# Evaluation of patient nasal saline irrigation practices following endoscopic sinus surgery

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***Background:*** **Functional endoscopic sinus surgery (FESS) is an effective treatment for chronic rhinosinusitis (CRS). Postoperative management strategies after FESS often vary from surgeon to surgeon. Recent data suggests that nasal saline irrigation following FESS is almost universally recommended; however, patient adherence has not been formally evaluated. The purpose of this study is to evaluate postoperative nasal irrigation practices and its effects on short-term outcomes in post-FESS patients.**

***Methods:*** **Eighty-two patients were followed prospectively following FESS at a tertiary-academic medical institution for 3 postoperative visits. Patients were surveyed on their irrigation practices (start date, frequency, and volume per irrigation per side), and adherence to prescribed antibiotic and steroid regimens. At each visit, 22-item Sino-Nasal Outcome Test (SNOT-22) questionnaires and endoscopic examinations were evaluated by the Lund-Kennedy Endoscopy Score (LKES). Factors evaluated include: patient demographics (age, sex, ethnicity), preoperative Lund-Mackay and SNOT-22 scores, comorbidities, extent of procedure, and use of nasal packing and/or spacers.**

***Results:*** **Adherence to irrigation instructions was 82.9%. Factors significantly associated with compliance with irrigation instructions included younger age ($p = 0.0022$), prior irrigation ($p < 0.0001$), revision surgery ($p = 0.0014$), and non-native English language speaking ($p = 0.0095$). Patients were more likely to irrigate with larger volumes if they were younger ($p = 0.0284$), had prior irrigation ($p < 0.0001$), or had revision surgery ($p = 0.0056$).**

***Conclusion:*** **Multiple factors are associated with patient compliance with nasal saline irrigation after FESS. Ethnic and cultural considerations, such as language barriers, should also be considered to improve outcomes. Identification of patients who may be noncompliant could potentially benefit from increased preoperative counseling to improve adherence rates.** © 2017 ARS-AAOA, LLC.

*Key Words:*
**endoscopic sinus surgery; chronic rhinosinusitis; FESS; medical therapy; postoperative**

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Functional endoscopic sinus surgery (FESS) is an effective treatment option for patients with chronic rhinosinusitis (CRS) refractory to medical management. In addition to the surgical procedure, previous studies have suggested that postoperative care following FESS is paramount to successful outcomes.[1] Though postoperative care does vary from surgeon to surgeon, nasal saline irrigation following FESS does appear to be a nearly universal recommendation. A survey of members in the American Academy of Otolaryngology–Head and Neck Surgery evaluated perioperative care after FESS surgery and found that 100% of fellowship trained rhinologists and 93.2% of otolaryngologists recommended nasal saline irrigations after FESS to their patients.[2] The recent International Consensus Statement on Allergy and Rhinology: Rhinosinusitis, published in February 2016, indicated that high-volume nasal saline irrigation is strongly recommended as an adjunct to other medical therapies for CRS. A systematic review performed in 2011 gave a "Strong recommendation/recommendation" for use of high-volume normal saline irrigations between 24 and 48 hours after FESS.[3,4]

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The use of antibiotics and steroids can vary widely among otolaryngologists. Currently, there is no consensus on the use of topical steroid sprays, steroid or antibiotic washes, systemic corticosteroids, oral antibiotics, and stents or spacers (drug-eluting or not) in the perioperative period.[4] Of all of these therapies, the greatest support is for the use of topical steroid sprays and postoperative debridement after FESS in a recent systematic review.[4]

Currently, there are no studies that have evaluated patient adherence to nasal saline irrigation following FESS in the adult population. The primary purpose of this study is to evaluate the compliance of patients with saline irrigation following FESS and identify factors associated with compliance. Secondarily, this study also examined the effects of saline irrigation practices and other perioperative factors on short-term outcomes.

