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Gender-Affirming Surgery

High Incidence of Postoperative Nausea and Vomiting in Transgender Women Undergoing Facial Feminization Procedures

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Background: Postoperative nausea and vomiting (PONV) is a significant concern due to its impact on patient comfort, recovery time, and extended hospital stay. Previous research links higher PONV rates in women during their periovulatory phase to estrogen. This study investigates the PONV risk in transgender women after facial feminization surgery.

Methods: Retrospective chart reviews of transgender women aged older than 18 undergoing facial feminization from 2014 to 2020 were undertaken. Data included demographics, hormone use history, comorbidities, and PONV history. PONV was classified as any nausea/vomiting episode before discharge. Anesthesia records were examined, and PACU notes were analyzed for PONV indicators. A cis-gender male and female cohort undergoing rhinoplasty served as controls.

Results: Of the 282 transgender women receiving facial feminization surgery, 104 experienced PONV, marking a 37% PONV rate. Compared with the 11% PONV rate among cis-gender rhinoplasty patients, this was notably higher. Hormone therapy discontinuation showed no influence on PONV incidence.

Conclusions: Transgender women undergoing facial feminization surgery have a 38% PONV rate, surpassing the 11% rate in cis-gender rhinoplasty patients and the general 20%–30% rate for all procedures, including the 25% for oral and maxillofacial surgery. This suggests a heightened PONV risk for transgender women after facial feminization procedures. *(Plast Reconstr Surg Glob Open 2023; 11:e5360; doi: 10.1097/GOX.0000000000005360; Published online 14 November 2023.)*

INTRODUCTION

Approximately 1 million adults in the United States identify as transgender.[1] Transgender individuals are those who experience an incongruence between their biological sex and self-identified gender identity. Given the lack of standardizations and noninclusivity of gender identity in census surveys, this number may be skewed mostly toward younger adults and, in reality, may be much larger.[1] Given increased acceptance and changes to the traditional notions of binary gender as well as broader insurance coverage options for transgender care, a growing number of transgender patients are presenting to hospitals and surgical center for gender-affirming surgery (GAS). Yet, acceptance and clinical care of transgender children and adults is still under attack with a recent Texas legislation making nearly all GAS procedures (surgical and nonsurgical) illegal.[2] Even when care is accessible, transgender patients continue to face discrimination and gaps in their care; a 2015 study of 141 OBGYN providers found that 80% did not receive training during residency on the care of transgender patients.[3] Another study in 2017 of 67 internal medicine residents found that although 97% of the residents believed that transgender medical issues are relevant to their practice, only 45% had prior education on caring for transgender patients.[4] The consequences of these gaps in care and in training lead to lower trust between transgender patients and their providers, reduction in seeking care, and increased adverse events.

In the surgical world, much is still unknown about the perioperative care, unique challenges, and adverse events encountered by transgender patients. One such

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perioperative concern is postoperative nausea and vomiting (PONV).[5] Although this may seem like a minor concern in the face of other adverse events such as a venous thrombosis, PONV is one of the largest causes of patient dissatisfaction with surgical procedures, with one survey of 10,811 patients finding that the patient dissatisfaction was 4.09 times higher for those who experienced severe PONV.[6] One or more episodes of PONV can also prolong recovery time and hospital length of stay, with one study demonstrating a 20-minute delay in hospital discharge per PONV episode.[7] Not much is known about the prevalence of PONV after GAS.[7] This is of importance due to the previously demonstrated risk that estrogen has on PONV, with studies confirming increased incidence of nausea and vomiting with changes in the menstrual cycle.[8,9] High-dose estrogen therapy is often used for feminization of features in transgender women.

Given the prevalence of hormone therapy among transgender women, and the lack of postoperative outcomes data in this population, this study aimed to evaluate the perioperative risk of PONV for transgender women undergoing facial feminization surgery (FFS).

Takeaways

Question: As more transgender patients present to the operating room for gendering-affirming care, we aim to assess postoperative outcomes in an often understudied and vulnerable population.

Findings: Retrospective chart reviews of almost 300 patients found a postoperative nausea and vomiting (PONV) rate of nearly 38% at one large urban, academic ambulatory center, which is much higher than the comparable rate of 11% PONV in cis-gendered rhinoplasty patients and the approximately 20% PONV rate reported in the literature.

