Objectives. To identify factors associated with long-term postoperative hypocalcemia after total thyroidectomy and to understand the relationship between hypocalcemia and costs of care. Methods. We evaluated 126,766 patients undergoing total thyroidectomy between 2010-2012 using cross-tabulations and multivariate regressions. Results. Postoperative hypocalcemia was present in 19.1% of patients the first 30 days following surgery, and in 4.4% of patients at any time. Magnesium disorders were present in 2.1% of patients the first 30 days and in 0.3% patients at 1 year. Short and long hypocalcemia were significantly more likely in women, age 40-years, surgery for thyroiditis or cancer, vitamin D deficiency, concurrent neck dissection, and intraoperative parathyroid or recurrent laryngeal nerve injury. Compared to the initial postoperative period, the odds of hypocalcemia decreased by 90% (OR=0.109,95% CI=0.09-0.13) at 6-months and 95% (OR=0.070,95% CI=0.058-0.080) at 1 year. After controlling for all other variables, magnesium disorders were associated with the highest odds of postoperative hypocalcemia at 30 days (OR=9.07(8.1-10.5)) and at 1 year (OR=28.72(25.7-31.8)). Hypocalcemia was associated with significantly increased mean incremental costs at 30 days ($32,296) and at 1 year ($58,418), while magnesium disorders were associated with even higher mean incremental costs at 30 days ($4,004) and at 1 year ($50,229).

Conclusions. Hypocalcemia is common after total thyroidectomy but resolves in the majority of patients by 1 year. Magnesium disorders are a significant predictor of short- and long-term hypocalcemia, and are associated with significantly greater overall costs of care. These data suggest a potentially modifiable target to reduce morbidity of long-term hypocalcemia following total thyroidectomy.

Methods. A cross-sectional analysis of patients undergoing total thyroidectomy was performed using data from the MarketScan Commercial Claims and Encounters Database and the MarketScan Lab Database (Truven Health Analytics, Ann Arbor, MI). This is a large US-based employment-based database containing individual-level inpatient and outpatient insurance billing claims for employees and their dependents from approximately 45 large employers covered by over 100 commercial payors. MarketScan allows longitudinal tracking of patients across different sites of care over multiple years and contains information regarding inpatient and outpatient treatment, demographic data, primary and secondary diagnoses, procedures, and related costs. 

Postoperative hypocalcemia and overall costs of care were examined as dependent variables. Hypocalcemia was defined as short-term when occurring during the initial treatment period, using claims listing from the first date of treatment to 30 days after the initial treatment end date, while long-term outcomes were defined as those present in claims at 3-6 months (90-180 days after surgery) and 6-12 months after surgery (181-365 days after surgery).

Data were analyzed using Stata 14 (StataCorp, College Station, TX). Associations between variables were analyzed using cross-tabulations, multivariate logistic regression analysis and multinomial logistic regression analysis. Data were structured as panel data for the analysis of outcomes that were measured over time. National projections of case volumes in the commercially insured population were extrapolated using a proprietary methodology developed by MarketScan, and were included in the MarketScan Database. The mean age was 46.5 years (range: 18-84 years), and the majority of patients were female (81.6%) with no comorbidity (95%). The most common pathological indication for surgery was thyroid malignancy (50.2%). Reported surgical complications were rare, with recurrent laryngeal nerve injury documented in 2.4% of patients, and 10% of patients who required re-implantation of their parathyroid glands. Approximately 3.9% of patients were readmitted within 30 days following surgery.

In the initial 30 days following surgery, 19.1% of patients were reported to have hypocalcemia, and 4.4% were reported to have a disorder of magnesium. Concurrent hypocalcemia and magnesium disorder were found in 1.4% of patients (p<0.001). At one year following surgery, the prevalence of hypocalcemia dropped to 4.4%, and that of magnesium disorders to 2.3%. Magnesium disorders were associated with the highest risk for both short-term (OR=9.07) and long-term (OR=28.72) hypocalcemia. After accounting for all related variables, at 6 months, the OR of hypocalcemia was 90.1% less than that in the initial treatment period, and 92.9% less at 1 year. The mean predicted total cost for overall hypocalcemia at 30 days following surgery was $14,666 and at 1 year following surgery was $25,276 in 2016 USD. Hypocalcemia was associated with significantly increased mean incremental costs at 30 days ($22,296) and at 1 year ($58,418), while magnesium disorders were associated with even higher mean incremental costs at 30 days ($4,004) and at 1 year ($50,229).

Discussion. These results demonstrate that transient hypocalcemia is a common complication following TT, but that it prevalence dramatically decreases at one-year follow up surgery. Persistent hypocalcemia at one year was significantly associated with magnesium disorder. Our data show that the presence of magnesium disorder was associated with a 9-fold increase in the odds for short-term hypocalcemia, and a 29-fold increase in the odds for long-term hypocalcemia. Nellis et al. reported a similar trend in Nationwide patient sample data, where the authors found that patients with magnesium disorders had the greatest odds ratio for developing hypocalcemia following thyroidectomy, even after adjusting for relevant covariates. Despite magnesium disorders being a rare preoperative finding in patients undergoing TT –4.4% of our population estimate – it is the strongest predictor for persistent hypocalcemia at six- and twelve-months following surgery. These findings shed light on a potential target for reducing the likelihood of both transient and persistent hypocalcemia following TT by screening for and managing magnesium disorders prior to surgery. Further research is needed to show if magnesium disorders can be used as a factor to risk-stratify patients for outpatient thyroidectomy.