Prevalence of Clinical Sinusitis in Young Children Followed Up by Primary Care Pediatricians

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Objective: To determine the proportion of young children seen in primary care pediatric practices who meet clinical criteria for the diagnosis of sinusitis, and variations in the management of these patients' conditions.

Design: Observational cohort study.

Setting: Pediatric practices in the Seattle, Wash, area participating in the Puget Sound Pediatric Research Network, a regional practice-based research organization.

Patients: Children, 1 to 5 years old, presenting for any reason to participating practices.

Methods: Parents of all 1307 eligible children completed a survey specifically detailing the presence of nasal congestion or discharge and daytime cough, the duration of these symptoms, and whether the symptoms were improving. For patients meeting clinical criteria for sinusitis (nasal congestion and daytime cough persisting for >9 days without improvement), the pediatrician recorded the presence/severity of other signs and symptoms, and the treatment prescribed. Severity of symptoms was reassessed using telephone interviews with parents at 48 to 72 hours, and again at 10 to 14 days, after the office visit. Study data were collected during 1-week to 3-week blocks at each office site during the winter months.

Results: Data were collected on 1307 children; 121 had persistent respiratory symptoms meeting criteria for a diagnosis of sinusitis (9.3%, 95% confidence interval, 7.7%-10.9%). Patients who presented with cold/cough symptoms were significantly more likely to meet criteria for sinusitis than those who came for any other reason (17.3% vs 4.2%, respectively, P<.001). A physician study form was completed on 87 children with persistent symptoms; antibiotics were prescribed for 68 (78%) of these patients. Antibiotic-treated patients were more likely to have symptoms lasting longer than 29 days (P=.004) and to have purulent nasal discharge (P=.03), and were judged to be sicker at enrollment (P=.001) than untreated children. A concurrent otitis media was diagnosed in 40 (46%) of 87 patients; if the proportion of children with otitis media is excluded, 5% of children 1 to 5 years old who are seen in primary care pediatrics might be expected to receive antibiotics exclusively for a diagnosis of sinusitis. At 24 to 48 hours and at 10 to 14 days after the clinic visit, a trend was noted toward more rapid improvement among those children who were treated with antibiotics.

Conclusion: When the criteria are strictly adhered to, only a small proportion of young children seen during the winter months in primary care pediatric practices will be diagnosed with sinusitis.

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Editor’s Note: Clinicians might be surprised with the relatively small proportion of children who meet the criteria for sinusitis. I think this is only one of several upper respiratory infections that are greatly overdiagnosed. How about otitis media?

Catherine D. DeAngelis, MD

The average child has between 6 and 8 colds annually, and it has been estimated that 5% to 10% of all upper respiratory tract infections are complicated by sinusitis. Sinusitis is therefore a significant and common problem in pediatric primary care practice.

Classically, acute maxillary sinusitis has been a well-defined entity with characteristic signs and symptoms of purulent nasal discharge, facial tenderness, headache, and fever. Evidence, however, shows that children with less-specific symptoms may also have bacterial sinusitis. Wald et al4-6 conducted a series of studies of children with upper respiratory tract symptoms presenting to either a university emergency department or an otolaryngology clinic. Symptom patterns were correlated with sinus aspirates and maxillary sinus radiographs, and the course of illness with and without antibiotic therapy was evaluated. In 75% of symptomatic young children with positive radiographs, sinus aspirates yielded pathogenic bacteria. Two clear symptom patterns emerged in these patients: “severe” symptoms of purulent nasal discharge, significant fever, facial pain, or headache; and “persistent” symptoms, defined as the presence of nasal congestion...
SUBJECTS AND METHODS

The study was conducted by the Puget Sound Pediatric Research Network. Puget Sound Pediatric Research Network is a regional, practice-based, research organization consisting of approximately 40 primary care pediatricians from 12 practices in the Seattle, Wash, area. For this study, data were collected at 6 office sites.

Study data were collected during 1- to 3-week blocks at each office site during the winter months (November 1, 1993–March 31, 1996). An attempt was made to collect information throughout the winter period; thus, data collection periods were staggered, and each practice collected data during at least 2 separate blocks of time. The timing and duration of each data collection period were determined by the availability of office staff to distribute and collect study forms.

