

# Same-Day Thyroidectomy Outcomes: A Canadian Multi-Center Retrospective Cohort Study

**Mélyssa Fortin**

McGill University

**Maxine Noik**

Marianopolis College

**Thomas J. Hudson**

Jewish General Hospital

**Sabrina D. da Silva**

Jewish General Hospital

**Véronique-Isabelle Forest**

Jewish General Hospital

**Michael P. Hier**

Jewish General Hospital

**Alex M. Mlynarek**

Jewish General Hospital

**Richard J. Payne** (✉ [rkpayne@sympatico.ca](mailto:rkpayne@sympatico.ca))

Jewish General Hospital

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## Research Article

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# Abstract

## Background

The American Thyroid Association supports same-day thyroid surgery (SDT) in select patients. In practice, it is common for thyroid surgeons to monitor patients overnight for postoperative complications such as cervical hematoma, recurrent laryngeal nerve injury (RLN) and symptomatic hypocalcemia. We sought to determine the safety profile and predictive factors of adverse postoperative outcomes for SDT based on the experience of three large institutions.

## Methods

A retrospective cohort study was conducted for all thyroidectomies performed at three McGill University tertiary and quaternary care centers in Montreal, Canada between January 1st, 2016 and November 13th, 2020. Patient characteristics were associated with outcomes by bivariate and multivariate analyses.

## Results

A total of 2297 records were surveyed and 1983 patients (1513 females, 470 males) met the inclusion criteria. Amongst them, 603 (30.4%) patients were discharged the same day. The overall postoperative complication rate amongst SDT was 3.6% compared with 10.7% for inpatients ( $p < 0.0001$ ). Cervical hematoma was not observed in the SDT group, whereas 8 inpatients (0.6%) developed this complication ( $p = 0.061$ ). RLN injury occurred in 7 SDT (1.2%), compared with 35 (2.5%) inpatients ( $p = 0.050$ ). Symptomatic hypocalcemia occurred in 3 SDT (0.5%) compared with 73 (5.3%) inpatients ( $p < 0.0001$ ). 36 (6%) 30-day Emergency department (ED) visits were noted for SDT compared to 172 (12.5%) for inpatients ( $p < 0.0001$ ), and none required readmission or reoperation within that postoperative period. In the multivariate logistic regression analysis, SDT patients were less associated with comorbidities and had a lesser risk to develop symptomatic hypocalcemia ( $p < 0.0001$ ). SDT patients had lower 30-day ED ( $p = 0.041$ ) and reoperation ( $p = 0.037$ ) rates compared with the inpatient group.

## Conclusion

This study demonstrates that SDT are safe in a select group of patients under the care of experienced thyroid surgeons at high volume thyroid surgery centers. SDT can also lead to significant cost savings in a publicly funded health care system. Further exploration is needed to clarify patient profiles most amenable to SDT and inform clinical decision-making.

## Introduction

Traditionally, patients undergoing thyroid surgery have been admitted to the hospital overnight for observation in the postoperative period. In recent years, same-day thyroid surgery (SDT) has increased in frequency as a result of potential benefits from postoperative recovery at one's home, coupled with a decrease in healthcare expenditures [1, 2].

The American Thyroid Association published an interdisciplinary consensus statement on ambulatory thyroid surgery. The committee concluded that outpatient thyroidectomies may be undertaken safely in a carefully selected patient population provided that certain precautionary measures are taken to maximize communication and minimize the likelihood of complications [3]. Traditionally, patients undergoing thyroid surgery remained in the hospital to allow for monitoring of potential life-threatening complications, particularly, an expanding cervical hematoma leading to the compromising of the airway, as well as symptomatic hypocalcemia and bilateral vocal fold paralysis [4–8].

Despite the technical advances in thyroid surgery, there continues to be concerns regarding the safety of SDT [9–12]. The aim of this study is to compare adverse postoperative outcomes between patients undergoing SDT to patients remaining in hospital overnight. The second aim of this study is to determine whether SDT in select patients are a safe alternative to an overnight hospital stay.

