

Clinical Practice Guideline: Improving Nasal Form and Function after Rhinoplasty

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Abstract

Objective. Rhinoplasty, a surgical procedure that alters the shape or appearance of the nose while preserving or enhancing the nasal airway, ranks among the most commonly performed cosmetic procedures in the United States, with >200,000 procedures reported in 2014. While it is difficult to calculate the exact economic burden incurred by rhinoplasty patients following surgery with or without complications, the average rhinoplasty procedure typically exceeds \$4000. The costs incurred due to complications, infections, or revision surgery may include the cost of long-term antibiotics, hospitalization, or lost revenue from hours/days of missed work.

The resultant psychological impact of rhinoplasty can also be significant. Furthermore, the health care burden from psychological pressures of nasal deformities/aesthetic shortcomings, surgical infections, surgical pain, side effects from antibiotics, and nasal packing materials must also be considered for these patients. Prior to this guideline, limited literature existed on standard care considerations for pre- and postsurgical management and for standard surgical practice to ensure optimal outcomes for patients undergoing rhinoplasty. The impetus for this guideline is to utilize current evidence-based medicine practices and data to build unanimity regarding the peri- and postoperative strategies to maximize patient safety and to optimize surgical results for patients.

Purpose. The primary purpose of this guideline is to provide evidence-based recommendations for clinicians who either perform rhinoplasty or are involved in the care of a rhinoplasty candidate, as well as to optimize patient care, promote effective diagnosis and therapy, and reduce harmful or unnecessary variations in care. The target audience is any clinician or individual, in any setting, involved in the management of these patients. The target patient population is all patients aged ≥15 years. The guideline is intended to focus

on knowledge gaps, practice variations, and clinical concerns associated with this surgical procedure; it is not intended to be a comprehensive reference for improving nasal form and function after rhinoplasty. Recommendations in this guideline concerning education and counseling to the patient are also intended to include the caregiver if the patient is <18 years of age.

Action Statements. The Guideline Development Group made the following *recommendations*: (1) Clinicians should ask all patients seeking rhinoplasty about their motivations for surgery and their expectations for outcomes, should provide feedback on whether those expectations are a realistic goal of surgery, and should document this discussion in the medical record. (2) Clinicians should assess rhinoplasty candidates for comorbid conditions that could modify or contraindicate surgery, including obstructive sleep apnea, body dysmorphic disorder, bleeding disorders, or chronic use of topical vasoconstrictive intranasal drugs. (3) The surgeon, or the surgeon's designee, should evaluate the rhinoplasty candidate for nasal airway obstruction during the preoperative assessment. (4) The surgeon, or the surgeon's designee, should educate rhinoplasty candidates regarding what to expect after surgery, how surgery might affect the ability to breathe through the nose, potential complications of surgery, and the possible need for future nasal surgery. (5) The clinician, or the clinician's designee, should counsel rhinoplasty candidates with documented obstructive sleep apnea about the impact of surgery on nasal airway obstruction and how obstructive sleep apnea might affect perioperative management. (6) The surgeon, or the surgeon's designee, should educate rhinoplasty patients before surgery about strategies to manage discomfort after surgery. (7) Clinicians should document patients' satisfaction with their nasal appearance and with their nasal function at a minimum of 12 months after rhinoplasty.

The Guideline Development Group made *recommendations against* certain actions: (1) When a surgeon, or the surgeon's designee, chooses to administer perioperative antibiotics for rhinoplasty, he or she should not routinely prescribe antibiotic therapy for a duration >24 hours after surgery. (2)

Surgeons should not routinely place packing in the nasal cavity of rhinoplasty patients (with or without septoplasty) at the conclusion of surgery.

The panel group made the following statement an *option*: (1) The surgeon, or the surgeon's designee, may administer perioperative systemic steroids to the rhinoplasty patient.

Keywords

rhinoplasty, septorhinoplasty, functional or cosmetic surgery or nose surgery, nasal valve, nasal surgery, nasal deformity, nasal obstruction, nasal injury

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Introduction

Rhinoplasty—a surgical procedure that alters the shape or appearance of the nose while preserving or enhancing the nasal airway—ranks among the most commonly performed cosmetic procedures in the United States, with >200,000 procedures reported annually.¹ As facial cosmetic enhancement has become more routine and socially acceptable, the procedure has increased in popularity in the United States and around the world.² In Latin American countries, rhinoplasty is the most commonly performed facial cosmetic procedure.²

Rhinoplasty is more than just a cosmetic procedure because it often seeks to enhance function by improving nasal respiration and relieving obstruction that is congenital or acquired. This dual role is reflected in the following qualifying statements to the term *rhinoplasty* as used in this guideline (see **Tables 1** and **2** for additional definitions of words used in the guideline):

- Rhinoplasty is defined as a surgical procedure that alters the shape or appearance of the nose while

preserving or enhancing the nasal airway. The change in appearance may be a consequence of addressing a functional abnormality (eg, deviated caudal septum, nasal valve compromise) and for cosmetic purposes (eg, an incidental cosmetic procedure).

- The primary reason for surgery can be aesthetic, functional, or both, and it may include adjunctive procedures on the nasal septum, nasal valve, nasal turbinates, or the paranasal sinuses.
- When these adjunctive procedures, however, are performed without an impact on nasal shape or appearance, they do not meet the definition of rhinoplasty and are therefore excluded from further consideration in this guideline—for example, septoplasty alone without an incidental or intended cosmetic component.

As increasing numbers of rhinoplasty procedures are performed, it is important to reduce surgical morbidity, promote appropriate therapy, engage patients in their care, and coordinate care effectively. There does not exist, however, any standard in this regard for counseling rhinoplasty patients, evaluating comorbid conditions (eg, bleeding disorders, obstructive sleep apnea [OSA], body dysmorphic disorder [BDD]), or assessing surgical outcomes or for the perioperative use of steroids, antibiotics, intranasal packing, or pain medications.

Despite the popularity and importance of rhinoplasty, there are currently no evidence-based multidisciplinary clinical practice guidelines to assist clinicians and patients in preoperative consultation, planning care, and working together through shared decision making to optimize clinical outcomes. This guideline was created to address this need, and the remainder of the introduction briefly highlights some of the clinical decisions that confront clinicians.

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The clinical practice guideline is not intended as the sole source of guidance in managing candidates for rhinoplasty. Rather, it is designed to assist clinicians by providing an evidence-based framework for decision-making strategies. The guideline is not intended to replace clinical judgment or establish a protocol for all individuals with this condition and may not provide the only appropriate approach to diagnosing and managing this program of care. As medical knowledge expands and technology advances, clinical indicators and guidelines are promoted as conditional and provisional proposals of what is recommended under specific conditions but are not absolute. Guidelines are not mandates. These do not and should not purport to be a legal standard of care. The responsible physician, in light of all circumstances presented by the individual patient, must determine the appropriate treatment. Adherence to these guidelines will not ensure successful patient outcomes in every situation. The American Academy of Otolaryngology—Head and Neck Surgery Foundation emphasizes that these clinical guidelines should not be deemed to include all proper treatment decisions or methods of care or to exclude other treatment decisions or methods of care reasonably directed to obtaining the same results.

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Table 1. Definitions of Words Used in the Guideline.

Rhinoplasty	Rhinoplasty is a surgical procedure that alters the shape or appearance of the nose while preserving or enhancing the nasal airway. The primary reason for surgery can be aesthetic, functional, or both and may include adjunctive procedures on the septum, turbinates, or paranasal sinuses. (When these adjunctive procedures, however, are performed without an impact on nasal shape or appearance, they do not meet the definition of rhinoplasty used in this guideline.)
Aesthetic	Concerned with beauty or the appreciation of beauty.
Body dysmorphic disorder	Psychiatric disorder consisting of distressing or impairing preoccupation with nonexistent or slight defects in one's appearance.
Cosmetic	Relating to treatment intended to restore or improve appearance.
Rhinitis	Inflammation of the mucus membranes of the nose frequently caused by infection or allergic reaction. It typically manifests with symptoms of nasal itching, increased mucus drainage, congestion, or postnasal drainage.
Obstructive sleep apnea	Sleep disorder involving at least 5 obstructive respiratory events per hour (detected during an overnight sleep study).
Nasal cycle	The often unnoticed alternating partial congestion and decongestion of the nasal cavities in humans and other animals. It is a physiologic congestion of the nasal turbinates due to selective activation of the autonomic nervous system on 1 side of the nose.
Anterior rhinoscopy	Examination of the anterior part of the nose, including the inferior turbinate, the septum, and the nasal valves.
Nasal packing	Nasal packing is material, either removable or absorbable, placed inside the nose to promote hemostasis, structural support, and reduction of scar formation. Traditional nasal packs include ribbon gauze, expandable nonbiodegradable pads, and nonstick dressing material. ¹¹⁵ There are many newer types of packing that are biodegradable. Silastic stents or nasal splints and custom-cut sheeting are not considered packing.

Table 2. Nasal Anatomy Definitions.

Upper lateral cartilage	The lateral cartilage piece of the nose, triangular in shape, meeting with the nasal bones superiorly and the lower lateral cartilages inferiorly and fusing with the septum in the midline.
Lower lateral cartilage	Thin flexible plate of cartilage folded on itself and situated just below the upper lateral cartilage. It makes up the medial and lateral wall of the nostril.
Internal nasal valve	Refers to the area bordered by the upper lateral cartilage laterally, the septum medially, the head of the inferior turbinate, and the floor of the nose.
External nasal valve	Refers to the area bordered by the lateral limb of the lower lateral cartilage laterally, the medial limb of the lower lateral cartilage and the septum medially, and the floor of the nose.
Nasal septum	Wall of cartilage and bone that runs down the middle of the nose dividing it into left and right nasal passages.
Nasal turbinates	Long narrow curved shelves of bone covered in mucus membrane and protruding into the nasal passage.

Rhinoplasty Controversies and Challenges

Variability exists in rhinoplasty goals and techniques, depending on factors such as patient preference and facial features. Rhinoplasty addresses myriad anatomic problems—including dorsal humps, bulbous nasal tips, twisted noses, tip rotation, nasal valve compromise, and projection concerns, to name a few. However, a growing body of evidence supports methods to optimize care in the perioperative period regardless of the specific anatomy corrected or technique used. Areas to expand the evidence base, which may support less variability in care, include the preoperative physical and psychosocial evaluation; the perioperative medication administration for bleeding, swelling, infection, and pain; and the use of supporting materials, such as nasal grafts and splints, among others.³⁻⁷ Furthermore,

opportunities exist to optimize the pre- and postoperative management of patients with OSA, a unique rhinoplasty patient population.⁸

The rhinoplasty procedure can be of tremendous benefit toward improving self-esteem among those with concerns about their nasal appearance. However, physicians consulting preoperatively with patients for rhinoplasty must consider patient expectations and motivations.⁹⁻¹¹ Body dysmorphic disorder (BDD)—where patients have obsessive ideas about their appearance out of proportion to their actual deformity—commonly manifests with nasal concerns.^{12,13} Patients with BDD are best served with other treatments, as opposed to surgery.⁵ Furthermore, given the intent of rhinoplasty to change nasal appearance, rhinoplasty surgeons must be cautious to

Anatomy of the Nose

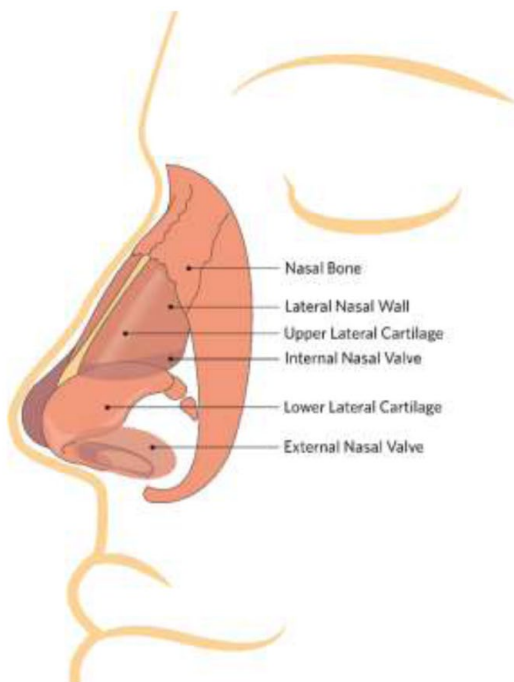


Figure 1. Oblique view of nose.

thoroughly understand the patient's desires for the procedure. Preoperative patient photographs may be reviewed with the patient, and image morphing may be useful to understand patient desires.¹⁴ However, it must be emphasized that the results shown in morphing are those that are desired but not guaranteed.

For the preoperative physical examination, the rhinoplasty surgeon should thoroughly evaluate skin quality, cartilage strength and position, nasal airway, and surrounding facial features. Skin quality varies by thickness and the presence of sebaceous tissue, which affect the result based on the ability to show underlying cartilaginous detail. A thorough examination via anterior rhinoscopy can reveal nasal components, including the presence or absence of caudal nasal obstruction (eg, septal deflection), while an endoscopic examination can reveal more posterior airway findings. **Figures 1-4** provide illustrations of several views of the anatomy of the nose.

