Complication Rates and Outcomes After Hysterectomy in Transgender Men

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OBJECTIVE: To describe the rate and 30-day outcomes after gender affirmation surgery in transgender men.

METHODS: We conducted a cross-sectional population-based study. Patients with male gender who underwent hysterectomy for benign indications between 2013 and 2016 in the American College of Surgeons' National Surgical Quality Improvement database were identified. Propensity score matching was performed to ameliorate selection bias. Student *t* test and Mann-Whitney tests were used to compare continuous variables between two groups where appropriate. The χ^2 and Fisher exact tests were used where appropriate to compare categorical variables across groups. Logistic regression models were used to evaluate factors associated with any postoperative adverse event.

RESULTS: Of 159,736 hysterectomies performed during the study period, 521 (0.3%) were performed in transgender men. The mean age was 23.9±13.8 years, and the median body mass index was 29.0 (range 24.8–34.2). The majority of patients were white (64.5%). The most common specified diagnosis associated with hysterectomy was gender identity disorder (20.9%). Laparoscopy was the most common route (57.2%) followed by laparoscopic-assisted vaginal hysterectomy (20.0%) and abdominal hysterectomy (15.2%). After propensity matching was performed, the composite rate of postoperative complications was similar between the transgender male and control groups (3.4% vs 3.3%, *P*=.92). On multivariate logistic regression controlling for age, presence of a major medical comorbidity, and primary mode of surgery, transgender male status and presence of a major medical comorbidity were not significantly associated with complications (adjusted odds ratio [OR] 1.11, 95% CI 0.56–2.10 and adjusted OR 1.16, 95% CI 0.58–2.27, respectively). Age remained weakly associated with postoperative complications (adjusted OR 1.04, 95% CI 1.01–1.06), whereas minimally invasive approaches to hysterectomy were significantly associated with lower incidences of complications (vaginal, adjusted OR 0.04, 95% CI 0.002–0.17; laparoscopic adjusted OR 0.09, 95% CI 0.04–0.18; and laparoscopic-assisted vaginal hysterectomy, adjusted OR 0.07, 95% CI 0.02–0.20).

CONCLUSION: Less than 1% of hysterectomies performed annually are for transgender male patients. Postoperative complications after hysterectomy in this patient population are similar to the complication rates found in cisgender women.

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The incidence of transgenderism in the United States is estimated to be approximately 0.4%, with many of these patients experiencing gender dysphoria as a result of an incongruence between their natal sex and gender identity.[1] Gender affirmation and the treatment of gender dysphoria exist on a spectrum. Successful treatment of dysphoria may be accomplished with medical management alone; however, gender affirmation surgery is also an option for patients and may help to resolve their gender dysphoria and improve their overall quality of life.[2,3] Chest reconstruction is the most commonly sought surgery by transgender men; still, approximately 20% of transgender male patients will also undergo hysterectomy, and approximately half of those patients will undergo concomitant bilateral salpingo-oophorectomy.[4,5]

Studies have reported on the effect of gender-affirming surgery on the psychosocial and sexual

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functioning of transgender men, but there are limited data on the incidence of hysterectomy and associated perioperative adverse events in transgender men seeking gender affirmation treatment. In the available literature, the reported cases were performed by a single surgeon at a single institution and involved only small cohorts.[6,7] Furthermore, the primary focus of many studies examining hysterectomy in the transgender male population has centered on the feasibility of the procedure rather than perioperative outcomes associated with the surgery.[8–11] In this unique population, hysterectomy is often performed for treatment of gender dysphoria, and in turn, it is common for patients not to report any concurrent gynecologic disease at the time of their surgery. Given that these patients lack overt gynecologic pathology, it is important to get a better understanding of the risks associated with hysterectomy for gender affirmation. The objective of this study is to describe national rates of hysterectomy for transgender men seeking affirmation treatment as well as the incidence of adverse events associated with hysterectomy using a large, multiinstitutional national surgical database. Studies using the National Surgical Quality Improvement database are considered minimal risk and thus exempt by our institutional review board.