## Materials and methods

This study was approved by the UCLA Institutional Review Board (#16-001257). Prospective collection of data was performed on consecutive patients undergoing endo scopic sinus surgery with 1 surgeon (J.D.S.) at a tertiary-referral medical center during a 3-month patient recruitment period. Patients who underwent septoplasty and/or inferior turbinate reduction alone were excluded. Demographics were collected along with preoperative 22-item Sino-Nasal Outcome Test (SNOT-22) scores, SNOT-22 scores from each visit, and Lund-Kennedy Endoscopy Scores (LKES) from each visit. Additional intraoperative and perioperative information including prescription of oral corticosteroid, pathology type, extent of procedure (limited vs "full house" meaning all 4 sinuses on both sides), septoplasty performance, revision surgery, use of triamcinolone-soaked Nasopore (Stryker, Kalamazoo, MI) packing, use of frontal sinus spacers or stents (silastic or Propel steroid-eluting stent [Intersect ENT, Menlo Park, CA]) were taken from chart review. Irrigation compliance, irrigation frequency per day, irrigation volume per side per rinse were all collected through patient interview.

After surgery, patients received instructions to begin nasal saline irrigations 48 hours following their surgery date. Each patient was given an identical post-FESS instruction sheet on the day of surgery, with written instructions for saline irrigation performance. Patients were instructed to irrigate with a 240-mL bottle of saline, split between the 2 sides, at least twice a day, with encouragement to irrigate more often if desired. Compliance to nasal saline irrigation instructions was defined as irrigation with 120 mL of normal saline per side, twice a day. Each patient was followed for 3 postoperative clinic visits during the study period, and the typical follow-up schedule was at approximately 2 weeks, 4 weeks, and 8 weeks after surgery. Endoscopy was performed at each visit with debridement at the first 2 visits, and during the third visit if necessary. LKES scoring was performed during each visit by 1 of the authors (F.Y., E.H.F., or J.D.S.) and recorded.

Statistical analysis was performed in bivariate and multivariate methods. For the SNOT-22 scores and LKES scores, LKES and SNOT-22 change from baseline scores were bivariably compared by level of each categorical variable parametrically using analysis of variance (ANOVA) or *t* test or nonparametrically using the Kruskal-Wallis test as appropriate. Also, the bivariable correlation between each of the scores vs the continuous covariates was assessed using the Spearman method. For irrigation compliance, we evaluate the bivariable association between irrigation compliance vs each categorical variable using the chi square test. We compared the continuous variables by compliance using ANOVA. Irrigation frequency was bivariably compared by level of each categorical variable using the Kruskal-Wallis test. The bivariable correlation between irrigation frequency vs the continuous covariates was assessed using the Spearman method.

For multivariable analysis, we evaluated the factors associated with LKES and ΔSNOT-22 scores at each postoperative visit time point using multivariable linear regression models after confirming the parametric assumptions of this model. Since the factors that were associated with each of the above outcomes were not the same at all times, separate regression models were performed by time interval. Candidate variables for the multivariable model were selected based on the bivariable screen, $p < 0.1$. Final models were selected using the backward procedure for variable selection and liberal $p < 0.15$ as the retention criterion. The normality assumption was evaluated by examining quantile-quantile plots of the residuals under the above model. The constant variance assumption was verified by examining plots of the residuals vs the predicted values under the model. The factors associated with frequency per side per day were evaluated nonparametrically using linear regression models with resampling.

## Results

A total of 82 patients enrolled in this study after exclusion of patients who had undergone limited nasal airway surgeries such as septoplasty and inferior turbinate reductions. Ten patients underwent concurrent skull base or orbital surgery which prevented irrigation in the immediate postoperative period. Table 1 reports descriptive statistics for the patient population. Sixty-eight patients complied with irrigation instructions following FESS, including those who were instructed not to irrigate after surgery. Rate of compliance to irrigation instructions in our patient cohort was 82.9%, when excluding patients who were instructed not to irrigate, 80.6%. Table 2 reports the SNOT-22 scores as a change from baseline and its association with perioperative factors. Irrigation compliance showed larger improvements in SNOT-22 scores at the second and third postoperative visit, but these were not significant. Irrigation frequency showed frequency-dependent decreases in SNOT-22 scores, but these was not significant for any visit, though approaching significance for the second. Patients who received

