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Risk factors for postoperative complications in total thyroidectomy

A retrospective, risk-adjusted analysis from the National Surgical Quality Improvement Program

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Abstract

Thyroid cancer incidence is increasing, and with it, an increase in total thyroidectomy. There are limited studies comparing outcomes in total thyroidectomy performed in the inpatient versus outpatient setting.

The objective of this study was to perform a comparative analysis of risk factors and outcomes of postoperative morbidity and mortality in total thyroidectomy performed as an inpatient versus outpatient surgery.

Retrospective cohort study of data from the 2005 to 2014 multi-institutional, risk-adjusted American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database. A multivariate regression model with corresponding odds ratios and 95% confidence intervals was used to determine 30-day morbidity and mortality after total thyroidectomies, and also risk factors of postoperative outcomes.

From 2005 to 2014, 40,025 total thyroidectomies were performed (48.5% inpatient, 51.5% outpatient). The 30-day complication rate for all total thyroidectomies was 7.74%. Multivariate logistic regression analysis was performed to control for potential confounding variables. Preoperative factors that affected complications rates for inpatient thyroidectomies included: age ≥70, non-Caucasian race, dependent functional status, history of congestive heart failure, smoking history, bleeding disorder, wound infection, and preoperative sepsis ($P < 0.05$). In addition, preoperative factors affecting complications in thyroidectomy performed as an outpatient surgery included malignant thyroid pathology (P 0.05).

We identified a subset of preoperative conditions that affect risk of complications after total thyroidectomy. Recommendations for patient selection for outpatient total thyroidectomies should be modified to account for pre-existing conditions that increase the risk of postoperative morbidity.

Abbreviations: ASA = American Society of Anesthesiology, BMI = body mass index, CHF = congestive heart failure, CVA = cerebrovascular accident, HTN = hypertension, SD = standard deviation, SSI = surgical site infection.

Keywords: adult thyroid surgery, ENT, surgery

1. Introduction

Total thyroidectomy has historically been performed as an inpatient surgery. Patients were admitted to hospital postoperatively due to the associated risk of life-threatening complications including hypocalcemia and airway obstruction, either due to bilateral recurrent laryngeal nerve (RLN) injury or neck hematoma.[1] However, there has been a trend towards performing procedures as an outpatient as permitted by advancements in anesthetic and surgical techniques.[2] In 2013, the American Thyroid Association (ATA) 2013 position paper established that "outpatient thyroidectomy may be undertaken safely in a carefully selected patient population provided that precautionary measures are taken."[3] As there are no consensus selection criteria for outpatient thyroid surgery, patients are considered for outpatient thyroidectomy if they have social support, access to care and communication, and have no prohibitive medical conditions.[4] Conversely, patients are selected for inpatient thyroidectomy due to significant comorbidity, simultaneous neck and mediastinal procedures, and social circumstances not conducive to outpatient surgery.[4,5]

The relationship between patient factors and postoperative complications is complex and influenced by intrinsic disease factors, patient comorbidities, and operative management. Select studies have revealed an increased risk of complications in outpatient total thyroidectomy associated with male sex, thyrotoxicosis, presence of malignancy, extent of resection, and revision surgery.[4,6–10] In contrast, a study by Khavanin et al[11] demonstrated increased risk of readmission, reoperation, and overall complications associated with

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inpatient total thyroidectomies, irrespective of 1:1 propensity score matching. Determining which patients can safely have outpatient total thyroidectomy has the potential to decrease cost and resource utilization and improve patient safety through quality improvement. Despite the consensus amongst surgeons that careful patient selection is critical in performing thyroidectomy, data examining risk stratification of patients undergoing thyroidectomy as an inpatient as compared to an outpatient are limited.[4] Therefore, the aim of this study was to investigate the demographics and preoperative clinical risk factors associated with 30-day postoperative morbidity and mortality in patients who are selected to undergo outpatient total thyroidectomy as compared with patients who are selected to undergo inpatient total thyroidectomy using a multi-institutional risk-adjusted database.