Rhinoplasty—particularly with an external surgical approach involving elevation of the soft tissue flap—may result in postoperative soft tissue edema, with patients noting the presence of a “swollen nose.” The swollen appearance may persist as a source of patient and surgeon dissatisfaction for weeks or months, depending on the type of procedure and the individual skin thickness. Methods described to minimize postoperative edema include intra- and postoperative administration of steroids.^{3,6,15} Postoperative pain from rhinoplasty remains a concern and a possible deterrent to surgery for prospective patients. Studies assessing advances in the procedure, including pre- and intraoperative administration of analgesics, resulted in lower postoperative pain scores and less postoperative pain medication consumption.^{4,16}

Anatomy of the Nose

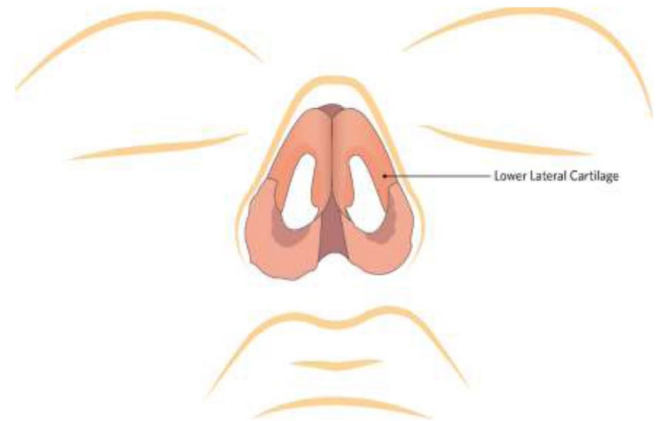


Figure 2. Base view of nose.

Anatomy of the Nose

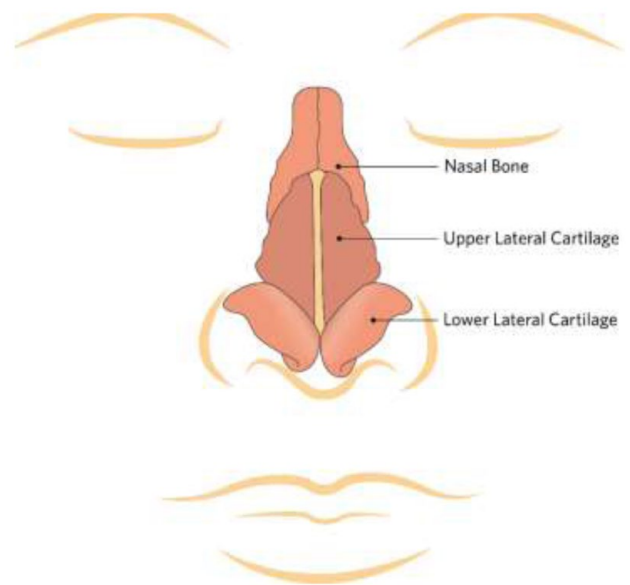


Figure 3. Frontal view of nose: I.

Other studies evaluated the postoperative utilization of intranasal packing and external nasal splints, a current source of variability among rhinoplasty surgeons and a source of anxiety among patients.⁷ While the risk of postoperative infection after rhinoplasty is generally low, perioperative antibiotics may minimize the risk of postoperative infection after rhinoplasty, although questions persist surrounding duration.^{17,18}

Guideline Purpose

The primary purpose of this guideline is to provide evidence-based recommendations for clinicians who either perform rhinoplasty or are involved in the care of a rhinoplasty candidate, as well as to optimize patient care, promote effective

Anatomy of the Nose

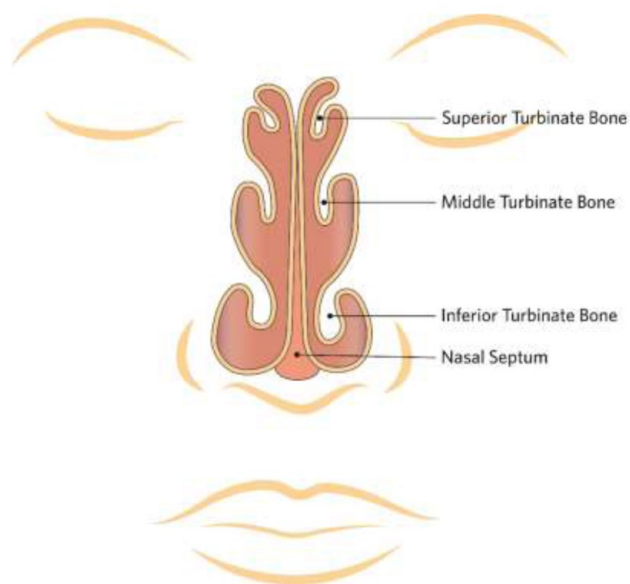


Figure 4. Frontal view of nose: 2.

diagnosis and therapy, and reduce harmful or unnecessary variations in care. The target audience is any clinician or individual, in any setting, involved in the management of these patients. The target population is all patients aged ≥ 15 years. The guideline is intended to focus on knowledge gaps, practice variations, and clinical concerns associated with this surgical procedure; it is not intended to be a comprehensive reference for improving nasal form and function after rhinoplasty. Recommendations in this guideline concerning education and counseling to the patient are also intended to include the caregiver, particularly if the patient is < 18 years of age.

Currently, variations in the goals and techniques used in rhinoplasty procedures exist. They are influenced by myriad factors that include the patient's preferences and facial features and the psychosocial effects and potential patient burden, pre- and post-operatively. This is the first evidence-based clinical practice guideline developed to address rhinoplasty, with the goal of providing clinicians and those involved in the management of these patients with a logical framework to improve patient care by using a specific set of focused recommendations based on an established and transparent process that considers levels of evidence, harm-benefit balance, and expert consensus.¹⁹ These recommendations may also be used to develop performance measures and identify avenues for quality improvement. The topics and issues considered in the development of this guideline are categorized by the National Quality Strategy (NQS) for the improvement of health care and are included as an online appendix (see Appendix S1 in the online version of the article).

Health Care Burden

Rhinoplasty provides the opportunity for direct surgical intervention to correct nasal deformities and anatomic variations

to alleviate nasal airway obstruction and improve overall nasal shape and aesthetics. According to the American Society of Plastic Surgeons' annual plastic surgery report, rhinoplasty/nose reshaping ranked second on the list of the 5 most common cosmetic operations, with approximately 217,000 procedures performed.¹ Of those, 162,000 (75%) rhinoplasty procedures were performed on women, with the most common (32%) age range being 20 to 29 years.

Ponsky et al found that of 100 patients screened prior to rhinoplasty, the male:female ratio was 20:80, with an average age of 37 (range, 15-64).²⁰ The majority of the cases presenting with subjective nasal obstruction (78%) required concomitant septal (90%) and turbinate (81%) surgery. Total expenditures on rhinoplasty in 2014 exceeded just US\$1 billion and was third only to breast augmentation and fillers.

Psychopathology and Rhinoplasty

There is a high potential burden or risk taken by both the patient and the surgeon when cosmetic surgery is performed on patients with preexisting psychopathology or BDD regardless of surgical outcome. A high incidence of predisposing psychopathology has been identified among patients desiring rhinoplasty.²¹ Because rhinoplasty significantly alters the appearance of patients ("type change"), they may require more psychological support than with other surgery. Interestingly, most patients who found benefit from rhinoplasty continue to notice the effects even 5 years after surgery, with reported improvement in social relationships²¹; however, patient dissatisfaction after surgery carries an additional burden, even if the surgeon considered the surgery objectively successful.

Individuals with BDD, or dysmorphophobia, account for approximately 5% of all patients desiring rhinoplasty; it is also the most common surgical procedure received by patients with BDD. They are typically young, depressive, and anxious, and they usually focus on minor, even nonexistent, deformities of the nose. They tend to feel generally unattractive; they are frequently preoccupied with the appearance of multiple body areas, believing that they look deformed or ugly; and they are usually dissatisfied with the outcome of cosmetic procedures, including rhinoplasty.²² These patients may live in social isolation and have unreasonable expectations for post-operative changes in quality of life. Honigman et al reviewed the literature on psychological and psychosocial outcomes for individuals undergoing cosmetic rhinoplasty to address whether it improved psychological well-being and psychosocial functioning and whether there were identifiable predictors of an unsatisfactory psychological outcome.²² They concluded that patients generally appeared satisfied with the outcome, although some exhibited transient and lingering psychological disturbance.

Factors associated with poor psychosocial outcome after rhinoplasty include being young and male and having unrealistic preoperative expectations, previous unsatisfactory cosmetic surgery, minimal preoperative deformity, a motivation for surgery based on personal relationship issues, as well as a history of depression, anxiety, or personality disorder.²³

Preoperative BDD was also found to be a predictor of poor outcome, warranting prescreening of individuals in cosmetic surgery settings. It is desirable to identify such patients before the operation.⁵

Cost and Complications

While it is difficult to calculate the exact economic burden incurred by rhinoplasty patients following surgery with or without complications, the average rhinoplasty procedure typically exceeds \$4000, not including anesthesia, operating room facilities, and other related expenses.^{1,24} The costs incurred due to complications, infections, or revision surgery may include long-term antibiotics, hospitalization, or lost revenue from hours/days of missed work. The resultant psychological impact can also be significant and in many ways immeasurable.

From a surgical perspective, the burden of postoperative wound infection or other complications has been reported as 2%.²⁰ Factors that may influence these complications include surgeon experience, choice of graft or suture materials, and comorbid conditions such as smoking or diabetes, which can lead to poor wound healing. Ponsky et al reported that most common rhinoplasty procedures include osteotomy, cephalic trim, dorsal nasal hump removal, and alar base resection.²⁰ Autologous cartilage grafts from the septum, ear, or rib are the most common graft materials. These are most commonly placed at the alar rim, as spreader grafts, alar batten grafts, or columella strut grafts, while interdomal or transdomal sutures were the most common suture technique. Winkler et al reported a postoperative infection rate of 2.8% (19 of 662 cases) in cases with alloplastic implants.²⁵

To minimize the incidence of postoperative infection, surgeons frequently prescribe antibiotics after rhinoplasty despite lack of standard criteria.²⁶ Many studies reported very low rates of local soft tissue infection (0.48%-0.6%) after septorhinoplasty among patients who were not given prophylactic antibiotics.²⁷⁻²⁹ Of the estimated 220,000 rhinoplasties performed per year in the United States, rhinoplasty surgeons reported that approximately 91% routinely use antibiotics.¹ Of that entire percentage, nearly 34% use antibiotics regularly for prophylaxis, while 37% decide on prophylaxis on a case-by-case basis, with 20% using antibiotics for long or contaminated cases. Additionally, a study conducted by Grunebaum and Reiter found that 49% of surgeons used antibiotics postoperatively for >24 hours, 43% gave 1 dose, and 11% continued the regimen for 24 hours after surgery.³⁰ These data suggest that antibiotics may be prescribed more than needed in approximately 100,000 rhinoplasty cases. This may further contribute to the risks of microbial resistance and/or untoward patient side effects, such as rash, gastrointestinal sequelae, and *Clostridium difficile* colitis, as well as increased patient morbidity.

OSA and Rhinoplasty

A major ongoing health care burden often related to nasal and upper airway obstruction is OSA, defined as increased events of obstructive breathing during sleep, which is common in adults. In a random sample of individuals aged 30 to 60 years,

the prevalence of OSA—defined by an apnea-hypopnea index (AHI) >5 events/hour—was 9% in women and 24% in men.³¹ OSA contributes to a substantial economic burden on society, with potential costs attributed to diagnosis and treatment, diminished quality of life, medical consequences, motor vehicle accidents (estimated to cost \$15.9 billion in 2000), and occupational losses.³² The estimated annual cost of treating the medical sequelae of OSA is \$3.4 billion in the United States.³²

Post-rhinoplasty, the burden of managing OSA can be challenging. For patients using nasal continuous positive airway pressure (CPAP) devices preoperatively, clinicians must consider the utility of nasal packing, wound care, and the timing to reinstatement of CPAP use. In a recent survey, 407 rhinoplasty surgeons reported that many of them temporarily suspend CPAP after nasal surgery, typically for a period of 1 to 2 weeks.³³ In the same study, many surgeons reported suspending CPAP postoperatively with minimal complications. The lack of uniformity on OSA screening preoperatively and reintroduction of postoperative CPAP poses a potential health burden on the patient.

Methods

This guideline was developed with an explicit and transparent a priori protocol for creating actionable statements based on supporting evidence and the associated balance of benefit and harm as outlined in the third edition of the “Clinical Practice Guideline Development Manual: A Quality-Driven Approach for Translating Evidence into Action.”¹⁹ The Guideline Development Group (GDG) consisted of 16 panel members representing experts in advanced practice nursing, plastic surgery, consumer advocacy, facial plastic and reconstructive surgery, otolaryngology, otology, psychiatry, plastic surgery, rhinology, and sleep medicine.

Literature Search

An information specialist conducted 3 literature searches from May 2015 through December 2015, using a validated filter strategy, to identify clinical practice guidelines, systematic reviews, and randomized controlled trials. The search terms used were as follows:

((rhinoplasty OR rhinoplasties OR septorhinoplasty OR septorhinoplasties OR ((functional OR cosmetic) AND (“nasal surgery” OR “nose surgery”))) ((“nasal valve” AND airflow) OR “nasal valve repair” OR “nasal valve surgery”)) (((rhinoplasty OR rhinoplasties OR septorhinoplasty OR septorhinoplasties OR ((functional OR cosmetic) AND (“nasal surgery” OR “nose surgery”))) (((“nasal valve” AND airflow) OR “nasal valve repair” OR “nasal valve surgery”))).

These search terms were used to capture all evidence on the population, incorporating all relevant treatments and outcomes.

