

Asia-Pacific survey of physicians' perceptions and managements of chronic rhinosinusitis

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Abstract

Background: The diagnosis and management of patients with chronic rhinosinusitis (CRS) may vary between otolaryngologists and allergists. Moreover, the adherence of different practitioners to European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS)2020 guideline recommendations has not been previously ascertained in Asia-Pacific regions.

Objective: Different specialists' perceptions and managements of CRS in Asia-Pacific regions were assessed in an attempt to gauge these practices against EPOS2020 guidelines.

Methods: A transregional, cross-sectional survey was conducted to assess otolaryngologists' and allergists' perceptions and managements of CRS with regard to diagnosis, management and adherence to EPOS2020 guidelines.

Results: Sixteen physicians in Asia-Pacific regions responded to the questionnaire. A total of 71.4% of otolaryngologists preferred to diagnose CRS with a combination of positive nasal symptoms and nasal endoscopy plus sinus CT, whereas 22.2% of allergists took such criterion to diagnose CRS. Compared to allergists, otolaryngologists more often considered the endotype classification (85.8% versus 55.5%). For the preferred first-line treatment, in addition to intranasal corticosteroids recommended by all respondents, 66.7% of allergists preferred antihistamines, whereas 71.4% of otolaryngologists preferred nasal saline irrigation. Regarding the proper timing of surgery, 71.4% of otolaryngologists reported 8-12 weeks of treatment after the initiation of medication, while more than half of the allergists recommended 4-6 weeks of medical treatment.

Conclusion: This survey shows that variable perceptions and practices for CRS may exist between physicians with different specialties and highlights the need for increased communication and awareness between otolaryngologists and allergists to improve the diagnosis and treatment of CRS.

Key words: Chronic rhinosinusitis, otolaryngologists, allergists, diagnosis, treatment

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Introduction

Chronic rhinosinusitis (CRS) is a prevalent chronic inflammatory condition of the nose and paranasal sinuses that significantly affects 5-12% of the general population and leads to a significant burden on society in terms of healthcare consumption and productivity loss.¹ Historically, CRS has been divided into two groups based on the presence or absence of polyps.² It has been clear for at least 20 years that this assessment is simplistic at best.³ The emerging view is that CRS is a heterogeneous disease characterized by a defective immune barrier and massive inflammatory cell infiltration.⁴

The European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS) provides an update on the published literature and studies undertaken in the eight years since the EPOS2012 position paper was published and addresses areas not extensively covered in EPOS2012.⁵ Compared to EPOS2012, an important difference is that we decided to move away from differentiating between the management of chronic rhinosinusitis without nasal polyps (CRSsNP) and chronic rhinosinusitis with nasal polyps (CRSwNP).³ In the past decade, the evolving understanding of the endotyping of CRS and its importance for CRS management resulted in the decision to describe the management of CRS based on endotyping and phenotyping.^{3,6-8}

Diagnosis and treatment approaches may vary among countries and physicians.^{2,9} However, to date, otolaryngologists' and allergists' views and experiences with managing CRS patients have yet to be investigated in depth in Asia-Pacific regions. Therefore, the Asia-Pacific Association of Allergy, Asthma and Clinical Immunology (APAAACI) conducted this online survey to assess the perceptions and self-reported practices of otolaryngologists and allergists on the diagnosis and management of CRS in an attempt to gauge these against EPOS2020.

Methods

Study design and participants

A transregional, cross-sectional and online survey of the APAAACI members was performed between March 27th and June 17th, 2020.¹⁰ This survey aimed to evaluate the perceptions of and management practices related to CRS among otolaryngologists and allergists in Asia-Pacific regions. The survey contained 29 questions and was mainly divided into four categories: demographics, assessment tools for nasal diseases, phenotyping and endotyping considerations for the diagnosis of CRS and treatment protocols.

Statistics

SPSS statistical software (version 19; IBM Corp, Armonk, NY, USA) was used for all statistical analyses. Continuous variables are directly expressed as the medians and ranges. Categorical variables are presented as frequencies (%).

Results

Physician demographics

In total, 16 physicians across Asia-Pacific regions responded to the questionnaire. Participants comprised 7 (43.8%) otolaryngologists (India-2, Indonesia-1, Thailand-1, China-1, Japan-1 and Korea-1) and 9 (56.3%) allergists (Indonesia-1, Mongolia-2, Thailand-1, Australia-1, Taiwan China-1, Hong Kong China-1, Malaysia-1 and Philippines-1). **Table 1** shows the characteristics of the participating physicians. The majority of the physicians had more than 10 years of experience [15 (93.8%)].