Meaning: Postoperative outcomes in transgender patients need to be better studied to enable higher quality, safer care.

METHODS

This study was conducted at Boston Medical Center, a safety-net hospital providing care to a relatively large transgender population in Massachusetts. The study protocol was approved by the Boston Medical Center institutional review board. The requirement for written informed consent was waived, given the retrospective nature of the study. Retrospective chart reviews were conducted of all patients who underwent facial feminization between 2014 and 2020. Electronic medical record reports were used to identify patients undergoing procedures with a single facial plastic surgeon at the institution who specialized in facial feminization for transgender women. Additionally, cis-gender patients were selected from a second surgeon, performing rhinoplasty procedures during the same time period. Inclusion criteria included patients who were older than 18 years at the time of chart review. Patient demographics including age, ethnicity, and body mass index (BMI) were collected as well as the history of hormone use, comorbidities, and history of PONV. PONV was defined as any episode of nausea and/or vomiting before discharge. If PONV was indicated, antiemetic administration and overnight hospital stay due to PONV were also recorded. The effect of previously studied risk factors such as age, volatile anesthetic use, BMI, and previous opioid/tobacco use was independently assessed as well as in conjunction with hormone therapy holding before surgery. Incidence of PONV, after controlling for other confounding factors, was compared between the two groups as well.

Surgical Technique

For the purpose of this study, FFS included individual or a combination of the following procedures, performed by a single surgeon, among others: chondrolaryngoplasty (tracheal shave), forehead contouring, scalp advancement, brow lift, blepharoplasty, rhinoplasty, lip lift, cheek implants, mandible contouring, chin contouring, face lift, submental lipectomy, voice feminization, and transfer of abdominal fat to portions of the face. The exact combination of procedures was an individualized decision to most appropriately align with the patient's desired results for facial feminization. Per the surgeon's instructions, all patients were asked to hold their hormone therapy starting 2–4 weeks before their procedure, and patients were educated regarding risks associated with noncompliance with this policy.

STATISTICAL ANALYSIS

All statistical analyses were performed using R Statistical Software (version 4.0.3; R Foundation for Statistical Computing, Vienna, Austria).[10] Frequencies were calculated for categorical data; means and SDs were calculated for numerical data. Baseline characteristics of participants with or without surgery were compared using the chi-squared analysis for categorical variables, and analysis of variance for continuous variables. Multivariate logistic regression analyses for independent parameters were used to assess for group-differences of nausea event, with other covariates included to control for their effects. All tests were two tailed, and a P value less than 0.05 was considered statistically significant.

RESULTS

A total of 282 transgender patients, who fit the study criteria and presented between 2014 and 2020, were enrolled. For comparison purposes, 375 cis-gender patients, 123 cis-men, and 252 cis-women, who did not use hormone therapy for feminization but underwent rhinoplasty procedures were included.

The mean age of our final cohort was 33.8 (±12.9) years, with 97.2% (274/282) of patients presenting with an ASA status of 1 or 2. Obesity, as defined by a BMI of more than 30, was observed in 9.6% (27/282) of patients, whereas 30.4% (86/282) of patients were overweight (BMI >25). Mental health conditions, such as depression and anxiety, were reported in 31.9% (90/282) and 31.2% (88/282) of patients, respectively. Additionally,

11.3% (32/282) of patients were diagnosed with asthma, and 9.9% (28/282) were diagnosed with gastroesophageal reflux disease (GERD). Compared with cis-men, transwomen experienced significantly higher levels of depression ($P < 0.001$), anxiety ($P < 0.001$), and ADHD ($p = 0.03$). Similarly, transwomen also experienced significantly higher rates of depression ($P < 0.001$), anxiety ($P = 0.004$), and hypertension ($P = 0.03$) than cis-women. Duration of procedure was also significantly higher with the facial feminization procedures that transwomen underwent when compared with the rhinoplasties that cis-men ($P < 0.001$) and cis-women underwent ($P < 0.001$). Additional baseline patient characteristics are summarized in Table 1.