The English-language searches were performed in multiple databases: HSTAT, AHRQ, BIOSIS Previews, CAB Abstracts, AMED, EMBASE, GIN International Guideline Library, Cochrane Library (Cochrane Database of Systematic Reviews, DARE, HTA Database, NHS EED), Australian National Health

and Medical Research Council, New Zealand Guidelines Group, SIGN, TRIP Database, NICE Evidence (includes NHS Evidence ENT & Audiology and National Library of Guidelines), CMA Infobase, National Guideline Clearinghouse, PubMed Search, Web of Science, and the Cumulative Index to Nursing and Allied Health Literature.

The initial English-language search identified 21 clinical practice guidelines, 116 systematic reviews, and 171 randomized controlled trials published in 2005 or later. Systematic reviews were emphasized and included if they met quality criteria of (1) clear objective and methods, (2) an explicit search strategy, and (3) valid data extraction. Randomized controlled trials were included if they met quality criteria of (1) randomization, (2) double blinding, and (3) a clear description of participant withdrawals and dropouts. Additional evidence was identified, as needed, with targeted searches to support the GDG in writing sections of the guideline text. After removing duplicates, irrelevant references, and non-English-language articles, we retained 0 guidelines, 25 systematic reviews, and 48 randomized controlled trials. In certain instances, targeted searches were performed by GDG members to address gaps from the systematic searches, identified in writing the guideline from November 2015 through July 2016. These additional searches yielded 1 additional clinical practice guideline and 4 additional systematic reviews. Therefore, in total, the evidence supporting this guideline includes 1 guideline, 22 systematic reviews, and 19 randomized controlled trials.

In a series of conference calls, the working group defined the scope and objectives of the proposed guideline. During the 16 months devoted to guideline development (ending in August 2016), the group met twice, with in-person meetings following the format previously described,³⁴ and it used electronic decision support software (BRIDGE-Wiz; Yale Center for Medical Informatics, New Haven, Connecticut) to facilitate creating actionable recommendations and evidence profiles.³⁵ Internal electronic review and feedback on each guideline draft were used to ensure accuracy of content and consistency with standardized criteria for reporting clinical practice guidelines.³⁶

American Academy of Otolaryngology—Head and Neck Surgery Foundation (AAO-HNSF) staff used the Guideline Implementability Appraisal and Extractor to appraise adherence of the draft guideline to methodological standards, to improve clarity of recommendations, and to predict potential obstacles to implementation.³⁷ Guideline panel members received summary appraisals in February 2016 and modified an advanced draft of the guideline. The final guideline draft underwent extensive external peer review. Comments were compiled and reviewed by the panel's chair and co-chairs, and a modified version of the guideline was distributed and approved by the guideline development panel. A scheduled review process will occur at 5 years from publication or sooner if new compelling evidence warrants earlier consideration.

Classification of Evidence-Based Statements

Guidelines are intended to produce optimal health outcomes for patients, to minimize harms, and to reduce inappropriate

variations in clinical care. The evidence-based approach to guideline development requires that the evidence supporting a policy be identified, appraised, and summarized and that an explicit link between evidence and statements be defined. Evidence-based statements reflect both the quality of evidence and the balance of benefit and harm that is anticipated when the statement is followed. The definitions for evidence-based statements are listed in **Tables 3** and **4**.³⁸⁻⁴⁰

Guidelines are not intended to supersede professional judgment but, rather, may be viewed as a relative constraint on individual clinician discretion in a particular clinical circumstance. Less frequent variation in practice is expected for a “strong recommendation” than for a “recommendation.” “Options” offer the most opportunity for practice variability.⁴⁰ Clinicians should always act and decide in a way that they believe will best serve their patients' interests and needs, regardless of guideline recommendations. They must also operate within their scope of practice and according to their training. Guidelines represent the best judgment of a team of experienced clinicians and methodologists addressing the scientific evidence for a particular topic.⁴⁰ Making recommendations about health practices involves value judgments on the desirability of various outcomes associated with management options. Values applied by the guideline panel sought to minimize harm and diminish unnecessary and inappropriate therapy. A major goal of the panel was to be transparent and explicit about how values were applied and to document the process.

Financial Disclosure and Conflicts of Interest

The cost of developing this guideline, including the travel expenses of all panel members, was covered in full by the AAO-HNSF. Potential conflicts of interest for all panel members in the past 2 years were compiled and distributed before the first conference call. After review and discussion of these disclosures,⁴¹ the panel concluded that individuals with potential conflicts could remain on the panel if they (1) reminded the panel of potential conflicts before any related discussion, (2) recused themselves from a related discussion if asked by the panel, and (3) agreed not to discuss any aspect of the guideline with industry before publication. Last, panelists were reminded that conflicts of interest extend beyond financial relationships and may include personal experiences, how a participant earns a living, and the participant's previously established “stake” in an issue.⁴²

Guideline Key Action Statements

Each evidence-based statement is organized in a similar fashion: an evidence-based key action statement in bold, followed by the strength of the recommendation in italics. Each key action statement is followed by an “action statement profile” of aggregate evidence quality, level of confidence in the evidence, benefit-harm assessment, and statement of costs. Additionally, there is an explicit statement of any value judgments, the role of patient preferences, clarification of any intentional vagueness by the panel, exceptions to the statement, any differences of opinion,

Table 3. Aggregate Grades of Evidence by Question Type.^a

Grade	CEBM Level	Treatment	Harm	Diagnosis	Prognosis
A	1	Systematic review ^b of randomized trials	Systematic review ^b of randomized trials, nested case-control studies, or observational studies with dramatic effect	Systematic review ^b of cross-sectional studies with consistently applied reference standard and blinding	Systematic review ^b of inception cohort studies ^c
B	2	Randomized trials or observational studies with dramatic effects or highly consistent evidence	Randomized trials or observational studies with dramatic effects or highly consistent evidence	Cross-sectional studies with consistently applied reference standard and blinding	Inception cohort studies ^c
C	3-4	Nonrandomized or historically controlled studies, including case-control and observational studies	Nonrandomized controlled cohort or follow-up study (postmarketing surveillance) with sufficient numbers to rule out a common harm. case series, case-control, or historically controlled studies	Nonconsecutive studies; case-control studies; or studies with poor, nonindependent, or inconsistently applied reference standards	Cohort study; control arm of a randomized trial; case series or case-control study; poor-quality prognostic cohort study
D	5	Case reports, mechanism-based reasoning, or reasoning from first principles			
X	N/A	Exceptional situations where validating studies cannot be performed and there is a clear preponderance of benefit over harm.			

Abbreviations: CEBM, Oxford Centre for Evidence-Based Medicine; N/A, not applicable.

^aAdapted from Howick and coworkers.³⁹

^bA systematic review may be downgraded to level B because of study limitations, heterogeneity, or imprecision.

^cA group of individuals identified for subsequent study at an early uniform point in the course of the specified health condition or before the condition develops.

Table 4. Guideline Definitions for Evidence-Based Statements.

Statement	Definition	Implication
Strong recommendation	A strong recommendation means that the benefits of the recommended approach clearly exceed the harms (or that the harms clearly exceed the benefits, in the case of a strong negative recommendation) and that the quality of the supporting evidence is excellent (grade A or B). ^a In some clearly identified circumstances, strong recommendations may be made on the basis of lesser evidence, when high-quality evidence is impossible to obtain and the anticipated benefits strongly outweigh the harms.	Clinicians should follow a strong recommendation unless a clear and compelling rationale for an alternative approach is present.
Recommendation	A recommendation means that the benefits exceed the harms (or that the harms exceed the benefits, in the case of a negative recommendation) but that the quality of evidence is not as strong (grade B or C). ^a In some clearly identified circumstances, recommendations may be based on lesser evidence when high-quality evidence is impossible to obtain and the anticipated benefits outweigh the harms.	Clinicians should also generally follow a recommendation but should remain alert to new information and sensitive to patient preferences.
Option	An option means either that the quality of evidence that exists is suspect (grade D) ^a or that well-done studies (grade A, B, or C) ^a show little clear advantage to one approach versus another.	Clinicians should be flexible in their decision making regarding appropriate practice, although they may set bounds on alternatives. Patient preference should have a substantial influencing role.

^aAmerican Academy of Pediatrics classification scheme.⁴⁰

and a repeat statement of the strength of the recommendation. Several paragraphs subsequently discuss the evidence base supporting the statement. An overview of each evidence-based statement in this guideline can be found in **Table 5**.

For the purposes of this guideline, *shared decision making* refers to the exchange of information regarding treatment risks and benefits, as well as the expression of patient preferences and values, which result in mutual responsibility in

Table 5. Summary of Evidence-Based Statements.

Statement	Action	Strength
1. Communicating expectations	Clinicians should ask all patients seeking rhinoplasty about their motivations for surgery and their expectations for outcomes, should provide feedback on whether those expectations are a realistic goal of surgery, and should document this discussion in the medical record.	Recommendation
2. Comorbid conditions	Clinicians should assess rhinoplasty candidates for comorbid conditions that could modify or contraindicate surgery, including obstructive sleep apnea, body dysmorphic disorder, bleeding disorders, or chronic use of topical vasoconstrictive intranasal drugs.	Recommendation
3. Nasal airway obstruction	The surgeon, or the surgeon's designee, should evaluate the rhinoplasty candidate for nasal airway obstruction during the preoperative assessment.	Recommendation
4. Preoperative education	The surgeon, or the surgeon's designee, should educate rhinoplasty candidates regarding what to expect after surgery, how surgery might affect the ability to breathe through the nose, potential complications of surgery, and the possible need for future nasal surgery.	Recommendation
5. Counseling for obstructive sleep apnea patients	The clinician, or the clinician's designee, should counsel rhinoplasty candidates with documented obstructive sleep apnea about the impact of surgery on nasal airway obstruction and how obstructive sleep apnea might affect perioperative management.	Recommendation
6. Managing pain and discomfort	The surgeon, or the surgeon's designee, should educate rhinoplasty patients before surgery about strategies to manage discomfort after surgery.	Recommendation
7. Postoperative antibiotics	When a surgeon, or the surgeon's designee, chooses to administer perioperative antibiotics for rhinoplasty, he or she should <i>not</i> routinely prescribe antibiotic therapy for a duration >24 hours after surgery.	Recommendation against
8. Perioperative steroids	The surgeon, or the surgeon's designee, may administer perioperative systemic steroids to the rhinoplasty patient.	Option
9. Nasal packing	Surgeons should <i>not</i> routinely place packing in the nasal cavity of rhinoplasty patients (with or without septoplasty) at the conclusion of surgery.	Recommendation against
10. Outcome assessment	Clinicians should document patient satisfaction with their nasal appearance and with their nasal function at a minimum of 12 months after rhinoplasty.	Recommendation

decisions regarding treatment and care.⁴³ In cases where evidence is weak or benefits are unclear, the practice of shared decision making—again, where the management decision is made by a collaborative effort between the clinician and an informed patient—is extremely useful. Factors related to patient preference include, but are not limited to, absolute benefits (numbers needed to treat), adverse effects (number needed to harm), cost of drugs or procedures, and frequency and duration of treatment.

Key Action Statements

STATEMENT 1: COMMUNICATING EXPECTATIONS: Clinicians should ask all patients seeking rhinoplasty about their motivations for surgery and their expectations for outcomes, should provide feedback on whether those expectations are a realistic goal of surgery, and should document this discussion in the medical record. *Recommendation based on observational studies, with a preponderance of benefit over harm.*

Action Statement Profile

- **Quality improvement opportunity:** Avoid poor surgical outcomes among patients with unrealistic expectations (NQS domains: patient safety; patient and family engagement)
- **Aggregate evidence quality:** Grade C, based on observational studies with a preponderance of benefit over harm
- **Level of confidence in evidence:** Low because of limited evidence
- **Benefits:** Promote realistic expectations of achievable surgical outcomes, avoid surgery among patients with unrealistic expectations, better align clinician and patient expectations, promote enhanced communication, identify underlying psychiatric disorders (eg, BDD), promote patient satisfaction
- **Risk, harm, cost:** Patient anxiety, time spent in assessing and counseling the patient

- **Benefit-harm assessment:** Preponderance of benefit over harm
- **Value judgments:** Perception by the GDG that expectations are not always fully considered before rhinoplasty and that explicitly assessing expectations could help improve outcomes and potentially avoid surgery among patients with unachievable goals
- **Intentional vagueness:** The specifics of the discussion are left to the discretion of the patient and clinician
- **Role of patient preferences:** None
- **Exceptions:** None
- **Policy level:** Recommendation
- **Differences of opinion:** None

Supporting Text

The purpose of this statement is to diminish the potential for poor surgical outcomes caused by unrealistic patient motivations and expectations regarding rhinoplasty. These can result from a variety of factors, including poor understanding of the surgical procedure and its capabilities, as well as psychological pathology (eg, BDD). The surgical team is responsible for identifying and clarifying these factors. Failure to understand patients' desires can lead to their dissatisfaction with the outcome, despite achieving the desired surgical results from the surgeon's perspective.

Surgeons should specifically ask patients about their motivations for surgery and their expectations. Surgeons should then give feedback about what is reasonable to expect from the rhinoplasty. They should document all 3 of these items in the medical record:

1. Patient motivations for surgery, including a description of the patient's concerns and how they link to larger issues, such as job potential
2. Patient expectations regarding surgical outcomes, with particular attention to overly specific concerns and desires for a "perfect" result
3. Surgeon feedback on whether the expectations are a realistic goal of surgery

When patients present with unrealistic or distorted expectations regarding rhinoplasty outcomes, the surgeon should elicit additional details that allow more in-depth discussion to correct misunderstandings and realign expectations. If this cannot be readily accomplished, the surgeon should assess the appropriateness of surgery and consider the possibility of BDD, which affects 13% of patients seeking facial cosmetic surgery.⁵ Patients with BDD express excessive preoccupation with nonexistent or minimal flaws or defects in their appearance, which typically are not observable or appear slight to others. Common traits that may be elicited among patients with BDD include the performance of "repetitive behaviors such as mirror checking, excessive grooming, and skin picking."⁴⁴ Additional information in assessing for BDD is provided in the key action statement that follows on comorbidities.