Assessment tools used for nasal diseases

With regard to the medical instruments or equipment commonly used for nasal diseases in the clinic, otolaryngologists interviewed reported routinely evaluating nasal diseases with nasal endoscopy (100%), followed by paranasal sinus CT (71.4%) and anterior rhinoscopy (57.1%), whereas anterior rhinoscopy (77.8%), paranasal sinus CT (55.6%) and X-ray of paranasal sinuses (55.6%) were most commonly used for assessing nasal diseases by allergists (**Figure 1A**).

When analyzed according to available laboratory tests for patients with nasal diseases, all physicians reported that skin prick tests (SPTs) or serum-specific IgE tests were the most common laboratory tests for nasal diseases. Compared to allergists, otolaryngologists tended to take more specialized laboratory tests (nasal cytology, rhinomanometry and nasal challenges) for evaluating and assessing nasal diseases (**Figure 1B**).

Diagnosis of CRS

Seventy-five percent of the respondents believed that the diagnosis criteria would be positive nasal symptoms combined with any objective measures (nasal endoscopy and/or sinus CT), and 25% believed it should be positive symptoms only. When analyzed for further analysis, 33.2% of allergists took a CRS diagnosis criterion with positive symptoms only, whereas only 14.3% of otolaryngologists took such a CRS diagnosis criterion (**Figure 2A**). A total of 71.4% of otolaryngologists preferred to use a diagnosis criterion with a combination of positive nasal symptoms and nasal endoscopy plus sinus CT.

Table 1. Demographic data of the responding physicians

Variables	Total respondents (N = 16)	Otolaryngologists (N = 7)	Allergists (N = 9)
Age, median (range), years	53 (39-62)	52 (39-61)	53 (40-62)
Female sex No. (%)	6 (37.5)	2 (28.6)	4 (44.4)
Time on specialist register No. (%)			
5-10 years	1 (6.3)	NA	1 (11.1)
10-20 years	5 (31.3)	3 (42.9)	2 (22.2)
20-30 years	5 (31.3)	2 (28.6)	3 (33.3)
> 30 years	5 (31.3)	2 (28.6)	3 (33.3)
Patients seen in clinical practice			
Proportion of CRS patients over total outpatients per year No. (%)			
< 5%	5 (31.3)	NA	5 (55.6)
5%-10%	2 (12.5)	1 (14.3)	1 (11.1)
10%-20%	3 (18.8)	2 (28.6)	1 (11.1)
20%-30%	5 (31.3)	4 (57.1)	1 (11.1)
> 30%	1 (6.3)	NA	1 (11.1)

Abbreviations: CRS, Chronic rhinosinusitis; ENT, Ear, nose, throat; ESS, Endoscopic sinus surgery; NA, not applicable. Data are median (Range) or n/N (%), where N is the total number of patients with available data.

