Characteristics, treatment patterns and disease burden of juvenile myasthenia gravis in the United States

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*These authors contributed equally to the development of the poster

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Introduction

- MG is a rare, chronic, autoimmune disease characterized by dysfunction and damage at the neuromuscular junction[1]
- JMG (MG in patients <18 years old) is very rare; most conventional treatments used for MG are not approved for use in JMG and are often prescribed off-label based on adult guidelines and expert opinion[2,3]
- This longitudinal study using secondary data analysis of claims databases aimed to
  - Describe treatment patterns and HCRU among patients with newly diagnosed JMG
  - Explore differences between patients with pre- and post-pubertal-onset JMG

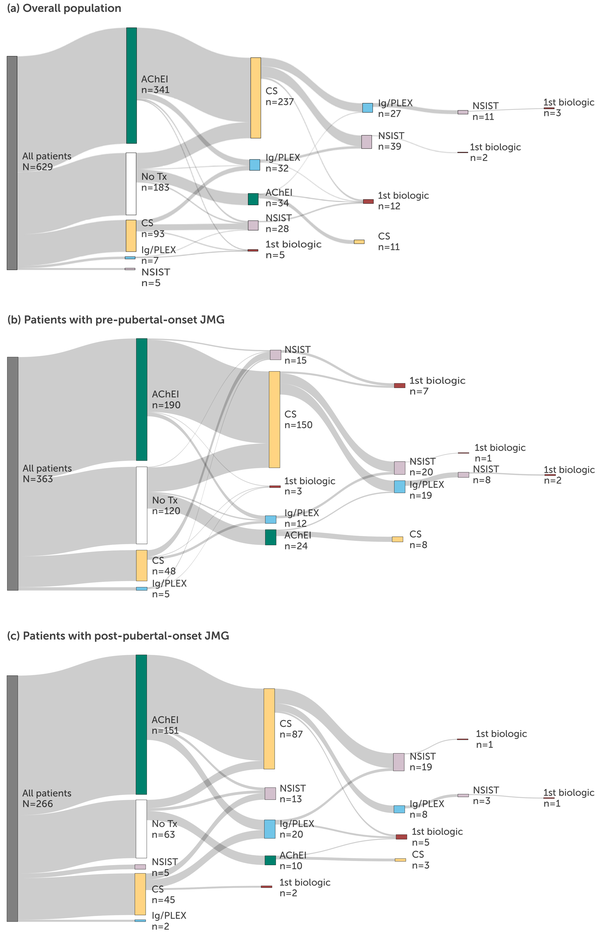
Methods

- Patients were identified using the Merative™ Marketscan® MDCD and CCAE databases. An index date for 'newly diagnosed JMG' was assigned based on either a patient's first JMG diagnosis, or first treatment with AChEIs, maintenance IVIg, or PLEX therapy (whichever occurred first). A baseline period of at least 180 days prior to the index date was imposed to patients who were newly diagnosed (not required for patients ≤1 year at index date)
- Patients with index dates between January 1, 2008 and December 31, 2021 were followed until they reached 18 years of age, discontinuation of medical insurance or the study end date (December 31, 2021), whichever occurred first
- Patients were divided by age at index: pre-pubertal JMG onset (<12 years) and post-pubertal JMG onset (12–17 years)
- The primary outcome was JMG-related treatment patterns during follow-up, assessed by descriptive statistics
  - Hierarchical treatment cohorts were defined based on the best current understanding of JMG treatment regimens: Cohort 0, time before any treatment; Cohort 1, first AChEI; Cohort 2, first CS; Cohort 3, first maintenance Ig/PLEX; Cohort 4, first NSIST; and Cohort 5, first biologic
- JMG-related clinical events or HCRU were evaluated for exacerbations, myasthenic crises, thymectomy, and acute use of IVIg/PLEX during follow-up, inpatient hospitalizations ER visits, and ICU admissions