**TABLE 1.** Descriptive statistics for patients included in study (n = 82)

| | n (%) |
|---|---|
| Gender | |
| Male | 39 (47.6) |
| Female | 43 (52.4) |
| Ethnicity | |
| White | 55 (67.1) |
| Black | 5 (6.1) |
| Asian | 11 (13.4) |
| Hispanic | 4 (4.9) |
| Other | 7 (8.5) |
| CRS subtype | |
| CRSsNP | 28 (34.2) |
| CRSwNP | 20 (24.4) |
| Eosinophilic CRSwNP | 20 (24.4) |
| AFRS | 8 (9.8) |
| Other | 6 (7.2) |
| Extent of procedure | |
| Limited FESS | 38 (46.3) |
| Full house FESS | 44 (53.7) |
| Concurrent septoplasty | 30 (36.6) |
| Systemic corticosteroid | 39 (47.6) |
| Triamcinolone-soaked Nasopore packing | 37 (45.1) |
| Frontal sinus spacer | |
| None | 43 (52.4) |
| Silastic | 23 (28.1) |
| Steroid-eluting stent | 16 (19.5) |
| Compliance to irrigation | |
| No | 14 (17.1) |
| Yes | 58 (70.7) |
| Instructed not to irrigate | 10 (12.2) |
| Irrigation frequency | |
| 0 | 20 (24.4) |
| 1 | 4 (4.9) |
| 2 | 29 (35.4) |
| 3 | 13 (15.9) |
| 4 | 8 (9.8) |
| 5+ | 8 (9.8) |
| Irrigation volume per side/per rinse | |
| 0 mL | 20 (24.4) |
| 120 mL | 50 (61.0) |
| 180 mL | 2 (2.4) |
| 240+ mL | 10 (12.2) |
| Revision FESS | 42 (51.2) |
| Prior irrigation | 65 (79.3) |

AFRS = allergic fungal rhinosinusitis; CRS = chronic rhinosinusitis; CRSsNP = chronic rhinosinusitis without nasal polyps; CRSwNP = chronic rhinosinusitis with nasal polyps; FESS = functional endoscopic sinus surgery.

"full-house" FESS and underwent concurrent septoplasty were noted to have significantly larger decreases in SNOT-22 scores at the third visit, though extent of procedure was also associated with significant differences in baseline SNOT-22 scores (limited FESS = 28.7, "full-house" FESS = 41.2, $p = 0.0219$). Patients who had triamcinolone-soaked Nasopore packing placed intraoperatively were noted to have larger decreases in SNOT-22 scores, but this was significant only for the second visit ($p = 0.0175$). Packing type did not affect long-term quality of life or nasal endoscopy scores at the third visit.

Table 3 presents LKES values for each postoperative visit and its association with perioperative factors. Only extent of procedure and systemic corticosteroid use was associated significantly with LKES scores. For limited FESS procedures, LKES values were lower compared to "full house" procedures ($p = 0.0211$) at the first postoperative visit, and the use of systemic steroids was associated with a worse LKES value ($p = 0.0151$) at the second postoperative visit.

Irrigation compliance was significantly associated with younger age ($p = 0.0022$), prior irrigation history ($p < 0.0001$), prior FESS history ($p = 0.0014$), and non-native English speaking status ($p = 0.0095$) (Fig. 1, Table 4). Irrigation volume per rinse per side was also significantly associated with younger age ($p = 0.0284$), prior irrigation ($p < 0.0001$), and revision surgery ($p = 0.0056$) on bivariate analysis, but on multivariate analysis, only prior irrigation ($p < 0.0001$) and younger age ($p = 0.0470$) (Fig. 2, Table 4) remained significant. Irrigation frequency per day was significantly associated with prior irrigation ($p < 0.0001$) and revision surgery ($p = 0.0077$) on bivariate analysis, with significant associations with male gender ($p = 0.0450$) and prior irrigation ($p < 0.0001$ on multivariate analysis (Fig. 3). On Spearman correlation, age was negatively associated with both irrigation volume per side per rinse (−0.29363, $p = 0.0074$) and irrigation frequency per day (−0.20708, $p = 0.0619$) (Table 4).