2. Methods

2.1. Study design

This study was carried out as a retrospective cohort study of patients undergoing total thyroidectomy in both inpatient and outpatient settings. Patients were selected from the American College of Surgeons National Surgical Quality Improvement Program (ASC-NSQIP) registry from the years 2005 to 2014.[12] Briefly, the ASC-NSQIP database was developed by the US Department of Veteran Affairs. It is a comprehensive surgical database and quality improvement program which collects data and provides risk-adjusted outcomes. To date, 445 medical centers contribute data to ASC-NSQIP, including the United States, Canada, United Kingdom, Saudi Arabia, and United Arab Emirates. Demographic, preoperative, intraoperative, and 30-day postoperative data are collected. The details of the ASC-NSQIP database collection methods have been previously described.[13,14] As this study served audit purposes, ethical approval was not required.

Patients were selected for inclusion based on current procedural technology (CPT) codes that were recorded in the ASC-NSQIP database. To capture all total or near total thyroidectomy without any additional procedure such as neck dissection or sternotomy, we included the following CPT codes in this study: 60225, unilateral total thyroid lobectomy with contralateral subtotal lobectomy, including isthmusectomy; 60240, total or complete thyroidectomy; and 60271, thyroidectomy, including cervical approach to substernal thyroid. Outpatient status was identified in the ASC-NSQIP registry as same day procedure or $\leq$23 hours inhospital stay. International Classification of Diseases (ICD)-9 codes were used to screen patients to capture patients with an underlying pathology including benign and malignant thyroid neoplasm, and thyroid goiter with and without thyrotoxicosis (ICD-9: 193, 226, 241, 242).

Based on the previously reported literature and a priori knowledge of risk factors for postoperative complications, we included preoperative risk variables to analyze the primary endpoint of interest, 30-day postoperative complication rates for inpatient versus outpatient total thyroidectomy.[15] A composite outcome of interest, overall postoperative complication rates, was established. Overall postoperative complication rates included: pneumonia, pulmonary embolism, ventilator requirement >48 hours, progressive renal insufficiency, acute renal failure, urinary tract infection, stroke with neurological deficit, coma >24 hours, cardiac arrest, myocardial infarction, deep vein thrombosis, sepsis, septic shock, readmission, superficial, deep and organ space surgical site infection, wound disruption, unplanned intubation, peripheral nerve injury, bleeding transfusions, reoperation, and death.

2.2. Statistical analysis

Baseline patient characteristics were illustrated using descriptive statistics, including proportions, means, and standard deviations (SDs). For ease of interpretation, all continuous variables were dichotomized to binomial variables. Patients with missing data or incomplete follow-up for the 30-day postoperative period were excluded from the regression analysis. Also, only variables with data from 2005 to 2014 were included in the analysis. Variables that were excluded due to missing data included history of previous myocardial infarction, history of angina before surgery, and prior cardiac surgery. As such, presence of congestive heart failure (CHF) was used as a proxy for cardiac status in the regression analysis. Significant predictors for 30-day postoperative morbidity were identified through univariate and multivariate logistic regression modeling. Given that selection for inpatient and outpatient total thyroidectomy is based on surgeon preference, the analysis was stratified by inpatient and outpatient. As the study population was stratified by the exposure of interest, inpatient/outpatient status was excluded from the final multivariate model. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were compared between the 2 groups (ie, inpatient and outpatient total thyroidectomies) to estimate the difference in 30-day postoperative complications attributable to covariates. The multivariate logistic model was constructed using explanatory variables chosen by clinical importance (univariate significance level at 0.001). All analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC).

3. Results

A total of 40,025 patients were selected from the ASC-NSQIP data as having undergone total thyroidectomies between the years 2005 and 2014. Of these procedures, 48.5% were performed as inpatient procedures and 51.5% as outpatient procedures. The 30-day complication rate for all patients was 7.74%. The descriptive statistics and complications of the study populations are summarized in Tables 1 and 2, respectively. Outpatient surgery carried a lower odds of complications as compared with inpatient total thyroidectomy (ie, OR 0.57, $P<0.0001$) as seen in Table 3. The rate of unplanned readmission in the outpatient total thyroidectomy cohort was 2.35%.

Patients who underwent inpatient total thyroidectomies demonstrated significantly higher rates of postoperative pneumonia, pulmonary embolism, respiratory failure, urinary tract infection, cerebrovascular accident (CVA)/stroke, cardiac arrest, myocardial infarction, blood transfusion, sepsis, septic shock, and death compared with patients who underwent total thyroidectomies as an outpatient. Inpatient total thyroidectomy was associated with increased risks of readmission, and a return to the operating room (Table 2).

