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Influence of Interpersonal Traits on Patient Outcomes in the Treatment of Chronic Rhinosinusitis

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Abstract

BACKGROUND—Patient reported outcome measures (PROMs) measure health states in chronic rhinosinusitis (CRS) and have become the dominant metrics of treatment outcomes. Interpersonal traits (IPTs) are patient-specific factors that include personality type, perceived social support, and trust in physicians. The association of IPTs on treatment outcomes among patients with CRS has not been previously described and IPTs may represent important clinical factors influencing treatment outcomes.

METHODS—Adult patients electing medical or surgical treatment for recalcitrant CRS were prospectively enrolled into a multi-institutional, observational outcomes study. Validated measures of IPTs, including: the Big Five Inventory-10 Short Version (BFI-10), Multidimensional Scale of Perceived Social Support (MSPSS) and the Trust in Physician Scale (TPS) were completed and compared to PROMs, including: the 22-item SinoNasal Outcome Test (SNOT-22), the Medical Outcomes Study Short Form-6D (SF-6D), and the Patient Health Questionnaire-2 (PHQ-2).

RESULTS—354 participants were included and followed for an average [$\pm$ standard deviation] of 16.3 [$\pm$ 4.8] months. Significant within-subject improvement in mean PROM scores was reported (all $p < 0.001$). No association was detected between PROM score improvement and baseline BFI-10 or MSPSS scores ($p > 0.050$). Significant, but weak, absolute correlations were reported

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between baseline TPS scores and improvement in SNOT-22, SF-6D and PHQ-2 total scores ($p < 0.050$; $R_p = 0.138$).

CONCLUSIONS—Personality type and perceived social support do not associate with improvement following treatment for CRS. However, increased trust in physicians is weakly associated with greater post-treatment improvement. Further study is needed to examine the relationship between physician trust, patient satisfaction and treatment outcomes among patients with CRS.

Keywords

Medical Subject Headings - Key Words: Sinusitis; endoscopy; chronic disease; personality; trust; sociological factors; patient outcome assessment

INTRODUCTION

Patient reported outcome measures (PROMs) are utilized as a measure of health states in chronic rhinosinusitis (CRS) and have become the dominant metrics through which outcomes are determined.^{1–3} The utilization of PROMs to determine success ensures that outcomes are patient-centered and reflect changes in health states perceived by the patient, as opposed to biomarkers or other objective measures which may not correlate with patient experience.^{4,5} However, PROMs may be influenced by factors unrelated to the disease of interest, potentially confounding outcomes assessment and determination of success. Interpersonal traits (IPTs) are patient-specific factors that include personality type, perceived social support, and trust in physicians. Previous studies have described associations between IPTs and measures of healthcare engagement and retention among patients with chronic diseases, factors which could influence outcomes.^{6–8} The impact of IPTs on PROMs would be critical to understand, considering some are not modifiable (eg. personality type), some are modifiable but likely beyond the influence of the physician (eg. social support), and others might be directly influenced (eg. trust in physician).

The influence of IPTs on treatment outcomes among patients with CRS has not been previously described and represents a potentially important clinical factor with implications for outcomes assessment. This study therefore seeks to test the hypothesis that among patients undergoing treatment for CRS, measures of self-reported personality type, perceived social support, and trust in physicians are associated with differences in post-treatment improvement across PROMs.

MATERIALS and METHODS

Study Inclusion Criteria and Treatment Modality

Adult patients (≥ 18 years old) with a diagnosis of medically refractory CRS were prospectively enrolled into a multi-institutional, observational, cohort study to compare the effectiveness of treatment outcomes. Findings from this investigation have been previously described.^{9–12} Enrollment locations consisted of four academic, tertiary care practices, including: the Oregon Health & Science University (OHSU, Portland, OR, USA), the Medical University of South Carolina (Charleston, SC, USA), Stanford University (Palo

Alto, CA, USA), and the University of Calgary (Calgary, Alberta, Canada). The Institutional Review Board at each enrollment location provided oversight and annual study review, while central review and coordination was conducted at OHSU.

A diagnosis of CRS was confirmed via the Adult Sinusitis Guidelines, and all patients had failed initial medical treatment with broad spectrum or culture directed oral antibiotics (2 weeks) and either topical nasal corticosteroid sprays (3 weeks) or a 5-day trial of systemic steroid therapy.^{13,14} Patients received personalized physician counseling regarding subsequent treatment options per the standard of care.

