



Understanding readmissions following operations of the thyroid and parathyroid glands



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ABSTRACT

Background: In anticipation of bundled-payment models for thyroid and parathyroid disease, a better understanding of resource utilization following surgery is required. We sought to characterize the use of hospital services following such operations using an analysis of readmissions.

Methods: Patients age 18+years who underwent a thyroid or parathyroid operation in CA or NY (2008–2011) were classified by procedure type. Primary outcome was readmission within 90 days. Univariate and multivariable logistic regression were used to determine factors associated with readmission. Subset analysis was performed for thyroid cancer patients.

Results: Among 59,427 patients, 34.2% had thyroid cancer. Eleven percent (n = 6462) were readmitted within 90 days, with 27% readmitted to a different hospital than the index. 66.2% of thyroid cancer patients were readmitted for a related condition.

Conclusion: Eleven percent of patients are admitted to the hospital within 90 days of an operation in the thyroid or parathyroid glands. Patient factors and diseases necessitate the use of hospital services. Bundled payments must consider the patients' needs for hospital-based services in calculating costs for surgically treated endocrine disorders.

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1. Background

There are more than 100,000 thyroid operations and 17,000 parathyroid operations performed annually in the United States.^{1,2} For some of these procedures, guideline-based care includes expected “re”-admissions following the index operation.^{3–5} For example, both an indeterminate nodule of the thyroid that is found to be malignant after surgical resection, and persistent/recurrent hyperparathyroidism following an index operation, require reoperation and necessitate the use of hospital services according to current recommendations.⁶ These planned readmissions frequently occur within 90-days of the index operation.

The restricted use of hospital-based services has been targeted for cost savings in bundled payment models that do not allow for readmissions. The Center for Medicare/Medicaid Services' (CMS) Final Rule for the Comprehensive Care of Joint Replacement (CJR) model exemplifies this approach. In this model, hospitals retain financial responsibility for entire episodes of care for Medicare beneficiaries undergoing CJR. An episode of care is defined as: “all-related care, or admissions, within 90 days of hospital discharge”.⁷ As written, this approach would not allow for the anticipated need for hospital-based care for patients with surgically treated thyroid and parathyroid conditions following an index operation.^{8–10}

To date, studies that examine nationwide rates of readmission after thyroidectomy and parathyroidectomy are few in number,² and little is known about readmissions within 90 days. Adding further complexity, patients often seek hospital care at several facilities rather than just one hospital. We aimed to characterize the use of hospital services following thyroid and parathyroid operations using an analysis of readmissions within 90 days. We specifically sought to inform future discussions regarding potential bundled payments by better understanding the complete needs for hospital-based care of patients based on their individual profiles.

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2. Methods

We performed a retrospective observational cohort study for all patients 18+ in California or New York (2008–2011) who received an inpatient thyroid (ICD-9 procedure codes 06.2, 06.3, 06.31, 06.39, 06.4, 06.5, 06.50, 06.51, 06.52) or parathyroid (06.8, 06.81, 06.89) gland resection. Subjects were grouped by their procedure type during the index admission (partial thyroidectomy, total thyroidectomy, substernal goiter resection, thyroidectomy with lymph node dissection (LND), or parathyroidectomy). Patients who died prior to discharge were not at risk for readmission within 90 days and were excluded ($n = 131$).

Data for this study was derived from discharge data from California State Inpatient Databases (SID), Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality¹¹; and the New York's Statewide Planning and Research Cooperative System (SPARCS) Database.¹² SPARCS and California SID contain all inpatient claims for a core set of clinical (patient characteristics like age, race and sex, diagnoses, procedures performed, time to procedure, length of stay and readmissions) and nonclinical factors (year of care, state of care, insurance status, and structural hospital characteristics). A hybrid dataset was prepared from both SPARCS and California SID for study analysis.

Patient demographics, comorbidities, diagnoses, operation type, timing of surgery, and the presence of any admission in the year preceding the index operation were identified as covariates. Any admission in the year prior to the index admission was flagged as a potential marker of poor health status, and was therefore included in the analysis. All comorbidities were defined using the Elixhauser index software, provided by the Agency for Healthcare Research and Quality (AHRQ), and classified as 0, 1, or 2+ comorbidities.¹³ Individual complications were defined using ICD-9 codes for hypocalcaemia, vocal cord paralysis, nerve injury, vocal disturbance, hematoma, and tracheostomy after day of surgery (see Appendix 2). A binary variable denoting “any complication,” defined as the occurrence of any of the aforementioned complications, was also created. Hospital volume was determined by the number of beds (small <100; medium 100–300, >large 300). Prolonged length of stay (LOS) indicated a stay greater than or equal to the 75th percentile of all stays per hospital and procedure type.