In Table 2, surgery subtypes are separated and presented as a count. It is important to note that these procedures were not mutually exclusive (ie, a patient who obtained a tracheal shave may also opt to obtain a brow-lift, forehead contouring, or any number of procedures they desire). The three most popular procedures were tracheal shave, forehead contouring, and brow-lift at 42.2% (119/282), 40.4% (114/282), and 37.6% (106/282). However, no association between these procedures individually and the incidence of PONV was observed.

Hormone Regimen and Perioperative Management

Estrogen-containing hormone therapy was prescribed to 83.7% (236/282) of patients (Table 3). Of those taking hormone therapy, 71.6% (169/236) used oral formulations, whereas 20.3% (47/236) and 8.1% (19/236) used intramuscular and transdermal routes, respectively. Hormone therapy was held preoperatively in 69.5% (164/236) of patients before their procedure, with data missing in 20.3% of patient charts (48/236). Of those who held hormone therapy, the most common holding duration was 2–4 weeks, with 84.1% (138/164) of patients discontinuing their medications for this time range.

Table 1. Baseline Characteristics of Transgender Women and Cis-gender Male and Female Patients Represented as Mean ± SD or Count (%)

Baseline Characteristics	Cohort Transwomen	Control Cis-men	*P**	Control Cis-women	*P*†
Total	282	123		252	
Age at the date of surgery	33.8±12.9	34.3±11.8	0.72	33±12.1	0.46
Patient's height (m)	4.2±20.7	3.1±14.7	0.52	4.6±21.4	0.83
Patient's weight (kg)	72.4±15.1	79.5±14.4	**<0.001**	63.2±14.2	**<0.001**
Patient's BMI			**0.02**		0.44
Less than 30	255 (90.4)	101 (82.1)		221 (88.4)	
Equal to or more than 30	27 (9.6)	22 (17.9)		29 (11.6)	
Race			**0.014**		0.22
Asian	10 (3.5)	4 (3.3)		11 (4.4)	
Native American/Alaska Native/Pacific Islander	1 (0.4)	2 (1.6)		2 (0.8)	
Black/African American	8 (2.8)	13 (10.6)		12 (4.8)	
White	154 (54.6)	61 (49.6)		153 (60.7)	
Two or more races	0 (0)	0 (0)		1 (0.4)	
Unknown	109 (38.7)	43 (35)		73 (29)	
Hispanic or Latino?			**<0.001**		**0.007**
Yes	21 (7.4)	34 (27.6)		38 (15)	
No	252 (89.4)	87 (70.7)		212 (84.2)	
Unknown	9 (3.2)	2 (1.7)		2 (0.8)	
Marital status			**<0.001**		**<0.001**
Single	185 (65.6)	89 (72.4)		164 (65.1)	
Married	27 (9.6)	23 (18.7)		57 (22.6)	
Unknown	70 (24.8)	8 (6.5)		27 (10.7)	
Other	0 (0)	3 (2.4)		4 (1.6)	
Tobacco use			0.17		**0.03**
Former	48 (17)	14 (11.4)		23 (9.1)	
Current	15 (5.3)	11 (8.9)		15 (5.9)	
Never	219 (77.7)	98 (79.7)		214 (85)	
Comorbidities					
ADHD	19 (6.7)	2 (1.6)	**0.03**	12 (4.8)	0.33
Depression	90 (31.9)	12 (9.8)	**<0.001**	31 (12.3)	**<0.001**
Anxiety	88 (31.2)	13 (10.6)	**<0.001**	51 (20.2)	**0.004**
Asthma	32 (11.3)	9 (7.3)	0.22	23 (9.1)	0.40
GERD	28 (9.9)	15 (12.2)	0.49	18 (7.1)	0.25
Hypertension	19 (6.7)	10 (8.1)	0.61	7 (2.8)	**0.03**
Duration of procedure (min)	179.0 (104.56)	148.84 (45.02)	**<0.001**	152.23 (75.79)	**<0.001**

Bold values indicate *P* values that are ≤ 0.05.
*P = transwomen compared with cis-men.
†P = transwomen compared with cis-women.

