

# The Sino-Nasal Outcome Test-22: translation and validation in an Estonian population\*

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## Abstract

**Background:** Background: The Sino-Nasal Outcome Test-22 (SNOT-22) is widely used to assess symptom severity and quality of life for chronic rhinosinusitis patients. No translated version of the tool is available for the study and care of Estonian patients. Thus, the present study aimed to a) translate the SNOT-22 to Estonian and b) validate its adaptation and application to Estonian patients.

**Methods:** The SNOT-22 was translated to Estonian following standard procedures. Fifty CRS patients and 25 healthy controls were recruited after application of stringent inclusion and exclusion criteria. Thirty-seven patients provided responses at the re-test stage (14 days after first test). Internal consistency, test-retest stability and validity were evaluated using appropriate statistical tests.

**Results:** The overall mean score was significantly higher in the CRS group relative to healthy volunteers, indicating strong test validity. Internal consistency was good for both the initial test and the re-test. Test-retest reproducibility was excellent showing robust response stability over time.

**Conclusions:** The SNOT-22 was successfully translated to Estonian and well-received by a cohort of Estonian subjects. The validation reported here shows that it is a reliable outcome measure for the study of CRS in Estonia.

**Key words:** nasal polyps, nasal obstruction, quality of life, rhinitis, sinusitis

## Introduction

Rhinosinusitis is defined as an inflammation of the nose and the paranasal sinuses and is characterized by two or more cardinal symptoms. For patients to receive a diagnosis of chronic rhinosinusitis (CRS), symptoms must persist for over 12 weeks and be supported by endoscopy and/or CT-based objective findings<sup>(1)</sup>. CRS represents a significant health problem with a substantial socioeconomic burden<sup>(2)</sup> and effect on quality of life, comparable to that of other chronic diseases like chronic heart disease, chronic obstructive pulmonary disease and chronic backpain<sup>(3)</sup>.

The exact prevalence of the disease presently remains unknown owing to differences in the study methods and diagnostic criteria employed by different groups. Previous studies and surveys suggest that the prevalence stands at 14–16% in the US<sup>(4,5)</sup> and 6.9–27.1% in Europe<sup>(6)</sup>.

The Sino-nasal Outcome Test 22 (SNOT-22) is a widely used and validated patient-reported measure of chronic rhinosinusitis-related symptom severity and health-related quality of life<sup>(7)</sup>. The SNOT-22 itself is a modified version of the SNOT-20<sup>(8)</sup>. The SNOT-22 consists of 22 individual items (score range of 0-5) with

the total score ranging from 0-110. The items cover both the functional and psychological aspects of the disease. The SNOT-22 has been translated into several languages, including French, Lithuanian, Danish and Czech<sup>(9-12)</sup> and been appropriately validated. Currently, no Estonian version of the questionnaire exists. Therefore, the aim of this study was to translate the SNOT-22 to Estonian and validate it using standard procedures described elsewhere<sup>(13)</sup>.

## Materials and Methods

### Translation

Two native Estonian rhinology specialists, both with high fluency in English, independently translated the questionnaire to Estonian. Both translations were compared, following which a combined version was prepared. This version was then back-translated to English by a professional medical translator who didn't have access to the original English version. The reverse translation was then approved by the license holder (Washington University). Minor fine-tuning changes were made to the wording for Item 6 during the study to enable better comprehension.

### Validation

This study enrolled 50 patients who had been diagnosed with CRS with or without polyps and 25 healthy volunteers. Pre-test analyses using SNOT-22 scores previously reported in the literature were used to estimate the required sample size. All patients were diagnosed in accordance with the EPOS criteria<sup>(1)</sup> and were consecutively recruited from the Department of Otolaryngology at the Tartu University Hospital between March 2018 and March 2019. Healthy volunteers were recruited from the medical student body and faculty after ensuring fulfillment of the inclusion criteria: a) no nasal symptoms, b) no previous nasal surgeries and/or c) recent and/or current use of nasal medications. General exclusion criteria included a) inability to complete the questionnaire, b) age under 18, c) pregnancy, d) head- and neck cancer and/or f) presence of acute respiratory illness.