Results

- During the study period, 630 patients had newly diagnosed JMG (57.6% pre-pubertal onset) (**Table 1**)
- The median (range) follow-up time for the overall population was 2.4 (0–13) years, and for pre- and post-pubertal-onset groups was 3.4 (0–13) years and 1.9 (0–6) years, respectively
- Of 533 treated patients, 375 (70.4%) had first-line treatment with AChEIs (Cohort 1), initiated at a median of 2 days from first JMG claim (**Figures 1** and **2**)
- Treatments were escalated faster for patients with post-pubertal-onset JMG than for those with pre-pubertal-onset JMG, although large ranges were observed according to median (**Figure 2**)
- Thymectomy IR was higher in post-pubertal-onset patients than pre-pubertal-onset patients across all treatment cohorts (**Figure 3**)
- **In later-line treatment cohorts (3–5), exacerbations (Figure 4), and rescue treatment (IVIg or PLEX; data not shown) occurred less frequently in the post- than the pre-pubertal-onset group**
- **Patients treated with maintenance Ig/PLEX (Cohort 3) had the highest rate of MG hospitalizations (IR for overall population: 113.91 per 100 PY; pre-pubertal onset: 124.37 per 100 PY; post-pubertal onset: 100.77 per 100 PY)**
- **Thymectomy, exacerbations, myasthenic crises, MG-related hospitalizations, ER visits and ICU admission were all highest in the first year of follow-up, in the overall population and in each age-of-onset subgroup**
- Limitations: reasons for treatment escalation (i.e. lack of efficacy or adverse events) were not available; small sample size for biologics cohort

Figure 1 Treatment escalation patterns



Of the 630 patients initially identified, one did not receive any treatment, but was followed for less than three months and so did not qualify for the 'no treatment' cohort. This patient was therefore excluded and all analyses involving treatment cohorts were based on 629 patients.

In total, 446, 243 and 203 patients received treatment within three months of the first claim in the overall population, the pre-pubertal-onset group and the post-pubertal-onset group, respectively.

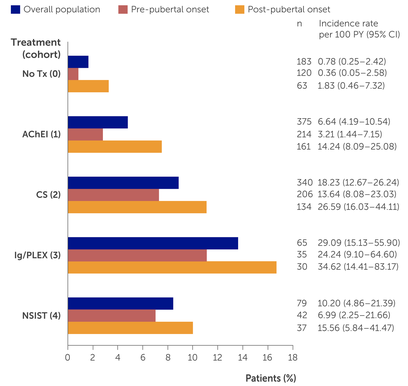
Table 1 Baseline characteristics

	Overall population	Pre-pubertal onset (Aged <12 years)	Post-pubertal onset (Aged 12–17 years)
Patients, n	**630**	**363***	**267***
Sex, female, n (%)	**404** (64.1)	**219** (60.3)	**185** (69.3)
Age at onset, years, median (range)	**10** (0–17)	**5** (0–11)	**15** (12–17)
Comorbidities, n (%)			
Infection	**125** (19.8)	**80** (22.0)	**45** (16.9)
Depression	**36** (5.7)	**10** (2.8)	**26** (9.7)
Anxiety	**93** (14.8)	**45** (12.4)	**48** (18.0)
Hypertension	**14** (2.2)	**7** (1.9)	**7** (2.6)
Any diabetes	**10** (1.6)	**2** (0.6)	**8** (3.0)
Autoimmune thyroiditis	**5** (0.8)	**2** (0.6)	**3** (1.1)
Systemic lupus erythematosus	**3** (0.5)	**0** (0.0)	**3** (1.1)
Other autoimmune disease[†]	**4** (0.6)	**2** (0.6)	**2** (0.8)
Dyslipidemia	**3** (0.5)	**1** (0.3)	**2** (0.8)

*Pre-pubertal-onset and post-pubertal-onset patients comprised 57.6% and 42.4%, respectively, of the overall population.

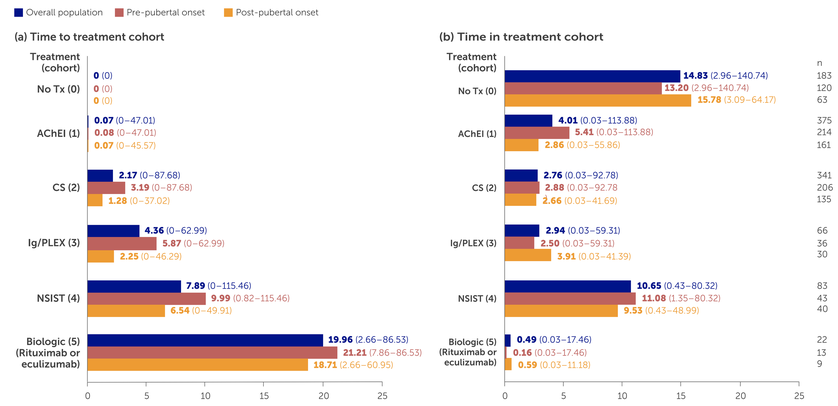
[†]Includes ankylosing spondylitis, psoriasis, psoriatic arthritis, Crohn's disease and ulcerative colitis.

