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Clinical Practice Guideline: Nosebleed (Epistaxis)

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Abstract

Objective. *Nosebleed*, also known as *epistaxis*, is a common problem that occurs at some point in at least 60% of people in the United States. While the majority of nosebleeds are limited in severity and duration, about 6% of people who experience nosebleeds will seek medical attention. For the purposes of this guideline, we define the target patient with a nosebleed as *a patient with bleeding from the nostril, nasal cavity, or nasopharynx that is sufficient to warrant medical advice or care. This includes bleeding that is severe, persistent, and/or recurrent, as well as bleeding that impacts a patient's quality of life*. Interventions for nosebleeds range from self-treatment and home remedies to more intensive procedural interventions in medical offices, emergency departments, hospitals, and operating rooms. Epistaxis has been estimated to account for 0.5% of all emergency department visits and up to one-third of all otolaryngology-related emergency department encounters. Inpatient hospitalization for aggressive treatment of severe nosebleeds has been reported in 0.2% of patients with nosebleeds.

Purpose. The primary purpose of this multidisciplinary guideline is to identify quality improvement opportunities in the management of nosebleeds and to create clear and actionable recommendations to implement these opportunities in clinical practice. Specific goals of this guideline are to promote best practices, reduce unjustified variations in care of patients with nosebleeds, improve health outcomes, and minimize the potential harms of nosebleeds or interventions to treat nosebleeds.

The target patient for the guideline is any individual aged $\geq$3 years with a nosebleed or history of nosebleed who needs medical treatment or seeks medical advice. The target audience of this guideline is clinicians who evaluate and treat patients with nosebleed. This includes primary care providers such as family medicine physicians, internists, pediatricians, physician assistants, and nurse practitioners. It also includes specialists such as emergency medicine providers, otolaryngologists, interventional radiologists/neuroradiologists and neurointerventionalists, hematologists, and cardiologists. The setting for this guideline includes any site of evaluation and treatment for a patient with nosebleed, including ambulatory medical sites, the emergency department, the inpatient hospital, and even remote outpatient encounters with phone calls and telemedicine. Outcomes to be considered for patients with nosebleed include control of acute bleeding, prevention of recurrent episodes of nasal bleeding, complications of treatment modalities, and accuracy of diagnostic measures.

This guideline addresses the diagnosis, treatment, and prevention of nosebleed. It focuses on nosebleeds that commonly present to clinicians via phone calls, office visits, and emergency room encounters. This guideline discusses first-line treatments such as nasal compression, application of vasoconstrictors, nasal packing, and nasal cautery. It also addresses more complex epistaxis management, which includes the use of endoscopic arterial ligation and interventional radiology procedures. Management options for 2

special groups of patients—patients with hereditary hemorrhagic telangiectasia syndrome and patients taking medications that inhibit coagulation and/or platelet function—are included in this guideline.

This guideline is intended to focus on evidence-based quality improvement opportunities judged most important by the guideline development group. It is not intended to be a comprehensive, general guide for managing patients with nosebleed. In this context, the purpose is to define useful actions for clinicians, generalists, and specialists from a variety of disciplines to improve quality of care. Conversely, the statements in this guideline are not intended to limit or restrict care provided by clinicians based on their experience and assessment of individual patients.

Action Statements. The guideline development group made *recommendations* for the following key action statements: (1) At the time of initial contact, the clinician should distinguish the nosebleed patient who requires prompt management from the patient who does not. (2) The clinician should treat active bleeding for patients in need of prompt management with firm sustained compression to the lower third of the nose, with or without the assistance of the patient or caregiver, for 5 minutes or longer. (3a) For patients in whom bleeding precludes identification of a bleeding site despite nasal compression, the clinician should treat ongoing active bleeding with nasal packing. (3b) The clinician should use resorbable packing for patients with a suspected bleeding disorder or for patients who are using anticoagulation or antiplatelet medications. (4) The clinician should educate the patient who undergoes nasal packing about the type of packing placed, timing of and plan for removal of packing (if not resorbable), postprocedure care, and any signs or symptoms that would warrant prompt reassessment. (5) The clinician should document factors that increase the frequency or severity of bleeding for any patient with a nosebleed, including personal or family history of bleeding disorders, use of anticoagulant or antiplatelet medications, or intranasal drug use. (6) The clinician should perform anterior rhinoscopy to identify a source of bleeding after removal of any blood clot (if present) for patients with nosebleeds. (7a) The clinician should perform, or should refer to a clinician who can perform, nasal endoscopy to identify the site of bleeding and guide further management in patients with recurrent nasal bleeding, despite prior treatment with packing or cautery, or with recurrent unilateral nasal bleeding. (8) The clinician should treat patients with an identified site of bleeding with an appropriate intervention, which may include one or more of the following: topical vasoconstrictors, nasal cautery, and moisturizing or lubricating agents. (9) When nasal cautery is chosen for treatment, the clinician should anesthetize the bleeding site and restrict application of cautery only to the active or suspected site(s) of bleeding. (10) The clinician should evaluate, or refer to a clinician who can evaluate, candidacy for surgical arterial ligation or endovascular embolization for patients with persistent or recurrent bleeding not controlled by packing or nasal cauterization. (11) In the absence of life-threatening bleeding, the clinician should initiate first-line treatments prior to transfusion, reversal of anticoagulation, or withdrawal of anticoagulation/antiplatelet medications for patients using these medications. (12) The clinician should assess, or refer to a specialist who can assess, the presence of nasal telangiectasias and/or oral mucosal telangiectasias in patients who have a history of recurrent bilateral nosebleeds or a family history of recurrent nosebleeds to diagnose hereditary hemorrhagic telangiectasia syndrome. (13) The clinician should educate patients with nosebleeds and their caregivers about preventive measures for nosebleeds, home treatment for nosebleeds, and indications to seek additional medical care. (14) The clinician or designee should document the outcome of intervention within 30 days or document transition of care in patients who had a nosebleed treated with nonresorbable packing, surgery, or arterial ligation/embolization.

The policy level for the following recommendation, about examination of the nasal cavity and nasopharynx using nasal endoscopy, was an *option:* (7b) The clinician may perform, or may refer to a clinician who can perform, nasal endoscopy to examine the nasal cavity and nasopharynx in patients with epistaxis that is difficult to control or when there is concern for unrecognized pathology contributing to epistaxis.

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Introduction

Nosebleed, also known as *epistaxis*, is a common problem that occurs at some point in at least 60% of people in the United States.[1] While the majority of nosebleeds are limited in severity and duration, about 6% of people who experience nosebleeds will seek medical attention.[2] For the purposes of this guideline, we define the target patient with a nosebleed as *a patient with bleeding from the nostril, nasal cavity, or nasopharynx that is sufficient to warrant medical advice or care. This includes bleeding that is severe, persistent, and/or recurrent, as well as bleeding that impacts a patient's quality of life (QOL)*.

Interventions for nosebleeds range from self-treatment and home remedies to more intensive procedural interventions in medical offices, emergency departments, hospitals, and operating rooms. Epistaxis has been estimated to account for 0.5% of all emergency department visits and up to one-third of all otolaryngology-related emergency department encounters.[1,3,4] Inpatient hospitalization for aggressive treatment of severe nosebleeds has been reported in 6% of patients treated for nosebleeds in emergency departments.[4]

The comprehensive management of nosebleeds was recently addressed in 2 sets of publications: a series of guidelines on aspects of epistaxis management in France and an ''audit'' of epistaxis management from the United Kingdom. These 2 sets of publications addressed the initial evaluation of patients with nosebleeds, the use of packing and cautery as initial treatments, the care of nosebleeds in patients who are taking medication that impair clotting, the use of surgical and endovascular procedures for refractory epistaxis, and the management of nosebleeds in patients with comorbid conditions, such as hypertension or hereditary hemorrhagic telangiectasia (HHT) syndrome.[5-12] This multidisciplinary clinical practice guideline has been developed with the guideline development process of the American Academy of Otolaryngology–Head and Neck Surgery Foundation (AAO-HNSF) to create evidence-based recommendations to improve quality and reduce variations in the care of patients with nosebleeds.[13]

Guideline Scope and Purpose

The purpose of this multidisciplinary guideline is to identify quality improvement opportunities in the management of nosebleeds and to create clear and actionable recommendations to implement these opportunities in clinical practice. Expert consensus to fill evidence gaps, when used, is explicitly stated and supported with a detailed evidence profile for transparency. Specific goals of this guideline are to promote best practices, reduce unjustified variations in the care of patients with nosebleeds, improve health outcomes, and minimize the potential harms of nosebleeds and/or interventions to treat nosebleeds.

The target patient for the guideline is any individual aged $\geq$3 years with a nosebleed or history of nosebleed. Children aged <3 years are excluded, as the guideline development group (GDG) felt that very young, otherwise healthy children rarely required evaluation for nosebleeds. The group also recognized that literature informing treatment of nosebleeds in infants and toddlers was scant. Additionally, while bleeding from the nose may occur secondary to a variety of systemic diseases and head and neck disorders, this guideline does not apply to patients who have a diagnosed bleeding disorder, tumors of the nose or nasopharynx, vascular malformations of the head and neck, a history of recent facial trauma, or who have undergone nasal and/or sinus surgery in the past 30 days. The management of nosebleeds in such excluded patients centers on the treatment of these causative factors, and the recommendations within this guideline may not consistently apply in such cases. Patients with intranasal telangiectasias associated with HHT are not excluded, as the GDG noted opportunity for improved care of these patients with specific recommendations based on studies of patients with HHT and epistaxis.

The target audience of this guideline is clinicians who evaluate and treat patients with nosebleed. This includes primary care providers, such as family medicine physicians, internists, pediatricians, physician assistants, and nurse practitioners. It also includes specialists, such as emergency medicine providers, otolaryngologists, interventional radiologists/neuroradiologists and neurointerventionalists, hematologists, and cardiologists. A plain language summary accompanies this clinical practice guideline for the use of patients and nonclinicians. The setting for this guideline includes any site of evaluation and treatment for a patient with nosebleed, including ambulatory medical sites, the emergency department, the inpatient hospital, and even outpatient remote encounters with phone calls and telemedicine (**Table 1**). Outcomes to be considered for patients with epistaxis include control of acute bleeding, prevention of recurrent episodes of nasal bleeding, complications of treatment modalities, and accuracy of diagnostic measures. Other considerations are cost, time, and efficiency of diagnostic and treatment measures in patients with nosebleed.

This guideline addresses the diagnosis, treatment, and prevention of nosebleed. It focuses on nosebleeds that commonly present to clinicians through phone calls, office visits, and emergency room encounters. This guideline discusses first-line treatments, such as nasal compression, application of vasoconstrictors, nasal packing, and nasal cautery. It also addresses more complex epistaxis management, which includes the use of endoscopic arterial ligation and interventional radiology procedures. Management options for 2 special groups of patients, patients with HHT and patients taking medications that inhibit coagulation and/or platelet function, are included in this guideline.

Table 1. Applying the Nosebleed Clinical Practice Guideline: Target Patient and Practice Settings.

Target Patient	Exclusions	Practice Settings/Encounter Type
• Age ≥3 years • Nosebleed that is severe, persistent, or recurrent or affects quality of life	• Age <3 years • Nasal or nasopharyngeal tumor • Vascular malformation of the head and neck • Diagnosed bleeding disorder • Recent facial trauma • Recent sinus and/or nasal surgery	• Outpatient office or clinic • Emergency department • Hospital (wards, radiology suites, operating rooms) • Phone call encounters • Emails/texts • Telemedicine

This guideline is intended to focus on evidence-based quality improvement opportunities judged most important by the working group. It is not intended to be a comprehensive, general guide for managing patients with nosebleed. In this context, the purpose is to define useful actions for clinicians, generalists, and specialists from a variety of disciplines to improve quality of care. Conversely, the statements in this guideline are not intended to limit or restrict care provided by clinicians based on their experience and assessment of individual patients.

Health Care Burden

Epidemiology

As noted previously, nearly 60% of the population experience a nosebleed at least once. One-tenth of these patients eventually seek medical advice/intervention, and 0.16% will need hospitalization.[14] Many people with nosebleed experience recurrent minor bleeding episodes and may not present for medical attention; instead, they may use home treatments or simply observe without need for intervention. One survey has shown that nearly one-third of households have ≥1 household members who experience these minor recurrent nosebleeds.[15]

A recent study based on data from the Nationwide Emergency Department Sample (NEDS) from 2009 to 2011 identified 1.2 million emergency department visits for epistaxis in the United States, thus representing 0.32% of all emergency department encounters.[16] The mean age of patients treated for epistaxis in the emergency department was 53.4 years, and 52.7% were male. In the audit of epistaxis cases managed in the United Kingdom during November 2016, 13.9% of patients treated for epistaxis presented again for treatment within 30 days.[17] These investigators also found a 30-day all-cause mortality rate of 3.4% in these patients.

Nosebleeds seem to affect the population in a bimodal age distribution, with more nosebleeds seen in children and the elderly.[18] A review of the National Hospital Ambulatory Medical Care Survey from 1992 to 2001 demonstrated this bimodal age distribution of patients presenting to emergency departments for treatment of epistaxis, with peak frequency of bleeding in children <10 years of age and in adults between ages 70 and 79 years.[4] A review of Medicare claims data showed an increase in emergency department visits for epistaxis with advanced age, with patients aged 66 to 75 years 1.36 times more likely, patients aged 76 to 85 years 2.37 times more likely, and patients aged >85 years 3.24 times more likely to present to the emergency room than patients <65 years old.[1] Although some studies report a higher incidence of nosebleeds in male patients,[4,19] other studies have not demonstrated any gender preponderance.[20]

Nosebleeds are very common in childhood, with 3 out of 4 children experiencing at least 1 episode of epistaxis according to 1 recent report.[5] Nosebleeds in otherwise healthy children most often are limited bleeds from the anterior nasal septum and can be caused or aggravated by digital trauma, crusting from nasal inflammation, or nasal foreign bodies. Persistent or recurrent nasal bleeding in adolescent males, particularly unilateral nosebleed in the presence of nasal obstruction, could suggest the diagnosis of juvenile nasopharyngeal angiofibroma, an uncommon histologically benign but locally invasive vascular tumor.[21] A recent study of emergency department databases in 4 states showed that children who presented with epistaxis had a mean age of 7.5 years and 57.4% were male.[22] Procedures to control epistaxis were required in 6.9% of these children, with 93.5% of these procedures coded as simple anterior epistaxis control (limited cautery and/or packing).[22]

About 5% to 10% of nosebleeds are from posterior sites on the lateral nasal wall or nasal septum not visible by anterior rhinoscopy, known as *posterior epistaxis.* Posterior epistaxis is more common in older patients and often more difficult to control.[2] One series demonstrated that posterior epistaxis accounted for 5% of all patients with nosebleed treated in the emergency department or admitted to the hospital.[23]

While epistaxis is usually spontaneous without obvious cause, some nosebleeds can be associated with systemic hematologic, hepatic, renal, genetic, or cardiovascular diseases. Forty-five percent of patients hospitalized for epistaxis had systemic illnesses that likely contributed to the nosebleeds.[24] In the NEDS study of patients with epistaxis, 15% of patients were on long-term anticoagulation; 33% had a history of hypertension; and 0.9% had an underlying coagulation disorder.[16] The often-assumed causal relationship between epistaxis and hypertension is not well

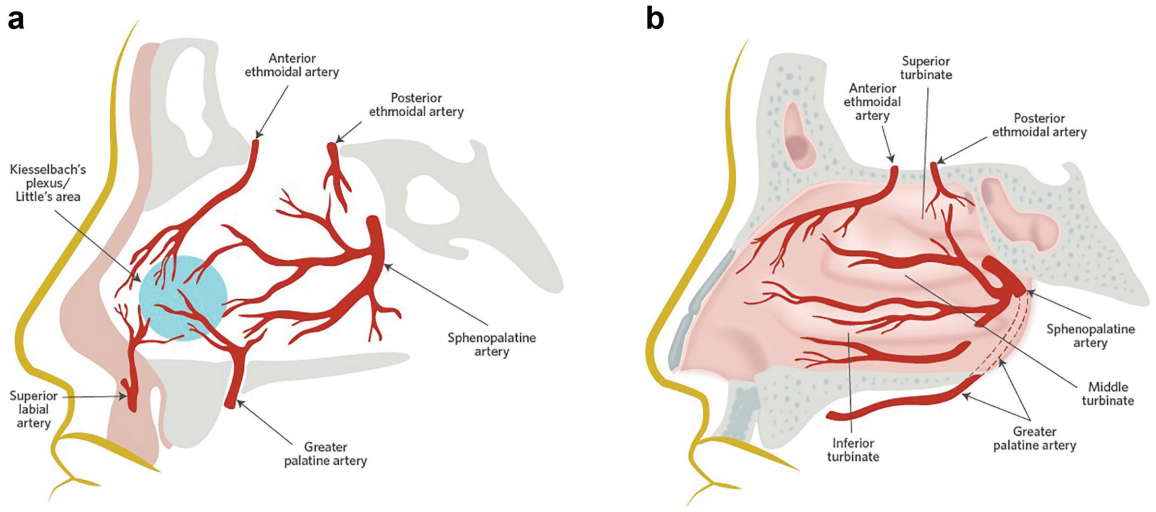


Figure 1. Epistaxis illustration: Vascular supply of the (a) nasal septum and (b) lateral nasal wall.

established.[18] A recent systematic review showed an association of hypertension with epistaxis (odds ratio [OR], 1.532; 95% CI, 1.181-1.986), but no study supported any causal relationship.[25] These authors noted that the prevalence of hypertension in patients with epistaxis has been reported to be between 24% and 64%. An accompanying commentary provides additional information about available studies of the relationship between hypertension and nosebleed.[26]

Nosebleeds are also a recognized problem for patients with known inherited bleeding disorders, such as von Willebrand disease or hemophilia,[27] as well as for patients with abnormal nasal vasculature, such as that seen in HHT syndrome.[28] Nosebleeds are common in patients taking anticoagulants and medications that impair platelet function. New-generation anticoagulants appear to increase the risk of nosebleed, and algorithms for treating these nosebleeds and indications for discontinuing such medications in these patients are being developed.[6,12,29] The increasing use of such medications, with observations of associated nosebleeds, was one of the key concerns of the GDG.

