



**Cochrane**  
**Library**

**Cochrane** Database of Systematic Reviews

## **Intranasal steroids versus placebo or no intervention for chronic rhinosinusitis (Protocol)**

Chong LY, Head K, Hopkins C, Philpott C, Burton MJ

Chong LY, Head K, Hopkins C, Philpott C, Burton MJ.

Intranasal steroids versus placebo or no intervention for chronic rhinosinusitis.

*Cochrane Database of Systematic Reviews* 2015, Issue 12. Art. No.: CD011996.

DOI: 10.1002/14651858.CD011996.

**[www.cochranelibrary.com](http://www.cochranelibrary.com)**

## TABLE OF CONTENTS

HEADER . . . . .	1
ABSTRACT . . . . .	1
BACKGROUND . . . . .	1
OBJECTIVES . . . . .	2
METHODS . . . . .	2
ACKNOWLEDGEMENTS . . . . .	7
REFERENCES . . . . .	7
APPENDICES . . . . .	8
CONTRIBUTIONS OF AUTHORS . . . . .	16
DECLARATIONS OF INTEREST . . . . .	16
SOURCES OF SUPPORT . . . . .	16

# Intranasal steroids versus placebo or no intervention for chronic rhinosinusitis

Lee Yee Chong<sup>1</sup>, Karen Head<sup>1</sup>, Claire Hopkins<sup>2</sup>, Carl Philpott<sup>3</sup>, Martin J Burton<sup>1</sup>

<sup>1</sup>UK Cochrane Centre, Oxford, UK. <sup>2</sup>ENT Department, Guy's Hospital, London, UK. <sup>3</sup>Department of Medicine, Norwich Medical School, University of East Anglia, Norwich, UK

Contact address: Lee Yee Chong, UK Cochrane Centre, Oxford, UK. [leeyee.ebm@gmail.com](mailto:leeyee.ebm@gmail.com).

**Editorial group:** Cochrane ENT Group.

**Publication status and date:** New, published in Issue 12, 2015.

**Citation:** Chong LY, Head K, Hopkins C, Philpott C, Burton MJ. Intranasal steroids versus placebo or no intervention for chronic rhinosinusitis. *Cochrane Database of Systematic Reviews* 2015, Issue 12. Art. No.: CD011996. DOI: 10.1002/14651858.CD011996.

Copyright © 2015 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

## ABSTRACT

This is the protocol for a review and there is no abstract. The objectives are as follows:

To assess the effects of intranasal corticosteroids in people with CRS.

## BACKGROUND

### Description of the condition

Chronic rhinosinusitis (CRS) represents a common source of ill health; 11% of UK adults reported CRS symptoms in a world-wide population study (Hastan 2011). Symptoms, including nasal obstruction, nasal discharge, facial pain, anosmia and sleep disturbance, have a major impact on quality of life, reportedly greater in several domains of the SF-36 than angina or chronic respiratory disease (Gliklich 1995). Acute exacerbations, inadequate symptom control and respiratory disease exacerbation are common. Complications are rare, but may include visual impairment and intracranial infection.

Two major phenotypes of CRS have been identified based on the presence or absence of nasal polyps on examination. Nasal polyps are tumour-like hyperplastic swellings of the nasal mucosa, most commonly originating from within the ostiomeatal complex (Larsen 2004). Chronic rhinosinusitis with nasal polyps (CRSwNP) is diagnosed when polyps are seen (on direct or endo-

scopic examination) bilaterally in the middle meatus. The acronym CRSsNP is used for the condition in which no polyps are present. Although the aetiology of CRS is not fully understood, it may involve abnormalities in the host response to irritants, commensal and pathogenic organisms and allergens, obstruction of sinus drainage pathways, abnormalities of normal mucociliary function, loss of the normal mucosal barrier or infection. Two typical profiles may be observed with respect to inflammatory mediators; in eosinophilic CRS, which is typically associated with nasal polyps, high levels of eosinophils, immunoglobulin E (IgE) and interleukin (IL)-5 may be found, while in neutrophilic CRS, more often associated with CRS without polyps, neutrophils predominate, with elevated interferon (IFN) gamma, IL-8 and tumour necrosis factor (TNF).

Despite the differences in phenotype and aetiology, in clinical practice many treatments for CRS are initiated without knowledge of a patient's 'polyp status'. Even when it is known whether or not a patient with CRS has polyps, this knowledge does not always suggest adjustments to treatment. This review (and most of its companion reviews) will consider patients with and without

polyps together in the initial evaluation of treatment effects. However, subgroup analyses will explore potential differences between them.

The most commonly used interventions for CRS are used either topically (sprayed into the nose) or systemically (by mouth) and include steroids, antibiotics and saline.

## Description of the intervention

Anti-inflammatory therapy plays a significant role in the treatment of CRS. This includes corticosteroids and low-dose macrolides. Topical corticosteroids are more widely used than oral steroids because treatment can be given for longer without significant adverse effects.

Intranasal corticosteroid therapy is often prescribed for patients with CRS, but with considerable variability in timing, frequency, dose, topical delivery method and the specific agent used (Benninger 2003; Spector 1998). The topical delivery method may affect the amount of steroid that comes into contact with the paranasal sinus mucosa (Grobler 2008; Harvey 2009). The simplest nasal delivery methods are drops, sprays, aerosols, nebulisers and atomisers. These contrast with methods involving direct sinus cannulation and nasal irrigation with squeeze bottles and neti pots, which are likely to provide better delivery to the sinuses, especially in the post-sinus surgery setting (Grobler 2008; Harvey 2009).

Classes of topical corticosteroid include first-generation intranasal steroids (beclomethasone dipropionate, triamcinolone acetonide, flunisolide and budesonide) and newer preparations (fluticasone propionate, mometasone furoate, ciclesonide and fluticasone furoate).

