Saline nasal irrigation for acute upper respiratory tract infections (Review)

Kassel JC, King D, Spurling GKP

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2010, Issue 3

http://www.thecochranelibrary.com

WILEY

TABLE OF CONTENTS

[Intervention Review]

Saline nasal irrigation for acute upper respiratory tract infections

Jessica C Kassel[2], David King[1], Geoffrey KP Spurling[1]

[1]Discipline of General Practice, University of Queensland, Brisbane, Australia. [2]School of Population Health, University of Queensland, Brisbane, Australia

Contact address: David King, Discipline of General Practice, University of Queensland, Level 8, Health Sciences Building, Royal Brisbane Hospital, Brisbane, QLD, 4029, Australia. d.king@uq.edu.au. d.king@sph.uq.edu.au.

Editorial group: Cochrane Acute Respiratory Infections Group.
Publication status and date: Edited (no change to conclusions), published in Issue 10, 2010.
Review content assessed as up-to-date: 14 May 2009.

Citation: Kassel JC, King D, Spurling GKP. Saline nasal irrigation for acute upper respiratory tract infections. *Cochrane Database of Systematic Reviews* 2010, Issue 3. Art. No.: CD006821. DOI: 10.1002/14651858.CD006821.pub2.

ABSTRACT

Background

Acute upper respiratory tract infections (URTIs), including the common cold and rhinosinusitis, are common afflictions that cause discomfort and debilitation, and contribute significantly to workplace absenteeism. Treatment is generally by antipyretic and mucolytic drugs, and often antibiotics, even though most infections are viral. Nasal irrigation with saline is often employed as an adjunct treatment for chronic or allergic sinusitis, but little is known about its effect on acute URTIs.

Objectives

To evaluate the efficacy of saline nasal irrigation in treating the symptoms of acute URTIs.

Search methods

We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2009, issue 2) which contains the Acute Respiratory Infections (ARI) Group's Specialised Register, MEDLINE (1966 to May 2009), EMBASE (1974 to May 2009), CINAHL (1982 to May 2009), AMED (1985 to 2009) and LILACS (May 2009).

Selection criteria

Randomised controlled trials (RCTs) comparing topical nasal saline treatment to other interventions in adults and children with clinically diagnosed acute URTIs.

Data collection and analysis

Two review authors (DK, GS) independently assessed trial quality and extracted data. All data were analysed using Cochrane Review Manager software.

Main results

Three RCTs (618 participants) were included. Most results showed no difference between nasal saline treatment and control. However, there was limited evidence of benefit with nasal saline irrigation in adults. One study showed a mean difference of 0.3 day (out of eight days) for symptom resolution, but this was not significant. Nasal saline irrigation was associated with less time off work in one study. Minor discomfort was not uncommon and 40% of babies did not tolerate nasal saline drops.

Authors' conclusions

Included trials were too small and had too high a risk of bias to be confident about the possible benefits of nasal saline irrigation in acute URTIs. Future trials should involve much larger numbers of participants and be rigorously designed and controlled.

PLAIN LANGUAGE SUMMARY

Nasal saline treatment for acute upper airway infection symptoms

Acute upper respiratory tract infections (URTIs) are infections of the upper airways that can cause symptoms for up to four weeks. Acute URTIs include colds, influenza and infections of the throat, nose or sinuses. The symptoms are often treated with painkillers and decongestants. Sometimes antibiotics are prescribed, although most acute URTIs are caused by viruses. Nasal saline sprays or irrigation have been used to treat symptoms of chronic airway infections, and sometimes for acute infections.

This review is limited by the differences in the characteristics of the included studies, including study populations and outcome measures. However, it found little research to support the use of nasal saline for acute URTIs. Included studies showed limited benefit for symptoms relief with nasal saline irrigation in adults. Nasal saline is safe and may reduce time off work but may cause minor adverse effects such as dry nose or irritation in less than half of users.

Future studies are needed to establish the use of nasal saline irrigation as a way of reducing acute URTI symptoms safely while keeping people at work and reducing antibiotic use.

BACKGROUND

Description of the condition

Acute upper respiratory tract infections (URTIs) involve the upper airways (the nose, sinuses, larynx and pharynx). Examples include the common cold, influenza, rhinitis, sinusitis, laryngitis, pharyngitis, tonsillitis and otitis media. Acute infections are those with symptoms lasting up to 28 days (Meltzer 2006).

Acute URTIs are common and symptoms include fever, sore throat and nasal congestion, which can be painful and debilitating, and are a major cause of employee absence in the workforce. The economic impact of the common cold alone on workplace absenteeism is estimated to be billions of dollars (Bramley 2002).

Description of the intervention

Usual treatments for URTIs include antipyretic and analgesic drugs, mucolytics, expectorants and decongestants (Simasek 2007). While acute URTIs are mainly caused by viruses, antibiotics are often prescribed (Nash 2002). This may lead to increased antibiotic resistance and adverse outcomes, as well as being unnecessary for the patient.

How the intervention might work

Saline irrigation of the nose, which is a popular treatment for sinonasal conditions, is believed to alleviate URTI symptoms by clearing excess mucus, reducing congestion and improving breathing (Tomooka 2000). It is known to improve mucociliary clearance by increasing the ciliary beat frequency (Talbot 1997). As well as relieving sinonasal symptoms, saline irrigation may remove infectious material from the sinuses, and reduce cough associated with postnasal drip (Kaliner 1998). Nasal saline irrigation is sometimes used as an effective treatment for chronic sinusitis (Rabago 2002) and allergic rhinitis (Garavello 2003). It has been used as monotherapy or as an adjunct to other treatments, such as oral antihistamines. It is available commercially in various concentrations and formulations of salts, and is usually delivered by atomised spray or larger volumes for lavage.

Why it is important to do this review

If effective, nasal saline treatment could potentially reduce the burden of disease and workplace absenteeism resulting from such infections. It may also reduce the over-prescription of antibiotics for acute URTIs. One review of the existing literature (Papsin 2003) found that most trials of nasal saline in acute URTIs were very small, with some being uncontrolled experiments. Though

not a systematic review, Papsin 2003 evaluated the evidence as "fair". A Cochrane Review (Harvey 2007) assessed nasal saline irrigation as a treatment for chronic rhinosinusitis and found it may be useful in providing symptomatic relief, without significant side effects.

This systematic review evaluates the efficacy of saline irrigation in the treatment of acute URTIs, to determine whether saline nasal irrigation improves respiratory symptoms of acute URTIs.

OBJECTIVES

The primary objective was to assess the efficacy of saline nasal irrigation for symptom reduction in patients with acute URTIs.

METHODS

Criteria for considering studies for this review

Types of studies

We included randomised controlled trials (RCTs) comparing topical nasal saline treatment (liquid, drops or spray) with at least one other intervention. We also included studies trialling another therapy, where saline irrigation was used as a control treatment. We excluded non-RCTs or non-comparative studies and trials involving patients with chronic URTIs or allergic rhinosinusitis. Treatment studies for acute URTIs were included; prevention studies for acute URTIs were excluded.