STATEMENT 2: COMORBID CONDITIONS: Clinicians should assess rhinoplasty candidates for comorbid conditions that could modify or contraindicate surgery, including OSA, BDD, bleeding disorders, or chronic use of topical vasoconstrictive intranasal drugs. *Recommendation based on observational studies, with a preponderance of benefit over harm.*

Action Statement Profile

- **Quality improvement opportunity:** Identify known and potentially unknown comorbid conditions that could result in poor outcomes or complications if not detected prior to surgery (NQS domain: patient safety)
- **Aggregate evidence quality:** Grade C, based on observational studies with a preponderance of benefit over harm
- **Level of confidence in evidence:** High
- **Benefits:** Reduce surgical complications, identify opportunities to optimally prepare patients for surgery, better counsel patients regarding surgical risk, avoid surgery in poor candidates
- **Risk, harm, cost:** Time spent in assessing for comorbid conditions, false-positive results from screening surveys, making the patient self-conscious
- **Benefit-harm assessment:** Preponderance of benefit over harm
- **Value judgments:** None
- **Intentional vagueness:** None
- **Role of patient preferences:** None
- **Exceptions:** None
- **Policy level:** Recommendation
- **Differences of opinion:** None

Supporting Text

The purpose of this statement is to engage rhinoplasty clinicians to (1) ask potential patients about comorbid conditions in the preoperative assessment, which may affect the perioperative management as well as the postoperative outcome; (2) encourage coordination of care with other providers (eg, sleep medicine specialists, psychiatrists); (3) improve care and preoperative counseling with patients; and (4) promote shared decision making and patient education in an effort to set realistic expectations. These recommendations for preoperative patient screening are based on observational studies with a preponderance of benefit over harm.

Obstructive sleep apnea. The importance of screening potential rhinoplasty patients for OSA is supported by its high prevalence in the general population (a high proportion of patients are undiagnosed)³¹ and the elevated risk for perioperative complications among patients suffering from the disorder. Screening tools such as the 8-item STOP-Bang questionnaire (Appendix 1)⁴⁵ can effectively identify at-risk patients and allow coordination of care with a sleep medicine specialist.⁴⁶

Careful planning is necessary rhinoplasty is performed among patients with severe OSA, due to the higher risk of

complications intraoperatively (eg, intubation, pulmonary care, safe recovery) and postoperatively. Nevertheless, rhinoplasty and related procedures are performed among selected severe OSA patients to improve compliance with established treatments such as CPAP. The surgeon should coordinate care with the sleep medicine specialist for the postoperative plan regarding CPAP mask use.

Body dysmorphic disorder. BDD is a psychiatric disorder that appears under the section of obsessive-compulsive and related disorders in the *Diagnostic and Statistical Manual of Mental Disorders* (fifth edition).⁴⁷ Affected individuals express excessive preoccupation with nonexistent or minimal flaws or defects in their appearance, which typically are not observable or appear slight to others. These concerns can reach delusional proportions and are associated with symptoms that cause marked distress and life disruption. A systematic review concluded that the prevalence of BDD among cosmetic surgery patients was nearly 6 to 13 times higher than in the general population (2%-5%).⁴⁸

In the context of rhinoplasty, patients with BDD typically express concern about the appearance of their nose and seek cosmetic surgery to improve it. Unfortunately, BDD symptoms and complaints may worsen following surgery, as patients become even more preoccupied with their perceived handicaps, and they may seek more operative procedures or pursue other forms of rectification for their perceptions of failed surgery. Therefore, BDD is a contraindication to elective rhinoplasty, and surgery should be strongly discouraged.

Screening instruments, such as the Body Dysmorphic Disorder Questionnaire (Appendix 2), provide a validated method to identify BDD in at-risk patients.⁵ While the questionnaire is highly specific and sensitive, it requires a subsequent diagnostic interview to confirm the diagnosis. Patients who screen positively for BDD by their Body Dysmorphic Disorder Questionnaire responses deserve a more detailed evaluation, with possible referral for psychiatric treatment, to avoid unnecessary surgery and postoperative dissatisfaction. Presurgical diagnosis is imperative for patient safety and satisfaction, in part due to the potential for suicide or for legal or physical threats or action toward the surgeon. Postoperative identification of BDD should prompt coordinated care with a psychiatric specialist.

Bleeding disorders. A potential rhinoplasty patient should be asked about disorders of the coagulation cascade that may increase the risk of perioperative blood loss or a hypercoagulable state that may result in thrombotic events. Preoperative assessments should include a discussion of excessive bruising, bleeding after small injuries, epistaxis, family history of bleeding disorders, bleeding after previous surgery, current anticoagulation medications, prior need for transfusion, platelet dysfunction/thrombocytopenia, herbal medications, vitamins, and supplements that may affect bleeding. Similarly, patients should be asked about previous deep venous thrombosis or pulmonary embolism and risk factors for increased thrombosis.

Coordination of care with the patient's primary care physician or hematologist should be considered to manage bleeding disorders, prior to choosing elective rhinoplasty. Routine preoperative laboratory screening (eg, coagulation testing) is not supported for elective surgery without additional risk factors.⁴⁹

Topical nasal medications. The vasoconstrictive effects of topical nasal medications and illicit drugs can have adverse outcomes on nasal surgery outcomes. Preoperatively, patients should be asked about the use of routine nasal decongestant sprays (eg, oxymetazoline, phenylephrine). Chronic use of these agents often results in a rebound effect of severe congestion of the nose (rhinitis medicamentosa) that will not be improved with septorhinoplasty. Cessation tactics should be implemented prior to rhinoplasty to prevent patient dissatisfaction from surgery.⁵⁰

Similarly, patients should be asked about recreational intranasal cocaine and other stimulants. Surgeons should use caution in proceeding with surgery among patients who admit to, or show signs of, recreational drug use. These patients should be counseled on the increased risk of septal perforation and poor rhinoplasty outcomes (functional and aesthetic).⁵¹

STATEMENT 3: NASAL AIRWAY OBSTRUCTION: The surgeon, or the surgeon's designee, should evaluate the rhinoplasty candidate for nasal airway obstruction during the preoperative assessment. *Recommendation based on observational studies, with a preponderance of benefit over harm.*

Action Statement Profile

- **Quality improvement opportunity:** Call explicit attention to an aspect of rhinoplasty planning that could be overlooked, and identify unrelated causes of nasal airway obstruction (NQS domain: clinical process/effectiveness)
- **Aggregate evidence quality:** Grade C, based on observational studies with a preponderance of benefit over harm
- **Level of confidence in evidence:** High
- **Benefits:** Avoid overlooking nasal airway obstruction; refine the surgical plan; identify deviated nasal septum, nasal valve collapse, or both; identify non-anatomic causes of obstruction, including inflammatory disorders, neoplastic disorders, and obstructing adenoids
- **Risk, harm, cost:** Cost and adverse events of diagnostic procedures (endoscopy, imaging), time spent in evaluating the patient, potential for focusing attention on incidental or asymptomatic findings
- **Benefit-harm assessment:** Preponderance of benefit over harm
- **Value judgments:** Perception by a majority of the GDG that early evaluation for nasal airway obstruction could identify opportunities to surgically improve the airway during rhinoplasty, which may

have been overlooked if not explicitly assessed prior to surgery

- **Intentional vagueness:** The method of evaluating for nasal airway obstruction is left to the discretion of the clinician
- **Role of patient preferences:** Limited, primarily concerns the choice of tests or procedures beyond the basic physical examination
- **Exceptions:** None
- **Policy level:** Recommendation
- **Differences of opinion:** Minor differences regarding the inclusion of nasal function versus nasal obstruction in the key action statement resulted in a panel vote: 8 members of the GDG voted to include nasal obstruction; 3 voted to include nasal function; and 1 did not have an opinion

Supporting Text

The purpose of this statement is to provide guidance to clinicians regarding the preoperative evaluation of the rhinoplasty patient for nasal airway obstruction. Evaluation of both function and form is critical in the preoperative workup of the rhinoplasty patient.

Patients presenting with symptoms of nasal congestion, described as fullness or obstruction leading to reduced airflow, are commonly encountered in clinical practice. Most causes of nasal congestion are attributed to rhinitis and rhinosinusitis. Alternatively, anatomic variation (congenital malformation, trauma, etc) of nasal structures (nasal bones and cartilage) may lead to nasal obstruction and resultant airflow compromise. A comprehensive history with respect to nasal breathing is necessary. Clinicians should document whether it is one or both sides that are congested and at what time of the day this occurs.

Intermittent nasal congestion resulting from the nasal cycle should be distinguished from nasal airway obstruction that might benefit from surgical correction. Patients should be educated that breathing through only 1 side of the nose, which can alternate throughout the day, may be normal. As the nasal cycle occurs every 1.5 to 3.0 hours, patients may not breathe through both sides of the nose at all times. The key diagnostic feature for the nasal cycle is alternating obstruction, in which 1 side of the nose is normal and the other is temporarily congested.⁵²

Patient-oriented surveys, questionnaires, and measures are helpful in determining and documenting the extent of nasal obstruction and its impact on the patient's outcome. These may include any or all of the following: Nasal Obstruction Septoplasty Effectiveness (NOSE) scale⁵³ (Appendix 3), the visual analog scale,⁵⁴ or the Sino-Nasal Outcome Test (SNOT-22).⁵⁵

Anterior rhinoscopy is useful for evaluating the nasal septum and turbinates. However, among patients with nasal airway obstruction and no obvious cause on anterior rhinoscopy, nasal endoscopy can be valuable. Nasal endoscopy can provide additional information regarding the posterior septum, the ostiomeatal complex, the possibility of nasal polyps or

Table 6. Structures to Assess in Rhinoplasty.

Structure	Diagnostic Method	Example of Abnormality or Problem
Adenoids	Nasal endoscopy	Adenoidal hypertrophy
Anterior septum	Anterior rhinoscopy, nasal endoscopy	Caudal septal deviation
Inferior turbinate	Anterior rhinoscopy, nasal endoscopy	Inferior turbinate hypertrophy
Nasal septum	Anterior rhinoscopy, nasal endoscopy	Deviated septum
Nasal valve	Cottle maneuver, modified Cottle maneuver	Nasal valve collapse
Posterior septum	Nasal endoscopy	Posterior septal spur
Sinus ostia	Nasal endoscopy	Chronic sinusitis, polyps, pus

purulent drainage, the posterior choanae, adenoidal hypertrophy, and the presence of any tumors.^{56,57}

Septoplasty can improve the nasal airway⁵⁸; therefore, a thorough evaluation of the septum preoperatively is critical, as it is a common cause of nasal obstruction.⁵⁹ Enlarged inferior turbinates, as seen in allergic rhinitis, may also be a frequent contributor to nasal airway obstruction, and evaluation of these structures should be included in the preoperative physical examination, as listed in **Table 6**.⁵⁷

Surgery to correct nasal valve collapse can also improve the nasal airway⁶⁰; therefore, evaluating the internal nasal valve and external nasal valve areas are important, especially among patients complaining of nasal congestion prior to rhinoplasty.⁶¹ Techniques such as static and dynamic inspection, the modified Cottle maneuver (as depicted in **Figure 5**),⁶² and palpation can augment the physical examination.^{60,63-65} Furthermore, the rhinoplasty surgeon should be cognizant of the dynamic nature of the operation and consider how attempts to alter the aesthetic appearance of the nose may affect nasal airway obstruction. For example, careful evaluation of the strength of the nasal tip and lower lateral cartilages is important, as too much resection in the setting of weak cartilage can lead to postoperative nasal obstruction.⁶⁶ The preoperative examination should identify potential intraoperative areas for concern and inform the surgeon as he or she develops an outline of the operation.

Imaging studies are unnecessary to determine the extent of septal deviation, turbinate hypertrophy, and nasal deformity, and plain radiographs should not be performed.⁵⁶ In the instance of the patient with signs and symptoms of sinusitis, a computed tomography scan may be helpful.^{67,68} Rhinometry is another diagnostic modality that can be helpful in documenting nasal congestion.^{65,69} It is not widely performed at this time, but it is the best objective measurement. In addition to nasal airway obstruction, it is important to ask patients about any problems with their sense of smell so that any abnormalities can be documented prior to surgery. Decreased sense of smell can be debilitating from a quality-of-life and safety



Figure 5. Demonstration of the modified Cottle maneuver (a = external valve, b = internal valve), with the curette placed exteriorly only to demonstrate the area to be supported intranasally. Reproduced and adapted from Fung et al (2014).⁶²

standpoint; it is not surprising that complications related to smell are a frequent source of postoperative litigation.⁷⁰

STATEMENT 4: PREOPERATIVE EDUCATION: The surgeon, or the surgeon's designee, should educate rhinoplasty candidates regarding what to expect after surgery, how surgery might affect the ability to breathe through the nose, potential complications of surgery, and the possible need for future nasal surgery. *Recommendation based on observational studies on the benefits, in general, of the value of education and counseling, with a preponderance of benefit over harm.*

Action Statement Profile

- **Quality improvement opportunity:** To facilitate shared decision making regarding the need for surgery and surgical outcomes (NQS domain: patient and family engagement)
- **Aggregate evidence quality:** Grade C, based on observational studies on the benefits, in general, of the value of education and counseling, with a preponderance of benefit over harm
- **Level of confidence in evidence:** High
- **Benefits:** Facilitate shared decision making, promote realistic expectations, promote informed consent, identify unrealistic expectations, improve quality of care and outcomes
- **Risk, harm, cost:** Time spent with education, patient anxiety
- **Benefit-harm assessment:** Preponderance of benefit over harm
- **Value judgments:** None
- **Intentional vagueness:** None
- **Role of patient preferences:** None
- **Exceptions:** None
- **Policy level:** Recommendation
- **Differences of opinion:** None

Supporting Text

The purpose of this statement is to highlight the importance of patient education counseling and shared decision making prior to rhinoplasty, specifically as it relates to the patient experience after surgery, how surgery may affect nasal breathing, the potential complications of rhinoplasty, and the possible need for revision nasal surgery.