## How the intervention might work

The use of topical (intranasal) corticosteroids has been widely advocated for the treatment of CRS given the belief that inflammation is a major component of this condition (Fokkens 2007; Hamilos 2000; McNally 1997). The mechanism of action is a combination of anti-inflammatory effects (for example, reducing pro-inflammatory, and increasing anti-inflammatory, gene transcription and reducing airway inflammatory cell infiltration) and suppression of the production of pro-inflammatory mediators, cell chemotactic factors and adhesion molecules (Mullol 2009). Several factors could affect the relative levels of effectiveness or harm from using intranasal corticosteroids. It has been suggested that the type of steroid, dose and method of delivery (which affects the bioavailability) may contribute to the relative effectiveness of the treatment. In addition, it is unclear whether patient characteristics will affect levels of effectiveness (i.e. whether they have polyps and whether they are adults or children). Another uncertainty is whether the duration of treatment is important. If heterogeneity in

effects is indeed observed, we plan to explore these factors through subgroup analyses.

## Why it is important to do this review

Intranasal corticosteroids are the mainstay and currently recommended treatment for CRS. This review incorporates an update of two previous Cochrane reviews (Kalish 2012; Snidvongs 2011). Unlike the previous reviews, this review will focus on the effects of intranasal corticosteroids when compared to no treatment or placebo, to establish their effectiveness in the treatment of CRS. The relative effects of different types, doses and methods of delivery are investigated in a separate review (Chong 2015a).

This review is one of a suite of reviews looking at management options for patients with CRS (Chong 2015a; Chong 2015b; Chong 2015c; Chong 2015d; Chong 2015e). Unlike previous Cochrane reviews, and other published systematic reviews, these reviews will specifically focus on clinically relevant treatment regimes and outcomes. We will not include studies designed to evaluate interventions in the immediate peri-surgical period, which are focused on improving the surgical procedure or post-surgical results.

## OBJECTIVES

To assess the effects of intranasal corticosteroids in people with CRS.

## METHODS

### Criteria for considering studies for this review

#### Types of studies

We will include randomised controlled trials, including cluster-randomised trials and quasi-randomised trials.

We will only include cross-over trials if the data from the first phase are available.

We will exclude studies that randomised patients by side of nose (within-patient controlled). It is difficult to ensure that the effects of any of the interventions considered can be localised.

We will only include studies where patients were followed up for at least three months, to reflect the importance of focusing on long-term outcomes for a chronic condition.

We will exclude perioperative studies, where the sole purpose of the study was to investigate the effect of intranasal corticosteroids on surgical outcomes.

## Types of participants

Patients with CRS, whether with polyps (CRSwNP) or without polyps (CRSsNP).

We will exclude studies that have included a majority of patients with:

- cystic fibrosis;
- allergic fungal sinusitis/eosinophilic fungal/mucinous rhinosinusitis;
- aspirin-exacerbated respiratory disease;
- antrochoanal polyps (benign polyps originating from the mucosa of the maxillary sinus);
- malignant polyps;
- primary ciliary dyskinesia;
- a history of surgery for nasal polyps within six weeks of entry to the study.

## Types of interventions

All intranasal corticosteroids; this will include nasal sprays and nasal drops.

First-generation intranasal corticosteroids:

- Beclomethasone dipropionate
- Triamcinolone acetonide
- Flunisolide
- Budesonide

Second-generation intranasal corticosteroids:

- Ciclesonide
- Fluticasone furoate
- Fluticasone propionate
- Mometasone furoate
- Betamethasone sodium phosphate

If other interventions are used, these should be used in both treatment arms. Allowed co-interventions include:

- nasal saline irrigation;
- antibiotics;
- intermittent nasal decongestants.

The comparators will be placebo *or* no intervention.

The main comparison pair is:

- intranasal corticosteroids *versus* placebo or no intervention.

Other possible comparison pairs include:

- intranasal corticosteroids *plus* co-intervention A *versus* placebo *plus* co-intervention A.

This review is part of a larger series of six reviews for the treatment of CRS.

- Intranasal steroids versus placebo or no intervention for chronic rhinosinusitis (this review).
- Different types of intranasal steroids for chronic rhinosinusitis (Chong 2015a). This review will compare different classes, doses and delivery methods of intranasal corticosteroids for CRS.

- Short-course oral steroids alone for chronic rhinosinusitis (Chong 2015b). This review will compare short-course oral steroids alone with placebo or no intervention, or against other pharmacological interventions such as antibiotics or nasal saline irrigation.

- Short-course oral steroids as an adjunct therapy for chronic rhinosinusitis (Chong 2015c). This review will compare oral steroids where they have been used as add-on therapy to other treatments for CRS (such as intranasal corticosteroids, antibiotics or saline solution).

- Saline irrigation for chronic rhinosinusitis (Chong 2015d). This review will compare nasal saline irrigation for CRS with both placebo/no intervention and with intranasal corticosteroids or antibiotics.

- Systemic and topical antibiotics for chronic rhinosinusitis (Chong 2015e). This review will compare both topical and systemic antibiotics with placebo/no treatment, two different antibiotics with each other and antibiotics with intranasal corticosteroids.

## Types of outcome measures

We will analyse the following outcomes in the review, but we will not use them as a basis for including or excluding studies.

### Primary outcomes

- Health-related quality of life, using *disease-specific* health-related quality of life scores, such as the Sino-Nasal Outcome Test-22 (SNOT-22), Rhinosinusitis Outcome Measures-31 (RSOM-31) and SNOT-20.
- Disease severity, as measured by patient-reported symptom score (such as the Chronic Sinusitis Survey (CSS) questionnaire and visual analogue scales).
- Significant adverse effect: epistaxis.

