

Sino-nasal Outcome Test (SNOT-22):

A predictor of post-surgical improvement in patients with chronic sinusitis

copy with Supplements

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Figure S1: Sino-Nasal Outcome Test-22 Questionnaire

A: Considering how severe the problem is when you experience it and how frequently it happens, please rate each item below on how bad it is by circling the number that corresponds with how you feel using this scale →

	No problem	Very mild problem	Mild or slight problem	Moderate problem	Severe problem	Problem as bad as it can be
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. Cough	0	1	2	3	4	5
5. Post nasal discharge (runs at the back of your throat)	0	1	2	3	4	5
6. Thick nasal discharge	0	1	2	3	4	5
7. Ear fullness	0	1	2	3	4	5
8. Dizziness	0	1	2	3	4	5
9. Ear pain	0	1	2	3	4	5
10. Facial pain/pressure	0	1	2	3	4	5
11. Difficulty falling asleep	0	1	2	3	4	5
12. Waking up at night	0	1	2	3	4	5
13. Lack of a good night's sleep	0	1	2	3	4	5
14. Waking up tired	0	1	2	3	4	5
15. Fatigue	0	1	2	3	4	5
16. Reduced productivity	0	1	2	3	4	5
17. Reduced concentration	0	1	2	3	4	5
18. Frustrated/irritated/irritable	0	1	2	3	4	5
19. Sad	0	1	2	3	4	5
20. Embarrassed	0	1	2	3	4	5
21. Sense of taste/smell	0	1	2	3	4	5
22. Blockage/congestion of nose	0	1	2	3	4	5
TOTAL:						

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SNOT-22
 Standard protocol for all patients presenting for evaluation included completion of the SNOT-22 prior to and following surgical intervention.

Each subject completed the SNOT-22 during a clinic visit by answering all questions based on a 0-5 scale, where

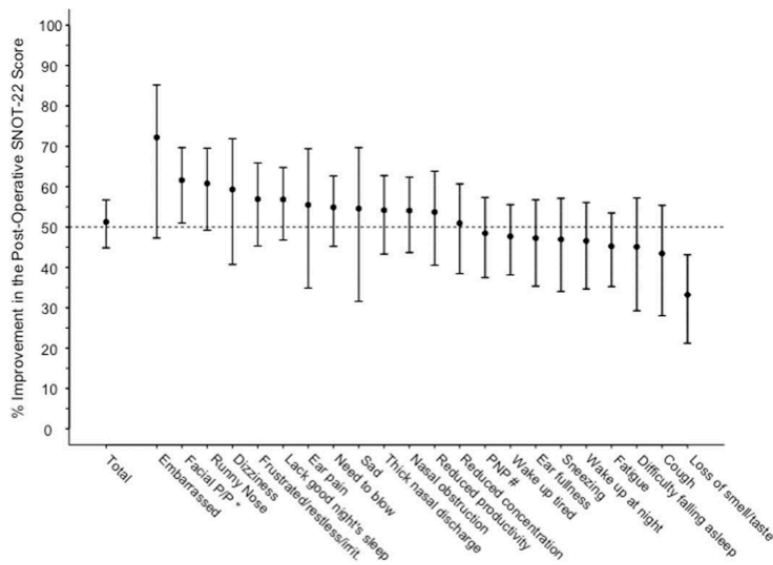
- 0 defines no problems with the given symptom and
- 5 defines maximal problems (supplemental Figure S1).

This is a validated patient-reported measure of outcome established to delineate the presence and severity of sino-nasal disorders.

Results

Kennedy et al.

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*P/P: Pain/Pressure; # PND: Post-nasal Drip

Figure 1. Univariate Analysis of Post-operative Improvement in SNOT-22 Scores by Question
 Abbreviations: PP - pain/pressure (*), PND - post-nasal drip (#).

Table S1. Summary for the post-operative improvement in the mean Snot22 questionnaire score unadjusted for the baseline score.