Types of participants

We included adults and children diagnosed with acute URTIs featuring nasal and/or sinus symptoms for less than 12 weeks. (Types of acute URTIs include rhinosinusitis, pharyngitis, otitis media, tonsillitis, common cold and influenza). We excluded studies involving patients with allergic respiratory symptoms, chronic respiratory infections or chronic diseases with respiratory features, such as cystic fibrosis, or recovering from sinus surgery.

Types of interventions

We compared the following interventions.

1. Nasal lavage, irrigation, or similar topical nasal liquid saline treatment, compared with a placebo.
2. Nasal lavage, irrigation, or similar topical nasal liquid saline treatment, compared with other standard treatment.
3. Nasal saline plus standard treatment compared with standard treatment alone.

Comparative treatments were different topical medications or other treatment methods.

We included studies using atomised or nebulised saline. We also included trials of all types of topical saline treatments, including isotonic and hypertonic solutions, as well as commercially available saline preparations.

Types of outcome measures

Primary outcomes

1. Improvement of acute URTI-related symptoms (for example, nasal discharge, congestion, sneezing, headache) over periods up to 28 days.
2. Duration and severity of symptoms.

Secondary outcomes

1. Adverse events associated with treatment.
2. Time to resolution of symptomatic illness.
3. Rhinomanometric resistance and nasal volume.
4. Antibiotic use.

Search methods for identification of studies

Electronic searches

We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2009, issue 2), which contains the Acute Respiratory Infections (ARI) Group's Specialised Register, MEDLINE (1966 to May 2009), EMBASE (1974 to May 2009), CINAHL (1982 to May 2009), AMED (1985 to 2009) and LILACS (May 2009).

The following search terms were used to search MEDLINE and CENTRAL. The MEDLINE search was combined with the Cochrane Highly Sensitive Search Strategy for identifying randomised trials in MEDLINE; sensitivity-maximizing version (2008 revision); Ovid format (Lefebvre 2008). The search terms were modified to search other databases. See Appendix 1 for the EMBASE search strategy.

MEDLINE (Ovid)

1 exp Respiratory Tract Infections/
2 (respiratory tract infection* or upper respiratory infection*).tw.
3 urti.tw.
4 Rhinitis/
5 rhinit*.tw.
6 Common Cold/
7 common cold*.tw.

8 exp Pharyngitis/
9 pharyngit*.tw.
10 sore throat*.tw.
11 Tonsillitis/
12 tonsillit*.tw.
13 exp Sinusitis/
14 sinusit*.tw.
15 exp Laryngitis/
16 laryngit*.tw.
17 rhinosinusit*.tw.
18 rhinorrhea*.tw.
19 Influenza, Human/
20 flu*.tw.
21 runny nose*.tw.
22 rhinorrhoea*.tw.
23 ((nasal* or nose*) adj2 congest*).tw.
24 or/1-22
25 Sodium Chloride/
26 (saline or salt* or sodium chloride*).tw,nm.
27 or/25-26
28 Irrigation/
29 (irrigat* or lavage* or wash* or rins* or douch* or atomis* or atomiz*).tw.
30 or/28-29
31 (nasal* or nose*).tw.
32 Nose/
33 32 or 31
34 30 and 33
35 exp Nasal Lavage/
36 or/34-35
37 24 and 27 and 36

Searching other resources

We checked the Australian Clinical Trial Register database (http://www.actr.org.au/) and the US National Institutes of Health (http://www.clinicaltrials.gov) for relevant studies. Evidence of any adverse effects of saline nasal irrigation was sought from other sources, including the US Food and Drug Administration's MedWatch (www.fda.gov/medwatch), the UK Medicines Control Agency (http://www.open.gov.uk/mca) and the Australian Adverse Drug Reactions Bulletin (http://www.health.gov.au).

We also identified studies by checking the bibliographies of all studies retrieved. We contacted authors of relevant trials regarding any recent unpublished work. There were no language or publication restrictions.

Data collection and analysis

Selection of studies

One review author (JK) selected the studies. Two review authors (DK, GS) checked the results.

Data extraction and management

Two review authors (DK, GS) independently extracted and summarised details of the studies using a data extraction sheet. Data extracted included year and country of study, study population, methodological quality, type of saline solution used, any adverse events and outcomes. We contacted trial authors for missing information where possible. However, none replied with data. Data were managed and analysed using Review Manager software, version 5 (RevMan 2008).

Assessment of risk of bias in included studies

We assessed trials for risk of bias and appropriateness for inclusion. We processed data from included trials as described in the *Cochrane Handbook for Systematic Reviews of Interventions 5.0.1* (Higgins 2008). We undertook risk of bias assessment by evaluating the following components for each included study.

1. The method of generation of the randomisation sequence - if it delivered a known chance allocation to each given group, but individual allocation could not be anticipated.
2. The method of allocation concealment - considered 'adequate' when the assignment could not be foreseen.
3. Who was masked or unmasked to the intervention (participants, clinicians, outcome assessors).
4. Participants lost to follow up in each arm of the study (split into post-randomisation exclusions and later losses if possible), and whether participants were analysed in the groups to which they were originally randomised (intention-to-treat).

In addition, we collated aspects related to follow up, participants lost to follow up, protocol violations and sample size determinations. We recorded the information in 'Risk of bias' tables and gave a description of the quality of each study, based on a summary of these components.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

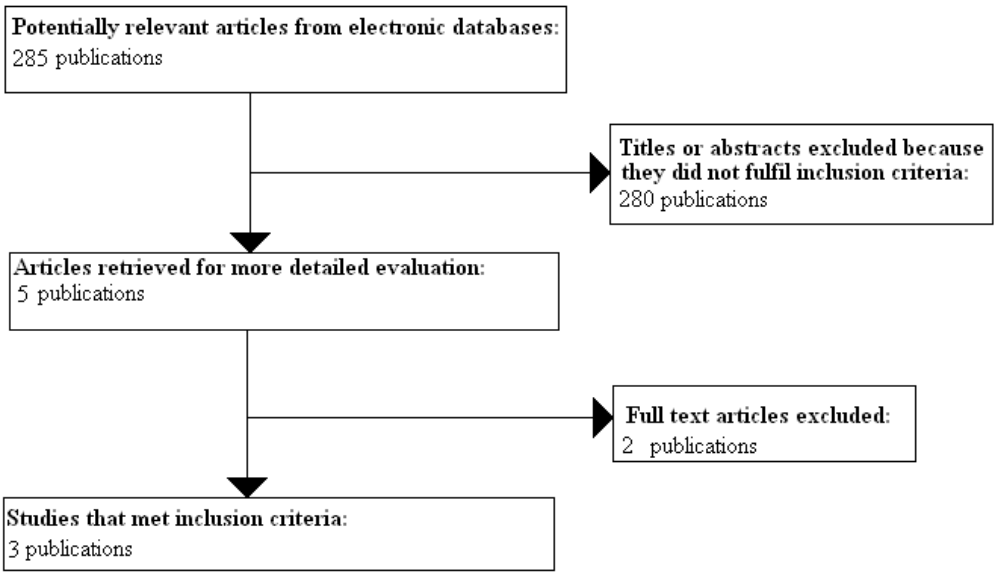
We assessed three studies (Adam 1998; Bollag 1984; Slapak 2008) as meeting most criteria for low risk of bias and we selected these for inclusion in the review. Two studies (Inanli 2002; Passali 2005) were assessed as having a higher risk of bias. Problems with these two studies included inadequate description of the method of randomisation (or doubt as to randomisation used), unblinded

trials and inadequate data analysis. Additionally, Inanli 2002 was assessed as not fully meeting the review criteria as it measured one biological parameter (mucociliary clearance) but not clinical symptoms of acute URTI. We excluded these two studies.