### Secondary outcomes

- Health-related quality of life, using *generic* quality of life scores, such as the SF-36, EQ-5D and other well-validated instruments.
- Other adverse effects: local irritation (including oral thrush, sore throat).
- Other adverse effects:
  - in children - stunted growth (minimum time point: six months of treatment and follow-up);
  - in adults - osteoporosis.
- Endoscopic score (depending on population, either nasal polyps size score or endoscopy score, e.g. Lund Mackay).
- Computerised tomography (CT) scan score (e.g. Lund Kennedy).

Outcomes will be measured at three to six months, six to 12 months and more than 12 months. For adverse events, we will analyse data from the longest time periods.

## Search methods for identification of studies

The Cochrane ENT Trials Search Co-ordinator will conduct systematic searches for randomised controlled trials and controlled clinical trials. There will be no language, publication year or publication status restrictions. We may contact original authors for clarification and further data if trial reports are unclear and we will arrange translations of papers where necessary.

### Electronic searches

Published, unpublished and ongoing studies will be identified by searching the following databases from their inception:

- the Cochrane Register of Studies ENT Trials Register;
- the Cochrane Central Register of Controlled Trials (CENTRAL, current issue);
- Ovid MEDLINE (1946 to date);
- Ovid MEDLINE (In-Process & Other Non-Indexed Citations);
- PubMed (as a top up to searches in Ovid MEDLINE);
- Ovid EMBASE (1974 to date);
- ClinicalTrials.gov, [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (search via the Cochrane Register of Studies to date);
- ICTRP (search to date);
- Google Scholar (search to date).

The subject strategies for databases will be modelled on the search strategy designed for CENTRAL ([Appendix 1](#)). Where appropriate, these will be combined with subject strategy adaptations of the highly sensitive search strategy designed by Cochrane for identifying randomised controlled trials and controlled clinical trials (as described in the *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0, Box 6.4.b. ([Handbook 2011](#))).

### Searching other resources

We will scan the reference lists of identified publications for additional trials and contact trial authors if necessary. In addition, the Trials Search Co-ordinator will search PubMed, TRIPdatabase and *The Cochrane Library* to retrieve existing systematic reviews relevant to this systematic review, so that we can scan their reference lists for additional trials. We will search for conference abstracts using the Cochrane ENT Trials Register and EMBASE.

## Data collection and analysis

### Selection of studies

At least two review authors will independently screen all titles and abstracts of the studies obtained from the database searches to identify potentially relevant studies. At least two review authors will evaluate the full text of each potentially relevant study to determine if it meets the inclusion and exclusion criteria for this review.

We will resolve any differences by discussion and consensus, with the involvement of a third author for clinical and/methodological input where necessary.

### Data extraction and management

Two review authors will independently extract data from each study using a standardised data collection form (see [Appendix 2](#)). Whenever a study has more than one publication, we will retrieve all publications to ensure complete extraction of data. Where there are discrepancies in the data extracted by different review authors, we will check these against the original reports and resolve differences by discussion and consensus, with the involvement of a third author or a methodologist where appropriate. We will contact the original study authors for clarification or for missing data whenever possible. If differences are found between publications of a study, we will contact the original authors for clarification. We will use data from the main paper(s) if no further information is found.

We will include key characteristics of the studies, such as study design, setting, sample size, population and how outcomes were defined or collected in the studies. In addition, we will also collect baseline information on prognostic factors or effect modifiers. For this review, this includes:

- presence or absence of nasal polyps;
- baseline polyp score (where appropriate);
- whether the patient has had previous sinus surgery.

For the outcomes of interest to the review, we will extract the findings of the studies on an available case analysis basis; i.e. we will include data from all patients available at the time points based on the treatment randomised whenever possible, irrespective of compliance or whether patients had received the treatment as planned.

In addition to extracting pre-specified information about study characteristics and aspects of methodology relevant to risk of bias, we will extract the following summary statistics for each trial and each outcome:

- For continuous data: the mean values, standard deviations and number of patients for each treatment group. Where endpoint data are not available, we will extract the values for change from baseline. We will analyse data from measurement scales such as SNOT-22 and EQ-5D as continuous data.
- For binary data: the numbers of participants experiencing an event and the number of patients assessed at the time point.

- For ordinal scale data: if the data appear to be approximately normally distributed or if the analysis that the investigators performed suggests parametric tests were appropriate, then we will treat the outcome measures as continuous data. Alternatively, if data are available, we may convert into binary data.

We have prespecified the time points of interest for the outcomes in this review. While studies may report data at multiple time points, we will only extract the longest available data within the time points of interest. For example, for 'short' follow-up periods, our time point is defined as 'three to six months' post-randomisation. If a study has reported data at three, four and six months, we will only extract and analyse the data for the six-month follow-up.

### Assessment of risk of bias in included studies

Two review authors will independently assess the risk of bias of each included study. We will follow the guidance in the *Cochrane Handbook for Systematic Reviews of Interventions* (Handbook 2011) and we will use the Cochrane 'Risk of bias' tool. With this tool we will assess the risk of bias as 'low', 'high' or 'unclear' for each of the following six domains:

- sequence generation;
- allocation concealment;
- blinding of participants, personnel and outcome assessment;
- incomplete outcome data;
- selective reporting;
- other sources of bias.

### Measures of treatment effect

We will summarise the effects of dichotomous outcomes (e.g. proportion of patients with symptom resolution) as risk ratios (RR) with CIs. For the key outcomes that we will present in the 'Summary of findings' table, we will also express the results as absolute numbers based on the pooled results and compared to the assumed risk. We may also calculate the number needed to treat to benefit (NNTB) using the pooled results. The assumed baseline risk is typically either (a) the median of the risks of the control groups in the included studies, this being used to represent a 'medium risk population' or, alternatively, (b) the average risk of the control groups in the included studies is used as the 'study population' (Handbook 2011). If a large number of studies are available, and where appropriate, we may also present additional data based on the assumed baseline risk in (c) a low-risk population and (d) a high-risk population.

