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Thirty-Day Hospital Revisit Rates and Factors Associated With Revisits in Patients Undergoing Septorhinoplasty

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Abstract

IMPORTANCE—Estimates of the 30-day hospital revisit rate following septorhinoplasty and the risk factors associated with revisits are unknown in the current literature. Surgical 30-day readmission rates are important to establish, as they are increasingly used as a quality care metric and can incur future financial penalties from third-party payers and government agencies.

OBJECTIVE—To determine the rate of 30-day hospital revisits following septorhinoplasty and the risk factors associated with revisits.

DESIGN, SETTING, AND PARTICIPANTS—A retrospective cohort analysis was conducted of 175 842 patients undergoing septorhinoplasty between January 1, 2005, and December 31, 2009, using data from the Healthcare Cost and Utilization Project state inpatient database, state ambulatory surgery database, and state emergency department database from California, Florida, and New York. Information on revisits for these patients was collected from the 3 databases between January 1, 2005, and December 31, 2012. Data analysis was conducted from September 1, 2014, to May 1, 2015.

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Author Contributions: Drs Spataro and Kallogjeri 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.

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MAIN OUTCOMES AND MEASURES—Hospital revisits within 30 days after an index septorhinoplasty and the primary diagnosis at the time of the revisit were the main outcome measures. The revisit rate was calculated within subgroups of patients based on different demographic and clinical characteristics. A multivariable model was then used to determine independent risk factors for the occurrence of a hospital revisit within 30 days of the septorhinoplasty procedure.

RESULTS—In total, 11 456 of 175 842 patients (6.5%) who underwent septorhinoplasty procedures revisited the hospital within 30 days of the procedure. Most of these revisits (6353 [55.5%]) were to the emergency department. The most common primary diagnosis was bleeding or epistaxis, occurring in 2150 patients (1.2%). Multivariable logistic regression showed that patients aged 41 to 65 years (adjusted odds ratio [aOR], 1.09; 99% CI, 1.02–1.16) or older than 65 years (aOR, 1.23; 99% CI, 1.06–1.43) had an increased revisit rate, as did black patients (aOR, 1.39; 99% CI, 1.16–1.66); those with Medicare (aOR, 1.55; 99% CI, 1.32–1.81) and Medicaid (aOR, 1.63; 99% CI, 1.33–2.01); those with diagnoses of autoimmune disorders or immunodeficiency (aOR, 2.69; 99% CI, 1.20–6.03), coagulopathy (aOR, 2.06; 99% CI, 1.33–3.20), anxiety (aOR, 1.79; 99% CI, 1.55–2.07), and alcohol use (aOR, 1.70; 99% CI, 1.35–2.14); and those who had a conchal cartilage graft (aOR, 2.01; 99% CI, 1.29–3.14).

CONCLUSIONS AND RELEVANCE—The study results suggest that patients with more medical comorbidities and lower socioeconomic status most commonly returned to the emergency department for surgical complications, such as bleeding or epistaxis, in the 30-day period after the procedure. These data provide valuable preoperative counseling information for patients and physicians. In addition, this study provides data to third-party payers or government agencies in which postprocedure readmissions in the 30-day period are used as a quality care metric affecting reimbursements and financial penalties.

Estimates of the 30-day hospital revisit rate following septorhinoplasty and the risk factors associated with revisits are unknown in the current literature. Septorhinoplasty is generally performed as an elective outpatient procedure owing to the expectation of low rates of surgical complications and need for admission in the perioperative period. Surgical 30-day readmission rates are important to establish, as they are increasingly used as a quality care metric and can incur future financial penalties.¹ The Hospital Readmissions Reduction Program, established through the Affordable Care Act in 2012, is a program requiring the Centers for Medicare and Medicaid Services to reduce payments to hospitals with excessive 30-day readmissions.¹ Initially, only medical conditions were monitored, including acute myocardial infarction, heart failure, and pneumonia. These conditions have since expanded to include surgical procedures, such as total hip and knee arthroplasty as well as coronary artery bypass surgery.

Because many surgical procedures are elective, there is an opportunity to identify patient risk factors associated with a higher rate of hospital revisits and intervene to improve these factors before surgery to reduce revisit rates.² Several publications about general and orthopedic surgical procedures identified procedural and patient risk factors associated with increased readmission rates,^{2–5} as have publications focusing on otolaryngology procedures.^{6–10} The consensus among surgical data is that postsurgical complications are most greatly associated with increased risk of readmission following surgery, but

socioeconomic factors and patient comorbidities also have a significant effect.^{2–10} However, data on the 30-day revisit rate specifically relating to facial plastic surgical procedures, including septorhinoplasty, are still lacking.

