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FACIAL PLASTICS: FUNCTIONAL RHINOPLASTY(TD WANG AND CZ JOHNSON, SECTION EDITORS)

Patient Reported Outcome Measures for Functional and Aesthetic Rhinoplasty

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Abstract

Purpose of Review Rhinoplasty is the most common aesthetic and functional plastic surgery performed in the USA. While the facial plastic surgeon can analyze before and after photographs or other objective criteria, success in rhinoplasty is ultimately determined by the patient's perception of the surgical outcome. The purpose of this review is to categorize and discuss validated outcome measures for functional and aesthetic rhinoplasty.

Recent Findings Patient reported outcome measures (PROMs) are increasingly used as a measure of healthcare quality. In the realm of facial plastic and reconstructive surgery, there are PROMs that are more general and those that are targeted to a specific procedure.

Summary This review of PROMs used in facial plastic surgery will discuss aesthetic only measures, functional only measures, and those measures with both functional and aesthetic components. The authors recommend the use of a PROM that has both functional and aesthetic components to best capture patient satisfaction postoperatively.

Keywords Rhinoplasty · Patient reported outcome measures · Quality of life · Cosmetic surgery · Nasal valve · Functional rhinoplasty

Introduction

Rhinoplasty is the most common aesthetic and functional plastic surgery performed in the USA. In 2020, 352,555 rhinoplasties were reported, a number which has remained relatively steady over the past decade [1]. While the facial plastic surgeon can analyze before and after photographs or other objective criteria, success in rhinoplasty is ultimately determined by the patient's perception of the surgical outcome. Naturally, the patient and the surgeon will assess the nose in different fashions. It has been shown that while patients and surgeons have reasonable agreement regarding the overall appearance of the nose, they differ on their analysis of surgical details such as tip dimensions, straightness, nostril show, and width [2]. Additionally, the patient's change in appearance may have a dramatic impact on their self-perception that might not be captured by an objective measurement. It has been demonstrated that objective measures frequently do not correlate with subjective patient reported outcomes of nasal surgery [3].

Patient reported outcome measures (PROMs) are increasingly used as a measure of healthcare quality. In the realm of facial plastic and reconstructive surgery, there are PROMs that are more general and those that are targeted to a specific procedure [4]. In a 2017 review, Barone et al. identified only ten rhinoplasty specific PROMs [5••]. These were further

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subdivided by those that are functional self-assessments, aesthetic self-assessments, and both aesthetic and functional self-assessments [5••]. Xiao et al. in 2019 reviewed only PROMs that covered both functional and aesthetic self-assessments, such as the Rhinoplasty Outcomes Evaluation, Functional Rhinoplasty Outcome Inventory, and Standardized Cosmesis and Health Nasal Outcomes Survey, and emphasized the benefits of using multi-functional PROMs rather than single purpose PROMs after rhinoplasty [4].

Aesthetic Only PROMs

The Facial Appearance Sorting Test (FAST) was the earliest PROM for rhinoplasty, published in 1989 [6]. It is a simple exercise for the patient, where 18 cards with crude drawings based on preoperative and postoperative rhinoplasty appearance are ranked by the patient in order from most pleasing to least pleasing appearances. The patient then indicates which of the 18 cards they most resemble. This position is recorded along with their ranks of the cards overall. The patients undergoing rhinoplasty, as opposed to non-cosmetic procedures, demonstrated an improvement in perception of appearance at the 6-month postoperative mark [6]. While there are clear practical drawbacks to this test, such as the need to store cards and the time it takes for an evaluator to record the ranks of the patient's cards, it is a simple test for the patient.

The Derriford Appearance Scale (DAS) was developed in the UK to assess the need for plastic surgery in patients and analyze postoperative outcomes. The goal of the DAS was mainly to demonstrate the benefit of and justify the need for plastic surgery within the National Health Service (NHS) [7]. While not specific for rhinoplasty, it was developed to apply to all plastic surgery patients. The original 59-item DAS was published in 2001, and a refined version with 24 items was published in 2005 by the same authors [8, 9].

