EE759

Staffing and Sustainability: The Workforce Burden and Environmental Impact of Administering MS Treatments Across Settings and Routes of Administration

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What did we want to know?

Administration of high-efficacy disease-modifying therapies (DMTs) for relapsing-remitting multiple sclerosis (RRMS) differs by route and setting, from intravenous (IV) hospital infusions to self-administered oral or subcutaneous (SC) treatments at home.

Considerations of workforce scarcity and environmental sustainability are gaining attention in reimbursement decisions and hospital policymaking. This is reflected, for example, in a pilot by the Dutch National Health Care Institute[1] that allows the impact on labour shortages and the environment to be considered in HTA submissions.

This analysis examines the workforce burden and environmental impact of administering high-efficacy DMTs for RRMS in the Netherlands, using data from a micro-costing study.

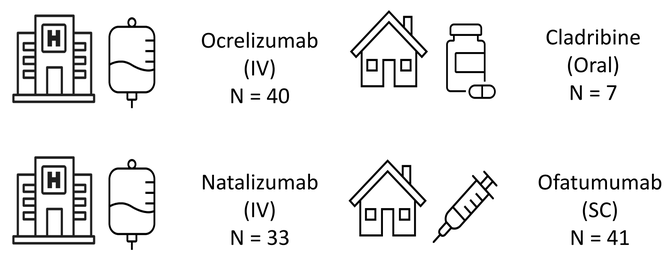
How did we approach this?

The MICRO-MARS study was an observational study using a bottom-up micro-costing approach. Data were collected through case report forms (for healthcare professional (HCP) time and use of consumables), patient questionnaires (for travel distance and mode of transport of patients and caregivers to hospital or pharmacy), and hospital records (for administrative HCP time). The impact of diagnostic procedures (i.e. blood tests and MRI scans for treatment initiation and monitoring) and emissions related to drug procurement were excluded because of data limitations. To assess workforce impact, personnel time was converted to full-time equivalents (FTEs).

Environmental impact was assessed by estimating carbon dioxide equivalents (CO_2e) associated with patient and caregiver travel (by mode of transport, per kilometer), procurement of consumable medical supplies (by material, per gram), and HCP time (per FTE, including hospital building energy use, waste management, staff travel). Emission factors were derived from literature and databases[2].

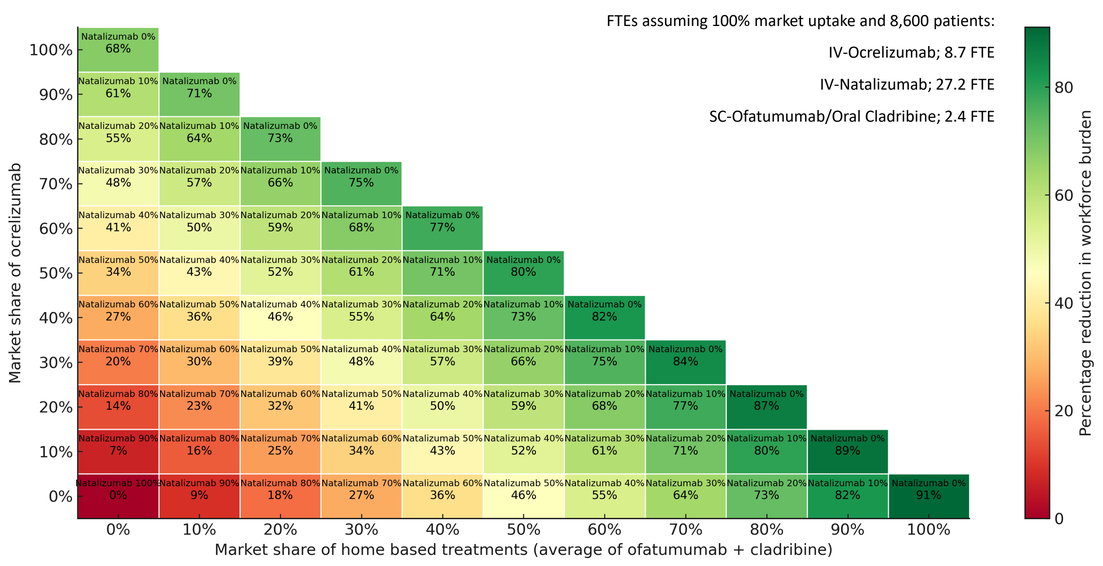
To account for differences in dosing schedules and the induction regimen of cladribine, annual impacts were calculated as averages over the initial 4 years of treatment. The following accumulated dosing frequencies were assumed: ocrelizumab 9, natalizumab 36.1, cladribine 18, ofatumumab 50[3]. For calculations illustrating the potential impact at national level, the Dutch target population for high-efficacy DMTs was estimated at 8,600 patients[4].

121 patients across 5 treatment centers



What did we find out?

