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Evolution of High-Efficacy Therapies for Relapsing Multiple Sclerosis

Does Innovation Meet Patient Preferences?

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Objectives

Several high-efficacy therapies (HET) for relapsing multiple sclerosis (MS) are used as treatment options. These therapies differ in their administration profiles. The objective of this study is twofold:

- To elicit preferences for administration characteristics of parenteral HET.
- To evaluate whether recent therapeutic innovations meet patient preferences.

Alongside we compare preferences for administration characteristics for people living with MS and people living without MS and check for differences in age, sex, language and other sociodemographics.

Methods

A. Preference elicitation

We conducted a discrete choice experiment (DCE) in Switzerland with 66 people living with multiple sclerosis (PWMS), as well as 985 people living without MS (PWOMS), approximating the perspective of newly diagnosed PWMS without prior treatment experience.

The survey was conducted in March 2025. The PWMS-sample was primarily recruited through a Swiss patient panel, while the PWOMS sample was drawn from an online panel representative of the Swiss population aged 18 and above in German- or French-speaking regions. By stratifying for age and gender (according to data in Iaquinto, 2024) the sample was made representative of the Swiss MS population along these two dimensions.

Preferences were elicited for five central aspects of HET-administration. These are displayed in Figure 1, together with the corresponding attribute levels.

Figure 1. Attributes (header) and corresponding levels (bullets) used in the DCE

Duration of administration	Frequency of administration	Place of administration	Route of administration	Premedication
• 4 hours (baseline) • 2 hours • 1 hour • 5 min	• Monthly (baseline) • Every 6 months	• Outpatient hospital (baseline) • Neurologist's practice • At home	• Infusion (i.v.) (baseline) • Subcutaneous (s.c.) syringe • Subcutaneous (s.c.) pen	• Necessary (baseline) • Not required

Each respondent made ten decisions between two unlabeled therapy options. Figure 2 shows an example of a choice set.

Figure 2. Example of a choice set

Attributes	Treatment A	Treatment B
Route of administration	Infusion	Infusion
Place of administration	Outpatient hospital	Neurologist's practice
Duration of administration	4 hours	2 hours
Frequency of duration	Every 6 months	Monthly
Premedication	Necessary	Not required
	☐ I choose Treatment A	☐ I choose Treatment B

The statistical analysis builds on the Random Utility Model (RUM) of discrete choice (McFadden, 2001). Individuals selected the alternative that provides the highest latent utility, where utility consists of a systematic component (explained by observable attributes) and a random error term.

To empirically implement this framework, we estimated a conditional logit model with a binary choice indicator as the dependent variable and the attributes as independent categorical variables. Respondent-level covariates were not included: in the PWMS sample due to the limited sample size, and in the PWOMS sample because representativeness was already achieved.

The estimation yields attribute-specific utility weights and allows the direct prediction of choice probabilities for alternative administration profiles defined by the attribute levels included in the survey. A critical assumption is that these levels cover the full range of plausible and relevant values.

B. Evolution of administration profiles

To trace the evolution of administration modalities for HET in relapsing MS, we defined a sequence of five administration profiles that reflect clinically relevant innovations over time. Each profile was designed by combining attribute levels from the DCE to approximate the administration characteristics of marketed therapies. The corresponding administration profiles were not part of the DCE but constructed and used for post estimation predictions.

C. Simulation of choice probabilities

Based on the estimated RUM utility weights from the DCE (Part A), we simulated preference-based choice probabilities for the administration profiles that mimic the evolution of administration modalities for HET in relapsing MS (Part B).

We conducted stepwise simulations. Starting from a baseline profile, we introduced four additional profiles one by one in the order derived in Part B and predicted market shares at each step. In a final scenario, all five profiles were offered simultaneously to assess their relative attractiveness in a competitive choice setting.

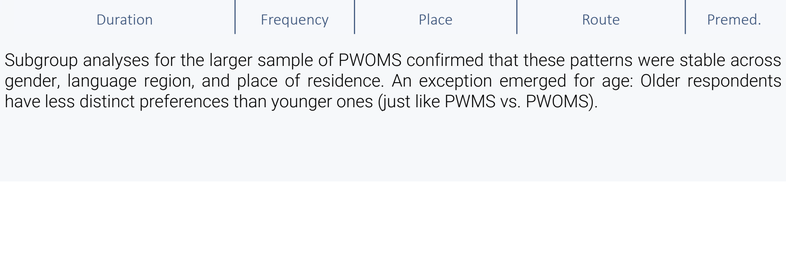
Results

A. Preference elicitation

For PWMS, the most influential aspects in treatment choice were the duration of administration, the treatment frequency, and the place of administration, as Figure 3 shows. Route of administration and the need for premedication played a minor role. When comparing PWMS and PWOMS, the overall weights were similar and differences between both groups not statistically significant, mostly due to large confidence intervals for the small sample size of PWMS.

