]

Businco 1981 [published data only]

Careddu 1993 [published data only]

Ciofalo 1991 [published data only]
Ciofalo AZG, Filaci F, Vecchio AL, Grasso S. Study of the efficiency of astemizole as a supplementary agent in...

Cuenant 1986 [published data only]

Culig 2010 [published data only]

Friedman 2006 [published data only]

Fujihara 2004 [published data only]

Georgalas 2005 [published data only]

Heatley 2001 [published data only]

Hynes 1989 [published data only]

Inanli 2002 [published data only]

Luchikhin 1999 [published data only]

Maes 1987 [published data only]

Mann 1982 [published data only]

McCormick 1996 [published data only]

Meltzer 2000 [published data only]

Meltzer 2005 [published data only]

Michel 2005 [published data only]

Murray 1971 [published data only]

Nayak 2002 [published data only]

Neffson 1968 [published data only]

Ottaviano 2011 [published data only]

Ovchinikov 2009 [published data only]
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Rabago 2002 [published data only]

Schmidt 1984 [published data only]

Sederberg-Olsen 1989 [published data only]

Shoseyov 1998 [published data only]

Simon 1997 [published data only]

Simon 1999 [published data only]

Tesche 2008 [published data only]

Tutkun 1996 [published data only]

Varricchio 2008 [published data only]

Vogt 1966 [published data only]

Wang 2009 [published data only]

Wei 2011 [published data only]

Wiklund 1994 [published data only]

Yilmaz 2000 [published data only]

References to studies awaiting assessment

Ozsoylu 1983 [published data only]

Seppey 1995 [published data only]

Topal 1999 [published data only]

Topal 2001 [published data only]

Additional references

AAPG 2001

Boluyt 2008

CDC 2007

Chonnaitre 2003
Chonnaitre T, Saced K, Uchida T, Heikkinen T, Baldwin CD, Freeman DH Jr, et al. A randomized,

**De Sutter 2012**

**Garbutt 2001**

**Harvey 2007**

**Higgins 2011**

**Kristo 2005**

**Lefebvre 2011**

**Meltzer 2004**

**Nash 2002**

**Pappas 2008**

**Scadding 2008**

**Shefrin 2009**

**Smith 2012**

**Talbot 1997**

**Wald 1981**

**Wald 1986**

**Wald 1988**

**Wald 1991**

**Wald 2009**

**References to other published versions of this review**

**Shaikh 2010**

**Shaikh 2012**

* Indicates the major publication for the study.
## Characteristics of excluded studies  
**[ordered by study ID]**

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<thead>
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<td>Bachmann 2000</td>
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<td>Barlan 1997</td>
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<td>Adult participants</td>
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<tr>
<td>Tutkun 1996</td>
<td>No decongestants or antihistamines used</td>
</tr>
<tr>
<td>Varricchio 2008</td>
<td>Not a randomized study</td>
</tr>
<tr>
<td>Vogt 1966</td>
<td>No control group</td>
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<tr>
<td>Wang 2009</td>
<td>Does not meet criteria for sinusitis</td>
</tr>
<tr>
<td>Wei 2011</td>
<td>Chronic sinusitis</td>
</tr>
<tr>
<td>Wiklund 1994</td>
<td>Adult participants</td>
</tr>
<tr>
<td>Yilmaz 2000</td>
<td>No control group</td>
</tr>
</tbody>
</table>
DATA AND ANALYSES

This review has no analyses.