The multivariate logistic model, using preoperative patient characteristics as predictors of 30-day postoperative complications after inpatient total thyroidectomies, identified 8 significant factors for the outcome of complication: age $\geq$70 years ($P\leq$ 0.0001), non-Caucasian race ($P\leq0.0001$), dependent functional status ($P\leq0.0001$), bleeding disorder ($P=0.005$), steroid use ($P=0.02$), preoperative sepsis ($P=<0.0001$), history of CHF ($P=0.009$), and American Society of Anesthesiology (ASA) classification $\geq$3 ($P<0.0001$) (Table 4; Fig. 1A). An increased

Table 1

Demographics and preoperative clinical characteristics.

	Inpatient	Outpatient	*P*
Patients (N)	19,398	20,627	
Age (mean ± SD)	52.41 ± 14.73	51.74 ± 14.45	<0.0001
Age ≥70 (%)	13.23	11.42	<0.0001
Sex (% female)	80.97	82.7	<0.0001
BMI (mean ± SD)	30.3 ± 7.6	30.49 ± 7.55	0.011
BMI ≥30 (%)	44.71	45.48	0.12
Caucasian race (%)	70.76	74.09	<0.0001
Non-Caucasian race (%)	29.24	25.91	<0.0001
Diabetic (%)	13.75	13.19	0.097
Smoker (%)	15.84	16.7	0.020
Alcohol consumer (%)	0.98	0.95	0.83
Function dependent (%)	0.94	0.37	<0.0001
Function independent (%)	99.06	99.63	<0.0001
CHF (%)	0.44	0.1	<0.0001
HTN (medicated) (%)	41.77	41.35	0.4
Dialysis (%)	0.46	0.17	<0.0001
Wound infection (%)	0.35	0.17	0.0005
Steroid use (%)	2.2	2.06	0.33
Bleeding disorder (%)	1.62	1.12	<0.0001
Preoperative sepsis (%)	0.45	0.22	<0.0001
ASA classification 1 to 2 (%)	69.66	70.13	0.31
ASA classification ≥3 (%)	30.34	29.87	0.31

Alcohol consumption was defined as >2 alcoholic beverages per day.
ASA = American Society of Anesthesiology, BMI = body mass index, CHF = congestive heart failure, HTN = hypertension, SD = standard deviation.

odds of postoperative complications was noted in patients who underwent inpatient total thyroidectomy for an underlying malignant pathology; however, this was found to be trending significance ($P = 0.06$).

The multivariate logistic model for all postoperative complications in the outpatient setting identified steroid use ($P = 0.04$), bleeding disorder ($P = 0.02$), ASA classification ≥3 ($P < 0.0001$), and underlying malignant thyroid pathology ($P = 0.0002$) as significant predictors of 30-day postoperative complications (Table 5; Fig. 1B). In the outpatient cohort of patients, wound infection was excluded from the multivariate regression model due to an insufficient number of events.

Table 2

Comparison of 30-day post-operative complications after inpatient and outpatient total thyroidectomy.

Complications	Inpatient (%)	Outpatient (%)	*P*
Wound infection	0.08	0.06	0.358
Wound disruption	0.04	0.02	0.3139
Pneumonia	0.38	0.05	<0.0001
Reintubation	0.82	0.1	<0.0001
Pulmonary embolism	0.1	0.03	0.006
Require ventilation	0.52	0.01	<0.0001
Renal insufficiency	0.04	0.01	0.0584
Acute renal failure	0.02	0.01	0.6785
Urinary tract infection	0.42	0.21	<0.0001
CVA/stroke	0.07	0	0.0009
Coma	0.01	0	1
Peripheral nerve injury	0.03	0.02	1
Cardiac arrest	0.1	0.01	0.0004
Myocardial infarct	0.09	0.02	0.0042
Blood transfusion	0.27	0.02	<0.0001
Deep vein thrombosis	0.07	0.03	0.0817
Sepsis	0.21	0.06	<0.0001
Septic shock	0.09	0	<0.0001
Readmission	3.54	2.35	<0.0001
Organ space SSI	0.05	0.03	0.5331
Superficial incisional SSI	0.25	0.29	0.5194
Return to OR	1.96	0.89	<0.0001
Death	0.1	0.02	0.0016
Total complications	5.02	2.72	<0.0001

CVA = cerebrovascular accident, OR = operating room, SSI = surgical site infection.