The first objective of this study was to evaluate the 30-day hospital revisit rate and the primary diagnosis at the time of revisit for a large cohort of patients undergoing septorhinoplasty, covering all practices (multisurgeon) and institutions. The second objective was to evaluate patient and procedure characteristics associated with increased rates of 30-day hospital revisits. Identification of factors associated with hospital revisits allows for better optimization and preparation of patients and physicians before this elective procedure to reduce 30-day revisit rates and provides normative data to third-party payers. This study uses the same databases that we analyzed to determine septorhinoplasty revision surgery rates,¹¹ which are large all-payer state databases through the Healthcare Cost and Utilization Project sponsored by the Agency for Healthcare Research and Quality, currently comprising the largest collection of longitudinal hospital care data in the United States.¹²

Methods

Study Design

This study is a secondary data analysis of a cohort of patients who underwent septorhinoplasty between January 1, 2005, and December 31, 2009, in California, Florida, and New York. Information on revisits for these patients was collected from the 3 databases between January 1, 2005, and December 31, 2012. The institutional review board of Washington University in St Louis School of Medicine waived approval of this study as well as the need for informed consent.

Data Sources

The Healthcare Cost and Utilization Project is a group of health care databases and related software tools and products developed through a federal, state, and industry partnership and sponsored by the Agency for Healthcare Research and Quality. This study uses the following 3 Healthcare Cost and Utilization Project databases: the state ambulatory surgery databases (SASD),¹³ the state inpatient databases (SID),¹² and the state emergency department database (SEDD)¹⁴ from California, Florida, and New York. These statewide databases contain information from discharge records for all patients regardless of age or payer (Medicare, Medicaid, private insurance, and no insurance). Records from ambulatory surgery visits at hospitals and freestanding ambulatory surgical centers are provided through the SASD. Discharge records of inpatient hospital visits are provided through the SID. Records from emergency department visits are provided through the SEDD.

Individual patients are linked and tracked across all 3 databases with an encrypted patient-level identifier. An encrypted variable for admission date, together with the length of stay, was used to calculate the period between visits for each patient while keeping exact dates encrypted to protect patient confidentiality.^{12–14}

Study Population

Patients 13 years or older who underwent septorhinoplasty at an outpatient surgery center from January 1, 2005, through December 31, 2009, in California, Florida, and New York were identified in the SASD using *Current Procedural Terminology* codes for primary and secondary septorhinoplasty (30400, 30410, 30420, 30430, 30435, 30450, 30460, 30462, 30465, and 30520).

The index septorhinoplasty procedure was defined as the first septorhinoplasty surgery for each patient in the SASD between January 1, 2005, and December 31, 2009. In addition, patients were required to be residents of the state in which the procedure was performed to limit loss to follow-up. Identified cases in the SASD were then linked by encrypted patient identifier to hospitalizations in the SID and emergency department encounters in the SEDD to obtain information on 30-day hospital revisit rates contained within these databases. A 30-day hospital revisit was defined as a revisit to an ambulatory surgery center, emergency department, or inpatient hospital admission within 30 days of the index procedure.

Outcome Measures

The primary outcome measure was a hospital revisit within 30 days after an index septorhinoplasty procedure. The time between the index procedure and hospital revisit in each of the 3 databases was recorded. These data were then used to calculate the 30-day revisit rate. Primary diagnosis at the time of revisit was also recorded.

The secondary analysis examined the association between patient and procedure characteristics and a 30-day hospital revisit. Demographic data were defined at the time of the index procedure. Age was divided into 4 groups: 13 to 18 years, 19 to 40 years, 41 to 65 years, and older than 65 years. Race/ethnicity was categorized as white, black, Hispanic, Asian or Pacific Islander, or other. Primary expected payer was divided into 5 groups: Medicaid, Medicare, private insurance, self-pay, or other. Patient location was categorized as large metropolitan (> 1 million residents), small metropolitan (<1 million residents), micropolitan (between 10 000 and 50 000 residents), or neither metropolitan nor micropolitan. Income data were also collected, with patients divided by median household income quartile.

Specific comorbidities were examined to determine their possible effect on wound healing, bleeding, or other surgical complications (Table 1). Most comorbidities were defined using the measure by Elixhauser et al,¹⁵ which contains a group of 30 comorbidities using *International Classification of Diseases, Ninth Revision (ICD-9)* codes found to be significantly associated with in-hospital mortality. To summarize these comorbidities, van Walraven et al¹⁶ derived and validated an Elixhauser Comorbidity Index, which ranges from -19 to 89. Comorbidities were indexed and grouped by quartile to represent overall patient comorbidity status. Elixhauser comorbidities were also grouped by number of comorbidities: 0, 1, 2, and 3 or more. Patient diagnoses and additional procedures performed at the time of the index procedure were also assessed (Table 1).

