

Socio-economic Aspects of Testing for Neutralising Antibodies in MS Patients on Interferon beta Treatment in Austria: A Cost of Illness Study

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Objectives

The development of neutralising antibodies (NAB) against interferon beta (IFNβ) is associated with a loss of efficacy in MS patients on this treatment. According to EU-guidelines testing all patients on interferon-beta (IFNβ) for presence of neutralising antibodies (NAB) is recommended irrespective of clinical course and stop IFNβ or switch to alternatives in patients who developed persistent NAB; based on the fact that development in persistently NAB-positive patients equals that of placebo-treated patients. The economic impact of NAB-testing in MS-patients has not been explored yet. The objective of this analysis was to determine the budget impact of Antibody testing in MS patients under Interferon therapy versus no Antibody-testing in Austria.

Methods

The aim of the analysis is to estimate the monetary impact of NAB-testing versus not testing during IFNβ treatment in MS-patients (n=3,590) on Austria's health care system. A cost of illness model (decision tree combined with an integrated Markov model), based on the cohort of IFNβ-treated patients was performed. The period under consideration was 5 years. Two alternatives were compared: Interferon treatment with NAB-testing (Fig. 1a) versus interferon treatment without NAB-testing. Patients within the NAB-testing arm have the possibility of switching to alternative therapies (Fig.1b) whereas no-NAB-testing did not. Direct costs comprised all treatment-costs of symptoms due to MS. Indirect costs were not included. All costs represent data from 2010 (discounted at 5%p.a). Treatment paths and resource consumption represents the Austrian clinical practise. Clinical data and resource use were determined by literature/experts. Efficacy assessment was based on the outcome measure "relapses avoided".