**TABLE 2.** Perioperative factors associated with change in SNOT-22 scores at each visit

| | Preoperative SNOT22 | | 1st postoperative ΔSNOT22 | | 2nd postoperative ΔSNOT22 | | 3rd postoperative ΔSNOT22 | |
|---|---|---|---|---|---|---|---|---|
| | Mean | *p* | Mean | *p* | Mean | *p* | Mean | *p* |
| Irrigation compliance | | 0.9237 | | 0.8107 | | 0.4941 | | 0.4853 |
| No | 35.3 | | −12.0 | | −7.3 | | −10.7 | |
| Yes | 35.8 | | −8.0 | | −16.1 | | −19.0 | |
| Irrigation frequency per day | | 0.0523 | | 0.4243 | | 0.0651 | | 0.4361 |
| 0–1 | 32.6 | | −10.1 | | −7.6 | | −10.1 | |
| 2 | 31.3 | | −5.8 | | −13.5 | | −15.1 | |
| 3–4 | 47.8 | | −14.3 | | −25.3 | | −22.4 | |
| 5+ | 27.9 | | −0.9 | | −3.6 | | −23.3 | |
| Irrigation volume per rinse | | 0.2282 | | 0.9063 | | 0.5026 | | 0.7471 |
| 0 mL | 32.5 | | −10.5 | | −12.7 | | −17.5 | |
| 120 mL | 34.0 | | −7.7 | | −12.9 | | −18.4 | |
| >180 mL | 46.3 | | −9.7 | | −21.8 | | −12.4 | |
| CRS pathology type | | 0.1656 | | 0.3345 | | 0.1644 | | 0.3853 |
| CRSsNP | 36.3 | | −4.1 | | −11.8 | | −15.3 | |
| CRSwNP | 26.6 | | −6.3 | | −9.1 | | −12.4 | |
| Eosinophilic CRSwNP | 43.5 | | −17.1 | | −26.6 | | −25.5 | |
| AFRS | 39.0 | | −11.1 | | −11.0 | | −18.6 | |
| Extent of procedure | | 0.0219 | | 0.2748 | | 0.1565 | | 0.0020 |
| Limited ESS | 28.7 | | −5.0 | | −9.8 | | −7.3 | |
| Full house ESS | 41.2 | | −10.9 | | −18.0 | | −25.1 | |
| Septoplasty | | 0.2326 | | 0.8607 | | 0.2080 | | 0.0096 |
| No | 33.2 | | −8.1 | | −11.7 | | −11.6 | |
| Yes | 39.8 | | −9.1 | | −19.2 | | −27.4 | |
| Oral corticosteroid | | 0.6050 | | 0.9680 | | 0.4504 | | 0.1685 |
| No | 34.2 | | −8.6 | | −12.0 | | −12.8 | |
| Yes | 37.1 | | −8.4 | | −16.4 | | −21.0 | |
| Triamcinolone-soaked Nasopore | | 0.2842 | | 0.1228 | | 0.0175 | | 0.1560 |
| No | 32.9 | | −4.7 | | −8.1 | | −13.1 | |
| Yes | 38.8 | | −12.8 | | −21.5 | | −21.5 | |
| Frontal sinus spacer | | 0.6230 | | 0.2235 | | 0.7516 | | 0.8546 |
| No | 34.2 | | −4.3 | | −12.7 | | −15.5 | |
| Silastic stent | 34.8 | | −12.5 | | −15.4 | | −19.2 | |
| Steroid-eluting stent | 41.2 | | −14.4 | | −18.5 | | −18.1 | |

ΔSNOT22 = change in 22-item Sino-Nasal Outcomes Test questionnaire score; AFRS = allergic fungal rhinosinusitis; CRS = chronic rhinosinusitis; CRSsNP = chronic rhinosinusitis without nasal polyps; CRSwNP = chronic rhinosinusitis with nasal polyps; ESS = endoscopic sinus surgery; FESS = functional endoscopic sinus surgery; SNOT22 = 22-item Sino-Nasal Outcomes Test questionnaire score.