Treatment modality selection was not randomized or assigned for study purposes from the time of enrollment. Patients elected to either continue physician-directed medical management or to pursue endoscopic sinus surgery (ESS). Study patients were categorized into either a continued medical therapy (CMT) or surgical treatment cohort. Patients in the CMT cohort received topical corticosteroid sprays and nasal saline irrigations, with adjunctive medications per physician discretion and current recommendations.^{15,16} Primary or revision ESS procedures consisted of either unilateral or bilateral maxillary antrostomy, partial or total ethmoidectomy, sphenoidotomy, or frontal sinusotomy (Draf IIa, IIb, or III), with septoplasty and inferior turbinate reductions as adjunctive procedures.

Exclusion Criteria

Due to alterations and disruptions in therapeutic regimens during the perioperative period, participants who originally elected CMT but later opted for ESS (eg treatment ‘cross over’) during the study follow-up period were excluded from study inclusion to increase treatment homogeneity. Study participants who did not complete all baseline survey evaluations or failed to provide any study-related follow-up evaluations were also excluded from final analyses.

Clinical Measures of Sinonasal Inflammation

Computed tomography (CT) imaging, without contrast, was utilized to assess CRS severity. Radiographic staging was completed by enrolling physicians at each site in accordance with the Lund-Mackay scoring system (score: 0–24) which quantifies the severity of sinonasal opacification.¹⁷ Sinonasal regions were evaluated using rigid, fiber-optic endoscopes (Karl Storz, Tuttlingen, Germany) during both baseline evaluations and follow-up clinical appointments. Bilateral endoscopic examinations were staged by enrolling physicians using the Lund-Kennedy scoring system (score: 0–20) which estimates pathologic characteristics within the paranasal sinuses.¹⁸ Higher total scores on both staging systems reflect worse overall disease severity.

Measures of Interpersonal Traits

Patient personality and trait profiles were evaluated using the Big Five Inventory-10 Short Version (BFI-10).¹⁸ This validated 10-item instrument evaluates five independent principal personality dimensions/domains including: conscientiousness, extraversion, agreeableness, openness, and neuroticism using Likert-scale responses (score: 1–5). Higher average total and individual dimension Likert scores reflect a greater degree of personality trait.

Patient social support was evaluated using the Multidimensional Scale of Perceived Social Support (MSPSS).¹⁹ The MSPSS is comprised of 12-items which include three domains used to evaluate perceived social support received from: family, friends, and significant others. Higher average scores for each subscale reflect greater degrees of perceived support (score: 1–7).

Physician trust was also evaluated using the Trust in Physician Scale (TPS).²⁰ This instrument consists of 11 survey items scored using Likert-scale responses ranging from 1 (“Strongly disagree”) to 5 (“Strongly agree”). A summarized measure of physician trust is calculated using the unweighted average of each item response and transforming the value to a 0–100 score range, with higher values indicating greater physician trust. Study participants were asked to consider the physician providing treatment for symptoms related to CRS.

Evaluation of IPTs were completed during baseline study enrollment.

Patient Reported Outcome Measures

Study participants were asked to complete the 22-item SinoNasal Outcome Test (SNOT-22) to evaluate the symptom severity of CRS (©2006, Washington University, St. Louis, MO). The SNOT-22 is a validated, treatment outcome measure applicable to chronic sinonasal conditions.²¹ Individual item scores are measured using patient selected responses on a Likert scale where higher scores indicate worse symptom severity. Higher total scores on the SNOT-22 suggest worse patient functioning or symptom severity (score: 0–110). Factory analysis of the SNOT-22 survey categorized survey items into five distinct domains including: rhinologic symptoms (score: 0–30), extra-nasal rhinologic symptoms (score: 0–15), ear/facial symptoms (score: 0–25), psychological dysfunction symptoms (score: 0–35), and sleep dysfunction symptoms (score: 0–25).²²

Study participants were also asked to complete the Medical Outcomes Study Short Form-6D (SF-6D) during each study evaluation time point. The SF-6D is a subset of questions extracted from the 36-item Medical Outcomes Study Short-Form (SF-36) survey and includes general-health survey inquiries measuring physical functioning, role limitations, social functioning, bodily pain, mental health, and vitality using Likert scale responses. Item scores were transformed into a standardized health utility value using a weighted algorithm described by Brazier et al. and used with permission from the Department of Health Economics and Decision Science at the University of Sheffield, Sheffield, United Kingdom.²³ This algorithm determines a normalized value that an individual patient places on their particular health state (score: 0.3 – 1.0) where lower values represent lower/worse valuations of health state and 1.0 representing perfect health.