Figure 3 Incidence of thymectomy in each treatment cohort



There was no incidence of thymectomy in the overall population and in each age-of-onset subgroup in patients treated with biologics (Cohort 5).

Figure 2 (a) Time to and (b) time in each treatment cohort, from index date



Abbreviations: AChEI, acetylcholinesterase inhibitor; CCAE, Commercial Claims and Encounters Database; CI, confidence interval; CS, corticosteroids; ER, emergency room; HCRU, healthcare resource utilization; ICU, intensive care unit; Ig, immunoglobulin; IR, incidence rate; IV, intravenous; JMG, juvenile myasthenia gravis; MDCD, Multi-State Medicaid Database; MG, myasthenia gravis; NSIST, non-steroidal immunosuppressant; PLEX, plasma exchange; PY, person-years; Tx, treatment.

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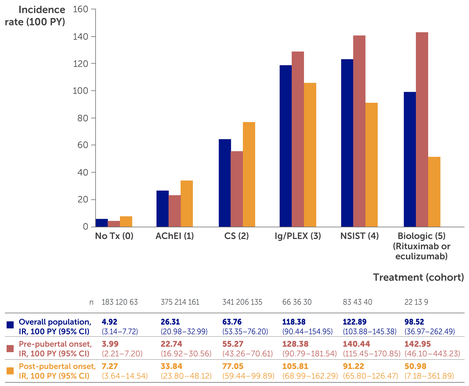
Summary and conclusions

- Some patients with JMG were escalated rapidly through the treatment hierarchy, but continued to experience exacerbations and high HCRU, suggesting current treatments do not provide adequate disease control
- Patients with post-pubertal-onset JMG were escalated faster onto later-line treatments than those with pre-pubertal-onset JMG
- The large ranges observed in time to treatment escalation could be indicative of individual disease expressions and highly individualized treatment approaches of clinicians in treatment of the pediatric population
- New treatments that provide rapid and adequate disease control for patients with JMG are needed to reduce the burden and social impact of disease on patients and their families and to decrease the costs associated with high HCRU

Figure 4 JMG-related exacerbations in each treatment cohort



	No Tx (0)	AChEI (1)	CS (2)	Ig/PLEX (3)	NSIST (4)	Biologic (5) (Rituximab or eculizumab)
n	183 120 63	375 214 161	341 206 135	66 36 30	83 43 40	22 13 9
Overall population, IR, 100 PY (95% CI)	**4.92** (3.14–7.72)	**26.31** (20.98–32.99)	**63.76** (53.35–76.20)	**118.38** (90.44–154.95)	**122.89** (103.88–145.38)	**98.52** (36.97–262.49)
Pre-pubertal onset, IR, 100 PY (95% CI)	**3.99** (2.21–7.20)	**22.74** (16.92–30.56)	**55.27** (43.26–70.61)	**128.38** (90.79–181.54)	**140.44** (115.45–170.85)	**142.95** (46.10–443.23)
Post-pubertal onset, IR, 100 PY (95% CI)	**7.27** (3.64–14.54)	**33.84** (23.80–48.12)	**77.05** (59.44–99.89)	**105.81** (68.99–162.29)	**91.22** (65.80–126.47)	**50.98** (7.18–361.89)