Our primary analysis included all patients selected in the cohort described above. Factors known to be associated with readmissions were explored. These factors included pre-operative health status, as measured by comorbidities and previous hospitalization, admission urgency, and thyroid cancer. The outcome of interest was the presence of any readmission within 90 days of the index operation.

For subset analysis, readmissions following surgery for thyroid neoplasm or cancer were classified by the admission diagnosis recorded in the subsequent admission (s). Additionally, the subset with a diagnosis of cancer in the subsequent admission (s) were categorized into three groups based upon the treatment received during the subsequent admission(s). The groups included: anticipated and related to the index operation (“Anticipated”), unanticipated and related to the index operation (“Unanticipated”), and unrelated to the index operation (“Unrelated”). Category assignments were made by a focus group of authors (RRK, GCK, LK) and classification disputes were resolved by the senior surgeon (RRK). Patients missing treatment information ($n = 48$) were excluded from this subset analysis.

Descriptive statistics were generated and univariate analysis was performed using chi-square and Fisher's exact test, as appropriate. Factors significantly associated with readmission within 90 days in univariate analysis were considered for inclusion in the multivariable model ($p < 0.10$). In subset analysis of readmitted patients, factors associated with readmission to a different hospital

were examined using univariate and multivariable regression. Finally, in a subset analysis of thyroid cancer and thyroid neoplasm patients who were readmitted, the nature of the readmission and readmission category were examined. Bonferroni correction was used to adjust for the multiple outcomes examined. All analyses were performed with STATA 13.1 (College Station, TX).¹⁴ This study was reviewed by the Institutional Review Board of the University of Pennsylvania and deemed exempt from continuing review.

3. Results

3.1. Index hospitalization

A total of 59,427 patients were included in the study. The most common operation performed was a total thyroidectomy ($n = 23,727$, or 39.8%) followed by partial thyroidectomy ($n = 20,008$, or 33.6%), substernal thyroidectomy ($n = 1,966$, or 3.3%), thyroidectomy with LND (4,412, or 7.4%), and parathyroidectomy ($n = 9,445$, or 15.9%). The population was predominantly female ($n = 45,245$; 78.9%), white ($n = 38,344$; 65.1%), and commercially insured ($n = 38,344$; 65.1%). Thirty-four percent ($n = 20,313$) of the population had thyroid cancer.

3.2. Primary analysis: 90 day readmissions

The overall 90-day readmission rate for this cohort was 10.9% ($n = 6462$). Patient characteristics associated with the highest readmission rates were as follows: having an operation on a day other than the day of admission (readmission rate 21.9%), age greater than 85 years (20.0%), hospital admission within the preceding 12 months (19.7%), emergency admission (18.6%), and thyroid cancer (17.6%). (See Tables 1 and 2). In examining post-operative characteristics, the highest rate of readmission was seen in patients with prolonged LOS (18.6%), or any complication of the operation (3.9%). Of the complications reported, nerve injury and tracheostomy after day of surgery were associated with the highest rates of readmission. (See Table 3). Differences in hospital setting and owner type had little effect upon rate of readmission (See Table 4).

In multivariable analysis, factors significantly associated with any readmission within 90 days included sex, state, year of operation, insurance, comorbidity, timing of procedure, emergency admission, and procedure type. Patients with thyroid cancer had the highest odds of readmission (OR 3.68; 95% CI 3.35–4.04) compared to all other patient and hospital covariates that were significantly associated with 90-day readmission. Other factors that significantly increased odds of readmission were the presence of 2+ comorbidities (1.36; 1.24–1.49), emergency admission (1.57; 1.37–1.81), and previous hospital admission (1.78; 1.45–1.71). Notably, patients had significantly decreased odds of readmission when they received surgery within 24 h of admission (0.59; 0.51–0.67), had a total thyroidectomy (0.64; 0.59–0.70), or a thyroidectomy with LND (0.68; 0.59–0.77). (See Table 5).

Subset Analysis: All readmitted patients by hospital type (index versus different).

Among the readmitted patients, 1716 (26.3%) were admitted to a different hospital rather than the index and 4746 patients (73.4%) were readmitted to the index hospital. Among patients who were treated at a small hospital during their index admission and readmitted to a different hospital, 94.3% returned to a larger one. A small majority of patients (58.1%) who went to a large hospital for the index admission returned to a large hospital for their readmission (See Table 6).

Multivariate analysis showed an increased odds of readmission to a different hospital for the following factors: total thyroidectomy OR 2.03; 95% CI (1.67–2.48), thyroidectomy with LND (2.31;

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