Interventions for Nosebleed

The majority of nosebleeds originate from the nasal septum, although the lateral nasal wall has a rich vascular supply as well (**Figure 1**).

Initial (''first-line'') treatment can include combinations of direct nasal compression, application of topical agents including vasoconstrictors, cautery of the bleeding site with chemicals or electrocautery, or packing with a variety of resorbable and nonresorbable materials.[18,30,31] In the aforementioned review of nosebleeds using NEDS, 19.7% of emergency room visits for epistaxis involved treatment with nasal packing. Fifty-two percent of these patients who required packing also had nasal cautery; 41% had anterior packing alone; and 7% had anterior and posterior nasal packing performed.[16] While the use of topical vasoconstriction and anterior nasal packing is accepted and used widely, questions remain about the types of topical agents, the method of packing, the specific packing materials employed, the duration of packing, and the aftercare for patients with nasal packing. Hemostatic aids, such as antifibrinolytic agents and hemostatic packing materials, provide additional options for control of nasal bleeding.

A small fraction of patients with nosebleeds refractory to initial local measures will require intensive management, usually with either surgical ligation/cautery of feeder arteries or the use of endovascular embolization procedures.[32] Success of surgical ligation and embolization procedures for acute control of nasal bleeding is >90%. A recent report of a care pathway for patients with severe epistaxis at a tertiary care center advocated for early sphenopalatine artery ligation to improve outcomes and reduce costs.[33] A review of the National Inpatient Sample database from 2008 to 2013 found 1813 cases treated with such procedures, with 57.1% undergoing surgical ligation and 42.9% treated with endovascular embolization. Use of interventional radiology procedures increased over the 5 years of review, although surgical ligation appeared to have fewer airway complications, lower hospital charges, and slightly shorter length of hospital stay. This clinical practice guideline provides recommendations, as evidence allows, to assist with selection of the most appropriate pathways for initial and rescue treatment of nosebleed.

Cost and Variations in Care

While the majority of patients with nosebleeds may not seek medical care, a small percentage will have bleeding requiring presentation to the emergency department with possible admission for additional consultation and control. Sethi et al reported 132 emergency department visits for epistaxis per 100,000 population yearly.[16] In this sample, 95.5% of patients with epistaxis were discharged home from the emergency department. The mean charge for these patients was estimated to be $1146.21 per visit, but the cost

increased when nasal packing was used ($1473.29 for packing vs $1048.22 otherwise).[16] A study from Canada reviewed costs when initial emergency department epistaxis management failed and found that repeat nasal packing could drive the cost up to CaD $4046.74 (US $3035 based on April 2018 exchange rates).[34]

Charges and costs dramatically increase for patients who require inpatient admission for epistaxis management. Goljo et al noted an average length of stay of 2.24 days with a mean cost of $6925 per admission.[35] They also noted that the presence of renal disease increased costs by $1272 per patient, with some of this increase due to hemodialysis that was required for 16.8% of their admitted patients. Costs were also increased in patients with a history of alcohol abuse and/or sinonasal disease. Costs were even higher in patients of Asian/Pacific Islander descent, of the top income quartile, or with private payer insurance. When actual hospital charges are considered, as opposed to the patient costs previously noted, the numbers are even more striking. Villwock et al compared costs associated with early or delayed intervention for admitted patients with epistaxis and studied costs of surgical ligation in the operating room (endoscopic sphenopalatine ligation) versus angiography with embolization.[36] Early intervention appeared to reduce the total cost of hospitalization. They also noted a $30,000 increase in charges for those undergoing embolization ($58,967) as compared with surgical ligation ($28,611).[36] Brinjikji et al expressed additional concerns about the cost of tertiary care for nosebleeds, as they documented a trend to more frequent use of embolization, from 2.8% of admitted patients with nosebleed in 2003 to 10.7% in 2010.[37]

These cost analyses indicate variations in care of patients with nosebleed, not all of which are readily explained. Male sex (OR, 1.14; 95% CI, 1.10-1.17) and the setting of long-term anticoagulation (OR, 1.21; 95% CI, 1.10-1.33) independently increased the likelihood of treatment with nasal packing. Packing also seemed to occur more often in the Midwest (OR, 1.85; 95% CI, 1.24-2.30) and South (OR 1.62; 95% CI, 1.12-1.34) when compared with the West and more frequently in nontrauma hospitals (OR, 1.56; 95% CI, 1.19-2.05). The authors postulated that increased packing rates could indicate reduced availability of otolaryngologic services.[16] Patients admitted on a weekday were more likely to receive early intervention for nosebleed than those admitted on a weekend (OR, 1.86; 95% CI, 1.34-2.58).[36] Additionally, admission to an urban hospital more often resulted in embolization or surgical ligation, likely due to increased availability of specialty services, but an increase in the likelihood of embolization specifically was not seen.

Quality of Life

Nosebleeds are troublesome and adversely affect the QOL of patients and their families. The Parental Stress Index Short Form is a validated test of stress with 3 subscales.[38] The stress on parents of pediatric patients with epistaxis was evaluated with this form, which showed that nearly one-third of the children and 44% of their parents reported high stress scores.[39]

There are few, if any, studies that measure either baseline QOL or QOL changes with treatment in patients with nosebleed, aside from several studies of patients with HHT. These studies of adults with epistaxis and HHT have shown severity-dependent effects on QOL and impairment on psychosocial QOL measures.[40,41] Merlo et al surveyed 604 patients with HHT using a validated survey, the Epistaxis Severity Score (ESS), and evaluated their health-related QOL.[41] The authors found that 27.6% patients had mild epistaxis (ESS <4), 47.2% moderate (≥ 4 ESS <7), and 25.2% severe (ESS ≥ 7). The patients with severe epistaxis had lower scores on the Mental and Physical Component Summaries of health-related QOL when compared with those with mild epistaxis. Similarly, in the study by Loaec et al, 115 patients were interviewed, and the authors found that frequent episodes of epistaxis and abundant bleeding decreased psychosocial QOL measures.[40] In addition, these patients expressed a ''desire to withdraw'' and ''felt different'' as compared with others.

Methods

General Methods

In developing this evidence-based clinical practice guideline, the methods outlined in the AAO-HNSF's ''Clinical Practice Guideline Development Manual, Third Edition'' were followed explicitly.[13]

Literature Search

An information specialist conducted several literature searches from November 2017 through March 2018, using a validated filter strategy, to identify clinical practice guidelines, systematic reviews, randomized controlled trials, and related clinical studies.

The following databases were searched for relevant studies: Medline (OvidSP, 1946–week 2 of February 2018), Embase (OvidSP, 1974–February 16, 2018), CINAHL (EBSCO, all years to February 19, 2018), and BIOSIS Previews (all years to February 17, 2018). All searches were conducted on February 17, 2018, except CINAHL, which was searched on February 19, 2018. The databases were searched with controlled vocabulary words and synonymous free text words for the topic of interest (epistaxis or nosebleed). The search strategies were adjusted for the syntax appropriate for each database/platform. The search was not limited to clinical study design and English language. The full strategy is shown in the appendix (available in the online version of the article). Alternatively, the authors may be contacted directly for search strategy details. These search terms were used to capture all evidence on the population, incorporating all relevant treatments and outcomes. In certain instances, targeted searches for lower-level evidence were performed by the GDG members to address

gaps from the systematic searches identified in writing the guideline from April 2018 through October 2018.

The English-language search identified 5 clinical practice guidelines, 30 systematic reviews, 35 randomized controlled trials, and 238 related studies published through March 2018. Clinical practice guidelines were included if they met quality criteria of (a) an explicit scope and purpose, (b) multidisciplinary stakeholder involvement, (c) systematic literature review, (d) explicit system for ranking evidence, and (e) explicit system for linking evidence to recommendations. Systematic reviews were emphasized and included if they met quality criteria of (a) clear objective and methodology, (b) explicit search strategy, and (c) valid data extraction methods. Randomized controlled trials were included if they met the following quality criteria: (a) trials involved study randomization; (b) trials were described as double-blind; and (c) trials denoted a clear description of withdrawals and dropouts of study participants. Other studies were included if they were deemed pertinent to the epistaxis topic. After removal of duplicates, irrelevant references, and non-English-language articles, the GDG retained 5 clinical practice guidelines, 17 systematic reviews, and 16 randomized controlled trials that met inclusion criteria. An additional 203 related studies were identified that were related to the key action statements. The recommendations in this clinical practice guideline are based on systematic reviews identified by a professional information specialist using an explicit search strategy. Additional background evidence included randomized controlled trials and observational studies, as needed, to supplement the systematic reviews or to fill knowledge gaps when a review was not available.

The AAO-HNSF assembled the GDG representing the medical disciplines of nursing, family medicine, emergency medicine, otolaryngology–head and neck surgery, pediatrics, rhinology, radiology, internal medicine, and hematology. The GDG also included a consumer/patient representative. The GDG had 3 conference calls and 2 in-person meetings, during which they defined the scope and objectives of the guideline, reviewed comments from the expert panel review for each key action statement, identified other quality improvement opportunities, reviewed the literature search results, and drafted/revised the document.

Key action statements were 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. Electronic decision support software (BRIDGE-Wiz; Yale Center for Medical Informatics, New Haven, Connecticut) was used to facilitate creating actionable recommendations and evidence profiles.[42]

AAO-HNSF staff used the GuideLine Implementability Appraisal to appraise adherence to methodologic standards, to improve clarity of recommendations, and to predict potential obstacles to implementation.[43] The GDG received summary appraisals and modified an advanced draft of the guideline based on the appraisal. The final draft of the clinical practice guideline was revised per the comments received during multidisciplinary peer review, open public comment, and journal editorial peer review. 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 harm, 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 **Table 2** and **Table 3**.[44,45]

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 what might be expected with a ''recommendation.'' ''Options'' offer the most opportunity for practice variability.[46] 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.[45] 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 disclosed, compiled, and distributed before the first conference call. After review and discussion of these disclosures,[47] 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

Table 2. Aggregate Grades of Evidence by Question Type.[a]

Grade	OCEBM 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[b]	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 studies, or poor-quality prognostic cohort study
D	5	Case reports, mechanism-based reasoning, or reasoning from first principles			
X	NA	Exceptional situations where validating studies cannot be performed and there is a clear preponderance of benefit over harm			

Abbreviations: NA, not applicable; OCEBM, Oxford Centre for Evidence-Based Medicine.
[a]Adapted from Oxford Centre for Evidence-Based Medicine Work Group.[44]
[b]A systematic review may be downgraded to level B because of study limitations, heterogeneity, or imprecision.
[c]A 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 3. Guideline Definitions for Evidence-Based Statements.

Statement	Definition	Implied Obligation
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 the quality of evidence is not as strong (grade B or C).[a] In some clearly identified circumstances, recommendations may be made on the basis of 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 that either 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.

[a]Adapted from the American Academy of Pediatrics classification scheme.[45]

include personal and professional experiences, how a participant earns a living, and the participant's previously established ''stake'' in an issue.[48] Conflicts were again delineated at the start of the in-person meetings and at the start of each teleconference meeting, with the same caveats followed. Conflicts were confirmed and/or updated within 1 month prior to the submission for publication consideration. All conflicts are disclosed at the end of this document.

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 the ''action statement profile'' with quality improvement opportunities, 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, exclusions to the statement, any differences of opinion, and a repeat statement of the strength of the recommendation. Several paragraphs subsequently discuss the evidence base supporting the statement. **Table 4** presents an overview of each evidence-based statement in this guideline.

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 decisions regarding treatment and care.[49] For an action statement where the evidence base demonstrates clear benefit, clinicians should provide patients with clear and comprehensible information on the benefits to facilitate patient understanding and shared decision making, which in turn leads to better patient adherence and outcomes.[49] For statements where evidence is weaker or benefits are less certain, the practice of shared decision making is extremely useful, wherein the management decision is made by a collaborative effort between the clinician and an informed patient.[49] Factors related to patient preference include (but are not limited to) absolute benefits (numbers needed to treat), potential adverse effects (number needed to harm), cost of drugs or procedures, frequency and duration of treatment, as well as certain less tangible factors, such as religious and/or cultural beliefs or personal levels of desire for intervention.

Key Action Statements

STATEMENT 1. PROMPT MANAGEMENT: At the time of initial contact, the clinician should distinguish the nosebleed patient who requires prompt management from the patient who does not. *Recommendation based on observational studies and a preponderance of benefit over harm.*

Action Statement Profile: 1

- Quality improvement opportunity: To identify those patients who need immediate diagnosis and treatment (National Quality Strategy: Patient Safety)
- Level of confidence in evidence: Medium, as available evidence only addresses nosebleed patients who actually seek and receive medical intervention
- Aggregate evidence quality: Grade C, based on observational studies on the effectiveness of interventions
- Benefits: Prevention of morbidity and in rare cases mortality; increased likelihood of timely treatment; more efficient allocation of resources to patients in greatest need of treatment; reduction of patient and family stress; avoidance of unnecessary interventions in patients who are not actively bleeding.
- Risk, harm, cost: Delayed treatment of patients who may actually need intervention, overtreatment of patients who are not actively bleeding, increased patient anxiety. No costs are associated with this recommendation
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: None
- Intentional vagueness: The actual appropriate timing for ''prompt'' management is not specified, as it may vary with different clinical situations; assessment of bleeding severity may occur during telephone/electronic communications or during face-to-face patient encounter.
- Role of patient preferences: None
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of this statement is to assist clinicians in determining the severity of a nosebleed as well as the appropriate clinical setting where the patient should be seen for management. The goals of such management are to achieve resolution of the nosebleed and minimize recurrence of bleeding. Patients with nosebleeds may present to a clinician with a telephone call or an electronic communication, walk in to an ambulatory medical setting, or present to the emergency department. Prompt assessment of bleeding severity will assist the clinician in directing the patient to the proper clinical site for management. While there are many studies that examine how to manage an existing nosebleed,[7] few studies address the ideal timing for intervention or the most appropriate setting for care of nosebleeds.

Active versus Nonactive Bleeding

When the patient reports or presents with active bleeding, the immediate concerns are possible airway compromise from bleeding into the oropharynx and airway or hemodynamic

Table 4. Summary of Evidence-Based Statements.

