Deep Brain Stimulation: A Cost-Saving Treatment Option for Extreme Treatment-Refractory Obsessive-Compulsive Disorder in the UK?

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Mclean A,[1] Porteous A,[2] Wright S,[2] McArthur E,[2] Gahan J,[2] Sireau N,[3] Zenoni M,[4] Fineberg NA,[5] Menchon J,[6] Tyagi H[7]

[1]Costello Medical, Bristol, UK; [2]Costello Medical, London, UK; [3]Orchard OCD, Cambridge, UK; [4]Department of Psychology, University of Cambridge, Cambridge, UK; [5]School of Life and Medical Sciences, University of Hertfordshire, Hatfield, UK; [6]Department of Psychiatry, Bellvitge University Hospital-IDIBELL, Barcelona, Spain; [7]National Hospital for Neurology and Neurosurgery, London, UK

Objective

To investigate the cost-offsets between maintenance treatments alone and deep brain stimulation (DBS) for extreme treatment-refractory obsessive-compulsive disorder (TROCD).

Background

- OCD is a psychiatric disorder typically characterised by a combination of recurrent obsessional thoughts and/or time-consuming compulsive rituals.[1, 2] It is associated with a high economic burden, estimated as an annual cost of £378 million to the NHS.[3]
- DBS is a neurosurgical procedure that has gained attention as a potential treatment for extreme TROCD,[4] but was only recommended by NICE in 2021 for use within a research setting due to limited evidence within the UK setting.[5]
- Alongside efficacy and safety, it is important to investigate the potential cost implications of DBS as an option for people with extreme TROCD, given management of this population is associated with particularly high HCRU.[3]

Methods

- A cost-offset model was developed from an NHS and PSS perspective to determine the difference in direct costs for the use of DBS in combination with maintenance treatments, compared with maintenance treatments alone for patients with extreme TROCD over a lifetime time horizon (60 years). Results were discounted at 3.5% per year.
- Model structure was a decision tree at model entry that split patients between DBS response categories within Cycles 1 and 2 (adjusted for mortality), followed by a cohort Markov model from Cycle 3 onwards, capturing maintenance of response and associated long-term HCRU (**Figure 1**).
- Four health states were pre-defined: Full Response, Partial Response, No Response and Death (all-cause and suicide).
- Efficacy inputs and costs were sourced from literature and national databases or based on clinical expert opinion where no data were available.
- A deterministic sensitivity analysis (DSA) and scenario analyses were explored to test the main drivers of uncertainty and their impact on the primary outputs.

Results

- Over the modelled time horizon, DBS in combination with maintenance treatments (£282,469) resulted in substantial cost-savings (−£194,724) compared with maintenance treatments alone (£477,193) (**Figure 2**).
  - Cost-savings emerged after seven years, driven by reduced monitoring and HCRU for those responding to DBS (**Figure 2**).
  - The main DBS costs were surgery administration, device removal and device acquisition (**Table 1**).
  - For both treatment arms, the main costs of maintenance treatments were for inpatient stay.
- The DSA showed that inputs with the greatest sensitivity were costs and frequencies of inpatient stay (**Figure 3**). Other influential inputs included the modelled discount rate and implantable pulse generator (IPG) replacement costs.
- In terms of percentage change in incremental cost-savings, the most influential scenarios identified through the scenario analyses were shortening the time horizon to 10 years (−77.82%) or five years (−112.12%), changing the proportion of the cohort receiving inpatient stay as a part of maintenance treatments from 20% to 0% (−169.84%) and 40% (+169.84%), and modelling indirect costs from a societal perspective (+119.52%) (**Figure 4**).

Conclusion

DBS was substantially cost-saving (−£194,724) compared to maintenance treatment alone.

Due to high upfront surgery costs, cost-savings emerged after seven years and continued to grow throughout the time horizon, driven by reduced HCRU.

As the long-term efficacy and safety of DBS become more established, this research provides strong economic rationale for reconsidering the commissioning of DBS for this small but highly cost-intensive patient population.