Table 3

Univariate regression model of all 30-day postoperative complications.

Predictors	Odds ratio	95% Confidence limits		*P*
Age ≥70 vs <70 y	1.41	1.21	1.64	<0.0001
Male vs female	1.11	0.98	1.27	0.11
Non-Caucasian vs Caucasian	1.29	1.14	1.45	<0.0001
BMI ≥30 vs <30	1.13	1.01	1.27	0.03
Diabetic yes vs no	1.05	0.91	1.21	0.51
Smoker yes vs no	1.29	1.12	1.49	0.0003
Functional status dependent vs independent	3.10	2.19	4.39	<0.0001
CHF yes vs no	2.32	1.34	4.00	0.003
Hypertensive yes vs no	1.13	0.98	1.28	0.055
Dialysis yes vs no	1.83	1.05	3.17	0.03
Wound infection yes vs no	1.80	0.95	3.39	0.07
Steroids yes vs no	1.67	1.28	2.19	0.0002
Bleeding disorder yes vs no	1.77	1.30	2.40	0.0002
Preoperative sepsis yes vs no	3.67	2.28	5.90	<0.0001
ASA class ≥3 vs 1 to 2	1.87	1.65	2.12	<0.0001
ICD-9 cancer vs nontoxic goiter	1.27	1.13	1.44	0.0001
ICD-9 benign neoplasm vs nontoxic goiter	1.02	0.80	1.29	0.89
ICD-9 thyrotoxicosis vs nontoxic goiter	1.14	0.96	1.34	0.13
Outpatient vs inpatient	0.57	0.51	0.64	<0.0001

ASA = American Society of Anesthesiology, BMI = body mass index, CHF = congestive heart failure, HTN = hypertension, ICD = International Classification of Diseases.

Table 4

Multivariate regression model of inpatient 30-day postoperative complications.

Predictors	Odds ratio	95% Confidence limits		*P*
Age ≥70 vs <70 y	1.56	1.30	1.87	<0.0001
Male vs female	1.11	0.94	1.32	0.22
Non-Caucasian vs Caucasian	1.48	1.28	1.71	<0.0001
BMI ≥30 vs <30	1.12	0.96	1.30	0.15
Diabetic yes vs no	1.02	0.85	1.23	0.82
Smoker yes vs no	1.38	1.15	1.65	0.0004
Functional status dependent vs independent	3.22	2.19	4.74	<0.0001
CHF yes vs no	2.18	1.22	3.91	0.009
Hypertensive yes vs no	1.19	1.01	1.39	0.04
Dialysis yes vs no	1.58	0.85	2.94	0.15
Wound infection yes vs no	2.52	1.28	4.96	0.007
Steroids yes vs no	1.68	1.20	2.34	0.003
Bleeding disorder yes vs no	1.70	1.17	2.46	0.005
Preoperative sepsis yes vs no	4.28	2.52	7.26	<0.0001
ASA class ≥3 vs 1 to 2	2.08	1.77	2.45	<0.0001
ICD-9 cancer vs nontoxic goiter	1.09	0.99	1.20	0.06
ICD-9 benign neoplasm vs nontoxic goiter	0.99	0.71	1.39	0.97
ICD-9 thyrotoxicosis vs nontoxic goiter	1.18	0.96	1.46	0.11

ASA = American Society of Anesthesiology, BMI = body mass index, CHF = congestive heart failure, HTN = hypertension, ICD = International Classification of Diseases.