Education may occur during the initial surgical consultation and again during any subsequent preoperative visits. Information should be provided in terms that are easily understood by the patient and should avoid excess medical jargon. The risks, benefits, and alternatives to surgery should be documented in the medical record, since that is a critical part of the patient education process. Patients should have time for discussion and be provided with contact information if questions or concerns arise. Printed instructions should be sent home with the patient and follow-up appointments scheduled. Makedessian et al noted that patients receiving written information about surgical risks in rhinoplasty retained more information than those receiving only verbal information following the procedure; therefore, written materials will be useful for patients.⁷¹

Common conditions that a patient may expect after surgery include the following: bruising, swelling, pain, numbness,⁷² nasal congestion, nasal drainage, epistaxis, changes in sense of smell, improvement or worsening OSA, nausea (from anesthesia or pain medications), and postoperative activity restrictions. **Table 7** provides a list of frequently asked questions. This is not meant to be an all-inclusive list; there may be other conditions that the surgeon wishes to review with patients before or after surgery.

In a systematic review by Rhee et al,⁶⁰ all articles reviewed supported the effectiveness of functional rhinoplasty techniques for treatment of nasal obstruction. Reported effectiveness ranged from 65% to 100%. No studies found functional rhinoplasty to be ineffective as an intervention. The Nasal Obstruction Septoplasty Effectiveness (NOSE) scale, used as a quality-of-life instrument, may provide a primary outcomes measure of the success of the operation and attempt to identify predictors of higher rates of success.^{53,60}

The possible complications, with potential rates of occurrence and when they may be expected to occur, should be discussed prior to surgery.⁷³ Rhee et al found that the distribution of the overall complications included intranasal synechiae (14%), infection (9%), graft resorption (7%), and residual septal deviation (7%).⁶⁰ Other reported complications included failure to improve nasal airway patency, residual external deformity, hematoma, graft dislocation/migration, septal perforation, vestibulitis, and tissue reaction to alloplastic materials, as well as the lack of subjective improvement of the underlying condition.⁶⁰ Patients undergoing autologous rib cartilage harvest for the rhinoplasty should be counseled on the possible complications, such as hypertrophic chest scarring (5.5%), pneumothorax (0.3%), and revision donor site surgery (14.1%).⁷⁴

Table 7. Frequently Asked Questions for Rhinoplasty Patients.

How much bruising and swelling should I expect? What can I do for it?	It is not unusual to have swelling and perhaps bruising, depending on the type of surgery. It may take about 7-10 days for bruising to resolve. Swelling may not fully resolve for several weeks. Elevating your head when sleeping/resting, applying ice, and using over-the-counter or herbal medications and supplements may assist in the relief of these symptoms.
When may I blow my nose?	You should not blow your nose for at least 1 week after surgery or as directed by your surgeon, to promote healing and limit trauma to nasal structures.
How much nasal drainage will I have?	You should expect some nasal drainage for the first few days. If you experience bleeding or drainage that does not resolve, you should contact your surgeon.
When may I resume sports?	Contact sports may not be permitted for several weeks/months. Any sports that involve the risk of injury, trauma, or strenuous activity should not be resumed until cleared by the surgeon.
When should I expect nasal fullness/congestion to subside?	Congestion may take weeks to fully resolve. This will improve as swelling decreases.
When may I return to work/school?	You should discuss when to return to work with your surgeon. You should limit heavy lifting and exposure to dusty/smoky environments.
What are the complications that may occur after rhinoplasty?	Bleeding, infection, persistent numbness, persistent change in smell or taste, abnormal scarring, nasal asymmetry, persistent nasal obstruction.
How likely am I to need additional nasal surgery?	A low percentage of patients have additional surgery or procedures, but this varies greatly, and you should have this conversation with your surgeon.

Revision rhinoplasty most often occurs when the surgical result achieved has not met preoperative patient expectations. This may be due, in part, to either aesthetic and/or functional objectives not being reached. Queries on the rhinoplasty population in TOPS⁷⁵ (Tracking Operations & Outcomes for Plastic Surgeons: a national database of plastic surgery procedures and outcomes sponsored by the American Society of Plastic Surgeons) were run according to *Current Procedural Terminology* rhinoplasty codes 30400, 30410, 30420, 30430, 30435, 30450, 30460, and 30462, and the results showed that between 2003 and 2015, approximately 12,819 rhinoplasty cases were submitted to TOPS. The percentage of revision rhinoplasties performed in this population was noted to be close to 2% (218 revisions out of 12,819 cases). However, the number of cases and revisions may be slightly higher since the registry is not all inclusive.

The GDG acknowledges that providing patients with education counseling and shared decision making may decrease patient anxiety and improve overall patient expectations of surgery, increase adherence to postoperative regimen, and improve patient satisfaction with the surgical outcome. There appears to be a gap in care in the ability to provide patients with a tool to measure their outcomes versus their satisfaction and whether there is sustained long-term benefit, since most studies provided only a 1- to 2-year follow-up.

STATEMENT 5: COUNSELING FOR OSA PATIENTS:
The clinician, or the clinician's designee, should counsel rhinoplasty candidates with documented OSA about the impact of surgery on nasal airway obstruction and how OSA might affect perioperative management. *Recommendation based on systematic reviews or randomized and observational studies with preponderance of benefit over harm.*

Action Statement Profile

- **Quality improvement opportunity:** To facilitate informed patient decisions and coordinate care for

optimal surgical outcomes (NQS domains: patient safety; care coordination)

- **Aggregate evidence quality:** Grade B, systematic reviews or randomized and observational studies regarding the positive impact of rhinoplasty on OSA (reduced CPAP pressures, enhanced CPAP compliance, lower apnea hypopnea index); Grade C, observational studies on the benefits, in general, of counseling on shared decision making
- **Level of confidence in evidence:** High
- **Benefits:** Increase awareness of beneficial effects of rhinoplasty on CPAP compliance and use, increase awareness of rhinoplasty as a means to reduce severity of OSA, facilitate shared decision making, facilitate coordination of care (primary care clinician, sleep medicine specialist, anesthesiologist, surgeon), plan more effectively for perioperative management
- **Risk, harm, cost:** Time spent counseling, increased patient anxiety
- **Benefit-harm assessment:** Preponderance of benefit over harm
- **Value judgments:** None
- **Intentional vagueness:** None
- **Role of patient preferences:** None
- **Exceptions:** None
- **Policy level:** Recommendation
- **Differences of opinion:** Minor regarding the need to include a separate statement about counseling for rhinoplasty candidates with OSA: 8 members of the GDG voted in favor of a statement; 5 members felt that an additional statement was unnecessary

Supporting Text

The purpose of this statement is to encourage the discussion of realistic expectations and clinical considerations regarding

the impact of rhinoplasty on the management of patients with known OSA.

OSA is a common disorder in which the upper airway intermittently and briefly collapses, either partially or completely, during sleep. This results in disrupted sleep leading not only to daytime sleepiness and increased risk of accidents but also to increased morbidity and mortality affecting cardiac, neurologic, and endocrine systems.⁷⁶ Prevalence estimates suggest that OSA affects 9% to 37% of men and 4% to 50% of women.³¹

The nasal passage contributes to approximately two-thirds of the upper airway resistance.⁷⁷ Any reduction in nasal airflow due to anatomic defects, such as nasal septal deviation or turbinate enlargement, can further increase this resistance, thereby increasing the likelihood of upper airway collapse during sleep and potentially worsening the severity of OSA. Additionally, anatomic defects can result in an increase in the required pressure during positive airway pressure therapy (eg, CPAP), the most commonly utilized treatment for this disorder.

Studies into the efficacy of nasal valve surgery or functional rhinoplasty in reducing the severity of OSA have yielded conflicting results. One study measured the severity of OSA with the Apnea-Hypopnea Index (AHI)—that is, the frequency of complete or partial collapse of the airway during sleep—among 26 patients with OSA and nasal obstruction and found that it decreased from 24.7 to 16.0 ($P = .013$) approximately 3 months after functional rhinoplasty.⁷⁸ Another study concluded that after septoplasty with or without turbinectomy, mean AHI in 21 patients fell from 39.0 ± 14.03 to 29.1 ± 14.42 ($P = .0001$).⁷⁹ One meta-analysis concluded that isolated nasal surgery among patients with nasal obstruction and OSA decreased the severity of OSA and sleepiness.⁸⁰ However, a randomized placebo-controlled study (ie, sham surgery) of septoplasty with or without bilateral inferior turbinectomy among 49 patients with OSA did not reveal improvement in the AHI.⁸¹ Similarly, a meta-analysis of 9 studies with 302 patients did not demonstrate improvement in the AHI (35.2 ± 22.6 to 33.5 ± 23.8 , $P = .69$) after various forms of nasal surgery.⁸² In fact, Friedman and colleagues demonstrated a postoperative increase in AHI, especially for those with mild OSA, 6 weeks following submucosal resection of the septum and inferior turbinates bilaterally.⁸³

Despite these conflicting findings, many studies have noted consistent improvement in the levels of daytime sleepiness, as measured by Epworth Sleepiness Scale.^{80,82,84-87} Li et al also showed improvements in quality of life and snoring after septoplasty and partial inferior turbinectomy in 51 subjects.⁸⁴ Since these subjective improvements can occur without significant improvement in the AHI, however, patients should follow up with their sleep specialists to ensure that risks associated with untreated OSA can be properly managed.

Nasal surgery has also been utilized to provide improved compliance with CPAP treatment. A meta-analysis of 18 articles with 279 patients concluded that the mean CPAP requirement decreased postoperatively (11.6 ± 2.2 to 9.5 ± 2.0 cm H₂O, $P < .00001$) and that 89% of patients who were not using

CPAP regularly subsequently accepted or adhered to CPAP use after their nasal surgery.⁸⁸

During the immediate postoperative period, nasal packing—if it is used (since routine nasal packing is not recommended—see key action statement 9—can worsen upper airway resistance and complicate the management of OSA. Friedman et al demonstrated that, among patients with mild OSA, the AHI significantly increased with nasal packing.⁸ This may be due to increased likelihood of mouth breathing, which is associated with a higher upper airway resistance as compared with nasal breathing (5.65 cm H₂O/L/s with nasal breathing vs 14.9 cm H₂O/L/s, $P = .005$).⁸ Similarly, if the nasal bones were broken, as occurs when osteotomy is performed in rhinoplasty, postoperative use of a CPAP mask that involves the nose (eg, nasal mask, nasal pillows, full-face mask) may be contraindicated, as it may affect the healing process. Therefore, it would be advisable to coordinate the care of such patients with their sleep specialists to discuss alternative mask options, such as switching to different mask options (eg, an oral interface or total face mask options), or alternative treatment options (eg, positional therapy, an oral appliance device, hypoglossal nerve stimulator).⁸⁹ Ideally, this coordination of care should occur several months prior to the planned rhinoplasty, since some of these options may require several months to be fully implemented. **Table 8** provides a list of frequently asked questions for patients to discuss with their providers.

There are insufficient data to adequately guide management of patients with OSA in the immediate postoperative period. The American Society of Anesthesiologists recommends, based on consensus agreement, that patients with moderate to severe OSA (eg, AHI > 15) be carefully monitored in the postanesthesia care unit with continuous pulse oximetry and placed in a nonsupine position.⁹⁰ Need for careful monitoring was further emphasized if any respiratory suppressants, such as opioids, are needed. The society further acknowledges the lack of data to guide dismissal criteria out of the postanesthesia care unit and to an unmonitored setting but, again per consensus agreement, recommends not dismissing patients with OSA until they are able to maintain adequate oxygen saturation while breathing room air, preferably while asleep. The recently published guideline from the Society of Anesthesia and Sleep Medicine did not make any recommendations regarding postanesthesia care unit dismissal criteria—due to a lack of any substantial data—but recommended working closely with a sleep specialist and reinitiating appropriate therapy as soon as it is feasible.⁹¹ Because of a lack of any definitive data, it is difficult for this group to make any strong recommendations regarding the immediate postoperative care and the need for continuous monitoring. This lack of evidence, then, reemphasizes the need to work closely with sleep specialists, especially for patients with moderate to severe sleep apnea, to best coordinate their care. It may be reasonable to consider continuous monitoring for patients with severe OSA who continue to require opioids but are unable to use a treatment device, until the care team feels that the patients can be safely dismissed to an unmonitored setting.

Table 8. Counseling Points for Patients with Obstructive Sleep Apnea to Discuss with Their Providers.