Statement	Action	Strength
1: Prompt management	At the time of initial contact, the clinician should distinguish the nosebleed patient who requires prompt management from the patient who does not.	Recommendation
2: Nasal compression	The clinician should treat active bleeding for patients in need of prompt management with firm sustained compression to the lower third of the nose, with or without the assistance of the patient or caregiver, for 5 minutes or longer.	Recommendation
3a: Nasal packing	For patients in whom bleeding precludes identification of a bleeding site despite nasal compression, the clinician should treat ongoing active bleeding with nasal packing.	Recommendation
3b: Nasal packing in patients with suspected increased bleeding risk	The clinician should use resorbable packing for patients with a suspected bleeding disorder or for patients who are using anticoagulation or antiplatelet medications.	Recommendation
4: Nasal packing education	The clinician should educate the patient who undergoes nasal packing about the type of packing placed, timing of and plan for removal of packing (if not resorbable), postprocedure care, and any signs or symptoms that would warrant prompt reassessment.	Recommendation
5: Risk factors	The clinician should document factors that increase the frequency or severity of bleeding for any patient with a nosebleed, including personal or family history of bleeding disorders, use of anticoagulant or antiplatelet medications, or intranasal drug use.	Recommendation
6: Anterior rhinoscopy to identify location of bleeding	The clinician should perform anterior rhinoscopy to identify a source of bleeding after removal of any blood clot (if present) for patients with nosebleeds.	Recommendation
7a: Examination using nasal endoscopy	The clinician should perform, or should refer to a clinician who can perform, nasal endoscopy to identify the site of bleeding and guide further management in patients with recurrent nasal bleeding, despite prior treatment with packing or cautery, or with recurrent unilateral nasal bleeding.	Recommendation
7b: Examination of nasal cavity and nasopharynx using nasal endoscopy	The clinician may perform, or may refer to a clinician who can perform, nasal endoscopy to examine the nasal cavity and nasopharynx in patients with epistaxis that is difficult to control or when there is concern for unrecognized pathology contributing to epistaxis.	Option
8: Appropriate interventions for identified bleeding site	The clinician should treat patients with an identified site of bleeding with an appropriate intervention, which may include one or more of the following: topical vasoconstrictors, nasal cautery, and moisturizing or lubricating agents.	Recommendation
9: Nasal cautery	When nasal cautery is chosen for treatment, the clinician should anesthetize the bleeding site and restrict application of cautery only to the active or suspected site(s) of bleeding.	Recommendation
10: Ligation and/or embolization for persistent nosebleeds	The clinician should evaluate, or refer to a clinician who can evaluate, candidacy for surgical arterial ligation or endovascular embolization for patients with persistent or recurrent bleeding not controlled by packing or nasal cauterization.	Recommendation
11: Management of patients using anticoagulation and antiplatelet medications	In the absence of life-threatening bleeding, the clinician should initiate first-line treatments prior to transfusion, reversal of anticoagulation, or withdrawal of anticoagulation/antiplatelet medications for patients using these medications.	Recommendation
12: Hereditary hemorrhagic telangiectasia (HHT) identification	The clinician should assess, or refer to a specialist who can assess, the presence of nasal telangiectasias and/or oral mucosal telangiectasias in patients who have a history of recurrent bilateral nosebleeds or a family history of recurrent nosebleeds to diagnose hereditary hemorrhagic telangiectasia syndrome.	Recommendation
13: Patient education and prevention	The clinician should educate patients with nosebleeds and their caregivers about preventive measures for nosebleeds, home treatment for nosebleeds, and indications to seek additional medical care.	Recommendation
14: Nosebleed outcomes	The clinician or designee should document the outcome of intervention within 30 days or document transition of care in patients who had a nosebleed treated with nonresorbable packing, surgery, or arterial ligation/embolization.	Recommendation

instability due to blood loss. These severe concerns would require emergent evaluation in a hospital or emergency department setting. If there is only minor active bleeding without airway or hemodynamic issues, the patient may be assessed in an ambulatory setting that has the clinical expertise and supplies necessary to diagnose and control bleeding. If active bleeding is not reported or seen but there is concern for recurrence of severe bleeding, the clinician should direct the patient to an emergency department or hospital. If there is no active bleeding and the prior bleeding was minor, then the patient may be assessed in an appropriate ambulatory clinic or office setting.

Severity of Bleeding

While a standard definition of ''severe epistaxis'' does not exist, severity of bleeding can be assessed in several ways. Bleeding duration >30 minutes over a 24-hour period was considered severe in the UK epistaxis audit.[17] Additionally, a history of hospitalization for nosebleed, prior blood transfusion for nosebleeds, or >3 recent episodes of nasal bleeding may indicate the need for prompt evaluation.[9] Patient self-report of bleeding severity may over- or underestimate actual bleeding.[17] Additional patient-related factors that have a bearing on the need for prompt evaluation include comorbid conditions such as hypertension, cardiopulmonary disease, anemia, bleeding disorders, and liver or kidney disease. When the clinician evaluates the patient, evidence of or suspicion for a prolonged or large volume bleeding, bleeding from both sides of the nose or from the mouth, or any signs of acute hypovolemia (ie, tachycardia, syncope, orthostatic hypotension) should warrant prompt management. If the patient contact is remote (ie, via telephone call or e-communication from the patient or family member or from another clinician), similar queries about duration and severity of bleeding will allow determination of appropriate timing and setting for assessment and treatment.

STATEMENT 2. NASAL COMPRESSION: The clinician should treat active bleeding for patients in need of prompt management with firm sustained compression to the lower third of the nose, with or without the assistance of the patient or caregiver, for 5 minutes or longer. *Recommendation based on observational studies and a preponderance of benefit over harm.*

Action Statement Profile: 2

- Quality improvement opportunity: To promote effective treatment for nosebleed patients (National Quality Strategy Domain: Patient and Family Engagement, Clinical Processes/Effectiveness)
- Level of confidence in evidence: Medium
- Aggregate evidence quality: Grade C, observational studies and control group of 1 randomized controlled trial
- Benefits: Use of the simplest method to stop nosebleeds, reduce morbidity, protect airway, reduce need for blood products, improve patient satisfaction, allow for further assessment and management
- Risk, harm, cost: May delay more definitive management if needed; patient discomfort
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: The GDG felt that the least invasive, most readily available, and lowest-cost management method should be used first in patients with nosebleeds
- Intentional vagueness: Patients or caregivers may choose to perform sustained digital compression under the direction of the clinician if willing and able. A nose clip is an alternative to digital compression if available and tolerated by the patient. The precise duration of compression is not stated, although the GDG felt that a minimum of 5 minutes was necessary to control bleeding. The GDG agreed that longer periods of compression and repeated compression may be helpful for persistent bleeding. Vasoconstrictors can be applied by clinician or patient in conjunction with compression.
- Role of patient preferences: None
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of this statement is to encourage clinicians to first utilize often effective, low-cost, easily performed, and noninvasive intervention for nosebleeds prior to attempting more invasive, higher-cost interventions.

Patients or caregivers may or may not have already attempted at-home management with pressure at various places along the nose and in a variety of body and head positions as well. Patients should be taught first to attempt to clear the nose of clotted blood (which may otherwise promote fibrinolysis) and then to apply sustained bidigital compression to the lower third of the nose,[50] with compression of the nasal ala against the septum (**Figure 2**). There are no studies of the duration of compression for effective nosebleed control, but 15 minutes of sustained compression was the duration used in the single identified clinical trial comparing nasal compression with either fingers or a nose clip. Education of patients and caregivers on appropriate positioning (head flexed slightly forward in a ''sniffing'' position), duration, and location of compression is a quality improvement opportunity.

Although 1 randomized controlled trial[51] (n = 61) and anecdotal reports[52] suggested that a nose clip may be superior to digital compression for controlling severe epistaxis and for patient satisfaction, we judged this single small study to be insufficient evidence to recommend a clip over simple compression with fingers. Nose clips are also not readily available at home and perhaps at some medical facilities as well.

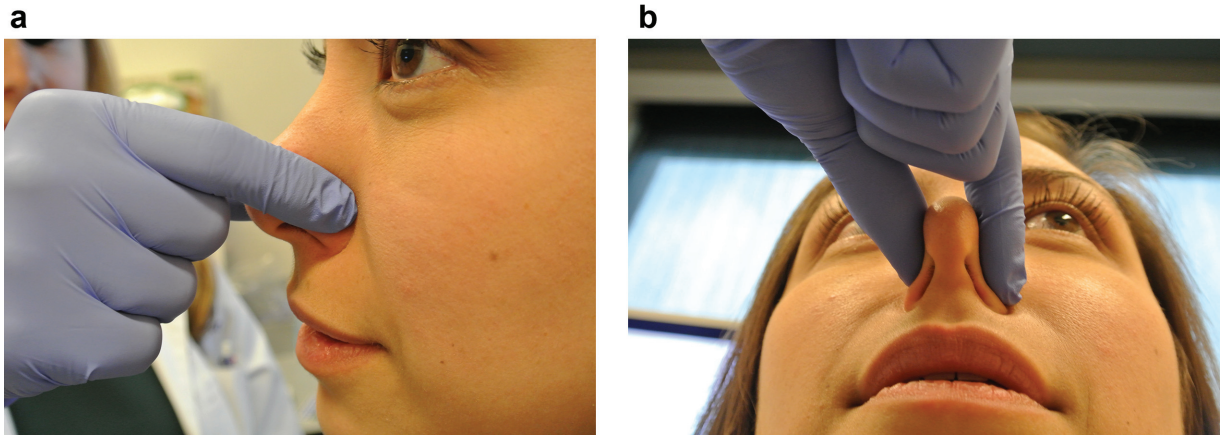


Figure 2. Digital compression to the lower third of the (a) nose (lateral view) and (b) nose (basal view).

While performing nasal compression, clinicians may concurrently obtain history from the patient or caregiver, such as use of medications, a personal history of bleeding other than a nosebleed, or a family history of bleeding or a bleeding disorder. Such history may suggest need for additional management of nosebleed besides compression. Indications for more aggressive management, such as packing or cautery, include a failure to stop or slow bleeding with compression or a nosebleed judged to be life-threatening or unlikely to respond to further compression alone.[50] Additionally, continued bleeding out the nose or into the posterior pharynx during compression may indicate a posterior bleeding site.

The use of vasoconstrictors around the time of applying compression may be helpful, but this is based on expert opinion rather than evidence from randomized controlled trials. One retrospective review of 60 patients with nosebleed who presented to an urgent care clinic or emergency department found that epistaxis control (brisk bleeding slowed within 5 minutes and bleeding stopped within 30 minutes) was achieved in 65% by spraying the nose with oxymetazoline.[53] It is not clear from this study whether nasal compression or other adjuncts were used. The aforementioned French guideline recommended the application of vasoconstrictors if bleeding continued after nasal compression.[50] Vasoconstrictors can be applied with nasal sprays or by intranasal insertion of cotton impregnated with these medications. The use of vasoconstrictors is more fully discussed in key action statement 8.

STATEMENT 3a. NASAL PACKING: For patients in whom bleeding precludes identification of a bleeding site despite nasal compression, the clinician should treat ongoing active bleeding with nasal packing. *Recommendation based on observational studies and a preponderance of benefit over harm.*

Action Statement Profile: 3a

- Quality improvement opportunity: Promote effective treatment for nosebleed patients (National Quality Strategy Domains: Patient and Family Engagement, Clinical Processes/Effectiveness)
- Level of confidence in evidence: Medium
- Aggregate evidence quality: Grade C, based on observational studies and 2 randomized controlled trials
- Benefits: Effective and prompt control of nasal bleeding, reduce morbidity, protect airway, reduce need for blood products, allow for additional assessment and management to control bleeding
- Risk, harm, cost: Failure to control bleeding, delay in care, can make subsequent examination more difficult, patient discomfort, mucosal damage from packing insertion/removal, damage to intranasal structures, possible infection, possible antibiotic exposure, adverse respiratory effects of nasal obstruction, cost of packing materials and procedure
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: None
- Intentional vagueness: The duration of packing is not specified, but the GDG felt that long durations of packing should be avoided.
- Role of patient preferences: Small to moderate, as some may decline packing and instead elect to try more or less aggressive treatments
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

STATEMENT 3b. NASAL PACKING IN PATIENTS WITH SUSPECTED INCREASED BLEEDING RISK: The clinician should use resorbable packing for patients with a suspected bleeding disorder or for patients who are using anticoagulation or antiplatelet medications. *Recommendation based on observational studies and 2 randomized controlled trials and a preponderance of benefit over harm.*

Action Statement Profile: 3b

- Quality improvement opportunity: Promote effective treatment for nosebleed patients, increase the likelihood that resorbable nasal packing will be available and used in settings where these patients are treated (National Quality Strategy Domains: Patient and Family Engagement, Clinical Processes/Effectiveness)
- Level of confidence in evidence: Medium
- Aggregate evidence quality: Grade C, based on observational studies and 2 randomized controlled trials
- Benefits: Reduce likelihood of additional bleeding when nonresorbable packing is removed, reduce morbidity, protect airway, reduce need for blood products, allow for proper further assessment and management, reduce the need for future visits, improve patient comfort as compared with nonresorbable packing
- Risk, harm, cost: Scarring, failure to control the bleed, can make subsequent examination more difficult, patient discomfort, cost for resorbable packing materials, possible infection, possible antibiotic exposure, adverse respiratory effects of nasal obstruction, delay of care if resorbable packing not available
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: The GDG felt that resorbable packing is underutilized in these patients
- Intentional vagueness: The specific type of resorbable packing is not addressed as there is a variety of materials, with limited evidence to support use of any one specific material. Experience and local availability may dictate the specific type of packing material used
- Role of patient preferences: None
- Exclusions: Patients who take ''low dose'' daily aspirin and do not take other antiplatelet and/or anticoagulation medications
- Policy level: Recommendation
- Differences of opinion: The use of the term *resorbable* versus other terms (absorbable, dissolvable, degradable) was debated by the GDG, as multiple terms are used in the literature. The vote was 0 for degradable, 1 for absorbable, 10 for resorbable, and 8 for dissolvable. One panel member was recused from these statements regarding nasal packing, as this member was concerned about potential conflict of interest with a role as a US Food and Drug Administration patient representative

Supporting Text

The purpose of these statements is to advocate for packing as management for patients with active nosebleeds that have not resolved with digital compression or when active bleeding precludes identification of a bleeding site for cauterization or application of vasoconstrictors. For patients with ongoing active bleeding, packing of the nose may slow or stop bleeding and facilitate intranasal examination to allow additional definitive management of bleeding. Similarly, the recent French epistaxis guidelines state, ''Anterior nasal cavity packing is recommended in case of failure of first-line treatment or if the exact origin of bleeding cannot be identified on nasal endoscopy.''[50] Nasal packing has been recommended by the National Institute for Health and Care Excellence and the British Medical Journal Best Practice guidance after failure of digital compression or nasal cautery.[54] While there are differences in costs among packing types (resorbable vs nonresorbable), placement of any type of packing may reduce the need for more invasive and more costly therapies.

Resorbable versus Nonresorbable Packing. Nasal packing materials can be divided into 2 types: resorbable and nonresorbable. While a variety of terms are used (see evidence profile), in this guideline we use the term *resorbable* to refer to packing that does not require removal. Nonresorbable packing includes a variety of gauze dressings, polymers, and inflatable balloons. All types of nonresorbable packings must be removed at some point after sustained control of nasal hemorrhage is achieved. The various commercially available resorbable and nonresorbable packing materials are listed in **Table 5**.

The traditional nonresorbable nasal packing includes ribbon gauze or nonadherent strips (Adaptic), often layered inside the nasal cavity and impregnated with ointments. Nonresorbable polymer packing, such as polyvinyl acetate sponge (Merocel), is also commonly utilized and is available in different sizes. Placement and removal of these types of packing is usually accompanied with patient discomfort. It is important to consider that rebleeding can result upon removal by causing mucosal abrasions or detaching eschar.[55] Some inflatable balloon packing (Rapid Rhino) is covered with hydrocolloid fabric to facilitate insertion and removal. In a prospective randomized controlled trial comparing polyvinyl acetate sponge and inflatable balloons with hydrocolloid fabric packs, the latter produced significantly lower scores for subjective patient discomfort during insertion and removal.[56]

Resorbable packing materials include oxidized regenerated cellulose (Surgicel), synthetic polyurethane sponge (Nasopore), chitosan-based materials (Posisep), purified porcine skin, and Gelatin USP Granules (Gelfoam) and hemostatic gelatin thrombin matrices (Floseal, Surgiflo), carboxymethylcellulose gel (SinuFoam), hyaluronic acid (Merogel/Meropack), and carboxymethylcellulose (Nasastent). While there are many studies that describe management of epistaxis with the various resorbable packing materials available, there are few if any comparative studies that allow support of one material over others.

Resorbable nasal packing is usually recommended in cases of bleeding disorders, anticoagulation, or vascular abnormalities such as HHT, when placement and/or removal of nonresorbable nasal packing can lead to mucosal trauma

Table 5. Nasal Packing Options.