Lastly, study participants were asked to complete the Patient Health Questionnaire-2 (PHQ-2) as a validated screening tool for depressive disorders. The PHQ-2 is comprised of two questions from the 9-item Patient Health Questionnaire, and queries patients about the severity of depressed mood and anhedonia (score: 0–6). Participants are asked to report how frequently they have experienced: 1) little interest or pleasure in doing things and 2) feeling down, depressed, or hopeless in the past two weeks using responses ranging from: 0= ‘Not at all’ to 3= ‘Nearly every day’.²⁴

All PROMs were completed during baseline enrollment meetings and during a follow-up evaluation for up to 18 months after the initial enrollment date. Study data from the last available follow-up was compared to baseline measures and utilized for analysis. Enrolling physicians were blinded to all IPT measures and PROM's for the study duration.

Data Management and Statistical Analysis

All statistical analyses were completed using commercial software (SPSS v.22, IBM Corp., Armonk, NY). Descriptive and graphical analysis was used to evaluate assumptions of data normality and linearity. Within-subjects post-treatment improvements over time were evaluated using two-tailed, paired t-test statistics with the last available PROM score.^{3,25} Linear associations between IPT measures and PROMs were evaluated with Pearson's correlation coefficients (R_p). Effect estimate magnitudes (β) were evaluated between IPT scores and PROMs using simple, bivariate linear regression modeling. Means, [standard deviations], and 95% confidence intervals (CIs) were reported where appropriate. Statistically significant associations were reported using a 0.050 type-I error probability threshold (alpha level).

RESULTS

Final Cohort and Baseline Evaluations

Study participants with CRS who met inclusion criteria (n=683) were enrolled between March, 2011 and June, 2013. Participants who did not complete baseline measure of interpersonal traits (n=234) or provide study follow-up evaluations (n=95) were excluded from final analyses. Cohort characteristics are described for all remaining study participants (n=354) in Table 1 while baseline measures of interpersonal traits are described in Table 2.

Overall outcomes across all patients

Regardless of treatment modality, study participants were followed through their standard of care for 16.3[4.8] months after baseline enrollment (range: 4 – 31 months). Mean endoscopy scores improved significantly for all study participants, with an average endoscopy improvement of -3.1[4.1] units over the study period (95% CI: -2.6 to -3.7; $p<0.001$). Mean differences in within-subject post-treatment PROM scores from baseline to last available follow-up for the total study cohort are described in Table 3. Highly significant within-subject improvement in all mean PROM scores were reported over time ($p<0.001$).

Association between Baseline Interpersonal Traits and Treatment Outcomes

Patient personality and trait profiles—Mean baseline BFI item score was 3.3[0.4] with the conscientiousness domain receiving the highest mean item domain score and the neuroticism domain receiving the lowest (Table 2). Patient personality and trait profile, as measured by baseline BFI-10 domain scores, was not associated with post-treatment improvement in SNOT-22 total scores, SF-6D, or PHQ-2 ($p>0.050$ for all).

Patient perceived social support—Mean baseline MSPSS item score was 6.0[1.0] with similar mean item scores reported across all domains (Table 2). Perceived level of social

support, as measured by baseline MSPSS item score, was also not associated with changes in SNOT-22 total scores, SF-6D, or PHQ-2 ($p>0.050$ for all).

Patient trust in physician—Mean baseline TPS score was 68.8[14.4] (Table 2). Baseline TPS scores were found to be significant but weakly correlated with post-treatment improvements in SNOT-22 total scores, such that the lower the baseline TPS score the less mean improvement after treatment reported by the patient ($R_p = -0.116$). Similar correlations between TPS and changes after treatment were seen for Rhinologic ($R_p = -0.139$), Extra-nasal ($R_p = -0.127$), and Psychological dysfunction ($R_p = -0.122$) domains of the SNOT-22 (Table 4). Baseline TPS scores were also significantly but weakly associated with changes in SF-6D health utility scores ($R_p = 0.124$) and PHQ-2 scores ($R_p = -0.129$). The effect estimate magnitudes (β) for IPT associations between baseline IPT measures and post-treatment improvement in PROM scores are also shown in (Table 4).