Should I bring my CPAP ^a with me to surgery?	Depending on the type, extent of your surgery, and if you will be staying overnight in the hospital, your surgeon may or may not have you wear your CPAP. To be prepared, you should bring your CPAP with you, but understand that you may not use it immediately after surgery.
When should I resume using my CPAP?	When to resume using your CPAP depends on the type and extent of your surgery. Because this decision is individualized, you should ask your care provider about the appropriate timing to resuming your CPAP use.
If I can't use my CPAP, what are my choices?	You may be able to continue using your CPAP but with a different mask. However, other treatment options range from avoiding sleeping on your back (with various barrier devices) and sleeping with the head of the bed elevated, if possible. Other treatment options may include using a mouth piece designed to thrust the lower jaw forward or an implanted stimulator. These latter options will often need several months to coordinate care and will need to be planned accordingly, and your sleep medicine care provider may discuss the appropriateness of these options with you. While some patients may use oxygen alone, this may not be appropriate for most patients with sleep apnea.
Will my surgery help me with my sleep apnea?	There is a possibility that the severity of your sleep apnea may improve slightly and the required pressure on your CPAP may be reduced, but this is not consistently the case.

^aCPAP—continuous positive airway pressure device. However, these questions apply to any positive airway pressure devices, such as bilevel positive airway pressure, adaptive servo ventilator, average volume-assured pressure support, intelligent volume-assured pressure support, and Trilog_y.

Functional rhinoplasty (which may involve the septum and/or inferior turbinates) can lead to improvement in subjective variables among OSA patients, such as snoring and quality of life. However, as the severity of their OSA may not change (as defined by objective measures such as AHI), it is imperative to advise patients to follow up with sleep specialists to adjust their CPAP settings, consider alternative treatments, or reconsider CPAP if they had previously declined its use. Nasal surgery may, in fact, provide improved compliance with CPAP, which is the primary treatment for the disorder. Furthermore, clinicians must determine when and how to reinstate CPAP therapy, especially if a nasal bone was manipulated or if nasal packing was used.

STATEMENT 6: MANAGING PAIN AND DISCOMFORT: The surgeon, or the surgeon's designee, should educate rhinoplasty patients before surgery about strategies to manage discomfort after surgery. *Recommendation based on studies of the value of education and counseling, with a preponderance of benefit over harm.*

Action Statement Profile

- **Quality improvement opportunity:** To facilitate informed patient decisions and coordinate care for optimal management of pain and discomfort (NQS domains: patient and family engagement; clinical process/effectiveness)
- **Aggregate evidence quality:** Grade C, observational studies on the benefits, in general, of the value of education and counseling, with a preponderance of benefit over harm
- **Level of confidence in evidence:** Medium because of the indirectness of evidence and need to extrapolate from other pain management studies
- **Benefits:** Establish expectations regarding pain and discomfort, increase patient satisfaction, decrease

need for postoperative calls to physician office, raise awareness of intraoperative and postoperative strategies to reduce pain and discomfort, reduce patient anxiety

- **Risk, harm, cost:** Time spent counseling
- **Benefit-harm assessment:** Preponderance of benefit over harm
- **Value judgments:** Importance of patient education in promoting optimal outcomes
- **Intentional vagueness:** None
- **Role of patient preferences:** None
- **Exceptions:** None
- **Policy level:** Recommendation
- **Differences of opinion:** None

Supporting Text

The purpose of this statement is (1) to assist the rhinoplasty surgical and clinical team and educate the patient in managing postoperative pain and (2) to improve patient outcomes and satisfaction after rhinoplasty through strategies that can minimize pain.

Effective pain management begins by helping patients understand what to expect after surgery, including actions that they can take to improve recovery (**Table 9**). Postoperative pain may range from negligible to moderate and is seldom severe. Pain at any intensity will usually persist for only 36 to 72 hours. Management strategies include analgesics, anti-inflammatory medications, local hypothermia (ice packs), keeping the head elevated at least 30 degrees, and keeping the nose clear of scabs with use of nasal saline spray. The nose may remain tender for as long as 3 months. For pain that persists at a significant level (moderate to severe) for >48 hours, the patient should notify their physician.

Pain management begins in the preoperative stage and can accelerate recovery and discharge from the surgical facility.⁹²

Table 9. Frequently Asked Questions: Patient Counseling/Education Regarding Pain Management and Discomfort.

Questions	Answers
How much pain should I expect?	The amount of pain is variable, but most patients state that it is minimal to moderate.
How long after surgery will my nose hurt?	Pain at any intensity will usually last for only 36 to 72 hours but may last longer if the nose is manipulated or bumped. Your nose may remain tender or sensitive to touch, however, for up to 3 months.
How should I manage my pain?	There are numerous ways to reduce pain: 1. Use acetaminophen and other pain medications prescribed by your physician. 2. Consider a nonsteroidal anti-inflammatory drug (eg, ibuprofen) after consulting with your physician. 3. Apply cold compresses or ice packs to the cheeks. 4. Ask your doctor about head positioning and nasal hygiene. 5. Avoid exertion.
When should I call the clinician for persistent pain?	Call your doctor if pain is not relieved by medications, if pain is getting worse (instead of gradually better), or if pain persists at a moderate to severe level for >48 hours after surgery.
What pain medications am I allowed to use?	Acetaminophen is acceptable, but check with your doctor about ibuprofen or other medications. Homeopathic preparations (e.g., <i>Arnica montana</i>) can have side effects that interfere with healing, so do not use them unless specifically approved by your doctor.
What can my surgeon do to minimize pain during surgery?	Surgeons frequently use local anesthetics during surgery to reduce pain in the recovery room. Some surgeons may administer intravenous steroids during surgery in an effort to reduce pain and swelling.

Lidocaine with epinephrine⁹³ or a long-acting local anesthetic agent, such as bupivacaine,^{94,95} can be injected during the procedure and will reduce agitation and expedite discharge without added risk.^{94,95} Topical intranasal anesthetics can also help reduce postoperative pain.⁹⁶

The efficacy of corticosteroids in reducing postoperative pain after rhinoplasty is disputed, and they are not used universally. Administering a single perioperative dose of dexamethasone decreases edema and ecchymosis formation over the first 2 postoperative days⁹⁷; there is also evidence that corticosteroids decrease pain and discomfort.^{15,98,99} In addition, corticosteroids reduce nausea and vomiting in the immediate postoperative period, which may improve patient satisfaction. Conversely, there is some evidence that perioperative steroids may prolong postoperative ecchymosis¹⁰⁰ (see key action statement 8).

Several adjunctive measures can be utilized to improve outcomes and patient satisfaction after surgery by decreasing pain and discomfort:

1. Operative and postoperative use of iced saline-soaked gauze applied to the external nose¹⁰¹
2. Postoperative use of low-pressure, high-volume nasal irrigation with normal saline and fluticasone by the patient after discharge⁵⁹
3. Eliminating nasal packing as a routine practice^{92,102}
4. Using nonsteroidal anti-inflammatory drugs as a supplement or replacement for narcotic analgesics at home,¹⁰³ although the data on this were derived from a tonsillectomy study

There is no documentation that managing acute postoperative pain improves the overall outcomes and patient satisfaction following rhinoplasty; however, the GDG assumed that interventions to reduce pain would likely improve satisfac-

tion. Furthermore, by implementing adjunctive measures (Table 10), the clinician would better encourage patient engagement in the recovery process, thereby improving the surgical result. Evidence for long-term improved patient satisfaction with the outcome of the rhinoplasty as it relates to the acute management of pain and discomfort is not available and is an area that requires investigation.

STATEMENT 7: POSTOPERATIVE ANTIBIOTICS: When a surgeon, or surgeon's designee, chooses to administer perioperative antibiotics for rhinoplasty, he or she should *not* routinely prescribe antibiotic therapy for a duration >24 hours after surgery. *Recommendation against prescribing based on randomized controlled trials and systematic reviews, with a preponderance of harm over benefit.*

Action Statement Profile

- **Quality improvement opportunity:** Reduce antibiotic prescribing after rhinoplasty and promote antibiotic stewardship (NQS domain: patient safety)
- **Aggregate evidence quality:** Grade B, randomized controlled trials and systematic reviews with a preponderance of harm over benefit
- **Level of confidence in evidence:** Medium based on indirectness of evidence about benefits beyond 24 hours and absence of evidence concerning benefits of antibiotic prophylaxis for rhinoplasty patients
- **Benefits:** Promote selective use of antibiotics after surgery (reducing induced bacterial resistance), reduce antibiotic adverse effects, reduce cost
- **Risk, harm, cost:** Potential for infection among patients who might have benefited from >24 hours of antibiotic therapy but did not receive it
- **Benefit-harm assessment:** Preponderance of benefit over harm

Table 10. Adjunctive Measures to Pain Management in Rhinoplasty.

Adjunctive Measure	Indication		Uses
Perioperative steroids	8-12 mg of Decadron preoperatively with a single additional dose in the next 24 hours	Reduces swelling, nausea, and vomiting	May reduce pain, may decrease the duration of postoperative ecchymosis
Postoperative nasal irrigation	High-volume, low-pressure nasal saline and fluticasone irrigation postoperatively	Reduces nasal crusting and nasal airway patency, possibly improving patient satisfaction	Will require patient instruction and education
<i>Arnica montana</i>	3 times per day	May reduce the amount of early postoperative swelling but has no influence on ecchymosis	May increase the risk of bleeding
Avoiding the placement of packing	Reduces postoperative discomfort	Not necessary in patients that are not bleeding	Should be used if there is persistent surgical bleeding
Intraoperative cold compresses	Iced saline gauze packs on the external nose during surgery	Reduces intraoperative bleeding, surgical time, and postoperative edema	May increase comfort

- **Value judgments:** Perception by the GDG that antibiotics are commonly prescribed after rhinoplasty despite a lack of evidence to consistently support benefits of administering antibiotics beyond a single intraoperative dose or >24 hours after surgery; a desire to avoid reflex, or automatic, prescribing of antibiotics after 24 hours
- **Intentional vagueness:** The word “routine” is used to avoid setting a legal standard of care and to reflect that there may be individual patient situations that warrant antibiotic prescribing
- **Role of patient preferences:** Small
- **Exceptions:** Revision surgery, complicated rhinoplasty, patients receiving nasal implants, patients with postoperative nasal packing, patients with baseline nasal colonization with MRSA (methicillin-resistant *Staphylococcus aureus*), extensive cartilage grafting, immunocompromised patients, concurrent medical condition requiring antibiotics (eg, rhinosinusitis)
- **Policy level:** Recommendation against
- **Differences of opinion:** None

Supporting Text

The purpose of this action statement is to encourage surgeons (or their designees) who choose to prescribe antibiotics after rhinoplasty to prescribe them for no more than 24 hours.

While there is literature to support the administration of a preoperative dose within 1 hour before surgical incision and no more than 24 hours of postoperative coverage for clean-contaminated surgery,¹⁰⁴ there is a preponderance of evidence provided by randomized controlled trials and systematic reviews that cite low rates of postrhinoplasty infection and mounting microbial resistance to antibiotic therapy. Ultimately, the decision of whether or not to prescribe antibiotics is at the discretion of the surgeon. However, after evaluation of all pertinent literature, the

recommendation of the GDG regarding the selective use of antibiotics in the perioperative period for rhinoplasty patients is made to not only reduce the incidence of bacterial resistance but also reduce adverse effects of antibiotic use to limit direct and indirect costs to patients.¹⁰⁴

Wound infection rates are low after rhinoplasty.²⁹ Many surgeons have reported a small infection rate (0.48-0.6%) after septorhinoplasty among patients who were not given prophylactic antibiotics.²⁷⁻²⁹ Prolonged antibiotic use may be associated with complications, including allergic reactions, toxicity, emergence of resistant pathogens, and the potential compromise of patient safety.²⁸ Slavin et al showed that for rhinoplasty patients who did not receive preoperative antibiotics, the most common organisms isolated were *Staphylococcus epidermidis* (82.7%) and *Streptococcus viridans* (17.3%).¹⁰⁵ No patient had a local or systemic infection during a 60-day follow-up period. Silk et al reported that *S aureus* was the most common organism isolated in postrhinoplasty infections, followed by coagulase-negative staphylococci, and further showed that none of the intraoperative blood cultures were positive for bacterial growth.¹⁰⁶

The effectiveness of prophylactic antibiotics following rhinoplasty surgery has not been well demonstrated in the literature. In the studies reviewed by the GDG, only Schafer and Pirsig found a difference in complications between revision rhinoplasty patients who received antibiotic prophylaxis and those who did not.¹⁰⁷ Toxic shock syndrome, one of the most severe complications, was not reported. Studies that did report toxic shock syndrome noted that it occurred even in the presence of prophylactic antibiotics.^{108,109}

A systematic review by Mansfield and Peterson reported that widespread use of prolonged antibiotic therapy poses a significant hazard to susceptible patients, which includes the economic burden of resistant organisms to patients and society.¹⁰⁹ Therefore, the GDG supports the use of a single preoperative dose of antibiotic and no more than 24 hours of postoperative antibiotics if postsurgical therapy is prescribed.

Table 11. Studies of Perioperative Steroid Use to Treat Swelling and Ecchymosis in Rhinoplasty Patients.