The Utrecht Questionnaire was designed as a short, user-friendly questionnaire to assess outcomes of aesthetic rhinoplasty. Published in 2013, it consists of five questions rated on a Likert scale and a single visual analogue scale (VAS) that assess the appearance of the nose. Notably two of the questions are "trick questions" that aim to identify patients with body dysmorphic disorder (BDD) [10]. On a similar note, the Expectations of Aesthetic Rhinoplasty Scale (EARS) was developed in Iran with the goal of measuring preoperative expectations and to differentiate between patients with and without BDD. Their initial study showed that EARS scores correlated with psychological symptoms and that patients with BDD had significantly higher preoperative expectations [11].

The FACE-Q rhinoplasty module began development in 2010 with patient input to evaluate satisfaction in surgical and non-surgical aesthetic patients by evaluating criteria such as appearance, quality of life, and adverse effects [12•]. It is the most comprehensive aesthetic PROM discussed in this review. The FACE-Q consists of 25 items over multiple scales, which rate satisfaction with nose, nostrils, and facial appearance as well as psychological and social function. The patients demonstrated higher scores across all scales after rhinoplasty as compared to preoperative scores. It features a four-question adverse effect scale, with the most common answer being skin of nose looking thick or swollen. Satisfaction with nose and nostril scores were lower in those participants specifically bothered by two adverse effects — the skin of the nose looking thick or swollen as well as unnatural appearing bumps and hollows on the nose [12•].

If using an aesthetic only outcome measurement, the authors of this review recommend the FACE-Q module. Other studies have replicated these results by reporting FACE-Q scores in pre and postoperative rhinoplasty patients. Schwitzer et al. demonstrated increased satisfaction with facial appearance, psychological well-being, and social function after rhinoplasty. Additionally, after rhinoplasty, the patients reported a significant increase in satisfaction with nose items [13].

Functional Only PROMs

The Nasal Obstruction Symptom Evaluation (NOSE) is a scaled questionnaire developed in 2004 and is the most widely used scale for functional rhinoplasty, also known as nasal valve repair (NVR) [14•]. Questions target the patient's subjective experience of nasal stuffiness, obstruction, and ability to breathe nasally during rest, exertion, and sleep. It consists of five scaled questions whose sum is multiplied by five. The most severe nasal obstruction is represented by a score of 100. Originating in 2003, this questionnaire has good test–retest reliability and internal consistency reliability with high rates of response sensitivity. The goal of the NOSE is to objectively quantify disease-specific health status between groups of patients or consistent groups across time and, thus, compare treatment plans and treatment efficacy [14•].

Functional septorhinoplasty (NVR) via augmentation of the nasal valve and septum encompasses a vast and heterogeneous array of surgical options [15, 16]. This currently prevents definitive conclusions to be drawn regarding superiority between techniques for particular patient presentations [15]. Meta-analysis of adults with moderate to severe preintervention NOSE scores, mean pooled score of 67 (95% CI, 61–74), experienced 43- to 50-point reductions status-postfunctional septorhinoplasty [15]. Similar preintervention scores were seen in Stewart et al., albeit NOSE scores only reduced by 31- to 37-points [17]. Importantly, Stewart

et al. only performed septoplasty, while the meta-analysis incorporated septorhinoplasty [14•, 15, 17]. This difference may be due to the manipulation of the nasal valves. However, definitive conclusions cannot be made due to the heterogenicity of studies incorporated into the meta-analysis [15]. A systematic review incorporating both septoplasty and septorhinoplasty showed a 35-to-60-point reduction in NOSE scores [18].

Conventional thinking regarding aesthetic nasal surgery is that "final" aesthetic appearance is not seen until 1 year postoperatively due to nasal tip swelling. Regarding functional rhinoplasty, this does not appear to be the case. In-group comparison 1-to-3 months and greater than 1-year postintervention did not show significant difference in NOSE scores [15, 16, 19]. Given the robustness of the underlying data, it is suggested that the 3-month outcomes can serve as a proxy for 1-year outcomes measured by NOSE scores [16].

The Sinonasal Outcomes Test (SNOT)-20 questionnaire originated from the 31-item Rhinosinusitis Outcome Measure (RSOM-31) by removal of 11 redundant items. Two items of interest, nasal obstruction and olfaction, were later added to form the SNOT-22 [20]. Scoring for each of the 22 questions is marked on a 0 to 5 scale for a maximum score of 110 with lower scores representing less symptomatic patients. SNOT-22 captures not only the functional status of the nose, but also the psychological sequalae in functional septorhinoplasty [20].