All 50 patients completed the first (i.e. initial test) SNOT-22 on-site without any interviewer aid. The questionnaire was resent (i.e. re-test) to patients after 14 days via an online link. Patients were sent a follow-up email if they failed to respond within 3 days. Patients that continued to remain unresponsive were subsequently excluded. Additionally, patients were excluded from the re-test if a) their treatment regimen had changed, b) they had developed acute respiratory illness and/or, c) if they had experienced a dramatic worsening/amelioration of symptoms.

### Statistical analysis

All statistical analyses were performed using the SPSS software package (IBM SPSS Statistics for Windows, Version 22; IBM Corp.). Data was checked for normal distribution and subsequent tests

were appropriately selected. We evaluated three main aspects to validate the questionnaire; these are detailed below.

### Internal consistency

Internal consistency measures whether different items in a questionnaire that address the same issue correlate with each other and yield similar scores. Cronbach's alpha was used to evaluate internal consistency in the CRS group.

### Test-retest reliability

Test-retest reliability reflects the stability of responses and scores over a period of time within which treatment remains unchanged and no symptom changes are expected. Here, we assessed it by correlating matched responses between the initial and re-test.

### Validity

Overall mean scores were subjected to the independent t-test to check if the questionnaire could reliably differentiate between healthy volunteers and CRS patients.

## Results

The Estonian version of the SNOT-22 is depicted in Figure 1. In total, 50 CRS patients and 25 healthy controls participated in the study. Using 0.05 alpha we performed a power analysis using the SPSS software package and were able to obtain a power of 1.00 for our study. The mean ages were 41.92 years (SD  $\pm$ 14.8) and 38.56 years (SD  $\pm$ 15.5) for the CRS and control groups, respectively. Demographic and clinical characteristics, including nasal comorbidities, previous nasal surgeries, use of nasal medications and SNOT-22 scores, are summarized in Table 1. Mean SNOT-22 scores significantly differed between CRS patients (41.98, SD  $\pm$ 16.7) and healthy controls (13.08, SD  $\pm$ 9.2), indicating the validity of the translated questionnaire ( $p < 0.0001$ ). Thirteen patients were excluded from the re-test; therefore, matched (initial and re-test) responses were available for 37 patients. The mean test-retest time interval was 16.3 days (SD  $\pm$ 3.7). No significant difference ( $p = 0.302$ ) was observed between the mean SNOT-22 score recorded at the initial test (41.98, SD  $\pm$ 16.7, range 10-77) and that recorded at the retest (38.97, SD  $\pm$ 9.2, range 9-76). A significant positive correlation ( $r = 0.931$ ,  $p < 0.0001$ ) was observed between the initial- and re-test mean scores, indicating response stability over time. Cronbach's alpha was 0.87 and 0.90 for the initial and repeat tests, respectively, underscoring its good internal consistency.

## Discussion

The SNOT-22 is a frequently used tool within both clinical and academic settings. Thus far, using it to evaluate symptom severity and health-related quality of life within Estonian CRS populations was not possible. The present study therefore aimed

Nimi:

Kuupäev:

**SINONASAALSETE KAEBUSTE 22 OSALINE KÜSIMUSTIK (SNOT22)**

Allpool leiate loetelu oma nina ja ninakõrvalkoobaste põletiku sümptomitest ja sellega kaasnevatest sotsiaalsetest ja emotsionaalsetest mõjudest. Sooviksime Teie kaebustest rohkem teada saada ja oleksime tänulikud, kui Te vastaksite järgmistele küsimustele nii hästi, kui suudate. Puuduvad õiged või valed vastused ning vaid Teie saate seda teavet meile anda. Palun hinnake oma kaebusi selliselt, nagu nad on olnud viimase kahe nädala vältel. Täname Teid osalemise eest.