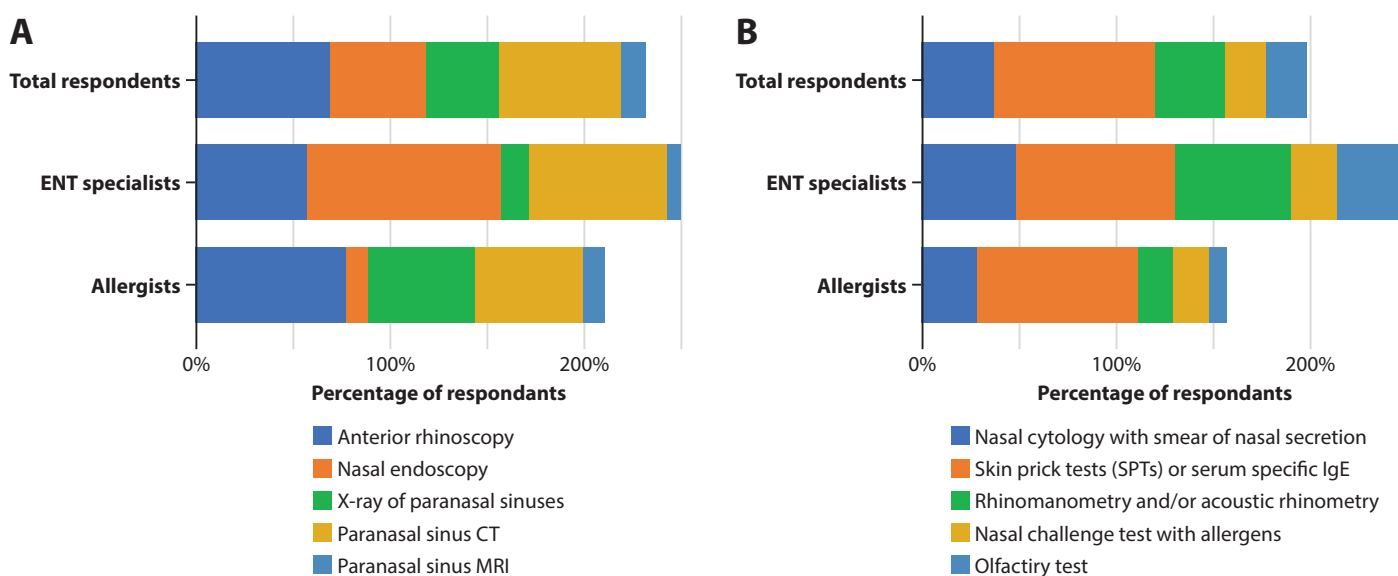


Figure 1. Assessment tools used to inspect or evaluate patients with nasal diseases in the clinic. (A) Medical instruments or equipment usually used to inspect or evaluate patients with nasal diseases in the clinic. (B) Laboratory tests available for the patients with nasal diseases in the clinic. The bars represent the proportion of assessment tools used for patients with nasal diseases in the clinic giving the respective response (%).

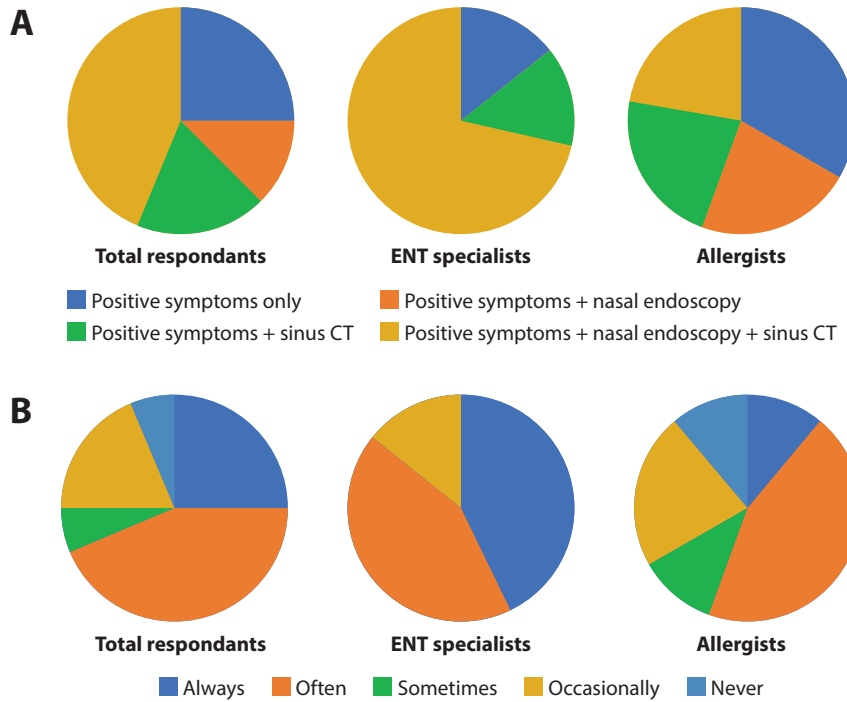


Figure 2. Phenotyping and endotyping consideration on the diagnosis of CRS. (A) Common criteria depended on to diagnose CRS. (B) Endotype consideration for further classification of CRS. The pie charts represent the proportion of criteria depended on to diagnose CRS or probability to further classify CRS patients into type 2 and non-type 2 endotypes giving the respective response (%).

However, only 22.2% of allergists took a CRS diagnosis criterion with a combination of positive nasal symptoms and nasal endoscopy plus sinus CT.

When considering the subtype classification of CRS, most respondents reported that they would further classify CRS into the type 2 (higher IgE, IL-5 and eosinophilia) and non-type 2 endotypes (lower IgE, IL-5 and neutrophilia).⁵ Compared to allergists, otolaryngologists more often considered endotype classification (85.8% versus 55.5%) (**Figure 2B**).

Management practices for patients with CRS

The majority of physicians (93.4%) thought that first-line medical treatment for CRS required additional and different combination protocols (**Figure 3**). All physicians preferred to use intranasal corticosteroids as the first-line treatment, irrespective of monotherapy or combination therapy. In addition, allergists preferred antihistamines and leukotriene receptor antagonists as the first-line treatment (66.7% and 55.6%, respectively), whereas 71.4% of otolaryngologists preferred nasal saline irrigation (**Figure 3**).