During each data collection period, parents of all children 1 to 5 years old, seen by one of the participating pediatricians for any reason, were asked to complete a questionnaire regarding respiratory symptoms in their child (Figure). Specifically, parents were asked whether their child had nasal congestion or drainage; the length of time the symptom had been present; and whether cough, if present, was occurring during the day or night. They were also asked if the symptoms were improving. Demographic information, including the reason for the visit to the physician and the age of the child, was also collected.

Parental questionnaires were reviewed by participating pediatricians during the physician visit. Parents of children with nasal congestion and daytime cough of longer than 9 days’ duration without improvement (ie, meeting criteria for a diagnosis of clinical sinusitis) were asked to participate in the evaluation and follow-up phase of the study. After written, informed consent was obtained, the physician completed a study form listing the symptoms elicited (history of fever, current temperature, character of nasal discharge, periorbital edema, history of irritability, abdominal pain, and headache), history of allergic rhinitis and/or asthma, and summary of the physical examination findings (presence of wheezing or rales, facial tenderness and/or swelling, condition of the nasal mucosa, and the presence of acute or serous otitis media). The pediatrician also rated the overall severity of illness using a 7-point Likert-like scale (1=least sick, 7=most sick). The physician recorded his or her management of the child’s respiratory symptoms including the name of any antibiotic prescribed, duration of antibiotic therapy, and the names of any other medications prescribed or recommended. Children who had received antibiotics in the previous 3 days, had a history of cystic fibrosis or immunodeficiency, or who required hospitalization were excluded from the follow-up phase of the study, as were those whose parents were non–English-speaking or without a home telephone.

The parental questionnaire and the physician study form of all children participating in the evaluation and follow-up phase of the project were collected and faxed daily to Puget Sound Pediatric Research Network staff. Using established protocols and scripts, study staff attempted to contact the parents of each of these study children at 48 to 72 hours and at 10 to 14 days following the physician visit. During each follow-up call, the parents were asked if their child’s respiratory symptoms (nasal congestion, cough) were better, worse, or unchanged since the visit, if there had been any further contact with the child’s pediatrician, and if the child was taking any prescribed medications.

Completeness of data collection was assessed by comparing the number of parental questionnaires collected at each office to the total number of children aged 1 to 5 years seen at these offices during the data collection periods. The total number of these children was determined using computerized billing records or by counting billing forms. This estimate was performed in 5 of the 6 participating practices.

Prior to beginning the project, we estimated that approximately three fourths of children meeting criteria for sinusitis would receive antibiotics, and that 75% of treated patients would have improvement of symptoms at the time of the first follow-up visit (48-72 hours after the physician visit). Given these estimates, 200 children with persistent respiratory symptoms would have to be enrolled to have an 80% power to detect a difference of 25 percentage points in improvement in symptoms at the first follow-up contact between antibiotic-treated and untreated patients. We expected that more than 20% of enrolled children would have persistent respiratory symptoms; thus, we hoped to collect data on at least 1000 patients.

For the analysis, $\chi^2$ or Fisher exact tests were used for categorical data, while differences in continuous variables were evaluated with t tests. Mann-Whitney U tests were used for nonparametric data. Differences were considered significant at $P<.05$. The study was approved by the Institutional Review Board of Children’s Hospital and Medical Center, Seattle.

or drainage of any character and daytime cough for longer than 9 days without improvement. Among children 2 to 6 years old who had either severe or persistent respiratory symptoms, sinus aspirates were positive in 70% to 75%. History alone predicted an abnormal sinus radiograph in 88% of all children younger than 6 years with persistent symptoms. These children were more likely to improve rapidly and to achieve a cure when treated with antibiotics compared to placebo. It was concluded that children with persistent respiratory symptoms constituted a small subgroup of all children with upper respiratory tract infections and that they should be treated with antibiotics for bacterial sinusitis.