For continuous outcomes, we will express treatment effects as a mean difference (MD) with standard deviation (SD) or as standardised mean difference (SMD) if different scales have been used to measure the same outcome. We will provide a clinical interpretation of the SMD values.

### Unit of analysis issues

This review will not use data from phase II of cross-over studies or from studies where the patient is not the unit of randomisation, i.e. cluster-randomised trials, or studies where the side (right versus left) was randomised.

### Dealing with missing data

We will try to contact study authors via email whenever the outcome of interest is not reported, if the methods of the study suggest that the outcome had been measured. We will do the same if not all data required for meta-analysis have been reported, unless the missing data are standard deviations. If standard deviation data are not available, we will approximate these using the standard estimation methods from P values, standard errors or 95% CIs if these are reported as detailed in the *Cochrane Handbook for Systematic Reviews of Interventions* (Handbook 2011). If it is impossible to estimate these, we will contact the study authors.

Apart from imputations for missing standard deviations, we will conduct no other imputations. We will extract and analyse all data using the available case analysis method.

### Assessment of heterogeneity

We will assess clinical heterogeneity (which may be present even in the absence of statistical heterogeneity) by examining the included trials for potential differences between studies in the types of participants recruited, interventions or controls used and the outcomes measured.

We will assess statistical heterogeneity by visually inspecting the forest plots and by considering the Chi<sup>2</sup> test (with a significance level set at P value < 0.10) and the I<sup>2</sup> statistic, which calculates the percentage of variability that is due to heterogeneity rather than chance, with I<sup>2</sup> values over 50% suggesting substantial heterogeneity (Handbook 2011).

### Assessment of reporting biases

We will assess reporting bias as between-study publication bias and within-study outcome reporting bias.

### Outcome reporting bias (within-study reporting bias)

We will assess within-study reporting bias by comparing the outcomes reported in the published report against the study protocol, whenever this can be obtained. If the protocol is not available, we will compare the outcomes reported to those listed in the methods section. If results are mentioned but not reported adequately in a way that allows analysis (e.g. the report only mentions whether the results were statistically significant or not), bias in a meta-analysis is likely to occur. We will seek further information from the study authors. If no further information can be found, we will note this

as being a 'high' risk of bias. Quite often there will be insufficient information to judge the risk of bias; we will note this as an 'unclear' risk of bias ([Handbook 2011](#)).

### Publication bias (between-study reporting bias)

We will assess funnel plots if sufficient trials (more than 10) are available for an outcome. If we observe asymmetry of the funnel plot, we will conduct more formal investigation using the methods proposed by [Egger 1997](#).

### Data synthesis

We will conduct all meta-analyses using Review Manager 5.3 ([RevMan 2014](#)). For dichotomous data, we plan to analyse treatment differences as a risk ratio (RR) calculated using the Mantel-Haenszel methods. We will analyse time-to-event data using the generic inverse variance method.

For continuous outcomes, if all the data are from the same scale, we may pool mean values obtained at follow-up with change outcomes and report this as a MD. However, if the SMD has to be used as an effect measure, we will not pool change and endpoint data. When statistical heterogeneity is low, random-effects versus fixed-effect methods yield trivial differences in treatment effects. However, when statistical heterogeneity is high, the random-effects method provides a more conservative estimate of the difference.

### Subgroup analysis and investigation of heterogeneity

We will conduct some subgroup analyses regardless of whether statistical heterogeneity is observed, as these are widely suspected to be potential effect modifiers. For this review, this includes:

- phenotype of patients: whether patients have CRSsNP, CRSwNP, a mixed group or the status of polyps is not known or not reported. We will undertake the subgroup analysis as although there appears to be a considerable overlap between the two forms of CRS with regards to inflammatory profile, clinical presentation and effect of treatment ([Cho 2012](#); [DeMarcantonio 2011](#); [Ebbens 2010](#); [Fokkens 2007](#); [Ragab 2004](#); [Ragab 2010](#); [van Drunen 2009](#)), there is some evidence pointing to differences in the respective inflammatory profiles ([Kern 2008](#); [Keswani 2012](#); [Tan 2011](#); [Tomassen 2011](#); [Zhang 2008](#); [Zhang 2009](#)), and potentially even differences in treatment outcome ([Ebbens 2011](#)).

We will present the main analyses of this review according to the subgroups of phenotypes of CRS. We will present all other subgroup analysis results in tables.

When studies have a mixed group of patients, we will analyse the study as one of the subgroups (rather than as a mixed group) if more than 80% of patients belong to one category. For example, if 81% of patients have CRSsNP, we will analyse the study as that subgroup.

In addition to the subgroups above, we will conduct the following subgroup analyses in the presence of statistical heterogeneity:

- patient age (children versus adults);
- dose;
- duration of treatment;
- method of delivery.

### Sensitivity analysis

We will carry out sensitivity analyses to determine whether the findings are robust to the decisions made in the course of identifying, screening and analysing the trials. We plan to conduct sensitivity analysis for the following factors, whenever possible:

- impact of model chosen: fixed-effect versus random-effects model;
- risk of bias of included studies: excluding studies with high risk of bias (we define these as studies that have a high risk of allocation concealment bias and a high risk of attrition bias (overall loss to follow-up of 20%, differential follow-up observed);
- how outcomes were measured: we will investigate the impact of including data where the validity of the measurement is unclear.

If any of these investigations finds a difference in the size of the effect or heterogeneity, we will mention this in the 'Effects of interventions' section.