Statistical Analysis

Data analysis was conducted from September 1, 2014, to May 1, 2015. Standard descriptive statistics were used to describe the study population, and the 30-day hospital revisit rates following septorhinoplasty within various subgroups were calculated. Univariable logistic regression, applied with a statistical command (PROC SURVEY LOGISTIC in SAS, version 9.3; SAS Institute Inc), was used to calculate odds ratios and CIs around the point estimate. Because of the large sample size, 99% CIs were used instead of 95% CIs. Clustering for the hospital identifier was performed to avoid institutional biases. All patient characteristics reaching statistical significance with an $\alpha = .01$ in the univariable model were included in multivariable logistic regression. Diagnostic tests, including tests of multicollinearity, were used to ensure all assumptions of the final model were met. A Kaplan-Meier curve was used to estimate the median time to 30-day hospital revisit. The SAS, version 9.3, and SAS Enterprise Guide programs were used for all database management and statistical analyses.

Results

Patient Characteristics and Demographics

A total of 175 842 patients older than 13 years underwent a septorhinoplasty procedure in California, Florida, and New York between January 1, 2005, and December 31, 2009. The mean (SD) age of patients undergoing septorhinoplasty was 41 (15.3) years. Most patients were male (99 255 of 168 972 [58.7%]), defined their race/ethnicity as white (116 241 of 151 223 [76.9%]), had private insurance (131 993 of 175 753 [75.1%]), and were located in large metropolitan areas (125 678 of 175 826 [71.5%]).

30-Day Hospital Revisit Rate, Primary Diagnosis, and Timing

The overall 30-day hospital revisit rate for septorhinoplasty procedures was 6.5% (11 456 of 175 842 patients). The emergency department was most frequently revisited, with an overall rate of 3.6% (6353 of 175 842) or 55.5% of the revisit population (6353 of 11 456), followed by an ambulatory surgery center (3145 of 175 842 total [1.8%]; 3145 of 11 456 revisits [27.5%]) and inpatient hospitalization (1306 of 175 842 total [0.7%]; 1306 of 11 456 revisits [11.4%]); a minority of patients revisited multiple locations (652 of 175 842 total [0.4%]; 652 of 11 456 revisits [5.7%]). Of note, 158 of 175 842 patients (0.09%) underwent revision septorhinoplasty during this time.

Epistaxis or bleeding was the most common primary diagnosis at the time of the 30-day hospital revisit, with an overall rate of 1.2% (2150 of 175 842) or 18.8% of all revisits (2150 of 11 456). Removal of surgical dressing was the next most frequent diagnosis (525 of 175 842 total [0.3%]; 525 of 11 456 revisits [4.6%]), followed by nasal infection or sinusitis (489 of 175 842 total [0.3%]; 489 of 11 456 revisits [4.3%]), headache or pain (405 of 175 842 total [0.2%]; 405 of 11 456 revisits [3.5%]), and syncope or collapse (153 of 175 842 [0.09%]; 153 of 11 456 revisits [1.3%]).

To further subdivide this population, patients returning within 24 hours after their surgery were examined. A total of 1104 patients (0.6%) returned, predominantly to the emergency department (930 of 1104 [84.2%]), within 1 day of their surgery. The primary diagnoses were

epistaxis or bleeding (240 of 1104 [21.7%]); nausea, vomiting, or dehydration (99 of 1104 [9.0%]); and headache or pain (91 of 1104 [8.2%]).

Of patients with a 30-day hospital revisit, the median time to revisit was 8 days after the index procedure, and 5728 patients (50.0%) revisited between 4 and 19 days.

Characteristics of Patients With 30-Day Hospital Revisit

The distribution of demographic and comorbidity characteristics for patients with a 30-day hospital revisit after septorhinoplasty is summarized in Table 2. There was no statistically significant difference in revisit rates when analyzing location by state. Patients who were aged 13 to 18 years were less likely to revisit the hospital (472 of 10 989 [4.3%]), whereas patients who were aged 41 to 65 years (5302 of 77 455 [6.8%]) or older than 65 years (1398 of 12 644 [11.1%]) were more likely to revisit the hospital compared with those aged 19 to 40 years (4284 of 74 754 [5.7%]). There was no statistically significant difference in revisit rates between males and females. A higher revisit rate was evident in black patients (390 of 4147 [9.4%]) and a lower revisit rate in Asian or Pacific Islander patients (238 of 4545 [5.2%]) compared with white patients (7838 of 116 241 [6.7%]). There was a higher revisit rate in patients with Medicare (1908 of 16 537 [11.5%]) and Medicaid (708 of 7128 [9.9%]) and a lower revisit rate for self-pay (416 of 12 323 [3.4%]) compared with private insurance (7896 of 131 993 [6.0%]). Patients in small metropolitan (3031 of 41 892 [7.2%]), micropolitan (488 of 5892 [8.3%]), and neither metropolitan nor micropolitan (198 of 2364 [8.4%]) areas had higher revisit rates compared with those in large metropolitan areas (7739 of 125 678 [6.2%]). Finally, we noted a trend that, with increasing income quartile, the 30-day hospital revisit rate decreased; however, these data were not fully analyzed owing to the large amount of missing data in this population (75 617 of 175 842 patients [43.0%]).