Commonly in practice, the SNOT-22 is used to stratify chronic rhinosinusitis severity. In the context of septoplasty and turbinate reduction, multiple authors have proposed correlation and even interchangeability of SNOT-22, NOSE, and VAS questionnaires [20, 21]. On the contrary, nasal inspiratory peak flow (NIPF) does not correlate with the SNOT-22, NOSE or VAS despite all measures significantly improving post-intervention [22]. Although this has been refuted by many authors, these differences suggest that a patient's subjective perception of nasal obstruction may not correlate with objective measures [23]. Interestingly, the patients' subjective perception of nasal obstruction is not strongly associated with objective assessment of disease severity [18]. In contrast to moderate or severely obstructed, mildly obstructive patients undergoing septoplasty may not benefit and may even experience degraded quality of life [24]. As disease severity increases, it is common for the surgeon to perform conventional open approach versus endonasal septorhinoplasty. There is not currently a stratification tool or indication of when to perform one over the other [25]. However, patient satisfaction measured by NOSE does not differ between approaches despite a longer operating time and longer healing period reported with an open approach [26].

The Internal Nasal Valve (INV) scale, proposed in 2018, is a 0 to 2 point scale grading the visibility of the middle turbinate for functional septorhinoplasty [23]. A score of 0 is full visibility, a score of 1 is partial visibility, and a score of 2 is a fully obscured head of middle turbinate on anterior rhinoscopy. Despite the high interrater and test–retest reliability, recent publications and computational dynamic studies of the region suggest structural variability [23]. This suggests that anterior rhinoscopy may not be sufficient; however, the authors had significant improvements in NOSE and VAS scores using the INV scale. Significance with SNOT-22 was not seen, but the authors argue this is due to the extra, non-functionally related questions in this questionnaire not present in the NOSE or VAS [23].

The Nasal Surgical Questionnaire (NSQ) is a less commonly used but available scale that was developed in Norway. It consists of three VAS items evaluating obstruction during the day, night, and while exercising, followed by Likert-scale items evaluating nasal symptoms and medication use. The NSQ was initially tested on healthy volunteers to show reliability and validity [27]. After initial development, it was tested preoperatively and 6 to 8 months postoperatively on 75 patients that underwent septoplasty. There was no significant difference among preoperative VAS scores between male and female, smokers and non-smokers, and allergic and non-allergic patients. All the items addressing symptoms showed a statistically significant improvement after septoplasty [28]. A drawback of the NSQ is that there is no well-established minimum clinically significant improvement in VAS scores [28]. Additionally, while the survey is patient friendly, there is not a single digit score to record and easily quantify improvement levels for the surgeon.

Functional and Aesthetic PROMs

It is widely accepted in facial plastic surgery and otolaryngology that nasal function and aesthetics are closely related. Thus, it follows that a purely functional or purely aesthetic outcome measure may not fully capture patient satisfaction. Even in purely aesthetic rhinoplasty patients, it is useful to evaluate the functional aspect of their nasal surgery as well.

The Rhinoplasty Outcomes Evaluation (ROE) is a widely used scale with excellent reliability, validity, and consistency scores. A 2001 study evaluated outcomes evaluations for rhinoplasty (ROE), facelift (FOE), blepharoplasty (BOE), and skin rejuvenation (SROE). The patients did experience a significant increase in quality of life after rhinoplasty. However, rhinoplasty had the lowest change in the mean patient satisfaction score (44.5%) of all the studied procedures and was below than the mean overall increase of 46.9% [29]. The major drawback of this scale is that it was developed without any patient input or feedback [12•]. While the ROE was the first published outcomes measure addressing both functional and aesthetic outcomes after rhinoplasty, it leans

Table 1 Comparison of rhinoplasty outcome measures

	Number of Items	Functional	Aesthetic	Reliable	Valid	Developed with patient input*
FAST	18		X	X	X	
GBI	18		X	X	X	X
Utrecht Questionnaire	6		X			
EARS	6		X	X	X	
FACE-Q	25		X	X	X	X
NSQ	17	X		X	X	
NOSE	5	X		X	X	X
SNOT-22	22	X		X	X	
INV	1	X		X	X	
ROE	6	X	X	X	X	
FROI-17	17	X	X	X	X	X
RHINO	10	X	X	X	X	
SCHNOS	10	X	X	X	X	X

*Developed with patient input = questions created or narrowed down based on patient responses, not simply survey validation on a pilot group.

toward measuring aesthetic outcomes. Of the ROE's six-item questionnaire, five items focus on aesthetic outcomes [30]. More balanced PROMs have since been proposed.