Study (Year)	Comparison	Outcome
Hwang (2015) ³	Perioperative steroid vs no steroid/placebo	Decreased upper and lower eyelid edema on PDs 1, 4, and 7
Hwang (2015) ³	Perioperative steroid vs no steroid/placebo	Decreased ecchymosis on PDs 1 and 4
Hwang (2015) ³	Multiple- vs single-dose steroid	Decreased upper and lower eyelid ecchymosis and edema
Hatef (2011) ¹¹²	Preoperative/induction steroids vs postoperative first dose	Reduced ecchymosis of the upper eyelids at PDs 1 and 7
Hatef (2011) ¹¹²	Extended- vs single-dose steroids	Decrease in upper and lower eyelid ecchymosis at PDs 1 and 7
Youssef (2013) ⁶	Variable dosing schedules	Reduced postoperative upper and lower eyelid edema on PD 1 and PD 3; effect was not seen at PD 7

Abbreviation: PD, postoperative day.

Exclusions to the “routine” postoperative antibiotic recommendation may include (at the surgeon’s discretion) high-risk patients (eg, immune compromised), revision rhinoplasty, extensive cartilage grafting, extended periods of nasal packing (2-5 days), nasal implants, patients known to be colonized with MRSA, and patients with comorbid conditions that require antibiotic prophylaxis based on current clinical practice guidelines.

STATEMENT 8: PERIOPERATIVE STEROIDS: The surgeon, or the surgeon’s designee, may administer perioperative systemic steroids to the rhinoplasty patient.
Option based on systematic review of randomized controlled trials with limitations and a balance of benefits and harms.

Action Statement Profile

- **Quality improvement opportunity:** Promote awareness of the benefits and risks of systemic steroids; engage patients in shared decisions; emphasize a need for future research to increase our confidence in the effect of perioperative steroids on the rhinoplasty patient (NQS domains: patient safety; clinical process/effectiveness)
- **Aggregate evidence quality:** Grade B, based on systematic review of randomized controlled trials with limitations and a balance of benefits and harms
- **Level of confidence in evidence:** Low, because of small randomized trials with heterogeneity in drug dosing, administration, and assessment of clinical outcomes; low precision in systematic review pooled estimates of treatment effect
- **Benefits:** Reduced periorbital ecchymosis and edema, reduced discomfort, less postoperative nausea and vomiting
- **Risk, harm, cost:** Cost, adverse events of systemic steroids (which include bone weakening, avascular necrosis of the femur, adverse effect on diabetes, nervousness/anxiety, etc), potential impact on wound healing
- **Benefit-harm assessment:** Balance of benefits and harms

- **Value judgments:** None
- **Intentional vagueness:** The specifics of dosing and timing of steroid administration are at the discretion of the clinician
- **Role of patient preferences:** Moderate role in deciding whether or not to receive steroids
- **Exceptions:** Patients for whom systemic steroids are contraindicated
- **Policy level:** Option
- **Differences of opinion:** None

Supporting Text

The purpose of this statement is to make clinicians aware of the current best evidence available regarding the benefits and harms of perioperative steroid therapy among patients undergoing rhinoplasty surgery.

Rhinoplasty can cause significant periorbital edema and ecchymosis because of the rich vasculature and lymphatics of the periorbital area. Perioperative steroids are often employed to decrease these postoperative sequelae, but the efficacy is unknown given inconsistencies in current literature. There is variability in the dose, duration, timing, type of perioperative steroid used, and comparison groups across reported trials. Some surgeons may give only a single intraoperative steroid dose, but others may elect to continue the steroids in the postoperative phase for 3, 5, or 7 days.

Existing literature regarding perioperative steroid use in the rhinoplasty patient to treat swelling and ecchymosis is highly variable, complicating attempts to analyze data across studies. Multiple attempts have been made to measure primary outcomes, which include using magnetic resonance imaging technology to measure tissue thickness,¹¹⁰ using photography-based measurements,¹¹¹ and averaging scores of multiple physician ratings.¹⁵ Furthermore, there are many confounding variables, such as type of anesthesia, use of lidocaine with or without epinephrine, use of arnica, surgical technique, performance and type of osteotomy, use of cold compresses, and instruction on head elevation after surgery. Despite noting significant heterogeneity among included

studies, several meta-analyses have been performed.^{3,6,112} The results of these are briefly summarized in **Table 11**.

A 2014 Cochrane review of 10 trials—of which 9 were studies exclusively regarding rhinoplasty—assessed the efficacy of corticosteroid administration in reducing edema and ecchymosis among patients undergoing facial plastic surgery. The authors concluded that there was some evidence that a single preoperative dose of dexamethasone (10 mg) decreased swelling and bruising over the first 2 postoperative days and that the clinical importance of this is unknown. Similarly, there was some evidence that high doses of perioperative methylprednisolone (>250 mg) decreased bruising and swelling on postoperative days 1, 3, and 7. There were no data to assess the risks of steroids or secondary outcome.⁹⁷

Postoperative nausea/vomiting is a common problem among postsurgical patients, including patients undergoing rhinoplasty. The role of dexamethasone in decreasing postoperative nausea and vomiting is well established in the anesthesia literature and supported for at-risk patients as identified by the Society for Ambulatory Anesthesia guidelines.^{113,114} Surgeons should consult with anesthesiologists regarding the use and dose of perioperative steroids as they relate to postoperative nausea and vomiting for patients undergoing rhinoplasty.

Corticosteroids are thought to be generally safe as a single dose, even when given at a high dose. Dexamethasone and methylprednisolone are cited in the current rhinoplasty literature as the most often used steroids. Dexamethasone is thought to have superior ease of dosing because the half-life is ≥ 36 hours. However, clinicians should consider the potential adverse effects of steroid administration, especially with a prolonged course or among patient populations at increased risk of adverse effects, such as patients with diabetes or peptic ulcer disease. Potential adverse effects, typically from postoperative administration, include anxiety and mood changes, sleep disturbances, appetite changes, immune suppression, wound-healing deficiencies, dysregulation of glucose homeostasis, osteonecrosis of the femoral head, and gastrointestinal bleeding. As most patients are expected to have resolution of ecchymosis and a significant amount of edema regardless of steroid intervention by 2 weeks postoperatively, the clinician is encouraged to be aware of the natural history of the postoperative course in his or her patient population to best guide patients on the risk and benefits of perioperative steroid use.

STATEMENT 9: NASAL PACKING: Surgeons should *not* routinely place packing in the nasal cavity of rhinoplasty patients (with or without septoplasty) at the conclusion of surgery. *Recommendation against, based on systematic reviews and randomized controlled trials with a preponderance of harm over benefit and a lack of studies regarding the benefits of nasal packing after rhinoplasty.*

Action Statement Profile

- **Quality improvement opportunity:** Improve patient comfort and outcomes by avoiding routine nasal packing in the absence of documented benefits

(NQS domains: patient safety; clinical process/effectiveness)

- **Aggregate evidence quality:** Grade C, based on systematic reviews and randomized controlled trials with a preponderance of harm over benefit
- **Level of confidence in evidence:** Low, due to lack of studies
- **Benefits:** Improved patient comfort, decreased pain after surgery, avoid additional risk of toxic shock syndrome, decreased patient anxiety, improved nasal airway, avoiding respiratory compromise, improved CPAP compliance among patients with OSA
- **Risk, harm, cost:** Risk of epistaxis
- **Benefit-harm assessment:** Preponderance of benefit over harm
- **Value judgments:** Perception by the GDG that nasal packing is frequently used after rhinoplasty despite no published evidence documenting benefits but significant evidence of potential harms; perception by the GDG that the use of nasal packing, in general, is declining among rhinoplasty surgeons and that, when packing is used, it is limited to 24 hours
- **Intentional vagueness:** The word “routinely” is used to avoid establishing a legal precedent and to allow clinicians discretion to identify patients who might benefit from nasal packing on an individualized basis
- **Role of patient preferences:** Moderate, the patient may have strong preferences about nasal packing that create an opportunity for shared decision making
- **Exceptions:** Patients with epistaxis that requires packing for control; patients with complex, unstable nasal fractures that require packing for stability; patients with a known bleeding/clotting disorder
- **Policy level:** Recommendation against
- **Differences of opinion:** None regarding the recommended action but some concern over whether a simple cotton ball or other temporary object in the nasal vestibule after nasal surgery could be misconstrued as packing

Supporting Text

The purpose of this action statement is to recommend that surgeons avoid unnecessary use of nasal packing following rhinoplasty. Nasal packing is material, either removable or absorbable, placed inside the nose to promote hemostasis, structural support, and reduction of scar formation. Traditional nasal packs include ribbon gauze, expandable nonbiodegradable pads, and nonstick dressing material.¹¹⁵ Many newer types of packing are biodegradable. Silastic stents or nasal splints and custom-cut sheeting are not considered packing.

There are limited data on complications related to nasal packing in isolated rhinoplasty. Most studies investigated nasal packing use during septoplasty, inferior turbinate reduction, and endoscopic sinus surgery, rather than rhinoplasty alone. Therefore, this literature would not necessarily apply to rhinoplasty without concurrent intranasal procedures in the prevention of postoperative complications, such as bleeding,

scarring, and loss of desired septal structural support. Even for septoplasty procedures, the evidence suggests that packing is not only unnecessary but can lead to discomfort, pain, and anxiety, thereby diminishing patient satisfaction.¹¹⁶ More severe potential risks include toxic shock syndrome,^{108,109} pack-related sleep apnea,¹¹⁷ and challenges with postoperative CPAP delivery.

When considered for postoperative epistaxis control, vigilant blood pressure management rather than nasal packing itself was found to be more important.¹¹⁸ The use of intranasal packing following isolated rhinoplasty appears to be declining. A 2014 survey of facial plastic surgeons revealed that only 34% of responders continued to use nasal packing and rarely >24 hours.¹¹⁹ This time frame of <24 hours is consistent with reports that used packing solely for epistaxis control.¹¹⁸ Therefore, a lack of evidence supporting the use of nasal packing for uncomplicated patients following isolated rhinoplasty alone, as combined with the potential risk of complications, solidifies the GDG's recommendation against the routine use of nasal packing in rhinoplasty. If packing is deemed necessary by the surgeon, nonbiodegradable packing should not be left in place >24 hours.

STATEMENT 10: OUTCOME ASSESSMENT: Clinicians should document patient satisfaction with their nasal appearance and with their nasal function at a minimum of 12 months after rhinoplasty. *Recommendation based on observational studies, with a preponderance of benefit over harm.*

Action Statement Profile

- Quality improvement opportunity: Incorporate patient-reported outcome measures in rhinoplasty surgery; empower the patient to express satisfaction and communicate with the clinician (NQS domains: patient and family engagement; clinical process/effectiveness)
- Aggregate evidence quality: Grade C, based on observational studies with a preponderance of benefit over harm.
- Level of confidence in evidence: Medium based on limited evidence concerning the optimal time frame to assess outcomes and the wide range of outcome measurements available
- Benefits: Empower the patient to communicate meaningful outcomes and express unmet expectations, provide feedback information on patient satisfaction to the surgeon, call explicit attention to the importance of assessing both cosmetic and function outcomes, identify patients who might benefit from additional counseling or management, identify causes of nasal obstruction unrelated to the original rhinoplasty that could be managed and corrected
- Risk, harm, cost: Time spent assessing outcomes, administrative burden of outcome measurements
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: The content experts in the GDG felt that 12 months was the minimal acceptable time

for a reasonable stable outcome assessment of nasal appearance. While earlier assessment and documentation may be useful for counseling, the final assessment should ideally be done at ≥ 12 months

- Intentional vagueness: The method of assessing satisfaction is not specified and is at the discretion of the clinician; the precise timing of the final outcome assessment is not specified but should be no sooner than 12 months.
- Role of patient preferences: Small
- Exceptions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of this statement is to encourage clinicians to assess and document outcome measurements of patient satisfaction after rhinoplasty surgery in a systematic manner. The assessment of patient-reported outcome measures complements the standard postoperative evaluation, such as physical examination and photography. The clinician should assess satisfaction with nasal appearance and with nasal function, which may require ≥ 1 outcome measurement tools.

Clinicians may use cosmetic outcome questionnaires that are standardized to the practice, such as numeric scales to measure satisfaction with appearance. However, validated patient-reported outcome tools are also available in the literature, such as the Rhinoplasty Outcomes Evaluation, Glasgow Benefit Inventory,¹²⁰ and the recently validated FACE-Q rhinoplasty instrument.^{121,122} Measuring cosmetic outcomes may add value in patient communication, documentation, physician self-assessment, and potential to compare results across practices.

Nasal function should also be assessed by clinicians after rhinoplasty surgery using a patient-reported outcome measure, such as a numeric scale or a published validated instrument. The Nasal Obstruction Septoplasty Effectiveness (NOSE) scale is a short instrument (5 questions) on nasal breathing to measure breathing outcomes in nasal surgery^{60,123} (Appendix 3). The Sino-Nasal Outcome Test (SNOT-22)⁵⁵ can provide other markers of patient satisfaction of nasal function before and after nasal surgery or among patients with concomitant sinonasal complaints, including olfaction.¹²⁴ Other tools include the visual analog scale,⁵⁴ Likert satisfaction scale, and Nasal Symptom Questionnaire.⁶⁰ Clinicians may choose to compare preoperative nasal function assessment with postoperative function; the initial assessment may aid in facilitating a discussion of underlying nasal function concerns. **Tables 12 and 13** represent validated patient-reported outcome tools currently used to perform cosmetic and functional assessments for rhinoplasty.

Validated patient-reported outcome instruments or other tools standardized to the practice can help clinicians with data-driven postoperative communication concerning reasonably expected outcomes. Throughout the healing period (thought to last up to ≥ 1 year after rhinoplasty surgery), patient satisfaction should be

Table 12. Cosmetic Assessments.