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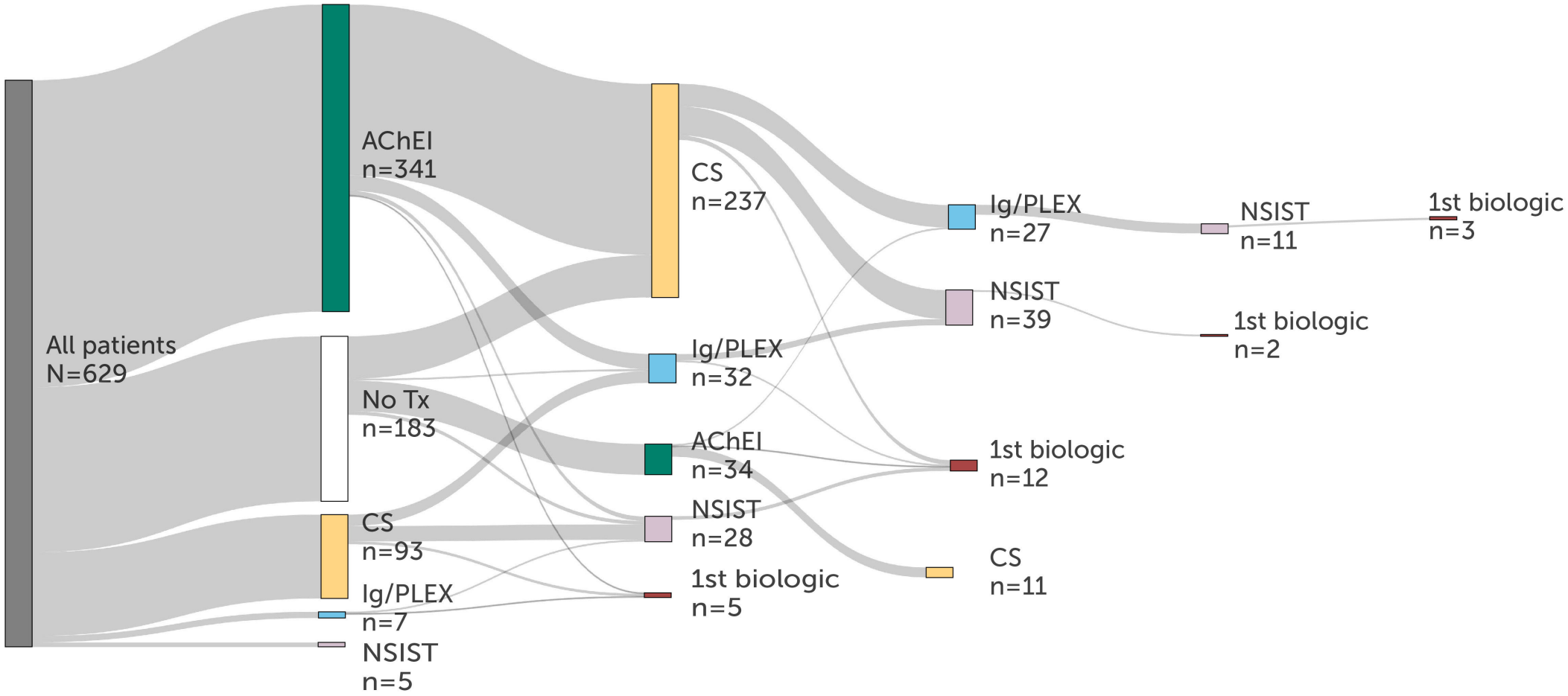
Figure 1 Treatment escalation patterns