Resorbable packing materials	
Surgicel (Ethicon)	Oxidized regenerated cellulose
Surgiflo (Ethicon)	Hemostatic gelatin thrombin matrices
Floseal (Baxter)	Hemostatic gelatin thrombin matrices
Nasopore (Stryker)	Synthetic polyurethane sponge
HemoPore (Stryker)	Synthetic polyurethane sponge with chitosan lactate
Posisep (Hemostasis)	Chitosan-based polymers
Gelfoam (Pfizer)	Purified porcine skin and gelatin USP granules
Merogel (Medtronic)	Hyaluronic acid
Nasastent (Smith & Nephew)	Carboxymethylcellulose
Sinu-foam (Smith & Nephew)	Carboxymethylcellulose
Nonresorbable packing materials	
Gauze packing strip (NuGauze [Kendall] or similar)	
Nonadherent gauze (Adaptic [Johnson & Johnson], vaseline impregnated gauze, other)	
Foley urinary catheters	
Merocel (Medtronic)	Polyvinyl acetate sponge
Rhino Rocket (Shippert)	Polyvinyl acetate sponge with applicator
Rapid Rhino (Smith & Nephew)	Inflatable balloon and hydrocolloid fabric
Epi Max (Boston Medical)	Inflatable 2-balloon catheter
Epi Stop (Boston Medical)	Inflatable 1-balloon catheter
EpiStax (Summit Medical)	Inflatable 2-balloon catheter
Post-Stop (Boston Medical)	Balloon epistaxis catheter with a suction/irrigation port
Epistat (Medtronic)	Inflatable 2-balloon catheter

and additional bleeding. Use of resorbable packing should also be considered in young children where removal of a nonresorbable pack can be challenging. A prospective randomized controlled trial of 70 patients compared hemostatic gelatin thrombin and polyvinyl acetate sponge packs in patients with anterior epistaxis who had failed conservative measures such as nose pinching.[57] The hemostatic gelatin thrombin packs were judged more effective and easier to use. The use of hemostatic gelatin thrombin matrices (resorbable) had decreased pain during placement when compared with polyvinyl acetate sponges (nonresorbable).[34]

Posterior packing, packing of the nose and nasopharynx usually for cases of posterior epistaxis, most often involves nonresorbable packing materials. As with anterior packing, multiple devices and materials are available to achieve this objective. Polyvinyl acetate sponges and inflatable balloon devices are commonly used to control posterior bleeding, while tagged gauze packs and tonsil balls have been used historically. Double (anterior/posterior) balloon catheters have proved effective in controlling 70% of cases of posterior epistaxis.[58] Foley urinary balloon catheters are readily available in most medical centers and can be used as nasal packing, but they are more difficult to use than balloon devices designed for management of nosebleeds.

Clinical Setting for Nasal Packing. Anterior nasal packing can be performed by nonspecialist clinicians in various settings, including the outpatient office or emergency department, provided there are adequate resources to perform anterior rhinoscopy. Nasal packing ideally includes inspection of the nose with illumination (headlight) and nasal specula, clearance of blood and clot with suction, and placement of packing material with forceps. Lubricants such as antibiotic ointments are often applied to packings to facilitate insertion with minimal mucosal trauma. The subsequent management of patients after packing varies widely, as high-level evidence does not exist to support any specific care pathway. Patients with resorbable packing are often managed as outpatients. Uncomplicated patients with nosebleeds controlled with anterior packing can usually be managed safely as outpatients even if they have been treated with nonresorbable packing.[59]

In contrast, management of patients with severe nosebleeds requiring posterior packing is usually carried out in an emergency department or a hospital setting. The ease of use of inflatable balloon devices often allows this type of packing to be inserted by a nonspecialist clinician in the emergency department. The care of most patients who require posterior packing should involve an otolaryngology consultant. Depending on the severity of bleeding, the type of packing, and the presence of comorbid disease, patients with posterior nasal packing may require intensive cardiorespiratory monitoring.[60] Major cardiopulmonary complications have been reported following use of posterior nasal packing. These events have been often attributed to a ''nasopulmonary reflex,''[61] although the existence of such a reflex remains controversial. Vagal nerve stimulation, apnea with concomitant hypoxia, and oversedation could also account for the complications that have been observed with posterior packing.[62]

Complications of Nasal Packing. Nasal packing is usually uncomfortable during the packing process as well as during the period that packs are in place. Regardless of the type of packing, nasal airflow will be obstructed to some extent by the packing. Nasal packings, particularly posterior packs, can cause airway obstruction if they are malpositioned or become dislodged. Such airway obstruction is more problematic in patients with comorbidities, such as obstructive sleep apnea or chronic lung disease. Mucosal insult can result from insertion or removal of the packing as well as from overinflated balloons. Such mucosal injury may occur with increased duration of packing. Synechiae can form following mucosal damage and may result in long-term nasal obstruction. Nasal septal perforation may occur with bilateral nasal packings. If a Foley catheter is used and secured with an umbilical-type clamp, positioning of the clamp away from the nasal ala is essential to prevent pressure necrosis of this area.[63] Such alar injury has been seen with other packing materials as well.

Duration of Nasal Packing. The duration of placement of nonresorbable anterior nasal packing varies per severity and location of bleeding and medical comorbidities. Packing duration typically ranges from 48 hours to 72 hours or even longer. One retrospective case series of 147 nosebleed patients showed no correlation between recurrence of nosebleeds and use of shorter packing durations.[64] These authors also noted an 85% nosebleed control rate with packing durations of 1 to 3 days.

Antibiotic Use with Nasal Packs. The use of systemic antibiotic prophylaxis while nasal packs are in place to prevent infection or toxic shock syndrome is controversial. Packs are often impregnated with antibiotic ointments prior to insertion. Systemic antibiotics directed against *Staphylococcus aureus* are often used after nasal packing. Several studies suggest that use of systemic antibiotics following nasal packing should not be mandatory.[65-68] Although the 1 available systematic review did not show a significant benefit to the use of antibiotics with nasal packing, the individual studies in the review were underpowered to detect prevention of rare complications such as toxic shock syndrome.[67] Given this lack of convincing data, the risks and benefits of antibiotic use in patients with packing in place should be evaluated in each patient.

STATEMENT 4. NASAL PACKING EDUCATION: The clinician should educate the patient who undergoes nasal packing about the type of packing placed, timing of and plan for removal of packing (if not resorbable), postprocedure care, and any signs or symptoms that would warrant prompt reassessment. *Recommendation based on observational studies and 1 systematic review with a preponderance of benefit over harm.*

Action Statement Profile: 4

- Quality improvement opportunity: To improve patient education regarding care after nasal packing (National Quality Strategy Domains: Patient Safety, Person and Family Centered Care, Health and Well-being of Communities)
- Aggregate evidence quality: Grade C, based on observational studies and 1 systematic review
- Level of confidence in evidence: Medium
- Benefits: Reduce complications of packing, prompt recognition of complications, avoid prolonged packing duration, decrease patient anxiety, improve patient satisfaction, allow shared decision making regarding the decision to use prophylactic systemic antibiotics, improve timing of appropriate follow-up
- Risk, harm, cost: Time for education, increase patient anxiety regarding potential complications
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: Although evidence regarding education specifically about nasal packing is not available, the GDG made this recommendation based on indirect evidence regarding the benefits of education about medical interventions in general; the GDG expressed concern that plans for removal of packing may not be clear for some patients, leading to prolonged packing duration and perhaps complications.
- Intentional vagueness: None
- Role of patient preferences: None
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of this statement is to emphasize the importance of education, as well as a defined plan for follow-up care, of patients treated with nasal packing for nosebleeds. This can be achieved through oral and written communications that specify the care plan and address common questions asked by patients and caregivers. We provide a list of frequently asked questions (**Table 6**) to guide and supplement discussions relating to the use of packing in the control of nosebleeds. Information should be provided with consideration given to patient and caregiver language, level of literacy, and culture.

Various types of packing exist, and the choice of various available resorbable or nonresorbable packing materials may depend on availability, the presence of underlying medical conditions, as well as clinician and patient preference. Nonresorbable packing requires removal after a predetermined length of time, and follow-up instructions for care and removal need to be clearly understood. Resorbable packing may require care such as intranasal saline sprays and perhaps scheduled follow-up to determine its complete dissolution. Regardless of packing type, postprocedural instructions are important for reducing risks and optimizing outcomes with limited sequelae.

Table 6. Nasal Packing: FAQs for Patients with Nosebleed.

How long will the packing stay in?	Your packing will remain in place for a time agreed upon with your clinician but typically should be in place for no longer than 5 days. The duration may depend on factors related to the severity and location of the nosebleed, certain underlying medical conditions, and your comfort. If your packing is resorbable, it may not need removal and will go away with time and the use of nasal saline sprays.
Will I be uncomfortable with packing?	Nasal packing takes up space in your nose and decreases airflow. It can also block your sinuses from draining and obstruct the flow of your tears into the nose. You may experience symptoms similar to a cold while the packing is in place, including nasal obstruction, decreased ability to smell, facial pressure, headaches, nasal drainage, and tearing from the eyes.
Can I still have a nosebleed with the packing in?	Yes, if pressure from the packing is not able to reach the area of bleeding in the nose, bleeding can occur. If this happens, apply pressure to the nose with pinching of the soft area, call your clinician, or go to the emergency department for further management.
Shouldn't we leave the packing in longer?	With nonresorbable packing, duration of use past the time recommended by your clinician can result in possible complications. Therefore, strict adherence to follow-up directions is important.
What complications can result from packing?	Packing is a foreign material that can support the growth of bacteria in the nose. There is a low risk of infection spreading to the nose and sinuses or, in extremely rare cases, throughout the body. The packing also provides pressure inside the nose. This may decrease blood flow to areas of the nose and result in injury. Septal perforations (hole in the partition dividing the right and left nasal cavity) and scar bands in the nasal cavity can develop after removal of the packing. If the packing is secured with clips at the nasal opening, pressure sores of the external skin can develop over time and result in external scarring. Packing obstructs airflow and can interrupt sleep at night, temporarily contributing to or worsening obstructive sleep apnea.
How can I reduce the chance of complications associated with packing?	In some cases, oral antibiotics will be used if the risk for infection is high. Antibiotics, while generally safe, do have some risks, including allergic reactions and gastrointestinal problems. A discussion with your clinician regarding the risks and benefits is appropriate. Keeping the nose and packing moist with nasal saline (salt water) sprays throughout the day can reduce crusting and help resorbable packing melt away. Strict adherence to follow-up instructions will allow for appropriate removal of packing when necessary and should make complications less frequent.
What type of restrictions should I follow?	To avoid increased blood flow to the nose and risk of further bleeding, you should avoid straining, lifting over 10 pounds, bending over, and exercising. Sleeping with the head slightly elevated may also help. Walking and other nonstrenuous activity is permitted. Unless otherwise instructed by your clinician, avoid over-the-counter pain medications that may increase bleeding, including aspirin and ibuprofen. Acetaminophen (Tylenol) does not increase bleeding and can be used. In general, you should not try to blow your nose if you have packing in place. If you feel the need to sneeze, sneeze with mouth open.
What types of symptoms should I be concerned with?	You should call your clinician with any of the following: return of blood from nose or mouth, fever over 101°F, increasing pain, vision changes, shortness of breath or labored breathing, loss of color around the skin of the nose, swelling of the face, or a diffuse skin rash.
Who will remove the packing and where will this happen?	You should discuss this with your clinician at the time when the pack is placed.
What happens after the packing is removed?	You may initially experience a small amount of bleeding from the raw surfaces inside your nose. Keeping the nose humid with saline spray and moisturizing agents will prevent dry crusts and facilitate healing. In some cases, nosebleeds may recur, and an additional treatment may be needed. If this happens, apply pressure to the nose with pinching of the soft area, and consider the use of a vasoconstrictor spray. If bleeding continues, call your medical provider, or go to the emergency department for further management.

Postprocedure Instructions. In the ambulatory setting where packing has been placed and the patient is stable for discharge home, the patient and family should have complete understanding of expectations, possible complications of packing, and warning signs of infection. If nonresorbable packing has been placed, the patient should understand the importance of follow-up for packing removal. With use of resorbable packing, follow-up is encouraged to monitor for the proper healing of nasal mucosa. The patient should understand that bleeding may recur while packed and/or

after removal of packing. Recurrence of bleeding after packing removal often occurs in the first 4 hours, and 40% of repeat bleeds occur within 1 week.[69] The need for nasal packing may also suggest that more nosebleeds may occur in the future.[70] Therefore, review of nasal maintenance measures as discussed in key action statement 13 should occur to reduce the risk for recurrent nosebleed.

STATEMENT 5. RISK FACTORS: The clinician should document factors that increase the frequency or severity of bleeding for any patient with a nosebleed, including personal or family history of bleeding disorders, use of anticoagulant or antiplatelet medications, or intranasal drug use. *Recommendation based on observational studies and a preponderance of benefit over harm.*

Action Statement Profile: 5

- Quality improvement opportunity: To improve awareness of factors that modify management of nosebleeds (National Quality Strategy Domains: Patient Safety, Effective Communication and Care Coordination)
- Level of confidence in evidence: Medium
- Aggregate evidence quality: Grade C, based on observational studies
- Benefits: Adapt treatment to comorbid conditions and history, avoid delay in diagnosis, early identification of contributing causes of bleeding, reduce costs for patients with associated conditions
- Risk, harm, cost: Unnecessary diagnostic procedures, potential delay in initiating first-line treatments for nosebleed while identifying and managing risk factors
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: None
- Intentional vagueness: The bleeding disorders or medications that can increase risk of nosebleed are not specified, as there are many such disorders and medications
- Role of patient preferences: None
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of this statement is to help clinicians recognize factors (**Table 7**) that might affect severity or recurrence of nosebleeds or modify management. A directed history can provide important clues to potential underlying causes of nosebleeds that will affect further workup and management. The history should include, but not be limited to, onset, duration, and frequency of nosebleed; other sites of bleeding or bruising; current medical conditions, including hypertension, prior nasal or sinus surgery, nasal cannula oxygen, or use of CPAP (continuous positive airway pressure); current medications (especially medications that affect clotting or platelet function); family history of bleeding, including nosebleeds; and history of nasal trauma or nose picking. Chronic kidney and liver diseases can be associated with bleeding tendency. Nosebleed may be the presenting symptom for patients with inherited or acquired bleeding disorders. The risk of bleeding disorders in patients with nosebleeds requires clinicians to look for signs and symptoms of systemic disease that would warrant further workup, including laboratory studies and potential referral to a hematologist.

Table 7. Risk Factors Associated with Nosebleed.

Prior nasal or sinus surgery
Nasal or facial trauma
Nasal cannula oxygen use
CPAP use (continuous positive airway pressure)
Intranasal medication or drug use
Use of medications that impair coagulation and/or platelet function
Personal or family history of bleeding disorder
Chronic kidney or liver disease

Von Willebrand disease is the most common inherited bleeding disorder, and von Willebrand factor deficiency causes defective platelet adhesion and aggregation at the site of vascular injury. A cohort study of 113 children with von Willebrand disease revealed that nosebleed was the presenting symptom in 31% of patients with this disorder and that 56% of these patients have had nosebleeds at some point.[71] Immune thrombocytopenia, previously known as idiopathic thrombocytopenic purpura, is an acquired autoimmune disease that causes isolated reduced platelet counts, which can lead to bleeding. A retrospective cohort study of large medical claims databases identified nosebleeds as one of the most common bleeding symptoms, with 5% of patients with immune thrombocytopenia having a nosebleed.[72]

The causative role of hypertension in nosebleeds is not established. Higher blood pressure readings are seen in patients presenting to the emergency department or otolaryngologist with a nosebleed as compared with patients presenting with other conditions.[73] It was not clear that the elevated blood pressure in the patients in this study actually caused the nosebleeds. Some studies have demonstrated an association between a medical history of hypertension and the risk of primary or recurrent nosebleeds, while others have not. Some of the studies that showed an association did not adequately control for confounders.[3,17,73-77]

Evidence supporting the role of blood pressure lowering in the acute treatment of nosebleeds is lacking. A small prospective cohort study of 80 patients with nosebleed presenting to an ear, nose, and throat clinic in Saudi Arabia demonstrated that patients with higher blood pressures at presentation required more complex interventions to achieve control of the nosebleed.[76] In the absence of hypertensive

urgency/emergency, interventions to acutely reduce blood pressure can have adverse effects. Excessive reduction of blood pressure may cause or worsen renal, cerebral, or coronary ischemia.[78] Given the lack of evidence and the potential for end-organ damage with rapidly lowering blood pressure, we do not recommend the routine lowering of blood pressure in patients with acute nosebleeds. However, blood pressure should be monitored in patients with nosebleed, and decisions about blood pressure control should be based on the severity of the nosebleed and/or the inability to control it, individual patient comorbidities, and the potential risks of blood pressure reduction.

