Multiple sclerosis: natural history and epidemiology

A review of the natural history and epidemiology of multiple sclerosis: implications for resource allocation and health economic models

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Executive summary

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Background

Multiple sclerosis (MS) is a progressive degenerative disease of the CNS with a pattern of symptoms that depends on the type of disease and the site of lesions. As damage accumulates, symptoms become more permanent and progressive disability ensues. MS is a disease characterised by wide variations between patients and for the individual over time, thus making categorisation difficult.

MS has a significant impact on the quality of life (QoL) for most patients over many years, with the disease lasting, on average, 30 years. The disease is twice as common in women than in men, and is at its peak in the most economically productive years of life.

In order to plan for the social and economic impact of MS on patients, their families and society as a whole, a better understanding of the natural history and epidemiology of the disease is needed. In particular there is a need to describe accurately the patterns and impact of disease progression over time.

Aim of the review

There are three main aims to the current report:

- to review existing natural history data
- to review existing epidemiology data
- to review modelling literature and outline the structure of a theoretical model, which could be developed and used in the future to reflect the course of MS in terms of disease progression, health utility and cost at different stages of the disease.

Methods

A literature search was conducted to identify all papers relevant to the natural history and epidemiology of MS and to MS-related models. MEDLINE, EMBASE and the Science Citation Index were used. The following inclusion criteria were applied:

- diagnostic classification system described
- methods of case ascertainment described
- time series conducted in the same place
- geographical studies conducted over a limited period
- case definitions and observers consistent over time and place
- studies with at least 100 cases reported.

Results

Natural history of MS

The most commonly quoted physical and cognitive effects of the disease include: weakness, fatigue, ataxia, bladder complaints, bowel problems, sensory effects and visual impairment.

The most supported tool for the grading of functional effects of MS is the (Expanded) Disability Status Scale ((E)DSS). The scale ranges from 1 (least severe) to 10 (death from MS). However, the scale is not ideal because there is a bias towards the physical effects of the disease (particularly ambulation) rather than the cognitive effects.

Relapse rates in relapsing-remitting MS vary considerably over time for an individual and between individuals, but there is a general pattern of exacerbations of more frequent relapses, followed by long periods of lower rates. This makes assessment of the effects of treatments in an individual extremely problematic. High relapse rates at the onset of the disease give a limited prediction of poor prognosis.

Epidemiology of MS

Epidemiological studies in England and Wales have given a range of prevalence estimates but the average is estimated at about 110 patients per 100,000 population. There is good international evidence of geographical variation in prevalence, best described by increasing prevalence with latitude (both north and south of the equator). This is not seen in the data for England and Wales, but this may be due to other causes of variation masking any trend in the limited data. If such a latitudinal variation did apply to England and Wales, then the prevalence would range from

104 to 156 per 100,000 (south to north), indicating substantial differences in resource consequences. Improved survival has led to increased prevalence.

Modelling

Of 30 papers reviewed on the use of modelling of MS progression, none provide a view of progression from onset to death. A Canadian longitudinal study of over 1000 patients provides the most detailed information available. It is limited by its use of the DSS as a measure of progression and by the level of detail published, but, combined with other work on the utility of DSS states, these Canadian data could be used to prepare a Markov model (a model type well suited to use in a chronic disease).

Cost studies of MS

Cost studies suggest that the general support costs for patients are related to increasing DSS step. The latest and most complete UK study shows that, on average, patients at EDSS 1–3.5 incur costs of around £3350 per annum compared with £9560 per annum at EDSS 6.5–8. Similar published data on health utility show that the health value of time spent in DSS states decreases with increasing DSS step.

Conclusions

MS is a chronic disease of long duration affecting a wide range of human functions. Short research studies of treatment efficacy cannot fully assess meaningful outcomes nor deliver the information needed for health economic analyses. All MS patients should be better monitored throughout the course of the disease both to improve their care and to better understand the natural history of the disease. New methods need to be developed for researching treatments of chronic diseases.

The development of a model of MS progression should incorporate information on costs and QoL at different stages of the disease in order to examine the long-term cost-effectiveness of any changes in progression.

Research recommendations

The following research recommendations have been identified.

- Trials on interventions for MS should be longer in duration to address the range of morbidity characteristic of the disease.
- More information is needed on the effects of MS on QoL and the costs relating to symptoms and disability.
- The (E)DSS requires further development to address its shortcomings in this disease.

Comprehensive data on the progression of MS patients over the long term, including symptoms experienced and rates and length of relapse, are needed for each (E)DSS state to enable accurate modelling of the impact of disease progression.

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NHS R&D HTA Programme

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