FIGURE 1

Model structure

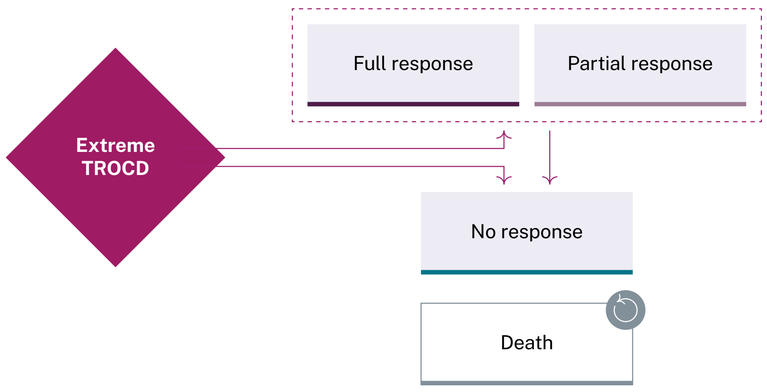
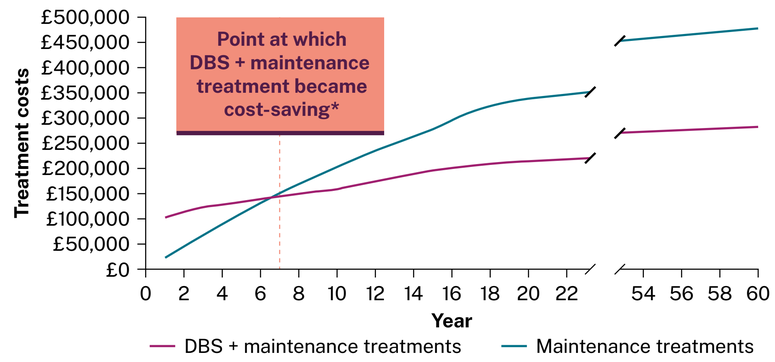


FIGURE 2

Discounted cumulative costs by year



*Compared to maintenance treatments alone.

TABLE 1

Discounted disaggregated costs by resource type over the full time horizon

Treatment	Treatment acquisition	Treatment administration	IPG replacement	DBS removal	*Ad hoc* relapse	Maintenance and monitoring	Suicide (death and attempt)	Adverse events	Indirect
DBS + maintenance treatments	£35,113	£65,649	£22,874	£30,918	£5,032	£122,154	£15	£713	£0
Maintenance treatments	£0	£0	£0	£0	£0	£477,124	£69	£0	£0