### GRADE and 'Summary of findings' table

We will use the GRADE approach to rate the overall quality of evidence for each outcome using the GDT tool (<http://www.guidelinedevelopment.org/>) for the *main comparison pairs* listed in the [Types of interventions](#) section. The quality of evidence reflects the extent to which we are confident that an estimate of effect is correct and we will apply this in the interpretation of results. There are four possible ratings: 'high', 'moderate', 'low' and 'very low'. A rating of 'high' quality evidence implies that we are confident in our estimate of effect and that further research is very unlikely to change our confidence in the estimate of effect. A rating of 'very low' quality implies that any estimate of effect obtained is very uncertain.

The GRADE approach rates evidence from RCTs that do not have serious limitations as high quality. However, several factors can lead to the downgrading of the evidence to moderate, low or very low. The degree of downgrading is determined by the seriousness of these factors:

- study limitations (risk of bias);
- inconsistency;
- indirectness of evidence;
- imprecision;
- publication bias.

The 'Summary of findings' table will present only the seven top priority outcomes (disease-specific health-related quality of life, disease severity score, adverse effects and generic quality of life score). We will not include the outcomes of endoscopic score and CT scan score in the 'Summary of findings' table.

## ACKNOWLEDGEMENTS

This project is one of a suite of reviews on the medical treatment of chronic rhinosinusitis, funded by the National Institute for Health

Research (award reference 14/174/03).

This project was also supported by the National Institute for Health Research, via Cochrane Infrastructure, Cochrane Programme Grant or Cochrane Incentive funding to Cochrane ENT. The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the Systematic Reviews Programme, NIHR, NHS or the Department of Health.

We are grateful to the external peer reviewer, Professor Wytke Fokkens, the consumer referee and Cochrane ENT editors for their insightful comments, which helped to strengthen this protocol.

## REFERENCES

### Additional references

#### Benninger 2003

Benninger MS, Ferguson BJ, Hadley JA, Hamilos DL, Jacobs M, Kennedy DW, et al. Adult chronic rhinosinusitis: definitions, diagnosis, epidemiology, and pathophysiology. *Otolaryngology - Head and Neck Surgery* 2003;**129**(Suppl 3): S1–32.

#### Cho 2012

Cho SH, Hong SJ, Han B, Lee SH, Suh L, Norton J, et al. Age-related differences in the pathogenesis of chronic rhinosinusitis. *Journal of Allergy and Clinical Immunology* 2012;**129**(3):858–60.e2.

#### Chong 2015a

Chong LY, Head K, Hopkins C, Philpott C, Burton MJ. Different types of intranasal steroids for chronic rhinosinusitis [Protocol]. Cochrane Database of Systematic Reviews in press.

#### Chong 2015b

Chong LY, Head K, Hopkins C, Philpott C, Burton MJ. Short-course oral steroids alone for chronic rhinosinusitis [Protocol]. Cochrane Database of Systematic Reviews in press.

#### Chong 2015c

Chong LY, Head K, Hopkins C, Philpott C, Burton MJ. Short-course oral steroids as an adjunct therapy for chronic rhinosinusitis. Cochrane Database of Systematic Reviews in press.

#### Chong 2015d

Chong LY, Head K, Hopkins C, Philpott C, Schilder AGM. Saline irrigation for chronic rhinosinusitis [Protocol]. Cochrane Database of Systematic Reviews in press.

#### Chong 2015e

Chong LY, Head K, Hopkins C, Philpott C, Burton MJ. Systemic and topical antibiotics for chronic rhinosinusitis [Protocol]. Cochrane Database of Systematic Reviews in press.

#### DeMarcantonio 2011

DeMarcantonio MA, Han JK. Nasal polyps: pathogenesis and treatment implications. *Otolaryngologic Clinics of North America* 2011;**44**(3):685–95, ix.

#### Ebbens 2010

Ebbens FA, Toppila-Salmi SK, Renkonen JA, Renkonen RL, Mullol J, van Drunen CM, et al. Endothelial L-selectin ligand expression in nasal polyps. *Allergy* 2010;**65**(1): 95–102.

#### Ebbens 2011

Ebbens FA, Toppila-Salmi S, de Groot EJ, Renkonen J, Renkonen R, van Drunen CM, et al. Predictors of post-operative response to treatment: a double blind placebo controlled study in chronic rhinosinusitis patients. *Rhinology* 2011;**49**(4):413–9.

#### Egger 1997

Egger M, Davey Smith G, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. *BMJ (Clinical research ed.)* 1997;**315**(7109):629–34. [PUBMED: 9310563]

#### Fokkens 2007

Fokkens W, Lund V, Mullol J. European position paper on rhinosinusitis and nasal polyps 2007. *Rhinology* 2007;**45** (Suppl 20):1–139.

#### Gliklich 1995

Gliklich RE, Metson R. The health impact of chronic sinusitis in patients seeking otolaryngologic care. *Otolaryngology - Head and Neck Surgery* 1995;**113**(1):104–9.

#### Grobler 2008

Grobler A, Weitzel EK, Buele A, Jardeleza C, Cheong YC, Field J, et al. Pre- and postoperative sinus penetration of nasal irrigation. *Laryngoscope* 2008;**118**(11):2078–81.

#### Hamilos 2000

Hamilos DL. Chronic sinusitis. *Journal of Allergy and Clinical Immunology* 2000;**106**:213–27.

