Accuracy of Self-reported Diagnosis of Chronic Rhinosinusitis

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Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

Abstract

Large cohort studies of chronic rhinosinusitis (CRS) prevalence often include patients who have been inappropriately diagnosed with the disease. In this investigation, new patients presenting to a tertiary rhinology practice completed a screening questionnaire that included questions about self-reported CRS status, demographic information, and symptomatology. Treating rhinologists evaluated patients according to clinical practice guideline criteria for CRS; 91 patients were ultimately diagnosed with CRS. The sensitivity of self-report for CRS was 84%; the specificity was 82%; and the estimated negative predictive value ranged from 97% to 99%. Prior sinus surgery or oral steroid use correlated with CRS self-report, and a concurrent self-report of nasal polyps or nasal steroid use improved the positive predictive value of CRS self-report. Self-report of CRS status may represent an effective and relatively inexpensive screening mechanism for CRS in large cohort studies, particularly when combined with other associated diagnostic features that improve performance parameters of self-report.

Keywords

chronic rhinosinusitis, self-report, chronic rhinosinusitis diagnosis, chronic rhinosinusitis diagnostic criteria

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The prevalence of chronic rhinosinusitis (CRS) is difficult to accurately estimate with large cohort studies. At present, many investigations rely on ICD codes (International Classification of Diseases) in patient charts, which are not always based on accurate diagnostic criteria. CRS is not diagnostically ambiguous; patients must have ≥2 of the following symptoms for >12 weeks: anterior or posterior rhinorrhea, nasal congestion, hyposmia, and facial pressure/pain.¹ Additionally, endoscopic evidence of purulent mucus, edema, or polyps or radiographic evidence of sinusitis is necessary to confirm the diagnosis. The necessity of objective evidence for a diagnosis makes population-based studies of CRS challenging.

Novis et al determined that the majority of patients diagnosed with CRS by nonotolaryngologists do not actually have the condition,² and they preached caution in studying CRS via administrative methods. National questionnaires and database reviews place the prevalence of sinusitis around 12% in the United States,³⁴ 4.5% in Canada,⁵ and 10.9% in Europe.⁶ Akkina et al showed a nearly 10-fold lower prevalence of accurately diagnosed CRS at an academic institution than what would be estimated for the region,⁷ suggesting that there may be substantial inaccuracies when unvalidated CRS diagnoses are used to determine prevalence. Other studies relied on self-report of CRS for patient classification, but these commonly did not distinguish between acute and chronic sinusitis. This is a critical distinction that is omitted in several large cohort studies, including the National Health Interview Survey.³ However, self-report of previously diagnosed CRS offers an alternative to ICD-coded CRS diagnoses and can potentially provide a complementary source of epidemiologic data. In the present study, we evaluate the potential value of a self-report questionnaire that can improve diagnostic assessment.

Methods

A prospective cohort study was performed with University of Pennsylvania Institutional Review Board approval, recruiting new patients presenting to the University of Pennsylvania rhinology practice, regardless of presenting...
Table 1. Demographic and Clinical Data for Patients with and without CRS.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Diagnosis</th>
<th>No Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>91</td>
<td>106</td>
</tr>
<tr>
<td>Age, y⁰</td>
<td>48.1 ± 15.2</td>
<td>47.9 ± 21.2</td>
</tr>
<tr>
<td>Male sex</td>
<td>47 (52)</td>
<td>64 (60)</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>82 (90)</td>
<td>94 (89)</td>
</tr>
<tr>
<td>African American</td>
<td>5 (5)</td>
<td>7 (7)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (4)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2 (2)</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Self-report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-report of CRS</td>
<td>76 (84)</td>
<td>19 (18)</td>
</tr>
<tr>
<td>Self-report of polyps</td>
<td>54 (59)</td>
<td>8 (8)</td>
</tr>
<tr>
<td>Prior sinus surgery</td>
<td>57 (63)</td>
<td>16 (15)</td>
</tr>
<tr>
<td>Oral steroid use</td>
<td>36 (40)</td>
<td>13 (12)</td>
</tr>
<tr>
<td>Oral antibiotic use</td>
<td>46 (51)</td>
<td>29 (27)</td>
</tr>
<tr>
<td>Prior diagnosis of CRS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary care doctor</td>
<td>4 (4)</td>
<td>6 (6)</td>
</tr>
<tr>
<td>Otolaryngologist</td>
<td>68 (75)</td>
<td>17 (16)</td>
</tr>
<tr>
<td>Allergist</td>
<td>9 (10)</td>
<td>4 (4)</td>
</tr>
</tbody>
</table>

Abbreviation: CRS, chronic rhinosinusitis.
⁰Mean ± SD.