(a) Overall population



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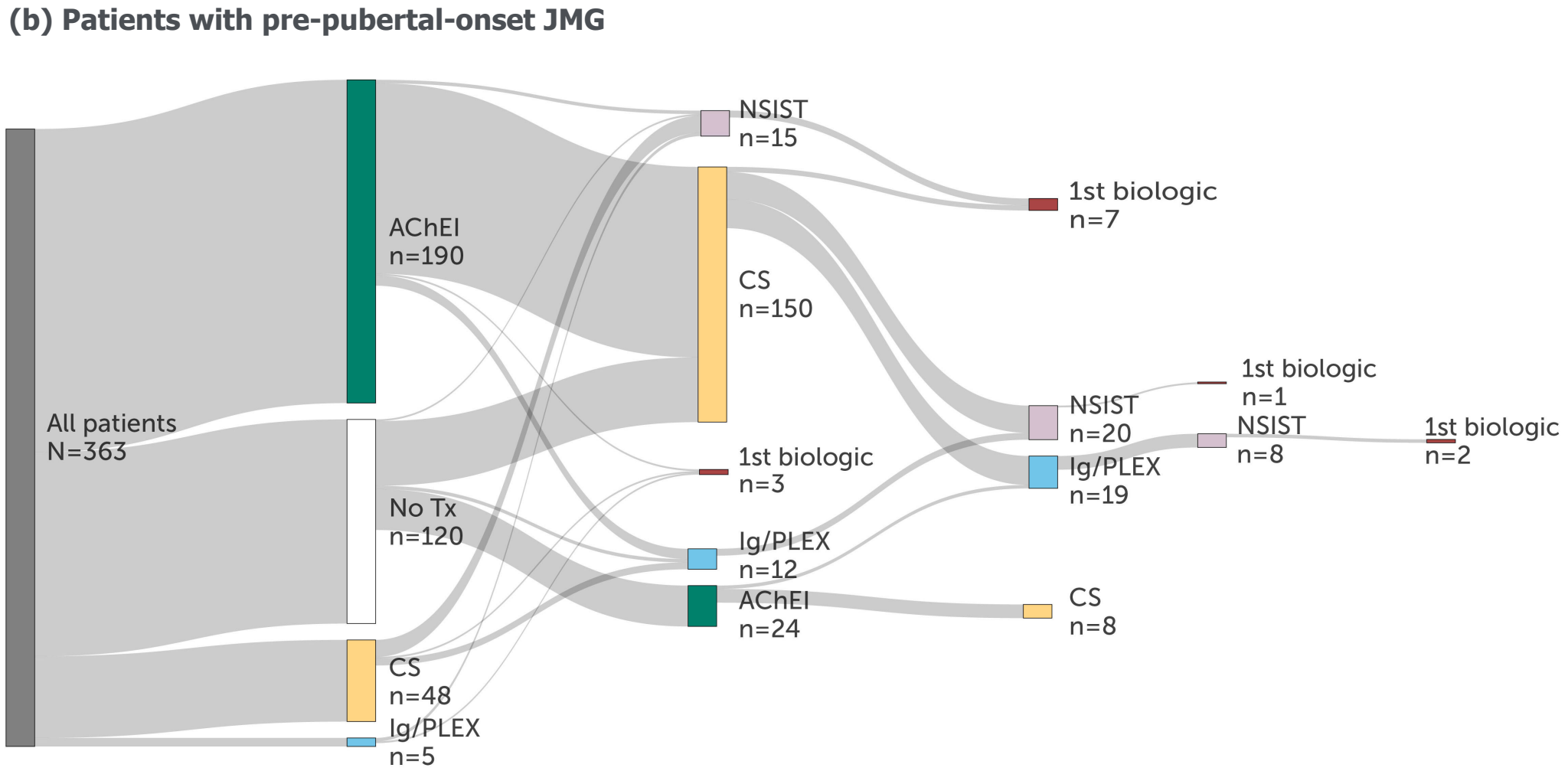