MATERIALS AND METHODS

This was a cross-sectional population-based study using data from the American College of Surgeons' National Surgical Quality Improvement Program database from January 2013 to December 2016. Studies using the National Surgical Quality Improvement database are considered exempt by our institutional review board. The National Surgical Quality Improvement database captures data on more than 150 perioperative variables, including preoperative comorbidities, intraoperative variables, and 30-day mortality and morbidity outcomes for multiple surgical procedures. Data from more than 600 participating hospitals are collected by certified surgical clinical reviewers and data quality is maintained by standardizing training of all reviewers as well as intermittent interrater reliability audits of the participating sites. Data at each site are obtained from medical chart review as well as direct contact with patients. The National Surgical Quality Improvement reports a 95% success rate in capturing outcomes on all cases within the database. The database uses Current Procedural Terminology (CPT) codes and the International Classification of Diseases, 9th Revision to report on all procedures. Patients younger than 18 years old are excluded from the database.

Several criteria were used to identify transgender men undergoing hysterectomy within the National Surgical Quality Improvement database. First, patients were identified using CPT codes for hysterectomy during the study period. Patients who underwent radical hysterectomy or hysterectomy with lymphadenectomy were excluded; once those patients were excluded, patients who underwent hysterectomy with "male" gender were included with any associated postoperative diagnoses. Patients with "female" gender were included if they underwent hysterectomy for any of the following International Classification of Diseases, 9th Revision postoperative diagnoses: 1) gender identity disorder in adolescents or adults, 2) transsexualism with unspecified sexual history, 3) transsexualism, 4) sexual and gender identity disorders, and 5) other elective surgery for purposes other than remedying health states. These two groups combined constituted the transgender male cohort. The patients who did not meet these criteria were considered to be cisgender women, that is, female patients who identify as female. Once patients were identified, the database was queried for demographic data such as age (years), body mass index (BMI, calculated as weight (kg)/[height (m)]^2), race, and American Society of Anesthesiologists class. Operative time (minutes), length of hospital stay (days), 30-day postoperative events and complications, readmission, and reoperation data were collected as well.

Given the significant differences in the clinical characteristics of transgender men and cisgender women undergoing hysterectomy, propensity score matching was used to create a cohort of cisgender women with similar preoperative characteristics as the transgender male cohort to minimize the influence that these variables may have on the primary outcome. Propensity scores were calculated using the following independent variables: age, race, BMI, smoking status, presence of a major medical comorbidity, American Society of Anesthesiologists class, type of primary surgery, and preoperative hematocrit. The propensity score then was used to match patients in the case group (transgender male patients undergoing hysterectomy) to control patients (cisgender women) using the nearest neighbor technique and a ratio of 1:2. Patients with missing data were excluded (Fig. 1).

The primary outcome was the presence or absence of a complication as defined by the National Surgical Quality Improvement data set, and this was analyzed as a dichotomous variable. The Student *t* test and Mann-Whitney tests were used to compare continuous variables between two groups where appropriate. The