Association between IPTs and PROMs by treatment type

Baseline IPTs and treatment outcome measures were separately evaluated for CMT and ESS cohorts. Among patients electing CMT ($n=66$), no significant correlations were detected between baseline IPT scores and any post-treatment improvements in PROMs ($R_p = 0.190$; $p>0.050$). Among patients undergoing ESS ($n=288$), baseline BFI-10 total scores and MSPSS domain scores were not significantly correlated with any PROM change score ($R_p = 0.111$; $p>0.050$). Baseline TPS mean total scores were significantly, but weakly correlated with postoperative improvements in SNOT-22 mean total scores, as well as Rhinologic symptom, Extra-nasal symptoms, and Psychological dysfunction domain scores of the SNOT-22 (Table 5).

DISCUSSION

Previous investigations have found no association between IPTs and treatment decision making among patients with CRS.²⁶ However, the association between baseline IPTs and treatment outcomes has not been previously reported among patients with CRS, and could represent an important clinical variable with the potential to influence patient-reported outcomes. Patients report improvement in multiple PROMs following treatment for CRS, consistent with previous study.^{3,25,27,28} While measures of patient personality (BFI-10) and peer support (MSPSS) did not correlate with CRS outcomes, statistically significant but weak associations were found between TPS scores and post-treatment improvement in several PROMs, including the SNOT-22, SF-6D and PHQ-2 measures. The association between TPS scores and treatment outcomes was greatest for those undergoing ESS.

Measures of self-reported personality among patients with CRS are consistent with those seen in a broad population, with mean item BFI-10 scores comparable to scores from a representative sample of a European population (range 2.57–3.96).²⁹ Likewise, measures of self-reported peer support among patients with CRS were comparable to a broad population, with similar MSPSS scores from both university students and breast cancer patients.^{7,30} Regardless, the lack of association between BFI-10, MSPSS, and PROM scores among CRS patients suggests that these measures of patient personality and peer-support may not influence treatment outcomes among patients with CRS. These findings have implications

for clinical care and research. From a physician standpoint, one can feel comfortable that patient personality type is unlikely to impact patient-reported outcome metrics, an important point as we enter an era of increased focus on individual surgeon performance and a concurrent reliance on PROMs to determine success in CRS.

Trust in physicians represents a global attribute of treatment relationships, encompassing aspects of patient satisfaction, communication, competency and privacy.³¹ Trust in physicians correlates positively with adherence to treatment recommendations, perceived effectiveness of care, and improvement in self-reported health.^{32–34} Patients with CRS report a wide range of TPS scores, with comparable results to patients with other chronic diseases.^{6,35,36} The association between trust in physicians and treatment outcomes among patients with chronic disease have been previously evaluated. Graham et al.³⁵ followed 178 patients with newly diagnosed human immunodeficiency virus, demonstrating a significant association between TPS scores and retention in care, but not adherence to medical therapies. Barton et al.⁶ evaluated factors associated with shared decision making (SDM) among 509 patients with rheumatoid arthritis, finding that TPS score was independently associated with SDM. Lobo et al.³⁶ examined factors associated with patient outcomes among 670 patients with fibromyalgia, demonstrating that TPS score was significantly associated with improvements in self-reported pain.

Trust in physician scores correlate weakly with outcome measures among patients with CRS. While the current study reports a statistically significant relationship between TPS score and several PROMs, the associated increase in SNOT-22 score of 0.18 per score unit increase of the TPS represents an absolute impact which is less than the minimal clinically important difference for subjective clinical change.²¹ The fact that this correlation is small in magnitude is not entirely unexpected. The majority of patients in this study underwent ESS, an intervention known to result in large improvements in PROM scores over time. It is not logical to expect variations in a patient's trust in their physician to result in impacts on a similar absolute scale as surgery. However, this data suggests that the physician-patient relationship does potentially impact patient-reported outcomes in CRS, even if on an absolute scale much lower than discrete interventions such as surgery.