Results of the search

The databases we searched yielded the following results: 146 articles in MEDLINE, 68 articles in EMBASE, 49 articles in CENTRAL, 22 results in CINAHL and no articles in AMED or LILACS. Of the total 285 trials retrieved, 280 were excluded based on a review of titles and abstracts. Of the five remaining trials, we assessed three as meeting the inclusion criteria, and excluded two as not meeting the minimum quality criteria. A QUORUM (quality of reporting of meta-analyses) flowchart of study selection is attached (Figure 1). After screening the full text of the selected trials, three met the inclusion criteria. The included trials were published in 1984, 1998 and 2008. All were published in English.

Figure 1. QUOROM (quality of reporting of meta-analyses) flowchart of study selection



Included studies

Adam 1998 met the inclusion criteria as it randomised adults in the USA with clinically diagnosed acute rhinosinusitis or common cold to one of three groups: hypertonic nasal saline irrigation, normal saline irrigation or no treatment (control).

Bollag 1984 met the inclusion criteria as children in the USA with clinically diagnosed acute URTIs were randomised to treatment with normal saline drops, phenylephrine drops or no treatment.

Slapak 2008 met the inclusion criteria as children in the Czech republic with clinically diagnosed common cold or influenza were randomised to receive standard treatment with or without adjunct nasal irrigation with isotonic saline. The study divided the patients receiving nasal saline treatment into three subgroups using different delivery strengths: fine spray, medium jet flow and fine spray eye and nose wash. Each subgroup used the same solution of commercial isotonic seawater. Results were reported for each subgroup and for the saline group as a whole; this review considers the results for the saline group as a whole.

We contacted the authors of each included trial to provide missing raw data for the studies, but none were provided.

Excluded studies

We excluded two trials (Inanli 2002; Passali 2005) after evaluation. The main reasons for exclusion were lack of description of randomisation, unblinded studies and inadequate data analysis. Mucociliary clearance, the only outcome measure used by Inanli

2002, was further assessed to be an unsuitable measure for acute URTI symptoms. Passali 2005 was excluded due to doubt as to proper randomisation of the study. For details, see 'Characteristics of excluded studies' table.

Risk of bias in included studies

None of the included trials used computer generated randomisation for allocating participants to study groups. Two trials (Adam 1998; Bollag 1984) used random number tables. The remaining trials stated allocation was random but did not describe the method.

Allocation

None of the included trials described the method of allocation concealment used.

Blinding

Each included trial was only partially blinded (patients, clinicians or outcome assessors; sometimes two, but not all three), suggesting some risk of biased results.

In particular, the design of Slapak 2008 made patient blinding largely impossible as each participant either used the saline spray or did not. The outcome assessors were blinded only to the type of saline spray delivery used, and not blinded as to whether or not participants were using the saline treatment.

Participants and clinicians were blinded in Adam 1998, but blinding of outcome assessors was not discussed. Conversely, the outcome assessors in Bollag 1984 were blinded to patient treatment group, but blinding of participants (and parents) was not discussed.

Incomplete outcome data

Adam 1998 omitted any discussion of participants lost to follow up, although intention-to-treat analysis was performed.

The other included trials (Bollag 1984; Slapak 2008) adequately discussed drop-out and losses to follow up.

Effects of interventions

The clinical measures used in the included studies were so heterogenous as to only allow minimal pooling of data. Other than nasal symptom score (assessed both by Adam 1998 and Bollag 1984) the results from each study must be analysed individually.

There was no significant difference in clinical symptom scores between control and intervention groups in the included trials. The only notable difference between groups was the respiratory symptom score on day one (Bollag 1984), where a slightly higher average score was found in the phenylephrine group compared to the normal saline group. The mean difference was -0.65 (95% confidence interval (CI) -1.11 to -0.19), indicating a small difference. Overall, baseline clinical features of the groups in each study were comparable, with no other significant differences.

Primary outcomes

Nasal symptom score

Comparison of nasal symptom score at day three between saline irrigation groups and those receiving either another treatment or a placebo revealed no statistically significant differences between any of the groups. Notably, the nasal symptom score at day three, combining two included studies (Adam 1998; Bollag 1984), showed no difference between the saline nasal irrigation group and the observation only group, with a standard mean difference of -0.07 (95% CI -0.45 to 0.31). Adam 1998 used a four-point symptom scale, from 0 (no symptoms) to 3 (severe symptoms); Bollag 1984 used a similar scale, with 1 representing severe symptoms and 4 indicating no symptoms.

Nasal secretion score

Participants studied by Slapak 2008 were assessed at the first and second visits for type of nasal secretions, and the qualitative assessment (absent, serous, seropurulent or purulent) translated to a numerical score for grouping of results. The mean difference for comparison of the saline wash and control groups at second visit was -0.34 (95% CI -0.49 to -0.19), indicating a small improvement with nasal saline irrigation.

Time to symptom resolution in one study (Adam 1998) did not differ significantly between groups.

Nasal patency

Slapak 2008 evaluated the degree of difficulty of nasal breathing as a "breathing score" for each patient at the first and second visits. The mean difference for the saline wash group compared with the control group at the second visit was -0.33 (95% CI -0.47 to -0.19). Like the nasal secretion scores, this may suggest improvement in the saline wash group.

Respiratory symptom score

Only one included study (Bollag 1984) provided respiratory symptom scores for each group of patients. At day three, there was no significant difference in respiratory symptom score between any of the compared treatment or control groups. The mean difference for comparison of saline nasal drops and observation was -0.25 (95% CI -0.73 to 0.28).

Activity symptom score

This is a score reflecting the child's degree of wellness in terms of behaviours such as feeding and sleeping. Analysis of the data for activity symptom score at day three (Bollag 1984) showed no statistically significant difference between any of the compared treatment or control groups. However there was a trend towards improvement with nasal saline irrigation over observation only, with a mean difference of -0.29 (95% CI -0.68 to 0.10).

Secondary outcomes

Day of well-being

One study (Adam 1998) included data on the 'day of well-being' for patients in each group, indicating on which day participants felt 'back to normal' (see Table 1). The mean day of well-being for the group treated with hypertonic nasal saline irrigation was 8.30 (95% CI 6.90 to 9.70). The normal saline group had a mean day of well-being of 8.30 (95% CI 6.82 to 9.78). Comparatively, the control group that received no treatment had a mean day of well-being of 8.00 (95% CI 6.70 to 9.30). There was no statistically significant difference in mean day of well-being between any of the groups.