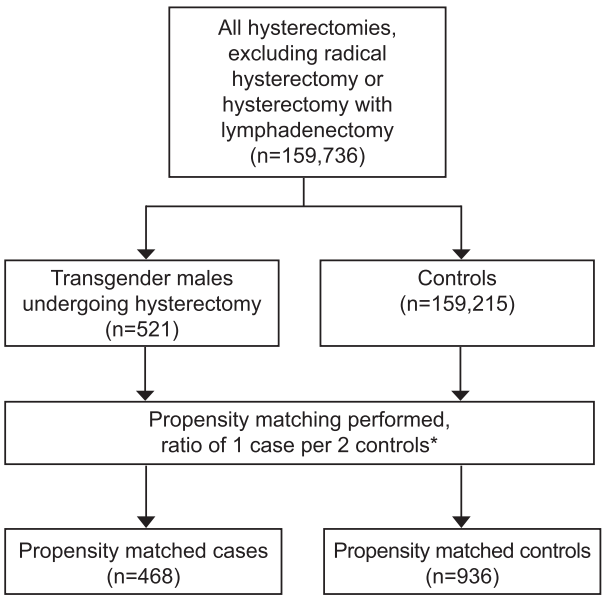

Fig. 1. Identification of cohorts. Transgender males undergoing hysterectomy included males who underwent hysterectomy for any indication and females who underwent hysterectomy for any of the following reasons: gender identify disorder in adolescents or adults, transsexualism with unspecified sexual history, transsexualism, sexual and gender identity disorders, or other elective surgery for purposes other than remedying health states. Controls included females who underwent hysterectomy who did not meet inclusion criteria. *Controlled for age, race, body mass index, smoking status, presence of a major medical comorbidity, American Society of Anesthesiologists physical classification, type of primary surgery, and preoperative hematocrit.

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χ^2 and Fisher exact tests were used where appropriate to compare categorical variables across groups. Logistic regression models were fit to evaluate factors associated with postoperative morbidity while adjusting for potential confounders. Body mass index and operative time were log-transformed for the model. A P value of $<.05$ was considered statistically significant. All data were analyzed with R 3.4.1.

RESULTS

Of 159,736 hysterectomies performed during the study period, 521 (0.33%, 95% CI 0.02–0.05) patients met inclusion criteria. Baseline characteristics of the overall transgender male cohort are shown in Table 1. The majority of patients had the gender designation of "male" (n=466 [89.4%]); the remainder had the designation of "female." The mean age of the cohort was 23.9±13.9 years, and the median BMI was 29.0 (range 24.8–34.2). The majority of patients (n=336 [64.5%]) were white. The majority of patients (n=220 [42.2%]) did not have an associated postoperative diagnosis with hysterectomy; of the reported diagnoses, gender identity disorder was the most common (n=109 [20.9%]). Laparoscopic hysterectomy was most commonly performed (n=298 [57.2%]) followed by laparoscopic-assisted vaginal (n=104 [20.0%]), abdominal (n=79 [15.2%]), and vaginal hysterectomy (n=40 [7.7%]). Transgender male patients differed significantly in all baseline and perioperative characteristics with the exception of smoking status compared with cisgender women who also underwent hysterectomy during the study period (n=159,215).

Only six patients underwent concurrent mastectomy (1.2%). Of these six, none had complications; four were white, and two were black. Five underwent laparoscopic hysterectomy, and one underwent laparoscopic-assisted vaginal hysterectomy.

Table 2 shows the baseline characteristics of the propensity matched cohorts, reflecting no statistical difference between the patients and those in the control group. Table 3 describes the perioperative characteristics of the propensity matched cohorts with the only significant differences being the presence of a major medical comorbidity, route of hysterectomy, and rate of reoperation between the two groups.

Table 4 lists the reportable postoperative complications as well as postoperative diagnoses. The composite rate of postoperative complications was similar between the transgender male and control groups (3.4% vs 3.3%, P=.92), whereas the postoperative diagnoses differed significantly. On univariate logistic regression (Table 5), American Society of Anesthesiologists class 3 (odds ratio [OR] 6.06, 95% CI 2.29–20.9) and presence of a major medical comorbidity (OR 2.31, 95% CI 1.27–4.16) were associated with a higher incidence of complications. Minimally invasive routes of surgery were associated with lower incidences of complications: vaginal (OR 0.04, 95% CI 0.002–0.18), laparoscopic (OR 0.07, 95% CI 0.03–0.15), and laparoscopic-assisted vaginal hysterectomy (OR 0.05, 95% CI 0.01–0.15). Transgender male status was not significantly associated with postoperative complications (OR 0.79, 95% CI 0.43–1.4).