The Glasgow Benefit Inventory (GBI) is an 18-item measure of patient quality of life benefit developed especially for otolaryngological interventions with the goal of creating a common metric to compare benefit across interventions. The GBI was developed with patient input and was shown to have high sensitivity to the five initially tested operations: rhinoplasty, middle ear surgery to improve hearing, middle ear surgery to remove disease process, cochlear implantation, and tonsillectomy [31]. Further studies have confirmed improvements in GBI criteria and QoL after functional and aesthetic rhinoplasty [32–34]. While not specific to rhinoplasty, it is a useful and reliable tool for the surgeon to compare rhinoplasty outcomes among operations.

The Functional Rhinoplasty Outcome Inventory 17 (FROI-17) is a 17-item questionnaire published in 2014 and developed with patient input. It has subscores for nasal symptoms, general symptoms, and self-confidence [30]. Further work from the authors compared both the FROI-17 and the ROE to the Short Form 36 Health Survey (SF-36), which is a non-specific QoL outcome measure with eight scales. The FROI-17 and the ROE both improved postoperatively, but only the FROI-17 displayed a positive correlation with the SF-36 [35].

The Rhinoplasty Health Inventory and Nasal Outcomes (RHINO) scale is a 10-item questionnaire designed as a comprehensive evaluation of QoL for both functional and aesthetic rhinoplasty [36]. It was shown to be reliable and valid in a pilot survey of 22 patients [36]. An excellent point raised by the authors of the RHINO scale is that when an outcome measure addresses both functional and aesthetic concerns, it can better capture if a patient is satisfied with a functional outcome but not with their aesthetic outcome, and vice versa [36].

The Standardized Cosmesis and Health Nasal Outcomes Survey (SCHNOS) was developed most recently of all the discussed combined outcome measures. The 10-item survey is subdivided into SCHNOS-O (questions 1–4) and SCHNOS-C (questions 5–10) [37]. The minimum clinically significant difference for the SCHNOS-O and SCHNOS-C has been shown to be 28 and 18 points, respectively [38]. In the initial study, SCHNOS-O and SCHNOS-C items were directly compared to the NOSE questionnaire and FACE-Q. The SCHNOS-O had excellent correlation with the NOSE questionnaire. A statistical correlation of the SCHNOS-C to the FACE-Q was not provided but Moubayed et al. propose that the SCHNOS-C is a comprehensive but less burdensome cosmetic survey. This was based on patient interviews in survey development indicating they were less concerned about their nostrils or adverse effects, which the FACE-Q covers in depth. Due to these findings, the authors recommend administering the SCHNOS as a stand-alone outcome measure [37]. The natural history of the SCHNOS score in patients undergoing functional and cosmetic rhinoplasty demonstrates improvement in both components of the SCHNOS as early as 2-months postoperatively. The improvements in SCHNOS-O and SCHNOS-C scores were sustained at the 12-month follow up period [39].

Conclusions

A comparison of all previously reviewed outcome measures for rhinoplasty is provided in Table 1.

Given the close relationship of nasal function and aesthetics, a purely functional or purely aesthetic outcome measure may not fully capture patient satisfaction. Even in primarily aesthetic rhinoplasty patients, it is useful to evaluate the functional outcome of their nasal surgery as well. Satisfaction with the aesthetic or functional component of rhinoplasty does not necessarily mean that the patient is satisfied with both aspects. Aesthetic satisfaction may decrease postoperatively while functional satisfaction increases, and vice versa. The authors of this review recommend the use of a PROM that assesses both functional and aesthetic outcomes for all septorhinoplasty procedures.

Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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