APPENDICES

Appendix 1. MEDLINE search strategy

MEDLINE (OVID)
1 exp Sinusitis/
2 sinusit*.tw.
3 (rhinosinusit* or nasosinusit*).tw.
4 Paranasal Sinus Diseases/
5 (sinus* adj2 infect*).tw.
6 (nasal adj2 (discharge* or congest*)).tw.
7 Nasopharyngitis/
8 (nasopharyngit* or rhinopharyngit*).tw.
9 ((purulent or acute) adj2 rhinit*).tw.
10 (rhinorrhea* or rhinorrhoea*).tw.
11 or/1-10 (26368)
12 exp Histamine H1 Antagonists/
13 antihistamine*.tw,nm.
14 azelastine.tw,nm.
15 brompheniramine.tw,nm.
16 chlorpheniramine.tw,nm.
17 diphenhydramine.tw,nm.
18 loratadine.tw,nm.
19 pheniramine.tw,nm.
20 promethazine.tw,nm.
21 terfenadine.tw,nm.
22 tripolidine.tw,nm.
23 exp Nasal Decongestants/
24 decongestant*.tw,nm.
25 cetirizine.tw,nm.
26 ephedrine.tw,nm.
27 norephedrine.tw,nm.
28 oxymetazoline.tw,nm.
29 phenylephrine.tw,nm.
30 phenylpropanolamine.tw,nm.
31 pseudoephedrine.tw,nm.
32 xylometazoline.tw,nm.
33 fexofenadine.tw,nm.
34 (levmethamphetamine or levomethamphetamine or l-methamphetamine).tw,nm.
35 clemastine.tw,nm.
36 doxylamine.tw,nm.
37 desloratidine.tw,nm.
38 levocetirizine.tw,nm.
39 hydroxyzine.tw,nm.
40 carbinoxamine.tw,nm.
dexchlorpheniramine.tw,nm.
Cromolyn Sodium/
cromolyn.tw,nm.
saline.tw,nm.
Sodium Chloride/
sodium chloride.tw,nm.
hypertonic solutions/ or saline solution, hypertonic/
Seawater/
(seawater or sea water or ocean).tw.
(saltwater or salt water).tw.
Isotonic Solutions/
isoionic.tw.
(wash* or spray* or mist* or irrigat* or rins* or douch* or lavage*).tw.
Nasal Lavage/
acrivastine.tw,nm.
astemizole.tw,nm.
azatadine maleate.tw,nm.
bepotastine.tw,nm.
carbinoxamine maleate.tw,nm.
cyproheptadine hydrochloride.tw,nm.
dimetindene maleate.tw,nm.
diphenhydramine.tw,nm.
epinastine hydrochloride.tw,nm.
homochlorcyclizine hydrochloride.tw,nm.
ketotifen fumarate.tw,nm.
levocabastine hydrochloride.tw,nm.
methylxylazine.tw,nm.
mizolastine.tw,nm.
oxatomide.tw,nm.
phenindamine tartrate.tw,nm.
rupatadine.tw,nm.
tritoqualine.tw,nm.
(amidefrine mesilate or amidefrine mesylate).tw,nm.
clonazoline hydrochloride.tw,nm.
fenoxazoline.tw,nm.
indanazoline.tw,nm.
metizoline.tw,nm.
naphazoline.tw,nm.
methoxyphenamine.tw,nm.
xylometazoline.tw,nm.
tritoqualine.tw,nm.
ebastine.tw,nm.
emadastine.tw,nm.
methylephedrine.tw,nm.
tetryzoline.tw,nm.
tramazoline.tw,nm.
or/12-88
11 and 89
#31 #11 AND #24 AND #27 AND #30 523
#30 #28 OR #29 910535
#29 random*:ab,ti OR placebo*:ab,ti OR factorial*:ab,ti OR crossover*:ab,ti OR 'cross over':ab,ti OR 'cross-over':ab,ti OR volunteer*:ab,ti OR assign*:ab,ti OR allocat*:ab,ti AND [embase]/lim 872935
#28 'randomized controlled trial'/exp OR 'single blind procedure'/exp OR 'crossover procedure'/exp AND [embase]/lim 234353
#27 #25 OR #26 1919638
#26 infant*:ab,ti OR infancy:ab,ti OR newborn*:ab,ti OR baby*:ab,ti OR babies:ab,ti OR neonat*:ab,ti OR preterm*:ab,ti OR premature*:ab,ti OR child*:ab,ti OR schoolchild*:ab,ti OR preschool*:ab,ti OR kid*:ab,ti OR kids:ab,ti OR toddler*:ab,ti OR adolesc*:ab,ti OR teen*:ab,ti OR boy*:ab,ti OR girl*:ab,ti OR minor*:ab,ti OR pubert*:ab,ti OR pubescen*:ab,ti OR pediatric*:ab,ti OR paediatric*:ab,ti OR (school* NEAR/1 (nursery OR primary OR secondary OR high OR elementary)):ab,ti OR kindergarten*:ab,ti OR highschool*:ab,ti OR 'school age':ab,ti OR 'school ages':ab,ti OR 'school aged':ab,ti AND [embase]/lim 1471230
#25 'infant'/exp OR 'child'/exp OR 'adolescent'/exp OR 'puberty'/de OR 'pediatrics'/exp OR school*/de OR 'kindergarten'/de OR 'nursery school'/de OR 'primary school'/de OR 'middle school'/de OR 'high school'/de AND [embase]/lim 1197106
#24 #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 564106
#23 acrivastine:ab,ti OR astemizole:ab,ti OR 'azatadine maleate':ab,ti OR bepotastine:ab,ti OR 'carbinoxamine maleate':ab,ti OR 'cyproheptadine hydrochloride':ab,ti OR 'dimetindene maleate':ab,ti OR diphenhydramine:ab,ti OR 'epinastine hydrochloride':ab,ti OR 'homochlorycyclizine hydrochloride':ab,ti OR 'ketotifen fumarate':ab,ti OR 'levocabastine hydrochloride':ab,ti OR mehydrolin:ab,ti OR mequitazine:ab,ti OR mizolastine:ab,ti OR oxatomide:ab,ti OR tartrate:ab,ti OR rupatadine:ab,ti OR tritioqualine:ab,ti OR 'amidazine mesilate':ab,ti OR 'amidazine mesylate':ab,ti OR 'clonazoline hydrochloride':ab,ti OR fenoazozone:ab,ti OR indanazoline:ab,ti OR 'metizoline':ab,ti OR naphazoline:ab,ti OR oxymetazoline:ab,ti OR 'phenindamine'/de AND [embase]/lim 200323
#20 'hypertonic solution'/de OR 'isotonic solution'/de OR 'sea water'/de AND [embase]/lim 134555
#19 saline:ab,ti OR 'sodium chloride':ab,ti AND [embase]/lim 131527
#18 'sodium chloride'/de AND [embase]/lim 87254
#17 cromolyn:ab,ti AND [embase]/lim 1248
#16 cromoglycate disodium'/de AND [embase]/lim 13135
#15 decongestant*:ab,ti OR cetirizine:ab,ti OR ephedrine:ab,ti OR norephedrine:ab,ti OR oxymetazoline:ab,ti OR phenylephrine:ab,ti OR phenylpropanolamine:ab,ti OR pseudoephedrine:ab,ti OR xylometazoline:ab,ti OR levmetamfetamine:ab,ti OR levomethamphetamine:ab,ti OR doxylamine:ab,ti OR desloratidine:ab,ti OR levocetirizine:ab,ti OR hydroxyzine:ab,ti OR chloroxazine:ab,ti OR dexchlorpheniramine:ab,ti OR 'l-methampethamine':ab,ti AND [embase]/lim 24591
#14 'decongestive agent'/exp AND [embase]/lim 78794
#13 antihistamin*:ab,ti OR azelastine:ab,ti OR brompheniramine:ab,ti OR chlorpheniramine:ab,ti OR diphenhydramine:ab,ti OR loratadine:ab,ti OR pheniramine:ab,ti OR promethazine:ab,ti OR terfenadine:ab,ti OR triprolidine:ab,ti AND [embase]/lim 17698
#12 'antihistaminic agent'/exp AND [embase]/lim 141245
#11 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 #10 33388
#10 rhinorrhea:ab,ti OR rhinorrhoea:ab,ti AND [embase]/lim 3218
#9 ((purulent OR acute) NEAR/2 rhinit*):ab,ti AND [embase]/lim 207
#8 nasopharyngit*:ab,ti OR rhinopharyngit*:ab,ti AND [embase]/lim 606
#7 'rhinopharyngitis'/de AND [embase]/lim 4132
#6 (nasal NEAR/2 (discharg* OR congest*)):ab,ti AND [embase]/lim 2603
#5 'nose congestion'/de AND [embase]/lim 4796
#4 (sinus NEAR/2 infect*):ab,ti AND [embase]/lim 622
#3 'sinus congestion'/de OR 'sinus pain'/de OR 'sinus headache'/exp AND [embase]/lim 307
#2 sinus*:ab,ti OR rhinosinusit*:ab,ti OR nasosinusit*:ab,ti AND [embase]/lim 12654