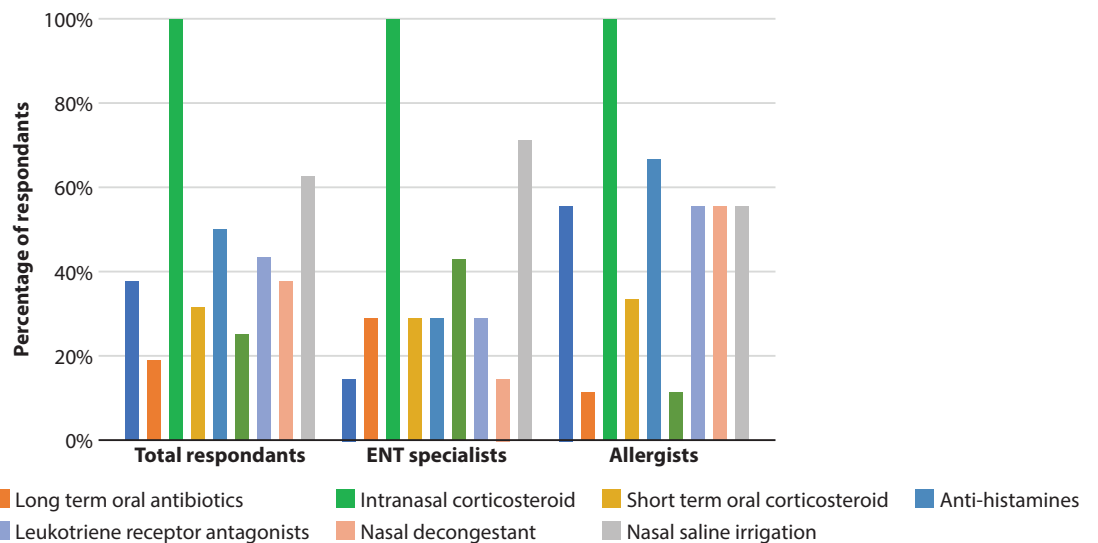


Figure 3. The preferred first-line medication to treat CRS. The bars represent the proportion of recommended medications giving the respective response (%).

According to our survey, medical treatment protocols for adult patients with CRS are shown in **Table 2**. Phenotype and endotype considerations were mentioned in OCS and long-term oral macrolide treatment in this survey. Regarding OCS treatment in CRSwNP, 62.5% of respondents reported considering the difference between type 2 and non-type 2 endotype classification. With respect to long-term oral macrolides, almost all otolaryngologists recommended this for CRSsNP, especially for non-type 2 CRSsNP patients. However, 22.2% of allergists recommended long-term oral macrolide treatment for all CRS patients, and 11.1% of allergists

recommended long-term oral macrolide treatment for non-type 2 CRSwNP patients.

Regarding the factors which may influence the use of monoclonal antibodies for CRSwNP patients, 85.7% otolaryngologists and 55.6% allergists reported that asthma comorbidity was the main consideration followed by ineffective corticosteroid therapy (71.4% of otolaryngologists and 55.6% of allergists) (**Figure 4**). When asked about which monoclonal antibody was usually prescribed for type 2 CRSwNP patients, both otolaryngologists and allergists were more likely to choose anti-IgE monoclonal antibody and either anti-IL-5 or anti-IL- 4/IL-13 antibodies. (**Table 2**).

