

# Treatment Cost Analysis of refractory chronic migraine patients in a UK NHS setting

Fayyaz Ahmed<sup>1</sup>, Peter J. Goadsby<sup>2</sup>, Ria Bhola<sup>3</sup>, Thomas Reinhold<sup>4</sup>, Bernd Brüggengjürgen<sup>4,5</sup>

<sup>1</sup>Neurosciences Business Unit, Hull and Yorkshire Hospitals NHS Trust, UK; <sup>2</sup>NIHR-Wellcome Trust Clinical Research Facility, King's College Hospital, London, UK; <sup>3</sup>eNeura Inc., Sunnyvale, CA, USA; <sup>4</sup>Institute for Social Medicine, Epidemiology and Health Economics at the Charité University Medical Center, Berlin, Germany; <sup>5</sup>Boston Healthcare Associates International GmbH, Berlin, Germany;

## BACKGROUND

- Chronic migraine is a long-term disease, affecting around 610,000 people alone in the UK. Its attack frequency is a debilitating factor for patients and a strong indicator of resource use and related costs (1).
- Attack frequency is a substantial parameter in economic models to simulate the cost impact, as well as clinical benefit in chronic migraine management. Costs are related both to acute and preventive treatments (2).
- Onabotulinum toxin type A (BTX) is an approved preventive treatment for adults with chronic migraine (3).
- Open-label data suggest single pulse TMS (transcranial magnetic stimulation) may be useful as a migraine preventive (4).

**Objective:** To outline the impact of risk sharing approaches on the budget impact of alternative treatment schemes in chronic migraine patients.

## METHODS

A decision analytic modeling approach was developed in order to both outline the budget impact (BI) of a risk-sharing approach and in a second step to prepare for a full cost effectiveness analysis (CEA) based on a UK real-life data.

The budget impact model design was aligned to a pathway model published by NICE. Treatment continuation rates in the decision tree model were modified to 30%, 50% and 70% (base case) in order to show the different budget impacts related to the risk-share approach offered by Spring TMS. Modeling was performed using Treeage (5).

Treatment cost components were covering costs for physician visits due to migraine, cost of hospital visit due to migraine, cost of ER visit due to migraine and symptomatic treatment costs per day with headache.

## METHODS

Prevention treatment costs for BOTOX (£349 per cycle) were based on published NICE appraisal figures. TMS costs applied were £450 per cycle acknowledging the fact that based on a risk-sharing scheme only responders are subject for payment and first quarter was free.

Based on ongoing UK real life setting research alongside the markov model design for the later real-life CEA the submitted abstract results are also updated. After refined costing research the markov model parameter appeared to be too conservatively set. Hence the preliminary research data for the markov model were also calculated for a setting where the current UK policy is applied that Spring TMS will not be paid for even if the patient is successfully treated in the first quarter and furthermore where indirect costs due to productivity loss are not included.