Figure 1. FTE impact assuming different market shares across treatments *(reference case: 100% natalizumab)*



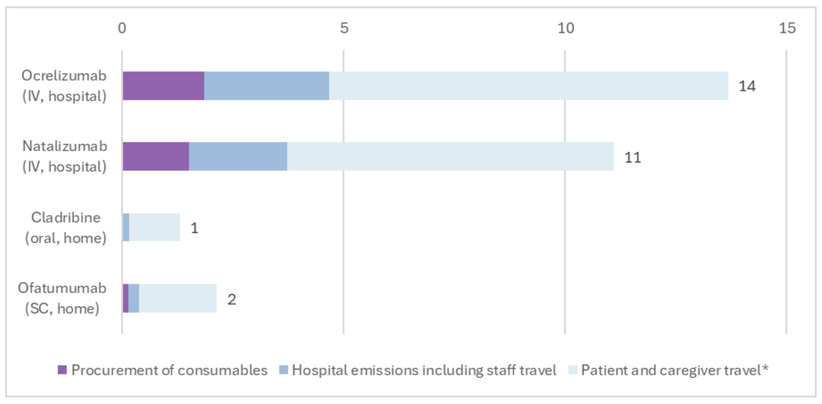
Workforce burden

- Hospital-based therapies required substantially more personnel time than home-based therapies, ranging from less than one hour per patient-year for cladribine and ofatumumab, to 2 hours for ocrelizumab, and 6 hours for natalizumab.
- At the national level in the Netherlands, assuming a hypothetical 100% market share for an individual treatment, treatment administration would correspond to an annual workforce requirement of 27.2 FTEs for natalizumab and 8.7 FTEs for ocrelizumab, compared with 4.0 and 0.8 FTEs for ofatumumab and cladribine, respectively.
- Shifting 50% of patients from IV-natalizumab to home-based therapies reduces the FTE burden by 46% compared with a hypothetical 100% IV-natalizumab market share. Shifting 50% of these patients to IV-ocrelizumab reduces the burden by 34% compared with the same reference (Figure 1)

Environmental impact

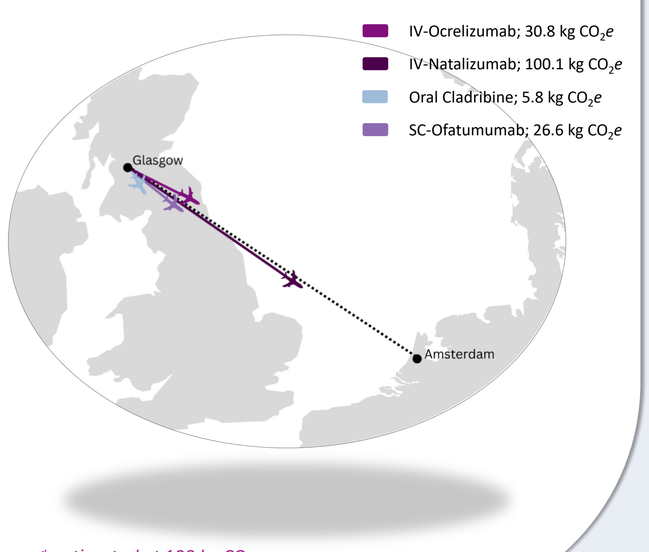
- The environmental impact per administration was higher for hospital-based DMTs than for home-based DMTs, varying from 1.3 and 2.1 kg CO_2e for cladribine and ofatumumab, to 11.1 and 13.7kg CO_2e for natalizumab and ocrelizumab (Figure 2).
- Patient and caregiver travel was the largest contributor to CO_2e emissions for all treatments.
- Considering the treatment frequencies, the impact per patient-year was 30.8kg CO_2e for ocrelizumab, 100.1kg CO_2e for natalizumab, 26.6kg CO_2e for ofatumumab and 5.8kg CO_2e for cladribine.
- To illustrate, 1.7 patient-years of natalizumab treatment emit as much CO_2e as a one-way flight from Glasgow to Amsterdam; for cladribine, approximately seven patient-years would be required to match this footprint (Figure 3).

Figure 2. Environmental impact for a single treatment administration in kg CO_2e



** Travel includes patient trips to hospital or pharmacy, caregiver trips to hospital or pharmacy, and caregiver trips to the patient.*

Figure 3. Average CO_2e emissions per patient-year, relative to a one-way flight from Glasgow to Amsterdam*



** estimated at 168 kg CO_2e*

What does this mean for clinical practice?

- Home-based DMT administration reduces workforce pressure, requiring fewer FTEs than hospital-based administration.
- The environmental impact follows the same pattern. Preventing travel movements from patients and caregivers is a key contributor to emission reduction.
- Findings suggest that home-based administration and less frequent infusions may contribute to lowering both workforce requirements and environmental emissions.

What did we learn for future studies?

- Micro-costing data provide a strong basis for estimating workforce burden, but environmental sustainability remains more challenging to quantify accurately.
- Caregiver travel contributes substantially to total emissions yet is often overlooked or insufficiently captured in available data.
- Because the scope of micro-costing is limited to activities directly related to the clinical procedure, future research should also consider downstream contributors such as diagnostics and post-admission adverse events to better quantify total workforce and environmental burden.
- Strengthening emission data—particularly for medicine production, patient chair time, and administrative HCP tasks—will be essential for more robust sustainability assessments.
- More research is needed to estimate avoided emissions (opportunity emissions; e.g., reduced home energy use or travel during hospital stays). Not accounting for these could potentially lead to an overestimation of net healthcare emissions.

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References:
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2. Main sources for emission factors: Ecoinvent 3.8 (database), CO2 Emissionfactors 2024 (database), Milieubarometer Kengetallen Ziekenhuis 2024 (website).
3. Farmacotherapeutisch Kompas. Zorginstituut Nederland *(National Health Care Institute)*; 2025.
4. Gipdatabank. Zorginstituut Nederland *(National Health Care Institute)*; 2025.

Disclosures: The authors have nothing to disclose.

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