The largest difference in point estimates concerns the route of administration, which seems more important for PWOMS, approximating a naïve population, about to make their first therapy decision.

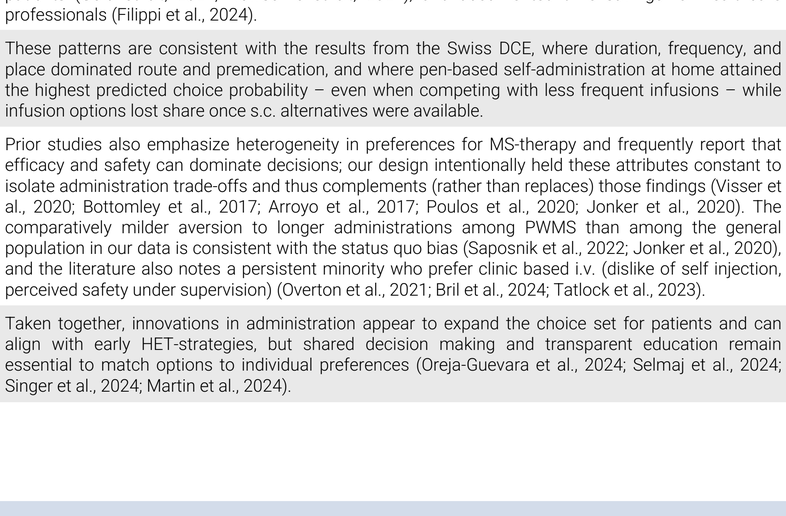
Figure 3. Attribute weights: Relative importance of administration characteristics



All groups of participants showed a clear preference for shorter duration of administration, lower treatment frequency, home administration, and the absence of premedication.

Figure 4 compares the preference for attribute levels of PWMS and PWOMS. PWOMS have more distinct preferences, e.g., they like short durations better and dislike long durations more than PWMS. Possible reasons for differences are a status quo bias for PWMS (based on previous experience with therapy) or simply different preferences (e.g., about risk aversion).

Figure 4. Preferences for attribute levels of PWMS and PWOMS (with 95%-CI)



Subgroup analyses for the larger sample of PWOMS confirmed that these patterns were stable across gender, language region, and place of residence. An exception emerged for age: Older respondents have less distinct preferences than younger ones (just like PWMS vs. PWOMS).

B. Evolution of developments in administration

We identified a sequence of treatment innovations to describe how treatment options have expanded from clinic-based infusions to s.c. injections, including home-based self-administration.

Table 1 specifies the administration profiles of treatments A to E. Innovations are highlighted in green: The first innovation (treatment B vs. treatment A) is 6-monthly administration (instead of monthly), at the "cost" of longer duration and the requirement for premedication (see the last two columns).

Table 1. Sequence of innovations in the development of HET-administration

	Duration	Frequency	Place	Route	Premedication		Innovation	Trade-off
	4h<2h<1h<5min	*monthly<6-monthly*	*outp<pract<home*	*i.v.<syringe<pen*	*yes<no*			
Treatment A	1 hour	monthly	neur. pract.	i.v.	no		*[baseline]*	
Treatment B	2 hours	6-monthly	neur. pract.	i.v.	yes	(1)	frequency	duration & premed
Treatment C	5 minutes	monthly	neur. pract.	s.c. syringe	no	(2)	duration, route & premed	frequency
Treatment D	5 minutes	monthly	at home	s.c. pen	no	(3)	place & route	
Treatment E	5 minutes	6-monthly	neur. pract.	s.c. syringe	yes	(4)	frequency	route, place & premed

C. Simulation of choice probabilities

Simulations of preference-based market shares illustrate how conditional choice probabilities change as new administration profiles are introduced. Table 2 shows the results for PWMS.

We start with a high-efficacy therapy option that requires a monthly i.v. infusion lasting 1 hour without premedication (Treatment A in Table 1) and consider four scenarios:

(1) We add a new treatment option (Treatment B) that decreases i.v. infusion frequency from monthly to six-monthly (at the cost of need for premedication and increased infusion time). We predict a choice probability of Treatment B of 55%, implying that the market share of Treatment A drops to 45% (first column in Table 2).

(2) When we additionally offer Treatment C (monthly s.c. syringe from healthcare professionals, requiring only 5 minutes for administration), this treatment is chosen in 49% of cases, implying smaller shares for established i.v.-based treatment options A and B (second column in Table 2).

(3) Adding a pen for self-administration at home (Treatment D) is the preferred choice for 2 out of 3 PWMS (predicted choice probability is 67%). Infusion-based treatments (A and B) are only preferred in 17% of cases, and Treatment C drops to 16% (third column in Table 2).

