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## Background and introduction

- A 2015 report highlighted wide variation in MS diagnostic and care services.<sup>1</sup>
- Healthcare quality improvement (QI) approaches aim to reduce variation and improve outcomes; action-effect methodology has been used as a systematic framework for visualization and evaluation.<sup>2</sup>
- In this analysis, we sought to 1) gather data on variation in the diagnosis and treatment of MS, as well as on neurologists' views regarding quality standards, and 2) apply action-effect methodology to identify barriers to MS service delivery.

## Objectives

- To encourage widespread implementation of key recommendations from the *Brain health: time matters in multiple sclerosis* report,<sup>1</sup> we set out to:
  - gather data on diagnosis of MS, treatment optimization and high-priority areas for QI
  - use action-effect methodology to identify factors that affect MS service delivery.

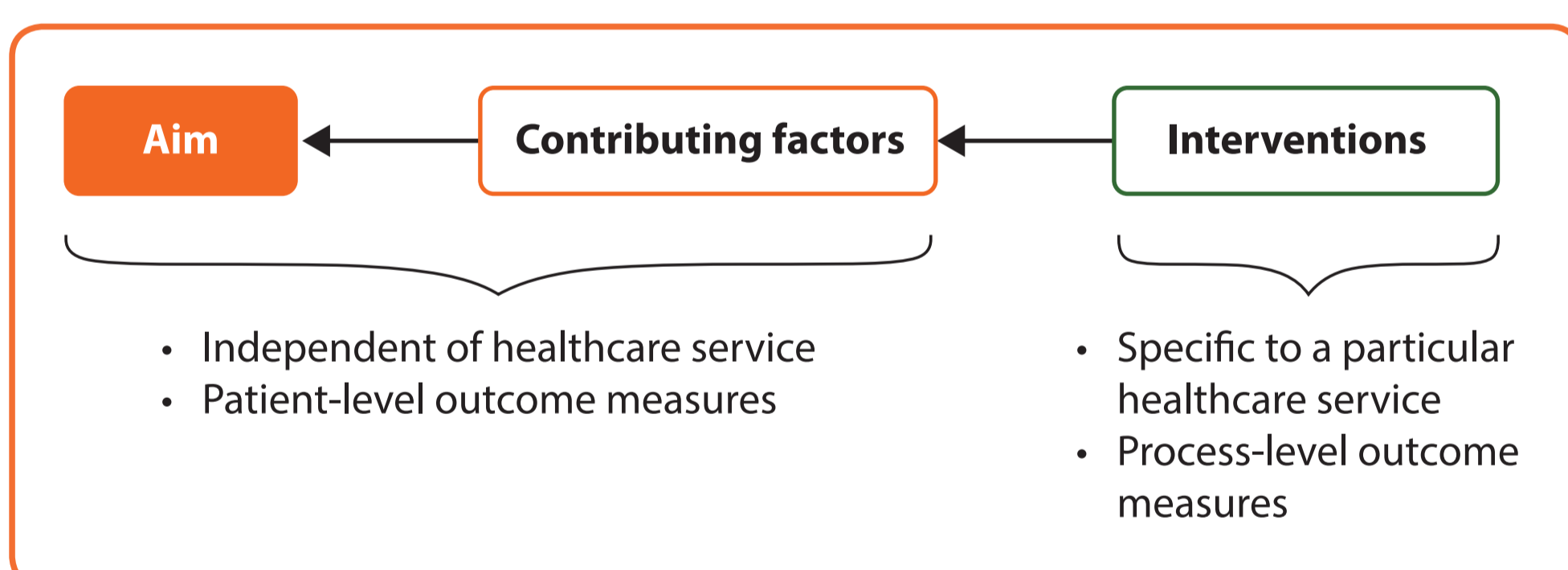
## Methods

### Assessing variation and high-priority areas for quality improvement in MS services

- Time to diagnosis:** 2374 patients in 8 countries, all diagnosed with MS within the last 5 years, reported time from their first symptoms to diagnosis.<sup>3</sup>
- Treatment optimization:** data on switching from a first-line disease-modifying therapy (DMT) were obtained from Germany for:
  - 278 hospital outpatients with relapsing-remitting MS, from a prospective study<sup>4</sup>
  - more than 3500 non-hospital-based patients with MS, from pharmacist databases.
- Neurologists' opinions on priorities for QI:** 115 UK neurologists were surveyed about high-priority areas for QI that could be added to draft MS Quality Statements from the National Institute for Health and Care Excellence (NICE).<sup>5</sup>

### Identifying factors that affect MS service delivery

- An action-effect diagram (AED) of MS services was developed. This methodology (Figure 1) was selected because it:
  - specifies an aim, contributing factors and putative cause-effect relationships
  - highlights where interventions could improve outcomes
  - provides a framework of outcome measures to support evaluation
  - is iterative, allowing continual refinement and local adaptation
  - is visual, to facilitate stakeholder engagement.



**Figure 1.** Structure of an action-effect diagram: once the aim is clear, the contributing factors can be identified and potential interventions agreed. The arrows show putative cause-effect relationships.

## Results

### Variation and high-priority areas for quality improvement in MS services

- Time to diagnosis:** mean time from onset of symptoms to diagnosis ( $\pm$  standard deviation) was 8.64 ( $\pm$  10.06) years ( $n = 2374$ ); 49% of patients were diagnosed within 4 years.
- Treatment optimization:** practice patterns are shown in Table 1.
- Priorities for QI:** 49/115 (42.6%) surveyed UK neurologists responded; most endorsed the following as high-priority areas for QI:
  - overall DMT treatment rates (33 of 49 respondents)
  - second-line DMT rates (31/49)
  - MRI for monitoring (30/49).

