

BACKGROUND

- Thyroid eye disease (TED), also known as Graves' ophthalmopathy or thyroid-associated orbitopathy, is a debilitating, potentially sight-threatening, autoimmune disorder that affects approximately 10 per 10,000 people.¹
- Despite recent advancements, including the FDA's approval of teprotumumab, gaps persist in understanding TED onset, treatment efficacy, the benefits of early intervention, and the role of various healthcare providers (HCPs) in patient care.
- Prior claims analyses have focused on TED epidemiology,²⁻⁵ treatment patterns prior to the approval of teprotumumab,^{3,6-8} teprotumumab-associated adverse events (e.g., hearing dysfunction, diabetes risk)⁹⁻¹³ as well as reoperation risk factors.¹⁴
- However, there is a need for a more comprehensive view of TED epidemiology, and care patterns including which HCPs are involved, to enhance disease awareness and inform clinical development of future therapies.

STUDY OBJECTIVES:

- Develop and apply a method for identifying patients with TED utilizing both claims and electronic health records (EHR) data.
- Analyze the latest patterns of care and treatment sequencing in newly diagnosed patients with TED.
- Build a holistic view of TED patients, including symptom presentation, patient journey, and symptom management.

METHODS

- Data from the Optum[®] de-identified Clinformatics[®] Data Mart (Optum[®] CDM) Database and Optum[®] de-identified Electronic Health Record data set (Optum[®] EHR) between January 1, 2016, to September 30, 2023 (study period) were collected for analysis (Figure 1).
- Patients diagnosed with GD and ≥1 TED symptom (including exophthalmos, diplopia, lid retraction, orbital inflammation, or gaze-evoked pain) during the study period were identified from July 1, 2016, to March 31, 2023 (patient identification period), using diagnosis codes and physician notes.
- Moderate-to-severe (MTS) TED was determined via recommended TED-specific interventions¹⁵ (i.e., surgical procedures or pharmacologic treatment), initiated within 6 months of diagnosis.

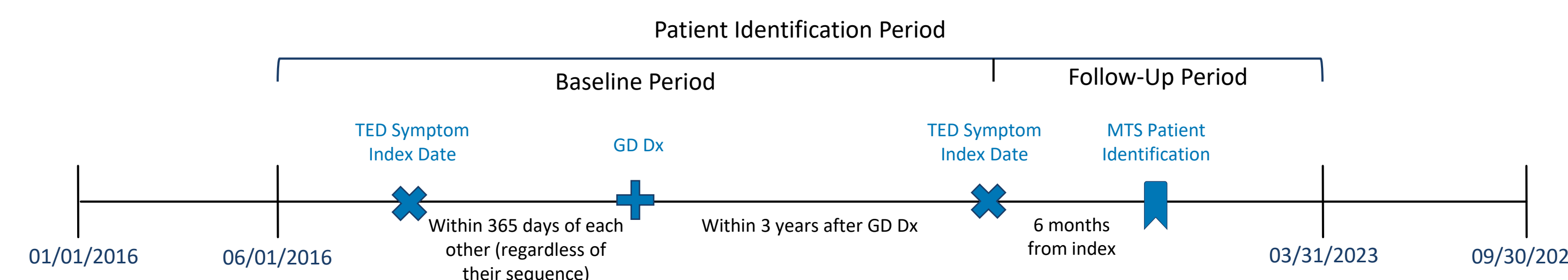


Figure 1. Study design overview. The study population only included new cases of TED (i.e., no prior TED symptoms at baseline). ^aThe first TED symptom (including exophthalmos/proptosis, diplopia, lid retraction, orbital inflammation/disorders, or gaze-evoked orbital pain) was considered the index date. **CAS**, Clinical Activity Score; **Dx**, diagnosis; **GD**, Graves' disease; **ICD**, International Classification of Diseases; **MTS**, moderate-to-severe; **TED**, thyroid eye disease.

Patient Criteria

Unique TED patients were identified based on presence of ≥1 of the following criteria at the index date:

- Graves' disease Dx AND ≥1 TED symptom(s)^a – first date of each within 365 days of each other, or TED symptom within 3 years after diagnosis
- At least 2 visits to an ophthalmologist/oculoplastic surgeon coded with ICD-9: 242.00, ICD-10: E05.00
- Patients with 2 positive mentions of thyroid eye disease OR Graves' eye disease OR Graves' orbitopathy OR Graves' Ophthalmopathy OR Thyroid ophthalmopathy OR Thyroid orbitopathy)

RESULTS

Patient Cohort Identification

- Of 86,656 unique patients meeting one of the three criteria, 36,527 were eligible for inclusion. Among these, 7,494 patients met the criterion for MTS TED (Figure 2).
- Within this dataset, the prevalence of TED was estimated to be 107 per 100,000 (0.12%). This is compared to estimates from the National Organization for Rare Disorders (0.09%–0.3%)¹⁶ and other registry (IRIS, 0.09%)¹ analyses.

