

Control Assessment of Chronic Rhinosinusitis in Patients Followed in Kinshasa Hospitals

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Abstract

Background and Objective: The persistence or worsening of symptoms of Chronic Rhinosinusitis (CRS) leads to an altered quality of life (QoL) with a negative socio-economic impact. The present study aimed to evaluate the control of CRS symptoms and to identify factors contributing to poor control of the disease in our setting. **Methods:** An analytical cross-sectional study was conducted in the three Otorhinolaryngology services of the Kinshasa hospitals. CRS patients followed up in these clinics for more than 6 months were re-evaluated in our study. Disease control was assessed according to the European Position Paper on Rhinosinusitis and Nasal Polyps 2020 (EPOS20) guidelines. **Results:** Out of 137 CRS patients recruited, 22 patients (16.1%) were defined as controlled, 35 patients (25.5%) as partially controlled and 80 patients (58.4%) as uncontrolled. Visual analogue scale (VAS), sinonasal outcome test (SNOT)-22 and Lund-Mackay scores were significantly elevated in patients with uncontrolled CRS ($p < 0.001$). After multivariate analysis, age < 40 years ($ORa = 4.1$; $p = 0.005$), lower level of education ($ORa = 3.1$; $p = 0.017$), allergy ($ORa = 2.8$; $p = 0.021$), use of indigenous products ($ORa = 7.2$; $p < 0.001$) and Lund-Mackay score > 10 ($ORa = 3.8$; $p = 0.007$) were identified as factors in poor control of CRS. **Conclusion:** A large number of patients have uncontrolled CRS in our setting. Management should therefore take into account the factors negatively associated with CRS.

Keywords

Assessment, Associated Factors, Chronic Rhinosinusitis, Control, Kinshasa, Quality of Life

1. Introduction

Chronic Rhinosinusitis (CRS) is an inflammatory disease of the naso-sinusal mucosa, clinically characterised by the persistence of at least two major symptoms such as nasal obstruction, anterior and/or posterior nasal discharge, facial pain and loss of smell for at least 12 weeks [1] [2]. These symptoms may be associated with endoscopic or CT signs of inflammation of the mucosa of the nasal cavities and paranasal sinuses [1]-[3]. CRS is a public health problem, with a symptom-based prevalence ranging from 5.5% to 28.0% of the general population worldwide [1] [2]. This prevalence is reduced from 3.0% to 6.0% when based on endoscopic or CT scan evidence outside of nasal symptoms [1] [4]. The persistence and worsening of symptoms lead to a deterioration in patients' quality of life (QoL), with a negative socio-economic impact due mainly to absenteeism from work and reduced productivity [2] [5]. To improve QoL, symptom control is essential. This control reflects the ability to maintain persistent symptoms at a level that is not bothersome for the patient, thanks to appropriate management [2] [6]. The European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS) proposed a number of parameters for monitoring CRS. These include the severity of major symptoms, sleep disturbance and/or fatigue, the appearance of the nasal mucosa on endoscopy, and the use of medical treatment [2]. By considering the level of control, CRS can therefore be classified as controlled, partially controlled and uncontrolled [2]. It should also be noted that this concept of CRS control was validated by studies carried out by several researchers, including Van der Veen [7], Calus [8] and Snidvongs [9]. Some authors emphasise the factors that can influence control of the disease. These factors may be related to the patient, the disease, the diagnosis or the treatment [10]. However, epidemiological and clinical data on the control of CRS are virtually non-existent in our setting. The aim of this study is therefore to assess the level of CRS control and identify the factors contributing to poor control of the disease in Kinshasa hospitals.

2. Patients and Method

Type, setting and study population

This was a cross-sectional analytical study carried out between June 2022 and May 2023 in the otorhinolaryngology services of three major medical settings in Kinshasa, namely the Kinshasa University Hospital, the Monkole Hospital Center and the Bondeko Village Center. The choice of these settings was motivated by good attendance at the otorhinolaryngology service.

The patients aged at least 18 years followed in these medical settings for more than 6 months for CRS with or without nasosinusal polyposis according to the new EPOS criteria [1] [2] were included in the study. Written informed consent was obtained from each participant. Patients with associated pathologies such as cardiovascular disease and tumors were excluded from the study.

The study was approved by the Ethics Committee of the School of Public Health at the University of Kinshasa (approval no. ESP/CE/192/2020). The survey was

conducted in strict compliance with ethical and deontological rules, while guaranteeing confidentiality, according to the principles of the Declaration of Helsinki.