## **Materials And Methods**

### **Study design and population**

This retrospective cohort study was conducted at three McGill University affiliated tertiary and quaternary care centers located in Montreal, Quebec, Canada: the Jewish General Hospital (JGH), the McGill University Health Centre (Royal Victoria Hospital (RVH) and Montreal General Hospital (MGH)). Research Ethics Board approval was obtained. Eligibility criteria included previously untreated patients, who were of the age 18 or older, submitted for thyroid surgery between January 1st, 2016 and November 13th, 2020. Patients undergoing a parathyroidectomy alone, lateral or bilateral neck dissection, or any other non-thyroid surgical procedure were not included in the study. Data was collected from electronic records, using preoperative and postoperative documentation: operative reports, pathology records and laboratory studies.

### **Independent variables and outcomes**

Comorbidity was defined as any poorly controlled medical condition or illness with functional impairment (American Society of Anesthesiologists score > 2) [11]. Patients with Graves' disease, nodules > 5cm, on anticoagulants, Type 1 diabetes, both Type 2 diabetes and hypertension, coagulopathies, severe obstructive sleep apnea, obesity and other comorbidities deemed by the treating physician to be unsafe for same-day discharge, were selected to remain in the hospital overnight [12–13]. Patients living alone or more than 1 hour away from a hospital were also selected to remain in the hospital overnight. Patients in the SDT cohort were discharged between 4 and 11 hours after surgery. Meanwhile, the inpatient

population encompassed all patients admitted overnight, including those with a prolonged hospital stay. Every patient received both standardized verbal and written perioperative instructions [14].

The primary outcomes were defined as postoperative complications, such as 1) recurrent laryngeal nerve (RLN) injury as evidenced by vocal fold paresis or paralysis, 2) cervical hematoma requiring surgical evacuation or 3) symptomatic hypocalcemia. Secondary outcomes included 1) 30-day postoperative Emergency department (ED) visits, 2) readmission, or 3) reoperation amongst both thyroid surgery groups. Duplicates, patients who were lost to follow-up, or those with incomplete medical records were excluded from further analysis.

## Statistical analysis

Statistical analyses of associations between variables were performed by the two-sided Fisher's exact test (with significance set for  $P < 0.05$ ) and for continuous variables, the non-parametric Mann–Whitney u test. Multivariate logistic regression models were used to determine the most significant independent variables. All analyses were performed using the statistical software package STATA-13 (STATA Corporation, College Station, TX, USA).

## Results

### Study characteristics

During the study period, 2297 records were surveyed. A total of 1983 patients were included in the study. Of the entire cohort, 1544 patients (77.9%) underwent thyroid surgery at the JGH, 415 patients (20.9%), at the RVH, and 24 patients (1.2%) at the MGH. The 1577 thyroidectomies included: 628 cases (31.7%) were benign, 1311 cases (66.1%) malignant, and 44 cases (2.2%) were classified as non-invasive follicular thyroid neoplasm (NIFTP). In decreasing order of frequency, the surgeries performed included hemi/subtotal thyroidectomy (62%), total thyroidectomy (27%) with or without central neck dissection and completion thyroidectomy (11%). The overall patient population included 1513 females (76.3%) and 470 males (23.7%). Comorbidities were observed in 881 patients (44.4%), and 1102 patients (55.6%) were found to be generally healthy and without any association with risk factor. Patient clinical profiles are shown in Table 1.