FACE-Q Rhinoplasty Instrument	Initially, 40 questions for patients undergoing facial aesthetic surgery to assess satisfaction with facial appearance, social function, psychological well-being, and satisfaction with the nose, with subsequent refinement to 25 questions for rhinoplasty surgery.
Glasgow Benefit Inventory	18 questions measuring the general perception of well-being and psychological, social, and physical well-being. Originally developed for multiple operations of the head and face, including rhinoplasty, with subsequent validation studies on rhinoplasty alone.
Rhinoplasty Outcome Evaluation	6 questions examining 3 major domains: appearance, functional outcome, and social acceptance following rhinoplasty.

Table 13. Functional Assessments.

Nasal Obstruction Septoplasty Effectiveness (NOSE) scale	A 5-question scale developed specifically to evaluate nasal obstruction, with frequent literature citation in septoplasty and functional rhinoplasty surgery.
Sino-Nasal Outcome Test (SNOT-22)	A 22-item questionnaire originally designed for rhinosinusitis—adapted to assess nasal patency in septoplasty, nasal valve, and functional rhinoplasty surgery.

routinely assessed. The content experts in the GDG felt that 12 months was the minimal acceptable time for a reasonable stable assessment of nasal appearance. However, research publications frequently report postoperative assessments of patient satisfaction with nasal appearance and function at time points far less than 6 months.⁶⁰ While earlier assessment and documentation may be useful for counseling, the final assessment should be done ideally at 12 months or later.

Implementation Considerations

The clinical practice guideline is published as a supplement to *Otolaryngology—Head and Neck Surgery*, which will facilitate reference and distribution. A full-text version of the guideline will be accessible, free of charge, at <http://www.entnet.org>. The guideline was presented to AAO-HNS members as a miniseminar at the AAO-HNSF 2016 Annual Meeting & OTO EXPO. Existing brochures and publications by the AAO-HNSF will be updated to reflect the guideline's recommendations.

As a supplement to clinicians, an algorithm of the guideline's action statements has been provided (**Figure 6**). The algorithm allows for a more rapid understanding of the guideline's logic and the sequence of the action statements. The GDG hopes that the algorithm can be adopted as a quick reference guide to support the implementation of the guideline's recommendations.

Research Needs

This guideline was based on the current body of evidence regarding the improvement of nasal form and function after rhinoplasty. While many of the key action statements were supported by grade B- and grade C-level evidence, review of the evidence profile for other statements revealed knowledge gaps and the need for further research. As determined by the GDG's review of the literature, assessment of current clinical practices, and determination of evidence gaps, research needs were determined as follows.

Communicating Expectations

What are the short- (<12 months) and long-term (>12 months) metrics showing patient satisfaction and functional outcome improvement following rhinoplasty?

Comorbid Conditions

What is the best preoperative assessment to evaluate patients for preoperative comorbidities, including OSA (eg, STOP-BANG, Body Dysmorphic Disorder Questionnaire)?

Nasal Airway Obstruction

What is the best measure to evaluate and objectify airway obstruction in rhinoplasty patients?

What is the optimal time to evaluate nasal airway obstruction following rhinoplasty?

Preoperative Education

What are the data on revision rhinoplasty that include outcomes as they relate to patient expectation and preoperative counseling?

What are the rates of litigation in rhinoplasty and revision rhinoplasty?

What are patients specifically told about surgical expectations?

What mechanism can be used to provide patients with a tool to measure their outcomes versus their satisfaction?

What is the sustained long-term benefit of using a tool to measure outcomes versus patient satisfaction?

Obstructive Sleep Apnea

What are the best CPAP appliances to use following rhinoplasty as they relate to patient comfort and optimal surgical healing while treating OSA?

When specifically should CPAP be reinstated after rhinoplasty?

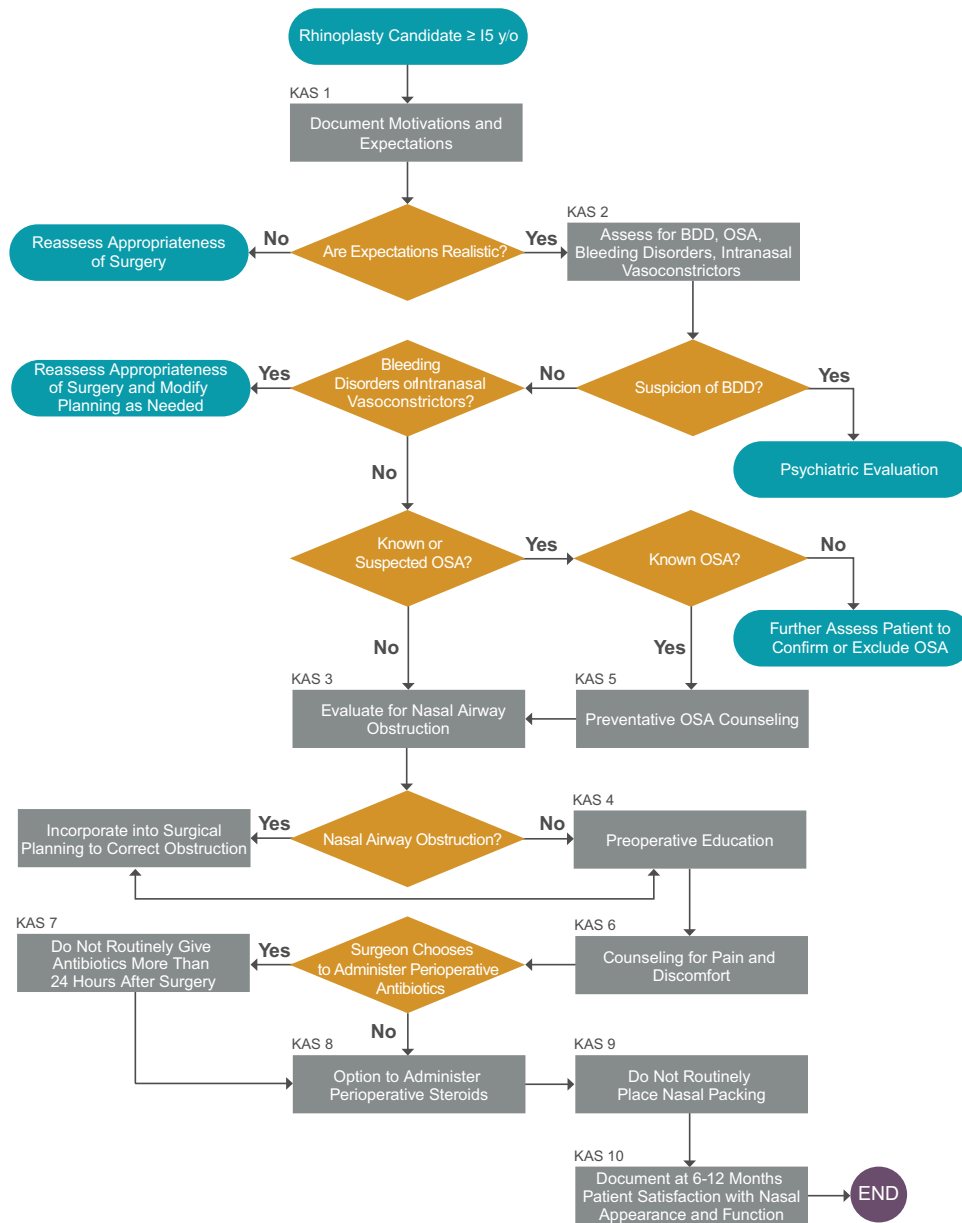


Figure 6. Algorithm of the guideline's action statements. BDD, body dysmorphic disorder; KAS, key action statement; OSA, obstructive sleep apnea.

Managing Pain and Discomfort

What is the optimal duration and dosage of pain medication, including nonsteroidal anti-inflammatory drugs, to use after rhinoplasty?

What is the optimal intraoperative pain medication?

Can the management of acute postoperative pain improve the overall outcomes and patient satisfaction following rhinoplasty?

What are the long-term outcomes of improved patient satisfaction of rhinoplasty as it relates to the acute management of pain and discomfort?

Antibiotics

What is the optimal prophylactic antibiotic to be given prior to rhinoplasty?

When used postoperatively, what antibiotic is the best, and what are the data showing optimal efficacy?

Steroids

What should be the specific steroid and dose given pre- and postoperatively?

Are there increased wound complications or delays in wound healing when steroids are used postoperatively?

Should steroids be given to immune-compromised patients after rhinoplasty?
 Do topical nasal steroids improve recovery after rhinoplasty?

What are the long-term functional and cosmetic outcomes as they relate to the use of nasal packing in the postoperative period?
 What are the specific benefits of nasal packing?

Nasal Packing

Outcome Assessment

What specific packing materials and time frames do rhinoplasty surgeons use?

What are the long-term data on validated metrics for patient satisfaction and functional outcome?

APPENDICES

- 1) Modified from Chung F, et al. *Anesthesiology*. 2008; 108:812-21, Chung F, et al. *Br J Anaesth*. 2012; 108:768–75, Chung F, et al. *J Clin Sleep Med*. 2014. “With permission from University Health Network, www.stopbang.ca”.
- 2) Katharine A. Phillips, MD *The Broken Mirror: Understanding and Treating Body Dysmorphic Disorder: Revised and Expanded Edition*. New York: Oxford University Press, 2005
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Appendix I: STOP-Bang Sleep Apnea Questionnaire⁴⁵

Snoring?

Yes No	Do you Snore Loudly (loud enough to be heard through closed doors or your bed-partner elbows you for snoring at night)?
--------	---

Tired?

Yes No	Do you often feel Tired, Fatigued, or Sleepy during the daytime (such as falling asleep during driving)?
--------	--

Observed?

Yes No	Has anyone Observed you Stop Breathing or Choking/Gasping during your sleep?
--------	--

Pressure?

Yes No Do	you have or are being treated for High Blood Pressure?
-----------	--

Body Mass Index more than 35kg/m²?

Yes No

Age older than 50-year-old?

Yes No

Neck size large? (Measured around Adams apple)

Yes No	For male, is your shirt collar 17 inches/43 cm or larger? For female, is your shirt collar 16 inches/41 cm or larger?
--------	--

Gender = Male?

Yes No

Scoring Criteria:

For general population

Low risk of OSA: Yes to 0-2 questions

Intermediate risk of OSA: Yes to 3-4 questions

High risk of OSA: Yes to 5-8 questions

or Yes to 2 or more of 4 STOP questions + male gender

or Yes to 2 or more of 4 STOP questions + BMI > 35 kg/m²

or Yes to 2 or more of 4 STOP questions + neck circumference

(17"/43cm in male, 16"/41cm in female)

Modified from Chung F et al., Anesthesiology 2008; 108:812-21, Chung F et al Br J Anaesth

2012; 108:768-75, Chung F et al J Clin Sleep Med Sept 2014

“With permission from University Health Network, www.stopbang.ca”

Appendix 2: Body Dysmorphic Disorder (BDD) Questionnaire¹²⁵

Name Date

Please read each question carefully and circle the answer that is true for you. Also write in answers where indicated.

1) Are you worried about how you look? Yes No

–If yes: Do you think about your appearance problems a lot and wish you could think about them less? Yes No

–If yes: Please list the body areas you don’t like: _____

Examples of disliked body areas include: your skin (for example, acne, scars, wrinkles, paleness, redness); hair; the shape or size of your nose, mouth, jaw, lips, stomach, hips, etc.; or defects of your hands, genitals, breasts, or any other body part.

NOTE: If you answered “No” to either of the above questions, you are finished with this questionnaire. Otherwise continue.

2) Is your main concern with how you look that you aren’t thin enough or that you might get too fat? Yes No

3) How has this problem with how you look affected your life?

• Has it often upset you a lot? Yes No

• Has it often gotten in the way of doing things with friends, dating, your relationships with people, or your social activities? Yes No

–If yes: Describe how: _____

• Has it caused you any problems with school, work, or other activities? Yes No

–If yes: What are they? _____

- Are there things you avoid because of how you look? Yes No

–If yes: What are they? _____

4) On an average day, how much time do you usually spend thinking about how you look? (Add up all the time you spend in total in a day, then circle one.)

- (a) Less than 1 hour a day (b) 1-3 hours a day (c) More than 3 hours a day

Interpretation of results:

A diagnosis of BDD is likely with the following answers:

- Question 1: Yes to both parts
- Question 3: Yes to any of the questions
- Question 4: Answers b or c

Appendix 3: Nasal Obstruction and Septoplasty Effectiveness Scale¹²³

Physician AAO-HNS#: _____ Patient ID: _____ Today's date: _____ //

To the Patient: Please help us to better understand the impact of nasal obstruction on your quality of life by completing the following survey. Thank You!

Over the past ONE month, how much of a problem were the following conditions for you?

Please **circle** the most correct response

	<i>Not a Problem</i>	<i>Very Mild Problem</i>	<i>Moderate problem</i>	<i>Fairly Bad Problem</i>	<i>Severe roblem</i>
1. Nasal congestion or stuffiness	0	1	2	3	4
2. Nasal blockage or obstruction	0	1	2	3	4
3. Trouble breathing through my nose	0	1	2	3	4
4. Trouble sleeping	0	1	2	3	4
5. Unable to get enough air through my nose during exercise or exertion	0	1	2	3	4

NOSE SCALE ADMINISTRATION

1. Have patient complete the questionnaire as indicated by circling the response closest to describing their current symptoms.
2. Sum the answers the patient circles and multiply by 20 to base the scale out of a possible score of 100 for analysis.

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Supplemental Material

Additional supporting information is available in the online version of the article.

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