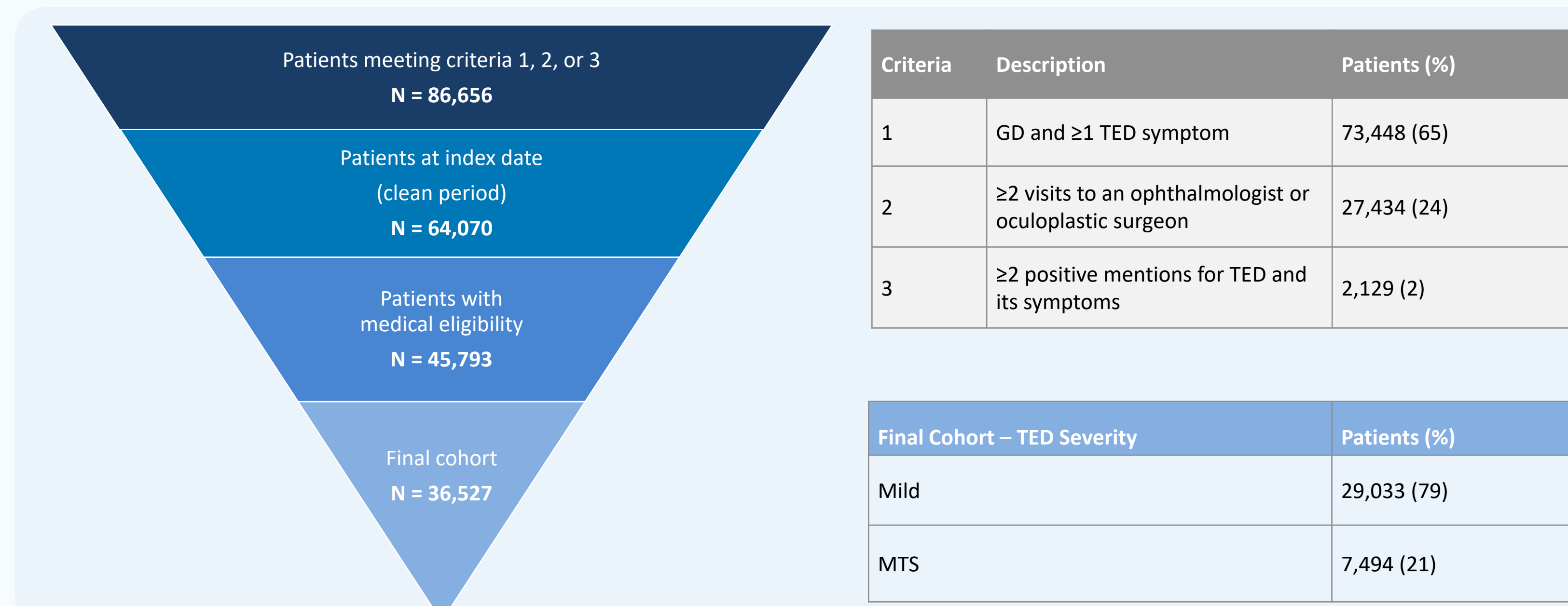


Figure 2. Patient cohort identification. Patients with TED who met 1 of the 3 criteria at index were considered. The index-clean period included patients who may have had an index TED symptom ≥7/1/2016 but first Graves' diagnosis may have been prior to 7/1/2016. No patients with TED symptoms during the baseline period were considered. Among patients with medical eligibility (i.e., medical/pharmacy coverage and/or electronic health records), those with no TED-specific intervention within 6 months prior to index made up the final cohort. **GD**, Graves' disease; **TED**, thyroid eye disease.