Table 2. Management practices for patients with CRS

Variables	Total respondents (N = 16)	Otolaryngologists (N = 7)	Allergists (N = 9)
Delivery methods for intranasal GC No. (%)			
Nasal spray	13 (81.3)	5 (71.4)	8 (88.9)
Nasal spray + any other methods	3 (18.8)	2 (28.6)	1 (11.1)
Endotype consideration of CRSwNP for OCS No. (%)			
Endotypes considered	10 (62.5)	5 (71.4)	5 (55.6)
Endotypes not considered	6 (37.5)	2 (28.6)	4 (44.4)
Nasal saline irrigation for CRS patients No. (%)			
Always	9 (56.3)	5 (71.4)	4 (44.4)
Often	3 (18.8)	1 (14.3)	2 (22.2)
Sometimes	2 (12.5)	1 (14.3)	1 (11.1)
Occasionally	2 (12.5)	NA	2 (22.2)
Never	NA	NA	NA
Long-term oral macrolides No. (%)			
For all CRSsNP patients	2 (12.5)	1 (14.3)	1 (11.1)
For non-type 2 CRSsNP patients	9 (56.3)	5 (71.4)	4 (44.4)
For non-type 2 CRSwNP	1 (6.3)	NA	1 (11.1)
For CRS patients	2 (12.5)	NA	2 (22.2)
Never	2 (12.5)	1 (14.3)	1 (11.1)
Muco-active agents for CRS patients No. (%)			
Always	1 (6.3)	1 (14.3)	NA
Often	3 (18.8)	2 (28.6)	1 (11.1)
Sometimes	5 (31.3)	2 (28.6)	3 (33.3)
Occasionally	5 (31.3)	NA	5 (55.6)
Never	2 (12.5)	2 (28.6)	NA
Oral or nasal antihistamines for CRS patients combined with AR No. (%)			
Always	5 (31.3)	2 (28.6)	3 (33.3)
Often	8 (50)	3 (42.9)	5 (55.6)
Sometimes	2 (12.5)	2 (28.6)	NA
Occasionally	1 (6.3)	NA	1 (11.1)
Never	NA	NA	NA

Table 2. (Continued)

Variables	Total respondents (N = 16)	Otolaryngologists (N = 7)	Allergists (N = 9)
Monoclonal antibody prescribed for type 2 CRSwNP patients No. (%)			
Anti-IgE monoclonal antibody	5 (31.3)	2 (28.6)	3 (33.3)
Anti-IL-5 monoclonal antibody	1 (6.3)	1 (14.3)	0
Anti-IL-4/IL-13 monoclonal antibody	2 (12.5)	1 (14.3)	1 (11.1)
All are possible	5 (31.3)	2 (28.6)	3 (33.3)
Never recommend	3 (18.8)	1 (14.3)	2 (22.2)
Timing for surgery No. (%)			
4 weeks after the initiation of medication	3 (18.8)	1 (14.3)	2 (22.2)
6 weeks after the initiation of medication	4 (25)	1 (14.3)	3 (33.3)
8 weeks after the initiation of medication	4 (25)	3 (42.9)	1 (11.1)
12 weeks after the initiation of medication	5 (31.3)	2 (28.6)	3 (33.3)
Peri-operative GC treatment for CRS No. (%)			
Preoperative OCS for CRSwNP			
Always	2 (12.5)	2 (28.6)	NA
Often	4 (25)	1 (14.3)	3 (33.3)
Sometimes	5 (31.3)	2 (28.6)	3 (33.3)
Occasionally	2 (12.5)	2 (28.6)	NA
Never	3 (18.8)	NA	3 (33.3)
Postoperative OCS for CRSwNP			
Always	2 (12.5)	1 (14.3)	1 (11.1)
Often	1 (6.3)	NA	1 (11.1)
Sometimes	NA	NA	NA
Occasionally	8 (50)	6 (85.7)	2 (22.2)
Never	5 (31.3)	NA	5 (55.6)
Postoperative topical GC duration for CRSsNP			
< 3 months	6 (37.5)	3 (42.9)	3 (33.3)
3-6 months	6 (37.5)	2 (28.6)	4 (44.4)
6-12 months	2 (12.5)	1 (14.3)	1 (11.1)
12-24 months	1 (6.3)	NA	1 (11.1)
> 24 months	1 (6.3)	1 (14.3)	NA
Postoperative topical GC duration for CRSwNP			
< 3 months	2 (12.5)	NA	2 (22.2)
3-6 months	6 (37.5)	2 (28.6)	4 (44.4)
6-12 months	3 (18.8)	1 (14.3)	2 (22.2)
12-24 months	3 (18.8)	2 (28.6)	1 (11.1)
> 24 months	2 (12.5)	2 (28.6)	NA

Table 2. (Continued)

Variables	Total respondents (N = 16)	Otolaryngologists (N = 7)	Allergists (N = 9)
Peri-operative GC treatment for CRS No. (%) (Continued)			
Preferred subtypes of CRS for GC-eluting implants during operation			
Primary CRSsNP patients	NA	NA	NA
Recurrent CRSsNP patients	3 (18.8)	1 (14.3)	2 (22.2)
Primary CRSwNP patients	1 (6.3)	NA	1 (11.1)
Recurrent CRSwNP patients	6 (37.5)	4 (57.1)	2 (22.2)
Never	6 (37.5)	2 (28.6)	4 (44.4)
ESS consideration for pediatric patients with CRS when failure improvement after regular medical treatment			
Always	NA	NA	NA
Often	3	NA	3 (33.3)
Sometimes	4	2 (28.6)	2 (22.2)
Occasionally	6	4 (57.1)	2 (22.2)
Never	3	1 (14.3)	2 (22.2)