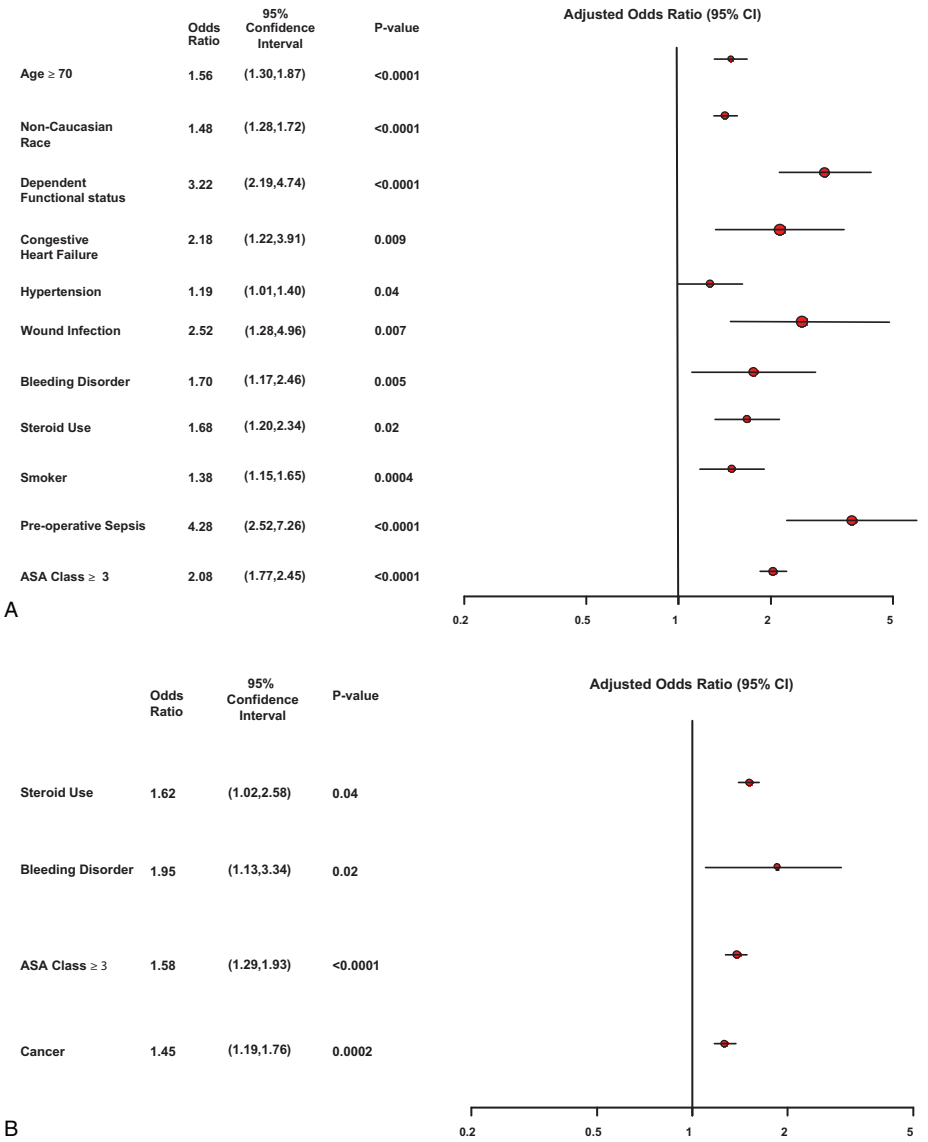

Figure 1. Significant preoperative risk factors of postoperative complications in total thyroidectomies. (A) Inpatient total thyroidectomies; (B) outpatient total thyroidectomies. ASA = American Society of Anesthesiology, BMI = body mass index.

A sensitivity analysis of age as a risk factor for postoperative complications was performed (Appendix Tables 1–3, http://links.lww.com/MD/B542). Controlling for preoperative factors and hospital setting, increased BMI was only a significant risk factor for postoperative complications when age was increased above our threshold of 70 years ($P = 0.03$). Collinearity of these preoperative factors was investigated further in the multivariate regression model to determine their potential contribution to postoperative complication rates in the inpatient and outpatient setting; however, this was not significant in the multivariate regression model ($P = 0.19$). Of note, collinearity between smoking status, hypertension, and history of CHF was also investigated and found to not have significance in the multivariate regression model ($P > 0.05$).

4. Discussion

There has been increasing interest in performing many surgeries, including total thyroidectomy, on an outpatient rather than inpatient basis. The greatest area of controversy associated with this change in practice is its safety and the potential risk of fatal complications in discharged patients.[16] As there is limited consensus on guidelines for the multifactorial selection process for inpatient and outpatient total thyroidectomies, we sought to further decipher the intrinsic and extrinsic factors that contribute to 30-day postoperative complications. Given the potential for cost savings that outpatient procedures offer, investigations into surgical risk stratification are critical to appropriately select patients. Interestingly, there is a paucity of comparative studies examining the predictors of morbidity and mortality after total thyroidectomy in the inpatient and outpatient setting.