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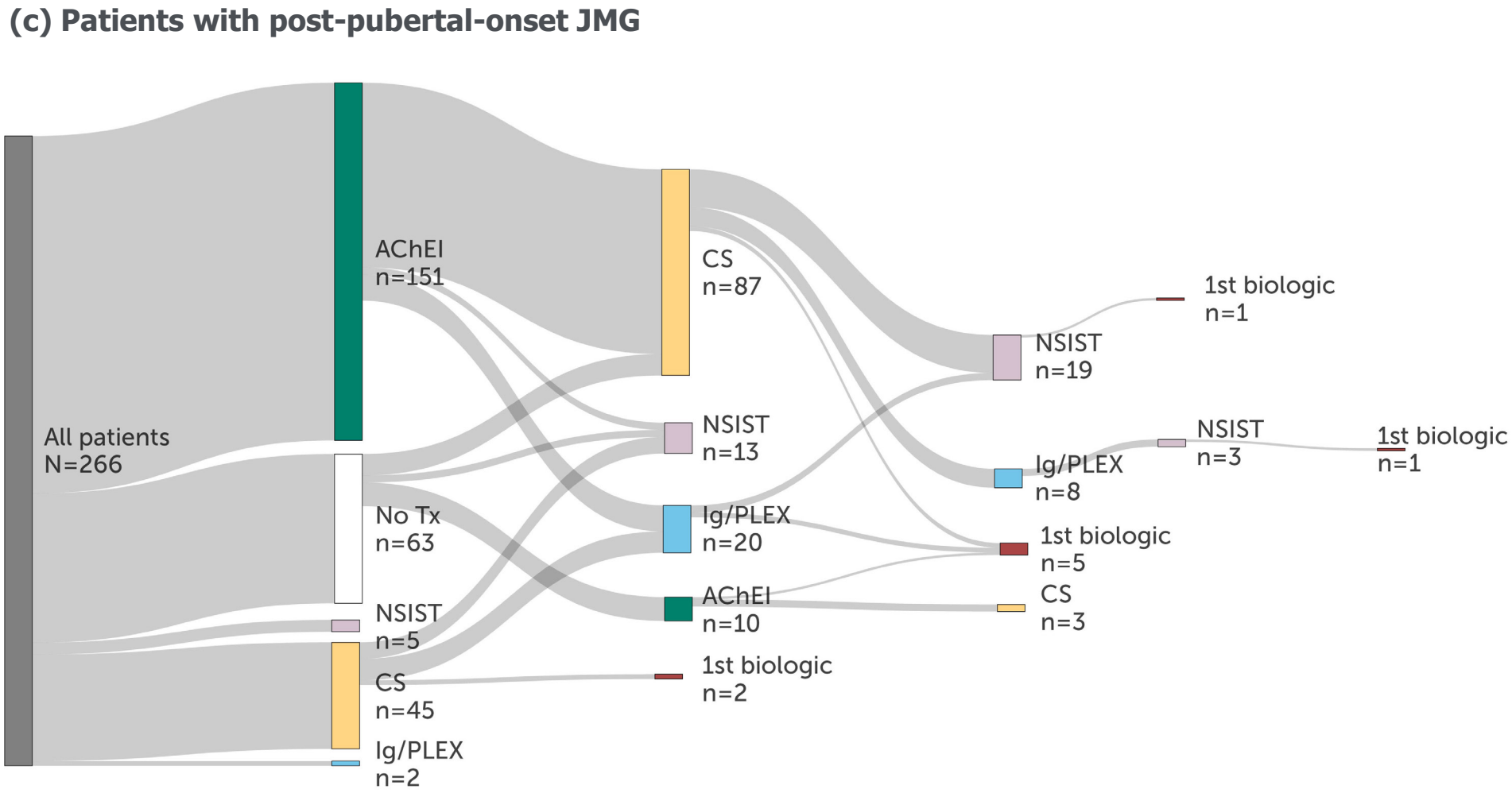

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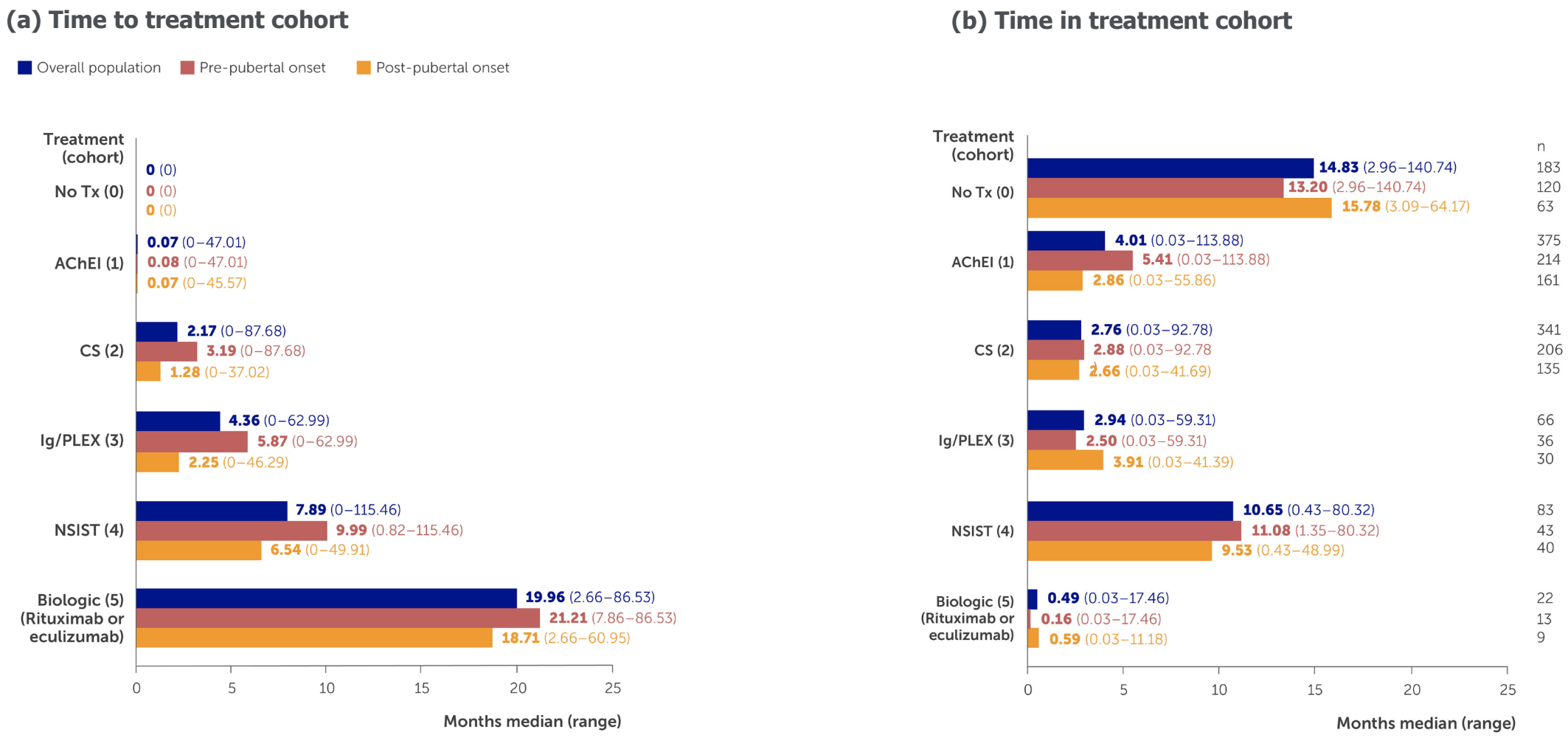

