

SNOT-22: A life quality score questionnaire in Portuguese patients with Chronic Rhinosinusitis

Simão Nogueira¹, João Laffont², João Carlos Ribeiro^{1,2}

1. Faculty of Medicine, University of Coimbra, Portugal
2. Department of Otorhinolaryngology, Centro Hospitalar e Universitário de Coimbra, Portugal

Contact: simaocnogueira@gmail.com

Abstract:

Introduction: Health-related quality of life questionnaires use has been increasing in clinical practice to assess the impact of medical intervention and measure the outcome of health care intervention in a patient quality of life. The SNOT-22 questionnaire has been considered the most appropriate tool to evaluate chronic rhinosinusitis. This study aims to determine the functional impact of surgical treatment of nasosinusal diseases on patients' quality of life, measured by a quality of life questionnaire, the SNOT-22.

Methods: Prospective observational study with 52 patients with chronic rhinosinusitis submitted to surgery who answered the SNOT-22-pt questionnaire. Data were collected preoperatively and 3 months after surgery and analysed to determine the internal consistency and responsiveness of the SNOT-22 questionnaire.

Results: This study found that there was a statistically significant ($P < 0,0001$, $t = 9,643$) decrease in patient reported SNOT-22-pt scores (mean 21) compared to before surgery (mean 51), showing clinical responsiveness. SNOT-22-pt showed a high level of internal consistency (Cronbach's alpha of 0.895). The overall effect size was 1.91, which is considered large. The minimally important difference was 28, which means that a change of less than 28 points is not perceived by the patient as a real improvement. Normal post operative scores cut-off are below 25 points.

Conclusion: We found that the Portuguese version of the SNOT-22 questionnaire is a valid and easy to use instrument to evaluate patients with CRS, as it demonstrated a high internal consistency, responsiveness and easy clinical interpretability. The SNOT-22-pt should be used as a tool to facilitate routine clinical practice to assess the impact of CRS on a patient's quality of life and also to measure the effectiveness of surgical interventions.

Keywords: SNOT-22, Chronic Rhinosinusitis, Functional Impact, Surgical Treatment, Quality of life

Introduction:

Chronic Rhinosinusitis (CRS) affects up to 14% of the Portuguese population and has shown to have significant impact on quality of life.¹ Rhinosinusitis (including nasal polyposis) is defined as an inflammation of the nose and paranasal sinuses characterized by two or more symptoms, one of which must be stuffed/obstructed/congested nose or nasal discharge (anterior/posterior rhinorrhea) - may also present pain/pressure on the face and/or reduction or loss of smell - along with endoscopic signs of: polyps and/or mucopurulent rhinorrhea, and/or edema/mucosal obstruction and/or change in computed tomography: mucosal changes at the level of the osteomeatal complex and/or nasal sinuses.

CRS patient symptoms differ largely across the population and not all patients can accurately define them. Given this diversity there was a need to create methods able to quantify nasal symptoms – similar to the VAS (visual analogue scale) for pain – that were reliable in determining subjective symptomatology.² According to the European position paper for CRS, the use of validated questionnaires for the subjective assessment of symptoms is recommended.³

Quality of life questionnaires present themselves with an increasing importance in the assessment of CRS, allowing a correct diagnosis and staging and consequently, an adequate treatment. Several CRS-specific evaluation tools exist, with SNOT-22 being one the most widely accepted of those tools.³ The SNOT-22 is a modified version of SNOT-20 and RSOM-31 and is the latest version of the SNOT questionnaires. It is a quality of life questionnaire that assesses the severity of symptoms of nasosinusal conditions based on patient reports. SNOT-22 weighs the physical problems, functional limitations, and emotional consequences of patients with CRS.⁴

Several studies have shown that SNOT-22 was most appropriate for evaluating patients with CRS. Hopkins C et al⁵ concluded that the SNOT discriminated clearly between

sick and healthy and identified differences in the subgroups of CRS. Pannu KK et al⁶ evaluated the benefits of nasal septum surgery on nasal symptoms and quality of life and demonstrated that the SNOT-22 score was a useful and reliable tool in nasal septum surgery. It is of the utmost importance that inadequate and unnecessary surgeries are avoided in patients with CRS and it has been suggested that SNOT-22 may be a robust tool for the subjective evaluation of patients' symptoms. It is a tool that can also be used to assess the impact of CRS treatment by measuring the difference between the pre- and post-treatment outcome.