> The lack of causal evidence for hypertension as a risk factor for nosebleed and the controversies about blood pressure lowering as a treatment for acute nosebleed were discussed extensively by the GDG. An accompanying commentary provides additional information about available studies of the relationship between hypertension and nosebleed.[26]

Anticoagulant and antiplatelet medications increase the risk of nosebleeds. Clinicians should ask patients about the use of these medications and should inquire about recent changes in dosage or medication type. Patients taking warfarin should have an international normalized ratio (INR) checked to evaluate if they are in the therapeutic range of anticoagulation. Supratherapeutic INR results may require specialty consultation, discontinuation of medications, or administration of reversal agents if a nosebleed is severe and does not respond to initial therapies.

Intranasal medications, most notably nasal corticosteroids, can increase the risk of nosebleeds. A systematic review of 13 randomized controlled studies, including >2500 subjects, compared intranasal corticosteroids with placebo for treatment of chronic rhinosinusitis. Intranasal corticosteroids substantially increased the risk of nosebleeds, with a relative risk of 2.74 (range, 1.88-4.00).[79] The severity of the nosebleeds in these trials ranged from mild to severe, and it is not clear how many of these enrolled study patients would have sought medical attention on their own for the nosebleed. Cessation of nasal corticosteroids should be considered in patients with recurrent or severe nosebleeds. Other intranasal medications and drugs of abuse can precipitate nosebleeds and should be assessed in the history.[80]

STATEMENT 6. ANTERIOR RHINOSCOPY TO IDENTIFY LOCATION OF BLEEDING: The clinician should perform anterior rhinoscopy to identify a source of bleeding after removal of any blood clot (if present) for patients with nosebleeds. *Recommendation based on observational studies with a preponderance of benefit over harm.*

Action Statement Profile: 6

- Quality improvement opportunity: To educate clinicians regarding the importance of anterior rhinoscopy in diagnosis and treatment and to show optimal techniques to perform anterior rhinoscopy (National Quality Strategy Domains: Patient Safety, Prevention and Treatment of Leading Causes of Morbidity and Mortality)
- Aggregate evidence quality: Grade C, based on observational studies
- Level of confidence in evidence: Medium
- Benefits: Identify a bleeding site that could expedite and focus treatment; instruct that removal of clot, when present, can assist with hemostasis and identification of the bleeding site; diagnose other causes of nosebleeds, such as tumor, differentiate anterior from posterior nosebleeds, determine laterality of the bleeding
- Risk, harm, cost: Potential trauma to the nose, patient discomfort, cause bleeding with clot removal or manipulation
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: None
- Intentional vagueness: None
- Role of patient preferences: None
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of this statement is to highlight the important role of visualizing the anterior nasal cavity to identify the location of the source of the nosebleed. Anterior rhinoscopy, performed with a nasal speculum with or without the use of topical decongestant, may augment the physical examination and guide treatment. Clinicians should perform anterior rhinoscopy to determine the laterality of the nosebleed, to differentiate anterior from posterior nosebleeds, and to find the precise site of bleeding.

Anterior rhinoscopy is a simple procedure performed with a nasal speculum or otoscope that allows inspection of at least the anterior one-third of the nasal cavity.[81] With anterior rhinoscopy, the clinician should examine the anterior nasal septum, inferior and middle turbinates, floor of the nose, and anterior nasal mucosa for a site of bleeding.[82] A light source, such as a headlight, head mirror, or otoscope, enhances the examination, while a speculum or other instrument can dilate the nasal vestibule (**Figure 3**).

In patients with a recent nosebleed, a blood clot may be present, obstructing complete visualization of the nasal cavity. Removal of the clot either by suction or gentle nose blowing can help identify the site of bleeding. During anterior rhinoscopy, the clinician has the option to apply a topical decongestant and/or directed cautery following blood clot removal to stop the nosebleed.[53,83] It is also common practice to use an otoscope to visualize the anterior nasal cavity in young children.

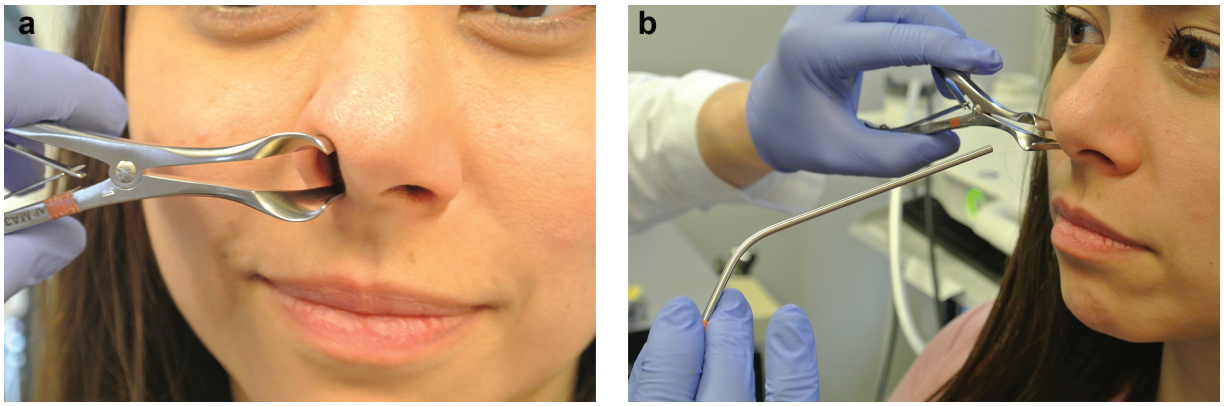


Figure 3. (a, b) Anterior rhinoscopy of the nose.

Anterior rhinoscopy may allow diagnosis of additional nasal pathology, such as nasal septal deviation or septal perforation, with resultant changes in management strategies. Septoplasty has been performed in patients with recurrent epistaxis and septal deviation, with control of bleeding likely from some combination of improved nasal airflow, interruption of mucosal vasculature, and/or more effective packing.[84]

STATEMENT 7a. EXAMINATION USING NASAL ENDOSCOPY: The clinician should perform, or should refer to a clinician who can perform, nasal endoscopy to identify the site of bleeding and guide further management in patients with recurrent nasal bleeding, despite prior treatment with packing or cautery, or with recurrent unilateral nasal bleeding. *Recommendation based on observational studies and a preponderance of benefit over harm.*

Action Statement Profile: 7a

- Quality improvement opportunity: Improve utilization of nasal endoscopy to facilitate complete and accurate diagnosis, evaluate patients at risk for a posterior bleeding site or additional associated sinonasal pathology; identify foreign bodies (National Quality Strategy Domains: Patient Safety, Prevention and Treatment of Leading Causes of Morbidity and Mortality)
- Level of confidence in evidence: Medium
- Aggregate evidence quality: Grade C, based on observational studies
- Benefits: Improve localization of bleeding sites, improve identification of patients with posterior bleeding, improve identification of patients with nasal and nasopharyngeal pathology including tumors, reduce time required to control bleeding, reduce unnecessary interventions, use video- or photo-documentation to improve care and communications with patients/care team.
- Risk, harm, cost: Procedural discomfort, cost of the procedure, lack of availability, risks of topical medications (anesthetics and decongestants), nasal bleeding risk from endoscopy
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: None
- Intentional vagueness: None
- Role of patient preferences: Moderate because of alternative options, cost, and potential for discomfort
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

STATEMENT 7b. EXAMINATION OF NASAL CAVITY AND NASOPHARYNX USING NASAL ENDOSCOPY: The clinician may perform, or may refer to a clinician who can perform, nasal endoscopy to examine the nasal cavity and nasopharynx in patients with epistaxis that is difficult to control or when there is concern for unrecognized pathology contributing to epistaxis. *Option based on observational studies with a balance of benefits and harms.*

Action Statement Profile: 7b

- Quality improvement opportunity: Improve utilization of nasal endoscopy to ensure complete diagnosis, especially for patients at risk for a posterior bleeding site or additional associated pathology; identify foreign bodies (National Quality Strategy Domains: Patient Safety, Prevention and Treatment of Leading Causes of Morbidity and Mortality)
- Level of confidence in evidence: Medium
- Aggregate evidence quality: Grade C, based on observational studies
- Benefits: Improve localization of bleeding sites, improve identification of patients with posterior bleeds, improve identification of patients with nasal and nasopharyngeal pathology including tumors, reduce time required to control bleeding, reduce unnecessary intervention

- Risk, harm, cost: Procedural discomfort, cost of the procedure, lack of availability, risks of topical medications (anesthetics and decongestants), nasal bleeding risk from endoscopy
- Benefit-harm assessment: Balance of benefits and harms
- Value judgments: None
- Intentional vagueness: The term *unrecognized pathology* was used, as multiple conditions could warrant nasal endoscopy for further evaluation in a patient with nosebleed
- Role of patient preferences: Large
- Exclusions: None
- Policy level: Option
- Differences of opinion: None

Supporting Text

The purpose of these statements is to make clinicians aware of the benefit of evaluating the nasal cavity and nasopharynx with nasal endoscopy with rigid or flexible scopes in certain patients with epistaxis. While anterior rhinoscopy generally allows for examination of at least the anterior one-third of the nasal cavity, nasal endoscopy provides magnification of anterior nasal structures and a direct view of posterior nasal structures and the nasopharynx. This procedure may aid in localization of the site of bleeding (either anterior or posterior) and direct treatment of active or recurrent bleeding.[7,85] Statement 7a recommends that nasal endoscopy be performed for those patients with persistent bleeding, who likely have a high risk of either bleeding from a posterior source or bleeding secondary to underlying nasal pathology. Patients for whom these conditions are of particular concern include those who have persistent or recurrent bleeding after normal efforts to control bleeding have failed and those who have recurrent unilateral bleeding. Statement 7b gives clinicians the option to perform nasal endoscopy for patients who do not meet the criteria for statement 7a but who have bleeding that is difficult to control or who have additional nasal symptoms that raise concern for additional pathology that may contribute to bleeding.

Nasal endoscopy should be performed for those patients who have recurrent bleeding after initial control with cautery or nasal packing. Such recurrence of epistaxis is seen more commonly in those patients with bleeding from areas other than Kiesselbach's plexus and when the site of bleeding is not located on initial evaluation.[9,75,77] With nasal endoscopy, the bleeding site can be localized in 87% to 93% of cases.[7] Posterior epistaxis can occur from locations on the septum (70%) or the lateral nasal wall (24%), making targeted therapy difficult without endoscopic identification of the source of bleeding.[85]

Recurrent unilateral epistaxis, especially when associated with unilateral nasal obstruction, may be a sign of a nasal or nasopharyngeal mass or foreign body and should prompt evaluation with endoscopy of the nose and nasopharynx. Nasal masses—which include benign lesions such as pyogenic granuloma, benign but locally aggressive tumors such as juvenile nasopharyngeal angiofibroma, and nasal or nasopharyngeal malignancies—may have nosebleed as the initial or major symptom. Juvenile nasopharyngeal angiofibroma, a rare tumor that occurs in adolescent male patients, presents with unilateral, unprovoked, and typically profuse unilateral epistaxis in 60% to 76% of patients.[86,87] Examination of the posterior nasal cavity and nasopharynx is recommended in adolescent male patients with these symptoms.[87] Nasal malignancies present with unilateral nasal obstruction in 66.7% and epistaxis in 55% of cases, and these tumors may not be visible on anterior rhinoscopy.[88] While these conditions are rare, life-threatening bleeding has been associated with delayed diagnosis.[86]

Nasal foreign bodies are a common issue in children, and delay in diagnosis is not uncommon. Common presenting symptoms of nasal foreign body include unilateral epistaxis, rhinorrhea, and foul smell. In a large case series, epistaxis was the presenting symptom in 7% of patients with a nasal foreign body. Bleeding was associated with the presence of a nasal foreign body or with removal of the foreign body in 30% of the cases.[89] Delay in diagnosis of a nasal foreign body can result in morbidity, including nasal infection, sinusitis, and nasal septal perforations or synechiae.[89] Morbidity is of even greater concern when the undetected foreign body is a disk battery, as retained batteries can cause tissue necrosis and septal perforation can occur in as little as 3 hours.[90] Nasal endoscopy may allow rapid and complete nasal examination to exclude foreign body not seen with anterior rhinoscopy.

While the conditions listed here warrant evaluation with nasal endoscopy, they are not an exhaustive list of indications for endoscopy in the management of patients with epistaxis. Even when a suspected bleeding site is identified and/or controlled in Kiesselbach's plexus, evaluation with nasal endoscopy may still be indicated, particularly if bleeding was unusually difficult to control or if clinical symptoms or signs exist alerting the clinician to additional bleeding sites or intranasal pathology. The recent French Society of Otorhinolaryngology guidelines for adults with epistaxis recommend nasal endoscopy in the evaluation of all patients with epistaxis, even when ectasia of Kiesselbach's plexus is seen.[50] The decision to proceed with nasal endoscopy in less severe nosebleeds should be discussed with the patient or caregiver, with the benefits of the procedure weighed against the risks.

STATEMENT 8. APPROPRIATE INTERVENTIONS FOR IDENTIFIED BLEEDING SITE: The clinician should treat patients with an identified site of bleeding with an appropriate intervention, which may include one or more of the following: topical vasoconstrictors, nasal cautery, and moisturizing or lubricating agents. *Recommendation based on randomized controlled trials and a systematic review with a preponderance of benefit over harm.*

Action Statement Profile: 8

- Quality improvement opportunity: To initiate appropriate treatment interventions when a bleeding site is identified; to reduce risk of recurrent nasal bleeding (National Quality Strategy Domains: Patient Safety, Prevention and Treatment of Leading Causes of Morbidity and Mortality)
- Level of confidence in evidence: Medium
- Aggregate evidence quality: Grade B, based on randomized controlled trials and a systematic review
- Benefits: Provide effective treatment, encourage shared decision making, prevent recurrent bleeding, improve management by using effective therapies and avoiding harm associated with unproven or ineffective therapies
- Risk, harm, cost: Specific adverse effects based on the treatments used—possible injury from cautery, side effects of vasoconstrictors; cost of treatments; some initial treatments may fail; patient discomfort from treatment
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: None
- Intentional vagueness: A preferred treatment option is not specified, since there is little evidence comparing these options. In fact, combinations of several methods are often used. We also do not specify the order of interventions. Moisturizing and lubricating agents would not likely be used for an active bleed, but such agents would be used after bleeding is stopped with cautery and/or vasoconstrictors.
- Role of patient preferences: Large
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of this statement is to address the options for management of a nosebleed patient with an identified anterior nasal bleeding site (**Table 8**). When such a site is identified, initial therapy may consist of topical treatments, including application of vasoconstricting agents such as oxymetazoline, phenylephrine, epinephrine, or cocaine and/or use of nasal cautery. After bleeding ceases, lubricants and moisturizing agents may help prevent additional bleeding at an identified site.

Oxymetazoline and phenylephrine are over-the-counter vasoconstrictors, administered as an intranasal spray or on a cotton pledget or similar. Studies report that 65% to 75% of patients have resolution of nasal bleeding with oxymetazoline.[53,83] The use of these agents may be associated with an increased risk of cardiac[91,92] or other systemic[93,94] complications.

One recent trial performed with patients without hypertension, cardiovascular disease, or nasal disease showed no differences in mean arterial pressure with intranasal application of phenylephrine 0.25%, oxymetazoline 0.05%, or lidocaine 1% with 1:100,000 epinephrine when compared with saline.[95] The effects of these agents on blood pressure and cardiovascular risk in patients with nosebleed is not well documented. These agents should be used cautiously in patients who may have adverse effects of peripheral vasoconstriction due to alpha-1-adrenergic agonists, such as those with hypertension, cardiac disease, or cerebrovascular conditions. These agents are also used cautiously in young children, as oxymetazoline use in children aged <6 years is recommended only with advice of a clinician. More dilute (0.125%) phenylephrine nasal solutions can be used in children aged ≥ 2 years.