Question	Estimate % Improvement in Mean Score	Lower 95% Confidence Limit	Upper 95% Confidence Limit
Total	51.1	44.8	56.7
Embarrassed	72.1	47.3	85.2
Facial P/P	61.4	51.0	69.7
Runny Nose	60.6	49.2	69.5
Nasal Obstruction	59.2	40.7	71.9
Frustrated/restless/irritable	56.8	45.3	65.9
Lack of a good night's sleep	56.7	46.8	64.8
Ear pain	55.4	34.9	69.4
Need to blow nose	54.8	45.2	62.7
Sad	54.4	31.6	69.7
Thick nasal discharge	54.0	43.3	62.7
Loss of smell/taste	53.9	43.7	62.3
Reduced productivity	53.6	40.5	63.8
Reduced concentration	50.8	38.5	60.7
PND	48.3	37.5	57.3
Wake up tired	47.5	38.1	55.5
Ear fullness	47.1	35.4	56.7
Sneezing	46.8	34.0	57.1
Wake up at night	46.4	34.7	56.1
Fatigue	45.1	35.2	53.5
Difficulty falling asleep	45.0	29.3	57.2
Cough	43.3	28.0	55.4
Loss of smell/taste	33.1	21.2	43.1

Example Int J Clin Exp Med. 2014; 7(6): 1585–1591.

PMC full text: Published online 2014 Jun 15.

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Table 4

Bin Shen et al. 2014

Comparison of the SNOT-20 scores in patients with CRS with/without NP between preoperative and postoperative

Total Scores (n=60)	Preoperative	Postoperative one month	Postoperative six months	F value	P value
Items of 20	22.47±11.20	8.47±4.82	5.10±3.37	69.03	<0.01
Items of 5	7.82±3.49	3.52±2.00	2.38±1.64	59.33	<0.01

total score = Sum over 60 patients of (individual patient's score) / 60

Kennedy et al.

Table 2

Pre-Operative Score	Absolute Improvement units [95% CI]	Percent Improvement % [95% CI]
15	5.3 [2.6, 7.4]	35.0 [17.1, 49.1]
30	16.1 [13.6, 18.3]	53.7 [45.2, 60.9]
45	25.2 [22.3, 27.8]	56.1 [49.6, 61.7]
60	31.9 [26.4, 36.4]	53.1 [44.0, 60.7]

Versuch einer Erklärung der %-Angaben in Figure 1

- (1) Wenn eine Person bei einer Position ("Question") im SNOT-22-Sheet
- vor der OP: Symptomstärke = 5 und
 - nach der OP: Symptomstärke = 2

eingetragen hat, ist Improvement Score = $(5 - 2) / 5 = 0.6 = 60\%$

- (2) Improvement Score = 50% ergibt sich bei 10 Personen aus

- vor der OP: Symptomstärke = 10 Personen mit Symptomstärke = 5 und
- nach der OP: Symptomstärke = 5 Personen mit Symptomstärke = 3 und 5 Personen mit Symptomstärke = 2

Improvement Score = $(50 - (5 * 3 + 5 * 2)) / 50 = 0.5 = 50\%$

- (3) Table 2

Percent Improvement = Absolute Improvement / Pre-Operative Score * 100%

Zelle 1: Percent Improvement = $5.3/15 * 100\% = 35\%$
 $2.6/15 * 100\% = 17\%$
 $7.4/15 * 100\% = 49\%$

Loss of smell/taste

Table S1

Score 40% (nahe Upper-Confidence-Level-Verbesserung 43%) ergibt sich aus:

- vor der OP: Symptomstärke = 5 und
- nach der OP: Symptomstärke = 3.

Improvement Score = $(5 - 3) / 5 = 0.4 = 40\%$

Score 33% erhält man beim Mittel über 10 Personen so:

- vor der OP: Symptomstärken = 5, 5, 5, 5, 5, 5, 5, 5, 5, 5 (= 10 x 5) und
- nach der OP: Symptomstärken = 3, 3, 3, 3, 3, 4, 4, 4, 4, 4 = 5 x 3 + 5 x 4 = 35

Improvement Score = $(50 - 35) / 50 = 0.3 = 30\%$

Das gibt ein Gefühl für das Maß an Verbesserung durch eine durchschnittlich gelungene OP (Komplikationen nicht berücksichtigt)

Noch genauer hineinschauen

Int J Clin Exp Med. 2014; 7(6): 1585–1591.