This study aims to determine the functional impact of surgical treatment of nasosinusal diseases on patients' quality of life, measured by a quality of life questionnaire, the SNOT-22.

Materials and methods:

Study Design:

Data were prospectively collected preoperatively and 3 months after surgery, and analysed to determine validity of the SNOT-22.

Translation:

The translation of quality of life questionnaires requires five stages: (1) translation and (2) retranslation, (3) review by a translation and retranslation committee, (4) equivalence pre-test with bilingual individuals, and (5) re-examination of the scores' weights, when relevant, as proposed by Guillemin.⁷

Recruitment of subjects:

The sample presented was made up by patients with elective surgery scheduled and diagnosed with chronic rhinosinusitis or rhinosinusitis with polyps. The exclusion criteria considered were: age below 18 years, previous nasal surgery, immunodeficiency, primary ciliary dyskinesia, vasculitis, recent treatment for any infection (in the previous 15 days) and recent use of endonasal spray medication.

The preoperative questionnaire also elicited information about comorbidities, symptom duration, health behaviours and previous treatments. This included details of asthma, allergy and smoking habits. Patients rated their preoperative general health on a 10 point visual scale ranging from excellent (0 points) to poor (10 points). The same scale was used on the postoperative questionnaire.

Patients who had consented to follow up were contacted at 3 months after their surgery. The theoretical range of the new measure is 0-110, with lower scores implying a better health-related quality of life. Patients were also asked whether they felt much better,

better, the same or worse following surgery.

The study was approved by the Centro Hospitalar de Coimbra ethics committee.

Data analysis:

The reliability was analysed by measuring the internal consistency, which reflects how each question is associated with the others in the questionnaire, since there must be homogeneity through the items questioned. Internal consistency is measured by the Cronbach's alpha coefficient. The minimum acceptable value is 0.7.⁵

The responsiveness reflects how the questionnaire is able to detect clinical changes over time. A paired *t*-test was used to compare scores before and after surgery. To determine responsiveness the scores before and after surgery were analysed and the effect size was calculated. By convention, an effect size of >0.2 is considered small, >0.5 moderate and >0.8 is considered a 'large' improvement in health-related quality of life.⁵

The clinical interpretability is a key challenge for researchers interested in the measurement of health-related quality of life.⁵ One method of facilitating this is to calculate the smallest change in scores that a group of patients can detect as a real improvement: the 'minimally important difference' (MID).⁸ To calculate the MID, patients reported in the postoperative questionnaire a rating scale classifying their postoperative health when compared to preoperative health and were then split in transition groups where 1= 'much better', 2 = 'a little better', 3 = 'about the same', 4= 'a little worse', 5 = 'much worse'. The mean change SNOT-22 scores were calculated for each transition group. MID was determined by subtracting the mean score variation of the 'a little better' group of patients with the mean score variation of the 'about the same' group of patients.⁵

Results:

Translation:

The results from the SNOT-22 translation and cultural adaptation are presented in table 1.

Patient's characteristics:

Of the 52 patients that completed both pre and post operative questionnaires, 56% were females and 44% were male. The mean age was 43.8 years (range 20 to 71). Patients preoperative general health mean measured by visual scale was 7.4 and the postoperative general health mean was 2.9.

Data obtained:

Internal consistency:

Cronbach's alpha score was 0.895 for the preoperative scores, indicating a high level of internal consistency. Each and all items reported high reliability scores.

Table 1. Portuguese Language Version of the SNOT-22

Questionário Sino-Nasal 22 (PT-PT)

Nome:

Data:

No quadro em baixo encontra-se uma lista de sintomas e conseqüências emocionais e sociais causados pelo seu problema nasal. Gostaríamos de perceber melhor as suas queixas, pelo que agradecemos que responda às perguntas o melhor que souber.

Não há respostas certas ou erradas, e só o próprio é que pode responder de acordo com o que sente.

Responda tendo em conta as últimas duas semanas.

Muito obrigado pela sua participação.