On multivariate logistic regression controlling for age, presence of a major medical comorbidity, and primary mode of surgery, transgender male status and presence of a major medical comorbidity were not significantly associated with complications (adjusted OR 1.11, 95% CI 0.56–2.10 and adjusted OR 1.16, 95% CI 0.58–2.27, respectively; Table 6). Age remained weakly associated with postoperative complications (adjusted OR 1.04, 95% CI 1.01–1.06), whereas minimally invasive approaches to hysterectomy were significantly

Table 1. Preoperative and Intraoperative Patient Characteristics

Characteristic	Transgender Men Undergoing Hysterectomy (n=521)	Cisgender Women Undergoing Hysterectomy (n=159,215)	*P*
Age (y)	23.9±13.8	32.4±11.8	<.001
Gender			NA
Male	466 (89.4)	159,215 (100)	
Female	55 (10.6)		
BMI (kg/m^2)	29.0 (24.8–34.2)	31.8 (25.9–36.3)	<.001
Race			.01
White	336 (64.5)	107,811 (67.7)	
Black	65 (12.5)	22,476 (14.1)	
Unknown	94 (18.0)	20,886 (13.1)	
Other*	26 (5.0)	8,042 (5.1)	
ASA class†			<.001
1	108 (20.7)	17,046 (10.7)	
2	324 (62.2)	102,251 (64.2)	
3	88 (16.9)	38,442 (24.1)	
4	1 (0.2)	1,372 (0.9)	
5	0	10 (0)	
NA	0	94 (0)	
Smoking	73 (14)	26,220 (16.5)	.13
Major medical comorbidity‡	110 (21.1)	54,838 (34.4)	<.001
Preoperative hematocrit (%)	41.9±5.5	38.8±4.31	<.001
Missing	50	8,135	
Route of hysterectomy			<.001
Abdominal	79 (15.2)	40,866 (25.7)	
Vaginal	40 (7.7)	24,252 (15.2)	
Laparoscopic	298 (57.2)	70,849 (44.5)	
Laparoscopic-assisted vaginal	104 (20.0)	23,248 (14.6)	
Operative time (min)	108 (81–150)	133.3 (87–164)	<.001
Postoperative complication	16 (3.1)	7,146 (4.5)	.12
Readmission	20 (3.8)	5,281 (3.3)	.51
Reoperation	16 (3.1)	2,450 (1.5)	.005

NA, not assigned; BMI, body mass index; ASA, American Society of Anesthesiologists.
Data are mean±SD, n (%) or median (interquartile range) unless otherwise specified.
* Other includes Native American, Alaska Native, Asian, Native Hawaiian, or Pacific Islander.
† Excluded 4, 5, NA, none assigned from analysis owing to small numbers.
‡ Major medical comorbidity includes the following diagnoses: diabetes, chronic obstructive pulmonary disease, ascites, chronic heart failure, hypertension requiring medication, renal failure, dialysis, disseminated cancer, chronic steroid use, unexplained weight loss, bleeding disorder.

associated with lower incidences of complications (vaginal, adjusted OR 0.04, 95% CI 0.002–0.17; laparoscopic adjusted OR 0.09, 95% CI 0.04–0.18; and laparoscopic-assisted vaginal hysterectomy, adjusted OR 0.07, 95% CI 0.02–0.20).

DISCUSSION

We present a large cohort of hysterectomy in transgender men. In this cross-sectional population-based study, we found that, over a 3-year period, approximately 0.3% of all hysterectomies were performed for transgender individuals, and the overall incidence of complications associated with these procedures was low at 3.1%. After propensity matching, the incidence of any postoperative complication was not significantly associated with transgender male status.

The World Professional Association for Transgender Health states that hysterectomy is a medically necessary surgical procedure for the treatment of gender dysphoria if desired by the patient with a significant number of transgender men undergoing or planning to undergo this procedure.[4,10] There have been several surgical series describing techniques for hysterectomy in this population, but they have primarily focused on feasibility, and although the authors did report on complication rates, analyses were limited by small sample sizes.[6–8,10–12]