Fig. 1a: Decision tree

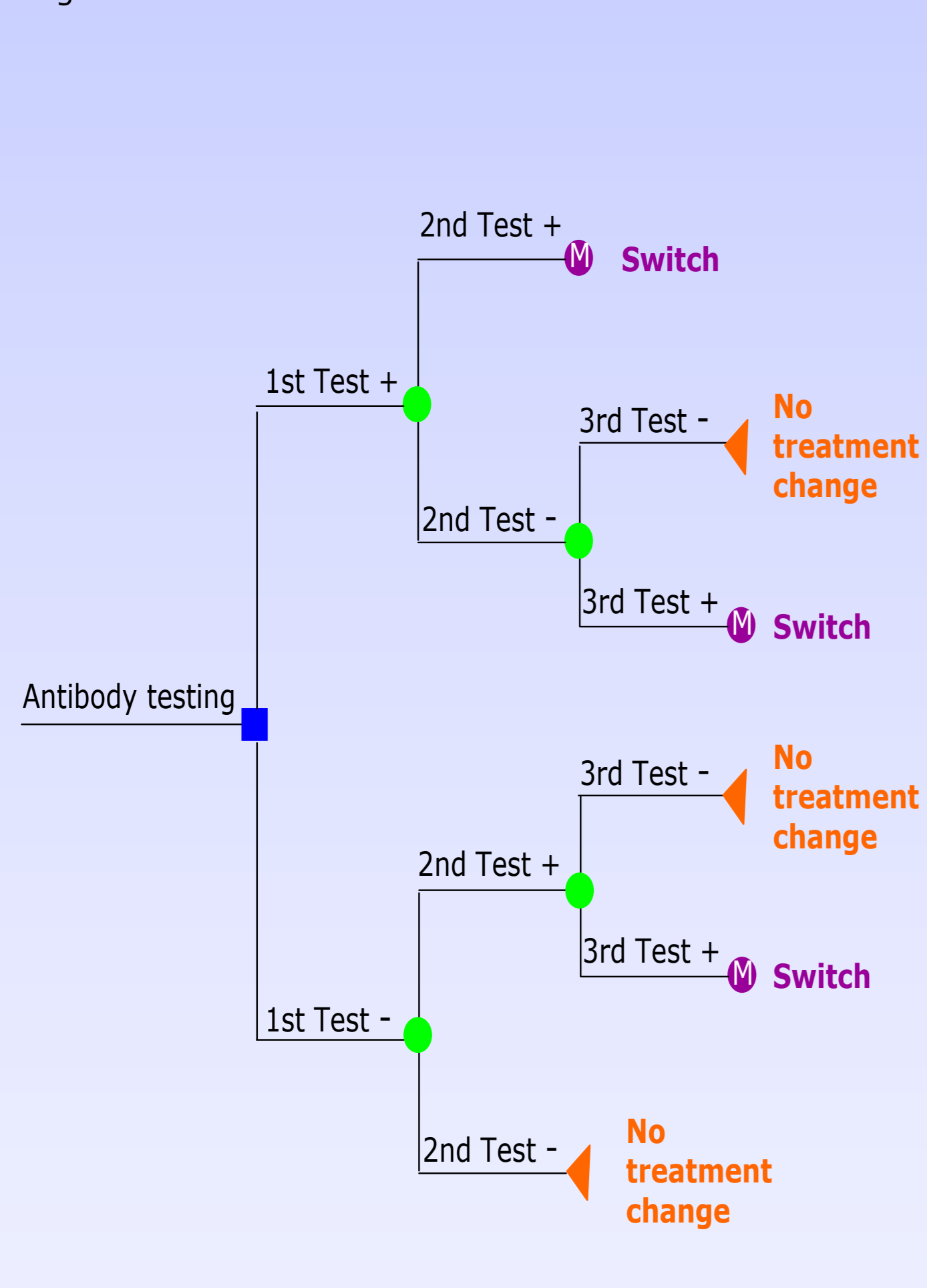
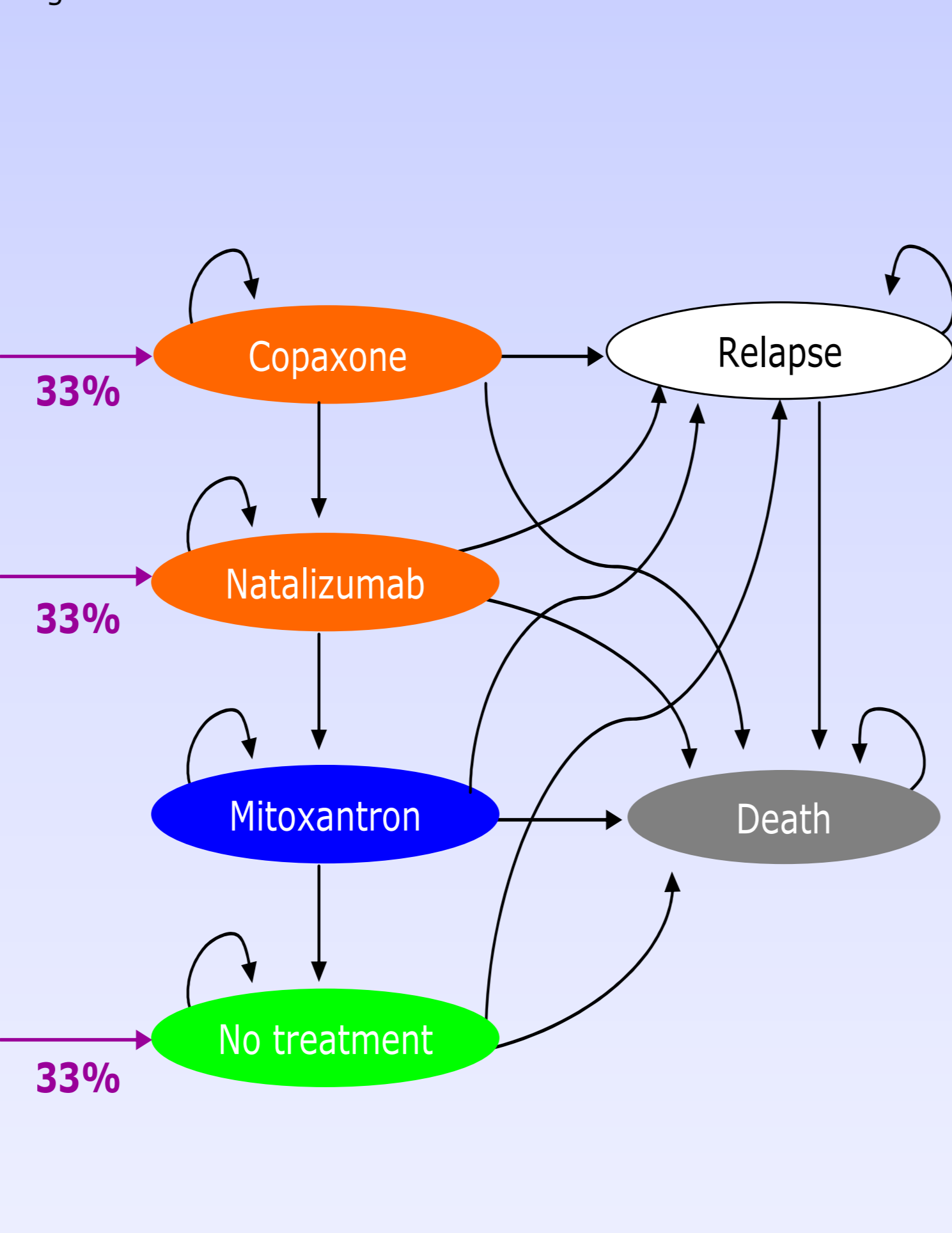


Fig. 1b: Markov model



Source: developed by IPF

Health States and Transition Probabilities

1/3 of MS patients with 2 positive test results switch from IFNβ to Copaxone, 1/3 to Natalizumab and the remaining 1/3 to no treatment, that means 1/3 of all patients entered the Markov model in the "Copaxone" state, 1/3 in the "Natalizumab" state and 1/3 in the "No treatment" state. The model includes six a-priori defined health states. Disease progression leads to a passover to the next health state; the others remain. The Markov-cycle length is three month. Transition probabilities are derived from the literature.