Overall health status

Slapak 2008 included health status scores, indicating the degree of symptomatic improvement based on physician examination (see Table 2). Scores were given on a scale of 1 to 4, with a health status score of 1 indicating no symptoms, and a score of four representing severe symptoms. The mean health status score at the follow-up examination was 2.06 (95% CI 1.93 to 2.19) for the control group, compared with 1.72 (95% CI 1.66 to 1.78) for the saline wash group. This suggests a statistically significant benefit of nasal saline wash.

Time to symptom resolution in one study (Adam 1998) did not differ significantly between groups.

Antibiotic use

Slapak 2008 found a trend to reduced antibiotic use in the nasal saline group, though this did not reach statistical significance (see Table 3).

Time off work

Significantly fewer participants in the nasal saline group required time off work compared to the observation group in one study (Slapak 2008).

Adverse effects

All included studies reported adverse effects from treatment with nasal saline, or difficulty with patient toleration of treatment. These are summarised in Table 4.

The study using infant patients (Bollag 1984) reported six out of 15 participants (40.0%) did not tolerate treatment with saline nasal drops, while seven out of 16 (43.7%) did not tolerate treatment with phenylephrine drops. While the group numbers are small, the similar proportions suggest the infants may not have tolerated the delivery of nasal drops, rather than the saline itself.

The study using adult patients (Adam 1998) found no participants reporting intolerance of the treatment. However, in the group using hypertonic saline irrigation, seven out of 33 participants (21.2%) complained of dry nose, and 11 out of 33 (33.3%) reported pain or irritation. Among the group treated with normal saline irrigation, 11 out of 36 (30.5%) complained of dry nose, and four out of 31 (12.9%) reported pain or irritation from the treatment.

The third study, using children (Slapak 2008), found an overall rate of adverse events of 8.7%, most of which were reported by participants in the medium jet group and associated with the higher flow rate. The trial authors did not specify further the type of complaints but mention that three patients experienced nosebleeds.

As none of the papers discuss patient withdrawal in detail, it is possible that some may have left the studies for reasons related to adverse effects or discomfort from treatment.

DISCUSSION

Summary of main results

The included randomised controlled trials (RCTs) of saline nasal irrigation provide limited evidence that treatment is effective for symptoms of acute upper respiratory tract infections (URTIs). Measured symptom scores were statistically similar between treatment and control groups, and the length of time to resolution of symptoms was not clinically significant.

There was a trend toward reduced antibiotic use in one study with saline nasal irrigation and this study also demonstrated a statistically significant reduction in time off work with nasal saline irrigation compared to control (Slapak 2008).

No serious adverse effects occurred in the trials reviewed, although three children in one study (Slapak 2008) experienced nose bleeds. Minor adverse events were not uncommon and 40% to 44% of babies were shown to have difficulty with nasal drops. Discomfort in one study (Slapak 2008) was associated with higher application pressures rather than the nasal saline solution itself.

Overall completeness and applicability of evidence

This review focused on RCTs of saline nasal irrigation for the symptomatic treatment of acute URTIs. The nature of saline nasal irrigation makes double-blinding difficult and an appropriate placebo difficult to find. There were a limited number of RCTs available and all of these studies were small in size. Of the three included trials, due to the differences in clinical measures used, only one outcome incorporated pooled data.

Each trial reviewed used different strengths of saline solution, again limiting the possibilities for data comparison. In particular, Slapak 2008 used a commercial isotonic seawater product containing zinc and other elements that may be a factor in the effects of the product.

Only one of the included papers (Slapak 2008) examined the effect of saline irrigation on other symptoms, such as anosmia (loss of the sense of smell) and cough associated with acute URTIs. This is a potential clinical application of the treatment but no other papers addressing the topic were located.

The clinical outcomes measured by each study were largely subjective, focusing on patient-reported symptoms, which increases risk of bias in the results. Furthermore, Bollag 1984 relied on interpretation and reporting of infant patients' symptoms by parents, compounding this effect. This must be considered as a limitation of the studies and outcome measures.

The two excluded studies (Inanli 2002; Passali 2005), although excluded for reasons of high risk of bias, provided some corroborating evidence to support the need for future research that is better structured and controlled to investigate nasal saline irrigation as a treatment for acute URTIs. The measure of mucociliary clearance (measured by Inanli 2002) is not clinically relevant, and data relating to symptom relief and duration of illness would be more useful.

AUTHORS' CONCLUSIONS

Implications for practice

Limited data from three RCTs suggest that saline nasal irrigation may have some benefit in adults with acute URTIs. While some participants experienced minor discomfort, no serious side effects were identified. Treatment with nasal saline irrigation was associated with less time off work and there is a trend towards less antibiotic use.

Nasal irrigation with saline is a safe treatment that may be mildly beneficial to some patients, though the existing evidence is too limited to recommend it as a standard intervention.

Implications for research

Further RCTs are warranted to establish the place of nasal saline irrigation in acute URTIs and should include clinical relevant respiratory symptoms as outcome measures, including cough. Given the range of different available topical saline treatments, future studies could include comparisons of liquid saline to sprays in the treatment of URTIs.

ACKNOWLEDGEMENTS

The review authors wish to thank Kathie Godfrey, David Rabago, Michael Friedman, Richard Shoemaker, and Ludovic Reveiz for their feedback on the draft protocol. Thanks also to David Rabago, Michael Friedman, Robert Ware, and Ludovic Reveiz for commenting on the draft review. We are also grateful to Professor Robert L. Blake, Professor Ueli Bollag and Professor Desiderio Passàli for their assistance in locating relevant papers for this review.

REFERENCES

References to studies included in this review

Adam 1998 *{published data only}*
Adam P, Stiffman M, Blake RL. A clinical trial of hypertonic saline nasal spray in subjects with the common cold or rhinitis. *Archives of Family Medicine* 1998;**7**(1):39–43.

Bollag 1984 *{published data only}*
Bollag U, Albrecht E, Wingert W. Medicated versus saline nose drops in the management of upper respiratory infection. *Helvetica Paediatrica Acta* 1984;**39**(4):341–5.

Slapak 2008 *{published data only}*
Slapak I, Skoupá J, Strnad P, Horník P. Efficacy of isotonic nasal wash (seawater) in the treatment and prevention of rhinitis in children. *Archives of Otolaryngology - Head and Neck Surgery* 2008;**134**(1):67–74.

References to studies excluded from this review

Inanli 2002 *{published data only}*
Inanli S, Ozturk O, Korkmaz M, Tutkun A, Batman C. The effects of topical agents of fluticasone propionate, oxymetazoline, and 3% and 0.9% sodium chloride solutions on mucociliary clearance in the therapy of acute bacterial rhinosinusitis in vivo. *Laryngoscope* 2002;**112**(2):320–5.

Passali 2005 *{published data only}*
Passali D, Damian V, Passali FM, Passali GC, Bellussi L. Atomised nasal douche vs nasal lavage in acute viral rhinitis. *Archives of Otolaryngology - Head & Neck Surgery* 2005;**131**(9):788–90.