Table 2. Baseline Characteristics of Propensity Matched Cohorts

Characteristic	Transgender Men Undergoing Hysterectomy (n=468)	Cisgender Women Undergoing Hysterectomy (n=936)	*P*
Age (y)	25.6±13.9	25.5±12.5	.87
BMI (kg/m^2)	29.1 (24.8–34.3)	29.2 (25.0–35.4)	.66
Race			.09
White	303 (64.7)	653 (69.8)	
Black	61 (13.0)	87 (9.3)	
Unknown	81 (17.3)	142 (15.2)	
Other*	23 (4.9)	54 (5.8)	
ASA class			.42
1	90 (19.2)	179 (19.1)	
2	295 (63.0)	564 (60.3)	
3	83 (17.7)	193 (20.6)	
Smoking	67 (14.3)	150 (16.0)	.40
Major medical comorbidity	107 (22.9)	265 (28.3)	.03
Preoperative hematocrit (%)	41.9±5.5	41.7±5.4	.28

BMI, body mass index; ASA, American Society of Anesthesiologists.
Data are mean±SD, median (interquartile range), or n (%) unless otherwise specified.
* "Other" includes Native American, Alaska Native, Asian, Native Hawaiian, or Pacific Islander.

The overall incidence of postoperative complications after hysterectomy in our transgender male cohort was lower than what has previously been reported in the literature for hysterectomy in transgender men, but is similar to what is reported for hysterectomy in cisgender women.[6–9,13] Previous studies have not specifically reported on readmission rates after hysterectomy in transgender men; however, the incidence of readmission found in this study was also similar to what has been previously reported for cisgender women.[14,15] We found that the baseline characteristics of transgender men undergoing hysterectomy differ significantly from the general population of patients undergoing hysterectomy. Specifically, the mean age of the transgender male cohort was nearly 10 years younger than the general population. This cohort's younger age may explain the difference in American Society of Anesthesiologists class and he presence of a major medical comorbidity.

We performed propensity matching to better evaluate the effect of transgender male status on postoperative outcomes. In our study, transgender male status was not found to be significantly associated with postoperative complications after hysterectomy after univariate and multivariate logistic regression models. Interestingly, neither the rate of readmission nor reoperation in the 30-day postoperative window differed between the transgender male and control groups.

Regarding route of surgery, laparoscopic approach was the most commonly performed hysterectomy in both the transgender male and

Table 3. Perioperative Characteristics of Propensity Matched Cohorts

Characteristic	Transgender Men Undergoing Hysterectomy (n=468)	Cisgender Women Undergoing Hysterectomy (n=936)	*P*
Route of hysterectomy			<.001
Abdominal	73 (15.6)	171 (18.3)	
Vaginal	39 (8.3)	115 (12.3)	
Laparoscopic	260 (55.6)	416 (44.4)	
Laparoscopic-assisted vaginal	96 (20.5)	234 (25.0)	
Operative time (min)	112 (83–156)	109 (80–155)	.30
Postoperative complication	16 (3.4)	31 (3.3)	.92
Readmission	17 (3.6)	26 (2.8)	.38
Reoperation	14 (0.3)	13 (1.4)	.04

Data are n (%) or median (interquartile range) unless otherwise specified.

Table 4. Postoperative Diagnoses and Adverse Events of Propensity Matched Cohorts

	Transgender Men Undergoing Hysterectomy (n=468)	Cisgender Women Undergoing Hysterectomy (n=936)	*P*
Postoperative diagnosis			.02*
Null	175 (37.4)	349 (37.3)	
Gender identity disorder	98 (20.9)	0	
Leiomyoma	59 (10.7)	126 (13.5)	
Abnormal uterine bleeding	48 (10.3)	157 (16.8)	
Other, elective[†]	20 (4.3)	38 (4.1)	
Prolapse	18 (3.8)	47 (5.0)	
Malignancy[‡]	18 (3.8)	35 (3.7)	
Endometriosis	9 (1.9)	37 (4.0)	
Benign neoplasms	7 (1.5)	15 (1.6)	
Premalignant[§]	7 (1.5)	2 (0.2)	
Inflammatory processes	3 (0.6)	9 (1.0)	
Dyspareunia	1 (0.2)	5 (0.5)	
Other[‖]	14 (3.0)	116 (12.4)	
Postoperative complication	16 (3.4)	31 (3.3)	.92
Transfusion	11 (2.4)	24 (2.6)	
Dehiscence	2 (0.4)	0	
Pulmonary embolus	2 (0.4)	4 (0.4)	
Deep venous thrombosis	2 (0.4)	0	
Deep surgical site infection	1 (0.2)	0	
Urinary tract infection	1 (0.2)	2 (0.2)	
Sepsis	1 (0.2)	1 (0.1)	
Pneumonia	1 (0.2)	1 (0.1)	
OSSI	0	0	
Septic shock	0	0	
Reintubation	0	0	
Renal insufficiency	0	0	
Renal failure	0	0	
Cerebrovascular accident	0	1 (0.1)	
Myocardial infarction	0	0	