Very few patients fell within the higher quartiles of the Elixhauser Comorbidity Index; therefore, patients were stratified by number of comorbidities as well. Patients with a greater number of comorbidities had a greater 30-day hospital revisit rate. Patients with no comorbidities had a revisit rate of 5.2% (6891 of 132 315), those with 1 comorbidity had a rate of 8.7% (2338 of 26 823), those with 2 comorbidities had a rate of 11.4% (1174 of 10 287), and those with 3 or more comorbidities had a 30-day revisit rate of 16.4% (1053 of 6417). Patients with specific comorbidities analyzed all had a greater rate of 30-day hospital revisit compared with those not having that comorbidity. Patients with a diagnosis of autoimmune disorders or immunodeficiency (277 of 1311 [21.1%]) and those with coagulopathy (77 of 367 [21.0%]) had the highest rates of 30-day hospital revisits. Patients with drug use (172 of 993 [17.3%]) and those with alcohol use (189 of 1148 [16.5%]) had the next highest rates of hospital revisits.

The 30-day hospital revisit rate for different diagnoses and procedure characteristics were analyzed (Table 3). The patient diagnosis or procedure code associated with the highest rate of 30-day hospital revisit was a conchal cartilage graft, with a revisit rate of 13.1% (215 of 1636). Diagnosis codes associated with lower 30-day hospital revisit rates were surgery for cosmetic appearance (151 of 5009 [3.0%]), acquired nasal deformity (936 of 17 991 [5.2%]), and congenital nasal deformity (109 of 2661 [4.1%]), while procedure codes associated with lower revisit rates were primary rhinoplasty—complete or bony (183 of 5307

[3.4%]), primary rhinoplasty–septal repair (593 of 11 290 [5.3%]), secondary rhinoplasty–minor (55 of 1609 [3.4%]), and secondary rhinoplasty–intermediate (26 of 830 [3.1%]).

Factors Associated With 30-Day Hospital Revisit

Multiple demographic, clinical, and procedural factors were associated with 30-day hospital revisits after univariable analysis; therefore, multivariable logistic regression was performed to identify factors with an independent association with the revisit rate (Table 4). Relative to patients aged 19 to 40 years, those aged 13 to 18 years had a decreased revisit rate (adjusted odds ratio [aOR], 0.73; 99% CI, 0.63–0.84), whereas there was an increased revisit rate in patients aged 41 to 65 years (aOR, 1.09; 99% CI, 1.02–1.16) or older than 65 years (aOR, 1.23; 99% CI, 1.06–1.43). Relative to white race, patients of black race (aOR, 1.39; 99% CI, 1.16–1.66) had a higher revisit rate. Patients with Medicare (aOR, 1.55; 99% CI, 1.32–1.81) and Medicaid (aOR, 1.63; 99% CI, 1.33–2.01) had higher 30-day revisit rates compared with patients with private insurance, whereas patients who were self-pay had lower revisit rates (aOR, 0.71; 99% CI, 0.55–0.92). Patient location did not remain statistically significant after multivariable analysis. All patient comorbidities except obesity remained statistically significant after multivariable analysis. Autoimmune disorders or immunodeficiency had the highest aOR (2.69; 99% CI, 1.20–6.03), followed by coagulopathy (aOR, 2.06; 99% CI, 1.33–3.20), anxiety (aOR, 1.79; 99% CI, 1.55–2.07), and alcohol use (aOR, 1.70; 99% CI, 1.35–2.14). Patients with a diagnosis of surgery for cosmetic appearance had a lower revisit rate (aOR, 0.70; 99% CI, 0.51–0.97), as did patients who underwent primary rhinoplasty–complete or bony (aOR, 0.70; 99% CI, 0.51–0.97) or secondary rhinoplasty–minor (aOR, 0.56; 99% CI, 0.33–0.95) and secondary rhinoplasty–intermediate (aOR, 0.51; 99% CI, 0.30–0.87). Patients who had a conchal cartilage graft had a higher 30-day hospital revisit rate (aOR, 2.01; 99% CI, 1.29–3.14).

Discussion

The overall 30-day hospital revisit rate in this large population of patients undergoing septorhinoplasty was 6.5%, with most patients returning to the emergency department with a primary diagnosis of epistaxis or bleeding. An increased revisit rate was independently associated with age between 41 and 65 years and older than 65 years, black race, Medicare or Medicaid insurance, several comorbidities, and use of a conchal cartilage graft. Diagnosis of autoimmune disorders or immunodeficiency had the highest revisit rate aOR at 2.69. A decreased revisit rate was independently associated with patients aged 13 to 18 years, those who used self-pay, and those who underwent surgery for cosmetic appearance, primary rhinoplasty–complete or bony, and minor or intermediate secondary rhinoplasty. These data suggest that preoperative risk factors implying a sicker patient (older age and greater number of comorbidities) as well as socioeconomic factors (race, insurance status), are more predictive of 30-day hospital revisits rather than the complexity of the procedure performed or other procedure-related diagnoses, as seen when analyzing revision surgery rates.¹¹ In addition, because most of the primary diagnoses at the time of revisit were related to the surgical procedure, it appears that postoperative complications are also significant factors in the 30-day revisit rate. This information will help physicians identify patient populations at higher risk for return visits to the emergency department, inpatient hospital setting, or

ambulatory surgery center to enable appropriate preoperative risk assessment and medical optimization, as well as targeted counseling regarding follow-up for potential complications.