Additional references

Bramley 2002
Bramley TJ, Lerner D, Sames M. Productivity losses related to the common cold. *Journal of Occupational and Environmental Medicine* 2002;**44**(9):822–9.

Garavello 2003
Garavello W, Romagnoli M, Sordo L, Gaini RM, Bernardino C, Angrisano A. Hypersaline nasal irrigation in children with symptomatic seasonal allergic rhinitis: a randomized study. *Pediatric Allergy and Immunology* 2003; **14**:140–3.

Harvey 2007
Harvey R, Hannan SA, Badia L, Scadding G. Nasal saline irrigations for the symptoms of chronic rhinosinusitis. *Cochrane Database of Systematic Reviews* 2007, Issue 1. [DOI: 10.1002/14651858.CD006394.pub2]

Higgins 2008
Higgins JPT, Green S, (editors). Cochrane Handbook for Systematic Reviews of Interventions 5.0.1 [updated September 2008]. The Cochrane Collaboration, 2008. Available from www.cochrane-handbook.org.

Kaliner 1998
Kaliner M. Medical management of sinusitis. *American Journal of the Medical Sciences* 1998;**316**(1):21–8.

Lefebvre 2008
Lefebvre C, Manheimer E, Glanville J. Chapter 6: Searching for studies. In: Higgins JPT, Green S, (editors). Cochrane Handbook for Systematic Reviews of Interventions Version 5.0.1 [updated September 2008]. The Cochrane Collaboration, 2008. Available from www.cochrane-handbook.org.

Meltzer 2006
Meltzer EO, Hamilos DL, Hadley JA, Lanza DC, Marple BF, Nicklas RA, et al.Rhinosinusitis: developing guidance for clinical trials. *Journal of Allergy and Clinical Immunology* 2006;**118**(Suppl 5):17–61.

Nash 2002
Nash DR, Harman J, Wald ER, Kelleher KJ. Antibiotic prescribing by primary care physicians for children with upper respiratory tract infections. *Archives of Pediatric and Adolescent Medicine* 2002;**156**:1114–9.

Papsin 2003
Papsin B, McTavish A. Saline nasal irrigation: its role as an adjunct treatment. *Canadian Family Physician* 2003;**49**: 168–73.

Rabago 2002
Rabago D, Zgierska A, Mundt M, Barrett B, Bobula J, Maberry R. Efficacy of daily hypertonic saline nasal irrigation among patients with sinusitis: a randomized controlled trial. *Journal of Family Practice* 2002;**51**(12): 1049–55.

RevMan 2008
The Nordic Cochrane Centre. The Cochrane Collaboration. Review Manager (RevMan). 5.0. Copenhagen: The Nordic Cochrane Centre. The Cochrane Collaboration, 2008.

Simasek 2007
Simasek M, Blandino DA. Treatment of the common cold. *American Family Physician* 2007;**75**:515–22.

Talbot 1997
Talbot AR, Herr TM, Parsons DS. Mucociliary clearance and buffered hypertonic saline solution. *Laryngoscope* 1997; **107**(4):500–3.

Tomooka 2000
Tomooka LT, Murphy C, Davidson TM. Clinical study and literature review of nasal irrigation. *Laryngoscope* 2000;**110** (7):1189–93.

* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Adam 1998

Methods	Randomised controlled trial
Participants	Adults with common cold or acute rhinosinusitis
Interventions	Hypertonic saline Normal saline No treatment
Outcomes	Nasal symptom score Time to symptom resolution Additional OTC treatment required
Notes	-

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Random number table used
Allocation concealment?	Unclear	Not mentioned in paper
Blinding? All outcomes	Yes	Patients and clinicians blinded; outcome assessors not discussed
Incomplete outcome data addressed? All outcomes	Unclear	Drop-out and losses to follow up not discussed
Free of selective reporting?	Yes	Intention-to-treat analysis performed
Free of other bias?	Yes	No other potential sources of bias identified

Bollag 1984

Methods	Randomised controlled trial
Participants	Children with unspecified acute upper respiratory infections
Interventions	Saline nose drops Phenylephrine nose drops No treatment

Bollag 1984 (*Continued*)

Outcomes	Nasal symptom score Respiratory symptom severity Activity signs
Notes	-

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Random number table used
Allocation concealment?	Unclear	Not mentioned in paper
Blinding? All outcomes	Unclear	Outcome assessors blinded; others (including patients/ parents) not discussed
Incomplete outcome data addressed? All outcomes	Yes	Drop-out and losses to follow up adequately discussed
Free of selective reporting?	Unclear	Intention-to-treat analysis not performed
Free of other bias?	Yes	No other potential sources of bias identified

Slapak 2008

Methods	Randomised controlled trial
Participants	Children with common cold or influenza
Interventions	Isotonic saline (sea water) plus standard treatments Standard treatments only
Outcomes	Nasal symptom and breathing scores Health status score Additional treatment required
Notes	-

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	No	Sequence of clinic arrival used for allocation
Allocation concealment?	Unclear	Not mentioned in paper

Slapak 2008 (*Continued*)

Blinding? All outcomes	No	No patient blinding possible due to study design; outcome assessors blinded to saline delivery method but not to intervention versus control
Incomplete outcome data addressed? All outcomes	Yes	Drop-out and losses to follow up adequately discussed
Free of selective reporting?	Unclear	Intention-to-treat analysis not performed
Free of other bias?	Yes	No other potential sources of bias identified

OTC = over the counter

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Inanli 2002	Method of allocation concealment not described No blinding Selection bias not controlled No clinically relevant outcome measure
Passali 2005	Methods of randomisation and allocation concealment not described Doubt as to randomisation used No blinding No placebo group Intention-to-treat analysis not performed

DATA AND ANALYSES

Comparison 1. Nasal symptom score - day 1

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Normal saline versus phenylephrine drops	1	31	Mean Difference (IV, Fixed, 95% CI)	-0.41 [-0.85, 0.03]
2 Normal saline versus observation only	1	30	Mean Difference (IV, Fixed, 95% CI)	-0.43 [-0.89, 0.03]
3 Phenylephrine drops versus observation only	1	31	Mean Difference (IV, Fixed, 95% CI)	-0.02 [-0.47, 0.43]

Comparison 2. Nasal symptom score - day 3

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Hypertonic nasal saline irrigation versus observation only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2 Hypertonic saline nasal irrigation versus normal saline nasal irrigation	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3 Normal saline nasal irrigation versus observation only	2	108	Std. Mean Difference (IV, Fixed, 95% CI)	-0.07 [-0.45, 0.31]
4 Normal saline versus phenylephrine drops	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5 Phenylephrine drops versus observation only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 3. Respiratory symptom score - day 1

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Normal saline versus phenylephrine drops	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2 Normal saline versus observation only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3 Phenylephrine drops versus observation only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 4. Respiratory symptom score - day 3

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Normal saline versus phenylephrine drops	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2 Normal saline versus observation only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3 Phenylephrine drops versus observation only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 5. Activity symptom score - day 1

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Normal saline versus phenylephrine drops	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2 Normal saline versus observation only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3 Phenylephrine drops versus observation only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 6. Activity symptom score - day 3