The mechanisms resulting in the significant association between TPS and treatment outcomes are currently unknown among patients with CRS, but may relate to improved patient compliance and/or retention. Alternatively, scores could simply represent placebo effect or reporting bias. Patient compliance represents a logical factor influencing treatment outcome, with improved adherence to postoperative medications and treatments, such as sinonasal irrigations or topical steroids. However, previous study found no association between TPS score and compliance among patients with newly diagnosed HIV and further study would need to investigate this mechanism within CRS.³⁵ Patient satisfaction also represents a component of physician trust, and may influence patient compliance and subsequent outcomes among patients with CRS.³¹ Future study is needed to explore the complex relationship between physician trust, medical adherence, care retention, and treatment outcomes among patients with CRS.

There are several limitations in the current study. This multi-institutional cohort consists of academic, tertiary care centers and therefore may not be applicable to all patients with CRS, particularly those in other practice settings which may report different IPT profiles. All IPTs were evaluated from the perspective of the patient and may differ from more objective evaluations or assessments performed from other perspectives. Study methods did not investigate other comorbid psychological disorders which could confound both baseline IPT and PROM scores, although these would not be expected to be prevalent.^{2,37} Additionally, the CMT cohort is likely underpowered to detect the small effect size demonstrated between IPTs and PROM measures and therefore conclusions should not be made that IPTs do not influence medical treatment outcomes.

CONCLUSIONS

Personality type and perceived social support are not associated with changes in PROM scores after treatment for CRS. However, increased trust in physicians is weakly associated with improvements in QOL, health state utility, and depressive symptoms, although of relatively small clinical effect. Further study is needed to examine the relationship between physician trust, patient satisfaction and treatment outcomes among patients with CRS.

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Table 1

Descriptive statistics for final study cohort (n=354)

Final Cohort Characteristics:	Mean [SD]	Range (LL, UL)	N (%)
Age (years at enrollment)	51.4 [14.8]	(18 – 86)	
Females			190 (54%)
White/Caucasian			301 (85%)
Hispanic/Latino			17 (5%)
Asthma			122 (35%)
Nasal polyposis			137 (39%)
Allergy (mRAST/skin prick testing)			126 (36%)
Aspirin intolerance			34 (10%)
Septal deviation			137 (39%)
Turbinate hypertrophy			47 (13%)
Depression (self-report)			61 (17%)
Prior endoscopic sinus surgery			192 (54%)
Corticosteroid dependent conditions			23 (7%)
Lund-Mackay CT score	12.4 [6.1]	(0 – 24)	
Lund-Kennedy endoscopy score	6.4 [4.0]	(0 – 20)	
Continued medical therapy treatment			66 (19%)
Endoscopic sinus surgery treatment			288 (81%)
Disease-specific PROMs:	Mean [SD]	Range (LL, UL)	N (%)
SNOT-22 total score	51.4 [19.0]	(4 – 106)	
Rhinologic symptom domain	16.3 [6.0]	(0 – 30)	
Extra-nasal symptom domain	8.4 [3.3]	(0 – 15)	
Ear / facial symptom domain	9.1 [5.0]	(0 – 23)	
Psychological dysfunction domain	15.0 [8.3]	(0 – 35)	
Sleep dysfunction domain	13.0 [6.7]	(0 – 25)	
SF-6D Health utility score	0.69 [0.14]	(0.34 – 1.00)	
PHQ-2 Depression screening score	1.5 [1.6]	(0 – 6)	

SD, standard deviation; N, sample size; LL, lower limit; UL, upper limit; mRAST, modified radioallergosorbent test; CT, computed tomography; PROMs, patient reported outcome measures; SNOT-22, 22-item SinoNasal Outcome Test; SF-6D, the Medical Outcomes Study Short Form-6D; PHQ-2, the 2-item Patient Health Questionnaire depression screening survey.

Table 2

Baseline measures of interpersonal traits (n=354)

Interpersonal Trait Measures:	Mean [SD]	Range (LL – UL)
BFI-10 total score	3.3 [0.4]	(1.9 – 4.7)
Conscientiousness domain	4.3 [0.8]	(2.0 – 5.0)
Extraversion domain	3.3 [1.1]	(1.0 – 5.0)
Agreeableness domain	3.8 [0.9]	(1.0 – 5.0)
Openness domain	3.5 [1.0]	(1.0 – 5.0)
Neuroticism domain	2.7 [1.1]	(1.0 – 5.0)
MSPSS total score	6.0 [1.0]	(1.0 – 7.0)
Friends domain	6.0 [1.2]	(1.0 – 7.0)
Family members domain	5.7 [1.3]	(1.0 – 7.0)
Special persons domain	6.2 [1.2]	(1.0 – 7.0)
TPS total score	68.8 [14.4]	(13.6 – 100.0)

SD, standard deviation; BFI-10, Big Five Inventory-10 Short Version survey; MSPSS, Multidimensional Scale of Perceived Social Support survey; TPS, Trust in Physician Scale; LL, lower limit; UL, upper limit.