OSSI, organ space surgical site infection.
Data are n (%) unless otherwise specified.
* Excluding diagnosis of gender identity disorder.
† Other, elective includes the following diagnoses: other elective surgery for purposes other than remedying health states, unspecified symptom associated with female genital organs, other specified conditions influencing health status, other reasons for seeking consultation, unspecified disorder of male genital organs, other specified symptoms associated with female genital organs.
‡ Malignancy includes the following diagnoses: malignant neoplasm of corpus uteri, malignant neoplasm of the ovary, malignant neoplasm of the uterus part unspecified, other malignant lymphomas unspecified site.
§ Premalignant conditions include the following diagnoses: complex hyperplasia without atypia, endometrial hyperplasia unspecified, simple endometrial hyperplasia without atypia, endometrial hyperplasia.
‖ Other: any other diagnoses not present in the transgender male cohort.

cisgender female groups. Furthermore, we found that the minimally invasive approach to surgery (vaginal or laparoscopic) was associated with a lower incidence of complications even when we controlled for possible confounders including transgender male status. This is consistent with previous reports in the general population, which have shown that minimally invasive approaches to hysterectomy are associated with fewer complications and shorter recovery time compared with the open abdominal approach.[16]

In the transgender male cohort, vaginal hysterectomy was the least common type of surgery performed. Several surgeons have cited that there are

Table 5. All Postoperative Adverse Events—Univariate Logistic Regression

Variable	OR (95% CI)
Transgender men	1.03 (5.5–1.88)
Age*	1.05 (1.03–1.07)
BMI	2.11 (0.63–6.89)
Race†	
Black	3.44 (1.68–6.75)
Unknown	0.65 (0.19–1.70)
Other	1.96 (0.57–5.20)
ASA class‡	
2	2.21 (0.86–7.52)
3	6.06 (2.29–20.9)
Smoking	0.96 (0.39–2.03)
Major medical comorbidity§	2.31 (1.27–4.16)
Preoperative hematocrit (%)‖	0.004 (0.008–0.02)
Route of surgery¶	
Vaginal	0.04 (0.002–0.18)
Laparoscopic	0.07 (0.03–0.15)
Laparoscopic-assisted vaginal	0.05 (0.01–0.15)
Operative time (min)#	1.01 (1.01–1.01)

OR, odds ratio; BMI, body mass index; ASA, American Society of Anesthesiologists.
* Age per year as referent.
† White as the referent.
‡ ASA class 1 as the referent.
§ Absence of any major medical comorbidity as the referent.
‖ Hematocrit per 1% change as the referent.
¶ Open abdominal hysterectomy as the referent.
# Time per minute as the referent.

characteristics somewhat unique to the transgender population that may preclude feasibility of performing hysterectomy vaginally. These characteristics include the use of testosterone, which decreases vaginal tissue quality and can narrow the vaginal introitus, as well as nulliparity, which can make a vaginal approach challenging. However, Kaiser et al and Obedin-Maliver et al have published reports on feasibility of vaginal hysterectomy in this patient population and have determined that, even with adnexectomy, the vaginal approach can be performed without an increase in perioperative adverse events.[6,7] Our findings further support the notion that the least invasive approach for hysterectomy should be offered to all patients, regardless of their gender identity.