These findings are in accordance with many other studies investigating surgical readmission rates.^{2–10} In 2012, Kassin et al³ analyzed 1442 patients undergoing general surgical procedures and found a readmission rate of 11.3%. Any postoperative complication had the greatest association with 30-day readmission. After that study, Tsai et al² used Medicare data to calculate 30-day readmission rates for surgical patients and found a 13.1% readmission rate. In that study, hospitals with high surgical volume and low surgical mortality had lower rates of readmission, suggesting that surgical readmission rates were better markers of quality care compared with medical readmissions for pneumonia, heart attack, and heart failure, which are often multifactorial and related to disease severity and social factors. In contrast, a study by Glance et al⁴ assessed whether there was a difference in surgical readmission rates between safety net hospitals (SNHs), defined as having the highest quartile of low-socioeconomic patients, and non-SNHs. Under the current Hospital Readmissions Reduction Program approach, 25 of 41 SNHs (61%) were financially penalized for surgical readmissions compared with 72 of 144 non-SNHs (50%); however, after adjusting for socioeconomic status, only 21 of 41 SNHs (51%) would be penalized. These studies suggest that surgical readmissions, like medical readmissions, are multifactorial and related to socioeconomic and patient risk factors as well as surgical complications.

A study analyzing 1058 otolaryngology patients found a 7.3% readmission rate (93 of 1271 patients); the presence of a postoperative complication was the highest predictor of readmission.⁶ Other contributing patient factors were a marital status of widowed or divorced, having Medicaid or no insurance, and the presence of underlying comorbidities of severe heart or lung disease. These data suggest that, although postoperative complications are likely to be the greatest predictor of a 30-day revisit, several preoperative factors can also help identify those at greater risk for returning to the hospital.

Most studies relating specifically to septoplasty or rhinoplasty readmission rates are found in the British literature; they discuss performing these operations as outpatient procedures and the risk for readmission within the first 24 hours of surgery.^{17–20} The Royal College of Surgeons of England stipulated that the readmission rate for outpatient procedures in the first 24 hours should be between 2% and 3%, and there was a goal to identify patient factors that increased unanticipated admissions.¹⁷ In a study of 256 septoplasties, an overall admission rate of 9% was found (23 of 256 patients), almost all owing to epistaxis (22 of 23 patients).¹⁷ Contributing factors were performance of additional procedures during septoplasty and American Society of Anesthesiologists classification greater than 1. In a 2005 study examining 787 cases of outpatient plastic surgery, which included rhinoplasty, the 24-hour admission rate was 3.6% (28 of 787 patients).¹⁹ Age older than 80 years, male sex, body mass index greater than 30 (calculated as weight in kilograms divided by height in meters squared), and surgery lasting longer than 45 minutes were predictive of admission, and 20 of these 28 admissions (71%) were owing to surgical causes, predominantly bleeding. Rhinoplasty specifically was found to have a readmission rate of approximately 8% (1 of 12 patients). In our study, there was a small revisit rate of 0.6% (1104 of 175 842

patients) in the first 24 hours after surgery; as shown in the previous studies, postoperative bleeding was the most common reason for postprocedure readmission or emergency department visit.

Although outcomes research has yet to definitively identify which patients are at highest risk for unplanned readmission for specific procedures, policies that carry penalties for any readmission within 30 days are already in effect.⁵ Our study aims to provide an initial basis of normative data in the facial plastic surgery and otolaryngology literature to third-party payers or government agencies. Although the current Hospital Readmissions Reduction Program approach places fines on hospitals for readmissions within 30 days of inpatient surgical procedures, this approach has not yet been extended to include ambulatory procedures. However, the Centers for Medicare and Medicaid Services is now developing a new measure using hospital-wide readmission data as opposed to condition-specific readmission rates. Rosen et al²¹ found that all-cause readmission rates do not correlate with condition-specific readmission rates. Use of hospital-wide readmission data penalized only 60% of the hospitals that would have been penalized from condition-specific penalties; however, it is not known which is a better predictor of quality of care. The Centers for Medicare and Medicaid Services quality care metrics including any hospital readmission will increase the importance of identifying patients at higher risk of a 30-day revisit and ensuring preoperative optimization of comorbidities or planned overnight stays in high-risk populations.