#### Handbook 2011

Higgins JPT, Green S (editors). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0

- [updated March 2011]. The Cochrane Collaboration, 2011. Available from [www.cochrane-handbook.org](http://www.cochrane-handbook.org).
- Harvey 2009**  
Harvey RJ, Debnath N, Srubiski A, Bleier B, Schlosser RJ. Fluid residuals and drug exposure in nasal irrigation. *Otolaryngology - Head and Neck Surgery* 2009;**141**(6): 757–61.
- Hastan 2011**  
Hastan D, Fokkens WJ, Bachert C, Newson RB, Bislimovska J, Bockelbrink A, et al. Chronic rhinosinusitis in Europe - an underestimated disease. A GA<sup>2</sup>LEN study. *Allergy* 2011;**66**(9):1216–23.
- Kalish 2012**  
Kalish L, Snidvongs K, Sivasubramaniam R, Cope D, Harvey RJ. Topical steroids for nasal polyps. *Cochrane Database of Systematic Reviews* 2012, Issue 12. [DOI: 10.1002/14651858.CD006549.pub2]
- Kern 2008**  
Kern RC, Conley DB, Walsh W, Chandra R, Kato A, Tripathi-Peters A, et al. Perspectives on the etiology of chronic rhinosinusitis: an immune barrier hypothesis. *American Journal of Rhinology* 2008;**22**(6):549–59.
- Keswani 2012**  
Keswani A, Chustz RT, Suh L, Carter R, Peters AT, Tan BK, et al. Differential expression of interleukin-32 in chronic rhinosinusitis with and without nasal polyps. *Allergy* 2012;**67**(1):25–32.
- Larsen 2004**  
Larsen P, Tos M. Origin of nasal polyps: an endoscopic autopsy study. *Laryngoscope* 2004;**114**(4):710–9.
- McNally 1997**  
McNally PA, White MW, Kaliner MA. Sinusitis in an allergists' office: analysis of 2000 consecutive cases. *Allergy and Asthma Proceedings* 1997;**18**:169–75.
- Mullol 2009**  
Mullol J. Corticosteroid treatment in chronic rhinosinusitis: the possibilities and the limits. *Immunology and Allergy Clinics of North America* 2009;**29**(4):657–68.
- Ragab 2004**  
Ragab SM, Lund VJ, Scadding G. Evaluation of the medical and surgical treatment of chronic rhinosinusitis: a prospective, randomised, controlled trial. *Laryngoscope* 2004;**114**(5):923–30.
- Ragab 2010**  
Ragab SM, Lund VJ, Scadding G, Saleh HA, Khalifa MA. Impact of chronic rhinosinusitis therapy on quality of life: a prospective randomized controlled trial. *Rhinology* 2010;**48**(3):305–11.
- RevMan 2014 [Computer program]**  
The Nordic Cochrane Centre, The Cochrane Collaboration. Review Manager (RevMan). Version 5.3. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014.
- Snidvongs 2011**  
Snidvongs K, Kalish L, Sacks R, Craig JC, Harvey RJ. Topical steroid for chronic rhinosinusitis without polyps. *Cochrane Database of Systematic Reviews* 2011, Issue 8. [DOI: 10.1002/14651858.CD009274]
- Spector 1998**  
Spector SL, Bernstein IL, Li JT, Berger WE, Kaliner MA, Schuller DE, et al. Parameters for the diagnosis and management of sinusitis. *Journal of Allergy and Clinical Immunology* 1998;**102**(6 Pt 2):S107–44.
- Tan 2011**  
Tan BK, Li QZ, Suh L, Kato A, Conley DB, Chandra RK, et al. Evidence for intranasal antinuclear autoantibodies in patients with chronic rhinosinusitis with nasal polyps. *Journal of Allergy and Clinical Immunology* 2011;**128**(6): 1198–206.e1.
- Tomassen 2011**  
Tomassen P, Van Zele T, Zhang N, Perez- Novo C, Van Bruaene N, Gevaert P, et al. Pathophysiology of chronic rhinosinusitis. *Proceedings of the American Thoracic Society* 2011;**8**(1):115–20.
- van Drunen 2009**  
van Drunen CM, Reinartz SM, Wigman J, Fokkens W. Inflammation in chronic rhinosinusitis and nasal polyposis. *Immunology and Allergy Clinics of North America* 2009;**29**(4):621–9.
- Zhang 2008**  
Zhang N, Van Zele T, Perez-Novo C, Van Bruaene N, Holtappels G, DeRuyck N, et al. Different types of T-effector cells orchestrate mucosal inflammation in chronic sinus disease. *Journal of Allergy and Clinical Immunology* 2008;**122**(5):961–8.
- Zhang 2009**  
Zhang XH, Lu X, Long XB, You XJ, Gao QX, Cui YH, et al. Chronic rhinosinusitis with and without nasal polyps is associated with decreased expression of glucocorticoid-induced leucine zipper. *Clinical and Experimental Allergy* 2009;**39**(5):647–54.
- \* Indicates the major publication for the study