Table 6. All Postoperative Adverse Events—Multivariate Logistic Regression

Adjusted Variable	Adjusted OR (95% CI)
Transgender men	1.11 (0.56–2.10)
Age*	1.04 (1.01–1.06)
Major medical comorbidity†	1.16 (0.58–2.27)
Route of surgery‡	
Vaginal	0.04 (0.002–0.17)
Laparoscopic	0.09 (0.04–0.18)
Laparoscopic-assisted vaginal	0.07 (0.02–0.20)

OR, odds ratio.
* Age per year as the referent.
† Absence of any major medical comorbidity as the referent.
‡ Open abdominal hysterectomy as the referent.

The majority of hysterectomies performed for transgender men did not have a specific postoperative diagnosis associated with the procedure, that is, the postoperative diagnosis was listed as "null." This finding may reflect either miscoding by the primary surgeon or other motivations such as protecting the patient's privacy, which cannot be directly inferred from this study. Given that a large proportion of the control group also had a "null" diagnosis listed, this discrepancy may be the result of coding error. Approximately 6% of the patients in this study underwent hysterectomy for malignant conditions, which is approximately half of the overall rate of hysterectomy for gynecologic malignancy in the general population, reported to be approximately 11% in 2010.[17] Also of interest, the mean age of our cohort (24 years) was much younger than the general population undergoing hysterectomy for benign indications, which occurs most commonly in the fifth decade of life.[18]

The main strength of this study is that it represents the largest sample size of transgender men undergoing hysterectomy. Additionally, the cohort was identified using the National Surgical Quality Improvement database, which is a large, national database that contains data that are collected in a standardized and audited manner. We chose to perform a propensity matching to better elucidate the risks associated with transgender male status after hysterectomy.

The major limitation of our article is that we were likely unable to capture all transgender men undergoing hysterectomy. First, the gender assigned to each patient in the database does not accurately reflect patients' true gender identity, as demonstrated by the fact that some of the patients were assigned "male" gender in the National Surgical Quality Improvement database and others were "female." A priori, we made the assumption that all "males" undergoing hysterectomy and all "females" undergoing hysterectomy with a postoperative diagnosis of gender dysphoria were transgender men. We likely did not capture all transgender male patients, because some "female" patients who underwent hysterectomy for a diagnosis other than gender dysphoria may have been transgender men. We recognize that gender identity and providing care to patients with gender dysphoria is complicated, and many factors such as protecting patient privacy, limitations of insurance coverage, and patients' choice to not disclose their gender identify to health care providers influence how these cases are

coded in databases. However, given the size of our cohort and other studies evaluating surgical outcomes in this population, it is unlikely that inclusion of these patients would have led to drastically different cohort demographics or changes in the primary outcome.

In addition, although the National Surgical Quality Improvement database adheres to a rigid data collection methods, studies that are based on large databases are subject to information and data collection biases that include inaccurate coding of procedures, diagnoses, and perioperative outcomes as well as bias from nonresponse or missing data. Because we had to rely on CPT codes for descriptions of the procedures performed, we were not able to accurately determine how many patients in our cohort underwent concurrent adnexectomy because, in contrast to minimally invasive hysterectomy codes, the CPT code for abdominal hysterectomy does not distinguish whether a concurrent adnexectomy was performed. Furthermore, given the limitation of the National Surgical Quality Improvement database, we did not have data regarding uterine pathology after hysterectomy.

Another limitation of this study is our lack of information regarding preoperative testosterone use in the transgender male cohort. Exogenous hormones can have an important effect on perioperative outcomes. As previously mentioned, testosterone can affect tissue quality and make a vaginal approach for hysterectomy difficult as well as affect tissue healing postoperatively in addition to potential cardiovascular and hematologic effects.[19–21] Because the overall complication rate in both the transgender male and control cohorts was low, significant differences between groups may be obscured as a result of the small sample size. However, preoperative hematocrit did not differ significantly between the two cohorts, and the incidence of deep venous thromboembolism and pulmonary embolism was very low in both groups. More studies are needed to evaluate the effect of testosterone on surgical outcomes in the transgender male population.

Of all the hysterectomies performed, few are performed for transgender men. The rate of postoperative complications associated with hysterectomy is similar between transgender men and the general population. Minimally invasive hysterectomy should be offered to all patients seeking hysterectomy to minimize the risk of perioperative complications.

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