Limitations of this study include the use of an all-payer database, which relies on the accurate recording of *ICD-9* and *Current Procedural Terminology* codes by health care professionals and medical record technicians. Incomplete recording can lead to gaps in reporting of specific information, such as sex, race, insurance, patient income, and patient location, as seen in Table 2. Furthermore, this effect has been shown in a patient population readmitted within 90 days after a procedure in which comorbidities were consistently underreported in the administrative database compared with those that had been reported in the hospital medical records.²² Except for patient income, which was excluded from our analysis owing to the high percentage of missing data (43.0%), the other categories had a much lower rate of missing data, ranging from 0.009% (16 patients) to 14.0%. In addition, inpatients were not analyzed separately from outpatients owing to the small number of inpatients (5568 patients [3.2%]), and an even smaller number of patients returned within the first 24 hours after surgery (1104 [0.6%]). Therefore, it is beyond the scope of this article to infer whether patients with risk factors associated with hospital revisits would be less likely to return if they had been inpatients. Finally, details of the revisit beyond the primary diagnosis code cannot be elucidated beyond the *ICD-9* code at the time of revisit, eliminating further analysis of more specific factors contributing to hospital revisits.

Conclusions

This study suggests that the overall 30-day hospital revisit rate for patients undergoing septorhinoplasty is 6.5% and varies predominantly by patient factors such as age, race, insurance status, and number and type of comorbidities. In addition, the most common reason for revisit was surgical, including postoperative bleeding or epistaxis, removal of a

surgical dressing, and nasal infection or sinusitis. This information will allow physicians to identify patient populations at higher risk for return visits to the emergency department, inpatient hospital setting, or ambulatory surgery center to enable appropriate preoperative risk assessment and counseling regarding follow-up and potential complications. Finally, this study will also help provide normative data to third-party payers or government agencies where hospitals are penalized for 30-day hospital readmissions.

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Key Points**Question**

What is the rate of hospital revisits in the 30-day period after septorhinoplasty and what risk factors are associated with revisits?

Findings

Approximately 6.5% of patients who underwent septorhinoplasty procedures revisited the hospital within 30 days of the procedure; the most common primary diagnosis was bleeding or epistaxis. Patients aged 41 to 65 years or older than 65 years had an increased revisit rate, as did black patients; those with Medicare and Medicaid; those with diagnoses of autoimmune disorders or immunodeficiency, coagulopathy, or anxiety; and those with a conchal cartilage graft.

Meaning

Patients with more medical comorbidities and lower socioeconomic status returned for surgical complications, such as bleeding or epistaxis, in the 30-day period after septorhinoplasty. These data provide valuable preoperative counseling information for patients and physicians.

Table 1*ICD-9* Diagnosis Codes and *CPT* Procedure Codes for Included Data

ICD-9/CPT Code	Description
Inclusion criteria	
30400	Primary rhinoplasty, lateral and alar cartilages, and/or tip
30410	Primary rhinoplasty, bony pyramid, lateral and alar cartilage, and/or tip
30420	Primary rhinoplasty, bony pyramid, lateral and alar cartilages, and/or tip, including major septal repair
30430	Secondary rhinoplasty, minor revision (nasal tip)
30435	Secondary rhinoplasty, intermediate revision (bony work with osteotomies)
30450	Secondary rhinoplasty, major revision (nasal tip and osteotomies)
30460	Cleft lip rhinoplasty, including columellar lengthening, tip only
30462	Cleft lip rhinoplasty, including columellar lengthening, tip, septum, and osteotomies
30465	Repair of nasal vestibular stenosis (eg, spreader grafting, lateral nasal wall reconstruction)
30520	Septoplasty or submucous resection with or without cartilage scoring, contouring, or replacement with graft
Patient comorbidities	
305.1, V15.82	Tobacco use
446.4, 135, 733.99, 710.0, G8859, G8860	Autoimmune disorder
042, 279.(x), 203.(x), 204.(x), 205.(x), 206.(x), 207.(x), 288.(x)	Immunodeficiency
295.(x), 296.(x), 297.(x), 298.(x), 300.(x), 301.(x), 303.(x), 304.(x), 311.(x)	Psychiatric disorders
Patient diagnoses	
V50.1	Plastic surgery for unacceptable cosmetic appearance
470	Deviated nasal septum (acquired)
478	Hypertrophy of nasal turbinate
478.19	Nasal airway obstruction or perforation
738	Acquired nasal deformity
748.1	Congenital nasal deformity
754	Congenital nasal or septal deformity
905	Late effect of craniofacial fracture
733.81	Malunion of nasal septal fracture
959.09	Nose or septum injury
Other surgical procedures	
30130, 30140, 30930, 30801, 30802	Inferior turbinate reduction or outfracture
30560	Lysis of synechia
20912	Septal cartilage graft
21210	Bone graft to nose
21230	Rib cartilage graft to nose
21235	Ear cartilage graft to nose

ICD-9/CPT Code	Description
30310, 20670, 20680	Removal of nasal foreign body, deep or superficial implant
Principle diagnoses	
784.7; 998.11	Epistaxis or hemorrhage after procedure
V58.31	Removal of surgical dressing
478.19; 473.8; 473.9	Nasal infection or sinusitis
784.0; 338.18	Headache or pain
780.2	Syncope or collapse

Abbreviations: *CPT*, Current Procedural Terminology; *ICD-9*, International Classification of Diseases, Ninth Revision.

