Diagnosis and treatment of acute bacterial rhinosinusitis

Authors' objectives
To assess the performance of diagnostic tests and the effects of antibiotics and ancillary treatments in the management of community-acquired acute bacterial rhinosinusitis in children and adults.

Searching
MEDLINE was searched from 1966 to May 1998 for articles published in English; the search terms were reported. Excerpta Medica and Abstracts from the Interscience Conference on Antimicrobial Agents and Chemotherapy (American Society for Microbiology, 1993-1997) were also searched. In addition, the references from all identified studies and review articles were checked, and experts in the field were contacted. Further MEDLINE searches for relevant foreign language studies were also conducted.

Study selection
Study designs of evaluations included in the review
Diagnosis: prospective diagnostic accuracy studies were eligible for inclusion.

Treatment: randomised controlled trials (RCTs) were included.

Specific interventions included in the review
Diagnosis: studies comparing the performance of two or more tests were eligible for inclusion. The specific tests evaluated included sinus puncture, radiography, ultrasound and clinical examination (overall clinical impression, or use of a decision aid such as risk score).

Treatment: studies that compared amoxicillin or a folate inhibitor agent (e.g. trimethoprim or sulfamethoxazole) with either placebo or another active treatment, generally one with a broad spectrum of activity (including cephalosporins, penicillins with beta-lactamase inhibitors, tetracyclines, quinolones or macrolides), were included.

Reference standard test against which the new test was compared
No inclusion criteria were specified for the reference standard. The decision as to which test should be regarded as the reference standard in each comparative study was based upon a 'hierarchy' of test accuracy, with the most accurate being treated as the reference standard: the most accurate test was considered to be sinus puncture, followed by radiography, ultrasonography and then clinical criteria. It was unclear upon what the 'hierarchy' of accuracy was based.

Participants included in the review
Diagnosis: studies of either adults or children presenting with suspected acute bacterial rhinosinusitis were eligible for inclusion. Studies were excluded if diagnostic tests were evaluated on individuals not presenting with symptoms of acute bacterial rhinosinusitis.

Treatment: studies of adults or children with acute sinusitis or an acute exacerbation of chronic sinusitis ('acute-on-chronic'), with a duration of symptoms of 4 weeks or less, were eligible for inclusion. Studies of participants with subacute or chronic sinusitis (greater than 4 weeks mean symptom duration), immunocompromised patients, and trauma- or surgery-related sinus infections were excluded.

Outcomes assessed in the review
Diagnosis: studies that reported sufficient data for a 2x2 table of test performance to be constructed were included. Where data for more than one threshold or cut-off point were reported, data were extracted for each cut-off point separately. Studies were excluded if some participants did not undergo all the tests being compared.

Treatment: studies that reported the outcomes of 'cure', 'improvement' or 'failure' within 48 hours of the end of
treatment were included.

How were decisions on the relevance of primary studies made?
One reviewer assessed the relevance of studies for inclusion.

Assessment of study quality
Diagnosis: the studies were assessed according to specification of the reference standard and index tests, and blinding of the interpreters to additional clinical information and the other test results. Verification bias was avoided by excluding studies where some patients did not undergo all of the tests being compared.

Treatment: the studies were assessed according to the methods of randomisation, blinding, specification of criteria for the diagnosis of sinusitis, use of coninterventions (decongestants), the robustness of the assessment of clinical outcomes, and the reporting of withdrawals and losses to follow-up.

Two reviewers independently assessed study quality. Any disagreements were resolved through discussion with a third reviewer.

Data extraction
Two reviewers independently extracted the data. Any disagreements were resolved through discussion with a third reviewer.

Methods of synthesis
How were the studies combined?
Diagnosis: summary receiver operator characteristic curves, weighted by the inverse of the variance, were derived for each combination of the test of interest and the reference standard. Multiple data points from studies that provided data for more than one cut-off were included in these curves. In addition, random-effects weighted averages were used to calculate the average sensitivity and specificity for each comparison.

Treatment: the studies were combined in a meta-analysis using both fixed-effect (Mantel-Haenszel) and random-effects (DerSimonian and Laird) models. For the random-effects model, the studies were weighted by the inverse of the variance.