Resource Use and Cost

Assessment of the resource use is based on a survey among Austrian MS patients conducted in 2005.

Tab. 1: Direct costs

Direct costs	in Euro
Medication	
Natalizumab 300mg 1/month	1,613.55
Interferones (weighted avg of Betaferon®, Avonex®, Rebif®)	970.73
Methylprednisolon 1000mg per day	49.85
Copolymer 1	882.90
Mitoxantron (off label, during inpatient stay)	518.00
Outpatient Setting	
∅ Consultation Cost, Relapse	81.24
∅ Consultation Cost, No Relapse	80.81
Inpatient Setting	
Inpatient stay (avg 1.5 stays)	3,132.00
Day clinic	484.50
Rehabilitation	
Rehabilitation	195.00

Source: IPF own calculations

All direct medical costs (Tab. 1), linked to a particular therapy relevant to the chosen health care system's perspective, are captured. These are: Medication cost, consultations, hospital outpatient department, inpatient treatment due to relapses, and rehabilitations cost. Medication cost is calculated based on reimbursement price.

Results

Total discounted costs for all Austrian MS-patients on IFNβ-therapy (incl. testing) from a health care system's perspective amount to 187,360,49€ for 5 years (52,190€ per patient). Total costs for all MS-patients without testing amount to 176,331,61€ (49,117€ per patient). The difference of costs between tested patients, and therefore switching, and not tested patients amounts to 11,028,88€ (3,072 per patient). Considering all IFNβ-treated patients and a time horizon of 5 years 1,400 relapses can be avoided. Testing for NAB leads to costs per relapse avoided of 22,493€p.a. versus 27,569€p.a. when no tests are done. Testing results in a difference of 5,076€ per patient and relapse avoided in favour of NAB-testing.

Tab. 2: Results

	per Patient	3,590 Patients
Cost with testing	€ 52,190	€ 187,360,485
Effectiveness (relapses avoided)	0.420	
Cost per Relapse avoided within 5 years	€ 124,261	€ 446,096,392
Per year	€ 22,593	
Cost without testing	€ 49,11	€ 176,331,610
Effectiveness (relapses avoided)	0.324	
Cost per Relapse avoided within 5 years	€ 151,629	€ 544,347,609
Per year	€ 27,569	
Difference effectiveness	0,10	
Difference Cost per Patient	€ -3,072	

Source: IPF own calculations

Conclusion

General routine NAB-testing in MS-patients on IFNβ-therapy is reasonable and cost effective. Patients switching to effective and more expensive alternatives do not account for higher health care costs. Furthermore, less relapses increase QoL.

References

- C. Gneiss, P. Tripp, F. Reichartseder et al., Differing immunogenic potentials of interferon beta preparations in multiple sclerosis patients, in: Multiple Sclerosis 2006; 12: 731-737
- AFFIRM, Polman CH, O'Connor PW, Havrdova E. et al. A randomized, placebo-controlled trial of natalizumab for relapsing multiple sclerosis, in: N Engl J Med 354(9), 2006
- PRISMS; G C Ebers G-C, G Rice G, J Lesaux J, et al., Randomised double-blind placebo-controlled study of interferon β-1a in relapsing/remitting multiple sclerosis, in: Lancet 352, 1998
- Sibley W., Ebers G., Panitch H., et al., Interferon beta-1-b is effective in relapsing-remitting multiple sclerosis: I. clinical results of a multicenter, randomized, double-blind, placebo-controlled trial, in: Neurology 43, 1993
- Jacobs L, Cookfair D., Rudick R, et al., Intramuscular Interferon Beta-1a for Disease Progression in Relapsing Multiple Sclerosis, in: Annals of Neurology 39(3), 1996
- Hartung HP, Gonsette R., König N., et al., Mitoxantrone in progressive multiple sclerosis: a placebo-controlled, double-blind, randomised, multicentre trial, in: The Lancet 360(21/28), 2002
- Johnson K, Brooks B, Cohen J, et al., Copolymer 1 reduces relapse rate and improves disability in relapsing-remitting multiple sclerosis: Results of a phase III multicenter, double-blind, placebo-controlled trial, in: Neurology 45, 1995
- OÖGKK, STGKK, TGKK, WGKK
- Austrian DRG System (LKF), 2010
- PVA, Österreichische Pensionsversicherungsanstalt, oral communication, 2006
- Warenverzeichnis I Österreichischer Apothekerverlag (Austrian Codex of Pharmaceuticals), www.ami-info.at
- Walter E. Österreichische Guidelines zur gesundheitsökonomischen Evaluation, in: PharmacoEconomics – German Research Articles 2006; 4(2): 55-63

Additional Literature with the authors