Table 2

Demographic and Clinical Characteristics of Patients With a 30-Day Hospital Revisit After Septorhinoplasty

Characteristic	Patients, No.	Patients With Hospital Revisit, No. (%)	Unadjusted Odds Ratio (99% CI)
Total	175 842	11 456 (6.5)	
State			
California	73 810	4958 (6.7)	1 [Reference]
Florida	51 911	3924 (7.6)	1.14 (0.80–1.61)
New York	50 121	2574 (5.1)	0.75 (0.54–1.05)
Age, y			
13–18	10 989	472 (4.3)	0.74 (0.65–0.84)
19–40	74 754	4284 (5.7)	1 [Reference]
41–65	77 455	5302 (6.8)	1.21 (1.12–1.30)
>65	12 644	1398 (11.1)	2.05 (1.81–2.31)
Sex ^a			
Male	99 255	6600 (6.6)	1 [Reference]
Female	69 717	4570 (6.6)	0.99 (0.91–1.07)
Race ^b			
White	116 241	7838 (6.7)	1 [Reference]
Black	4147	390 (9.4)	1.43 (1.21–1.69)
Hispanic	17 898	1369 (7.6)	1.15 (0.98–1.34)
Asian or Pacific Islander	4545	238 (5.2)	0.76 (0.61–0.95)
Other	8392	473 (5.6)	0.83 (0.64–1.07)
Insurance ^c			
Medicare	16 537	1908 (11.5)	2.05 (1.79–2.34)
Medicaid	7128	708 (9.9)	1.73 (1.35–2.22)
Private insurance	131 993	7896 (6.0)	1 [Reference]
Self-pay	12 323	416 (3.4)	0.55 (0.42–0.72)
Other	7772	524 (6.7)	1.14 (0.87–1.48)
Patient location ^d			
Large metropolitan	125 678	7739 (6.2)	1 [Reference]
Small metropolitan	41 892	3031 (7.2)	1.90 (1.03–1.37)
Metropolitan	5892	488 (8.3)	1.38 (1.08–1.75)
Not metropolitan or micropolitan	2364	198 (8.4)	1.39 (1.05–1.84)
Median household income, percentile ^e			
0 to 25th	16 420	1289 (7.9)	<i>f</i>
26th to 50th	25 987	1759 (6.8)	<i>f</i>
51st to 75th	26 878	1747 (6.5)	<i>f</i>
76th to 100th	30 940	1581 (5.1)	<i>f</i>

Characteristic	Patients, No.	Patients With Hospital Revisit, No. (%)	Unadjusted Odds Ratio (99% CI)
Elixhauser Comorbidity Index ^g			
0	173 460	11 030 (6.4)	1 [Reference]
1	2379	425 (17.9)	3.20 (2.68–3.82)
2	<10 ^h	<10 ^h	^f
3	0	0	^f
No. of Elixhauser comorbidities ^g			
0	132 315	6891 (5.2)	1 [Reference]
1	26 823	2338 (8.7)	1.74 (1.38–2.20)
2	10 287	1174 (11.4)	2.35 (1.96–2.80)
3	6417	1053 (16.4)	3.57 (3.16–4.03)
Patient comorbidities			
Diabetes	5681	686 (12.1)	2.03 (1.77–2.33)
Obesity	5566	548 (9.8)	1.60 (1.38–1.84)
Alcohol use	1148	189 (16.5)	2.86 (2.28–3.58)
Drug use	993	172 (17.3)	3.04 (2.35–3.93)
Tobacco use	13 138	1345 (10.2)	1.72 (1.46–2.03)
Anxiety	4439	645 (14.5)	2.53 (2.16–2.95)
Depression	3691	487 (13.2)	2.23 (1.87–2.68)
Autoimmune disorder or immunodeficiency	1311	277 (21.1)	3.92 (2.09–7.34)
Coagulopathy	367	77 (21.0)	3.83 (2.69–5.44)

^aData missing for 6870 patients.

^bData missing for 24 592 patients.

^cData missing for 89 patients.

^dCategories are defined in the Outcome Measures subsection of the Methods section. Data missing for 16 patients.

^eData missing for 75 617 patients.

^fNo analysis was performed owing to the high percentage of missing data.

^gDescribed in Elixhauser et al.¹⁵

^hThe Healthcare Cost and Utilization Project does not report exact numbers for categories with fewer than 10 patients.