(4) When competing against Treatments A to D, Treatment E (a six-monthly syringe with premedication) attracts 25% (last column in Table 2).

With all treatments available, the treatment with pen at home remains the most-preferred option (51%), followed by syringe injections (37%) and infusions (12%).

Table 2. Decision probabilities of different HET-landscapes for PWMS

Scenario	(1)		(2)		(3)		(4)	
	Share	95%-CI	Share	95%-CI	Share	95%-CI	Share	95%-CI
Treatment A	45%	[0.35; 0.55]	23%	[0.18; 0.29]	8%	[0.02; 0.13]	6%	[0.02; 0.07]
Treatment B	55%	[0.45; 0.65]	28%	[0.20; 0.36]	9%	[0.02; 0.16]	7%	[0.02; 0.11]
Treatment C			49%	[0.40; 0.58]	16%	[0.07; 0.24]	12%	[0.06; 0.17]
Treatment D					68%	[0.48; 0.88]	51%	[0.31; 0.70]
Treatment E							25%	[0.16; 0.34]
Sum	100%		100%		100%		100%	

D. Sensitivity analysis

Several robustness checks support the stability of our findings.

Considering people living without MS, approximating the perspective of newly diagnosed PWMS

Compared to PWMS, PWOMS have stronger preferences for administration via pen and at home (see Table 3 compared to Table 2). Accordingly, Treatment D (pen at home) turns out to be particularly dominant: its choice probability is 80%, if all five options are available (vs. 51% for PWMS). This reflects the stronger preference of PWOMS for "good" attribute levels from Figure 4.

Table 3. Sensitivity: Decision probabilities of different HET-landscapes for PWOMS

Scenario	(1)		(2)		(3)		(4)	
	Share	95%-CI	Share	95%-CI	Share	95%-CI	Share	95%-CI
Treatment A	42%	[0.40; 0.44]	17%	[0.16; 0.19]	1%	[0.01; 0.02]	1%	[0.01; 0.02]
Treatment B	58%	[0.56; 0.61]	24%	[0.22; 0.26]	2%	[0.01; 0.02]	2%	[0.01; 0.02]
Treatment C			59%	[0.56; 0.62]	5%	[0.03; 0.06]	4%	[0.03; 0.05]
Treatment D					92%	[0.92; 0.94]	80%	[0.77; 0.84]
Treatment E							13%	[0.11; 0.15]
Sum	100%		100%		100%		100%	

Allowing preference heterogeneity

Estimations using a mixed logit model, which allows heterogeneity in route and place of administration, yielded results consistent with the conditional logit baseline. Other specifications were tested, but the models did not converge: All parameters randomly and other selections of attributes (duration and frequency, both as categorical and continuous variables).

Challenging treatment with pen at home

Relocating the six-monthly syringe injection (Treatment E) from the neurologist's practice to home substantially increased its predicted choice probability to 46% compared to 25% reported in Table 2. Pen at home (Treatment D) remains attractive with a predicted choice probability of 37%, while the "older" treatments combined receive less than 20%.

Validating preference weights via ranking

After the DCE we asked participants to rank treatment attributes from most to least important (see Table 4). This attribute ranking confirmed many of the DCE results, but the duration of administration ranked lower than in the DCE. Premedication was consistently rated as least relevant among the DCE-attributes. The distance between the average ranks for the route, place and duration of administration is rather small, indicating little variation among these factors.

The ranking confirmed efficacy and safety as the most important attributes overall. These were held constant in the experiment, as did patient costs for treatment, which received the lowest rank.

Table 4. Sensitivity: Validation of attribute weights with ranking (after choices)

		Average rank (most to least important: 1 to 8)	Weights from DCE: Relative (in %)	Weights from DCE: Rank (1 to 5)
	Efficacy of treatment	1.8		
	Safety of treatment	3.6		
DCE-attributes	Frequency of administration	3.9	25	2
DCE-attributes	Route of administration	4.7	13	4
DCE-attributes	Place of administration	5	24	3
DCE-attributes	Duration of administration	5.2	28	1
DCE-attributes	Premedication required	5.6	10	5
	Patient costs for treatment	6.2		

Discussion

Our results align with recent evidence that convenience of administration shapes patient choices. Across immune-related diseases, patients tend to prefer s.c. over i.v. administration and – where feasible – home over clinic (Bril et al., 2024; Overton et al., 2021). MS- and HET-specific studies reported preferences for s.c. over i.v. treatment mainly due to less clinic time and greater comfort for patients (Gold et al., 2024; Newsome et al., 2024), and documented time savings for healthcare professionals (Filippi et al., 2024).

These patterns are consistent with the results from the Swiss DCE, where duration, frequency, and place dominated route and premedication, and where pen-based self-administration at home attained the highest predicted choice probability – even when competing with less frequent infusions – while infusion options lost share once s.c. alternatives were available.