## APPENDICES

### Appendix I. CENTRAL search strategy

#1 MeSH descriptor: [Sinusitis] explode all trees  
#2 MeSH descriptor: [Rhinitis] this term only  
#3 MeSH descriptor: [Rhinitis, Atrophic] this term only  
#4 MeSH descriptor: [Rhinitis, Vasomotor] this term only  
#5 MeSH descriptor: [Paranasal Sinus Diseases] this term only  
#6 MeSH descriptor: [Paranasal Sinuses] explode all trees  
#7 rhinosinusitis or nasosinusitis or pansinusitis or ethmoiditis or sphenoiditis  
#8 kartagener\* near syndrome\*  
#9 inflamm\* near sinus\*  
#10 (maxilla\* or frontal\*) near sinus\*  
#11 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10  
#12 MeSH descriptor: [Chronic Disease] explode all trees  
#13 MeSH descriptor: [Recurrence] explode all trees  
#14 chronic or persis\* or recurrent\*  
#15 #12 or #13 or #14  
#16 #11 and #15  
#17 CRSsNP  
#18 (sinusitis or rhinitis) near (chronic or persis\* or recurrent\*)  
#19 #16 or #17 or #18  
#20 MeSH descriptor: [Nasal Polyps] explode all trees  
#21 MeSH descriptor: [Nose] explode all trees  
#22 MeSH descriptor: [Nose Diseases] explode all trees  
#23 #21 or #22  
#24 MeSH descriptor: [Polyps] explode all trees  
#25 #23 and #24  
#26 (nose or nasal or rhino\* or rhinitis or sinus\* or sinonasal) near (papilloma\* or polyp\*)  
#27 rhinopolyp\* or CRSwNP  
#28 #19 or #20 or #25 or #26 or #27  
#1 MeSH descriptor: [Sinusitis] explode all trees  
#2 MeSH descriptor: [Rhinitis] this term only  
#3 MeSH descriptor: [Rhinitis, Atrophic] this term only  
#4 MeSH descriptor: [Rhinitis, Vasomotor] this term only  
#5 MeSH descriptor: [Paranasal Sinus Diseases] this term only  
#6 MeSH descriptor: [Paranasal Sinuses] explode all trees  
#7 rhinosinusitis or nasosinusitis or pansinusitis or ethmoiditis or sphenoiditis  
#8 kartagener\* near syndrome\*  
#9 inflamm\* near sinus\*  
#10 (maxilla\* or frontal\*) near sinus\*  
#11 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10  
#12 MeSH descriptor: [Chronic Disease] explode all trees  
#13 MeSH descriptor: [Recurrence] explode all trees  
#14 chronic or persis\* or recurrent\*  
#15 #12 or #13 or #14  
#16 #11 and #15  
#17 CRSsNP  
#18 (sinusitis or rhinitis) near (chronic or persis\* or recurrent\*)  
#19 #16 or #17 or #18  
#20 MeSH descriptor: [Nasal Polyps] explode all trees

#21 MeSH descriptor: [Nose] explode all trees  
 #22 MeSH descriptor: [Nose Diseases] explode all trees  
 #23 #21 or #22  
 #24 MeSH descriptor: [Polyps] explode all trees  
 #25 #23 and #24  
 #26 (nose or nasal or rhino\* or rhinitis or sinus\* or sinonasal) near (papilloma\* or polyp\*)  
 #27 rhinopolyp\* or CRSwNP  
 #28 #19 or #20 or #25 or #26 or #27  
 #29 MeSH descriptor: [Steroids] explode all trees  
 #30 MeSH descriptor: [Adrenal Cortex Hormones] explode all trees  
 #31 MeSH descriptor: [Glucocorticoids] explode all trees  
 #32 MeSH descriptor: [Anti-Inflammatory Agents] explode all trees  
 #33 MeSH descriptor: [Anti-Inflammatory Agents, Non-Steroidal] explode all trees  
 #34 #32 not #33  
 #35 steroid\* or glucocorticoid\* or corticosteroid\* or glucosteroid\* or cyclocosteroid\*  
 #36 beclomethasone or beclometasone or beclamet or beclocort or becotide  
 #37 betamethasone or betadexamethasone or flubenisolone or celeston\* or cellestoderm or betnelan or oradexon  
 #38 dexamethasone or dexameth or dexone or dexametasone or decadron or dexasone or hexadecadron or hexadrol or methylfluor-prednisolone or millicorten  
 #39 flunisolide or fluticasone or hydrocortisone or cortisol or cortifair or cortril or hyrocortone or cortef or epicortisol or efcortisol or Cortisone  
 #40 methylprednisolone or medrol or metripred or urbason  
 #41 mometasone or prednisolone or precortisyl or deltacortril or deltastab or prednesol or deltasone or prednisone or cortan or liquid next pred or meticorten  
 #42 paramethasone or triamcinolone or aristocort or volon or atolone or kenacort or orasone or panasol or prednicen  
 #43 corticoid\* or betamethason\* or betamethasone or hydrocortison\* or celesto\* or dexamethason\* or hexadecadrol or budesonid\* or horacort or pulmicort or rhinocort or methylfluorprednisolone or flunisolid\* or nasalide or fluticason\* or flonase or flounce or mometason\* or nasonex or triamclinolon\* or nasacort or tri next nasal or aristocort or Ciclesonide  
 #44 #29 or #30 or #31 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43  
 #45 #28 and #44

## Appendix 2. Data extraction form

REF ID:	Study title:
Date of extraction:	Extracted by:
General comments/notes (internal for discussion):	

Flow chart of trial		
	Group A (Intervention)	Group B (Comparison)
No. of people screened		
No. of participants randomised - all		
No. randomised to each group		
No. receiving treatment as allocated		
No. not receiving treatment as allocated - Reason 1 - Reason 2		
No. dropped out (no follow-up data for any outcome available)		
No. excluded from analysis <sup>1</sup> (for all outcomes) - Reason 1 - Reason 2		
<sup>1</sup> This should be the people who received the treatment and were therefore not considered 'drop-outs' but were excluded from all analyses (e.g. because the data could not be interpreted or the outcome was not recorded for some reason)		

Information to go into 'Characteristics of included studies' table	
<b>Methods</b>	X arm, double/single/non-blinded, [multicentre] parallel-group/cross-over/cluster-RCT, with x duration of treatment and x duration of follow-up
<b>Participants</b>	<b>Location:</b> country, no of sites etc. <b>Setting of recruitment and treatment:</b> <b>Sample size:</b> <ul style="list-style-type: none"> <li>• <b>Number randomised:</b> x in intervention, y in comparison</li> <li>• <b>Number completed:</b> x in intervention, y in comparison</li> </ul> <b>Participant (baseline) characteristics:</b> <ul style="list-style-type: none"> <li>• Age:</li> <li>• Gender:</li> <li>• Main diagnosis: <i>[as stated in paper]</i></li> <li>• Polyps status: x % with polyps/no information <i>[add info on mean polyps score if available]</i></li> <li>• Previous sinus surgery status: <i>[x% with previous surgery]</i></li> </ul>