Control evaluation of chronic rhinosinusitis

Control of CRS was assessed using the criteria proposed by EPOS20 [2]. **Table 1** shows the level of control defined by symptoms over the past month. Each symptom was assessed according to whether it was absent, less bothersome (VAS Score ≤ 5) or present (VAS Score > 5). In addition to symptoms, patients were also asked to specify whether they had used medication (antibiotics or corticosteroids) to relieve symptoms in the last 6 months. This results in three categories of patients: patients with controlled CRS, partially controlled CRS and uncontrolled CRS.

Table 1. Evaluation criteria for clinical control of CRS according to EPOS 2020.

Clinical elements	Chronic rhinosinusitis		
	Controlled (All the following features)	Partially controlled (1 or 2 of the following characteristics)	Uncontrolled
Nasal obstruction	Absent or less troublesome ¹	Présent almost every day of the week ²	
Rhinorrhoea (antérieur ou posterior)	Little or mucous ¹	Abondant and/or mucopurulent ²	
Facial pain or pressure	Absent or less troublesome ¹	Présent almost every day of the week ²	≥3 characteristics of partially controlled CRS
Smell	Normal or slightly reduced ¹	Altered ²	
Sleep problems or fatigue	Absent	Présent ²	
Nasal endoscopy	Healthy or almost healthy mucosa	Inflamed mucosa, nasal polyps	
Treatment in the last 6 months	Not need	A course of antibiotics/systemic corticosteroids in the last 3 months	Long-term antibiotics/systemic corticosteroids in the last month

¹VAS score ≤ 5 ; ²VAS score > 5 .

Measuring the severity of chronic rhinosinusitis and its impact on quality of life

The severity of symptoms was assessed using the Visual Analogue Scale (VAS) rated from 0 to 10, with 0 indicating no symptoms at all and 10 indicating very severe symptoms [1] [2]. The mean VAS score of major symptoms was used to define mild CRS (VAS 0 - 3), moderate CRS (VAS >3 - 7) and severe CRS (VAS >7 - 10) [1] [2].

The impact of CRS on QoL was measured using the SNOT-22 questionnaire [1] [11], comprising 22 items, each rated from 0 to 5 (Questionnaire in **Appendix**). These items represent CRS-related health problems that have occurred in the last two weeks and that the patient rates according to how he or she feels. The maximum score for the SNOT-22 is 110.

The Lund-Mackay score was used to assess the severity of inflammation of the sinonasal mucosa as seen on the CT scan. Each sinus or ostio-meatal complex (OMC) was scored from 0 to 2. For the sinus, 0 = no abnormality, 1 = partial opacity and 2 = total opacity; and for the OMC, 0 = no obstruction and 2 = ob-

struction. The maximum score is 24 [12].

Operational definition of variables

The regularity in medical follow-up referred to the way in which patients responded to appointments scheduled by their physician. The use of indigenous products referred to the voluntary daily use of medicinal plant extracts, mainly nasal snuff (powdered tobacco), *Artemesia afra*, *Lippia javanica*, *Securidacalonge pedunculata* decocted or reduced to powder in addition to prescribed medicines. The higher education level corresponded to patients with at least a state diploma. The lower level of education represented incomplete primary and secondary education. Permanent exposure to pollution meant exposure to dust, smoke and other irritating gases on a permanent basis at home or in the workplace.

Data collection

Patients with CRS who had been followed for more than 6 months were recruited during their medical visit or by invitation to the Otorhinolaryngology service for reassessment. Their informed consent was obtained. Data were collected by interview, review of medical files and clinical examination using nasal endoscopy. Patients were asked to complete the VAS and SNOT-22 questionnaires. Recent CT images, taken within the last two months prior to the visit, were also examined to determine the Lund-Mackay score.

Statistical analysis

SPSS software version 26.0 was used for statistical analysis. Qualitative variables were expressed as frequency and percentage, and quantitative variables as mean and standard deviation. We used the t-test to compare means between patient groups, Pearson's chi-square test to compare proportions or percentages, and Fisher's exact test if the sample size was small (<5) for a categorical variable. Spearman's correlation test was used to assess correlations between the different scores used. Logistic regression was used to identify factors associated with poor control of CRS. Results were considered statistically significant when the p-value was <0.05.