Assinale com um círculo em cada uma das alíneas o número que lhe parecer mais adequado, de acordo com a escala à direita →

	Sem problema	Muito ligeiro	Ligeiro	Moderado	Grave	Muito grave	
1. Necessidade de assoar o nariz	0	1	2	3	4	5	
2. Espirros	0	1	2	3	4	5	
3. Corrimento/ pingo no nariz	0	1	2	3	4	5	
4. Tosse	0	1	2	3	4	5	
5. Corrimento posterior (secreções da parte de trás do nariz para a boca)	0	1	2	3	4	5	
6. Secreções nasais espessas	0	1	2	3	4	5	
7. Sensação de ouvido cheio	0	1	2	3	4	5	
8. Tonturas	0	1	2	3	4	5	
9. Dor de ouvidos	0	1	2	3	4	5	
10. Dor ou sensação de pressão na face	0	1	2	3	4	5	
11. Dificuldade em adormecer	0	1	2	3	4	5	
12. Acordar durante a noite	0	1	2	3	4	5	
13. Falta de uma boa noite de sono	0	1	2	3	4	5	
14. Acordar cansado	0	1	2	3	4	5	
15. Fadiga/ cansaço	0	1	2	3	4	5	
16. Baixa produtividade no seu dia-a-dia	0	1	2	3	4	5	
17. Falta de concentração	0	1	2	3	4	5	
18. Frustração/ irritabilidade / inquietação	0	1	2	3	4	5	
19. Tristeza	0	1	2	3	4	5	
20. Embaraçado	0	1	2	3	4	5	
21. Falta de apetite/gosto/cheiro	0	1	2	3	4	5	
22. Obstrução/congestionamento nasal	0	1	2	3	4	5	

TOTAL GERAL:

Responsiveness at 3-Months:

The mean scores of each question on the questionnaire in the pre and postoperative is presented on Table 2, including also the mean variation between pre and postoperative scores.

Table 2. SNOT-22 mean scores for each question.

Question:	SNOT-22 Mean Scores		
	Pre-operative	Post-operative	Pre and post-operative difference
1.	2.23	1.35	0.88
2.	2.25	1.10	1.15
3.	2.17	0.96	1.21
4.	2.31	1.31	1.00
5.	1.96	1.35	0.61
6.	1.94	1.29	0.65
7.	2.13	1.38	0.75
8.	1.98	0.83	1.15
9.	1.04	0.37	0.67
10.	1.85	0.96	0.89
11.	2.62	0.85	1.77
12.	2.42	0.73	1.69
13.	3.48	1.25	2.23
14.	3.15	1.33	1.82
15.	2.96	0.83	2.13
16.	2.08	0.69	1.39
17.	2.46	0.77	1.69
18.	2.77	1.10	1.67
19.	2.13	0.73	1.40
20.	1.88	0.65	1.23
21.	1.88	0.62	1.26
22.	3.35	0.65	2.70

This study found that there was a statistically significant ($P < 0,0001$, $t = 9,643$) decrease in patient reported SNOT-22 scores (21 ± 14 [17-25]) compared to before surgery (51 ± 22 [45-57]). Means of pre and postoperative scores are presented on Table 3, including the SNOT-22 score change. We are 95% confident that the normal post-operative SNOT-22

score on a scale of 0 to 110 is between 17 and 25. The overall effect size in all patients after 3 months was 1.91 (Cohen's *d*), which is considered large.

Clinical interpretability:

The mean changes in SNOT-22 score by each transition group is presented on Table 4. The minimally important difference was 28. The cut-off estimated for MID calculated with the area under the curve for SNOT-22-pt changes was also 28. This means that a change of less than 28 points is not perceived by the patient as a real improvement.

Table 3. Clinical responsiveness measured by SNOT-22-pt.