Table 2. Count of Facial Feminization Procedure Subtypes within the Transgender Women Cohort

Procedure	Count
Tracheal shave	119
Forehead contouring	114
Browlift	106
Mandible contouring	86
Scalp advancement	81
Chin contouring	63
Voice feminization	59
Rhinoplasty	50
Cranioplasty	33
Cheek implant	27
Neck lift	27
Liposuction	27
Fat harvest to face	17
Lip lift	14
Chin implant	13
Face lift	10
Blepharoplasty	10
Scar revision	7
Excision	5
Buccal fat removal	4
Facial feminization	2
Upper lip reduction	1

Please note that count is not mutually exclusive because patients could receive one or a combination of listed subtype procedures of FFS.

Table 3. Hormone Therapy Use, Route, and Withholding Details Before Surgery for a Cohort of Transgender Women

Characteristics	No PONV	PONV	*P*
Total patients	176	106	
Hormone therapy			
Yes	151 (85.8)	85 (80.2)	0.286
No	25 (14.2)	21 (19.8)	
Route of administration			0.258
Oral	108 (72.0)	61 (71.8)	
Intramuscular	27 (18.0)	20 (23.5)	
Transdermal	15 (10.0)	4 (4.7)	
Was hormone therapy held?			0.202
Yes	100 (66.2)	64 (75.3)	
No	19 (12.6)	5 (5.9)	
Unknown	32 (21.2)	16 (18.8)	
Duration of withholding			0.181
2 weeks or less	15 (15)	1 (1.6)	
2–4 weeks	75 (75)	61 (95.3)	
4 weeks or more	10 (10)	2 (3.1)	

Data are represented as count (%).

Transdermal administration of estrogen represented 8.1% of the total population but only represented 4.7% (4/85) of those who ultimately developed PONV postprocedure. Similarly, per patient's charts, 10.2% of patients claimed to not have held their hormone therapy before their procedure but represented only 5.9% of those who experienced PONV (Table 3).

PONV

Incidence of PONV, as defined in the Methods, was 37.6% (106/282) in the cohort of transwomen patients. The corresponding rate in cis-gender men was 5.7% (7/123), and in cis-gender women, 13.9% (35/252). Combined, this represents a rate of 11.2% (42/375). When analyzed with a multivariate logistic regression model, age, BMI, alcohol, and tobacco use were found to not be predictive of PONV in the cohort population of transgender women, cis-gender women, or cis-gender men (Tables 4–6). No significant difference was found when comparing PONV rates between transgender women who held hormone therapy before surgery and transgender women who did not ($P = 0.21$). The only variable to reach significance was duration of procedure for transwomen ($P = 0.03$). The use of TIVA (as compared with inhaled anesthetics) was also not significantly associated with PONV rates in any of the three groups (Tables 4–6). Upon combining all cohorts for the purpose of analyzing procedure duration, it is revealed that the odds ratio for procedure duration is 1, as demonstrated in Tables 7 and 8. Due to the considerably extensive range of durations within our cohorts, we are unable to establish a statistically significant association between procedure duration and the likelihood of developing PONV. Figure 1 is a graphical representation illustrating the disparity in anesthesia duration between cis-gender and transgender patients, stratified by the presence or absence of PONV. Each bar corresponds to the respective group size, whereas the line represents the mean duration of anesthesia in minutes, accompanied by the SD bars.

DISCUSSION

In this retrospective study of 282 transgender patients undergoing facial feminization procedures, 37.6% of transgender patients were reported to have PONV, which is significantly higher than the 5.7% PONV rate in cis-gender men and the 13.9% rate observed in cis-gender women undergoing rhinoplasty. This rate is also higher than the reported rate of 25%–30% for oral and maxillofacial surgery in the literature.[11]

The results of our study indicate a need for more comprehensive perioperative antinausea anesthesia approaches as well as therapy in this population. Some traditional risk factors for PONV, such as use of volatile anesthetics and low BMI, did not show a significant association with PONV. However, duration of procedure was significant for the development of PONV in transgender women only. The duration of procedure was also significantly greater for our cohort of transgender woman when compared with the procedures that cis-gender women and men underwent. Although this is consistent with the previous literature, it still fails to explain the observed rate of PONV in this study. Apipan et al, whose study is the reference point for incidence of PONV after oral and maxillofacial surgery for this study, find that there is only a strong association between PONV and duration of procedure when the duration of procedure is more than 4 hours.[11] Hence, it is difficult to ascertain whether the high incidence of PONV observed in this population of transgender women is solely due to the length of procedure.