Table 3

Diagnosis and Procedure Characteristics of 30-Day Revisit Rate After Septorhinoplasty

Characteristic	Patients, No.	Patients With Hospital Revisit, No. (%)	Unadjusted Odds Ratio (99% CI)
Total	175 842	11 456 (6.5)	
Patient diagnoses			
Deviated septum	150 000	9879 (6.6)	1.09 (0.87–1.35)
Turbinate hypertrophy	107 586	7195 (6.7)	1.08 (0.86–1.35)
Nasal airway obstruction	36 838	2367 (6.4)	0.98 (0.80–1.20)
Cosmetic appearance	5009	151 (3.0)	0.44 (0.33–0.58)
Deformity			
Acquired nasal	17 991	936 (5.2)	0.77 (0.64–0.92)
Congenital nasal	2661	109 (4.1)	0.61 (0.43–0.87)
Congenital septal	655	42 (6.4)	0.98 (0.66–1.46)
Late effect of craniofacial fracture	2652	170 (6.4)	0.98 (0.64–1.52)
Procedure performed			
Septoplasty	151 727	10 167 (6.7)	1.27 (1.00–1.62)
Inferior turbinate reduction	114 179	7627 (6.7)	1.08 (0.87–1.34)
Repair of vestibular stenosis	4441	368 (8.3)	1.31 (0.79–2.15)
Primary rhinoplasty			
Cartilage or tip	6023	357 (5.9)	0.90 (0.73–1.11)
Complete or bony	5307	183 (3.4)	0.51 (0.37–0.69)
Septal repair	11 290	593 (5.3)	0.78 (0.63–0.97)
Secondary rhinoplasty			
Minor	1609	55 (3.4)	0.51 (0.29–0.89)
Intermediate	830	26 (3.1)	0.46 (0.27–0.79)
Major	1083	54 (5.0)	0.75 (0.51–1.11)
Cleft			
Rhinoplasty	286	<10 ^a	^b
Septorhinoplasty	349	<10 ^a	^b
Graft			
Septal	4785	287 (6.0)	0.91 (0.70–1.20)
Conchal	1636	215 (13.1)	2.20 (1.31–3.69)
Rib	249	14 (5.6)	0.86 (0.40–1.85)
Bone	253	22 (8.7)	1.37 (0.79–2.38)

^aThe Healthcare Cost and Utilization Project does not report exact numbers for categories with fewer than 10 patients.^bNo analysis was performed owing to the high percentage of missing data.

Table 4

Multivariable Analysis of Characteristics Associated With 30-Day Revisit Rate After Septorhinoplasty

Characteristic	Hospital Revisit, Adjusted Odds Ratio (99% CI)
Age, y	
13–18	0.73 (0.63–0.84)
19–40	1 [Reference]
41–65	1.09 (1.02–1.16)
>65	1.23 (1.06–1.43)
Race	
White	1 [Reference]
Black	1.39 (1.16–1.66)
Hispanic	1.18 (1.00–1.39)
Asian or Pacific Islander	0.82 (0.65–1.03)
Other	0.91 (0.71–1.18)
Insurance	
Medicare	1.55 (1.32–1.81)
Medicaid	1.63 (1.33–2.01)
Private insurance	1 [Reference]
Self-pay	0.71 (0.55–0.92)
Other	1.16 (0.94–1.43)
Patient location ^a	
Large metropolitan	1 [Reference]
Small metropolitan	1.09 (0.94–1.25)
Micropolitan	1.19 (0.91–1.56)
Not metropolitan or micropolitan	1.28 (0.96–1.71)
Patient comorbidities	
Diabetes	1.32 (1.16–1.50)
Obesity	1.12 (0.98–1.27)
Alcohol use	1.70 (1.35–2.14)
Drug use	1.52 (1.17–1.98)
Tobacco use	1.23 (1.05–1.44)
Anxiety	1.79 (1.55–2.07)
Depression	1.42 (1.20–1.68)
Autoimmune disorder or immunodeficiency	2.69 (1.20–6.03)
Coagulopathy	2.06 (1.33–3.20)
Patient diagnoses	
Cosmetic appearance	0.70 (0.51–0.97)
Acquired nasal deformity	0.89 (0.74–1.07)
Congenital nasal deformity	0.83 (0.58–1.20)

Characteristic	Hospital Revisit, Adjusted Odds Ratio (99% CI)
Procedures performed	
Septoplasty	0.84 (0.61–1.16)
Primary rhinoplasty	
Complete or bony	0.70 (0.51–0.97)
Septal repair	0.78 (0.60–1.02)
Secondary rhinoplasty	
Minor	0.56 (0.33–0.95)
Intermediate	0.51 (0.30–0.87)
Conchal cartilage graft	2.01 (1.29–3.14)

^aCategories are defined in the Outcome Measures subsection of the Methods section.