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Erlotinib as a maintenance therapy for non-small cell lung cancer: use of a Markov decision analytical cost-effectiveness model

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BACKGROUND

- Healthcare policy makers like NICE in the UK assess and recommend on clinical and cost-effectiveness of health technologies, including pharmaceuticals.
- Manufacturer of drugs submits their appraisal documents for Technology assessments (TAs) of clinical and economic evidence, which involves decision model on the long-term cost-effectiveness of the technology.
- An independent Evidence Review Group (ERG) independently evaluate and assess evidence, which could impact recommendations. One major ERG critique on manufacturer's models surrounds the structural uncertainty in CE models (Briggs et al., 2006; Bojke et al., 2006)

INTRODUCTION

- Erlotinib as a maintenance treatment in squamous and non-squamous cell metastatic NSCLC patients following chemotherapy, but its cost-effectiveness was not proved.
- Manufacturer (Roche) submitted clinical and cost-effectiveness evidence of Erlotinib as a maintenance therapy for NSCLC patients.
- The manufacturer submission (MS) model was not a state-transition Markov model
- Following the ERG recommendations, we aim to restructure the MS model, employing fixed-and time-varying transition probabilities across health states

METHODS

- The MS model structure implies that the PFS and the PPS are the essential components which may lead to an increase in OS, where the PPS was not estimated directly but as the difference between OS and PFS.
- Transition from progression-free to progressed or death and progressed to death are not modelled explicitly in the MS, instead the proportion of patients in progression-free and progressed health states are estimated using the selected survival curves directly
- Using published summary survival data, we adopt three fixed- and time-varying approaches to estimate state transition probabilities

Placebo	Erlotinib
$p_1 = \lambda_1$	$p_1 = k^*\lambda_1$
$p_2 = \lambda_2$	$p_2 = k^*\lambda_2$
$p_3 = \lambda_3$	$p_3 = k^* \lambda_3$

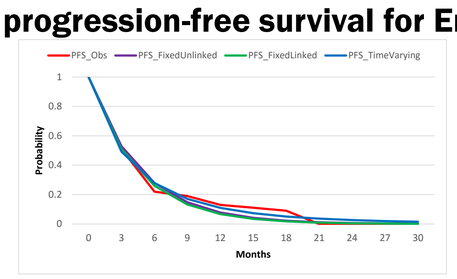
The cost-effectiveness model considered in the MS

Placebo	Erlotinib
$p_1 = \lambda_1 * e^{-\gamma 1 t} / (1 + \lambda_1 * e^{-\gamma 1 t})$	$p_1 = \lambda_1 * e^{-\gamma 1 t} / (1 + \lambda_1 * e^{-\gamma 1 t})$
$p_2 = \lambda_2 * e^{-\gamma 2 t} / (1 + \lambda_2 * e^{-\gamma 2 t})$	$p_2 = \lambda_2 * e^{-\gamma 2 t} / (1 + \lambda_2 * e^{-\gamma 2 t})$
$p_3 = \lambda_3 * e^{-\gamma 3 t} / (1 + \lambda_3 * e^{-\gamma 3 t})$	$p_3 = \lambda_3 * e^{-\gamma 3 t} / (1 + \lambda_3 * e^{-\gamma 3 t})$

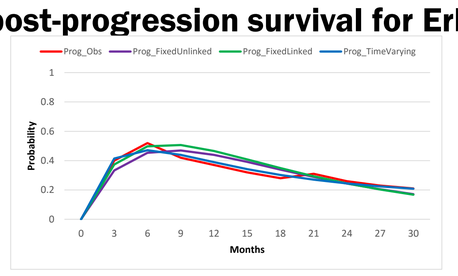
RESULTS

- Best fitting curves achieved for both PPS and probability of death for which data were available, but the curves started diverging towards the end of the period.

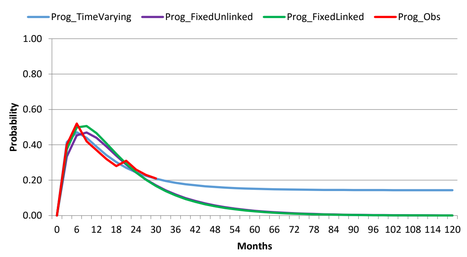
Observed versus modelled (Fixed-Unlinked, Fixed-Linked and Time-varying) progression-free survival for Erlotinib

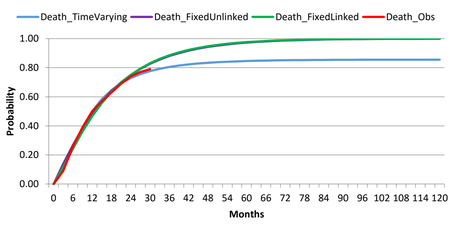


Observed versus modelled (Fixed-Unlinked, Fixed-Linked and Time-varying) post-progression survival for Erlotinib



Observed versus alternative model: probability of long-term post -progression survival and death from three approaches for Erlotinib





- The alternative models produce an ICER of £54k - £66k per QALY gain for Erlotinib, which is comparable to an ICER presented in the manufacturer submission (£55k/QALY gain).

CONCLUSION

- Results from restructured alternative models do not suggest different cost-effectiveness results to those reported in the MS, however, in terms of magnitude they vary.
- This variation in cost-effectiveness results from restructured models might be crucial for interventions falling near a willingness-to-pay threshold value.

REFERENCES

Briggs A, Sculpher M and Claxton K (2006): Decision Modelling for Health Economic Evaluation, Oxford University Press: Oxford, UK

Bojke L, Claxton K, Palmer S and Sculpher M (2006): Defining and characterising structural uncertainty in decision analytical models. University of York: Centre for Health Economics, available at http://www.york.ac.uk/media/che/documents/papers/researchpapers/rp9_structural_uncertainty_in_decision_analytic_models.pdf (Accessed March 21, 2015)

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