This study was conducted at one urban, academic medical center. Although this limits the generalizability of

Table 4. Unadjusted and Multivariate Adjusted Odds Ratio of PONV for Cohort of Transgender Women

Variables	Unadjusted OR (95% CI)	*P* (Unadj)	Multivariate OR (95% CI)	*P* (Adj)
Age	0.98 (0.96–1.00)	0.11	0.98 (0.93–1.03)	0.42
BMI	0.99 (0.93–1.04)	0.64	0.94 (0.80–1.09)	0.41
Alcohol	1.39 (0.83–2.33)	0.21	1.28 (0.40– 4.12)	0.68
Smoking	1.22 (0.68–2.16)	0.49	0.79 (0.21–2.89)	0.72
Duration of procedure	1.00 (1.00–1.00)	**0.03**	1.01 (1.00–1.02)	**0.004**
Hormone therapy held	2.43 (0.92–7.63)	0.09	2.91 (0.56–18.81)	0.21
Type of anesthesia (TIVA)	0.92 (0.56–1.50)	0.74	0.54 (0.17–1.64)	0.28

Bold values indicate *P* values that are ≤ 0.05.

Table 5. Unadjusted and Multivariate Adjusted Odds Ratio of PONV for Control Cis-gender Women

Variables	Unadjusted OR (95% CI)	*P* (Unadj)	Multivariate OR (95% CI)	*P* (Adj)
Age	1.00 (0.97–1.03)	0.82	1.00 (0.96–1.03)	0.99
BMI	1.00 (0.93– 1.06)	0.65	0.99 (0.92– 1.07)	0.89
Alcohol	163 (0.68–3.65)	0.25	1.79 (0.73–4.14)	0.19
Smoking	0.69 (0.20– 1.90)	0.52	0.70 (0.18–2.08)	0.55
Duration of procedure	1.00 (0.99–1.00)	0.78	1.00 (0.99–1.00)	0.89
Type of anesthesia (TIVA)	0.72 (0.35–1.47)	0.37	0.65 (0.30–1.38)	0.27

Table 6. Unadjusted and Multivariate Adjusted Odds Ratio of PONV for Control Cis-gender Men

Variables	Unadjusted OR (95% CI)	*P* (Unadj)	Multivariate OR (95% CI)	*P* (Adj)
Age	0.98 (0.91–1.05)	0.61	0.98 (0.90–1.06)	0.67
BMI	1.01 (0.83–1.20)	0.89	1.05 (0.85–1.25)	0.64
Alcohol	0.57 (0.03–3.55)	0.61	0.53 (0.03–3.91)	0.59
Smoking	1.69 (0.23–8.43)	0.55	3.55 (0.39–26.77)	0.22
Duration of procedure	1.00 (0.97–1.01)	0.69	1.00 (0.97–1.02)	0.74
Type of anesthesia (TIVA)	3.25 (0.67–23.35)	0.17	3.53 (0.59–31.23)	0.19

Table 7. Duration of Anesthesia Difference Between Cis-gender and Transgender Patients Stratified by PONV versus No PONV

	Cis-gender Patients, No PONV	Cis-gender Patients, PONV	Transgender Patients, No PONV	Transgender Patients, PONV	*P*
Count	330	42	176	106	
Duration of anesthesia (min), mean (SD)	151.97(69.05)	148.15 (46.59)	168.19 (114.94)	196.84 (82.12)	**<0.001**

Bold values indicate *P* values that are ≤ 0.05.