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Normal saline versus phenylephrine drops	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2 Normal saline versus observation only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3 Phenylephrine drops versus observation only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 7. Nasal secretion score - first visit

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Isotonic saline with usual treatments versus usual treatments only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 8. Nasal secretion score - second visit

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Isotonic saline with usual treatments versus usual treatments only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 9. Nasal patency - first visit

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Isotonic saline with usual treatments versus usual treatments only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 10. Nasal patency - second visit

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Isotonic saline with usual treatments versus usual treatments only	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 11. Antibiotic usage

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Antibiotic usage	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected

Comparison 12. Time off work

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Time off work or school	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected

Analysis 1.1. Comparison 1 Nasal symptom score - day 1, Outcome 1 Normal saline versus phenylephrine drops.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 1 Nasal symptom score - day 1

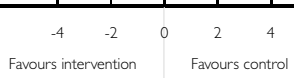
Outcome: 1 Normal saline versus phenylephrine drops

Study or subgroup	Normal saline N	Mean(SD)	Phenylephrine drops N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Bollag 1984	15	1.82 (0.63)	16	2.23 (0.63)		100.0 %	-0.41 [-0.85, 0.03]
Total (95% CI)	**15**		**16**			**100.0 %**	**-0.41 [-0.85, 0.03]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.81 (P = 0.070)

Test for subgroup differences: Not applicable

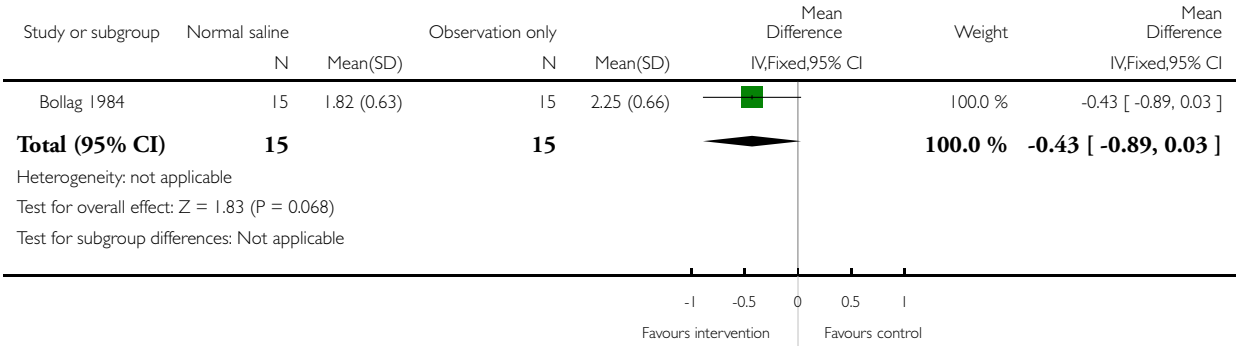


Analysis 1.2. Comparison 1 Nasal symptom score - day 1, Outcome 2 Normal saline versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 1 Nasal symptom score - day 1

Outcome: 2 Normal saline versus observation only

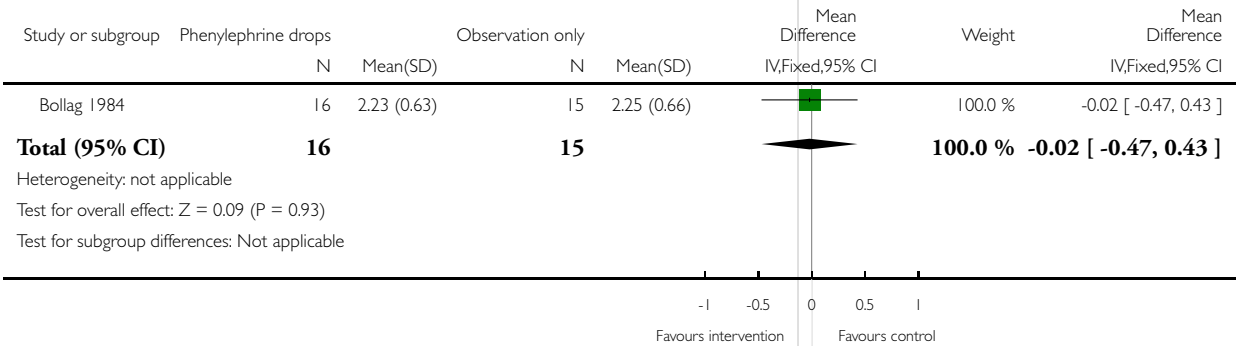


Analysis 1.3. Comparison 1 Nasal symptom score - day 1, Outcome 3 Phenylephrine drops versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 1 Nasal symptom score - day 1

Outcome: 3 Phenylephrine drops versus observation only



Analysis 2.1. Comparison 2 Nasal symptom score - day 3, Outcome 1 Hypertonic nasal saline irrigation versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 2 Nasal symptom score - day 3

Outcome: 1 Hypertonic nasal saline irrigation versus observation only

Study or subgroup	Hypertonic saline		Observation only		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Adam 1998	41	3.8 (2.61)	43	4.1 (2.01)		-0.30 [-1.30, 0.70]

Analysis 2.2. Comparison 2 Nasal symptom score - day 3, Outcome 2 Hypertonic saline nasal irrigation versus normal saline nasal irrigation.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 2 Nasal symptom score - day 3

Outcome: 2 Hypertonic saline nasal irrigation versus normal saline nasal irrigation

Study or subgroup	Hypertonic saline		Normal saline		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Adam 1998	41	3.8 (2.61)	35	3.7 (2.41)		0.10 [-1.03, 1.23]

Analysis 2.3. Comparison 2 Nasal symptom score - day 3, Outcome 3 Normal saline nasal irrigation versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 2 Nasal symptom score - day 3

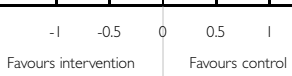
Outcome: 3 Normal saline nasal irrigation versus observation only

Study or subgroup	Normal saline		Observation only		Std. Mean Difference	Weight	Std. Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI		IV,Fixed,95% CI
Adam 1998	35	3.7 (2.41)	43	4.1 (2.01)		72.1 %	-0.18 [-0.63, 0.27]
Bollag 1984	15	3.02 (0.59)	15	2.88 (0.7)		27.9 %	0.21 [-0.51, 0.93]
Total (95% CI)	**50**		**58**			**100.0 %**	**-0.07 [-0.45, 0.31]**

Heterogeneity: Chi^2 = 0.82, df = 1 (P = 0.37); I^2 =0.0%

Test for overall effect: Z = 0.37 (P = 0.71)

Test for subgroup differences: Not applicable



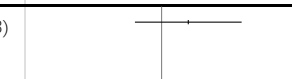
Analysis 2.4. Comparison 2 Nasal symptom score - day 3, Outcome 4 Normal saline versus phenylephrine drops.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 2 Nasal symptom score - day 3

Outcome: 4 Normal saline versus phenylephrine drops

Study or subgroup	Normal saline		Phenylephrine drops		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Bollag 1984	15	3.02 (0.59)	16	2.77 (0.83)		0.25 [-0.25, 0.75]



