Demonstrating cost-effectiveness in primary-progressive multiple sclerosis

Case study of a hypothetical emerging treatment

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Background

- In the UK ocrelizumab is the only approved disease-modifying treatment for primary-progressive multiple sclerosis (PPMS), a chronic neurodegenerative disease of the central nervous system
- This analysis aimed to identify cost and efficacy profiles that an emerging hypothetical treatment in PPMS would require to be considered cost-effective versus best supportive care (BSC) from an English NHS perspective

Methods

- A cohort-based Markov model was constructed using a lifetime horizon to estimate costs and health outcomes for PPMS patients treated with BSC and a hypothetical emerging treatment
- The model structure was based on the ocrelizumab NICE submission (TA585)[1], with health states representing different levels of disability, measured by EDSS, and with treatment influencing outcomes by slowing confirmed disability progression (CDP) versus BSC
- Clinical data, costs and utility inputs were obtained from the literature, previous health technology assessments and relevant UK databases
- Two-way sensitivity analysis was used to explore cost and efficacy (defined as the hazard ratio [HR] for CDP versus BSC) profiles for the emerging treatment and one-way sensitivity analysis was used to identify key drivers of cost-effectiveness
- A literature review was conducted to compare the cost-effectiveness drivers in relapsing-remitting MS (RRMS) with those in this PPMS analysis

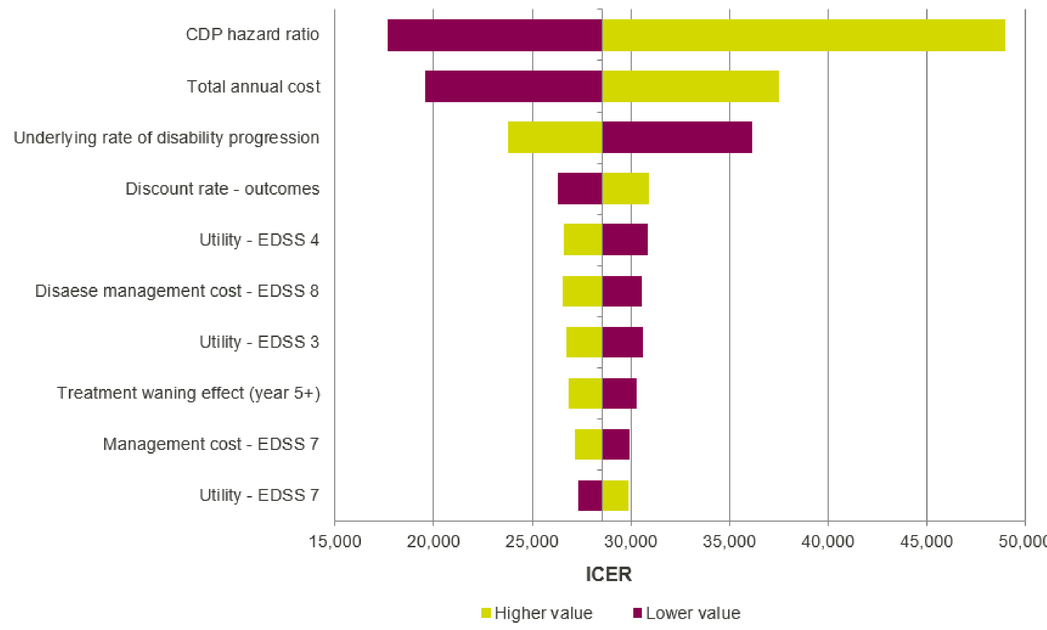
Results

- For an emerging treatment with a CDP HR of 0.8, 0.6, and 0.4 versus BSC, the maximum annual treatment cost at a willingness-to-pay threshold of £30,000 was found to be £2,486, £5,161 and £7,934, respectively
- Considering the CDP hazard ratio presented for ocrelizumab in TA585 of 0.68, the results of the analysis suggest that an emerging treatment may require a commercial arrangement to be considered cost-effective from an English NHS perspective
- Deterministic sensitivity analysis was explored for the profile with a CDP HR of 0.6 and a cost of £5,000 (*Table 1, Figure 1*). As expected, the main drivers of cost-effectiveness identified were annual treatment cost and the CDP HR
- Other important drivers included the underlying rate of disability progression (natural history), as well as health state utility values and disease management costs
- The choice of natural history data to determine disability progression, and patient utility data have also been identified as cost-effectiveness drivers in RRMS appraisals, in line with the results of this PPMS analysis

Table 1: Two-way sensitivity analysis of the ICER for hypothetical PPMS treatment profiles

Annual cost	CDP hazard ratio								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
£1,000	Dominant	Dominant	Dominant	Dominant	Dominant	Dominant	Dominant	£2,499	£23,071
£2,000	Dominant	Dominant	Dominant	Dominant	Dominant	£1,575	£7,992	£20,995	£61,171
£3,000	Dominant	Dominant	Dominant	£1,101	£4,871	£10,565	£20,130	£39,490	£99,270
£4,000	Dominant	£730	£3,390	£6,958	£11,980	£19,555	£32,269	£57,986	£137,370
£5,000	£2,442	£5,021	£8,353	£12,815	£19,089	**£28,545**	£44,407	£76,482	£175,470
£6,000	£6,207	£9,311	£13,315	£18,672	£26,198	£37,535	£56,546	£94,977	£213,570
£7,000	£9,973	£13,601	£18,278	£24,529	£33,307	£46,525	£68,684	£113,473	£251,670
£8,000	£13,739	£17,892	£23,240	£30,386	£40,416	£55,515	£80,822	£131,968	£289,770
£9,000	£17,505	£22,182	£28,203	£36,244	£47,526	£64,505	£92,961	£150,464	£327,870
£10,000	£21,271	£26,473	£33,166	£42,101	£54,635	£73,495	£105,099	£168,960	£365,970
£11,000	£25,037	£30,763	£38,128	£47,958	£61,744	£82,486	£117,237	£187,455	£404,070
£12,000	£28,802	£35,053	£43,091	£53,815	£68,853	£91,476	£129,376	£205,951	£442,170
£13,000	£32,568	£39,344	£48,053	£59,672	£75,962	£100,466	£141,514	£224,447	£480,270

Figure 1: One-way deterministic sensitivity analysis



Conclusions

- Using established PPMS modelling approaches, a range of cost-effective profiles were identified for a hypothetical emerging treatment
- The analysis suggests that a commercial arrangement would likely be required for an emerging treatment to be considered cost-effective from an English NHS perspective based on list prices for disease modifying treatments in RRMS; this is in line with the NICE recommendation for ocrelizumab in PPMS which is conditional on a commercial agreement
- Drivers of cost-effectiveness in this PPMS analysis were found to be consistent with those detailed in the RRMS literature

References

[1] NICE. (2019) Final appraisal document: Ocrelizumab for treating primary progressive multiple sclerosis. URL: https://www.nice.org.uk/guidance/TA585

BSC: best supportive care; CDP: confirmed disability progression; EDSS: expanded disability status scale; HR: hazard ratio; HTA: health technology assessment; ICER: incremental cost-effectiveness ratio; NHS: National Health Service; NICE: National Institute for Health and Care Excellence; PPMS: primary progressive multiple sclerosis; RRMS: relapsing-remitting multiple sclerosis; UK: United Kingdom