FIGURE 3

Tornado plot of DSA results

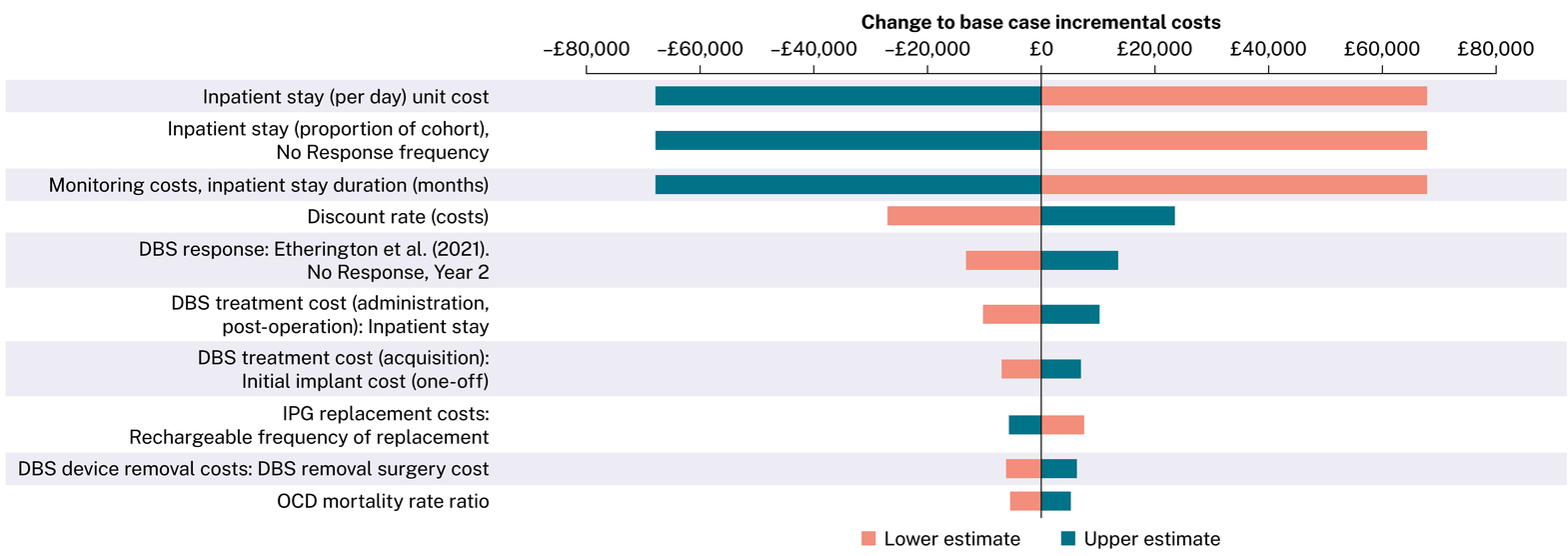
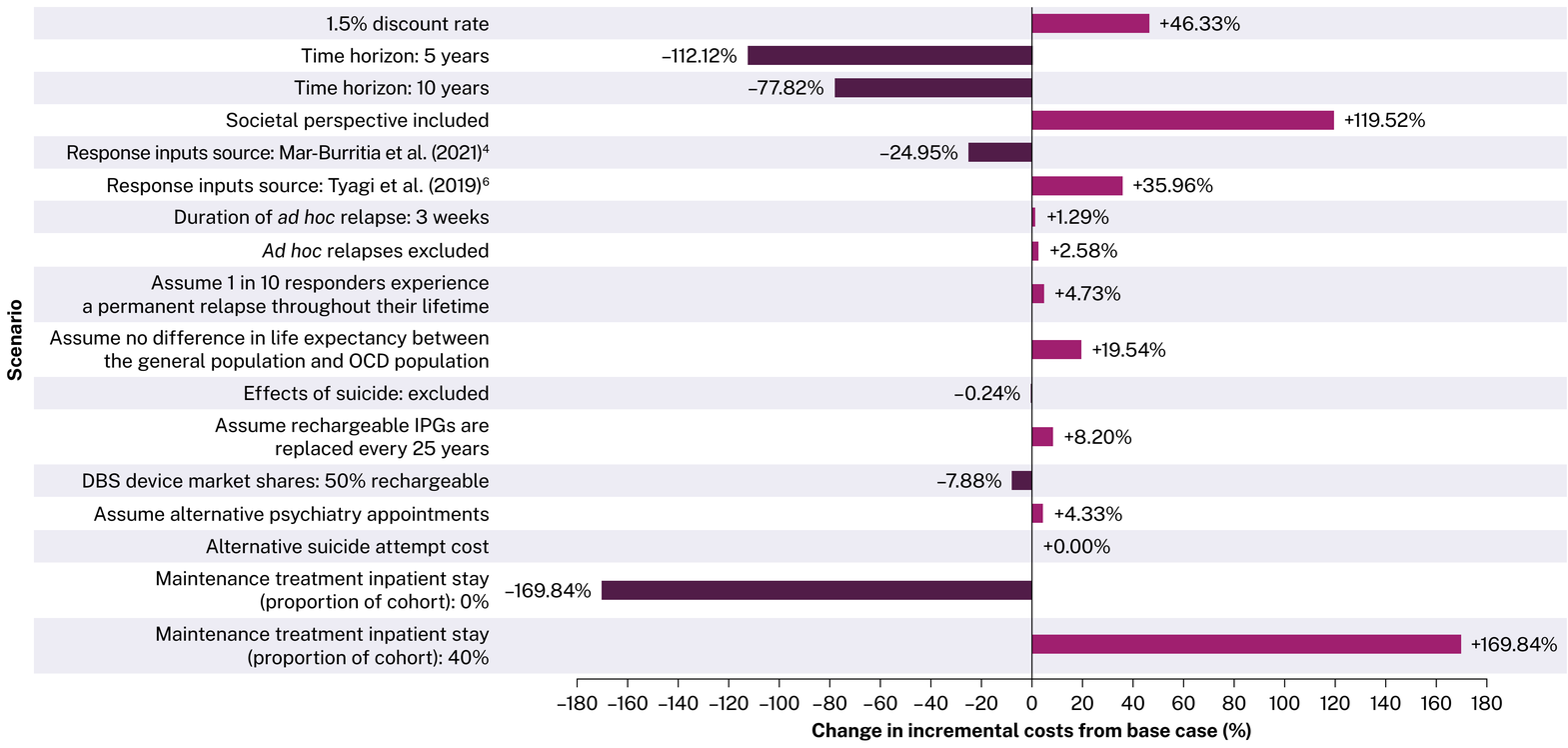


FIGURE 4

Scenario analyses results



Abbreviations: DBS: deep brain stimulation; **DSA:** deterministic sensitivity analysis; **HCRU:** healthcare resource use; **IPG:** implantable pulse generator; **NICE:** National Institute for Health and Care Excellence; **NHS:** National Health Service; **OCD:** obsessive compulsive disorder; **PSS:** Personal Social Services; **TROCD:** treatment-refractory obsessive compulsive disorder; **UK:** United Kingdom.

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