Table 3

Mean within-subjects improvements in PROM scores

Disease-specific PROMs:	Mean [SD]	95% CI (LL, UL)	t-test statistic
SNOT-22 Total Score	−20.4 [22.4] *	(−22.8, −18.1)	17.2
Rhinologic symptom domain	−6.7 [7.7] *	(−7.5, −5.9)	16.3
Extra-nasal symptom domain	−3.2 [4.0] *	(−3.7, −2.8)	15.4
Ear / facial symptom domain	−3.9 [5.2] *	(−4.5, −3.4)	14.3
Psychological dysfunction domain	−5.8 [8.4] *	(−6.7, −4.9)	12.9
Sleep dysfunction domain	−4.8 [7.0] *	(−5.5, −4.0)	12.8
SF-6D Health utility score	0.06 [0.14] *	(0.04, 0.07)	−7.8
PHQ-2 Depression screening score	−0.5 [1.5] *	(−0.6, −0.3)	6.3

* indicates significant within-subjects improvement over time ($p < 0.001$). SD, standard deviation; SNOT-22, 22-item SinoNasal Outcome Test; SF-6D, the Medical Outcomes Study Short Form-6D; PHQ-2, the 2-item Patient Health Questionnaire depression screening survey. CI, confidence interval; LL, lower limit; UL, upper limit.

Table 4

Correlation coefficients (Rp) between interpersonal trait measures and within-subject improvements in PROM scores for total cohort (n=354)

	TPS total score (Rp)	TPS total score (β)	p-value
SNOT-22 total score	-0.116 *	-0.180 *	0.030
Rhinologic symptom domain	-0.139 *	-0.075 *	0.009
Extra-nasal symptom domain	-0.127 *	-0.035 *	0.017
Ear / facial symptom domain	-0.038	-0.014	0.475
Psychological dysfunction domain	-0.122 *	-0.072 *	0.022
Sleep dysfunction domain	-0.079	-0.038	0.140
SF-6D Health utility score	0.124 *	0.001 *	0.021
PHQ-2 Depression screening score	-0.129 *	-0.013 *	0.015

* p-values <0.050. Rp, Pearson's correlation coefficient (unadjusted; two-tailed); TPS, Trust in Physician Scale; PROM, patient reported outcome measure; SNOT-22, 22-item SinoNasal Outcome Test; SF-6D, the Medical Outcomes Study Short Form-6D; PHQ-2, the 2-item Patient Health Questionnaire depression screening survey. β , Effect estimate magnitudes;

Table 5

Correlation coefficients (Rp) between interpersonal trait measures and within-subject improvements in PROM scores for each treatment modality

Postoperative Change Measures:	TPS total Score (Rp) CMT	p-value	TPS total Score (Rp) ESS	p-value
SNOT-22 total score	0.009	0.946	−0.127 *	0.031
Rhinologic symptom domain	−0.036	0.777	−0.151 *	0.011
Extra-nasal symptom domain	0.004	0.973	−0.143 *	0.015
Ear / Facial symptom domain	−0.015	0.905	−0.027	0.643
Psychological dysfunction domain	−0.004	0.972	−0.133 *	0.024
Sleep dysfunction domain	0.095	0.447	−0.103	0.082
SF-6D Health utility score	0.190	0.126	0.102	0.086
PHQ-2 Depression screening score	−0.172	0.168	−0.114	0.054

* p-values <0.050. CMT, continued medical therapy; ESS, endoscopic sinus surgery; Rp, Pearson's correlation coefficient (unadjusted; two-tailed); TPS, Trust in Physician Scale; PROM, patient reported outcome measure; SNOT-22, 22-item SinoNasal Outcome Test; SF-6D, the Medical Outcomes Study Short Form-6D; PHQ-2, the 2-item Patient Health Questionnaire depression screening survey.