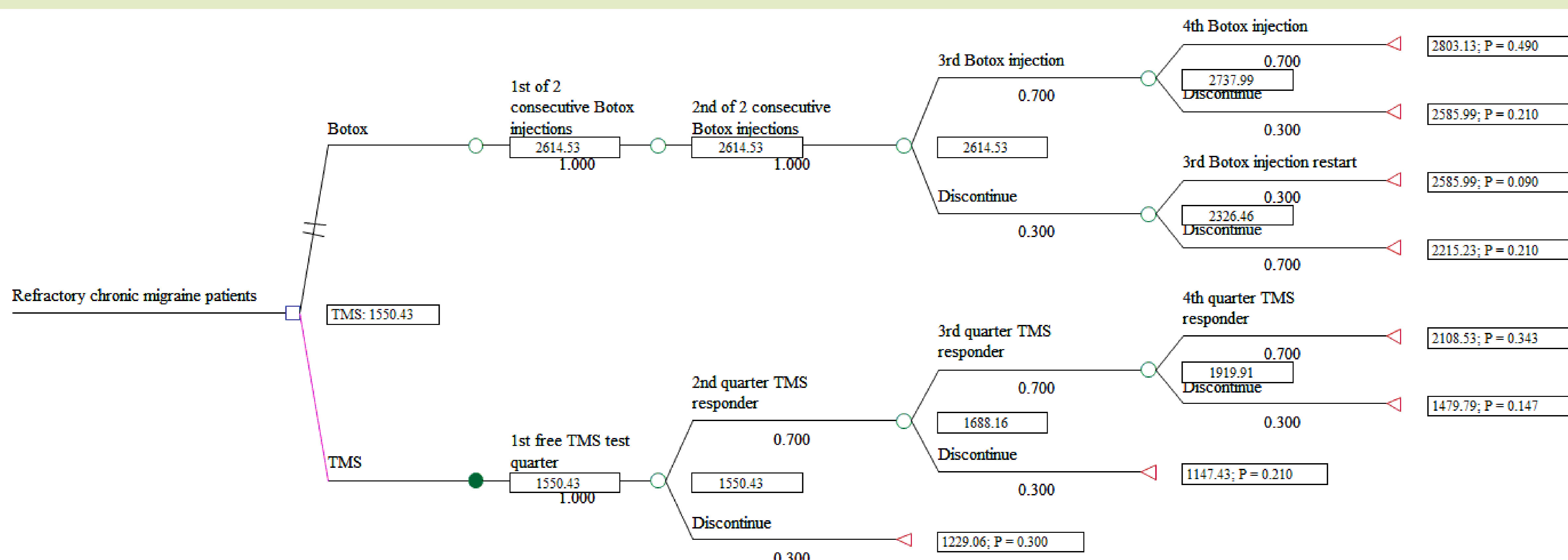
## RESULTS

Assuming a 70% continuation rate for both BOTOX and TMS in a one year time frame and including average quarterly acute treatment costs, the total direct cost per year results in expenses of £1550 for the TMS pathway and £2412 for BOTOX, which represents a cost difference of £912.

In a sensitivity analysis it has been shown that the costs are £1350 for TMS and £2511 for BOTOX when assuming a 50% continuation rate. Considering a 30% continuation rate, costs are £1251 for TMS and £2424 for BOTOX. This causes £1161 lower treatment costs for TMS compared to BOTOX with 50% continuation rates, and a difference of £1227 in a 30% continuation rate scenario. In all scenarios the less costly option is TMS.

Preliminary interim update of the Markov model (prepared for future CEA): The corresponding preliminary costing values when assuming similar efficacy for both treatments amounts to £2,118 for BOTOX and £1,376 for TMS.

## DECISION TREE MODEL



## Inputs (based on figures used by the NHS)

Costs (in £)		Resource Use	
Visit at emergency department	112	Number of A&E events per quarter	0.41
Quarterly botox admin costs (one Neurologist follow-up)	127	Annual GP utilization migraine care	2.07
Quarterly Botox Drug Costs	267.4	Number of hospital inpatient stays per quarter	0.09
Costs 1 GP Visit	36	Number of neurologists visits per quarter	0.52
Costs Hospital Inpatient Stay Migraine	528	Number of GP visits for TMS patients per quarter	1
Costs follow-up neurologist visit	127		
Costs TMS in follow-up quarter if responding	450		
Costs Triptan use per attack	3.35		

## CONCLUSIONS

- The decision analytic tree model demonstrates that treatment of chronic migraine using Transcranial Magnetic Stimulation may lead to a substantial cost reduction in the management of chronic migraine when compared to BTX.
- Furthermore it shows that risk sharing is a relevant approach to performance based management in healthcare systems.
- Risk sharing approaches are applied in several European legislations and hence a comparison to other countries would be revealing.
- Risk-sharing is particularly attractive if benefit is unclear, and is an efficient approach for budget-holders in healthcare.

## REFERENCES

- Buse DC, Manack AN, Fanning KM, Serrano D, Reed ML, Turkel CC, et al. Chronic migraine prevalence, disability, and sociodemographic factors: results from the American Migraine Prevalence and Prevention Study. *Headache*. 2012;52(10):1456-70.
- Bloudek LM, Stokes M, Buse DC, Wilcox TK, Lipton RB, Goadsby PJ, et al. Cost of healthcare for patients with migraine in five european countries: results from the International Burden of Migraine Study (IBMS). *Journal of Headache and Pain*. 2012;13:361-78.
- Centre for Health Technology Evaluation. Botulinum toxin type A for the prevention of headaches in adults with chronic migraine. UK: National Institute for Health and Care Excellence 2012. p. Technology Appraisal Guidance 260.
- Bhola R, Kinsella E, Ahmed F, Goadsby PJ. Update of the UK post market pilot programme with single pulse transcranial magnetic stimulation (STMS) for the acute treatment of migraine. *Journal of Headache and Pain*. 2014;15(Suppl 1):M2.
- TreeAge Pro 2014. TreeAge Software, Williamstown, MA