

ONLINE FIRST

Ambulatory Laryngopharyngeal Surgery

Evaluation of the National Survey of Ambulatory Surgery

Hossein Mahboubi, MD, MPH; Sunil P. Verma, MD

Objectives: To determine the demographics and perioperative outcomes of ambulatory laryngopharyngeal surgery in the United States and to investigate potential changes over a 10-year period.

Design: Cross-sectional, population-based study of representative US ambulatory surgery data.

Setting: The National Survey of Ambulatory Surgery (NSAS).

Patients: The study included all patient records from the 1996 and 2006 National Survey of Ambulatory Surgery databases with at least 1 surgery performed on the pharynx or larynx. By definition, the surgeries were outpatient and did not require an overnight stay within the facility.

Main Outcome Measures: Data regarding sex, age, facility type, principal payer, anesthesia type and administration, diagnosis, type of surgery, frequency of reported complications, and patient disposition were extracted and analyzed.

Results: In 1996 and 2006, a total of 176 305 (95% CI, 146 954-205 657; mean [SD] age, 37 [26] years) and

189 930 (95% CI, 135 827-244 003; mean [SD] age, 45 [22] years) patients, respectively, underwent ambulatory laryngopharyngeal surgery. No significant changes were noted in the number, demographics, and outcomes of the patients during the 10-year period. The patients were more likely to be men aged 45 to 64 years and to have their surgery performed in a hospital under general anesthesia. The unexpected admission rate after laryngopharyngeal surgery was less than 4%. While minor complications were present in approximately 9% of all surgeries, no serious adverse events occurred in this representative population.

Conclusions: Despite the growth in the US population, the number of patients who underwent ambulatory laryngopharyngeal surgery did not change significantly during the study period. The complication rates of ambulatory laryngopharyngeal surgeries are relatively low, demonstrating the safety of these procedures.

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THE LAST 150 YEARS HAVE been witness to a large growth in the field of laryngology. This field, which began with the advent of the laryngeal mirror examination, experienced rapid growth after the developments of general anesthesia and direct laryngoscopy.¹ An increased understanding of laryngeal anatomy and physiology and technological advances that have resulted in an improved ability to visualize the laryngopharynx, in addition to many other factors, have contributed to the growth of laryngology.²⁻⁴ Recently, the attention to laryngeal education has grown dramatically, resulting in a rise in the number of postgraduate laryngology fellowships.⁵ As the field of laryngology has continued to develop and expand, a natural question arises regarding whether the

number of laryngopharyngeal surgeries has risen proportionally.

Another question that has emerged involves the safety of routine laryngopharyngeal surgery. In fact, the safety of rigid endoscopy performed with the patient under general anesthesia was debated during the 1990s.⁶⁻⁸ Up to this point, the safety of rigid endoscopy was established through single institutional experiences, with drastically varied reports of complication and unexpected admission rates after surgery. In an effort to answer the questions regarding how many ambulatory laryngopharyngeal surgeries are performed in the operating room as well as the perioperative outcomes of these procedures, the National Survey of Ambulatory Surgery (NSAS) was queried. The aims were to produce nationwide estimates for the number, demographics, and perioperative out-

Author Affiliations:
Department of
Otolaryngology–Head and Neck
Surgery, University Voice and
Swallowing Center, University
of California, Irvine School of
Medicine.

comes of ambulatory laryngopharyngeal surgeries and to investigate the changes over a 10-year period.