**TABLE 3.** Perioperative factors associated with LKES at each postoperative visit

| | 1st postoperative visit LKES | | 2nd postoperative visit LKES | | 3rd postoperative visit LKES | |
|---|---|---|---|---|---|---|
| | Mean | *p* | Mean | *p* | Mean | *p* |
| Irrigation compliance | | 0.6545 | | 0.7932 | | 0.5818 |
| No | 4.6 | | 4.1 | | 2.5 | |
| Yes | 4.0 | | 4.2 | | 1.7 | |
| Irrigation frequency per day | | 0.4485 | | 0.6566 | | 0.5311 |
| 0–1 | 4.3 | | 4.4 | | 2.0 | |
| 2 | 4.2 | | 3.9 | | 2.5 | |
| 3–4 | 3.4 | | 4.8 | | 2.8 | |
| 5+ | 4.6 | | 3.9 | | 1.6 | |
| Irrigation volume per rinse | | 0.3397 | | 0.9032 | | 0.5568 |
| 0 mL | 4.7 | | 4.5 | | 2.0 | |
| 120 mL | 3.9 | | 4.2 | | 2.4 | |
| >180 mL | 3.8 | | 4.2 | | 2.8 | |
| Pathology type | | 0.3182 | | 0.3696 | | 0.1732 |
| CRSsNP | 3.4 | | 3.5 | | 2.0 | |
| CRSwNP | 4.4 | | 4.3 | | 2.4 | |
| Eosinophilic CRSwNP | 4.6 | | 5.2 | | 3.4 | |
| AFRS | 3.9 | | 4.1 | | 1.6 | |
| Extent of procedure | | 0.0211 | | 0.1542 | | 0.3375 |
| Limited FESS | 3.5 | | 3.8 | | 2.1 | |
| Full house FESS | 4.6 | | 4.7 | | 2.6 | |
| Septoplasty | | 0.9339 | | 0.2346 | | 0.8969 |
| No | 4.1 | | 4.0 | | 2.3 | |
| Yes | 4.1 | | 4.7 | | 2.4 | |
| Oral corticosteroid | | 0.2887 | | 0.0151 | | 0.1860 |
| No | 3.8 | | 3.5 | | 2.0 | |
| Yes | 4.4 | | 5.0 | | 2.7 | |
| Triamcinolone-soaked Nasopore | | 0.8974 | | 0.1356 | | 0.1874 |
| No | 4.0 | | 3.8 | | 2.1 | |
| Yes | 4.1 | | 4.8 | | 2.7 | |
| Frontal sinus spacer | | 0.4411 | | 0.9357 | | 0.8639 |
| No | 4.0 | | 4.4 | | 2.4 | |
| Silastic stent | 4.5 | | 4.1 | | 2.2 | |
| Steroid-eluting stent | 3.6 | | 4.3 | | 2.6 | |

AFRS = allergic fungal rhinosinusitis; CRSsNP = chronic rhinosinusitis without nasal polyps; CRSwNP = chronic rhinosinusitis with nasal polyps; FESS = functional endoscopic sinus surgery; LKES = Lund-Kennedy Endoscopy Score.