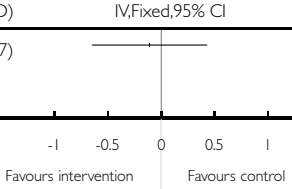
Analysis 2.5. Comparison 2 Nasal symptom score - day 3, Outcome 5 Phenylephrine drops versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 2 Nasal symptom score - day 3

Outcome: 5 Phenylephrine drops versus observation only

Study or subgroup	Phenylephrine drops N	Mean(SD)	Observation only N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Bollag 1984	16	2.77 (0.83)	15	2.88 (0.7)		-0.11 [-0.65, 0.43]



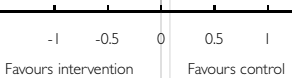
Analysis 3.1. Comparison 3 Respiratory symptom score - day 1, Outcome 1 Normal saline versus phenylephrine drops.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 3 Respiratory symptom score - day 1

Outcome: 1 Normal saline versus phenylephrine drops

Study or subgroup	Normal saline N	Mean(SD)	Phenylephrine drops N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Bollag 1984	15	1.93 (0.68)	16	2.58 (0.62)		-0.65 [-1.11, -0.19]



Analysis 3.2. Comparison 3 Respiratory symptom score - day 1, Outcome 2 Normal saline versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 3 Respiratory symptom score - day 1

Outcome: 2 Normal saline versus observation only

Study or subgroup	Normal saline		Observation only		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Bollag 1984	15	1.93 (0.68)	15	2.29 (0.86)		-0.36 [-0.91, 0.19]

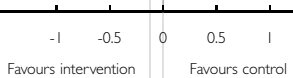
Analysis 3.3. Comparison 3 Respiratory symptom score - day 1, Outcome 3 Phenylephrine drops versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 3 Respiratory symptom score - day 1

Outcome: 3 Phenylephrine drops versus observation only

Study or subgroup	Phenylephrine drops		Observation only		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Bollag 1984	16	2.58 (0.62)	15	2.29 (0.86)		0.29 [-0.24, 0.82]



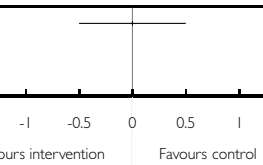
Analysis 4.1. Comparison 4 Respiratory symptom score - day 3, Outcome 1 Normal saline versus phenylephrine drops.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 4 Respiratory symptom score - day 3

Outcome: 1 Normal saline versus phenylephrine drops

Study or subgroup	Normal saline		Phenylephrine drops		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Bollag 1984	15	2.84 (0.75)	16	2.84 (0.65)		0.0 [-0.50, 0.50]



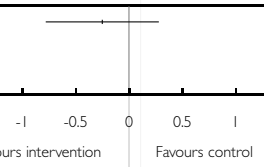
Analysis 4.2. Comparison 4 Respiratory symptom score - day 3, Outcome 2 Normal saline versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 4 Respiratory symptom score - day 3

Outcome: 2 Normal saline versus observation only

Study or subgroup	Normal saline		Observation only		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Bollag 1984	15	2.84 (0.75)	15	3.09 (0.74)		-0.25 [-0.78, 0.28]



Analysis 4.3. Comparison 4 Respiratory symptom score - day 3, Outcome 3 Phenylephrine drops versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 4 Respiratory symptom score - day 3

Outcome: 3 Phenylephrine drops versus observation only

Study or subgroup	Phenylephrine drops N	Mean(SD)	Observation only N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Bollag 1984	16	2.84 (0.65)	15	3.09 (0.74)		-0.25 [-0.74, 0.24]

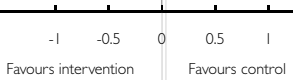
Analysis 5.1. Comparison 5 Activity symptom score - day 1, Outcome 1 Normal saline versus phenylephrine drops.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 5 Activity symptom score - day 1

Outcome: 1 Normal saline versus phenylephrine drops

Study or subgroup	Normal saline N	Mean(SD)	Phenylephrine drops N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Bollag 1984	15	2.13 (0.5)	16	2.17 (0.5)		-0.04 [-0.39, 0.31]



Analysis 5.2. Comparison 5 Activity symptom score - day 1, Outcome 2 Normal saline versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 5 Activity symptom score - day 1

Outcome: 2 Normal saline versus observation only

Study or subgroup	Normal saline		Observation only		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Bollag 1984	15	2.13 (0.5)	15	2.18 (0.59)		-0.05 [-0.44, 0.34]

Analysis 5.3. Comparison 5 Activity symptom score - day 1, Outcome 3 Phenylephrine drops versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 5 Activity symptom score - day 1

Outcome: 3 Phenylephrine drops versus observation only

Study or subgroup	Phenylephrine drops		Oobservation only		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Bollag 1984	16	2.55 (0.51)	15	2.18 (0.59)		0.37 [-0.02, 0.76]

Analysis 6.1. Comparison 6 Activity symptom score - day 3, Outcome 1 Normal saline versus phenylephrine drops.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 6 Activity symptom score - day 3

Outcome: 1 Normal saline versus phenylephrine drops

Study or subgroup	Normal saline		Phenylephrine drops		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Bollag 1984	15	2.33 (0.6)	16	2.55 (0.51)		-0.22 [-0.61, 0.17]

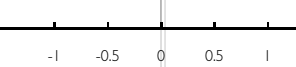
Analysis 6.2. Comparison 6 Activity symptom score - day 3, Outcome 2 Normal saline versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 6 Activity symptom score - day 3

Outcome: 2 Normal saline versus observation only

Study or subgroup	Normal saline		Observation only		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Bollag 1984	15	2.33 (0.6)	15	2.62 (0.48)		-0.29 [-0.68, 0.10]



Analysis 6.3. Comparison 6 Activity symptom score - day 3, Outcome 3 Phenylephrine drops versus observation only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 6 Activity symptom score - day 3

Outcome: 3 Phenylephrine drops versus observation only

Study or subgroup	Phenylephrine drops N	Mean(SD)	Observation only N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Bollag 1984	16	2.55 (0.51)	15	2.62 (0.48)		-0.07 [-0.42, 0.28]

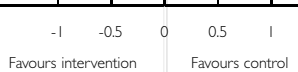
Analysis 7.1. Comparison 7 Nasal secretion score - first visit, Outcome 1 Isotonic saline with usual treatments versus usual treatments only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 7 Nasal secretion score - first visit

Outcome: 1 Isotonic saline with usual treatments versus usual treatments only

Study or subgroup	Isotonic saline with usual treatments N	Mean(SD)	Usual treatments only N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Slapak 2008	389	2.57 (0.61)	101	2.16 (0.67)		0.41 [0.27, 0.55]



Analysis 8.1. Comparison 8 Nasal secretion score - second visit, Outcome 1 Isotonic saline with usual treatments versus usual treatments only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 8 Nasal secretion score - second visit

Outcome: 1 Isotonic saline with usual treatments versus usual treatments only

Study or subgroup	Isotonic saline with usual treatments N	Mean(SD)	Usual treatments only N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Slapak 2008	389	1.72 (0.64)	101	2.06 (0.69)		-0.34 [-0.49, -0.19]