How were differences between studies investigated?
Heterogeneity was not assessed in the diagnostic studies.

For the treatment studies, heterogeneity was assessed using the chi-squared test (P<0.10). Further differences between the studies were assessed using sensitivity analyses.

Results of the review
Fourteen diagnostic accuracy studies (n=1,651) and 29 RCTs (n=4,708) were included in the meta-analyses.

A summary of the main results are reported in the following section. For a more detailed analysis of the results, readers are referred to the main report and the related publications (see Other Publications of Related Interest nos.1-2).

The overall methodological quality and reporting of both the diagnostic accuracy studies and RCTs was poor.

Diagnosis.
A meta-analysis of 6 studies indicated that sinus radiography had a moderate sensitivity and specificity, 73% (95% CI: 60, 83) and 80% (95% CI: 71, 87), respectively, when compared with the reference standard of sinus puncture for the diagnosis of acute bacterial rhinosinusitis. The results of studies comparing the accuracy of ultrasonography with puncture or sinus radiography were inconclusive in determining the accuracy of ultrasonography. There was some
evidence that a clinical diagnosis made on the presence of three or four symptoms (purulent rhinorrhea with unilateral predominance, local pain with unilateral predominance, bilateral purulent rhinorrhea, and the presence of pus in the nasal cavity) may have a similar diagnostic accuracy to that of sinus radiography.

Treatment.

Treatment with antibiotics was significantly more effective than treatment with placebo (risk ratio 0.54, 95% confidence interval: 0.37, 0.79). Treatment with amoxicillin or folate inhibitors was as effective as treatment with newer and more expensive antibiotics. There were no significant differences in the number of withdrawals due to side-effects in the trials of amoxicillin compared with the trials of other antibiotics.

Cost information
Yes. Initial symptomatic treatment was the most cost-effective strategy up to a prevalence of 25%, with the use of clinical criteria for diagnosis being the most cost-effective strategy for a prevalence of 25 to 83%. Use of antibiotic treatment with either amoxicillin or a folate inhibitor was only cost-effective above a prevalence of 83%. Sinus radiography as an initial management strategy for uncomplicated patients was not cost-effective at any prevalence.

Authors' conclusions
Where the prevalence of bacterial infection in patients presenting with uncomplicated symptoms of acute rhinosinusitis was low to moderate, such as in primary care, initial symptomatic treatment or the use of clinical criteria to guide treatment was the most cost-effective strategy. If antibiotics are indicated, amoxicillin or a folate inhibitor should be initially considered, as should the severity of the symptoms.

CRD commentary
The review questions were broad but reasonably defined in terms of the interventions, participants, outcomes and study designs. A limited number of sources were searched for potentially relevant studies, although both foreign language and unpublished studies were sought. This means that some potentially relevant studies might have been missed. Studies were selected by only one reviewer, and no efforts were made to minimise bias and errors in this process. The data extraction and quality assessment were undertaken using more rigorous methods to minimise bias in the review process. The quality of the included studies was adequately assessed and details of the included studies were tabulated, thus enabling the reader to assess whether the authors' results and conclusions are consistent with the evidence presented. The use of meta-analyses to combine the studies appeared appropriate, and differences between the studies were adequately addressed. Overall, the authors' conclusions are consistent with the evidence reviewed and are likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that where the prevalence of bacterial infection in patients presenting with uncomplicated symptoms of acute rhinosinusitis is low, initial symptomatic treatment or the use of clinical criteria to guide treatment is the most cost-effective strategy. They also stated that if antibiotics are indicated, amoxicillin or a folate inhibitor should initially be considered.

Research: The authors stated that future studies should use more rigorous diagnostic standards and clinical outcome measures. The optimal duration of treatment, the role of patient preferences in clinical decision-making, and the emergence of antibiotic resistance also need to be addressed.

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Bibliographic details

Original Paper URL
http://www.ahrq.gov/clinic/epcsums/sinussum.htm

Other publications of related interest

These additional published commentaries may also be of interest. Willett LR. Review: diagnostic tests for bacterial rhinosinusitis have moderate accuracy; antibiotics reduce clinical failures. Evid Based Med 2000;5:125. Diagnosing acute sinusitis. Bandolier 2001;8:5.

Indexing Status
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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.