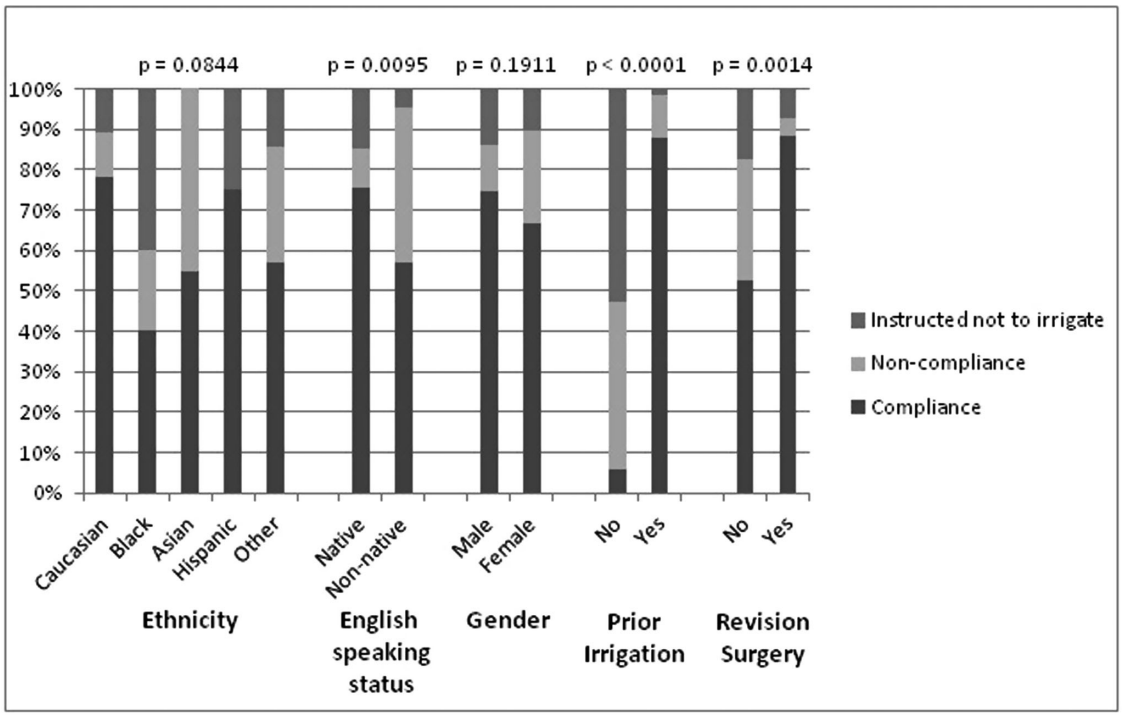


**FIGURE 1.** Factors associated with irrigation compliance.

**TABLE 4.** Age with respect to irrigation compliance, volume per rinse per side, and irrigation frequency per day, with presentation of bivariate and multivariate analysis, and Spearman correlation as applicable

| | Age (years) (mean) | *p* (bivariate) | *p* (multivariate) |
|---|---|---|---|
| Irrigation compliance | | 0.0022 | N/A |
| Yes | 51.91 | | |
| No | 67.36 | | |
| Instructed not to irrigate | 50.70 | | |
| Irrigation volume per rinse per side | | 0.0284 | 0.0470 |
| 0 mL per rinse | 60.15 | | |
| 120 mL per rinse | 54.16 | | |
| >180 mL per rinse | 45.83 | | |

| Spearman correlation | Coefficient | *p* |
|---|---|---|
| Age and irrigation volume per rinse per side | −0.29363 | 0.0074 |
| Age and irrigation frequency per day | −0.20708 | 0.0619 |

N/A = not applicable.

## Discussion

Nasal saline irrigation compliance to date has not been evaluated in an adult, post-FESS population, but has been studied in pediatric populations showing fair to high compliance rates of 63.6% and 86%.[5,6] In our study, we found a high level of patient compliance at 82.9% in an adult population, compared to studies which evaluated compliance to medication at rates of 40% to 50% for long-term and 70% to 80% for short-term therapies.[7] Granted, this finding is within patients treated at a tertiary medical center, many with a history of prior FESS, which may introduce selection bias toward patients who had had previous treatment for sinonasal disease and thus may be more familiar with nasal irrigations. Additionally, nasal saline irrigation has an immediate impact on patient subjective symptoms, adding motivation to performance of irrigation, which may not be the case for the long-term medical therapies that were most commonly examined in other compliance studies.[7]

Prior irrigation, previous sinus surgery, and younger age improved irrigation compliance. Likely, patients who have had experience with sinus irrigation as part of previous treatments would be more comfortable with performing this postoperatively. In terms of age, there may be an increased propensity for younger patients to be comfortable with nasal irrigations as elderly patients may have more difficulty performing irrigations on their own. Some patients remarked during interview that they were unsure how to perform irrigations correctly. A few compliant patients did report they sought out instructive resources on the Internet; thus, younger patients may also be more technologically savvy in seeking out instructive sources on the Internet. Interestingly, this finding is incongruent to previous reports regarding age and medical compliance with the majority of