3. Results

Socio-demographic and clinical characteristics of patients and control of CRS

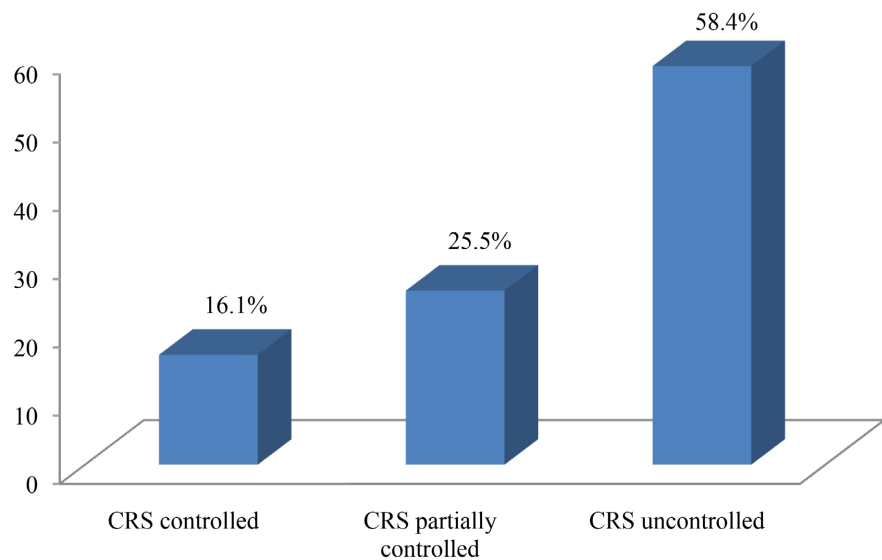
During the period of our study, we included 137 CRS patients who were followed for more than 6 months in hospital setting. Their socio-demographic characteristics and history are summarised in **Table 2**.

Depending on the level of control, more than half of the patients were uncontrolled, followed by 25.5% partially controlled and 16.1% controlled (**Figure 1**).

The patient's ages ranged from 18 to 76 years, with an average age of 42.4 ± 14.2 years. The uncontrolled patients were predominantly young and had a lower level of education, compared to the controlled and partially controlled groups (all significant p-values). The other characteristics weren't statistically different between the groups.

Table 2. Socio-demographic characteristics and history of patients.

Variables	Chronic Rhinosinusitis				p-value
	Total (n = 137)	Controlled (n = 22)	Partially controlled (n = 35)	Uncontrolled (n = 80)	
Mean age (years) ± SD	42.4 ± 14.2	49.7 ± 9.5	45 ± 11.3	39.2 ± 15.4	0.004
Gender (%)					
Male	65 (47.4)	12 (54.5)	17 (48.6)	36 (45.0)	0.721
Female	72 (52.6)	10 (45.5)	18 (51.4)	44 (55.0)	
Level of education (%)					
Lower	64 (46.7)	5 (22.7)	14 (40.0)	45 (56.3)	0.013
Superior	73 (53.3)	17 (77.3)	21 (60.0)	35 (43.8)	
Smoking (%)	38 (27.7)	10 (45.5)	9 (25.7)	19 (23.8)	0.125
Permanent exposure to pollution (%)	113 (82.5)	17 (77.3)	29 (82.9)	67 (83.8)	0.777
Allergy (%)	49 (35.8)	4 (18.2)	10 (28.6)	35 (43.8)	0.051
Asthma (%)	17 (12.4)	1 (4.5)	3 (8.6)	13 (16.3)	0.245
Hypersensitivity to Aspirin (%)	6 (4.4)	0 (0.0)	2 (5.7)	4 (5.0)	0.541

**Figure 1.** Levels of control for chronic rhinosinusitis.

The most frequently reported symptoms were nasal obstruction (80.3%), posterior rhinorrhoea (75.3%) and anterior rhinorrhoea (62.8%). The rhinorrhoea was mucopurulent in 50.4% of cases. Nasal polyps were found in 42 patients (30.7%). Endoscopic surgery was performed in only 9.5% of patients. Medical follow-up was regular in almost the same proportion. Nearly 40.0% of patients had used indigenous products on their own initiative, mainly nasal snuff (Table 3).

Many symptoms, as well as nasal polyps, were less reported or not reported in the controlled group compared to the partially controlled and uncontrolled groups. According to the VAS score, CRS was slight in the controlled group and severe in

the uncontrolled group. The irregular medical follow-up and the use of indigenous products were more common in uncontrolled patients. The SNOT-22 score and Lund-Mackay score were higher in uncontrolled patients. The other characteristics were not statistically significant for the groups (**Table 3**).

