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Variation in Postoperative Debridement Patterns in Endoscopic Sinus Surgery: A Retrospective Cohort Study

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1 | Introduction

Endoscopic sinus surgery (ESS) is recommended for cases of chronic rhinosinusitis refractory to medical management. Postoperative care following ESS is important for achieving successful surgical outcomes and reducing infection rates, inflammation, and synechiae [1, 2]. Indeed, a 2012 survey of 265 otolaryngologists found that 87.9% of them routinely perform postoperative debridements (PDs) [3]. Evidence on the optimal timing, frequency, duration, and intensity of PDs, however, is limited. Nonetheless, between 2000 and 2016, average annual growth rate in the total PD number and cost billed to Medicare Part B was 6.0 and 8.4%, respectively [4].

The American Academy of Otolaryngology states the frequency of PDs is a clinical decision best determined by the surgeon and on a case-by-case basis [5]. No study has explored factors which affect PD utilization. Therefore, we used a commercial claims database to characterize variation in PD patterns, highlighted by a random-effects analysis to test the hypothesis that variation in the number of PDs was dependent on the surgeon who performed the ESS.

Key points

- PDs are judiciously performed in the United States, as nearly all surgeons perform three or fewer PDs.
- Much of the variation in the number of PDs depends on the surgeon's practice preferences.

2 | Methods

We conducted a retrospective cohort study in the Merative™ MarketScan Commercial Database.

We queried every claim between 2003 and 2022 with an ESS procedural code (CPT: 31241, 31253-31257, 31259, 31267, 31276, 31287, 31288, 31295–31298). We selected the first claim for each patient and excluded patients younger than 18 years. We used a clinician identifier variable which became available in 2015 to group patients to surgeons—thus, our cohort was restricted to initial ESS between 2015 and 2022. We counted number of days on which patients had an outpatient PD (31237) within 90 days of their ESS. Patients with fewer than 90 continuous days of coverage following ESS were excluded.

Descriptive statistics of patient characteristics and number of PDs were calculated. Ordinary linear regression analyzed the association between number of PDs and patient characteristics, including bilateral versus unilateral ESS, septoplasty versus no septoplasty, age, sex, geography, year, insurance plan, and state. A random-intercept linear regression determined whether the number of PDs was clustered by the surgeon who performed the

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ESS [6]. Upon identifying clustering, the intraclass correlation was calculated, which quantified how much of the variation in the number of PDs not explained by the covariates was instead explained at the surgeon level [6].

3 | Results

We identified 69,170 patients undergoing initial ESS between 2015 and 2022 (Table 1). The average age was 44.0 years (standard deviation: 12.7), 52.6% were female, and 82.9% resided in urban geographies. In total, 70.1% of patients underwent bilateral ESS, 49.2% underwent concurrent septoplasty, and 35.6% underwent bilateral ESS and concurrent septoplasty. The 69,170 patients were seen by 11,147 unique otolaryngologists, with each surgeon operating on an average and median of 6.2 (standard deviation: 14.8) and 2 (interquartile range: 1–6) patients, respectively. The number of PDs ranged from 0 to 15 within 90 days of ESS, with 72.2% of surgeons performing a PD on at least one of their patients. Overall, 38.8% of patients had zero PDs, 25.9% had one PD, 21.3% had two PDs, 10.2% had three PDs, and 3.8% had four or more PDs.

Bilateral ESS and concurrent septoplasty were associated with increased number of PDs ($p < 0.001$; Table 2). Older age was also associated with increased number of PDs ($p < 0.001$), while rural compared with urban geography was associated with fewer PDs ($p < 0.001$). Random-intercept regression identified significant clustering in the number of PDs by surgeon. The intraclass correlation was 0.387, such that 38.7% of the unexplained variation in the number of PDs was at the surgeon level.

4 | Discussion

This retrospective cohort study identified significant variation in the number of PDs performed following ESS. Some of this variation was explained by the laterality of the ESS, whether concurrent septoplasty was performed, and the geography of the patient; however, approximately 39% of the unexplained variation was explained at the surgeon level. These results underscore a lack of consensus regarding how many PDs are appropriate to perform after ESS.

This study is the first to demonstrate that much of the variation in PD patterns depends on surgeon practice preferences. Follow-up research is necessary to determine which characteristics of a surgeon explain this variation; however, we considered the following: first, there is variation in surgical beliefs and attitudes regarding the indications and frequency for PD, as is often described in literature explaining geographic variation in clinical care [7]. These beliefs and attitudes may be secondary to the institutional preferences surgeons develop during training. Second, there is geographic variation in patient demand for ESS and ensuing PDs, to which surgeons respond accordingly [4]. Indeed, we found that patients in rural areas received fewer PDs. Third, there is variation in compensation structures among surgeons, as ESS does not have a global period [5]. Surgeons whose compensation structure is productivity-based may have stronger financial incentives to perform PDs.