This study represents the largest analyzed population of total thyroidectomies using the ACS-NSQIP database to better understand the association between demographics and preoperative characteristics, and 30-day postoperative complications. A post hoc qualitative assessment of the patient demographic profile in our study with previous studies provided further

Table 5

Multivariate regression model of outpatient 30-day postoperative complications.

Predictors	Odds ratio	95% Confidence limits		P
Age ≥70 vs <70 y	1.19	0.92	1.54	0.18
Male vs female	1.12	0.90	1.39	0.31
Non-Caucasian vs Caucasian	0.99	0.81	1.21	0.94
BMI ≥30 vs <30	1.14	0.95	1.38	0.14
Diabetic yes vs no	1.11	0.87	1.41	0.41
Smoker yes vs no	1.19	0.95	1.50	0.13
Functional status dependent vs independent	1.99	0.79	5.03	0.14
CHF yes vs no	1.48	0.19	11.35	0.70
Hypertensive yes vs no	1.06	0.87	1.29	0.58
Dialysis yes vs no	2.39	0.72	7.93	0.15
Steroids yes vs no	1.62	1.02	2.58	0.04
Bleeding disorder yes vs no	1.95	1.13	3.34	0.02
Preoperative sepsis yes vs no	1.39	0.33	5.88	0.65
ASA class ≥3 vs 1 to 2	1.58	1.29	1.93	<0.0001
ICD-9 cancer vs nontoxic goiter	1.45	1.19	1.76	0.0002
ICD-9 benign neoplasm vs nontoxic goiter	1.06	0.74	1.50	0.75
ICD-9 thyrotoxicosis vs nontoxic goiter	1.03	0.77	1.37	0.85

ASA = American Society of Anesthesiology, BMI = body mass index, CHF = congestive heart failure, HTN = hypertension, ICD = International Classification of Diseases.

validation that our study population was an accurate representative sample population of thyroid surgery patients.[11,17,18]

4.1. Significant risk factors in inpatient thyroidectomies

Our analysis of preoperative risk factors for 30-day morbidity and mortality after inpatient total thyroidectomy identified intrinsic patient factors that significantly contributed to postoperative complications. These included age, race, dependent functional status, history of CHF, smoking history, wound infection, and history of preoperative sepsis. These preoperative factors also varied in prevalence by study population, with higher rates in inpatient compared with outpatient surgery. Furthermore, reintubation, readmission, reoperation, and overall complication rates were significantly higher in patients who underwent inpatient total thyroidectomy as compared with outpatients. These results were consistent with a previous analysis of 2011 to 2012 data from ASC-NSQIP.[11] The consistency of these findings supports the validity of our study results. These risk factors were found to contribute significantly to the odds of pneumonia, stroke, admission to critical care unit, coagulopathies, organ failure, and cardiac arrest postoperatively in patients who underwent total thyroidectomies in the inpatient setting. This would be consistent with the current recommendations from the American Thyroid Association that patients with complex comorbidities should be selected to undergo total thyroidectomies as an inpatient, given the increased risk of complication rates in this patient population.[3] It seems, then, that surgeons were appropriately stratifying patients with these risk factors preoperatively to be admitted to hospital after their surgeries.

It would be warranted to further underscore the need for smoking cessation counselling before surgery, given the increased risk of complications in patients who require an inpatient total thyroidectomy. After accounting for demographics and comorbidities, the odds of postoperative complications in patients who were selected to undergo inpatient total thyroidectomies was 38% higher in smokers.

As total thyroidectomies are typically performed as elective procedures, we would not expect preoperative sepsis and wound infections to be commonly encountered risk factors that surgeons would need to consider in their preoperative plan. Nonetheless, the presence of preoperative sepsis was associated with the highest odds of postoperative complications (ie, OR 4.28). Furthermore, wound infections were found to carry a 2.52-fold higher odds of postoperative complications. As such, surgeons should exercise extreme caution when embarking on total thyroidectomies in the emergent settings on patients known to have active infections.

Hypertension was found to be an effect modifier in our regression analysis, increasing the odds of complications in the inpatient cohort when the analysis was stratified by hospital setting. We can assume that the increased morbidity associated with hypertension stems from the increased rate of perioperative hematoma formation associated with uncontrolled hypertension. These findings would emphasize a need for preoperative recognition and treatment of hypertension in patients. With optimization of preoperative hypertension and close postoperative monitoring, it is possible that the rates of postoperative complications due to this subset of patients may decline.