Table 1  
Patient profile comparison between same-day and inpatient thyroid surgery groups

<b>Variants</b>	<b>Same day thyroid surgery n = 603 (%)</b>	<b>Inpatient thyroid surgery n = 1380 (%)</b>
Age (years) ± SD	47 ± 12	53 ± 14
< 30	59 (10)	75 (5)
30 < 50	293 (49)	495 (36)
50 < 70	228 (38)	615 (45)
70+	23 (4)	195 (14)
Sex		
Female	471 (78)	1042 (76)
Male	132 (22)	338 (24)
Presence of comorbidities		
Yes	179 (30)	702 (51)
No	424 (70)	678 (49)
Type of surgery ± CND		
Hemi/subtotal thyroidectomy	497 (82)	735 (53)
Completion thyroidectomy	84 (14)	135 (10)
Total thyroidectomy	22 (4)	510 (37)
Final pathology		
Benign	213 (35)	415 (30)
Malignant	372 (62)	939 (68)
NIFTP	18 (3)	26 (2)
† Percentages are presented in parenthesis. They were rounded to the closest digit.		
‡ Central neck dissection (CND); Non-invasive follicular thyroid neoplasm (NIFTP)		

## Clinical outcomes

During the study period, 603 (30.4%) patients were discharged home on the same day of surgery. An increasing number of same-day surgeries were noted as time went on: 2016 (70 same-day surgeries) to 2020 (142 same day surgeries). Additionally, it represented 17% of all thyroid surgeries performed in 2016 compared to 46% in 2020 (Fig. 1).

The postoperative complication rate and hospital course following same-day and inpatient thyroid surgery are presented in Table 2 for comparison. The overall postoperative complication rate amongst SDT cases was 3.6% compared with 10.7% inpatient ( $p < 0.0001$ ). Complications included RLN injury ( $n = 7$ , 1.2% in same-day surgery compared with  $n = 35$ , 2.5% of inpatient;  $p = 0.050$ ), symptomatic hypocalcemia ( $n = 3$ , 0.5% in same-day surgery compared with  $n = 73$ , 5.3% of inpatient;  $p < 0.0001$ ). Other adverse events noted in the day surgery population included: seroma requiring drainage (5), new-onset of dysphonia with normal vocal fold movement on flexible laryngoscopy (3), surgical site infection or dehiscence (2) and allergic reaction to perioperative dressing/glue (2). Overall, postoperative complications accounted for eleven of the thirty-six 30-day ED visits recorded for the outpatient surgery population. In fact, most ED visits ( $n = 36$ , 6% in same-day surgery compared with  $n = 172$ , 12.5% of inpatient;  $p < 0.0001$ ) pertained to paresthesia with normal calcium levels or other physical complaints (headache, neck, chest or knee pain, general weakness) with no concerning features. Meanwhile, cervical hematoma was not observed in the same-day surgery patient population compared to 8 inpatients (0.6%) ( $p = 0.061$ ). None of the same day patients required readmission (compared with  $n = 28$  in inpatients, 2%;  $p < 0.0001$ ) or reoperation (compared with  $n = 9$  in inpatients, 0.9%;  $p = 0.047$ ) within the first 30 days of the postoperative period. The multivariate logistic regression analysis (Table 3) revealed that SDT patients were less associated with comorbidities (-0.185; 95% CI, -0.224-0.145;  $p < 0.0001$ ) and had a lower risk of developing symptomatic hypocalcemia (-0.223; 95% CI, -0.342-0.104;  $p < 0.0001$ ). Moreover, the SDT group had lower 30-day ED ( $p = 0.041$ ) and reoperation ( $p = 0.037$ ) rates compared with inpatient group (-0.0323; 95% CI, -0.627-0.020, and - 0.076; 95% CI, -0.148-0.003 respectively).

