A NSQIP Risk Assessment for Thyroid Surgery Based on Comorbidities

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BACKGROUND: Thyroid surgery is associated with low mortality and morbidity and often is performed in an ambulatory setting. The majority of patients undergoing thyroidectomy have an uncomplicated outcome, but common comorbidities may increase mortality and morbidity. Due to low complication rates, studies using single surgeon or single institutional data to identify risk factors for adverse outcomes may be limited by inadequate patient volume.

STUDY DESIGN: This retrospective cohort study used data from the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP). The study group included all thyroidectomy patients over a 6-year period (2005 to 2010). Common patient comorbidities were identified and analyzed using logistic regression. Risk of adverse outcomes was calculated for single and multiple comorbidities. Statistical significance was set at $p < 0.05$.

RESULTS: The study group included 38,577 consecutive patients. Thirty-day mortality and postoperative morbidity were 0.06% and 1.49%, respectively. The risk factors independently associated with morbidity included hypertension, diabetes, advanced age greater than 70 years, COPD, dialysis, malignant thyroid disease, and surgical approach (total thyroidectomy). Substernal thyroidectomy, hypertension, diabetes, age greater than 70 years, COPD, and dialysis were significant predictors (unadjusted) of mortality. Multiple comorbidities resulted in significant cumulative risk. The presence of 3 or more comorbidities was associated with a postoperative morbidity of 5.1% ($p < 0.001$) and mortality as high as 12.5%.

CONCLUSIONS: Thyroid surgery is generally safe. Common comorbidities significantly increase the risk of adverse outcomes and death. Clinically applicable risk calculation based on overall health may improve patient selection, surgical management, and informed consent. (J Am Coll Surg 2014;218:1231−1238. © 2014 by the American College of Surgeons)

Thyroid surgery is widely performed for both benign and malignant disease and is generally considered safe and effective when performed by experienced surgeons in high volume centers.[1-3] The incidence of thyroid cancer is rising; it is estimated that 60,000 men and women will be diagnosed with thyroid cancer in 2013, and 1,850 people are likely to die from this disease. The rate for new thyroid cancer has gone up an average of 6.4% each year over the last 10 years, and the death rate has been rising on average 0.9% each year during this time period. There are 534,973 people currently living with thyroid cancer in the United States.[4] With more patients requiring diagnostic or therapeutic operations, an evaluation of surgical risk is important.

The American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) is a multi-institutional initiative that collects data from more than 500 hospitals. The data include 135 variables including preoperative status, intraoperative variables, and postoperative outcomes, including 30-day postoperative morbidity and mortality.

The aim of this study was to use the ACS-NSQIP database in evaluating a large number of patients in order to

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Abbreviations and Acronyms
ASA = American Society of Anesthesiologists
BMI = body mass index
OR = odds ratio

identify the incidence of nontechnical postoperative complications and their associated risk factors. The majority of reports examining postthyroidectomy outcomes focus on technical complications such as temporary vocal cord dysfunction (2.5% to 7.2%), permanent vocal cord dysfunction (0% to 1.4 %),[5,6] transient hypocalcemia (1.6% to 53.6%), permanent hypocalcemia (0% to 9.3%),[7,8] and wound hematoma (0.1% to 1.6%).[9-11] Reported nontechnical complications for thyroidectomy have been limited due to the favorable safety profile.

METHODS

The ACS-NSQIP hospitals database was queried for patients undergoing transcervical thyroid surgery between 2005 and 2010, based on 2012 Current Procedural Terminology (CPT) codes (Table 1). Patients with a diagnosis of malignant thyroid disease were identified using postoperative International Classification of Disease 9th edition (ICD-9) codes (Table 1). The details of NSQIP data collection and risk adjustment for the assessment of comparative surgical care among various hospitals have been previously published.[12-16] The collected variables included age, sex, race, American Society of Anesthesiology (ASA) class, surgical approach, and nonmodifiable risk factors or comorbidities. Postoperative outcomes included 30-day morbidity and mortality. Postoperative morbidity included complications in 6 categories: pulmonary (reintubation, failure to wean, pulmonary embolism, COPD exacerbation), infectious (pneumonia, surgical site infection, urinary tract infection), neurologic (cerebrovascular event/stroke with neurologic deficit), renal (acute renal failure), cardiovascular (myocardial infarction, congestive heart failure, and cardiac arrest) and other (bleeding, deep venous thrombosis DVT). Predictors for return to the operating room were also identified.

The statistical methods used included logistic regression analysis using the software STATA, version 11.1.[17] Statistical significance was set at $p < 0.05$. Bivariate or multivariate analysis was used to identify and adjust for confounding risk factors. Cross-tabulated proportions and corresponding odds ratios (OR) and 95% confidence intervals were used to estimate the relative effect of various risk factors on the outcomes of interest. Multivariate analysis could not be performed for mortality secondary to only 25 deaths out of 38,577 patients. There were not enough observations in each cell to allow a meaningful risk adjustment.

Table 1. NSQIP Thyroidectomy CPT Codes and Postoperative ICD-9 Codes

	(Total n = 38,577)		
Code	**n**	**%**	**Description**
CPT code			
60210	2,202	5	Partial thyroid lobectomy
60212	364	1	Partial thyroid unilateral lobectomy with contralateral subtotal lobe
60220	11,069	28	Complete lobectomy
60225	1,191	3	Complete lobectomy with contralateral subtotal lobe
60240	17,355	44	Total thyroidectomy
60252	3,223	8	Total thyroidectomy with limited neck dissection
60254	512	1.3	Total thyroidectomy with radical neck dissection
60270	182	0.47	Repeat thyroid surgery with substernal thyroidectomy
60260	1,392	3	Completion thyroidectomy
60271	1,087	2.82	Substernal thyroid, cervical approach
ICD-9 Codes			
193	11,639	99.32	Malignant neoplasm of thyroid gland
194	1	0.01	Malignant neoplasm of other endocrine glands and related structures
194.1	15	0.13	Malignant neoplasm of parathyroid gland
194.9	7	0.06	Malignant neoplasm of endocrine gland, site unspecified
195	1	0.01	Malignant neoplasm of other and ill-defined sites
196.1	1	0.01	Secondary and unspecified malignant neoplasm of intrathoracic lymph nodes
196.9	2	0.02	Secondary and unspecified malignant neoplasm of intrathoracic lymph nodes, site unspecified
198.89	46	0.39	Secondary malignant neoplasm of other specified sites