Table 8. Multivariate Adjusted Odds Ratio of PONV for All Groups Combined

Variables	Multivariate OR (95% CI)	*P* (adj)
Transgender identity	4.64 (3.09, 7.08)	**3.8E-13**
Age	0.99 (0.97, 1.00)	0.076
Duration of procedure	**1.00 (1.00, 1.00)**	**0.041**
Type of anesthesia (TIVA)	0.93 (0.62, 1.38)	0.713

Bold values indicate *P* values that are ≤ 0.05.

our findings, it also decreases the impact of confounding variables, such as clinically differing patient populations between the control and study group, and differences in PACU nursing and anesthesia providers. One potential confounder, however, is the fact that the control and study populations underwent different procedures, with different surgeons and surgical techniques. However, patients who underwent tracheal shave procedures alone or in combination with other procedures, for example, were not found to be at a higher risk of PONV than their nontracheal shave obtaining counterparts. Because the cohort group often underwent a combination of procedures, our study does not have the power to show difference in PONV rates by procedure type alone. The authors of this article contend that perhaps FFS procedures that are lengthy in nature by themselves or that combine many different types of procedures resulting in a longer overall procedure may display an increased incidence of PONV. Surgeons and providers of FFS should educate patients regarding the risk of PONV with procedures with longer durations.

Another finding that would have helped explain the high incidence of PONV in this population is the prevalence of anxiety and depression amongst the cohort group. In fact, previous studies have confirmed a higher incidence of depression and anxiety amongst transgender individuals, with over 50% of the 226 transwomen survey respondents self-reporting depressive symptoms

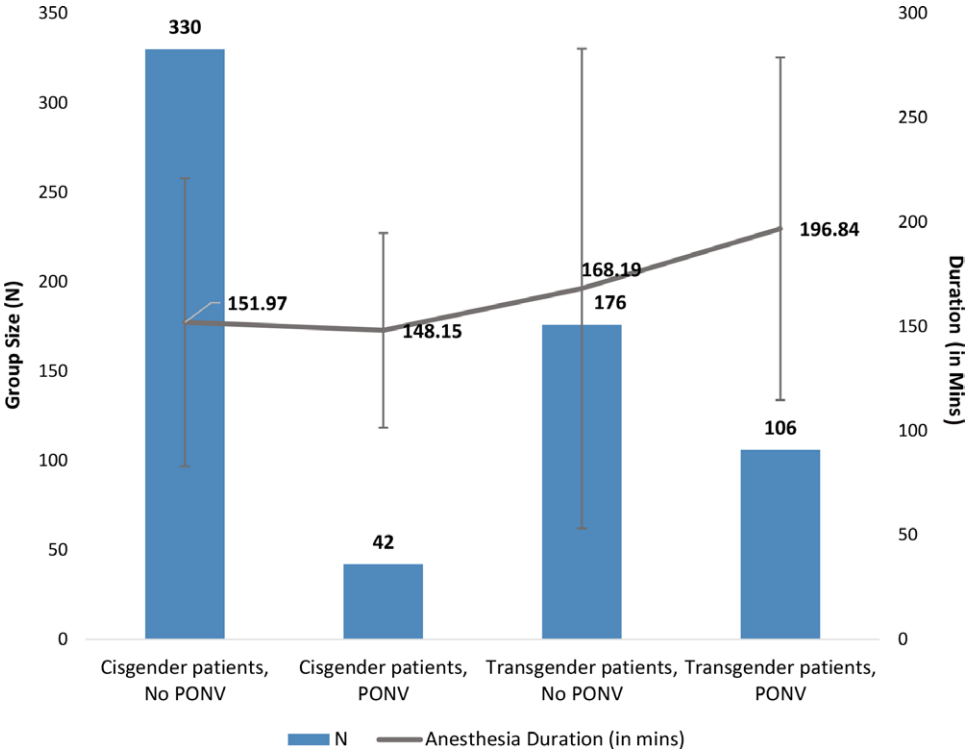

Fig. 1. Consort diagram depicting patients who experienced PONV as a subset of total population.

and 40% reporting anxiety.[12] Given the association of anxiety with PONV,[13] our finding that transwomen experience significantly higher rates of PONV than cismen and women may have in part been explained by the high prevalence of anxiety. However, multivariate analysis that included anxiety as a predictor for PONV showed no association between the two in our cohort, thus indicating a separate pathway for PONV in transgender women.

