MS Brain Health

# Brain health - time matters

The future: smarter science; connected care; deeper understanding

Multiple Sclerosis **(MS)**, Neuromyelitis Optica Spectrum Disorder **(NMOSD)**, and Myelin Oligodendrocyte Glycoprotein Antibody-Associated Disease **(MOGAD)** care is becoming more personalised, predictive, and proactive.

We've seen major progress in MS, NMOSD and MOGAD care but more is coming. Here's what's next.

New insights into disease origins may change prevention and care
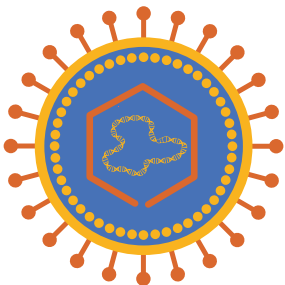
- Epstein-Barr virus (EBV) + genetics + environment: A 'multi-hit' model is gaining traction.[1-4]

- EBV is now confirmed as a necessary trigger for MS, but not the only one.[1,2]

- Vaccines or antivirals targeting EBV could reduce MS risk.[1,2]

- Research is ongoing into infectious links in NMOSD and MOGAD.[1,3]

EBV VIRUS · WHITE BLOOD CELLS · DNA DOUBLE HELIX · ENVIRONMENTAL FACTORS
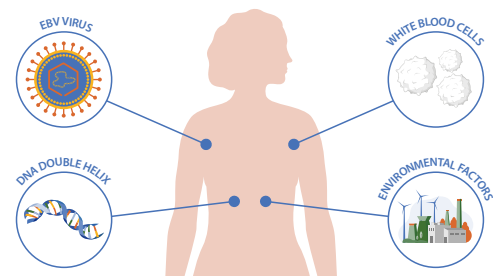
Better disease classification may sharpen diagnosis[1]

2024 revised McDonald criteria for MS include:[5]

- Central vein sign **(CVS)**
- Paramagnetic rim lesions **(PRLs)**
- Kappa free light chains **(K-FLCs)**
- Optic nerve added as fifth topographic location.

Enables earlier and more specific diagnosis, even in atypical cases[5]

Updated NMOSD criteria are expected soon[1]

Biomarkers will guide personalised monitoring and diagnosis

Biomarkers such as neurofilament light chain (NfL), glial fibrillary acidic protein (GFAP), kappa free light chains (K-FLC), and astrocytic/ microglial markers now guide:[1,5-9]

- Diagnosis, prognosis, and treatment decisions

- Monitoring in low-MRI access settings

- Applicable across MS/ NMOSD and MOGAD.

With many new avenues of research ongoing in this area.

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New treatment strategies may offer more tailored care

- Combination and dual therapies are under early investigation for MS.[1]

- Further studies are needed to explore if similar multi-modal approaches benefit NMOSD and MOGAD.[1]

Global access to medicines is improving - but more is needed

In 2023, MS (and MOGAD) therapies added to the **WHO Model List of Essential Medicines**. A big step for global equity.[1,6,10]

> Countries must follow up with national-level **implementation, monitoring**, and **equity evaluations** to realise benefits.

> NMOSD and MOGAD **still lack global recognition** in access efforts

AI in MS, NMOSD & MOGAD: smarter care, better outcomes, deeper insight

AI for predicting outcomes
AI can capture and interpret complex health data to identify outcomes for different groups.[1,11,12]

Early insights
AI has detected cognitive differences between people with and without MS;[1] predicted progression from relapsing-remitting MS (RRMS) to secondary progressive MS (SPMS);[13] and achieved over 90% diagnostic accuracy in distinguishing MS and NMOSD subtypes using multimodal MRI and ultrawide-field fundus photography.[14]

Holistic care
AI tools that include patient-reported outcomes (PROs) enable a more complete view of disease burden, helping to improve prognosis, guide treatment, and enhance quality of life.[1,11,15]

Trust is key
AI will only succeed in real-world care if it is trusted by both clinicians and patients.[15,16]

The future of AI
Involves collaborative learning and knowledge sharing among researchers, clinicians, and patients from all countries. By sharing data, algorithms, and insights across institutions and countries, AI models can be trained on diverse and representative datasets, leading to more robust and generalisable models that benefit the entire community.[12]
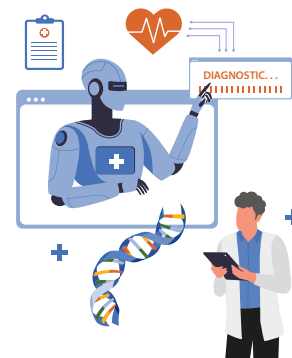
The future of brain healthcare for people with MS, NMOSD and MOGAD is:

- Data-driven
- Equitable
- Participatory

PREVENTION **PREDICTION**

By integrating new science, digital tools, and the lived experience of people with these conditions, we can:
- Delay or prevent more damage
- Deliver timely, person-centred support
- Enable everyone to live their best possible lives

PARTICIPATION **PERSONALISATION**

References

1. MS Brain Health. Brain health: time matters. 2024. LINK. **2.** Bar-Or A, *et al. Trends Mol Med.* 2021;27(4):410-11. **3.** Frau J, *et al. Life.* 2023;13(6):1309. **4.** Ballerini C, *et al. Front Immunol.* 2025;16:1557483. **5.** Dugue A. *Neurol AMJ.* 2025;2(1):26–29. **6.** ECTRIMS. NMOSD and MOGAD: Considerations about Diagnosis and Treatment. 2024. LINK. **7.** Di Filippo M, *et al. Lancet Reg Health Eur.* 2024;44:101009. **8.** Rodin RE, *et al. Front Neurol.* 2024;15:1415535. **9.** Sapana T, *et al. Front Immunol.* 2025;16:1594960. **10.** World Health Organization. The selection and use of essential medicines. 2023. LINK. **11.** Cruz Rivera S, *et al. Lancet Digit Health* 2023;5(3):e168–73. **12.** Naji Y, *et al. Cureus.* 2023;15(9):e45412. **13.** Sreenivasan AP, *et al. NPJ Digit Med.* 2025;8(1):224. **14.** Gu S, *et al. Front Med.* 2025;12:1555380. **15.** McCradden MD, *et al. Nat Med.* 2023;29(4):765–66. **16.** Khaligh-Razavi SM, *et al. BMC Neurol.* 2020;20(1):193.

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Our journey to change begins here!