Table 2  
 Comparison of postoperative complication rate and hospital course between same-day thyroidectomy patients and those admitted overnight

<b>Variants</b>		<b>Same-day n (%)</b>	<b>Inpatient n (%)</b>	<b>P-value</b>
Any postoperative complication	No	581 (96.4)	1232 (89.3)	< 0.0001
	Yes	22 (3.6)	148 (10.7)	
Recurrent laryngeal nerve injury	No	596 (98.8)	1345 (97.5)	0.050
	Yes	7 (1.2)	35 (2.5)	
Cervical hematoma	No	603 (100)	1372 (99.4)	0.061
	Yes	0	8 (0.6)	
Symptomatic hypocalcaemia	No	600 (99.5)	1307 (94.7)	< 0.0001
	Yes	3 (0.5)	73 (5.3)	
30-day ED visit	No	567 (94)	1208 (87.5)	< 0.0001
	Yes	36 (6)	172 (12.5)	
30-day readmission	No	603 (100)	1352 (98)	< 0.0001
	Yes	0	28 (2)	
30-day reoperation	No	603 (100)	1371 (99.3)	0.047
	Yes	0	9 (0.7)	
† Emergency department (ED)				

Table 3

Multivariate logistic regression analysis predicting the most significant outcomes associated with same-day compared to inpatient thyroidectomy

Variants	Regression coefficients	St. error	<i>t</i>	<i>P</i> -value	Lower bound <sup>†</sup>	Upper bound <sup>†</sup>
Comorbidity	-0.185	0.020	-9.109	0.0001	-0.224	-0.145
Any postoperative complication	-0.052	0.048	-1.088	0.277	-0.0146	0.042
Recurrent laryngeal nerve injury	-0.082	0.078	-1.045	0.296	-0.235	0.072
Symptomatic hypocalcaemia	-0.223	0.061	-3.682	0.0001	-0.342	-0.104
30-day ED visit	-0.076	0.037	-2.046	0.041	-0.148	-0.003
30-day readmission	-0.042	0.095	-0.440	0.660	-0.229	0.145
30-day reoperation	-0.0323	0.155	-2.087	0.037	-0.627	-0.020
† 95.0% confidence interval						
‡ Emergency department (ED)						

## Discussion

The healthcare system is under increased scrutiny to reduce costs without undermining the quality of patient care. Patient comfort and economic considerations have had a significant impact on the evolving trend towards ambulatory surgery. In head and neck surgery, SDT surgery has gained popularity for its potential to enhance postoperative recovery and patient satisfaction, whilst favoring the reallocation of resources [2]. However, given the potentially serious complications of thyroid surgery in the early postoperative period, a need arose for greater guidance to support best practices and appropriate postoperative management while ensuring patients' safety [15–18].

In select patients, the practice of SDT surgery has been supported by the American Thyroid Association and the Canadian Society of Otolaryngology-Head and Neck Surgery (CSOHNS) [3, 19]. Despite the risk of postoperative complications, studies have suggested that serious adverse events in SDT surgery could be treated promptly and effectively [8, 20–22]. The CSOHNS guidelines for SDT include: "Patient Factors, Social Situation, Final Check [physical examination and laboratory results postoperatively], and Protocol [verbal and written instructions to seek medical attention]" [19]. In this study, we sought to examine the safety profile of these guidelines in SDT surgery and searched for the existence of factors predicting complications or adverse outcomes.

We observed that select patients could be safely discharged on the same day as their thyroid surgery when the procedure was performed by experienced thyroid surgeons [8, 20–24]. The SDT postoperative

complication, 30-day ED visit and readmission rates were lower than for the inpatient population group, and fewer patients required calcium supplementation for symptomatic hypocalcemia. The remaining outcomes, including cervical hematoma, recurrent laryngeal nerve injury and 30-day reoperation did not reach statistical significance.

Access to medical care for the SDT group was adequate for those who returned to the ED. None of these patients required readmission or reoperation; they were reassured and sent back home. The most common complaint was paresthesia with normal serum calcium levels. Another common concern regarded erythema at the surgical site without evidence of infection.