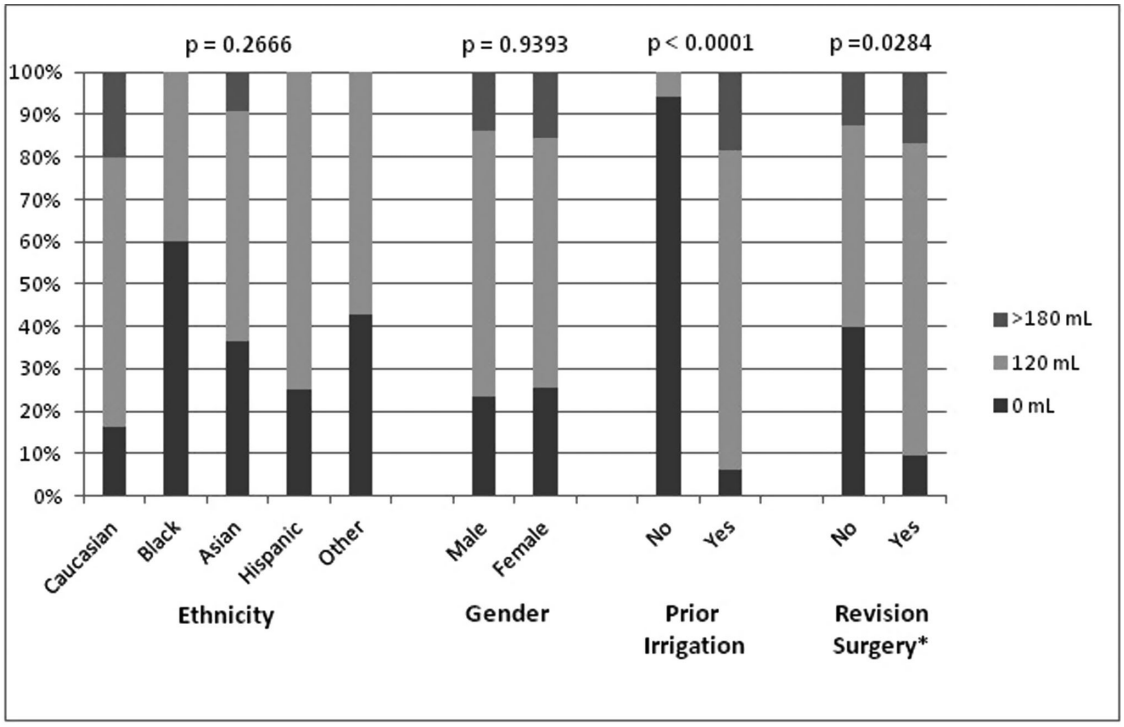


**FIGURE 2.** Factors associated with Irrigation volume per side per rinse, bivariate analysis *p* values shown. (*) denotes statistical significance with multivariate analysis.

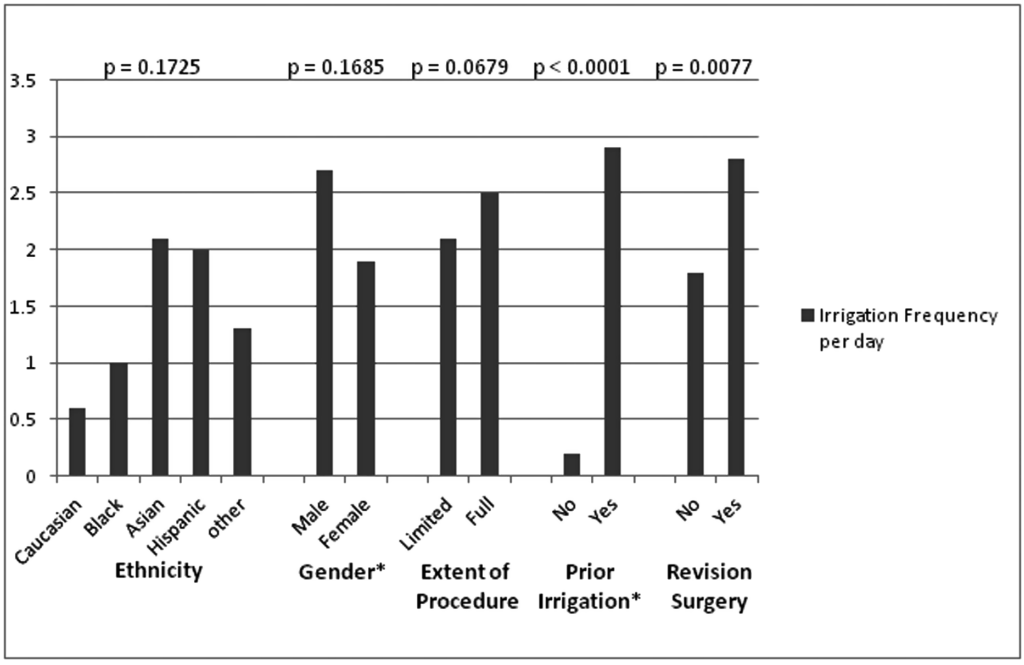


**FIGURE 3.** Factors associated with irrigation frequency per day, bivariate analysis *p* values shown. (*) indicates significance in multivariate analysis.

articles which studied age related to compliance to medications finding elderly patients to have higher compliance.[7] However, other studies included in this review showed the opposite effect, attributing the poorer compliance in elderly patients possibly to education level, cognitive impairment, and physical difficulties.[7]

Ethnicity also appears to be a risk factor for noncompliance with irrigation after FESS. Specifically, patients who

were non-native English speakers were found to be significantly less likely to adhere with irrigation instructions. This finding is consistent with a systematic review evaluating therapeutic noncompliance in terms of medication adherence for chronic conditions (hypertension, epilepsy, depression), which showed ethnicity was a factor in noncompliance, showing white race was associated with comparatively better compliance.[7] In our cohort, Asians made up only 13% of the study population, but over 45% of these patients were noncompliant with irrigation recommendations. Though all patients who were non-native or non-English speaking did receive instructions through either a family member or trained translator, there may have been some level of instructions being "lost in translation." One of the most commonly cited reasons for not adhering to irrigation instructions was that the patient was unaware they were supposed to perform them following surgery. Identification of non-native English speaking patients and providing additional instructions or follow-up, may increase compliance with postoperative care for these patients.