Topical epinephrine is also effective for control of nasal bleeding, but concern about cardiovascular effects from systemic absorption favors the use of oxymetazoline.[96] While a recent review supported the safety of topical epinephrine in healthy adults undergoing endoscopic sinus surgery, the safety of this medication in patients with acute nosebleed has not been studied.[97] Cocaine is used infrequently for nosebleeds due to possible cardiac side effects and other toxicities, as well as the potential for abuse.[98,99]

A small randomized trial in children with recurrent nosebleeds compared application of antiseptic cream with nasal cautery and found no difference in control of epistaxis.[100] A randomized controlled study in adults compared patients treated with either nasal pinching for 10 minutes or topical vasoconstriction (0.5% oxymetazoline or 1:10,000 epinephrine applied for 30 minutes) followed by silver nitrate cauterization.[101] Bleeding was controlled in 86% to 90% of patients who were given epinephrine or oxymetazoline pretreatment, while fewer patients (64%) had bleeding controlled with nasal pinching alone prior to cautery. These patients were observed for 1 hour after treatment and had clinical follow-up in 4 days. While this suggests that vasoconstrictor application prior to cautery improves control of epistaxis, this study did not assess patients for epistaxis control using vasoconstrictor treatment without subsequent cautery. A Cochrane review analyzed a heterogenous group of 5 studies of nosebleed treatment with antiseptic cream, petroleum jelly, and/or cautery with silver nitrate with or without antiseptic cream. There were no clear differences in control of nasal bleeding among these treatments, although use of a 75% silver nitrate cautery stick was judged more effective and less painful than a 95% silver nitrate cautery stick.[102]

The consensus statement of the British Rhinological Society strongly recommended, though based on low-quality evidence, that cautery of an identified bleeding site be used as first-line treatment. It also made a weak recommendation for vasoconstrictor use prior to cautery, again based on limited evidence.[7]

In the absence of high-quality evidence recommending one treatment over another, clinicians may use one or more treatment choices, including humidification, intranasal emollients, topically applied vasoconstrictor agents, and/or nasal cautery. In a patient presenting with active bleeding,

Table 8. Interventions for an Identified Anterior Nasal Bleeding Site.

Frequent Questions	Emollient Application	Vasoconstrictor Use	Cautery	Nonspecific Supportive Measures
What are my options for each category?	Application of emollient creams or ointments.	Application of oxymetazoline (Afrin) or other vasoconstrictors by using nose sprays or applying to cotton that is inserted into the nose.	Cautery can be done with either chemicals or electricity, under local anesthesia in the office setting in most cases. Young children and uncooperative patients may require sedation or general anesthesia for cautery.	Keeping the nose moist with nasal saline and humidifier use and preventing trauma to the nose by avoiding picking or rubbing.
What risks are involved?	This is well tolerated with no significant risks, other than the possibility of causing bleeding during application.	These medications can cause complications in some people with other health issues, such as hypertension and glaucoma. Repeated use may lead to loss of efficacy, nasal obstruction, or excessive dryness of the nasal lining (rhinitis medicamentosa).	Cautery usually is performed with local anesthesia, which may cause reactions. Even with anesthesia, the procedure may be painful. Excessively vigorous or extensive cautery may damage the nasal lining and septum. Bleeding may recur, leading to repeat cautery or other treatments. Sedation or general anesthesia, if needed, has risks as well.	None, aside from a delay in more definitive treatment.
What are the benefits?	These ointments do not stop active bleeding but are useful for preventing rebleed. Low cost, noninvasive	Little cost, and these strategies provide rapid control of active bleeding. This can be done by individuals with minimal instruction.	Usually provides prompt and often lasting control of a bleeding site.	May allow for healing of the bleeding area and help prevent future nosebleeds.
What are associated costs?	Small costs of the emollient agent.	Small costs of the vasoconstrictor agent.	Professional fee (and facility fees if needed) for office visit and cautery procedure.	Costs of nasal saline sprays and/or humidifiers.
Who else can I talk to about treatment for my nosebleeds?	This should be discussed with your primary care provider and an otolaryngologist, if one is seen.	Your primary care provider or an ear, nose, and throat specialist (otolaryngologist) may help you understand how to apply this therapy.	Your primary care provider may be capable of discussing and performing this procedure. An otolaryngologist can provide further information if needed.	Routine follow-up with your primary care provider should still be obtained if you have additional bleeding or any other questions.

initial use of a vasoconstrictor may allow either nosebleed control or improved initial identification of a bleeding site amenable to cautery. Complications of these interventions are rare, although bilateral cautery should be used selectively and cautiously to minimize the risk of septal perforation.[50]

Tranexamic acid (TXA) is an inexpensive antifibrinolytic agent—given orally or, more commonly, topically—that has been used to control acute nosebleeds.[103] Zahed et al studied 216 patients with anterior epistaxis in the emergency department and found higher rates of acute bleeding control and earlier discharge with topical TXA as compared with anterior nasal packing.[104] Similarly, a study of patients with nosebleed taking antiplatelet drugs (aspirin and/or clopidogrel), topical application of TXA provided more effective acute control of anterior nosebleeds than did standard anterior nasal packing in these patients treated in the emergency department.[105] The use of oral or topical TXA for nosebleed was the subject of a recent Cochrane review.[106] While benefits were noted with reduction of rebleed with use of TXA, this review stated that only 3 of the 6 included studies were performed after 1995, with all 3 conducted in Iran (including the 2 studies by Zahed et al).[104,105] Given these studies of moderate quality and newer techniques of epistaxis treatment with endoscopes and cautery, additional study of TXA is needed to understand indications and efficacy for nosebleed control.

STATEMENT 9. NASAL CAUTERY: When nasal cautery is chosen for treatment, the clinician should anesthetize the bleeding site and restrict application of cautery only to the active or suspected site(s) of bleeding. *Recommendation based on observational studies with a preponderance of benefit over harm.*

Action Statement Profile: 9

- Quality improvement opportunity: To limit the application of nasal cauterization to the site of bleeding to reduce damage to additional tissue, to reduce complications related to nasal cautery, to improve patient comfort during cautery (National Quality Strategy Domains: Patient Safety, Prevention and Treatment of Leading Causes of Morbidity and Mortality)
- Level of confidence in evidence: Medium
- Aggregate evidence quality: Grade C, based on observational studies and indirect evidence from randomized controlled trials comparing types of cautery and a systematic review
- Benefits: Reduce complications, improve control of pain during the procedure, improve patient satisfaction, avoid injury to healthy tissue, avoid scarring
- Risk, harm, cost: Possible reaction to the anesthetic medication, delay in treatment if anesthetics not readily available, cost of medication, inadequate control of bleeding, need for additional treatment, some severe nosebleeds and posterior bleeding sites may prove difficult to anesthetize
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: The GDG was concerned that topical anesthetics are perhaps underutilized before nasal cautery. The GDG also noted that cautery may be used in a manner not specifically directed to the specific site of bleeding
- Intentional vagueness: Choice of anesthetic agent and the method of delivery (topical vs injected) were not specified. The method of nasal cautery was also not specified
- Role of patient preferences: Moderate for the use of an anesthetic; none for limiting the application of cautery to the identified bleeding site
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of these statements is to identify practices of nasal cauterization that promote patient comfort, safety, and effective control of nosebleed. The initial approach to nasal cautery should include anesthetizing the nose and identifying the site of bleeding, followed by specific and controlled cauterization of only the presumed or actively bleeding source.

Anesthesia of the nose is usually accomplished with local anesthetics, commonly topical lidocaine or tetracaine. Topical application is made with either direct aerosolized spray application or application of cotton or pledgets soaked with the agent. The French guidelines recommend lidocaine (with a topical decongestant), although caution was noted for patients with uncontrolled epilepsy or those using class III antiarrhythmic agents.[50] Lidocaine can be injected into the nasal septum to provide anesthesia prior to cautery as well. General anesthesia can be used in young children, uncooperative patients, or those requiring advanced cauterization techniques, such as endoscopic cautery for a posterior bleeding site.

Available, albeit limited, evidence suggests that cautery is better tolerated and more effective than packing regardless of the method of cautery.[107] One randomized controlled trial of cautery for nosebleed showed bipolar cautery to be less painful with faster healing than monopolar cautery.[9]

Cautery may be performed with topical administration of chemically active agents, such as silver nitrate (25%-75%), chromic acid, or trichloroacetic acid, or through the application of heat or electrical energy, typically electrocautery or ''hot wire'' thermal cautery. Sites for application of cautery can range from the small anterior septal vessels in Kiesselbach's plexus to named larger arteries, such as the sphenopalatine artery and its branches located posterior in the nose. Evidence from a systematic review performed as part of the UK epistaxis audit suggests that electrocautery is more effective than chemical cautery and that any method

of cautery is more effective than nasal packing when a bleeding site can be identified.[107]

Cautery should be performed with direct view of the target bleeding site to prevent excessive tissue injury and increase chances of success. Ideally, a headlight, nasal speculum, and suction are used for this purpose in an anterior bleed.[108] The French guideline for first-line epistaxis treatment recommended cauterization only if ''an anterior bleeding site is clearly visible.''[50]

Complications from cautery include infection, tissue injury, and possibly septal necrosis and resultant perforation. In a randomized trial comparing unipolar and bipolar cautery for unilateral epistaxis, no septal perforations were reported in either group that was treated with unilateral cautery.[9] In a prospective study comparing chemical and electrical cautery, no complications were reported in 97 patients.[109] Although there is little to no quality evidence that bilateral cautery is associated with subsequent septal perforations, clinical experience suggests that simultaneous bilateral septal cautery should be performed judiciously.

Electrocautery, especially bipolar cautery, may be preferable in terms of efficacy, comfort, and cost as compared with other early interventions.[107,110] However, equipment availability and technical expertise limit use of electrocautery, particularly in the office setting. Further study is needed to assess optimal adjunctive anesthesia and vasoconstriction as well as methods of nasal cautery.

STATEMENT 10. LIGATION AND/OR EMBOLIZATION FOR PERSISTENT NOSEBLEEDS: The clinician should evaluate, or refer to a clinician who can evaluate, candidacy for surgical arterial ligation or endovascular embolization for patients with persistent or recurrent bleeding not controlled by packing or nasal cauterization. *Recommendation based on observational and case-control studies, with a preponderance of benefit over harm.*

Action Statement Profile: 10

- Quality improvement opportunity: To promote the appropriate use and awareness of these methods versus other less invasive use of control to allow more timely intervention in patients with severe or uncontrolled epistaxis (National Quality Strategy Domain: Clinical Care)
- Level of confidence in evidence: High
- Aggregate evidence quality: Grade C, based on observational studies and case-control studies
- Benefits: Improve access to effective treatment options, raise awareness of effective treatment options, provide effective and timely control of bleeding, reduce length of stay and overall cost for the patient, allow opportunity for shared decision making about methods more invasive than cautery to control nosebleed
- Risk, harm, cost: Complications of the procedures, risks of anesthesia, inappropriate patient selection, cost of the procedures
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: There may be inappropriate use (underutilization or overutilization) and/or timing of these procedures
- Intentional vagueness: The GDG did not specify a preferred surgical procedure or preference for surgery versus endovascular embolization as selection would depend on clinical factors and expertise available
- Role of patient preferences: Large
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of this statement is to (1) describe the advanced, more invasive techniques for patients with persistent nosebleeds who have failed initial management, including packing and nasal cautery; (2) improve care and encourage appropriate referral to specialists who can evaluate patient candidacy for surgical arterial ligation and/or endovascular embolization; and (3) promote shared decision making and patient education in an effort to set realistic expectations.

Although many cases of epistaxis will resolve primarily with conservative management, approximately 6% of patients will require management more invasive than cautery or packing for recurrent and/or intractable epistaxis.[18,35,37,111-113] In the past, prolonged posterior nasal packing (2-7 days) was performed, although this had mediocre hemostasis (recurrent bleeding in up to 52% of cases) and was associated with prolonged hospitalization and significant discomfort.[114] In this older treatment paradigm, surgical arterial ligation and/or endovascular embolization was typically reserved as third-line therapy. Endoscopic approaches to the nose and sinuses have become commonplace, and the use of the endoscope to identify and guide electric cautery to sites of posterior bleeding has been found to be an effective alternative to nasal packing.[115] In addition, recent treatment algorithms employ surgical arterial ligation and/or endovascular embolization as second-line therapies for recurrent and/or intractable epistaxis.

Surgical Arterial Ligation. Transnasal sphenopalatine artery ligation[116] and transnasal endoscopic sphenopalatine artery ligation (TESPAL),[117] described in 1985 and 1992, respectively, represent further refinement in surgical techniques for intractable epistaxis involving the posterior nasal cavity. These techniques have largely replaced transantral and transmaxillary external approaches to the sphenopalatine artery or internal maxillary artery branches. TESPAL is now the most commonly employed surgical arterial ligation technique, with a reported success rate of up to 98%.[118] Complication rates with TESPAL are relatively low,[119] with a low rate of postoperative hemorrhage (3.4%) and with a similar reported mortality rate as compared with embolization.[37] A recent

meta-analysis pooled 896 cases of sphenopalatine artery ligation or cauterization for epistaxis.[120] While these authors were comparing ligation versus cautery of the sphenopalatine artery, they reported a pooled rebleeding rate for the entire cohort of 13.4%. The most frequent complications of such sphenopalatine artery surgery were nasal crusting and sinusitis. A recent series by Piastro et al demonstrated effective hemostasis in difficult-to-control cases of epistaxis with combined sphenopalatine and internal maxillary artery ligation even in patients with prior interventions, including prior surgery.[121]

Epistaxis relating to anterior and posterior ethmoid arterial supplies is less common than bleeding from the sphenopalatine or internal maxillary artery branches and requires a different treatment paradigm. Traditionally, ligation of the anterior and posterior ethmoid arteries required an open approach and dissection along the medial orbit. Given the proximity of the posterior ethmoid artery to the optic canal in the posterior orbit, many surgeons have opted to ligate the anterior ethmoid artery alone when doing open surgery for epistaxis to minimize the risk of visual loss.

Transnasal endoscopic anterior ethmoid artery ligation has been described,[122] though the support for efficacy is limited as the literature contains only small case series studies and this procedure is usually combined with TESPAL. Transnasal endoscopic anterior ethmoid artery ligation requires additional steps, such as preoperative computed tomography imaging to confirm anterior ethmoid arterial anatomy and endoscopic accessibility, and consideration of additional unique complications, such as cerebrospinal fluid leak and orbital injury.[123] For these reasons, traditional external approaches are commonly utilized when anterior (and posterior) ethmoid artery ligation is needed. Endovascular embolization of the anterior and/or posterior ethmoid arteries is contraindicated, as they arise from the ophthalmic artery with inherent risks of blindness with such a procedure.

Endovascular Embolization. Embolization management of epistaxis was first described by Sokoloff et al in 1974 with use of small gelfoam particles.[124,125] Since that time, embolization has been refined with advancement of microcatheters and development of embolic materials, such as polyvinyl alcohol particles and calibrated embolic particles. Endovascular embolization is best suited for posterior nosebleeds, and current practice by interventional radiologists and interventional neuroradiologists involves embolization of the bilateral sphenopalatine/distal internal maxillary arteries and, in select cases, the facial arteries given anastomotic connection(s) to the sphenopalatine artery via the infraorbital artery and alar and septal branches from the anterior nasal compartment.