Previous studies observed that inpatient thyroid surgery could in fact correlate with an increased risk of postoperative complications [4, 25]. These results may be explained by the difference in demographics and comorbidities between SDT and inpatient groups. A younger and healthier population may be at a lesser risk of developing postoperative complications and adverse reactions to general anesthesia. Moreover, the extent of surgery (total vs hemi-thyroidectomy) may also have had an impact on morbidity, as total thyroidectomy requires more dissection and hemostasis, and increases the risk of RLN and a parathyroid gland injury. In our study, the majority of patients undergoing a total thyroidectomy remained in the hospital. As a result, the difference in complication rates may be attributed to the extent of surgery and not whether the patient remained in the hospital or were discharged the same day. Moreover, the extensive work performed at McGill affiliated institutions and worldwide successfully investigated postoperative management of calcium and parathyroid hormones to predict which patients would require active supplementation [26–28]. Combining that work with this study, surgeons at McGill affiliated institutions will be more comfortable sending a larger percentage of total thyroidectomy patients home the same day.

Common barriers to a same-day postoperative discharge following thyroid surgery can be examined with a biopsychosocial framework. Personal attributes favoring a postoperative admission include the presence of comorbidities leading to an increased perioperative risk of complications. Intraoperative adverse events, drain insertion, episodes of apnea or undiagnosed obstructive sleep apnea, and uncontrolled postoperative pain, nausea or vomiting also ought to be factored in [29]. Similarly, the distance from home to hospital, limited at home caregiver abilities, fear and anxiety are also social and emotional factors that need to be considered [30]. Moreover, planned day surgery patients can ultimately be admitted for postoperative observation and monitoring when there are unexpected peri-operative issues such as excessive bleeding. Conversely, some planned postoperative admissions were discharged the same day either due to patient preferences, favorable early postoperative outcomes and direct access to emergency resources. The ultimate responsibility to discharge the patient on the day of surgery requires flexibility on all fronts. A summary of factors ought to be considered in determining patients' postoperative pathway is presented in Fig. 2.

There are several limitations to this study that need to be recognized. First, there were changes in practice introduced in 2020 that lasted for several months due to the COVID-19 pandemic: 1) surgeries were

delayed or cancelled, potentially allowing for the progression of disease and increasing the risk of nerve adherence and complications, 2) flexible laryngoscopy was delayed, 3) longer intubation times, 4) limited access to hospital ED. Overall, these issues may have led to the under-identification of postoperative complications, to a diminution of self-reported symptoms and to fewer hospital visits for non-emergent complaints. Second, ED visits to institutions other than the surgery-based hospital or McGill University hospital network were not accounted for. Finally, other biases may have been introduced due to the retrospective nature of the study. That is to say, the quality of this study lies in its large sample size which we hope will help diminish the impact of these biases on our findings.

## Conclusion

This study supports previously published literature and reiterates that same-day thyroid surgeries are safe when performed by experienced surgeons. The COVID-19 pandemic has highlighted the importance of shared resources and has invited the medical community to reevaluate the appropriateness of ambulatory surgery. Further exploration of this data is needed to clarify patient profiles most amenable to day surgeries, thereby informing decision-making and facilitating changes in practice. Same-day thyroid surgeries have the potential to favor postoperative recovery, increase patient satisfaction, and promote the sharing of resources while decreasing overall healthcare expenditures. Such potential avenues for improvement ought to be considered - especially in publicly funded healthcare systems.

## List Of Abbreviations

*CSOHNS* Canadian Society of Otolaryngology-Head and Neck Surgery

*ED* Emergency department

*JGH* Jewish General Hospital

*MGH* Montreal General Hospital

*SDT* Same-day thyroid surgery

*RLN* Recurrent laryngeal nerve

*RVH* Royal Victoria Hospital

## Declarations

**Ethics approval and consent to participate:** Ethics approval was obtained from the institutional ethics review boards of the McGill University Health Centre (MP-37-2020-6087) and Jewish General Hospital (MEO-37-2020-2094).

**Consent for publication:** Not applicable

**Availability of data and materials:** The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Competing interests:** The authors declare that they have no competing interests.