METHODS

DATA SET

The NSAS, which is conducted by the National Center for Health Statistics at the Centers for Disease Control and Prevention, is the only national study of ambulatory surgical care in hospital-based and freestanding ambulatory surgery centers. *Ambulatory surgery* refers to any surgical or nonsurgical procedure performed in a hospital or ambulatory freestanding surgery center operating room or endoscopy and catheterization suite.⁹ By definition, the procedures were outpatient and did not require an overnight stay within the facility.⁹ Federal, military, and Department of Veterans Affairs hospitals were excluded in this data set.⁹

The NSAS was first conducted from 1994 to 1996 and was not conducted again until 2006. It is a nationally representative anonymous sample of surgical procedures in which a sample weight is assigned to each patient record based on the complex probabilities of being selected. The sample weight allows the production of national estimates of the number of patients undergoing surgery in the United States. The NSAS used the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)*, to identify patient diagnosis and procedures. Detailed information on methodology, instruments, and sample design is available elsewhere.¹⁰

PARTICIPANTS

After this study was classified as exempt by the University of California, Irvine, institutional review board, the 1996 and revised 2006 NSAS databases were selected to produce national population estimates for ambulatory laryngopharyngeal surgeries. For each surgery performed as part of the NSAS, up to 6 ICD-9-CM codes were recorded. Cases with at least 1 code indicative of “operations on pharynx,” “excision of larynx,” or “other operations on larynx and trachea” (ICD-9-CM codes starting with 29, 30, or 31) were extracted and included in the analysis.

VARIABLES

The difference in the sample selection of NSAS between 1996 (3-stage stratified cluster design) and 2006 (2-stage design) did not allow direct statistical comparison between-survey changes. Therefore, each database was analyzed separately to derive descriptive statistics for sex, age, facility type, principal payer, anesthesia type and administration, diagnosis, type of surgery, and patient disposition. Furthermore, the 2006 survey was assessed for the frequency of perioperative complications. Such data were not available for the 1996 database.

STATISTICAL ANALYSIS

A Taylor series approximation was used to calculate the standard error (SE) for the 2006 database. For the 1996 database, strata and cluster variables were not reported. Instead, the National Center for Health Statistics provided formulas for deriving the approximate relative SEs for aggregate estimates using precalculated parameters. Details of the formulas and parameters are available elsewhere.¹⁰

National estimates were reported only if both of the following conditions were met: (1) the subsample sample had a size of 30 or more, and (2) the relative SE (the SE divided by the

estimate) was less than 0.3. Otherwise, only percentages were reported. Where available, confidence intervals (CIs) were calculated to facilitate the comparison between the 2 surveys. While overlapping CIs do not always reject a significant difference, only nonoverlapping CIs were considered to be statistically different. Statistical analyses were performed using SAS version 9.3 for Windows (SAS Institute Inc).

RESULTS

The total estimated number of patients who underwent at least 1 ambulatory laryngopharyngeal surgery in the United States was 176 305 (95% CI, 146 954-205 657; mean [SD] age, 37 [26] years) in 1996 and 189 930 (95% CI, 135 827-244 003; mean [SD] age, 45 [22] years) in 2006. Using the population estimates of the US Census Bureau, these estimates amounted to approximately 66 per 100 000 US residents undergoing ambulatory laryngopharyngeal surgeries in 1996 and 63 per 100 000 in 2006. There were no statistically significant differences in the data points examined between the 1996 and 2006 surveys; therefore, only data from 2006 are presented. The **Table** presents the patient demographics, location of surgery, insurance, and anesthesia type and administration.

The most common ICD-9-CM diagnosis codes associated with ambulatory laryngopharyngeal surgeries were 784.49 (“other voice and resonance disorders”), 478.5 (“other diseases of vocal cords”), and 478.4 (“polyp of vocal cord or larynx”) (12.0%, 12.0%, and 9.3% of cases, respectively). The most common laryngopharyngeal surgeries performed are shown in the **Figure**. Because more than 1 surgery could have been performed on a patient in 1 session, these numbers represent the frequencies of surgeries performed rather than the number of patients treated.

The disposition status after surgery was routine in 87.6% of cases, observation unit in 2.4% of cases, hospital admission in 3.3% of cases, and not specified in 6.7% of cases. Perioperative complications were reported in 9.7% of cases. The reported complications were high blood pressure (1.6%), nausea (1.6%), hemorrhage (1.2%), vomiting (0.4%), and not specified (5%). There were no reports of cardiac arrest, arrhythmia, embolism, syncope, blood transfusion, accidental laceration, apnea, airway obstruction, malignant hyperthermia, shock, or hypoxia.