Comparison of different surgical approaches of functional endoscopic sinus surgery on patients with chronic rhinosinusitis.

Shen et al. 2014:

Question	Percent Improvement
need to blow nose	66.7%
thick nose discharge	63.3%
dizziness	53.3%
lack of a good night's sleep	40%
reduced concentration	30%

Table 4

Total Scores (n=60)	Preoperative	Postoperative one month	Postoperative six months	F value	P value
Items of 20	22.47±11.20	8.47±4.82	5.10±3.37	69.03	<0.01
Items of 5	7.82±3.49	3.52±2.00	2.38±1.64	59.33	<0.01

total score = Sum over 60 patients of (individual patient's score) / 60

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Danger points, complications and medico-legal aspects in endoscopic sinus surgery

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- on the one hand there is a possibly moderate subjective stress on the patient through his disease, low risk regarding the natural course of the disease and conservative treatment alternatives.
- On the other hand the extent of potential damage and personal consequences from a complication prone surgery should be considered.

The risk potential is higher in transnasal endoscopic rhinoneurosurgery; altogether this accounts for approximately 10% (-25%) of complications. The reported numbers have to be discussed; these apply to heterogenic interventions and patients.

It can be assumed in each case that the values are below those of traditional craniofacial surgery [101], [102].

The otorhinolaryngologist as partner in a rhino-neurosurgical team is confronted with a significantly wider spectrum of possible errors and risks during surgery. Examples are:

- intra- or suprasellar hematomas,
- damages to the chiasma or
- injuries of the parasellar carotid artery,
- postoperative endocrine disorders,
- secondary bleeding of branches of the sphenopalatine artery, postoperative sphenoid sinusitis [101], [103].

Table 1: Complications of endonasal sinus surgery (based on: [62]).

Localization/overall type of injury	"minor complication"	"major complication"
Orbital complication	<ul style="list-style-type: none"> • Orbital emphysema • Ecchymosis of the eyelid 	<ul style="list-style-type: none"> • Orbital hematoma • Reduced visual acuity / blindness • Enophthalmos • Injury of the nasolacrimal duct
Intracranial complication	<ul style="list-style-type: none"> • Uncomplicated CSF fistula 	<ul style="list-style-type: none"> • CSF leak • (Tension-) pneumocephalus • Encephalocele • Brain abscess • Meningitis • Intracranial (subarachnoid) hemorrhage • Direct injury of brain tissue
Bleeding	<ul style="list-style-type: none"> • minor bleeding (stopped with nasal packing, no need for blood transfusion) 	<ul style="list-style-type: none"> • Injury of the ant. ethmoidal artery • Injury of the sphenopalatine artery • Injury of internal carotid artery • Bleeding in need of transfusion
other	<ul style="list-style-type: none"> • Synechiae • Slight exacerbation of pre-existing bronchial asthma • Hyposmia • Local infection (osteitis) • Postoperative MRSA-infection • Atrophic rhinitis • Paraffinoma • Myospherulosis • Temporal irritation of the infraorbital nerve • Hypoesthesia of the lip or teeth 	<ul style="list-style-type: none"> • "Toxic shock syndrome" • Anosmia • Severe exacerbation of a pre-existing bronchial asthma or bronchospasm • Death

MS Curr Top Otorhinolaryngol Head Neck Surg. 2015 Dec 22;14:Doc08. doi: 10.3205/cto000123. eCollection 2015.

Comprehensive review on endonasal endoscopic sinus surgery.

Weber_RK1, Hosemann_W2.

Endoscopic sinus surgery can be considered as safe surgery with a rate of 0.5–1% of severe and 5–7% of light complications [448], [556]. The rates of severe complications are lower in the context of endoscopic technique compared to microscopic or classical endonasal surgery [557].