Treatment Patterns for Patients With MTS TED

- Among patients with mild TED, the mean/median time to receive their first intervention was approximately 2 years (data not shown).
- MTS patients typically started their first pharmacological treatment ≤3 months (median = 60 days); time to first surgical intervention was approximately 8 months (data not shown).
- Across all timepoints, majority of patients with MTS TED were treated pharmacologically (93%, data not shown) rather than surgically (23%, Figure 4A).
 - Most patients (78.4%) received GCs as their first treatment, while only 4% received immunotherapy first (Figure 4A).
 - Among patients who initiated treatment with glucocorticoids (GCs), approximately 61.5% of oral GC users did not receive a second treatment; however, this may not account for potential additional GC courses (data not shown).
 - Oral GCs were used more frequently than IV administration (80% vs 39.6%; Figure 4B).
 - Immunotherapy was more commonly used as a second-line treatment option, whereby 11% of patients received immunotherapy following initial GC therapy (data not shown).
 - Teprotumumab (9.4%) was the most used immunotherapy (Figure 4C).
 - In patients who received teprotumumab as initial treatment, 36.1% required a second treatment.
 - Among patients on teprotumumab, 18.7% subsequently underwent surgery with strabismus surgery being the most common (49.2% of surgeries performed after teprotumumab treatment; data not shown).

TED Symptom Presentation at Index

- At index, patients presented with various TED symptoms including exophthalmos (30%), diplopia (29%), orbit inflammation (26%), and lid retraction (13%) (data not shown).

TED Diagnosing and Prescribing Specialties

- Patients with TED received care from a broad spectrum of providers (Figure 3).
 - Specialties including ophthalmologists, optometrists, family practitioners (FPs)/general practitioners (GPs), internal medicine physicians, emergency medicine providers, and endocrinologists, were involved in diagnosing TED, while ophthalmologists played a significant role in managing certain TED symptoms (data not shown).

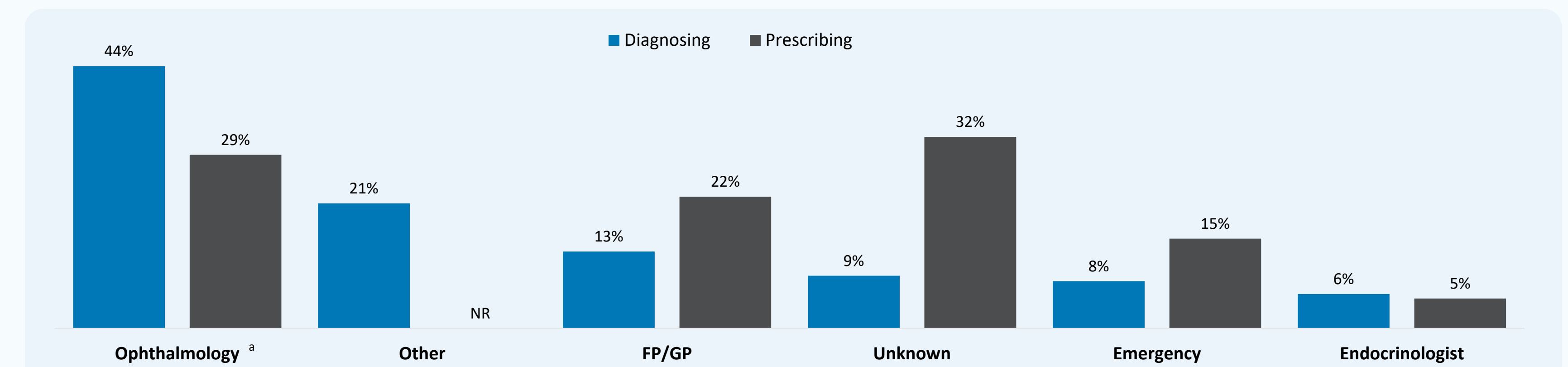


Figure 3. Diagnosing and prescribing specialties for patients with MTS TED. For diagnosis, if more than one specialty for symptom per date was recorded, the highest ranked specialty was used to avoid duplicate entries. Multiple specialties per treatment were possible if there was more than one date of treatment. Ranking first to last: ophthalmology, endocrinology, optometry, other (all other identified specialties, mid-level provider, nurse, physician assistant, other ancillary providers), facility type (hospital, lab, other facility), and unknown. ^aIncludes optometry and oculoplastic surgeons. **FP**, family practitioner; **GP**, general practitioner; **MTS**, moderate-to-severe; **NR**, not reported.