	Ei ole probleem	Väga leeb probleem	Leeb või tagasihoidlik probleem	Mõeldukas probleem	Raske probleem	Nii suur probleem, kui tülise olla saab		5 kõige olulisemat kaebust
1. Lähtudes sellest, kui suur probleem konkreetne kaebus Teie jaoks on ning kui sagedasti seda esineb, hinnake palun iga allpool loetletud sümptomi tõsidust Teie jaoks. Selleks tõmmake ring ümber numbrile, mis vastab Teie hinnangule antud skaalal →								
1. Nuuskamisvajadus	0	1	2	3	4	5		○
2. Ninakinnisus	0	1	2	3	4	5		○
3. Aevastamine	0	1	2	3	4	5		○
4. Vesine eritis ninast	0	1	2	3	4	5		○
5. Köha	0	1	2	3	4	5		○
6. Sekreedi/lima valgumine ninaneelu	0	1	2	3	4	5		○
7. Paks eritis ninast	0	1	2	3	4	5		○
8. Kõrvade lukustunne	0	1	2	3	4	5		○
9. Pearinglus	0	1	2	3	4	5		○
10. Kõrvavalu	0	1	2	3	4	5		○
11. Valu- või survetunne näos	0	1	2	3	4	5		○
12. Vähenenud lõhna-/maitsetundlikkus	0	1	2	3	4	5		○
13. Raskused uinumisel	0	1	2	3	4	5		○
14. Öine ärkamine	0	1	2	3	4	5		○
15. Halb uni	0	1	2	3	4	5		○
16. Väsinuna ärkamine	0	1	2	3	4	5		○
17. Kurnatus	0	1	2	3	4	5		○
18. Töövõime langus	0	1	2	3	4	5		○
19. Keskendumisvõime langus	0	1	2	3	4	5		○
20. Frustratsioon/rahutus/ärritus	0	1	2	3	4	5		○
21. Kurbus	0	1	2	3	4	5		○
22. Piinlikkus	0	1	2	3	4	5		○

2. Palun märkige Teie tervist enim mõjutavad kaebused (maksimaalselt 5 kaebust) \_\_\_\_\_ ↑

Figure 1. Estonian version of the SNOT-22.

to address this and make a validated and translated Estonian version of the questionnaire available for wider use. Here, we report on the successful translation and adaption of the questionnaire using standardized methods. The Estonian version of SNOT-22 proved to be valid, reliable and stable. The statistical values obtained here (e.g. internal consistency and stability) are comparable to those obtained during the validation of the original questionnaire <sup>(7)</sup>.

One of the limitations of our study was a relatively small sample size. However, given the statistical power analysis results and that the SNOT-22 has already been successfully validated and adapted several times, we believe that this is unlikely to have had a significant effect on the results reported here. Further, the present study is particularly robust given that it was prospec-

tively designed, and all diagnoses were confirmed by experts using the EPOS criteria.

**Conclusion**

In summary, the present study demonstrates that the Estonian version of the SNOT-22 has good internal consistency, stability and validity and is meaningful for the Estonian population. The questionnaire was well-received by patients and could be completed without any interviewer assistance or additional instructions. The translated version is therefore a critical addition to the currently available clinical and academic repertoire for the study of rhinological conditions in Estonia.

Table 1. Clinical and demographic data for all participants.

	Patients	Controls	p-value
N	50	25	
Age, mean (± SD), years	41.92 (±14.8)	38.56 (±15.5)	0.364
Sex, N (%)			0.514
Male	26 (55%)	11 (44%)	
Female	24 (45%)	14 (56%)	
Nasal comorbidities <sup>1</sup> , N (%)	21 (42%)		
Previous endoscopic sinus surgery, N (%)	7 (14%)		
Use of nasal medications <sup>2</sup> , N (%)	37 (74%)		
SNOT-22, mean (± SD)	41.98 (±16.7)	13.08 (±9.2)	< 0.0001

<sup>1</sup> Vasomotoric and/or allergic rhinitis, nasal turbinate hypertrophy, nasal septal deviation. <sup>2</sup> Intranasal and/or systemic steroids, antileukotriens, nasal irrigations

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## Authorship contribution

MP and PK designed the study. MP undertook data collection and analysis. MP and PK drafted the manuscript and revised it for intellectual content.

## Conflict of interest

The authors have no conflicts of interest to declare.

## Ethics approval and consent to participate

This study was approved by the Research Ethics Committee of the University of Tartu. Written informed consent was obtained from all participants prior to enrolment; all collected data was securely stored in a de-identified and confidential manner.

## Consent for publication

Not applicable.

## Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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