TABLE 1 | Characteristics of endoscopic sinus surgery patients and the number of postoperative debridements administered within 90 days of surgery.

Characteristic	Value
Patients, *N*	69170
Surgeons, *N*	11147
Patients per surgeon, mean (standard deviation)	6.2 (14.8)
Patients per surgeon, median (interquartile range)	2 (1–6)
Bilateral surgery, *N* (%)	48,455 (70.1)
Septoplasty, *N* (%)	33,996 (49.2)
Bilateral surgery and septoplasty, *N* (%)	24,605 (35.6)
Age, mean (standard deviation)	44.0 (12.7)
Sex, *N* (%)	
Male	32,796 (47.4)
Female	36,374 (52.6)
U.S. Census Bureau Region, *N* (%)	
Northeast	11,537 (16.7)
North Central	15,180 (22.0)
South	31,923 (46.2)
West	10,447 (15.1)
Unknown	83 (0.1)
Geography, *N* (%)	
Urban	57,357 (82.9)
Rural	6578 (9.5)
Unknown	5235 (7.6)
Year of surgery, *N* (%)	
2015	11,294 (16.3)
2016	11,808 (17.1)
2017	10,324 (14.9)
2018	10,306 (14.9)
2019	9216 (13.3)
2020	5950 (8.6)
2021	5745 (8.3)
2022	4527 (6.5)
Postoperative debridements, *N* (%)	
0	26,849 (38.8)
1	17,924 (25.9)
2	14,729 (21.3)
3	7079 (10.2)
4 or more	2589 (3.8)
Postoperative debridements, mean (standard deviation)	1.2 (1.2)
Postoperative debridements, median (interquartile range)	1 (0–2)

Tabulations of state and insurance plan are available upon request.

TABLE 2 | Number of postoperative debridements: linear regression estimates ($N = 69{,}170$).

Variable	Estimate (95% confidence interval); *p* value	
	Ordinary regression	**Random-intercept regression**
Bilateral surgery	0.14 (0.12, 0.16); $p < 0.001$	0.10 (0.08, 0.12); $p < 0.001$
Septoplasty	0.42 (0.40, 0.44); $p < 0.001$	0.32 (0.30, 0.33); $p < 0.001$
Age (per 10 years)	0.003 (0.002, 0.004); $p < 0.001$	0.003 (0.003, 0.004); $p < 0.001$
Sex		
Female	Reference	Reference
Male	0.00 (−0.02, 0.02); $p = 0.92$	0.00 (−0.01, 0.01); $p = 0.99$
Geography		
Urban	Reference	Reference
Rural	−0.18 (−0.21, −0.15); $p < 0.001$	−0.06 (−0.09, −0.03); $p < 0.001$
Unknown	−0.19 (−0.23, −0.14); $p < 0.001$	−0.12 (−0.16, −0.08); $p < 0.001$
Year of surgery		
2015	Reference	Reference
2016	0.07 (0.04, 0.10); $p < 0.001$	0.07 (0.04, 0.10); p<0.001
2017	0.13 (0.10, 0.16); $p < 0.001$	0.10 (0.07, 0.13); p<0.001
2018	0.08 (0.04, 0.11); $p < 0.001$	0.08 (0.05, 0.11); p<0.001
2019	0.07 (0.04, 0.11); $p < 0.001$	0.07 (0.04, 0.10); p<0.001
2020	0.10 (0.06, 0.14); $p < 0.001$	0.08 (0.04, 0.11); p<0.001
2021	0.07 (0.03, 0.10); $p = 0.001$	0.07 (0.03, 0.10); p<0.001
2022	0.02 (−0.02, 0.06); $p = 0.34$	−0.01 (-0.05, 0.03); p = 0.54
Residual variance	1.364	0.844 (0.835, 0.854)
Surgeon variance	–	0.533 (0.511, 0.556)
Intraclass correlation	–	0.387 (0.377, 0.398)
Log-likelihood	−108,848.991	−98590.361
Chi-squared (χ^2_{01})	–	20517.258

Regression output for state and insurance plan covariates are available upon request.