Abbreviations: CRS, Chronic rhinosinusitis; GC: Glucocorticoid; CRSwNP, Chronic rhinosinusitis with nasal polyps; CRSsNP, Chronic rhinosinusitis without nasal polyps; OCS, Oral corticosteroids; AR, Allergic rhinitis; NA, not applicable; ESS, Endoscopic Sinus Surgery; IgE, Immunoglobulin E; IL-5, Interleukin-5; IL-4, Interleukin-4; IL-13, Interleukin-13. Data are median (Range) or n/N (%), where N is the total number of patients with available data.

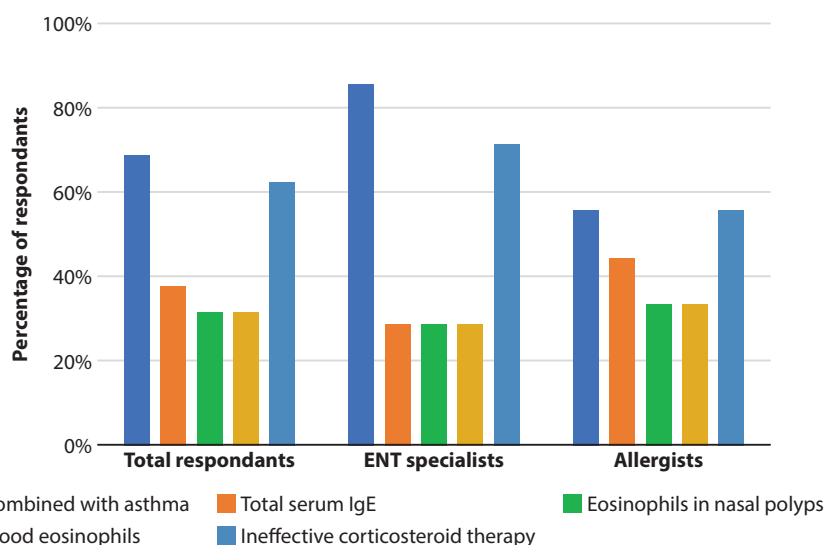


Figure 4. Affecting factors considered for patients with CRSwNP in the choice of monoclonal biological antibodies. The bars represent the proportion of affecting factors considered for CRSwNP patients in the choice of monoclonal biological antibodies giving the respective response (%).

The responses to the assessment of surgical management are summarized in **Table 3**. When asked about the optimum length of treatment for surgery, 71.4% of otolaryngologists reported 8-12 weeks of treatment after the initiation of medication; in contrast, more than half of allergists recommended 4-6 weeks of medical treatment.

For perioperative OCS treatment for CRS, pre- and post-operative OCS were not often recommended by physicians in our survey. Preferred subtypes of CRS for GC-eluting implants during surgery were more likely to be recommended in recurrent CRS patients (71.4% otolaryngologists and 44.4% allergists), especially recurrent CRSwNP patients.

Discussion

This online survey specific for the members of APAACI provides insights into the perception and practice of physicians managing patients with CRS in the Asia-Pacific region. Based on self-reported perceptions, there were not only some areas where their beliefs and clinical practices were not completely consistent with EPOS2020 guideline recommendations but also some perception and management variations between physicians with different specialties and among physicians with the same specialty.

The first guidelines that recommended CT sinus imaging and/or nasal endoscopy for confirmation of the symptom-only-based diagnosis of chronic rhinosinusitis were noted the EPOS2005.¹¹⁻¹² Nasal endoscopy is an essential part of the rhinological examination for nasal diseases, as it improves diagnostic accuracy up to 69.1%-85% compared to anterior rhinoscopy alone.^{5,13-16} Currently, paranasal CT scans also remain the gold standard in the radiologic evaluation of rhinologic disease, notably CRS.^{5,17-19} Although it was unclear from the responses of the EPOS2020 steering group whether it is essential to perform CT of the sinuses at initial presentation to the specialist in a patient with symptoms highly suggestive of CRS irrespective of whether the mucosa is abnormal or normal at endoscopy.⁵ In our study, all otolaryngologists preferred nasal endoscopy, while 77.8% of allergists preferred anterior rhinoscopy over requesting for a CT scan. In addition, otolaryngologists tended to take more specialized laboratory tests (such as nasal cytology with smear of nasal secretion, rhinomanometry and/or acoustic rhinometry, nasal challenge test with allergens and olfactory test) for evaluating and assessing nasal diseases. This is to be expected, as these otolaryngologists are trained and highly skilled in performing such procedures.