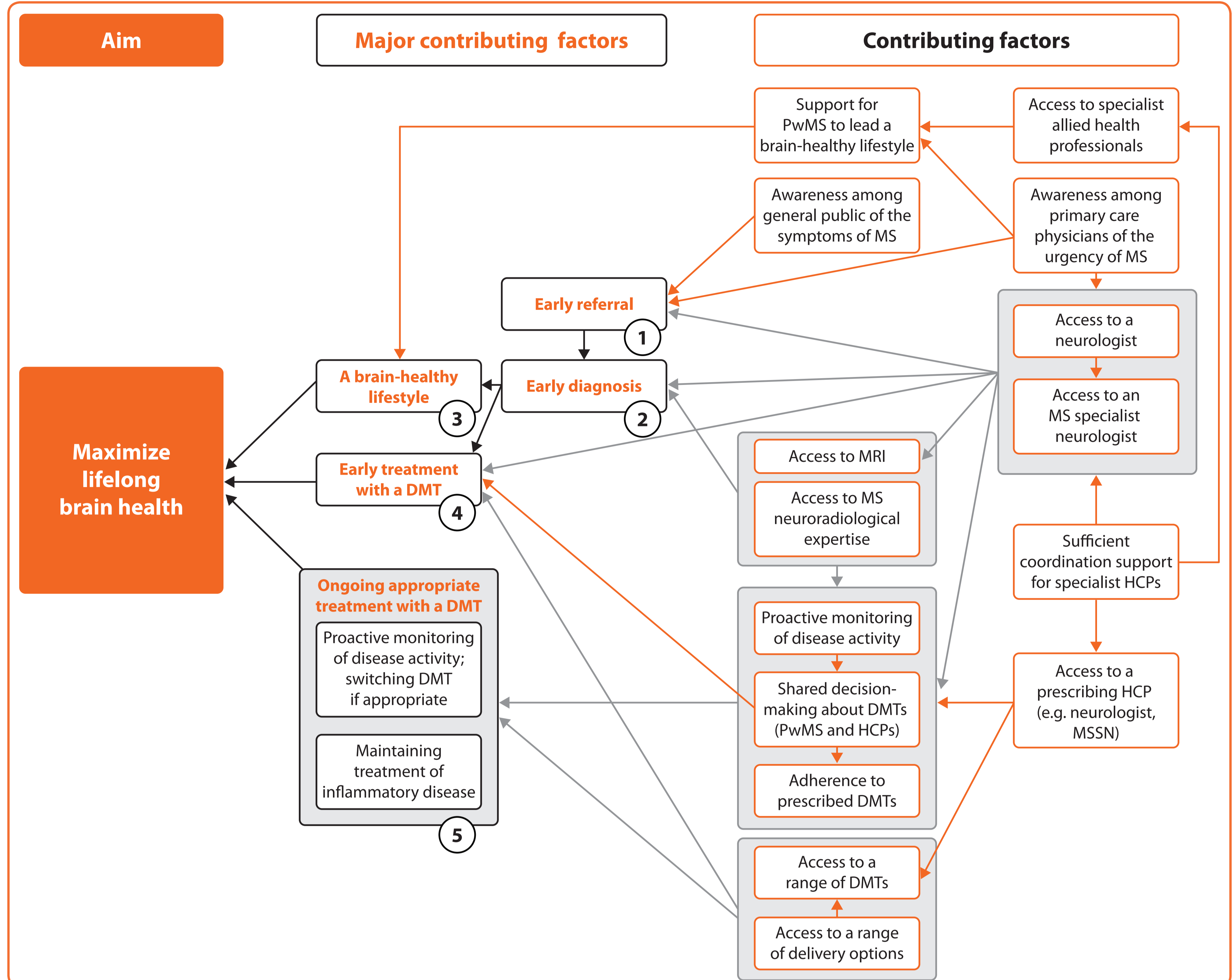
Population with MS who switched from a first-line DMT	First switch, to:		Second switch, to:	
	First-line DMT (%)	Second-line DMT (%)	First-line DMT (%)	Second-line DMT (%)
Hospital outpatients with RRMS (N = 278)	63	37	50	50
Non-hospital-based patients with MS (N > 3500)	79	21	78	22

**Table 1.** Practice patterns for switching from a first-line DMT in Germany. DMTs were defined as first- or second-line based on European Medicine Agency indications. DMT, disease-modifying therapy; RRMS, relapsing-remitting MS.

### Disclosures

J Hobart has received consulting fees, honoraria, support to attend meetings or research support from Acorda, Asubio, Bayer Schering, Biogen Idec, Genzyme, Merck Serono, Novartis, Teva, Oxford PharmaGenesis and F. Hoffmann-La Roche. M Alexander has nothing to disclose. A Bowen has nothing to disclose. H Butzkueven has received consulting fees from Genzyme, Biogen, Novartis, Merck and Oxford PharmaGenesis; and grant/research support from Biogen, Novartis, Merck and Genzyme. G Giovannoni has received consulting fees from AbbVie, Bayer HealthCare, Biogen, Canbex Therapeutics, Five Prime Therapeutics, GlaxoSmithKline, GW Pharma, Merck, Merck Serono, Novartis, Protein Discovery Laboratories, Oxford PharmaGenesis, Roche, Sanofi Genzyme, Synthon, Teva Neuroscience and UCB; and grant/research support from Bayer HealthCare, Biogen, Merck, Merck Serono, Novartis and Sanofi Genzyme. T Kenny has received consulting fees from AbbVie, Dune Business Consulting, Lilly, Matrix Policy Solutions, Quality Improvement Clinic, Shire and Spoonful of Sugar. G Kobelt has received consulting fees from Biogen, Merck Serono, Novartis, Sanofi Genzyme, Teva and Oxford PharmaGenesis. T Ziemssen has received personal compensation for participating on advisory boards, trial steering committees and data and safety monitoring committees, as well as for scientific talks and project support, from Bayer HealthCare, Biogen Idec, Elan, Genzyme, Merck Serono, Novartis, Roche, SanofiAventis, Synthon and Teva. Support for MS Brain Health activities and materials, including the preparation of this poster, has been provided by Oxford PharmaGenesis, Oxford, UK, funded by grants from AbbVie, Actelion Pharmaceuticals and Sanofi Genzyme and by educational grants from Biogen, F. Hoffmann-La Roche, Merck Serono and Novartis, all of whom had no influence on the content.