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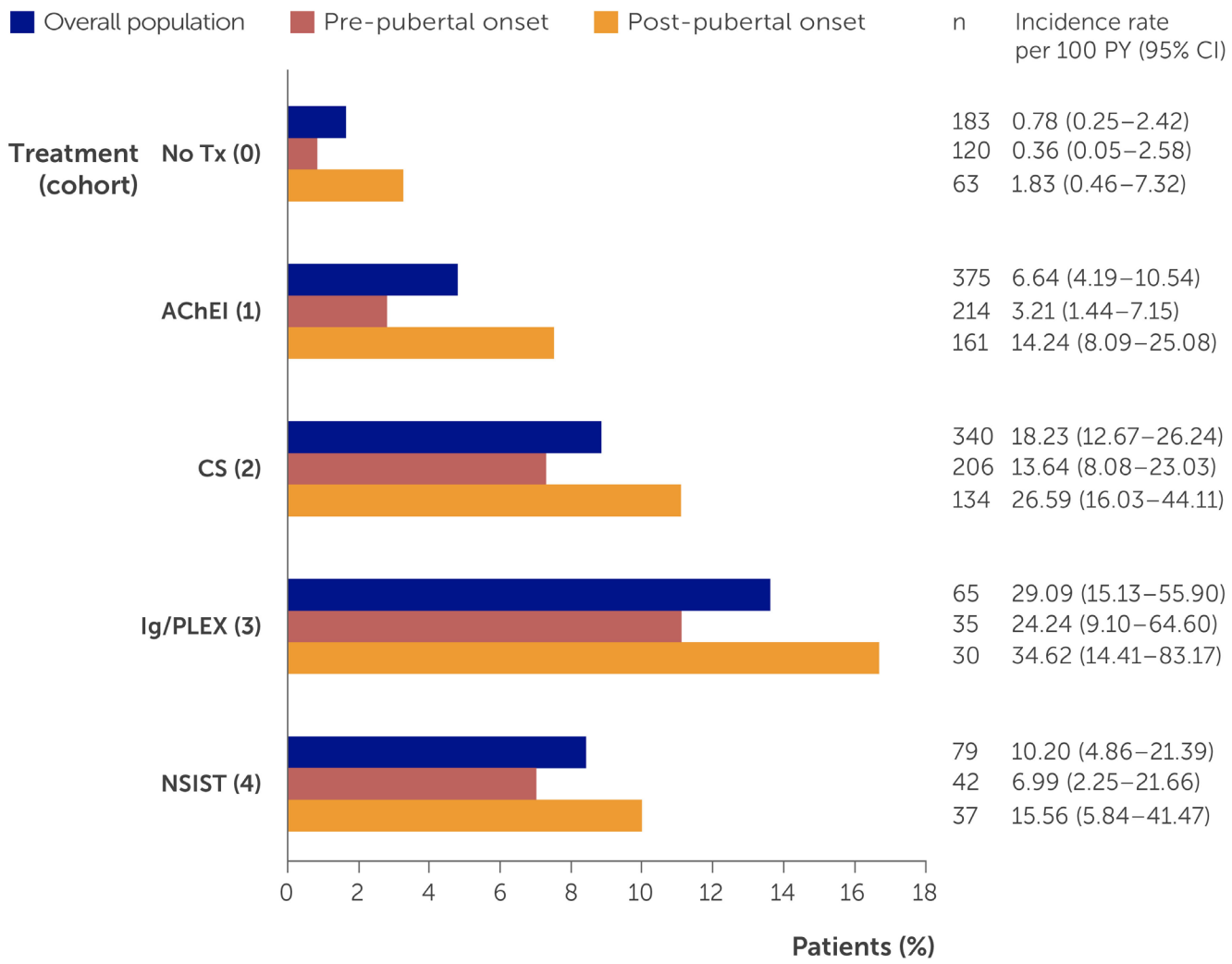

