

Title: Cost-Utility Analysis Alongside the PD SURG Trial

Authors : Alexander L Green FRCS(SN) MD¹, Ralph Gregory MD FRCP²

Affiliations;

¹Nuffield Department of Surgical Science, University of Oxford, UK

²Poole Hospital NHS Foundation Trust, UK

Corresponding Author: Dr Alexander L Green, Department of Neurosurgery, West Wing Level 3, John Radcliffe Hospital, Oxford, OX3 9DU, UK. Telephone: +44(0)1865 234605, email: alex.green@nds.ox.ac.uk

Word Count: 497

Running Title: PD Surg Cost Analysis

Key Words: Deep Brain Stimulation, DBS, Parkinson's disease, PD SURG, Cost Utility Analysis

Financial Disclosure: AG holds consultancy agreements with and has received occasional honoraria from Medtronic Inc., St Jude Medical Inc. and Boston Scientific Inc. who are manufacturers of DBS systems. He has also received grants from St Jude Medical regarding unrelated research. RG has nothing to declare.

Funding Sources: None

Re: Cost-Utility Analysis of Deep Brain Stimulation Surgery Plus Best Medical Therapy Versus Best Medical Therapy in Patients With Parkinson's: Economic Evaluation Alongside the PD SURG Trial

McIntosh E, Gray A, Daniels J, Ives N, Jenkinson C, Mitchell R, Pall H, Patel S, Quinn N, Rick C, Wheatley K, Williams A and on behalf of The PD SURG Collaborators Group.

Movement Disorders Article first published online: 5 FEB 2016; DOI: 10.1002/mds.26423

Authors: Alexander L Green, Ralph Gregory

To the Editor: It is important to estimate costs and effects as in this well performed cost-utility analysis (CUA) by McIntosh et al ¹ comparing deep brain stimulation (DBS) to best medical therapy (BMT) for patients with advanced Parkinson's disease (PD) in the UK. We agree with Dams and Dodel ² in their editorial that the study is the first to fill a number of gaps in the existing literature. However, clarification of the appropriateness of the time horizon of the base case analysis, the interim nature of the current analysis, the extrapolation of early 'extra' surgical costs beyond one year and the use of obsolete data is required.

Considering the time horizon of a CUA should reflect temporal consequences and costs of treatments, a one-year time horizon as the base case is biased against DBS as most of its costs occur in the first year of treatment unlike the recurrent cost of BMT.

While patients in the PD SURG trial, were followed for up to nine-years, the current CUA was based on data up to one-year with extrapolation, and data extraction from the literature. This analysis is therefore interim. Indeed, the authors stated that "By extrapolating beyond the end of the trial using individual patient estimates for all costs and QALYs, the long-term cost-effectiveness has used best available patient-specific data." Williams *et al.* reported that 12 and 118 patients in the BMT group had surgery between baseline and 1 year and after one year, respectively.³ However, only the cost of 12 patients undergoing DBS in the BMT group was taken into consideration in the current analysis. It appears that the cost of replacing

electrodes in the first year was factored into the extrapolation resulting in an overestimation of the DBS costs because revisions due to lack of effect beyond one year are mainly due to lead migration and are generally less than 2%.⁴ Also, data published by Joint *et al.* and Vergani *et al.* in 2002 and 2010, respectively, were used to estimate the rate of DBS hardware complications even though PD SURG data were available. A significant technological advancement that would reduce the ICER is the use of rechargeable IPGs. Whilst more costly, they negate the need for replacement thus eradicating surgical, ward and infection costs related to IPG replacement. The length of hospital stay associated with DBS implantation in this CUA was primarily 9.7 days, although four days was used in sensitivity analysis to reflect recent practice, reducing the 1-year ICER by 14%. However, this reduction does not appear to have been applied to the 5- and 10-year analyses. Medication use in the DBS arm was not significantly reduced which is not reflected in contemporary practice or recent studies.⁵

Finally, whilst not immediately relevant to this study, BMT alternatives also include Apomorphine and Duodopa. Despite costing approximately £35,000 annually, excluding jejunostomy replacements. Duodopa has been accepted by the National Health Service Executive without evidence of cost-effectiveness. Also, other CUAs have estimated highly acceptable ICERs for DBS.⁶

Word count: 497

Author Roles: AG is the main author of the manuscript which was commented on, and criticized by RG who suggested further additions.

Acknowledgements: The authors would like to thank Ms Gillian Barnett (Gillian Barnett and Associates Ltd, County Donegal, Ireland) for her technical expertise regarding Health Economics and assistance with preparing the manuscript. Ms Barnett has worked for Medtronic Inc. but no funding was received for her contribution to this letter.

References

1. McIntosh E, Gray A, Daniels J, et al. [Cost-utility analysis of deep brain stimulation surgery plus best medical therapy versus best medical therapy in patients with Parkinson's: Economic evaluation alongside the PD SURG trial.](#) Mov Disord 2016 [epub ahead of print] DOI: 10.1002/mds.26423
2. Dams J and Dodel R. An Economic Evaluation of Patients with Parkinson's Disease. Mov Disord 2016 [epub ahead of print] DOI: 10.1002/mds.26701
3. Williams A, Gill S, Jenkinson C, et al. Deep brain stimulation plus best medical therapy versus best medical therapy alone for advanced Parkinson's disease (PD Surg trial): a randomised, open-label trial. Lancet Neurol 2010;9(6):581-591.
4. Baizabal Carvallo JF, Mostile G, Almaguer M, Davidson A, Simpson R, Jankovic J. Deep brain stimulation hardware complications in patients with movement disorders: risk factors and clinical correlations. Stereotact Funct Neurosurg 2012;90(5):300-306.
5. Weaver FM, Stroupe KT, Cao L, et al. Parkinson's disease medication use and costs following deep brain stimulation. Mov Disord 2012;27(11):1398-403.
6. Dams J, Siebert U, Bornschein B, et al. Cost-effectiveness of deep brain stimulation in patients with Parkinson's disease. Mov Disord 2013;28(6):763-771.