Decongestants, antihistamines and nasal irrigation for acute sinusitis in children (Review)

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WHAT'S NEW

Last assessed as up-to-date: 12 June 2014.

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<td>The conclusions remain unchanged.</td>
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<td>12 June 2014</td>
<td>New search has been performed</td>
<td>Searches conducted. No new trials were included.</td>
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HISTORY

Review first published: Issue 12, 2010

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<td>The conclusions remain unchanged.</td>
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<tr>
<td>31 January 2012</td>
<td>New search has been performed</td>
<td>Searches conducted. No new trials were included. Four new trials were excluded (Culig 2010; Ottaviano 2011; Ovchinnikov 2009; Wei 2011).</td>
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CONTRIBUTIONS OF AUTHORS

Nader Shaikh (NS) was responsible for protocol development, searching, data interpretation and manuscript preparation.

Ellen R Wald (ERW) was responsible for protocol development and manuscript preparation.

DECLARATIONS OF INTEREST

Nader Shaikh: none known.

Ellen R Wald: none known.
**Sources of Support**

**Internal sources**
- Departmental funds, USA.

**External sources**
- No sources of support supplied

**Differences Between Protocol and Review**

The names of several decongestants and antihistamines were added to the search strategy after the protocol was published.

**Index Terms**

**Medical Subject Headings (MeSH)**
- *Nasal Lavage; Acute Disease; Combined Modality Therapy [methods]; Histamine Antagonists [*therapeutic use]; Nasal Decongestants [*therapeutic use]; Sinusitis [*therapy]*

**MeSH check words**
- Adolescent; Child; Humans