Mayo Clin Proc. 2011 May; 86(5): 427–443.
doi: 10.4065/mcp.2010.0392

Rhinosinusitis Diagnosis and Management for the Clinician: A Synopsis of Recent Consensus Guidelines

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PMCID: PMC3084646

TABLE 4. Summary of Recent Evidence-Based Guidelines for the Diagnosis of CRS^{3a,b}

Guideline	Criteria for diagnosis	Special assessment recommendations
EP'OS, ¹ 2007	<p>≥2 symptoms lasting >12 wk, 1 of which should be either nasal blockage/obstruction/congestion or nasal discharge (anterior/posterior nasal drip)</p> <p>± Facial pain/pressure</p> <p>± Reduction or loss of smell</p> <p>Objective criteria</p> <p>Endoscopy or rhinoscopy to identify presence/absence of NP</p>	<p>Recommended</p> <p>Endoscopy</p> <p>Anterior rhinoscopy, if endoscopy unavailable</p> <p>Allergy testing, if history is suggestive</p> <p>Not recommended</p> <p>CT for primary care</p> <p>Optional</p> <p>CT for ENT specialists</p>
RI, ² 2004	<p>CRS with or without NP</p> <p>≥2 of the following symptoms for ≥12 wk</p> <p>Anterior and/or posterior mucopurulent drainage</p> <p>Nasal obstruction</p> <p>Facial pain/pressure/fullness (without NP only)</p> <p>Decreased sense of smell (with NP only)</p> <p>Objective criteria</p> <p>Nasal airway examination to confirm or exclude NP and/or to document inflammation</p> <p>Sinus CT not essential but should be strongly considered</p> <p>AFRS</p> <p>≥1 of the symptoms already listed</p> <p>Objective criteria</p> <p>Endoscopy to document presence of allergic mucin^c containing fungal hyphae or culturable fungi and inflammation (eg, edema of middle meatus or ethmoid area, NP)</p> <p>Evidence of fungus-specific IgE (by skin test or in vitro blood test)</p> <p>No histologic evidence of invasive fungal disease</p>	<p>Diagnosis of CRS with or without NP</p> <p>Strongly recommended</p> <p>Nasal airway examination, CT (not essential)</p> <p>Diagnosis of AFRS</p> <p>Recommended</p> <p>Skin test or in vitro blood test for fungus-specific IgE</p> <p>Endoscopy</p> <p>Fungal stain of allergic mucin</p> <p>Optional</p> <p>Fungal culture</p> <p>Total serum IgE</p> <p>Imaging by >1 technique (highly suggestive of diagnosis)</p>
JTFPP, ⁴ 2005	<p>Same symptoms as for ARS</p> <p>Varying severity</p> <p>Duration ≥8 wk</p> <p>May be vague or insidious</p> <p>Objective criteria</p> <p>Abnormal findings on CT or MRI expected</p>	<p>Recommended</p> <p>Allergy testing</p> <p>CT and MRI may be useful to confirm diagnosis in patients with vague symptoms or if symptoms persist despite optimal medical treatment</p> <p>CT is particularly helpful for diagnosis of AFRS</p> <p>Optional</p> <p>Nasal endoscopy</p> <p>Nasal-sinus biopsy</p>
CPG:AS, ⁷ 2007	<p>≥12-wk duration of ≥2 of the following</p> <p>Mucopurulent drainage</p> <p>Nasal obstruction</p> <p>Facial pain/pressure/fullness</p> <p>Decreased sense of smell</p> <p>AND</p> <p>Inflammation documented by ≥1 of the following objective criteria</p> <p>Purulent mucus or edema in the middle meatus or ethmoid region</p> <p>NP in nasal cavity or middle meatus</p> <p>Radiographic imaging showing inflammation of the paranasal sinuses</p>	<p>Recommended requirement for diagnosis</p> <p>Documentation of inflammation by examination through either nasal endoscopy or CT</p> <p>Optional</p> <p>Allergy/immunologic testing to rule out underlying causes of symptoms</p>