Prior studies also emphasize heterogeneity in preferences for MS-therapy and frequently report that efficacy and safety can dominate decisions; our design intentionally held these attributes constant to isolate administration trade-offs and thus complements (rather than replaces) those findings (Visser et al., 2020; Bottomley et al., 2017; Arroyo et al., 2017; Poulos et al., 2020; Jonker et al., 2020). The comparatively milder aversion to longer administrations among PWMS than among the general population in our data is consistent with the status quo bias (Saposnik et al., 2022; Jonker et al., 2020), and the literature also notes a persistent minority who prefer clinic based i.v. (dislike of self injection, perceived safety under supervision) (Overton et al., 2021; Bril et al., 2024; Tatlock et al., 2023).

Taken together, innovations in administration appear to expand the choice set for patients and can align with early HET-strategies, but shared decision making and transparent education remain essential to match options to individual preferences (Oreja-Guevara et al., 2024; Selmaj et al., 2024; Singer et al., 2024; Martin et al., 2024).

Limitations

This study has limitations that should be considered when interpreting the results.

- The analysis is conducted in the Swiss context, with samples drawn from the Swiss MS community and the general population in German- and French-speaking regions. While this ensures high relevance for Switzerland, transferability of the results to other healthcare systems may be limited, even though the literature reports comparable preferences across Europe (Jonker et al., 2020).
- The simulations rest on the critical assumption of comparable efficacy and safety across all administration profiles. This allows to isolate the role of administration attributes, but in clinical reality, perceptions of efficacy or safety may also affect patient preferences.
- We assume comparable patient-borne costs across options, as they were not included as an explicit DCE attribute. This is a plausible simplification for Switzerland, where mandatory health insurance covers treatments after deductibles, but it may limit transferability to other health systems.
- The study did not include treatment costs as an attribute. While costs are less salient for patients in the Swiss healthcare system due to reimbursement structures, out-of-pocket expenses or broader societal costs could nonetheless influence preferences in other contexts.
- The DCE captures stated rather than revealed preferences. Even though the design allows realistic trade-offs, actual treatment choices may be shaped by additional factors such as physician or peer recommendations and individual health status.
- Interactions between attributes might even better reflect real world trade-offs (e.g. between duration and frequency) but were not modeled due to the small PWMS sample.

Conclusion

This study demonstrates that for people living with MS in Switzerland, convenience of treatment administration is a key driver of preferences among high-efficacy therapies. Duration, frequency, and place of administration emerged as the most important aspects, with a consistent preference for shorter, less frequent, and more flexible modes of administration.

Simulation of sequential innovations in drug delivery shows that pen-based self-administration at home is strongly favored, even at a higher frequency, while infusions and other solutions out of home are less attractive once alternative options are available. Sensitivity analyses confirmed the robustness of these findings, showing similar patterns among the general population and across alternative specifications.

In a nutshell

- From the considered administration profiles, the treatment with a pen at home is preferred for people living with MS – even more so for people living without MS, who reflect newly diagnosed individuals facing the choice among high-efficacy therapies.
- Objective patient education on therapy options is needed to integrate patient preferences in therapy decisions.

POLYNOMICS

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References

Arroyo et al. (2017), https://doi.org/10.1136/bmjopen-2016-014433.
Bottomley et al. (2017), https://doi.org/10.1080/13696998.2017.1336099.
Bril et al. (2024), https://doi.org/10.57264/cer-2023-0171.
Filippi et al. (2024), https://doi.org/10.1007/s00415-023-11955-0.
Gold et al. (2024), https://doi.org/10.1177/17562864241241382.
Iaquinto et al. (2024), https://doi.org/10.1159/000542632.
Jonker et al. (2020), https://doi.org/10.1177/0272989X19897944.
Martin et al. (2024), https://doi.org/10.1016/j.msard.2024.106143.
McFadden (2001), http://dx.doi.org/10.1257/aer.91.3.351.
Newsome et al. (2024), https://doi.org/10.1002/acn3.52229.
Oreja-Guevara et al. (2024), https://doi.org/10.1177/17562864241284372.
Overton et al. (2021), https://doi.org/10.2147/PPA.S303279.
Poulos et al. (2016), https://doi.org/10.1007/s40271-015-0136-x.
Saposnik et al. (2022), https://doi.org/10.1016/j.msard.2022.104138.
Selmaj et al. (2024), https://doi.org/10.1007/s00415-023-11969-8.
Singer et al. (2024), https://doi.org/10.1007/s00415-024-12305-4.
Tatlock et al. (2023), https://doi.org/10.1007/s40271-023-00617-y.
Visser et al. (2020), https://doi.org/10.1016/j.msard.2020.101929.