A long-held belief in the field of perioperative care, and much of the research on PONV suggests that nasogastric (NG) tube suctioning reduces PONV by decreasing acidity and decompressing the stomach.[14] However, there are conflicting data with other experts in the field of PONV finding that NG tube use did not decrease PONV in a cohort of 1032 patients.[15] At our practice, NG tube suctioning and throat packs were routinely used for facial feminization procedures. The use of NG tube suctioning for rhinoplasty patients was a variable practice, left up to the discretion of the anesthesiologist and surgeon. Although data on use was unfortunately not collected, transgender patients in our cohort demonstrated a high incidence of PONV, compared with the control cohort and literature, despite NG tube suctioning.

PONV in this study was measured using information from the electronic health record. The reporting of PONV in the electronic health record may not have been consistent from provider to provider over the duration of the study, as there is no standardized protocol for reporting incidences of nausea and vomiting. Moreover, this study is also limited by virtue of being a retrospective study rather than prospective; as a result, we cannot determine causal links between PONV and other variables from our investigation.

Studies thus far have not been able to determine whether estrogen therapy should be discontinued before surgery. Most evidence on estrogen therapy has focused on estrogens that are not involved with transgender hormone therapy, and the utility of pausing estrogen therapy before surgery is still unclear.[16] In this investigation, 69.5% of transgender patients held estrogen therapy before surgery; 81.7% of those holding therapy stopped for 2–4 weeks before surgery. We found that there was no significant difference in PONV rates among patients who held hormone therapy before surgery and those who did not. In our recent publication, we reported that the same cohort of patients analyzed in this current study showed no incidence of venous thromboembolism after FFS for up to 1 year after the procedure.[17] These findings indicate that it may be safe to continue hormone therapy before gender-affirming surgery from the perspective of minimizing PONV and venous thromboembolism risk, while continuing to provide psychological comfort to patients, but further studies with larger sample sizes are needed on this topic before definitive conclusions can be made.

Given that transgender patients were found to be at higher risk for PONV than their cis-gender counterparts, but that the use of estrogen was not related to PONV risk, our findings may point to a PONV pathway that is separate from, or not entirely dependent on, the hypothesized estrogen-nausea link. Should future investigations on this topic corroborate our findings, clinicians may be able to confidently advise transgender women to continue their

hormone therapy before undergoing FFS. Based on our findings, we recommend greater antiemetic prophylaxis, further education of healthcare providers on this issue, and closer PACU monitoring for transgender patients undergoing facial feminization procedures, given their increased risk. Additionally, in considering the risk of postoperative nausea for these procedures, traditional scoring, such as Apfel scoring, would assign higher risk for cis-women undergoing rhinoplasty than transwomen undergoing facial feminization. Our results would argue against such risk stratification based on traditional nausea scoring methods.

The importance of education and adequate training of healthcare providers is of note, in particular, with one 2015 survey of 27,715 transgender individuals finding that the overwhelming majority of transgender patients, 86%, believe that it is "very important" to train healthcare providers about transgender health.[18] The findings of our study may also help guide anesthesiologists and surgeons performing GAS procedures to select anesthetic and surgical techniques that are nausea sparing for this patient population. Interestingly, TIVA was not seen to be protective for nausea in our study population, which is in contrast with previous studies in (presumably) cis-gender patients.[19] Healthcare providers should be informed of this increased risk to transgender women, and anesthesia providers may seek to give greater doses of prophylactic antiemetic medication during surgery.

To our knowledge, this is the largest investigation of transgender patients undergoing FFS thus far. Other studies should be conducted to corroborate our findings on this understudied and underserved patient population. Other GAS procedures should be studied to determine if there are also increased rates of PONV for other procedures. Such findings will allow providers to individualize perioperative patient management based on the patient's surgery. Investigators may also seek to study the rates of PONV in transgender patients for nongender-affirming surgery. These efforts can help determine whether the cause of increased PONV among transgender patients undergoing FFS is due to the nature of the surgery, the use of exogenous estrogen, or biopsychosocial factors that are associated with transgender identity. In the interim, education of healthcare providers providing care to transgender patients is of utmost priority and will not only help improve outcomes for transgender patients but also increase trust amongst providers and patients.