Results

A total of 197 patients were evaluated, with 91 being diagnosed with CRS. Questionnaire results are shown in Table 1, stratified by disease status. Eighty-four percent of patients with confirmed CRS corroborated this on a priori self-report, while only 18% of patients without CRS indicated that they had the disease. Thus, the sensitivity of self-report for CRS was 84% (95% CI, 74.3%-90.1%), while the specificity was 82% (95% CI, 73.4%-88.8%). Positive predictive value (PPV) and negative predictive value (NPV) are performance parameters that depend on disease prevalence in the cohort being studied, which was artificially high in a group of patients presenting to a rhinology practice. Based on an estimated prevalence of 12% in the general population, a PPV of 38.9% and an NPV of 97.3% should be expected. In our cohort of patients, with a 46% prevalence of CRS, the PPV was 80.0% and the NPV was 85.3%.

Logistic regression demonstrated factors that correlate with CRS self-report, which include a history of sinus surgery (odds ratio, 16.8; \( P < .001 \)) and oral steroid use (odds ratio, 3.2; \( P < .05 \)) but not oral antibiotic use. Of particular interest are additional factors that, when combined with CRS self-report, increase the predictive value of the assertion. All performance parameters were assessed with the general estimate of 12% for CRS prevalence in the general population. PPV rises from 38.9% to 75.8% when a concurrent self-report of nasal polyps is added or to 72.6% with concurrent report of nasal steroid use. NPV remains >97% in both these cases. Specificity of CRS self-report improves from 82% to 90% with the addition of prior FESS as a cofactor, while sensitivity remains unchanged. These additional pieces of information offer other promising potential factors for a self-report screening questionnaire.

Conclusions

Self-report of prior diagnosis is a relatively inexpensive screening mechanism and can help cleanse data in community health care settings, where CRS may be overdiagnosed by nonexpert physicians. Hsu et al demonstrated that most cases of CRS are never substantiated with endoscopy or imaging, suggesting that these diagnoses may be inherently unreliable. Furthermore, analysis of other large-scale prevalence studies based on administrative coding revealed a large association between upper respiratory illness and subsequent CRS diagnosis, perhaps highlighting diagnostic inaccuracies. For a condition as common and costly as CRS, additional tools for large-scale diagnostic appraisal are helpful. An important limitation of this study is that a tertiary care practice could predispose to patients who have previously been accurately diagnosed; sensitivity and specificity could be significantly decreased in a community practice setting. Thus, performance parameters identified in this study cannot be immediately generalized to the overall population or directly extrapolated based on hypothesized prevalence. However, this study provides evidence for a high NPV of CRS self-report in this tertiary referral population, accompanied by high sensitivity and specificity and a relatively high PPV if other self-report factors are included. These suggest that self-report of prior diagnosis may be a useful method of ruling out cases of CRS and that patients could be identified for medical record review to confirm or refute status based on diagnostic criteria or other associated variables.

Author Contributions

Alan D. Workman, wrote manuscript, performed data collection, analyzed data, final approval; Arjun K. Parasher, performed data collection, ran statistics, critically revised work, final approval; Mariel T. Blasetti, performed data collection, analyzed data, critically revised work, final approval; James N. Palmer, contribution to conception of work, performed data collection, analyzed data, revised work, final approval; Nithin D. Adappa, contribution
to conception of work, performed data collection, analyzed
data, assisted with manuscript writing, final approval;
**Jordan T. Glicksman**, substantial contribution to conception of
work, wrote manuscript, performed data collection, revised work
critically, final approval.

**Disclosures**

**Competing interests:** James N. Palmer, Acclarent, OptiNose—
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consultant.

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**Supplemental Material**

Additional supporting information is available in the online version
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premorbid diagnoses of patients with chronic rhinosinusitis.