Although our analysis showed a nonsignificant trend toward improved SNOT-22 scores in the second and third postoperative visits with respect to irrigation compliance, other randomized controlled trials have shown that nasal saline irrigations in patients with CRS after FESS lead to significant improvements in symptoms and endoscopic appearance of the sinuses.[8–10] Irrigation frequency did show a frequency-dependent improvement in SNOT-22 scores for second and third postoperative visit, but there was no dose-dependent pattern improvement in SNOT-22 for irrigation volume per rinse per side. This finding may indicate that increased frequency of irrigation may be more clinically important, leading to improved moisturization of nasal crusts, allowing for eventual removal and leading to improved subjective symptoms.

Our analysis also found that performance of concurrent septoplasty led to significantly greater improvement SNOT-22 in the third visit, which was confirmed on multivariate analysis. This finding is in agreement with a recent multicenter study which found higher frequency of performance of concurrent septoplasty was associated with improved SNOT-22 outcomes between centers, though further study is warranted into this phenomenon.[11] The performance of a septoplasty was typically reserved for patients who had obstructive septal deviations, allowing for improved visualization and instrumentation in the office setting. It is possible that the performance of a concurrent septoplasty may affect the quality of irrigation, allowing for increased penetration of irrigants to remove stagnant mucus and crusts in the early postoperative period.

The use of triamcinolone-soaked Nasopore packing was associated with greater improvement in SNOT-22 scores, and significantly so for the second visit. The use of triamcinolone-soaked packing was investigated in a previous studies showing improved efficacy over low-dose topical therapy in CRSwNP patients in terms of symptoms and endoscopic examinations.[12,13] Our study only revealed short-term benefit in quality of life scores with the SNOT-22, and no difference in LKES scores. Both the use of oral corticosteroids and the application of triamcinolone-soaked packing, however, was not applied uniformly to all patients or randomly applied, but was determined intraoperatively, considering patient's comorbidity status (diabetes or other medical condition precluding use of systemic steroids) and inflammatory burden. The differential application of these adjuncts may account for our findings.

There are a few limitations to this study. For one, the sample size was too small to perform meaningful multivariate analysis for all parameters collected as well as subgroup analysis by CRS subtype. Due to the small sample size and low noncompliance rates, we included patients with non-CRS pathology undergoing skull base procedures to bolster non-irrigating patient numbers for our analysis. Additionally, there were many areas where there was a trend noted on change in SNOT-22 scores that were not significant, which is likely secondary to the small sample size. Another limitation is that nasal saline irrigation practices were obtained from patients through self-reporting during their postoperative visits, lending this study to reporting bias. We attempted to prevent this by conducting solo interviews of the patients without their surgeon in the room and by explicitly stating to patients that the operating surgeon would not be informed of their irrigation practices. There is also the question of quality of irrigation, whereas more experienced and comfortable patients may perform irrigations in a more effective manner than others. This and other variables such has head positioning, which has been shown to affect the penetration of nasal irrigants to certain sinuses, are difficult to ascertain and control for in this particular study design.[14]

## Conclusion

Nasal saline irrigation after FESS is a nearly universal recommendation among otolaryngologists. Patient compliance with nasal saline irrigation is fairly high in our study population at a rate of 82.9%. Factors significantly associated with noncompliance with nasal saline irrigation after surgery were older age, primary ESS, no prior irrigation history, and non-native English speaking status. Ethnicity was approaching significance in its association with noncompliance with nasal saline irrigation, but this finding is likely associated with English-speaking status. In addition, frequency of irrigation, as opposed to volume of irrigation per rinse, may be more important in improving nasal saline irrigation efficacy. Identification of patients at risk of noncompliance to postoperative care instructions may allow for surgeons to improve adherence through more directed and comprehensive preoperative counseling.

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