Presented at the European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS), 14–17 September 2016, London, UK



**Figure 2.** Action-effect diagram for quality improvement in MS services; these factors are independent of healthcare service and geography.

Circled numbers refer to the outcome measures listed in Table 2.

Arrows show putative cause-effect relationships.

DMT, disease-modifying therapy; HCP, healthcare professional; MRI, magnetic resonance imaging; MSSN, MS specialist nurse; PwMS, people with MS.

Major contributing factor	Outcome measure
1 Early referral	Time from initial appointment with a primary care physician to referral
2 Early diagnosis	Time from referral to initial assessment by an MS HCP Time from initial assessment by an MS HCP to MRI scan
3 A brain-healthy lifestyle	Holistic regular <sup>a</sup> review, conducted by an MS HCP who encourages a brain-healthy lifestyle
4 Early treatment with a DMT	Time from diagnosis to initial DMT prescription
5 Ongoing appropriate treatment with a DMT	Eligible people with MS who are taking a DMT Eligible people with MS who are taking a 'more effective DMT' <sup>b</sup> Regular <sup>a</sup> use of MRI to monitor disease activity

**Table 2.** Proposed outcome measures to assess the major contributing factors shown in Figure 2.

<sup>a</sup>Specific targets would be set by healthcare services. <sup>b</sup>Definition is dependent on local treatment guidelines and licensing.

DMT, disease-modifying therapy; HCP, healthcare professional; MRI, magnetic resonance imaging.

### Factors that affect MS service delivery

- Our AED provides a framework of contributing factors (Figure 2) and outcome measures (Table 2) for QI in MS. This is early-stage work, addressing only some aspects of maximizing lifelong brain health.
- Healthcare services can use the AED to develop putative cause-effect relationships and identify potential interventions.
- Some example interventions with the potential to be mobilized quickly are listed in Table 3.

Contributing factor	Proposed interventions
Access to a neurologist or MS specialist neurologist	Introduce low standardized thresholds for investigation and referral to an MS specialist neurologist Provide a formal brain health training or education programme aimed at all HCPs
Proactive monitoring of disease activity	Follow a monitoring plan using brain MRI
Provision of sufficient coordination support for specialist HCPs	Develop systems that alert the MS team to MRIs showing brain or spinal cord inflammation

**Table 3.** Example interventions aimed at addressing barriers to MS service delivery.

HCP, healthcare professional; MRI, magnetic resonance imaging.

## Conclusions

- Time to diagnosis varied considerably, and was more than 4 years for the majority of patients diagnosed with MS within the last 5 years in a large international cohort, illustrating the need for QI in this area.
- In Germany, the majority of people with MS who switched from a first-line DMT received another first-line DMT rather than a second-line DMT.
- High-priority areas for QI, according to a small sample of UK neurologists, are MRI use for monitoring and DMT treatment rates (overall and second line).
- An AED can provide a systematic framework for QI in MS diagnostic and care services. Our example needs to be developed further, and adapted to local situations, through consultation with a wider range of stakeholders.
- Individual healthcare services can use the AED (Figure 2) as a tool to measure outcomes and develop local interventions.
- MS Brain Health encourages engagement from local stakeholders who desire to use this approach.

To get involved and to let us know how you are improving MS services in your area, visit [www.msbrainhealth.org/ectrims](http://www.msbrainhealth.org/ectrims)

## References

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To read *Brain health: time matters in multiple sclerosis*, visit [www.msbrainhealth.org](http://www.msbrainhealth.org)