4.2. Significant predictors of outcomes in the outpatient setting

Malignant pathology is associated with increased vascularity, immunosuppression, and poor wound healing. Presence of malignancy was identified as predictors of increased postoperative complications in the outpatient setting. This is consistent with previous studies of smaller sample sizes, supporting the role for postoperative admission for this specific patient population.[4,6–8,18] This would highlight malignant pathology as a critical consideration for surgeons and support the establishment of guidelines to only perform total thyroidectomy for malignant disease in the inpatient setting.

4.3. Significant predictors of outcomes in the inpatient and outpatient setting

The ASA classification ≥3, steroid use, and bleeding disorders were all identified as significant predictors of complications after total thyroidectomy, irrespective of inpatient or outpatient status. Patients diagnosed with an ASA class ≥3 were found to have 2.08 and 1.58 times greater risk of developing postoperative complications in the inpatient and outpatient setting compared with patients with ASA class 1 to 2, respectively. These results are consistent with previous studies that have identified an association between multiple medical comorbidities and increased postoperative complications in abdominal, orthopedic, neurosurgical and oncologic surgical procedures.[19–24] This would suggest that surgeons should exercise caution in pursuing outpatient total thyroidectomies in patients with a ASA classification ≥3, steroid use, and bleeding disorders, given the association with postoperative complications.

The limitations of this study are similar to those seen consistently in cohort studies: selection bias, information bias, and confounding. Selection bias would have a significant role in this study population, given that surgeons are likely to elect to perform outpatient surgery on patients with low levels of preoperative risk factors. For this reason, we stratified the

analyses by inpatient and outpatient status to limit the influence of this variable on the study results. Information bias, although present (data collectors rely on retrospective review of charts), is less likely due to the level of training and clinical experience demonstrated by ASC-NSQIP data collectors. There is a complex association between intrinsic patient characteristics and postoperative complications in this patient population, and as such, our study is limited by confounding. This likely contributed to the increased 30-day complication rate in the inpatient cohort, as these patients had a higher prevalence of underlying medical conditions. A final limitation lies within the variables collected within our database. The ACS-NSQIP data are collected for all surgical specialties, and as such, include only general types of surgical complications. As a result, data specific to complications after thyroid surgery are not present. These include complications rates secondary to injury to the RLN, hypocalcemia, and neck hematoma. Procedure-targeted data collection for ASC-NSQIP have been developed for thyroidectomy, which will allow for analysis of thyroidectomy-specific complications directly in future studies.

The main strength of our study lies in our data source. Data collection from a multi-institutional international database with strict criteria lends strength to our results and allows for external validity. There is nearly complete follow-up in ASC-NSQIP data with little to no loss to follow-up for all 30-day complications. Furthermore, the high level of training and strict criteria for data collectors result in minimal misclassification of data. Most importantly, the large sample size, of 40,025 patients, makes this the largest study of total thyroidectomy procedures to date and supports the external validity of our study results.

In summary, our study identified risk factors that significantly contribute to the development of postoperative complications in patients selected to undergo total thyroidectomy in both the inpatient and outpatient settings. Thyroid surgeons can use the results of our study to identify high-risk patients to undergo total thyroidectomies based on their preoperative risk factors. Age ≥70, non-Caucasian race, dependent functional status, history of CHF, smoking history, hypertension, wound infection, history of preoperative sepsis, steroid use, bleeding disorder, and ASA class ≥3 have demonstrated a significant correlation with postoperative complications in inpatient total thyroidectomies. Surgeons should be aware that patients undergoing total thyroidectomy in the inpatient setting with the aforementioned risk factors are at high risk of postoperative complications and counsel their patients around close monitoring in the postoperative setting. In considering patients for outpatient surgery, presence of malignancy was a significant predictor of postoperative complications. As such, surgeons undertaking outpatient total thyroidectomies should be wary of the increased risk of postoperative complications for this subset of patients and consider close follow-up for these patients. Information such as this is increasingly important as many healthcare systems are increasing emphasis on providing care of the best quality at the lowest cost. One of the key strategies in reducing healthcare costs is by decreasing hospital admission. This, however, can only be undertaken in patient populations for which it is safe and does not compromise quality of care.

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