Embolization procedures have shown an average nosebleed control rate of 87%, with minor transient complications in 20% (transient nasal ischemia, temporofacial pain or numbness, headache, swelling, jaw claudication, trismus, and access site complications not requiring additional therapy) and major complications in up to 2.1% to 3.8% (skin/nasal necrosis, permanent facial nerve paralysis, monocular blindness, and stroke).[37,126,127] Detailed angiography, including internal and external carotid angiography, and precise embolization techniques are required.[128] Despite use of meticulous techniques and knowledge of external carotid-internal carotid anastomoses, blindness and stroke are the most feared complications of embolization. These complications are rare but are more frequent than in patients undergoing surgical arterial ligation. Brinjikji et al demonstrated similar transient ischemic attacks across all groups but increased risk of stroke in the groups who underwent embolization alone (0.9%) or combined with surgical ligation (1.6%) as compared with surgical ligation alone (0.1%).[37]

Access, Costs, Patient Education, and Shared Decision Making. Ideally, patients and clinicians would have equal access to surgeons experienced with TESPAL and interventional radiologists/interventional neuroradiologists experienced in neuroangiography and endovascular embolization. However, expertise, specialist availability, and resource utilization vary widely. Brinjikji et al analyzed the National Inpatient Sample and found significantly increased use of endovascular embolization for epistaxis from 2.8% of cases in 2003 to 10.7% of cases in 2010.[37] Economic analyses have shown TESPAL to be a more cost-effective treatment strategy when compared with endovascular embolization.[112,129]

Discussion of local resource availability and expertise with risks and benefits of varying approaches should be employed with patients and their families to foster patient education and encourage shared decision making. An advantage of TESPAL is that concurrent endoscopic anterior ethmoidal artery ligation can be performed, though these endoscopic surgical procedures typically require general anesthesia. Advantages of embolization include the ability to perform the procedure under sedation without direct trauma to the nasal mucosa, as well as the ability to leave packs in place during the procedure. When the risk-benefit profiles of each treatment modality are factored in and both options are locally available, it has been suggested that a sequential approach for intractable epistaxis may be best with TESPAL, followed by endovascular embolization.[129]

STATEMENT 11. MANAGEMENT OF PATIENTS USING ANTICOAGULATION AND ANTIPLATELET MEDICATIONS: In the absence of life-threatening bleeding, the clinician should initiate first-line treatments prior to transfusion, reversal of anticoagulation, or withdrawal of anticoagulation/antiplatelet medications for patients using these medications. *Recommendation based on observational studies and expert opinion with a preponderance of benefit over harm.*

Action Statement Profile: 11

- Quality improvement opportunity: To discourage overuse of reversal agents, withholding of medications, and/or administration of blood products,

clotting factors, or specific antidotes, prior to attempting first-line interventions for patients with nosebleeds (National Quality Strategy Domains: Efficient Use of Health Care Resources and Patient Safety)
- Aggregate evidence quality: Grade C, based on observational studies and expert opinions
- Level of confidence in evidence: High
- Benefits: Control nosebleeds without increasing thrombotic risk associated with withholding medications, reduce blood product exposure, decrease cost associated with unnecessary administration of blood products (such as platelets, plasma, and clotting factors) and other agents
- Risk, harm, cost: Persistence or recurrence of nosebleeds, delay in treatment
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: The GDG felt that clinicians are willing to risk prolonging the time to resolution of nasal bleeding to avoid the increased risk of thrombotic events or the risks associated with blood products
- Intentional vagueness: The term ''life-threatening'' was used to both allow for some clinician flexibility and encourage judicious restraint regarding when to withhold medications, reverse medications, or administer blood products, clotting factors, or specific antidotes
- Role of patient preferences: Moderate
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of this statement is to inform clinicians about strategies to manage epistaxis in patients using anticoagulation medications (eg, vitamin K antagonists [VKAs] such as warfarin, heparin, direct oral anticoagulants such as dabigatran or apixaban, and others) and antiplatelet medications (eg, aspirin, clopidogrel, and others). Nosebleeds are a known side effect of antiplatelet and anticoagulation medications,[130] and patients taking these medications are more likely to present with recurrent epistaxis, have a large volume of blood loss (>250 mL), and require blood transfusion for treatment.[9,74,131,132] **Table 9** lists common anticoagulation and antiplatelet medications and their reversal strategies, if applicable. However, even in patients on a VKA or heparin medication, the first step in epistaxis management is the use of ''first-line'' treatments, including nasal compression, vasoconstrictors, moisturizing or lubricating agents, nasal cautery, and/or nasal packing (refer to applicable key action statements 2, 3, and 8 and **Figure 4**).

Good local control efforts are important because reversal strategies have risks. The use of plasma, cryoprecipitate, and platelet transfusions expose patients to blood products and their associated risks.[133] Reversal agents such as vitamin K for VKAs restore patients to normal hemostasis, though overcorrection of a patient's INR can increase risk of thromboembolic events.[134] Interventions such as 4-factor prothrombin complex concentrates or recombinant activated factor VII not only correct anticoagulation but may also induce hypercoagulability.[135]

For patients on VKAs, reversal strategy should be driven by the patient's clinical condition and bleeding severity as well as INR.[6] Patients with an INR >4.5 are more likely to require hospital admission and have prolonged hospital stays as compared with patients with a lower INR.[12,136] Conversely, clotting assays such as prothrombin time/INR and partial thromboplastin time do not reliably reflect the degree of anticoagulation for patients on direct oral anticoagulants; local institutions may have drug-specific calibrators for these assays.[137]

With respect to reversing antiplatelet medications, aspirin and clopidogrel cause irreversible inhibition of platelet function and have relatively short half-lives, whereas prasugrel reversibly blocks the ADP receptor but has a long half-life. When the use of platelet transfusion is being considered, it is important to know when the patient's most recent dose of medication was taken because transfused platelets can be inhibited if there is active medication in the patient's system.[138] There are no good data to support platelet transfusions for patients using antiplatelet medications, with bleeding among a wide range of bleeding complications.[138] The PATCH trial compared platelet transfusion versus standard of care (no transfusion) in patients with spontaneous intracranial hemorrhage using antiplatelet medications.[139] This trial found that patients who received platelet transfusions were more likely to have an in-hospital adverse event and a higher 90-day mortality rate than those in the no-transfusion arm.[139] Clinicians should balance the chance for benefit against the risk for harm when considering platelet transfusion.

Medications such as desmopressin and antifibrinolytics (eg, aminocaproic acid or TXA) do not specifically reverse any anticoagulant or antiplatelet medication, but they do improve hemostasis and are effective in treating mucocutaneous bleeding. Desmopressin acts by causing the release of von Willebrand factor, which increases plasma levels of both von Willebrand factor and factor VIII. Von Willebrand factor is an important part of primary hemostasis and is responsible for facilitating platelet adhesion and aggregation at the site of vascular injury. Antifibrinolytics prevent the breakdown of a thrombus by inhibiting plasmin and preventing dissolution of the fibrin clot.[105] A small randomized controlled trial of patients taking antiplatelet medications demonstrated that topical TXA was superior to standard anterior nasal packing with respect to cessation of the nosebleed within 10 minutes of application (73% vs 29%, respectively; $P < .001$).[105] Patients who received topical TXA were also less likely to have repeat bleeding in the subsequent 7 days.[105]

If reversal or treatment of anticoagulation or antiplatelet medications fails to stop the bleeding, other causes of nasal

Table 9. Anticoagulant and Antiplatelet Medications and Appropriate Reversal Agents Based on Severity of Bleeding.[a]

Medication	Reversal Agent[b]	Comments
VKA: warfarin (Coumadin)	Fresh frozen plasma, 4-factor PCC, vitamin K (should not be used alone for life-threatening bleeding)	4-factor PCC has a shorter time to correction of INR and a smaller volume to infuse.[135] Intravenous or oral vitamin K can be used in nonsevere bleeding. Treatment should be based on bleeding severity in combination with INR.
Heparin: unfractionated, LMWH (enoxaparin [Lovenox] or dalteparin [Fragmin])	Protamine sulfate	
DOACs: dabigatran (Pradaxa), edoxaban (Savaysa, Lixiana), apixiban (Eliquis), rivaroxaban (Xarelto)	4-factor PCC, idarucixumab (Praxbind, dabigatran only)	Antifibrinolytics and desmopressin may be used to support hemostasis, though they do not reverse the anticoagulation effect.
Platelet inhibitors: aspirin, clopidogrel (Plavix), prasugrel (Effient), ticagrelor (Brilinta, Brilique, Possia), ticlodipine (Ticlid)	Platelet transfusion	Platelet transfusion may not be effective depending on timing of most recent dose of medication; if active medication is present, transfused platelets will be affected in the same way as the patient's platelets. Antifibrinolytics and desmopressin may be used to support hemostasis, though they do not reverse the platelet inhibitory effects.

Abbreviations: DOAC, direct oral anticoagulant; INR, international normalized ratio; LMWH, low molecular weight heparin; PCC, prothrombin complex concentrate (contains inactive factors II, VII, IX, and X); VKA, vitamin K antagonist.
[a]It is important to discuss with the primary service managing the anticoagulation prior to fully reversing a patient's anticoagulation. Note that this table provides some of the more common medications in each class but is not an exhaustive list of these medications.
[b]For severe or life-threatening bleeding.

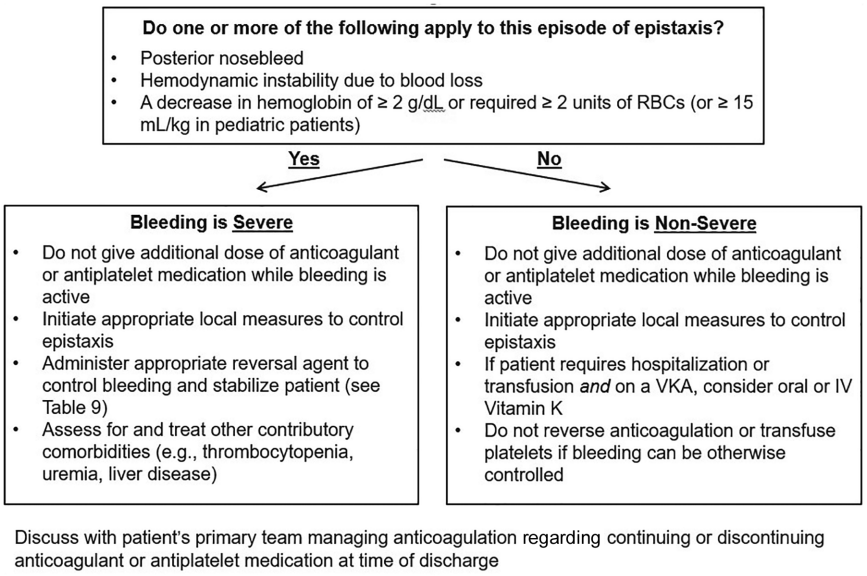


Figure 4. Flowchart to assess and treat epistaxis in patients on anticoagulants and/or antiplatelet medications. Adapted from the 2017 American College of Cardiology "Expert Consensus Decision Pathway on Management of Bleeding in Patients on Oral Anticoagulants."[163] IV, intravenous; RBCs, red blood cells; VKA, vitamin K antagonist.

bleeding should be considered and treated. For patients at high risk of thrombosis who do not require emergent reversal of their anticoagulation, the clinician managing the anticoagulation and comorbid conditions should be consulted regarding hemostatic management, particularly with respect to changes in the patient's medication plan.

STATEMENT 12. HEREDITARY HEMORRHAGIC TELANGIECTASIA (HHT) IDENTIFICATION: The clinician should assess, or refer to a specialist who can assess, the presence of nasal telangiectasias and/or oral mucosal telangiectasias in patients who have a history of recurrent bilateral nosebleeds or a family history of

Figure 5. (a) Endoscopic view of the right nasal cavity of a patient with hereditary hemorrhagic telangiectasia. Arrows denote 2 large telangiectasias. (b) Telangiectasias of the tongue. (c) Photograph of telangiectasias of the hard palate.

recurrent nosebleeds to diagnose hereditary hemorrhagic telangiectasia (HHT) syndrome. *Recommendation based on systematic reviews of observational studies, randomized trials, and cross-sectional studies with a preponderance of benefit over harm.*

Action Statement Profile: 12

- Quality improvement opportunity: To identify patients with HHT and refer them to the appropriate specialist for assessment and management of associated conditions (National Quality Strategy Domains: Patient Safety, Prevention and Treatment of Leading Causes of Morbidity and Mortality)
- Aggregate evidence quality: Grade B, based on systematic reviews of observational studies, randomized trials, and cross-sectional studies
- Level of confidence in evidence: High
- Benefits: Allow earlier diagnosis of HHT, increase use of resorbable packing for HHT patients, avoid inappropriate management of nasal bleeding
- Risk, harm, cost: Patient anxiety regarding possible incorrect diagnosis, cost of overreferral
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: The GDG felt that HHT is perhaps underdiagnosed or diagnosed after delays and felt that clinicians are often unfamiliar with the criteria for diagnosing HHT
- Intentional vagueness: None
- Role of patient preferences: None
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of these statements is to improve identification of patients with nosebleed who have HHT and to stress the importance of referral to a provider with expertise. HHT is a genetic disease leading to the development of arteriovenous malformations and telangiectasias. The arteriovenous malformations occur in large organs, and telangiectasias occur on the skin and/or the mucous membranes (**Figure 5**). The vessels are enlarged and have thin walls, which makes them more prone to rupture and bleeding. HHT appears to be unrecognized in many patients, with both underdiagnosis and delays in eventual diagnosis.[140-142]

The disease is inherited in an autosomal dominant pattern with variable penetrance, meaning that everyone who has the gene defect gets the disease, but clinical manifestations and severity can vary. It occurs in 1 in 5000 to 18,000 individuals, depending on geographic location.[143-146] The Curacao criteria, published in 2000, outline the criteria necessary for the diagnosis of HHT. These criteria include (1) recurrent epistaxis; (2) multiple telangiectasias of the face, lips, oral cavity, nasal cavity, and/or fingers; (3) arteriovenous malformations found in the lungs, liver, gastrointestinal tract, or brain; and (4) a first-degree relative with HHT (diagnosed according to these criteria).[147] The presence of $\geq$3 of these criteria is considered a ''definite'' diagnosis of HHT. Patients with 2 criteria have ''possible or suspected'' HHT. Fewer than 2 criteria makes the diagnosis of HHT unlikely. Identification of a heterozygous pathogenic variant in *ACVRL1, ENG, GDF2*, and *SMAD4* genes establishes the diagnosis if clinical features are inconclusive.[148]

Nosebleeds from telangiectasias are the main symptom in >90% of patients with HHT.[149,150] Nosebleed frequency often increases with age, leading to anemia (low blood counts), need for iron and blood transfusions, extensive medical expenses, and a significantly reduced QOL in patients with HHT.[28,40,151-153]

A review of topical medications to treat nosebleed in patients with HHT was recently published, summarizing the data supporting the long-term use of these adjuvants.[28,154] These reviews report that thalidomide can improve the severity and frequency of the epistaxis, improve hemoglobin concentrations, and decrease the need for blood transfusions. TXA has been shown to decrease the severity of nosebleeds, as measured by the ESS,[155] but did not improve hemoglobin levels, and selective estrogen modulators show promise in limited studies.[28] Intravenous administration and local infiltration of bevacizumab has shown to improve multiple clinical factors in patients with HHT, such as frequency and durations of bleeds and the ESS, but larger randomized

studies are required to better characterize the degree of benefit.[28] Interestingly, topical bevacizumab has not been shown to be effective in improving clinical factors.[154]

Resorbable packing is preferred for patients with HHT with active nasal bleeding, as removal of nonresorbable packing can irritate the nasal cavity and increase risk of rebleeding. While these resorbable materials are favored when a patient with HHT requires packing for nosebleeds, specific studies of primary nosebleed control and recurrence rates have not been published.

Patients with HHT, diagnosed or undiagnosed, may present initially to an otolaryngologist or another clinician who treats nosebleeds. HHT-related epistaxis poses unique challenges and management strategies, and such identified patients should be referred to a team of providers with experience treating HHT or to an HHT Center of Excellence for complete care of their complex disease. See https://curehht.org/understanding-hht/get-support/hht-treatment-centers/ for a list of treatment centers.

STATEMENT 13. PATIENT EDUCATION AND PREVENTION: The clinician should educate patients with nosebleeds and their caregivers about preventive measures for nosebleeds, home treatment for nosebleeds, and indications to seek additional medical care. *Recommendation based on systematic reviews with a preponderance of benefit over harm.*

Action Statement Profile: 13

- Quality improvement opportunity: To educate patients and caregivers regarding home control for nosebleeds, preventive measures for nosebleeds, and when to seek medical care (National Quality Strategy Domains: Patient Safety, Person and Family Centered Care, Prevention and Treatment of Leading Causes of Morbidity and Mortality)
- Aggregate evidence quality: Grade B, based on systematic reviews that suggest benefit on patient anxiety and comfort for other conditions
- Level of confidence in evidence: Medium
- Benefits: Reduce patient anxiety, foster patient empowerment, reduce nosebleed recurrence, reduce medical utilization, prevent use of improper or ineffective treatments
- Risk, harm, cost: Time to educate patients and caregivers, cost of educational materials
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: None
- Intentional vagueness: Method and content of the education are not specified because there are no studies that specifically address education about nosebleeds
- Role of patient preferences: None
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of this statement is to provide guidance and education to the patient, family members, and caregivers on measures to prevent nosebleeds, treat nosebleeds at home, and seek medical guidance when necessary. Those susceptible to nosebleeds include children, the elderly, and those with multiple comorbidities.[156] Because nosebleeds may be alarming and stressful, it is important to include family members and caregivers as well as patients when discussing proper techniques in nosebleed care and prevention. Key points for patient/caregiver education are found in **Table 10**.