**Funding:** Not applicable

**Authors' contributions:** MF, MN and TH proceeded with data collection. MF, TH, SD performed the statistical analysis. VIF, MH, AM and RP performed the surgeries. All authors were involved in data interpretation, manuscript writing and reviewing.

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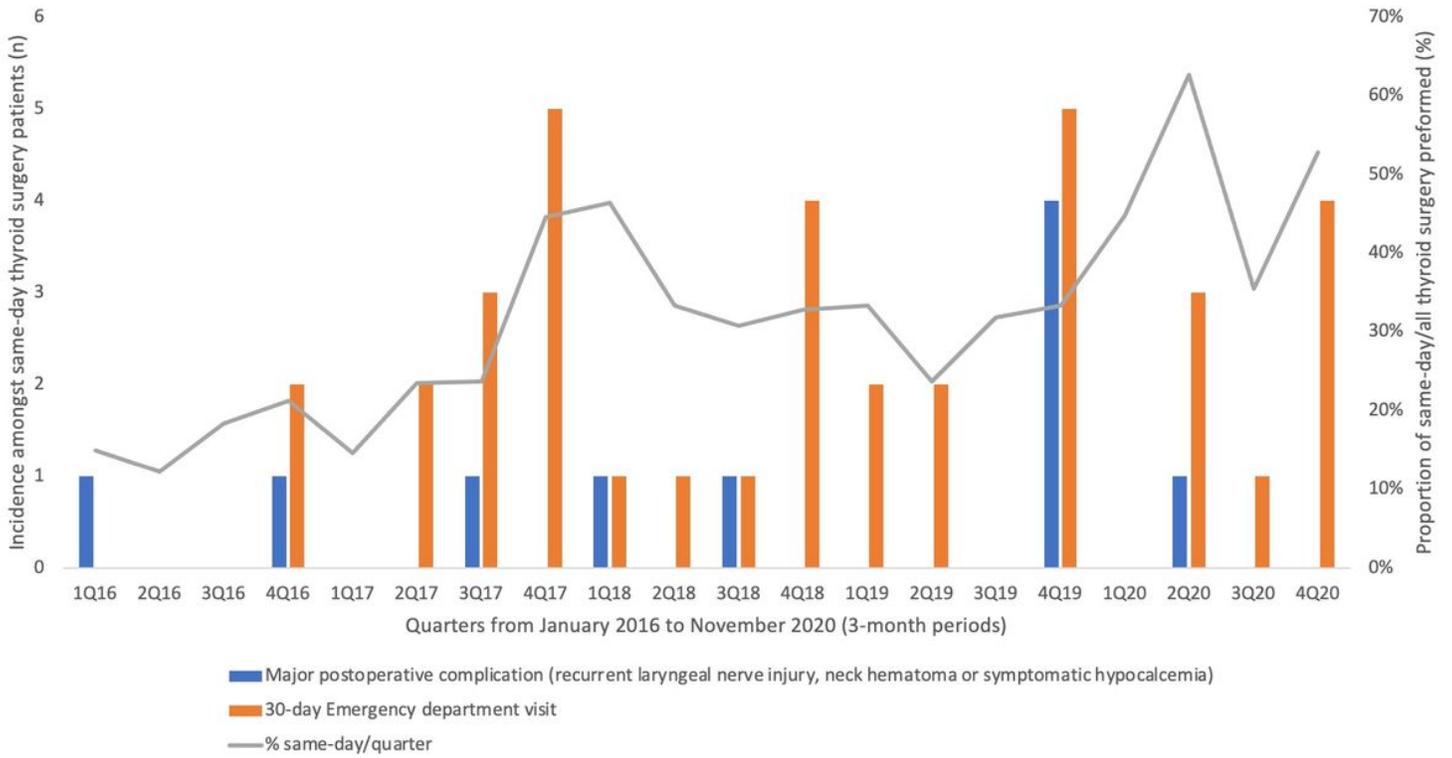
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## Figures