Based on these data collected on selected children seen in tertiary medical centers, it has been suggested that the symptoms of nasal discharge and daytime cough of longer than 9 days’ duration without improvement are de facto evidence of acute maxillary sinusitis in pediatric patients younger than 6 years. Further, the use of antibiotics in children with these symptoms has been advocated. This recommended approach may represent a dilemma to practicing pediatricians. Clinical experience suggests that a large proportion of young children seen during winter months have persistent respiratory symptoms. Tertiary care center emergency departments and otolaryngology clinics may serve a more seriously or chronically ill patient population or one that seeks care at a later stage of disease. Treatment of all such patients in a private pediatric office, therefore, might be unnecessary. In some cases, it could also result in complica-
A total of 1307 patients were enrolled in the project. Review of billing records in participating practices indicated that 82.5% of eligible children were enrolled in the study. Of the 1307 patients enrolled, 252 (19%) presented for a health supervision visit, 502 (38%) had a chief complaint of cold/cough symptoms, 294 (22%) came to the office for other reasons, and 294 (22%) had a scheduled follow-up visit, and 294 (22%) came to the office for other reasons. The mean age of children in the study was 34 months.

There were 121 patients who had persistent respiratory symptoms consistent with a diagnosis of sinusitis. Thus, among this unselected population of children aged 1 to 5 years, seen in private pediatricians’ offices during the winter months, 121 of 1307 (9.3%, 95% confidence interval [CI], 7.7%-10.9%) met criteria for sinusitis. Children who presented because of cold/cough symptoms were significantly more likely to meet criteria for sinusitis than those who came for all other reasons (17.3% vs 4.2%, P < .001). Among the subgroup of patients who presented to the pediatrician because of cold/cough symptoms, the mean age of those who met the criteria was similar to that of children who did not (34.7 ± 15.7 months and 34.6 ± 17.4 months, respectively). There was no difference in the rate of persistent symptoms in children aged 1 to 2 years and those aged 2 to 5 years (8.9% and 9.8%, respectively, P = .59). The proportion of patients meeting criteria in each of the 6 participating practices ranged from 5.1% to 14.5%; no significant differences were noted in the practice-specific prevalence of sinusitis when either all eligible children or the subgroup presenting with cold/cough symptoms were considered (P = .21 and .43, respectively).

Among the 121 children with symptoms consistent with sinusitis, 18 patients who had received antibiotic therapy during the preceding 72 hours. These 18 children were excluded from the follow-up phase of the study, as was the child of 1 mother who was a non–English speaker. The physician study form was completed on 87 (85%) of the remaining 102 eligible children; of these, 68 (78%) received antibiotics. There was little variation by practice in the proportion of children receiving antibiotics (P = .75). Although amoxicillin was most frequently prescribed (n = 31, 46%), a wide variety of antibiotics was used, including trimethoprim-sulfamethoxazole (n = 19, 28%), amoxicillin-clavulanate potassium (n = 4, 6%), clarithromycin (n = 4, 6%), cefaclor (n = 1, 1%), erythromycin-sulfisoxazole (n = 2, 3%), and several others (n = 7, 10%).

Signs and symptoms at the time of diagnosis in patients who received antibiotics were compared with findings in those untreated (Table 1). Children who re-