Measure	n	Mean ± SD	95% CI	
			Lower	Upper
Preoperative SNOT-22-pt	52	51.06 ± 22.42	44.82	57.23
Postoperative SNOT-22-pt	52	21.08 ± 14.54	17.03	25.12
SNOT-22 Change	52	29.98 ± 22.32	36.17	23.98

n = Number; SD = standard deviation

Table 4. Change in SNOT-22-pt from preoperative score to 3-months postoperative score by transition group:

Transition rating	n	Mean change in SNOT-22
Much better	16	52.75 ± 12.39
A little better	33	22.21 ± 16.32
About the same	3	- 6.00 ± 0.00
A little worse	0	0 ±
Much worse	0	0 ±

n = Number; SD = standard deviation

Discussion

We present a validated SNOT22 questionnaire for use in sinonasal Portuguese patients. It presents a high internal consistency ($\alpha= 0.895$) with an overall large size effect of 1.75. Our study reported the use of SNOT 22 in surgical sinonasal patients. The mean change after surgery was 30 ± 22 . The normal post-operative score is of 17-25 points with a minimally important difference of 28 points, which has important clinical and medico-legal relevance.

Outcome questionnaires are usually employed by self-administration, as the original questionnaire of the present study.⁵ However, similarly to others,⁹ we decided to read out loud the questions to the patients because of potential literacy problems with our population. The administration of the questionnaire to the patients by the examiner has some advantages over self-administration, such as faster filling out time, lower rate of missing data, and the interviewee's preference.¹⁰ We believe that this affected positively our results as we had no missing data.

The internal consistency of the SNOT-22 Cronbach's alpha score was 0.895 for the preoperative scores, similar to the one found in other studies reporting the use of the SNOT-22 questionnaire in other countries, such as in the following studies: French¹¹, Czech¹², Greek¹³, Swedish¹⁴, Danish¹⁵, Spanish¹⁶, Persian¹⁷, and Turkish¹⁸, with Cronbach's alpha between 0.84 and 0.93, indicating high level of internal consistency of the Portuguese version of the SNOT-22 questionnaire.

Responsiveness is one of the best qualities of the SNOT-22. We demonstrated a strong correlation with a global rating of symptoms at 3 months after surgery and a good responsiveness. Question 22 was the one with the greatest difference of the pre and postoperative scores, hence demonstrating the importance and the utility of the SNOT-22 questionnaire. The mean score reduction was 30 points 3 months after surgery. This mean reduction was similar to the ones found in other studies, including the original study with the

SNOT-22 in English^{5,9} The overall effect size in all patients in our study was 1.91, which is considered large and goes accordingly with the findings of the overall effect size in other studies, including the original study with the SNOT-22 in English (overall effect size 0.81).^{3,9}

The clinical interpretability was assessed using the minimally important difference. This helps the interpretation of the scores in terms of the real world clinical setting. We found that for the patient to detect the smallest change a reduction of 28 points on the SNOT-22 was needed. This means that only treatments that can achieve a reduction of 28 points on the SNOT-22 are perceived by the patient as a real benefit and has both clinical and medico-legal relevance.

A previous SNOT-22 version was published in a Portuguese cohort with 15 patients.¹⁹ We intended to further assess its real world clinical responsiveness with the minimally important difference. In our study, the normal post-operative score at 3 months after surgery should be between 17 and 25 and a change of less than 28 points in the SNOT-22 is not perceived by the patient as a real improvement at 3 months after surgery.

The SNOT-22-pt was easy to understand by the patients and quick to fill (estimated mean time: 10 minutes). It should be used as a tool to facilitate routine clinical practice to assess the impact of chronic rhinosinusitis on a patient's quality of life. It may also be used to measure the effectiveness of surgical interventions, both for clinical and medico-legal purposes.

Conclusion:

We found that the Portuguese version of the SNOT-22 questionnaire is a valid and easy to use instrument to assess patients with CRS, as it demonstrated a high internal consistency, responsiveness above 28 points and easy clinical interpretability. Normal post operative scores cut-off are below 25 points.

SNOT-22-pt is important for both clinical and medico-legal purposes.

Conflict of interest:

None to declare.

Acknowledgments:

I would like to thank my advisor (Professor Dr. João Carlos Ribeiro) and co-advisor (Dr. João Laffont) for the time and guidance through this study.

I would like to thank my family for the support while I developed this thesis.