Table 3. Clinical characteristics of patients.

Variables	Chronic Rhinosinusitis				p-value
	Total (n = 137)	Controlled (n = 22)	Partially controlled (n = 35)	Uncontrolled (n = 80)	
Nasal obstruction (%)	110 (80.3)	4 (18.2)	29 (82.9)	77 (96.3)	<0.001
Anterior nasal discharge (%)	86 (62.8)	0 (0.0)	10 (28.6)	76 (95.0)	<0.001
Posterior nasal discharge (%)	99 (72.3)	6 (27.3)	19 (54.3)	74 (92.5)	<0.001
Mucopurulent nasal discharge (%)	69 (50.4)	0 (0.0)	14 (40.0)	55 (68.8)	<0.001
Loss of sense of smell (%)	67 (48.9)	1 (4.5)	7 (20.0)	59 (73.8)	<0.001
Facial pain (%)	66 (48.2)	0 (0.0)	12 (34.3)	54 (67.5)	<0.001
Sleep disorders/Fatigue (%)	46 (33.6)	0 (0.0)	11 (31.4)	35 (43.8)	0.001
Nasal polyps (%)	42 (30.7)	0 (0.0)	7 (20.0)	35 (43.8)	<0.001
CRS (Using VAS) (%)					
Slight	32 (23.4)	20 (90.9)	12 (34.3)	0 (0.0)	
Moderate	58 (42.3)	2 (9.1)	23 (65.7)	33 (41.3)	<0.001
Severe	47 (34.3)	0 (0.0)	0 (0.0)	47 (58.7)	
Surgery (%)	13 (9.5)	0 (0.0)	2 (5.7)	11 (13.8)	0.101
Medical follow-up (%)					
Regular	78 (56.9)	18 (81.8)	21 (60.0)	39 (48.8)	
Irregular	59 (43.1)	4 (18.2)	14 (40.0)	41 (51.2)	0.019
Use of indigenous products (%)	54 (39.4)	10 (45.5)	5 (14.3)	39 (48.8)	0.002
VAS score (Mean ± SD)	5.4 ± 1.8	3.0 ± 0.1	4.0 ± 1.0	6.6 ± 1.0	<0.001
SNOT-22 score (Mean ± SD)	41.6 ± 14.3	28.4 ± 6.6	34.9 ± 12.0	48.1 ± 12.9	<0.001
Lund-Mackay score (Mean ± SD)	7.3 ± 4.9	5.7 ± 2.9	5.1 ± 3.3	8.6 ± 5.5	0.003

Correlation between severity of CRS and quality of life

According to the severity of disease, the VAS score was significantly correlated with the SNOT-22 score (QoL) and the Lund-Mackay score. However, the correlation between CRS symptoms and abnormalities observed on the CT scan was statistically weak (**Table 4**).

Table 4. Correlation between clinical and radiological scores in patients with CRS.

Scores	Spearman's correlation	p-value
VAS and SNOT-22	0.68	<0.001
SNOT-22 and Lund-Mackay	0.44	<0.001
VAS and Lund-Mackay	0.34	<0.001

Factors associated with poor control of chronic rhinosinusitis

Table 5 shows the various factors that may contribute to poor control of CRS in our study. We note that poor control was defined based on uncontrolled CRS as the reference category. The covariates introduced into the multivariate model were thus selected based on their significant p-value ($p < 0.05$) and/or their epidemiological and clinical relevance that could influence the control of CRS. Thus, age < 40 years, lower level of education, allergy, use of indigenous products and Lund-Mackay score > 10 had emerged as factors significantly associated with poor control of CRS.

Table 5. Factors associated with poor control of CRS.

Variables	Anivariate analysis			Multivariate analysis		
	Crude OR	95% CI	p-value	Adjusted OR	95% IC	p-value
Age (<40 years)	4.1	1.9 - 9.0	<0.001	4.1	1.5 - 10.8	0.005*
Gender (Female)	1.3	0.6 - 2.5	0.497	0.7	0.3 - 1.7	0.400
Level of education (lower)	2.6	1.3 - 5.2	0.009	3.1	1.2 - 7.7	0.017*
Allergy	2.4	1.1 - 5.0	0.022	2.8	1.2 - 7.1	0.021*
Asthma	2.6	0.8 - 8.3	0.116	1,2	0.3 - 4.6	0.812
Permanent exposure to pollution	1.2	0.5 - 2.9	0.644	1,5	0.5 - 4.9	0.481
Irregular medical follow-up	2.3	1.1 - 4.6	0.023	2.2	0.9 - 5.7	0.090
Use of indigenous products	2.7	1.3 - 5.6	0.009	7.2	2.6 - 20.3	<0.001*
Lund-Mackay score > 10	3.3	1.5 - 7.2	0.004	3.8	1.6 - 10.2	0.007*

*Significant at the $p < 0.05$ threshold; OR: Odds ratio; CI: 95% confidence interval.