According to EPOS2020 guideline recommendations, the clinical definition of CRS in adults is defined as positive symptoms and either endoscopic positive signs and/or CT changes.³ In our study, 75% of the respondents adhered to the clinical diagnosis of EPOS2020 guidelines, but 25% of the respondents believed it should be based on positive symptoms only. When further analyzed, 33.2% of allergists took a CRS diagnostic criterion with positive symptoms only, whereas only 14.3% of otolaryngologists applied such a CRS diagnostic criterion. While this symptom-only diagnostic criteria was recommended for using in a large-scale epidemiological survey conducted by the EPOS,⁵ we should be aware of the overestimation of the CRS prevalence due to overlapping symptoms between rhinosinusitis and rhinitis alone.

In addition, the EPOS2020 steering group chose to look at CRS in terms of primary and secondary and to divide each into localized and diffuse disease based on anatomic involvement. CRS is also characterized by endotype dominance, either type 2 or non-type 2 in EPOS2020 guidelines.^{5,20,21} In total, 6.3% of respondents never considered the endotype classification of CRS. For further analysis, compared to allergists, otolaryngologists would consider type 2 and non type 2 endotype classification more often, maybe because relative fewer otolaryngologists were interviewed than allergists.

This brings a subsequent need for improving awareness of the guideline-recommended clinical diagnosis for CRS and further endotyping consideration, and gradually incorporating the evidence-based recommendations into real-life clinical practice.

Regarding the medical and perioperative treatment of CRS, there seemed to be different physicians providing different treatment modalities. Allergists are likely to prescribe more anti-allergic drugs than otolaryngologists. When combined with allergic rhinitis, oral or nasal antihistamines were used more often by allergists than otolaryngologists. Otolaryngologists prefer to prescribe nasal saline irrigation more often than allergists. With regard to the timing of surgery, otolaryngologists reported a relatively longer time of medical treatment after the initiation of medication than allergists. Despite insufficient evidence regarding the efficacy or optimal duration of using such medications in the treatment of patients with CRS, standardization of medical treatment regimens across geographic regions and physician specialties may potentially help reduce unnecessary and potentially harmful variations in the CRS care.

This study had some limitations that are noteworthy when interpreting the results. First, it was limited by its small sample size and inhomogeneous representation of the region. The small number of respondents reflected the poor appreciation of the importance of such research to map practices in this region and compare them with the global scene. Second, the study was a web-based survey, so physicians working in remote areas with no internet access were left out. Thus, the results may not be the true representation of this region. The lack of direct interviews and probing may also lead to few unreliable data. Additionally, a detailed test-retest, face validity, and content validity were not calculated for the final questionnaire.

Conclusion

In summary, this survey shows that variable perceptions and practices of CRS may exist between physicians with different specialties. It also sheds light on the current landscape of specialist's practice on applying endotype classification in diagnosis and treatment of CRS in Asia-Pacific regions. Increased awareness and communication between otolaryngologists and allergists are needed to improve the diagnosis and treatment of CRS.

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Conflict of Interest

The authors have no conflicts of interest to declare.

Contributions

- Conception and design: Ming Zheng, Xiangdong Wang, Ruby Pawankar, Luo Zhang;
- Administrative support: Luo Zhang, Ruby Pawankar, Xiangdong Wang;
- Provision of study materials: Shan Shao, Ming Zheng, Xiangdong Wang, Amir HA Latiff, Dong Young Kim, Jiu Yao Wang, Marysia Recto, Michaela Lucas, Munkhbayarlakh Sonomjamts, Narantsetseg Logi, Niken Lestari, Nina Irawati, Pongsakorn Tantilipikorn, Samir Bhargava, Soumya MS, Takeshi Shimizu, Ting Fan Leung, Wasu Kamchaisatian, Ruby Pawankar, Luo Zhang;
- Collection and assembly of data: Ruby Pawankar, Luo Zhang;
- Data analysis and interpretation: Shan Shao, Ming Zheng, Xiangdong Wang;
- Manuscript writing: Shan Shao, Ming Zheng, Xiangdong Wang, Ruby Pawankar, Luo Zhang;
- Final approval of manuscript: all authors.