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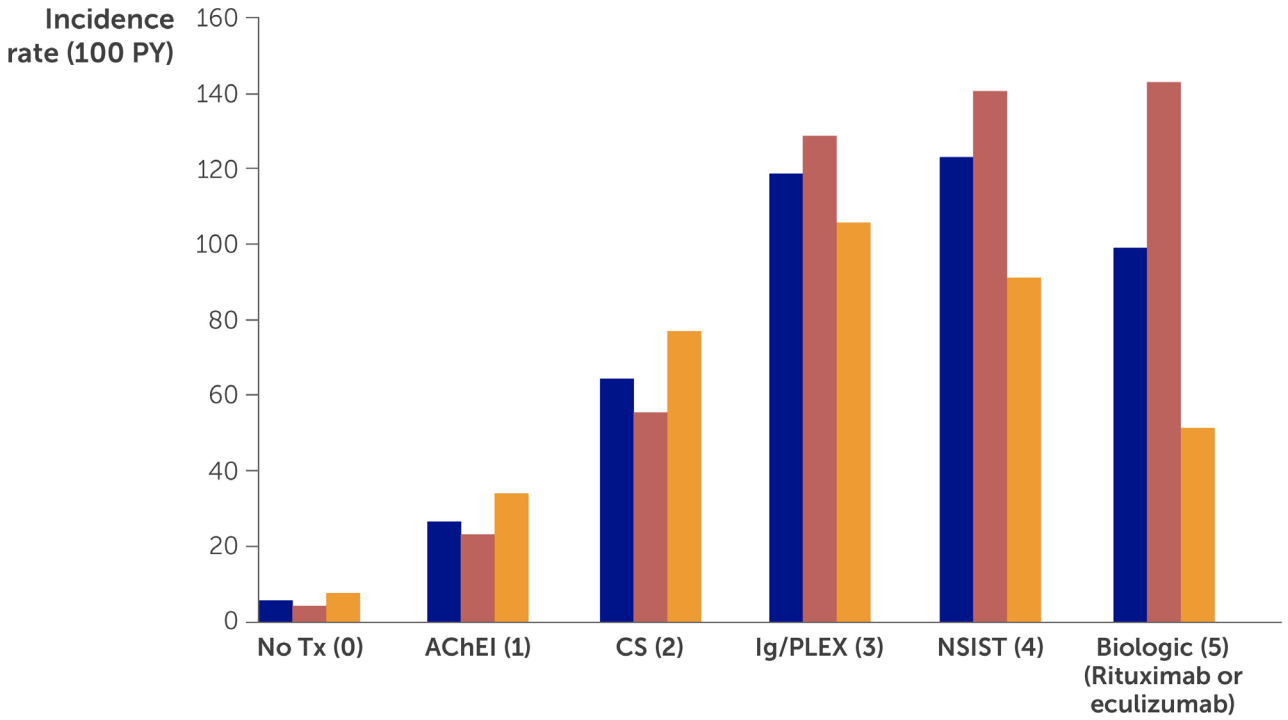

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