When the prevention of nosebleeds is discussed, it is important to understand that nose picking, trauma, infection, use of anticoagulation/antiplatelet medications, and hypertension are commonly associated with nosebleeds.[108] Educating caregivers and patients that avoiding digital trauma or nose picking and use of simple nasal hygiene measures are primary strategies to avoid nosebleeds. While most experienced clinicians note that moisturizers and lubricants such as nasal saline, gels, and ointments and use of air humidifiers can help prevent nosebleeds, quality supportive evidence is scarce. In one study of children with recurrent nosebleeds by Loughran et al, the nasal application of petroleum jelly twice a day did not reduce the number of nosebleeds. Patients who require nasal oxygen or CPAP should be encouraged to use humidification on their apparatus to decrease chances of drying the fragile mucosa of the nose and contributing to recurrent nosebleeds. Patients taking anticoagulants or antiplatelet medications are at an increased risk of recurrent epistaxis; thus, saline lubrication, as well as control of comorbidities, is recommended to prevent additional nosebleeds.[156]

The preventive measures discussed here are also important following ''first-line'' therapies for management of acute nosebleed to prevent rebleeding and to avoid the need for more invasive interventions. Patients should be encouraged to restart saline and/or lubrication to moisturize the area and allow proper healing.

STATEMENT 14. NOSEBLEED OUTCOMES: The clinician or designee should document the outcome of intervention within 30 days or document transition of care in patients who had a nosebleed treated with nonresorbable packing, surgery, or arterial ligation/embolization. *Recommendation based on observational studies with a preponderance of benefit over harm.*

- Quality improvement opportunity: To encourage clinicians to systematically obtain follow-up data for patients treated for nosebleeds. Potential for clinicians to assess interventions and improve outcomes (National Quality Strategy Domains: Patient Safety, Person and Family Centered Care, Effective Communication and Care Coordination)
- Aggregate evidence quality: Grade C, based on observational studies and large-scale audit that document up to 50% relapse rate

Table 10. Patient FAQs for Nosebleeds.

How can I prevent a nosebleed?	Nosebleeds can be reduced or prevented by eliminating contributing factors, such as digital trauma (nose picking) and vigorous nose blowing, as well as by using proper nasal hygiene. Moistening and lubrication of the nose with nasal saline and gels can be helpful. A humidifier at the bedside may also be helpful.
I have an active nosebleed. What can I do?	A nosebleed can be stressful, so keeping calm and knowing how to stop a nosebleed ahead of time can help. Leaning forward and pinching the soft part of the nose for at least 5 minutes is one of the first things to do. If the nosebleed slows continue holding for a full 15 minutes (see **Figure 2**).
Can I use any over-the-counter medications to help if my nose is bleeding?	Nasal saline gel or spray can help moisturize the tissues inside the nose. Oxymetazoline and phenylephrine are nasal spray decongestants that can help slow nosebleeds. Blow the nose to clear any clots, and then spray 2 sprays in the bleeding nostril and continue to hold the soft part of the nose for 5 minutes. You may repeat this once.
My nosebleed won't stop! What should I do?	If your nosebleed does not stop, despite trying the above methods, then you should call a medical professional. If the bleeding is severe or persistent or you feel weak or lightheaded, then seek immediate care at an emergency room department or call 911.
I saw my ear, nose, and throat specialist, and my nose was cauterized. Do I have any restrictions?	You must treat your nose with care to allow the area to heal. Avoid nose blowing, strenuous activity, heavy lifting, or placing any cotton or tissues in the nose for at least a week. You may use saline gel or spray to help lubricate the nose 1 to 3 times a day.
I am on a blood thinner medication, and my nose often bleeds. Should I stop taking this medication?	You should promptly check with the clinician who has prescribed the blood-thinning medication, as these medications are usually given to treat or prevent serious medical problems. If your nosebleed is severe, do not take additional doses of blood thinner until you are evaluated, but such evaluation should not be delayed.

- Level of confidence in evidence: Medium
- Benefits: Improve patient outcomes by identifying patients who need additional care, evaluate the effectiveness of our interventions, assess patient satisfaction
- Risk, harm, cost: Administrative burden, both cost and time, of obtaining follow-up data
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgments: The GDG felt that follow-up of treated nosebleed patients varied widely. The group also perceived lack of knowledge by individual clinicians as well as in the literature about the effectiveness of interventions for nosebleeds as well as the rebleed rates for treated patients
- Intentional vagueness: The 30-day outcome suggestion is a broad range that may not be applicable to all patients. The group was also intentionally vague about specifying the method to determine and document outcomes, leaving this up to the discretion of the clinician
- Role of patient preferences: None
- Exclusions: None
- Policy level: Recommendation
- Differences of opinion: None

Supporting Text

The purpose of this statement is to assist the clinician in evaluating and documenting 30-day outcomes after treatment for epistaxis. The GDG acknowledges that this may present a significant burden on clinicians in acute care settings. Documenting transition of care to another qualified clinician in the electronic medical record (eg, from the emergency department provider to a primary care provider or a specialist) is sufficient to meet this recommendation.

Epistaxis, as described in this document, can be a single severe/prolonged episode, or it can refer to multiple bothersome episodes recurring over the course of months to years. As such, it is important to document resolution of symptoms and any potential complications from treatment, as well as any underlying conditions that may predispose patients to recurrent episodes. Clinicians should evaluate patients following treatment for epistaxis if (1) bleeding has not resolved, (2) invasive treatments were performed, or (3) additional evaluation and testing suggest a potential underlying condition that predisposes to more nosebleeds.

Nosebleeds are known in the lay public to be a potentially chronic and recurrent problem.[100,102] Multiple factors may contribute to immediate or delayed recurrence of bleeding, including revascularization of the nasal mucosa, persistent digital trauma, and bacterial colonization. Recurrence rates vary in the literature based on technique and patient factors, ranging from an estimated <10% recurrence rate for surgical artery ligation or arterial embolization[36,37,157] to a 50% recurrence for nasal packing.[107] Many patients who have undergone treatment become lost to follow-up over time, making assessment of recurrent or persistent bleeding difficult.[100] For those patients seeking treatment, documenting outcomes may improve individual patient care, as well as provide research opportunities for studying the effectiveness of various treatment modalities.

Posttreatment evaluation for complications related to invasive management of epistaxis is important for patient safety and medicolegal purposes. Due to the wide range of techniques employed for the treatment of epistaxis, complications range from local nasal healing issues to issues that are more rare and severe, such as vision loss or stroke.[102] In addition, some complications, such as synechiae and septal perforation or hematoma, may develop well after treatment has been performed, and these conditions may not be readily apparent to the patient. The patient should be educated about secondary symptoms that may require additional follow-up, such as persistent nasal blockage, pain, and/or severe crusting. Routine follow-up is recommended for patients who have undergone invasive treatments for epistaxis.

Although rare, some patients presenting with epistaxis have an underlying condition predisposing them to nasal bleeding, including primary bleeding disorders, hematologic malignancies, or intranasal tumors or vascular malformations.[158-162] Adequate follow-up allows the clinician to assess and obtain further diagnostic testing when treatments are ineffective or recurrent bleeding is documented.

Implementation Considerations

The complete guideline is published as a supplement to *Otolaryngology–Head and Neck Surgery* to facilitate reference and distribution. An executive summary of the recommendations will also be published to more concisely present the key action statements to clinicians. The guideline was presented as a panel presentation to AAO-HNS members and attendees at the AAO-HNSF 2019 Annual Meeting & OTO Experience prior to publication. A full-text version of the guideline will also be accessible free of charge at www.entnet.org.

An anticipated barrier to diagnosis and management of epistaxis is the determination of which patient requires ''prompt'' care, especially when much of this information may be initially acquired by members of the care team who are not the provider. Additionally, recommendations regarding management of antithrombotic medications rely on an establishment of determining the severity of any 1 bleeding episode. **Figure 6** and several tables in this guideline should help provide a series of criteria that can direct the provider and/or members of the care team in determining the acuity and severity of any nosebleed such that the timely and risk-optimized care can be delivered.

The guideline also emphasizes appropriate diagnosis of comorbid conditions, such as antithrombotic medication use, or even rare conditions, such as HHT. Images are provided to identify normal and abnormal anatomic features and rhinoscopic findings that would indicate the presence of this disease.

With the rise in the use of a variety of antithrombotic agents, the guideline emphasizes the use of resorbable materials when packing is considered. Clinicians other than otolaryngologists may be unfamiliar with a variety of these products. As such, information regarding some of the more common options is presented in table form to educate the clinician about their possible use and not to advocate for any one specific product. Furthermore, as many of the antithrombotic agents are relatively new and do not have reversal agents, the provision of care to such patients may be limited due to the unfamiliarity with when and how to manage them. As noted earlier, the guideline provides information to help determine when these medications may need adjusting, but it also includes information regarding current and/or future reversal algorithms.

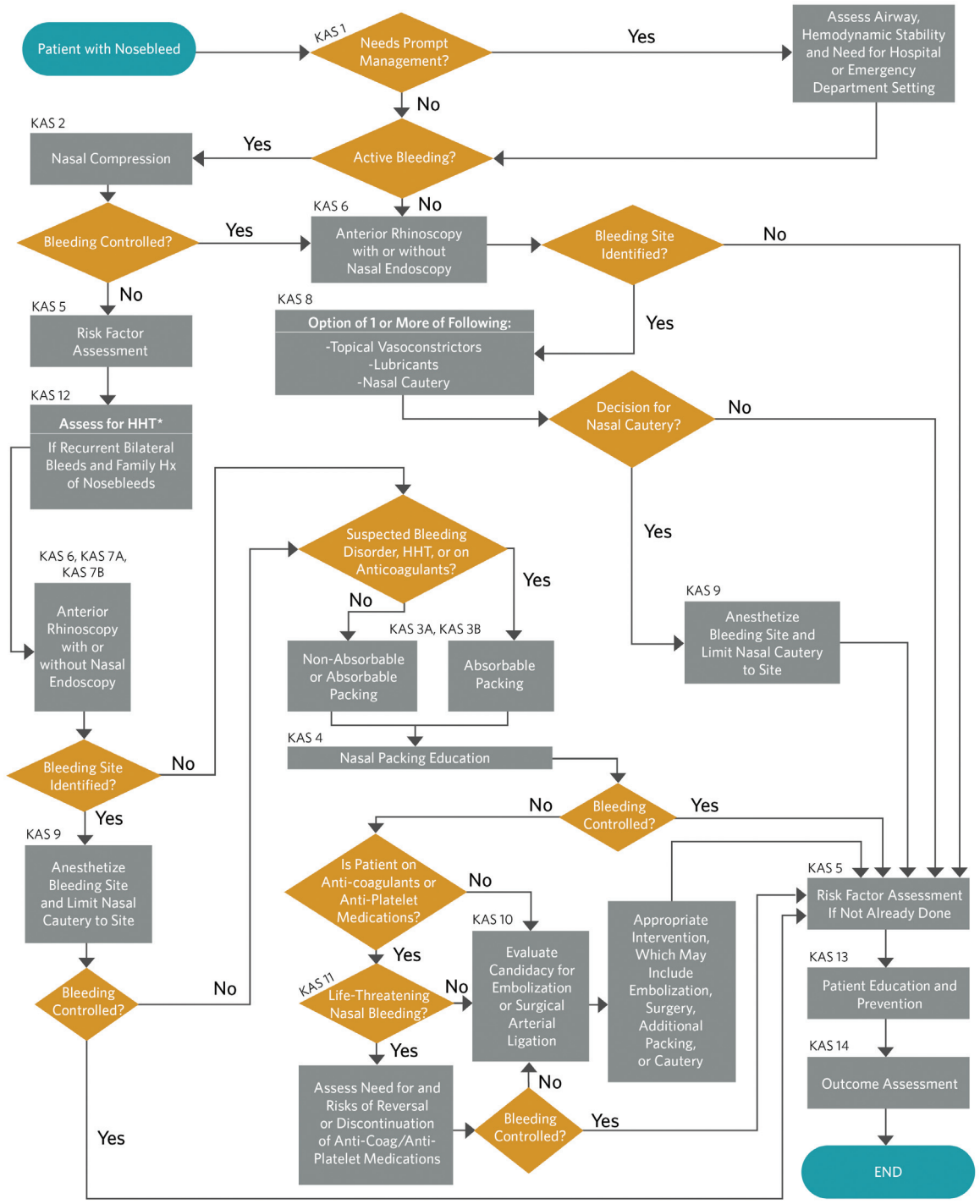
Follow-up on nosebleed management may be difficult when much of this care may be rendered by clinicians without a long-term relationship to the patient, such as urgent care and emergency department providers. It may thus be difficult to determine the success of any maneuvers, but the guideline allows for a transfer of this follow-up to other suitable providers. These outcomes are also predicated on the patients' understanding of their disease, need for specific and/or timely reevaluation, and preventive measures that can be accomplished at home. In the urgent/emergent setting, implementing this education can be difficult given time considerations, and so FAQ-based (frequently asked question) educational material is provided in the guideline.

Finally, we include an algorithm of the guideline action statements as a supplement to clinicians in **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

While nosebleeds are common, with an evolving variety of treatment strategies, the number of high-quality studies on nosebleed diagnosis and treatment is surprisingly small. We provide a list to guide ongoing and future study of epistaxis.

(1) Determine **predictive factors in history** that can help **identify** patients needing **prompt management**
(2) Determine **efficacy of various home measures** and **over-the-counter medications** to treat epistaxis. Should these be recommended prior to medical evaluation and treatment?
(3) Determine **optimal duration and techniques for digital nasal compression** to stop an active nosebleed.
(4) Determine if **application of vasoconstrictors is a useful early step** to control acute nosebleeds. What is the best timing and method for application of vasoconstrictors in relation to digital nasal compression? What are the effects of vasoconstrictors on short-term control of nosebleeds and rate of recurrence?
(5) Determine the role and efficacy of **hot water irrigation** for treatment of severe or posterior epistaxis.[164]



* Hereditary Hemorrhagic Telangiecstasia

Figure 6. Epistaxis guideline key action statements. HHT, hereditary hemorrhagic telangiectasia; Hx, history; KAS, key action statement.

(6) Determine what factors in **nasal packing** will lead to short- and long-term control of nosebleeds. **Duration** of packing? **Type** of packing material? Duration of observation after pack removal?

(7) Determine the indications for **inpatient hospital observation or intensive care monitoring** for patients with nosebleeds. After anterior nasal packing? After posterior nasal packing?

(8) Determine the **most effective method for nasal cautery**. Silver nitrate versus other chemicals versus electrocautery? Does endoscopic visualization improve nosebleed control and/or reduce complications?

(9) Determine whether **bilateral simultaneous septal cautery** causes septal perforation, and if so, how can we minimize this risk if both sides need treatment?
(10) Determine differences in efficacy, comfort, and morbidity with the use of various **dissolvable packing materials.**
(11) Determine which patients will benefit from use of **systemic antibiotics after nasal packing**, and study ideal length of therapy if antibiotic prophylaxis is prescribed.
(12) Determine the most time- and cost-efficient **indications for use of nasal endoscopy** for patients with epistaxis.
(13) Determine whether **hypertension** actually causes recurrent or severe nosebleed. What is the ideal management of elevated blood pressure in patients with recurrent epistaxis? With a severe acute nosebleed?
(14) What is the optimal use of nasal saline and other lubricants and moisturizers for prevention of recurrent nosebleed?
(15) Determine **the role of** TXA, topical or systemic, for acute treatment of nosebleeds. For prevention of nosebleeds? Are there certain clinical situations or patient groups who would benefit from TXA?
(16) Determine the actual risk of nosebleeds for patients taking **anticoagulation and/or antiplatelet medications**. Are there differences in nosebleed risks among the various medications? What is the increase in nosebleed risk for patients taking **low-dose aspirin**?
(17) Determine the risk of using various **complementary medications and herbal supplements** in terms of causing or increasing duration of nosebleeds.
(18) What are the most effective treatments for the prevention of nosebleeds in **patients with HHT**? Are there topical medications that are beneficial in these patients? Is **sclerotherapy** helpful and safe?
(19) Assess the **impact of epistaxis on QOL** in groups commonly affected with nosebleeds (ie, the elderly, patients with renal failure, patients taking medications that impair clotting).
(20) Determine if **patient and family education** on nosebleeds improves outcomes (fewer recurrent nosebleeds) as well as patient satisfaction.
(21) Determine what clinical information should be collected during the recommended **follow-up assessment**.

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Disclaimer

This clinical practice guideline is not intended as an exhaustive source of guidance for managing patients with epistaxis. 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 clinician, with consideration 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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Supplemental Material

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

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