References

- Vennik J, Eyles C, Thomas M, Hopkins C, Little P, Blackshaw H, et al. Management strategies for chronic rhinosinusitis: a qualitative study of GP and ENT specialist views of current practice in the UK. *BMJ open*. 2018;8(12):e022643.
- Passali D, Cingi C, Cambi J, Passali F, Muluk NB, Bellussi ML. A survey on chronic rhinosinusitis: opinions from experts of 50 countries. *Eur Arch Otorhinolaryngol*. 2016;273(8):2097-109.
- Fokkens WJ, Lund VJ, Hopkins C, Hellings PW, Kern R, Reitsma S, et al. Executive summary of EPOS 2020 including integrated care pathways. *Rhinology*. 2020;58(2):82-111.
- Wang X, Zhang N, Bo M, Holtappels G, Zheng M, Lou H, et al. Diversity of T(H) cytokine profiles in patients with chronic rhinosinusitis: A multicenter study in Europe, Asia, and Oceania. *J Allergy Clin Immunol*. 2016;138(5):1344-53.
- Fokkens WJ, Lund VJ, Hopkins C, Hellings PW, Kern R, Reitsma S, et al. European Position Paper on Rhinosinusitis and Nasal Polyps 2020. *Rhinology*. 2020;58(Suppl S29):1-464.
- Stevens WW, Peters AT, Tan BK, Klingler AI, Poposki JA, Hulse KE, et al. Associations Between Inflammatory Endotypes and Clinical Presentations in Chronic Rhinosinusitis. *J ALLER CL IMM-PRACT*. 2019;7(8):2812-20.e3.
- Wei B, Liu F, Zhang J, Liu Y, Du J, Liu S, et al. Multivariate analysis of inflammatory endotypes in recurrent nasal polyposis in a Chinese population. *Rhinology*. 2018;56(3):216-26.
- Tomassen P, Vandeplas G, Van Zele T, Cardell LO, Arebro J, Olze H, et al. Inflammatory endotypes of chronic rhinosinusitis based on cluster analysis of biomarkers. *J Allergy Clin Immunol*. 2016;137(5):1449-56.e4.
- Lee LN, Bhattacharyya N. Regional and specialty variations in the treatment of chronic rhinosinusitis. *Laryngoscope*. 2011;121(5):1092-7.
- Cronin RM, Hankins JS, Adams-Graves P, Thompson AA, Kalinyak K, Byrd J, et al. Barriers and facilitators to research participation among adults, and parents of children with sickle cell disease: A trans-regional survey. *Am J Hematol*. 2016;91(10):E461-2.
- Mullol J. Trends on rhinosinusitis diagnosis and treatment. *Otolaryngologia polska*. 2009;63(7):3-4.
- Fokkens W LV, Bachert C, et al. European position paper on rhinosinusitis and nasal polyps. *Rhinology Supplement*. 2005;18:1-87.
- Lange B, Thilsing T, Baelum J, Holst R, Kjeldsen A. Diagnosing chronic rhinosinusitis: comparing questionnaire-based and clinical-based diagnosis. *Rhinology*. 2013;51(2):128-36.
- Bhattacharyya N, Lee LN. Evaluating the diagnosis of chronic rhinosinusitis based on clinical guidelines and endoscopy. *Otolaryngol Head Neck Surg*. 2010;143(1):147-51.
- Sedaghat AR. Chronic Rhinosinusitis. *Am Fam Physician*. 2017;96(8):500-6.
- Psaltis AJ, Li G, Vaezaefshar R, Cho KS, Hwang PH. Modification of the Lund-Kennedy endoscopic scoring system improves its reliability and correlation with patient-reported outcome measures. *Laryngoscope*. 2014;124(10):2216-23.
- Younis RT, Anand VK, Davidson B. The role of computed tomography and magnetic resonance imaging in patients with sinusitis with complications. *Laryngoscope*. 2002;112(2):224-9.
- Bhattacharyya N. A comparison of symptom scores and radiographic staging systems in chronic rhinosinusitis. *Am J Rhinol*. 2005;19(2):175-9.
- Lund VJ, Kennedy DW. Staging for rhinosinusitis. *Otolaryngol Head Neck Surg*. 1997;117(3 Pt 2):S35-40.
- Grayson JW, Hopkins C, Mori E, Senior B, Harvey RJ. Contemporary Classification of Chronic Rhinosinusitis Beyond Polyps vs No Polyps: A Review. *JAMA Otolaryngol Head Neck Surg*. 2020;146(9):831-8.
- Husain Q, Sedaghat AR. Understanding and clinical relevance of chronic rhinosinusitis endotypes. *Clin Otolaryngol*. 2019;44(6):887-97.