Analysis 9.1. Comparison 9 Nasal patency - first visit, Outcome 1 Isotonic saline with usual treatments versus usual treatments only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 9 Nasal patency - first visit

Outcome: 1 Isotonic saline with usual treatments versus usual treatments only

Study or subgroup	Isotonic saline with usual treatments N	Mean(SD)	Usual treatments only N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Slapak 2008	389	2.26 (0.74)	101	2.16 (0.67)		0.10 [-0.05, 0.25]

Analysis 10.1. Comparison 10 Nasal patency - second visit, Outcome 1 Isotonic saline with usual treatments versus usual treatments only.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 10 Nasal patency - second visit

Outcome: 1 Isotonic saline with usual treatments versus usual treatments only

Study or subgroup	Isotonic saline with usual treatments N	Mean(SD)	Usual treatments only N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Slapak 2008	389	1.25 (0.52)	101	1.58 (0.68)		-0.33 [-0.47, -0.19]

Analysis 11.1. Comparison 11 Antibiotic usage, Outcome 1 Antibiotic usage.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 11 Antibiotic usage

Outcome: 1 Antibiotic usage

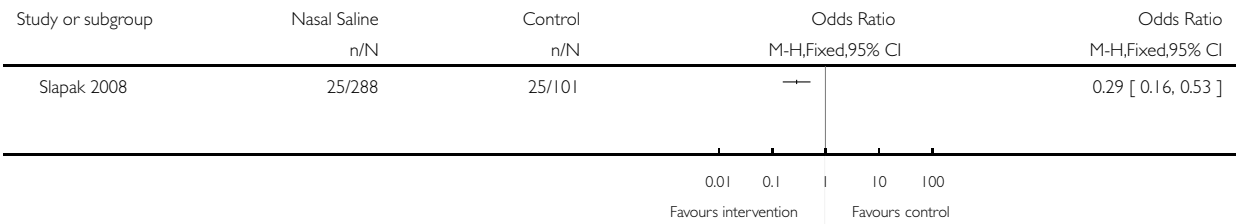
Study or subgroup	Nasal Saline n/N	Control n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Slapak 2008	12/288	9/101		0.44 [0.18, 1.09]

Analysis 12.1. Comparison 12 Time off work, Outcome 1 Time off work or school.

Review: Saline nasal irrigation for acute upper respiratory tract infections

Comparison: 12 Time off work

Outcome: 1 Time off work or school



ADDITIONAL TABLES

Table 1. Day of well-being (Adam 1998)

Treatment group	Day of well-being
Hypertonic saline irrigation	8.3 (95% CI 6.9 to 9.7)
Normal saline irrigation	8.3 (95% CI 6.82 to 9.78)
Observation only	8.0 (95% CI 6.7 to 9.3)

Table 2. Health status score following acute phase (Slapak 2008)

Treatment group	Health status score
Normal treatment only	2.06 (95% CI 1.93 to 2.19)
Normal treatment plus isotonic saline	1.72 (95% CI 1.66 to 1.78)

Table 3. Use of additional medications (Slapak 2008)

Medication type	Use before study (%)	Use at follow up (%)
Antipyretics	23.8 (control) 23.5 (saline wash)	12.9 (control) 7.6 (saline wash)

Table 3. Use of additional medications (Slapak 2008) (*Continued*)

Decongestants	40.0 (control) 29.4 (saline wash)	35.6 (control) 15.9 (saline wash)
Mucolytics	20.0 (control) 15.6 (saline wash)	31.7 (control) 17.3 (saline wash)
Systemic antibiotics	5.0 (control) 3.1 (saline wash)	8.9 (control) 5.5 (saline wash)

Table 4. Adverse events (included studies)

Adverse event	Adam 1998	Bollag 1984	Slapak 2008
(%) pain or irritation	33.3 (hypertonic saline) 12.9 (normal saline)	n/a	n/a
(%) dry nose	21.2 (hypertonic saline) 30.5 (normal saline)	n/a	n/a
(%) treatment not tolerated	n/a	40.0 (saline) 43.7 (control - phenylephrine)	8.7

APPENDICES

Appendix 1. Embase.com search strategy

1. 'respiratory tract infection'/de OR 'upper respiratory tract infection'/de OR 'rhinitis'/de OR 'common cold'/de OR 'pharyngitis'/de OR 'tonsillitis'/de OR 'sore throat'/de OR 'sinusitis'/de OR 'laryngitis'/de OR 'rhinosinusitis'/de OR 'influenza'/de
2. 'respiratory tract infection':ti,ab OR 'respiratory tract infections':ti,ab OR 'upper respiratory infection':ti,ab OR 'upper respiratory tract infections':ti,ab OR urti:ti,ab OR rhinit*:ti,ab OR 'common cold':ti,ab OR 'common colds':ti,ab OR pharyngit*:ti,ab OR 'sore throat':ti,ab OR 'sore throats':ti,ab OR tonsillit*:ti,ab OR sinusit*:ti,ab OR laryngit*:ti,ab OR rhinosinusit*:ti,ab OR rhinorrhea:ti,ab OR rhinorrhoea:ti,ab OR 'runny nose':ti,ab OR 'runny noses':ti,ab OR flu:ti,ab OR influenza*:ti,ab
3. #1 OR #2
4. 'nose'/de
5. nasal*:ti,ab OR nose*:ti,ab
6. #4 OR #5
7. lavage*:ti,ab OR wash*:ti,ab OR irrigat*:ti,ab OR rins*:ti,ab OR douch*:ti,ab OR atomis*:ti,ab OR atomiz*:ti,ab
8. #6 AND #7
9. 'sodium chloride'/de
10. salt*:ti,ab OR 'sodium chloride':ti,ab OR saline*:ti,ab
11. #9 OR #10
12. #8 AND #11
13. #3 AND #12

14. random*:ti,ab OR placebo*:ti,ab,de OR 'double blind':ti,ab
15. #13 AND #14

WHAT'S NEW

Last assessed as up-to-date: 14 May 2009.

Date	Event	Description
2 September 2010	Amended	Minor edit made to Acknowledgement section.

HISTORY

Protocol first published: Issue 4, 2007

Review first published: Issue 3, 2010

Date	Event	Description
16 August 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

Jessica Kassel (JK) drafted the protocol, reviewed the search results, entered and managed data, and drafted the final review.

David King (DK) and Geoffrey Spurling (GS) gave advice on performing the review, performed risk of bias assessment and data extraction, assisted with clinical interpretation of data, and helped write the protocol and final review.

DECLARATIONS OF INTEREST

No declared conflicts of interest.

INDEX TERMS

Medical Subject Headings (MeSH)

Acute Disease; Common Cold [therapy]; Laryngitis [therapy]; Nasal Lavage [adverse effects; *methods]; Pharyngitis [therapy]; Randomized Controlled Trials as Topic; Respiratory Tract Infections [*therapy]; Rhinitis [therapy]; Sinusitis [therapy]; Sodium Chloride [adverse effects; *therapeutic use]

MeSH check words

Adult; Child; Humans