COMMENT

During the last 20 years, there have been large changes within the field of laryngology that have led to an increased understanding of laryngeal disease, leading Belafsky¹¹ to designate the current period the “golden age of laryngology.” Despite these changes, it is interesting to note that the estimated number of ambulatory laryngopharyngeal surgeries has remained relatively stable and did not increase in a statistically significant manner over the 10-year period from 1996 to 2006. In comparison, during the same period, the number of pediatric adenotonsillar surgeries increased.¹² The number of laryn-

Table. Patient Characteristics^a

Variable	No. of Patients (% of Total)	(95% CI)
Sex		
Male	108 429 (57.1)	(88 267-128 592)
Female	81 501 (42.9)	(61 338-101 663)
Age, y		
<15	28 547 (15.0)	(15 408-41 686)
15-44	49 215 (25.9)	(28 843-69 587)
45-64	73 609 (38.8)	(58 816-88 402)
>65	38 559 (20.3)	(22 767-54 352)
Facility		
Hospital	151 701 (79.9)	(126 646-176 756)
Ambulatory surgery center	38 229 (20.1)	(13 174-63 284)
Principal payer^b		
Medicare	38 427 (20.2)	(25 161-55 609)
Medicaid	NR (7.0)	NR
Private insurance ^c	130 153 (68.5)	(106 727-141 179)
Other ^d	8086 (4.3)	(2407-13 764)
Anesthesia^b		
Topical	NR (4.8)	NR
IV sedation	NR (5.3)	NR
MAC	NR (5.2)	NR
General	157 679 (83.0)	(139 352-176 006)
Other ^e	NR (2.8)	NR
Anesthesia administration^b		
Anesthesiologist	141 622 (74.6)	(119 794-163 450)
CRNA	63 131 (33.2)	(37 951-88 311)
Surgeon	NR (4.1)	NR

Abbreviations: CRNA, certified registered nurse anesthetist; IV, intravenous; MAC, monitored anesthesia care; NR, not reportable (subsample size <30 or relative SE ≥0.3).

^aAmbulatory laryngopharyngeal surgery data from the 2006 National Survey of Ambulatory Surgery (NSAS) database.

^bBecause multiple categories could be chosen, the total percentage could be more than 100%.

^cBlue Cross Blue Shield, health maintenance organization, preferred provider organization, and other types of private insurance.

^dTRICARE; Workers' Compensation; other type of government insurance; self-pay, charity, and/or write-off; no charge; other; and not stated.

^eRegional (epidural, spinal, retrobulbar block, peribulbar block, and regional block) and not stated.

gopharyngeal surgeries per US resident estimated through use of this national database compares well with an investigation of a Maryland state database that estimated that 71 to 76 of every 100 000 residents underwent laryngopharyngeal surgery in 1996.¹³

Other studies have been performed using the NSAS database to establish the approximate numbers of ambulatory surgeries performed within other fields of otolaryngology—head and neck surgery.^{12,14-16} The number of ambulatory laryngopharyngeal surgeries performed was less than the number of ambulatory septoplasty/turbinate surgeries, sinus surgeries, and pediatric adenotonsillar and myringotomy surgeries^{12,14,15} and more than the number of ambulatory facial fracture repairs.¹⁶ In comparison, approximately 3.5 and 5.5 times more knee arthroscopies were performed (compared with laryngopharyngeal surgery) in 1996 and 2006, respectively.¹⁷

One of the most interesting data points gleaned from this database concerns the safety of ambulatory laryngopharyngeal surgery. Previous reports have chal-