### Table 1. Comparison of Signs and Symptoms in Children Treated and Untreated With Antibiotics

<table>
<thead>
<tr>
<th>Factor</th>
<th>No. (%) of Children*</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe nasal discharge</td>
<td>26/65 (40)</td>
<td>4/18 (22)</td>
</tr>
<tr>
<td>Purulent nasal discharge</td>
<td>49/66 (74)</td>
<td>8/19 (42)</td>
</tr>
<tr>
<td>Duration of symptoms &gt;29 d</td>
<td>21/68 (31)</td>
<td>0/19 (0)</td>
</tr>
<tr>
<td>No history of fever</td>
<td>41/68 (60)</td>
<td>11/17 (65)</td>
</tr>
<tr>
<td>Headache</td>
<td>7/65 (11)</td>
<td>2/16 (11)</td>
</tr>
<tr>
<td>History of allergic rhinitis</td>
<td>3/68 (4)</td>
<td>1/19 (5)</td>
</tr>
<tr>
<td>History of asthma</td>
<td>7/68 (10)</td>
<td>0/19 (0)</td>
</tr>
<tr>
<td>Signs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheezing</td>
<td>11/68 (16)</td>
<td>1/19 (5)</td>
</tr>
<tr>
<td>Facial swelling</td>
<td>8/68 (12)</td>
<td>0/19 (0)</td>
</tr>
<tr>
<td>Facial tenderness</td>
<td>2/68 (3)</td>
<td>0/19 (0)</td>
</tr>
<tr>
<td>Red nasal mucosa</td>
<td>26/68 (38)</td>
<td>6/19 (32)</td>
</tr>
<tr>
<td>Rales</td>
<td>8/68 (12)</td>
<td>2/19 (11)</td>
</tr>
<tr>
<td>Means±SD severity of illness score†</td>
<td>2.4±0.8</td>
<td>1.7±0.7</td>
</tr>
</tbody>
</table>

* Numerator indicates number of children; denominator, total in subgroup.
† Values are expressed on a 7-point Likert-like scale. The size of the subsample is 63 for children who received antibiotics and 19 for those who were untreated.

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**RESULTS**

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ceived antibiotics were significantly more likely to have a history of purulent nasal discharge and to have symptoms lasting at least 1 month. Physical findings, except for red nasal mucosa, were uncommon; the frequency of specific abnormalities were similar in those who were treated and those untreated with antibiotics. However, on a seven-point Likert-like scale rating the overall severity of illness (1=least sick, 7=most sick), the mean score for children treated with antibiotics was 2.4±0.8 vs. 1.7±0.7 for those who were untreated (P=.001, Mann-Whitney U test).

Of the 87 children who met criteria for sinusitis and on whom a physician form was completed, 40 (46%) were diagnosed with a concurrent otitis media. Similarly, among those patients with a chief complaint of cold/cough symptoms who met criteria for sinusitis, 46% were diagnosed with otitis media. Thus, in our population, if children receiving antibiotics for otitis media are excluded and every patient who met criteria for sinusitis had been treated, 5.0% (95% CI, 3.8%-6.2%) of all children aged 1 to 5 years seen in the office during the winter months would have received antibiotics exclusively for a diagnosis of sinusitis, and 9.4% (95% CI, 6.8%-12.0%) of those who presented with cold/cough symptoms would be prescribed antibiotics specifically for sinusitis.

Attempts were made at telephone follow-up for the 87 children who met criteria for sinusitis and for whom a physician form was completed; parents of 67 patients (77%) were contacted at 48 to 72 hours, and of 61 patients (87%) at 10 to 14 days after the study visits. Outcome at 48 to 72 hours and at 10 to 14 days are summarized in Table 2. A trend toward more rapid resolution of symptoms was noted in children who were treated with antibiotics. However, because the proportion of children who met criteria for clinical sinusitis was less than anticipated, the power to detect clinically significant differences between treated and untreated children was limited. Further, by 10 to 14 days after the study visit, parents of most children reported improvement in symptoms, regardless of treatment status.

### Table 2. Follow-up Status of Patients Meeting Criteria for Clinical Sinusitis*

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Follow-up at 48-72 h</th>
<th>Follow-up at 10-14 d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. (%) of Children</td>
<td>No. (%) of Children</td>
</tr>
<tr>
<td></td>
<td>Treated</td>
<td>Untreated</td>
</tr>
<tr>
<td>Decreased nasal congestion/drainage</td>
<td>36/51 (71)</td>
<td>6/13 (46)</td>
</tr>
<tr>
<td>Decreased cough</td>
<td>38/53 (72)</td>
<td>6/14 (43)</td>
</tr>
<tr>
<td>Decreased nasal congestion/drainage and cough</td>
<td>29/51 (57)</td>
<td>4/13 (31)</td>
</tr>
</tbody>
</table>

* Numerator indicates number of children; denominator, total in subgroup.