This study has limitations. First, we did not identify PDs beyond 90 days of ESS. Second, advance practice providers are performing more PDs [8], and those PDs were only captured if they were indirectly billed [9]. Third, the MarketScan database comprises privately-insured patients, so results may not generalize to publicly-insured patients. The database also does not include patient race/ethnicity or surgeon characteristics such as years in practice, training background, and compensation structure; furthermore, the database may be subject to coding inaccuracies (e.g., tumor surgery) and lack granular clinical information (e.g., polypoid disease). Finally, results may not generalize to revision ESS [10]. Whether debridement patterns increase risk of subsequent revision ESS remains an open question; future studies should investigate this issue.

Author Contributions

Conception and design: M. H. and C. R. *Data acquisition*: M. H. and C. R. *Analysis and interpretation*: M. H., N. K., J. P. and C. R. *Drafting the manuscript*: M. H., N. K., J. P. and C. R. *Critical revision*: M. H., N. K., J. P. and C. R. *Guarantor*: C. R.

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Ethics Statement

The data were previously collected, statistically de-identified, and are compliant with the conditions set forth in Sections 164.514(a)-(b)(1)ii of the Health Insurance Portability and Accountability Act of 1996 Privacy Rule; therefore, approval from an institutional review board was not sought.

Conflicts of Interest

The authors declare no conflict of interest.

Disclosures

The authors have nothing to report.

Data Availability Statement

Certain data used in this study were supplied by Merative US LP as part of one or more MarketScan Research Databases. Any analysis,

interpretation, or conclusion based on these data is solely that of the authors and not Merative.

Restrictions apply to the availability of the data supplied by Merative US LP. Information regarding data, code, and the statistical analysis is available from the corresponding author upon reasonable request.

References

1. P. Eloy, P. Andrews, and A. L. Poirrier, "Postoperative Care in Endoscopic Sinus Surgery: A Critical Review," *Current Opinion in Otolaryngology & Head and Neck Surgery* 25, no. 1 (2017): 35–42, https://journals.lww.com/co-otolaryngology/fulltext/2017/02000/postoperative_care_in_endoscopic_sinus_surgery__a.9.aspx.

2. S. Tzelnick, U. Alkan, M. Leshno, P. Hwang, and E. Soudry, "Sinonasal Debridement versus no Debridement for the Postoperative Care of Patients Undergoing Endoscopic Sinus Surgery," *Cochrane Database of Systematic Reviews (Online)* 11, no. 11 (2018): CD011988, https://doi.org/10.1002/14651858.CD011988.pub2.

3. R. A. Portela, J. Hootnick, and J. McGinn, "Perioperative Care in Functional Endoscopic Sinus Surgery: A Survey Study," *International Forum of Allergy & Rhinology* 2, no. 1 (2012): 27–33, https://doi.org/10.1002/alr.20098.

4. M. Xiong, R. S. Kshirsagar, and J. Liang, "Trends in Endoscopic Sinonasal Debridement in the Medicare Population," *Perm J* 25, no. 2 (2021): 1–1, https://doi.org/10.7812/TPP/20.110.

5. American Academy of Otolaryngology-Head and Neck Surgery. Position Statement: Debridement of the Sinus Cavity after ESS. Published online April 21, 2021.

6. T. Snijders and R. Bosker. Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling. *Httplst-Iiepiiep-Unescoorgcgi-Binwwwi32exeinepidoc1int2000013777100*. Published online January 1, 1999.

7. J. D. Birkmeyer, B. N. Reames, P. McCulloch, A. J. Carr, W. B. Campbell, and J. E. Wennberg, "Understanding of Regional Variation in the Use of Surgery," *The Lancet* 382, no. 9898 (2013): 1121–1129.

8. M. Ge, J. H. Kim, S. S. Smith, et al., "Advanced Practice Providers Utilization Trends in Otolaryngology from 2012 to 2017 in the Medicare Population," *Otolaryngology–Head and Neck Surgery* 165, no. 1 (2021): 69–75, https://doi.org/10.1177/0194599820971186.

9. S. Y. Patel, H. A. Huskamp, A. B. Frakt, et al., "Frequency of Indirect Billing to Medicare for Nurse Practitioner and Physician Assistant Office Visits," *Health Affairs (Project Hope)* 41, no. 6 (2022): 805–813, https://doi.org/10.1377/hlthaff.2021.01968.

10. K. A. Smith, R. R. Orlandi, G. Oakley, H. Meeks, K. Curtin, and J. A. Alt, "Long-term Revision Rates for Endoscopic Sinus Surgery," *International Forum of Allergy & Rhinology* 9, no. 4 (2019): 402–408, https://doi.org/10.1002/alr.22264.