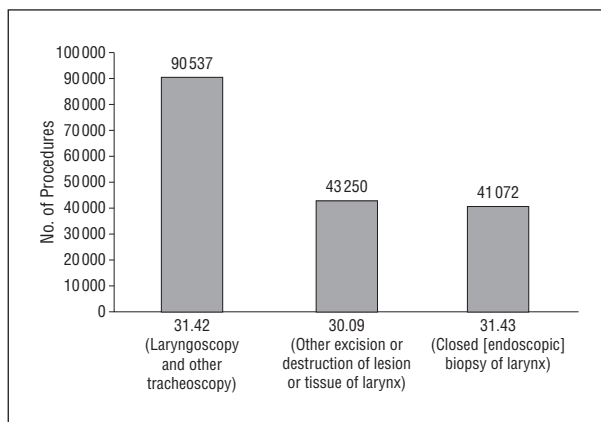


Figure. Number of most common surgeries performed per *International Classification of Diseases, Ninth Revision, Clinical Modification*, procedural code.

lenged the safety of ambulatory laryngopharyngeal surgery and have advocated the need for patients to be admitted after surgery⁷; however, until now, these risks had not been quantified at a national level. The revised NSAS 2006 database revealed that hemorrhage occurred in 1.2% of patients, while there was no episode of airway obstruction, apnea, or hypoxia. In the NSAS study group, 3.3% of patients were admitted to the hospital after planned outpatient surgery in 2006. This number compares well with the previously reported rates of unplanned admission after laryngoscopy, which range from 0 to 3%.^{6,8,18-21} In the literature, minor complications after laryngoscopy include dental and mucosal injuries, neuralgias, and dysphagia, with rates of up to 75%.²⁰⁻²² Unfortunately, these minor complications were not reported in the NSAS survey and may represent some of the “other” complications listed. Also, some complications, such as change in taste, though immediate, are not able to be determined until the first postoperative visit.

Evaluation of these data in comparison with the existing literature confirms the notion that, in general, ambulatory laryngopharyngeal surgery is safe. However, complications such as hemorrhage are not rare, and a small percentage of patients will require hospitalization. In some centers, performance of laryngeal surgery has begun to move from the operating room to the office.^{3,4,23-25} Avoiding risks of surgery performed with the patient under general anesthesia is one of the commonly cited reasons for performance of office-based surgery. This data set demonstrates that, while uncommon, risks do occur. Therefore, even if laryngopharyngeal surgery is being performed in an ambulatory surgery setting, resources for hospital admission should be available. Furthermore, some patients with abnormalities, such as obstructing masses, who require laryngoscopy may best be treated in a hospital setting should airway obstruction occur or the need for a tracheotomy arise.

There are limitations with the current study. The difference in sample selection between the 1996 and 2006 databases prevented direct statistical analysis between the 2 surveys. The NSAS, as any other large survey, is liable to possible omissions or errors in data entry. These errors may be true for actual coding of cases into the appropri-

ate ICD-9-CM codes as well as for complication codes. Therefore, the data should be interpreted with caution.

In conclusion, approximately, 189 000 patients undergo ambulatory laryngopharyngeal surgeries annually. The prevalence, demographics, and characteristics of ambulatory laryngopharyngeal surgeries have not changed substantially over time. Findings of the current study demonstrate low complication and admission rates and authenticate the safety of such surgeries in an outpatient setting. These results could establish a foundation for future studies on ambulatory laryngopharyngeal surgeries to assess the accompanying risk factors.

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Correspondence: Sunil P. Verma, MD, Department of Otolaryngology–Head and Neck Surgery, University Voice and Swallowing Center, University of California, Irvine, School of Medicine, 62 Corporate Pk, Ste 115, Irvine, CA 92606 (verma@uci.edu).

Author Contributions: Both authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Mahboubi and Verma. *Acquisition of data:* Mahboubi. *Analysis and interpretation of data:* Mahboubi and Verma. *Drafting of the manuscript:* Mahboubi and Verma. *Critical revision of the manuscript for important intellectual content:* Mahboubi and Verma. *Statistical analysis:* Mahboubi. *Study supervision:* Verma.

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