(Continued)

	<ul style="list-style-type: none"> <li>• Previous courses of steroids: <i>[add info on mean number of courses if available]</i></li> <li>• Other important effect modifiers, if applicable (e.g. aspirin sensitivity, comorbidities of asthma):</li> </ul> <p><b>Inclusion criteria:</b> <i>[state diagnostic criteria used for CRS, polyps score if available]</i></p> <p><b>Exclusion criteria:</b></p>
<b>Interventions</b>	<p><b>Intervention (n = x):</b> drug name, method of administration, dose per day/frequency of administration, duration of treatment</p> <p><b>Comparator group (n = y):</b></p> <p>Use of additional interventions (common to both treatment arms):</p>
<b>Outcomes</b>	<p><b>Outcomes of interest in the review:</b></p> <p>Primary outcomes:</p> <ul style="list-style-type: none"> <li>• Health-related quality of life, disease-specific</li> <li>• Disease severity symptom score</li> <li>• Significant adverse effects: <i>[review specific]</i></li> </ul> <p>Secondary outcomes:</p> <ul style="list-style-type: none"> <li>• Health-related quality of life, generic</li> <li>• <i>[Other review specific, pre-specified adverse events]</i></li> <li>• <i>[Other review specific, pre-specified adverse events]</i></li> <li>• Endoscopy (polyps size or overall score)</li> <li>• CT scan</li> </ul> <p>Other outcomes reported by the study:</p> <ul style="list-style-type: none"> <li>• <i>[List outcomes reported but not of interest to the review]</i></li> </ul>
<b>Funding sources</b>	'No information provided'/'None declared'/State source of funding
<b>Declarations of interest</b>	'No information provided'/'None declared'/State conflict
<b>Notes</b>	

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)		Quote: "..." Comment:
Allocation concealment (selection bias)		Quote: "..." Comment:
Blinding of participants and personnel (performance bias)		Quote: "..." Comment:

(Continued)

Blinding of outcome assessment (detection bias)		Quote: "..." Comment:
Incomplete outcome data (attrition bias)		Quote: "..." Comment:
Selective reporting (reporting bias)		Quote: "..." Comment:
Other bias (see section 8.15) Insensitive/non-validated instrument?		Quote: "..." Comment:
Other bias (see section 8.15)		Quote: "..." Comment:

#### Findings of study: continuous outcomes

#### Results (continuous data table)

Outcome	Group A			Group B			Other summary stats/Notes
	Mean	SD	N	Mean	SD	N	Mean difference (95% CI), P values etc.
Disease specific HRQL (instrument name/range) Time point:							
Generic HRQL (instrument name/range) Time point:							
Symptom score (overall) (instrument name/range) Time point:							
<b>Added total</b> - if scores reported separately for each symptom							

(Continued)

(range) Time point:							
Nasal blockage/ obstruction/ congestion (instrument name/range)							
Nasal discharge (instrument name/range)							
Facial pain/ pressure (instrument name/range)							
Smell (reduc- tion) (instrument name/range)							
Headache (instrument name/range)							
Cough (in children) (instrument name/range)							
Polyp size (instrument name/range)							
CT score (instrument name/range)							
Comments:							

Results (dichotomous data table)						
Outcome	Ap- plicable review/ intervention	Group A		Group B		Other summary stats/notes
		No. of people with events	No. of people analysed	No. of people with events	No. of people analysed	P values, RR (95% CI), OR (95% CI)
Epistaxis/nose bleed	INCS Saline irrigation					
Local irritation (sore throat, oral thrush, discom- fort)	INCS Saline irrigation					
Os- teoporosis (min- imum 6 months)	INCS					
Stunted growth (children, mini- mum 6 months)	INCS					<i>Can also be mea- sured as average height</i>
Mood disturbances	OCS					
Gastrointestinal disturbances (diarrhoea, nau- sea, vom- iting, stomach ir- ritation)	OCS Antibiotics					
Insomnia	OCS					
Os- teoporosis (min- imum 6 months)	INCS OCS					
Discomfort	Saline irrigation					
Skin irritation	Antibiotics					
Anaphylaxis or other serious allergic reactions such as Stevens-	Antibiotics					

(Continued)

Johnson						
Comments:						

## CONTRIBUTIONS OF AUTHORS

Lee Yee Chong: scoped, designed and wrote the protocol.

Karen Head: reviewed and edited the protocol.

Claire Hopkins: clinical guidance at all stages of project scoping and protocol development.

Carl Philpott: clinical guidance at all stages of project scoping and protocol development.

Martin J Burton: helped to draft the protocol; clinical guidance at all stages of project scoping and protocol development.

## DECLARATIONS OF INTEREST

Lee Yee Chong: none known.

Karen Head: none known.

Claire Hopkins: I have received financial support from several companies involved in producing instruments for sinus surgery: Acclarent, Sinusys, Cryolife and Medtronic.

Carl Philpott: I have previously received consultancy fees from the companies Acclarent, Navigant, Aerin Medical and Entellus.

Martin J Burton: Martin Burton is Co-ordinating Editor for the Cochrane ENT Group, but had no role in the editorial process for this protocol.

## SOURCES OF SUPPORT

### Internal sources

- No sources of support supplied

### External sources

- National Institute for Health Research, UK.

Funding to complete a suite of reviews on medical interventions for chronic rhinosinusitis in 2015/2016 (award reference 14/174/03), in addition to infrastructure funding for Cochrane ENT