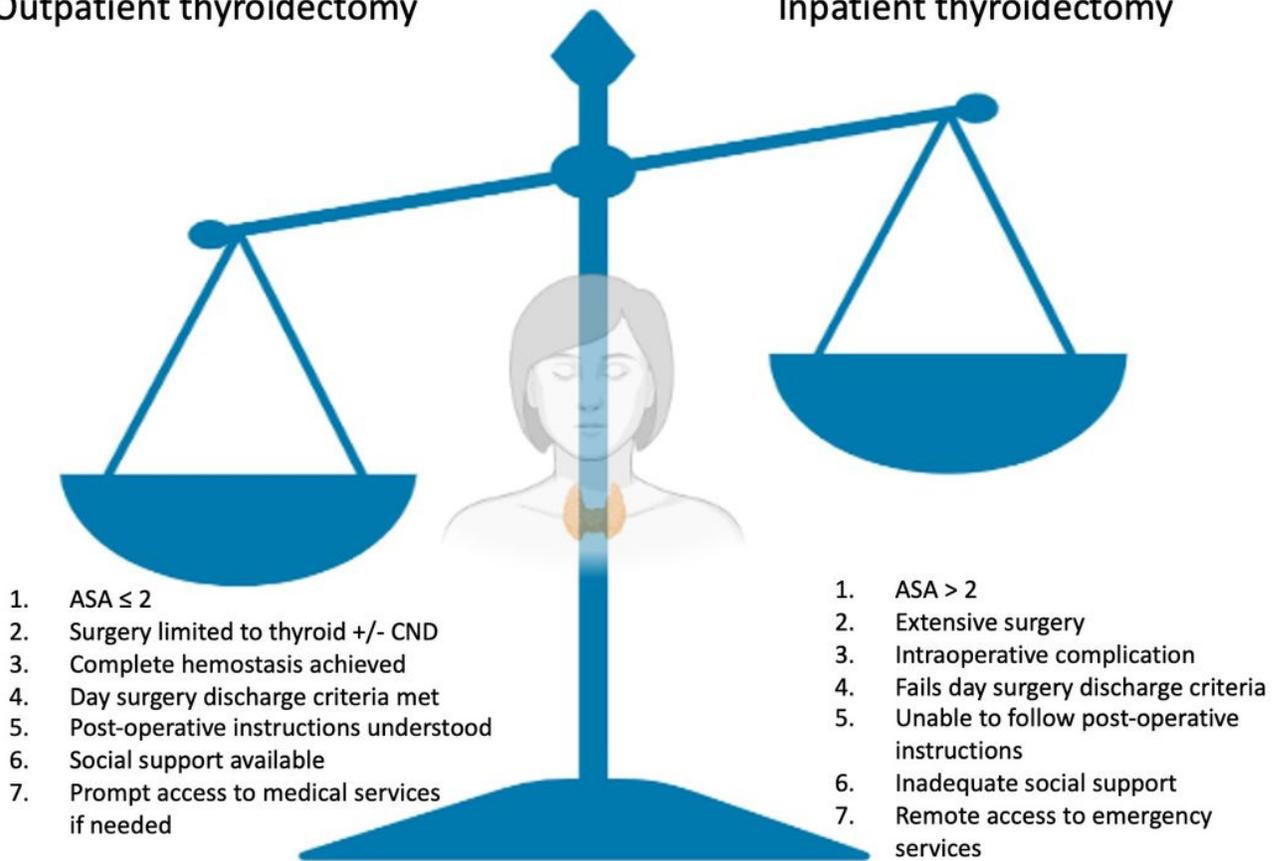


**Figure 1**

Temporal representation of the proportion of same-day thyroid surgery performed and associated major postoperative complications and Emergency department visits.

## Outpatient thyroidectomy

## Inpatient thyroidectomy



**Figure 2**

Clinical factors influencing decision for inpatient *versus* outpatient thyroid surgery. Image created with BioRender.com. ASA: American Society of Anesthesiologists score