The preschool child with a cough and runny nose may seem to be a ubiquitous feature of primary care pediatrics during the winter months. Data from this study, however, indicate that when the duration and character of these symptoms are specifically elicited, only a small proportion of children aged 1 to 5 years meet established clinical criteria for a diagnosis of sinusitis. We found that 17.3% of preschool children seen in pediatric primary care practices because of cold/cough symptoms met the criteria for sinusitis. This figure is similar to the estimates of Wald et al., who reported that 13.4% to 21.5% of upper respiratory tract infections in children 1 to 3 years old persisted for longer than 10 days, while 6.5% to 13.1% lasted for longer than 15 days. Only 4.2% of children who presented to the physician for reasons other than cold/cough symptoms had prolonged respiratory symptoms. Overall, patients in this study meeting clinical criteria for sinusitis were not significantly ill; for most children pediatricians rated the severity of illness less than 3 on a 7-point scale, whether or not they treated the child with antibiotics.

We were somewhat surprised with the lack of variation in both the prevalence and management of persistent respiratory symptoms in this population. Though we had anticipated that differing triage procedures would lead to markedly different numbers of patients meeting the criteria, the proportions did not vary significantly among the participating practices, and there was little variation among the pediatricians in the proportion of patients meeting clinical sinusitis criteria who were treated with antibiotics. Finally, a large proportion of young children with persistent respiratory symptoms received antibiotics for other infections; almost half of the patients meeting symptom criteria in the study were diagnosed with otitis media.

Wald et al. reported that children 2 to 16 years old with persistent respiratory symptoms treated with amoxicillin or a combination of amoxicillin-clavulanate were significantly more likely to be cured, or their symptoms improved, than similar patients who received placebo. Three days after beginning antibiotic therapy, 83% of their patients were improved or cured vs 51% of those receiving placebo (P=.002). In our study, although there was a trend toward more rapid resolution of symptoms, we were unable to demonstrate that antibiotic-treated children had clearly superior outcomes when compared with those not receiving antibiotics.

Our study has some clear limitations. We were disappointed to have been unable to conclude definitively that antibiotic therapy improves outcome in this population. This was due to several factors. In our study, the proportion of children with persistent respiratory symptoms was approximately half of what had been anticipated. Despite enrollment of more than 1300 patients, only 102 children were eligible for follow-up instead of...
the project number of 200, thus limiting our ability to detect any differences in outcome. In addition to a smaller-than-anticipated sample size, there were differences between antibiotic-treated and untreated patients, which might have biased the results. Treated children were more likely to have purulent nasal discharge, and were judged to be sicker at enrollment than those who did not receive antibiotics. Further, among antibiotic-treated patients, 31% had symptoms lasting for 30 or more days vs none who were untreated and had symptoms for that duration ($P=.004$). In a randomized controlled trial of children with symptoms persisting for longer than 21 days, investigators found no significant difference in resolution of symptoms when those who received antibiotics were compared with placebo recipients.7 Wald et al5,6 specifically excluded patients with symptoms lasting longer than 29 days.

Despite these limitations, our study does shed light on the rate of occurrence and current management of persistent respiratory symptoms in young children seen in the primary care setting. At the outset of this study we had postulated that the persistent respiratory symptoms criteria for the diagnosis of bacterial sinusitis were too nonspecific to be clinically useful in primary care pediatric practices. Our finding that fewer than 10% of children aged 1 to 5 years seen in the office during the winter months fulfilled these criteria was surprising. Further, our findings suggest that the results of studies conducted by Wald et al,4-6 in a tertiary care setting, are generalizable to a general primary care practice. Rather than contributing to rampant overuse of antibiotics, the results of our study suggest that, when the criteria of nasal congestion and daytime cough for longer than 9 days without improvement are strictly adhered to and the proportion of children with otitis media is subtracted, antibiotic therapy exclusively for sinusitis will be indicated for only about 5% of preschool children seen during the winter months. Primary care providers should ask carefully about the character and duration of symptoms, as well as whether the symptoms are improving, before making decisions about antibiotic therapy in children who present with persistent respiratory symptoms. When strict symptom criteria suggested in previous studies by Wald et al4-6 are used, clinical sinusitis is not commonly seen in the pediatric primary care setting.

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REFERENCES


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