CONCLUSIONS

In this retrospective study conducted at one large academic center, transgender women undergoing facial feminization procedures were found to have a 37.6% incidence of PONV, which is significantly higher than their cis-gender counterparts undergoing similar procedures. Although further, larger studies are needed to definitively study the risk factors, our study does not find an increased risk associated with hormone therapy use and PONV. Our results imply that it may be safe to continue hormone therapy before surgery for transgender women.

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REFERENCES

1. Meerwijk EL, Sevelius JM. Transgender population size in the United States: a meta-regression of population-based probability samples. *Am J Public Health.* 2017;107:e1–e8.
2. Mandler, C. Texas bill would ban nearly all gender-affirming care, including for trans adults. *CBS News.* Available at https://www.cbsnews.com/news/texas-bill-ban-gender-affirming-care-transgender-adults/. Accessed: May 26, 2023.
3. Unger CA. Care of the transgender patient: a survey of gynecologists' current knowledge and practice. *J Women's Health (Larchmt).* 2015;24:114–118.
4. Johnston CD, Shearer LS. Internal medicine resident attitudes, prior education, comfort, and knowledge regarding delivering comprehensive primary care to transgender patients. *Transgend Health* 2017;2:91–95.
5. Lindblad T, Forrest JB, Buckley DN, et al. Anaesthesia decreases a hormone mediated threshold for nausea and vomiting. *Anesth Analg.* 1990;70:S242.
6. Myles PS, Williams DL, Hendrata M, et al. Patient satisfaction after anaesthesia and surgery: results of a prospective survey of 10,811 patients. *Br J Anaesth.* 2000;84:6–10.
7. Gan TJ. Risk factors for postoperative nausea and vomiting. *Anesth Analg.* 2006; 102:1884–1898.
8. Honkavaara P, Pyykkö I, Rutanen EM. Increased incidence of retching and vomiting during periovulatory phase after middle ear surgery. *Can J Anaesth.* 1996;43:1108–1114.
9. Zou L, Miao S, Wang L, et al. Effects of menstrual cycle on nausea and vomiting after general anesthesia. *J Anesth.* 2020;34:519–526.
10. Team RC. R: A language and environment for statistical computing. Vienna: R Foundation for Statistical Computing; 2013.
11. Apipan B, Rummasak D, Wongsirichat N. Postoperative nausea and vomiting after general anesthesia for oral and maxillofacial surgery. *J Dent Anesth Pain Med.* 2016;16:273–281.
12. Budge SL, Adelson JL, Howard KA. Anxiety and depression in transgender individuals: the roles of transition status, loss, social support, and coping. *J Consult Clin Psychol.* 2013;81:545–557.
13. Laufenberg-Feldmann R, Müller M, Ferner M, et al. Is "anxiety sensitivity" predictive of postoperative nausea and vomiting? A prospective observational study. *Eur J Anaesthesiol.* 2019;36:369–374.
14. Erkalp K, Kalekoglu Erkalp N, Sevdi MS, et al. Gastric decompression decreases postoperative nausea and vomiting in ENT surgery. *Int J Otolaryngol.* 2014;2014:275860.
15. Kerger KH, Mascha E, Steinbrecher B, et al; IMPACT Investigators. Routine use of nasogastric tubes does not reduce postoperative nausea and vomiting. *Anesth Analg.* 2009;109:768–773.

16. Boskey ER, Taghinia AH, Ganor O. Association of surgical risk with exogenous hormone use in transgender patients: a systematic review. *JAMA Surg.* 2019;154:159–169.
17. Price R, Debryn D, Mukerji S, et al. No thromboembolic complications after facial feminization surgery in transgender patients utilizing estrogen therapy: a retrospective cohort study. *Transgend Health.* 2023;8:344–351.
18. James SE, Herman JL, Rankin S, et al. The report of the 2015 U.S. Transgender Survey. Washington, D.C.: National Center for Transgender Equality; 2016.
19. Yoo YC, Bai SJ, Lee KY, et al. Total intravenous anesthesia with propofol reduces postoperative nausea and vomiting in patients undergoing robot-assisted laparoscopic radical prostatectomy: a prospective randomized trial. *Yonsei Med J.* 2012;53:1197–1202.