4. Discussion

The large proportion of patients suffering from CRS was represented by patients with uncontrolled CRS, followed by patients with partially controlled CRS. This observation is consistent with that of Van der Veen *et al.* who studied the control of CRS in patients who had undergone endoscopic sinus surgery [7]. On the other hand, Xiaoyao *et al.* reported a low rate of uncontrolled CRS compared to controlled CRS patients operated in China [13].

Recent studies have shown a lack of uniformity in CRS control criteria [14] [15]. Sedaghat *et al.* also demonstrated that control assessment according to EPOS2020 criteria was less accurate than other methods evaluated by patients [15]. However, the introduction of nasal endoscopy among the criteria could make them more or less reliable.

Patients with uncontrolled CRS were younger in our series with a mean age of 39.2 ± 15.4 years. This average is close to that of Xiaoyao Tao *et al.*, which was 40.7 ± 10.6 years [13]. In our study, one third of CRS patients in general and forty percent of patients with uncontrolled CRS reported allergy as a comorbidity. This proportion of allergy was slightly higher than that found (23.4%) by Nyembue *et al.* in Kinshasa in CRS patients [16].

The correlation between the SNOT-22 score and the VAS score was statistically more significant and indicated a perfect relationship between the severity of CRS symptoms and impairment of QoL. This result is in line with those reported by many authors, such as Idugboe *et al.* in Nigeria ($r = 0.50$; $p = 0.008$) [17], Toma and Hopkins in the UK ($r = 0.85$; $p < 0.001$) [18], and Doulaptsi *et al.* in Belgium ($r = 0.65$; $p < 0.001$) [19]. Phillips *et al.* revealed a significant association between high SNOT scores, VAS scores and poor CRS control, reflecting the correlation between disease control and quality of life [20]. On the basis of these observations, it should therefore be understood that the choice of one or the other of these scores would be suitable for assessing the severity and the control of CRS. On the other hand, the weak correlation between the Lund-Mackay score and these clinical scores, as also found by other authors [21]-[24], does not statistically predict the severity of CRS.

According to the factors associated with poor control of CRS, we found that the age < 40 years, lower or non-university level of education, allergy mainly allergic rhinitis, use of indigenous products and high Lund-Mackay score were significantly associated with poor control of CRS in our study. The current literature indicates that young people are more likely to have CRS without PN [2], the latter being the most frequent form in our study. This age factor could therefore be classified as a disease-related factor that is difficult to manage.

It should also be pointed out that in our setting, less educated subjects pose a serious problem in terms of active participation in the management of their disease. They are less likely to adhere to treatment, and less likely to comply with hygiene measures and the advice of healthcare staff.

Jiahui Zhou *et al.* found that female gender and asthma were among the predictive factors for poor CRS control [14] [15]; this is not the case according to our analyses. This difference may be due to the sample size and the methods used to obtain the results.

The association observed between CRS and allergy, mainly allergic rhinitis, is thought to be due to a pathophysiological link based on Th2-type inflammation causing mucosal oedema, which leads to ostial obstruction [25]. Indeed, failure to control allergic rhinitis would imply persistence of the nasosinus inflammatory process. In treatment, taking into account the allergic predisposition could thus improve the optimal prognosis for CRS [26].

The use of indigenous products can also contribute to poor control of CRS. Extracts of certain medicinal plants for local use have been shown to be an alternative treatment for CRS [2]. However, their effectiveness remains uncertain. Elsewhere, topical plant extracts such as Sinupret, Nigella Sativa nasal and Sinupim have been shown to be effective in local phytotherapy, without significant adverse effects [27]-[30]. However, the quality of evidence for this type of treatment is low, which is why it is not yet recommended for the management of CRS. In our environment, snuff is an indigenous product commonly used to relieve nasal congestion for some people or as a substitute for smoking tobacco for others, as is seen

in many developing countries [31]. However, it appears to be a factor potentially involved in poor control of CRS, due to its direct action on the nasal mucosa [31] [32]. Unlike inhaled tobacco, snuff exposes the nasal mucosa to high concentrations of nicotine, nitrosamines and other irritants, causing persistent local inflammation. The other plants mentioned are used less and less.