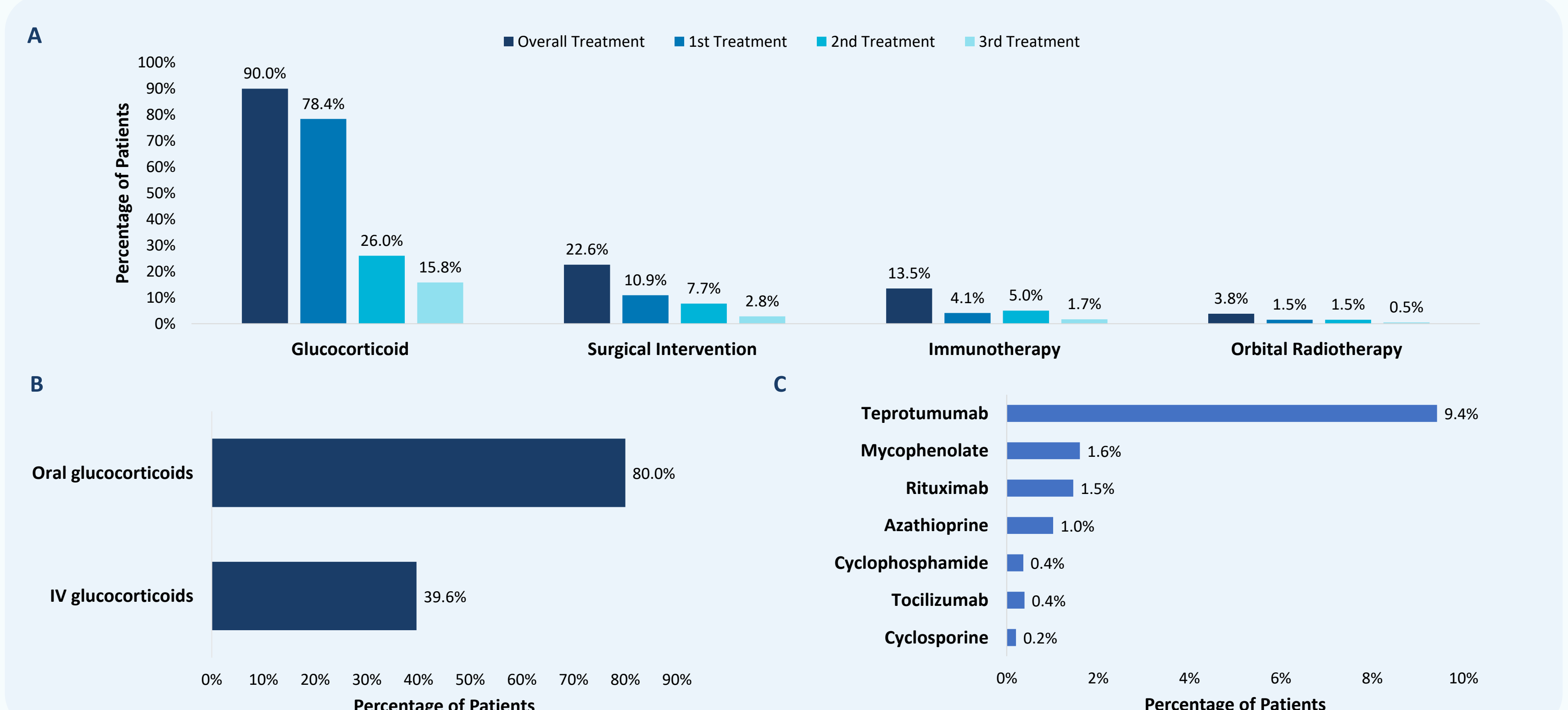


Figure 4. Treatment patterns for patients with MTS TED. A) Treatment choice by line of therapy; B) Overall glucocorticoid use by administration method; and C) Overall immunotherapy use by type. **IV**, intravenous; **MTS**, moderate-to-severe; **TED**, thyroid eye disease.

CONCLUSIONS

- Using data from both Optum[®] CDM and Optum[®] EHR, these findings build upon existing literature and provide further insight into the:
 - Heterogeneity of symptom presentation and multidisciplinary patient journey and management
 - Current treatment and management patterns for TED including the use of teprotumumab compared to other immunotherapies, glucocorticoids, and surgical interventions.
- The symptom presentation, multidisciplinary care, and current treatment patterns for TED patients suggest gaps in symptom resolution and treatment continuity, therefore underscoring the need for holistic and accessible treatment strategies.
- In the absence of a disease-specific ICD code, multicriteria approaches utilizing both claims and EHR data can be leveraged to enrich study samples and provide deeper insights into TED.

ACKNOWLEDGMENTS

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