Bibliography:

1. Barros E, Silva A, Sousa Vieira A, André C, Silva D, Branquinho Prata J, et al. Avaliação da prevalência e caracterização da rinosinusite nos cuidados de saúde primários em Portugal. *Rev Port Otorrinolaringol e Cir Cervico-Facial*. 2012;50.
2. Yeolekar AM, Dasgupta KS, Khode S, Joshi D, Gosrani N. A Study of SNOT 22 Scores in Adults with no Sinonasal Disease. *J Rhinology-Otologies*. 2013;6–10.
3. Fokkens W, Lund V, Mullol J. International Rhinology Rhinologie Internationale. *Rhinol Int J*. 2007;20:0–136.
4. Browne JP, Hopkins C, Slack R, Cano SJ. The Sino-Nasal Outcome Test (SNOT): Can we make it more clinically meaningful? *Otolaryngol Neck Surg*. 2007;136:736–41.
5. Hopkins C, Gillett S, Slack R, Lund V., Browne JP. Psychometric validity of the 22-item Sinonasal Outcome Test. *Clin Otolaryngol*. 2009;34:447–54.
6. Pannu KK. Evaluation of benefits of nasal septal surgery on nasal symptoms and general health. *Indian J Otorhinolaryngol Head Neck Surg*. 2009;61:59–65.
7. Guillemin F, Bombardier C. Cross-Cultural Adaptaion Of Health-Related Quality of Life Measures : Literature Review and Proposed Guidelines. *J Clin Epidemiol*. 1993;46(12):1417–32.
8. Jaeschke R, Singer J, Guyatt GH. Measurement of Health Status Ascertaining the Minimal

Clinically Important Difference. *Control Clin Trials*. 1989;10:407–15.

9. Kosugi E, Chen V, Guerreiro da Fonseca V, Cursino M, Mendes Neto J, Gregório LC. Translation, cross-cultural adaptation and validation of SinoNasal Outcome Test (SNOT) - 22 to Brazilian Portuguese. *Braz J Otorhinolaryngol* 2011;77(5):663–9.

10. Weinberger M, Oddone EZ, Samsa GP, Landsman PB. Are Health & Related Quality-of-life Measures Affected by the Mode of Administration?. *J Clin Epidemiol*. 1996;49(2):135–40.

11. de Dordolot C, Horoi M, Lefebvre P, Collet S, Bertrand B, Eloy P, et al. French adaptation and validation of the SinoNasal Outcome Test (SNOT)-22: a prospective cohort study on quality of life among 422 subjects. *Clin Otolaryngol*. 2015;40(1):29–35.

12. Schalek P, Sir D. Quality of life in patients with chronic rhinosinusitis : a validation of the Czech version of SNOT-22 questionnaire. *Eur Arch Otorhinolaryngol*. 2010;267:473–5.

13. Lachanas VA, Tsea M, Tsiouvaka S, Hajjiioannou JK, Skoulakis CE, Bizakis JG. The sino-nasal outcome test (SNOT)-22: validation for Greek patients. *Eur Arch Otorhinolaryngol*. 2014;271(10):2723–8.

14. Sahlstrand-Johnson P, Ohlsson B, Von Buchwald C, Jannert M, Ahlner-Elmqvist M. A multi-centre study on quality of life and absenteeism in patients with CRS referred for endoscopic surgery. *Rhinol Int J*. 2011;49:420–8.

15. Lange B, Thilsing T, Al-kalemji A, Baelum J, Martinussen T, Kjeldsen A. The Sino-Nasal Outcome Test 22 validated for Danish patients. *Dan Med Bull* 2001;58(2):A4235
16. de los Santos G, Reyes P, del Castillo R, Fragola C, Royuela A. Cross-cultural adaptation and validation of the sino-nasal outcome test (SNOT-22) for Spanish-speaking patients. *Eur Arch Otorhinolaryngol.* 2015;272(11):3335–40.
17. Jalessi M, Farhadi M, Kamrava SK, Amintehran E, Asghari A, Hemami MR, et al. The Reliability and Validity of the Persian Version of Sinonasal Outcome Test 22 (Snot 22) Questionnaires. *Iran Red Crescent Med J.* 2013;15(5):404–8.
18. Hanc D, Altun H, Alt N, Cingi C. Turkish translation, cross-cultural adaptation and validation of the SinoNasal Outcome Test (SNOT)-22. *ENT Updat.* 2015;5(2):51–7.
19. de Vilhena D, Duarte D, Lopes G. Sino-Nasal Outcome Test-22 : translation , cultural adaptation and validation in Portugal. *Clin Otolaryngol.* 2016;41:21–4.