This analysis shows that a high Lund-Mackay score was significantly associated with poor control of CRS. This result is consistent with several studies in the literature suggesting that the extent of inflammatory lesions in the nasosinus mucosa visible on CT scans reflects the severity and difficulty of controlling the disease [2] [13] [14]. However, some authors report a moderate correlation between the Lund-Mackay score and clinical severity, as mentioned above. Indeed, some patients may have a high radiological score but be less symptomatic, and vice versa. This discrepancy could be explained by the multifactorial nature of CRS, involving immunological, microbiological, allergic and environmental factors [2] [14] [21]-[24].

Limitations and strengths of the study

The small size of the sample collected does not allow us to generalize the results of our study to the entire community. In addition, the method used to assess CRS control presents a risk of underestimating or overestimating uncontrolled patients, as it is based more on the patient's own statements. Nevertheless, this study remains the first to evaluate CSR control according to EPOS criteria in our context, identifying certain factors associated with poor control in order to enable further in-depth studies.

5. Conclusion

This study showed that CRS control was insufficient for most patients in Kinshasa. Uncontrolled status was correlated with high VAS score symptoms and impaired QoL. The young age, low education level, allergy, indigenous product use and high Lund-Mackay score were associated with uncontrolled CRS in the multivariate analysis. Therefore, it is necessary to implement therapeutic strategies and to raise patients' awareness for improving CRS management taking into account the associated factors.

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Authors' Contributions

All authors have contributed to the realization of this article and have approved the version submitted for publication. Hilaire K. Kalala: designed, conducted and wrote the study. Patricia K. Kakobo: contributed to the design of the study protocol and revised the manuscript. Junior S. Mpiana: revised the manuscript. Lievin K. Mvita: collected and interpreted the CT data. Dieudonné T. Nyembue: de-

signed the study, analyzed the statistical data and revised the manuscript.

Ethics Approval and Consent to Participate

This study involving patient participation was reviewed and approved by the Ethics Committee of the School of Public Health of the University of Kinshasa, as indicated above (approval no. ESP/CE/192/2020). The study was conducted in strict compliance with ethical and deontological rules, according to the principles of the Declaration of Helsinki.

Statement on Data Availability

The raw data used to conduct this study are available and made available to the authors without reservation.

Conflicts of Interest

All authors have declared that they have no conflict of interest in relation to the results generated by this study.

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Appendix

Sino-Nasal Outcome Test (SNOT-22) Questionnaire

Below you will find a list of symptoms and social/emotional consequences of your nasal disorder. We would like to know more about these problems and would appreciate your answering the following questions to the best of your ability. Please assess your health problems over the last two weeks, considering the severity and frequency of the problem when it occurs. Thank you for your participation. Do not hesitate to ask for assistance if necessary.

Please rate each item below by circling the number that corresponds to how you feel, using the following scale:	No Problem	Very Mild Problem	Mild Problem	Moderate Problem	Severe Problem	Very severe problem
1. Need to blow nose	0	1	2	3	4	5
2. Sneezing	0	1	2	3	4	5
3. Runny nose	0	1	2	3	4	5
4. Nasal obstruction	0	1	2	3	4	5
5. Loss of smell or taste	0	1	2	3	4	5
6. Cough	0	1	2	3	4	5
7. Post-nasal discharge	0	1	2	3	4	5
8. Thick nasal discharge	0	1	2	3	4	5
9. Ear fullness	0	1	2	3	4	5
10. Dizziness	0	1	2	3	4	5
11. Ear pain	0	1	2	3	4	5
12. Facial pain/pressure	0	1	2	3	4	5
13. Difficulty falling asleep	0	1	2	3	4	5
14. Waking up at night	0	1	2	3	4	5
15. Lack of a good night's sleep	0	1	2	3	4	5
16. Waking up tired	0	1	2	3	4	5
17. Fatigue	0	1	2	3	4	5
18. Reduced productivity	0	1	2	3	4	5
19. Reduced concentration	0	1	2	3	4	5
20. Frustrated/restless/irritable	0	1	2	3	4	5
21. Sad	0	1	2	3	4	5
22. Embarrassed	0	1	2	3	4	5