BACKGROUND

Survival analysis has become an important part of cost-effectiveness methods for health technology appraisals in oncology. Current health technology assessments usually require mean survival times to estimate the life-years gained or, for Markov models, transition probabilities per cycle. Mean survival times are typically derived from fitting parametric survival curves for the full patient population or for the three treatment arms of the trial.\(^1\)

OBJECTIVES

The overall aim of this study was to compare different strategies for survival curve extrapolation and to determine which method provides the most realistic estimates of life-years gained for the relevant patient populations.

THE DATA

The data used in this study were from elderly patients (≥ 80 years old) in whom general, age-related mortality was a factor, which was not detectable in the short-term RCTs of different cancer treatments.\(^2\) The methods that directly used external data appeared to perform better. However, the Bayesian model appeared to underestimate the error as a high proportion of probabilities were not matched with the RCT data.\(^3\) Sensitivity analyses can be used to address this to some extent in other models. However, presenting and making sense of numerous models for multiple approaches makes the results less transparent and harder to interpret.

METHODS: EXTRAPOLATION AND EVALUATION

Extrapolation of Standard Parametric Models

This method was based on the method described by Bach et al.\(^1\) Standard parametric models were fitted and evaluated in terms of plausibility and fit. Models included standard parametric models, stratified parametric models, and Royston and Parmar\(^2\) spline-based models with 1-3 knots, which assumed proportional hazards and time-varying effects.

Bootstrap Procedure

The whole procedure was bootstrapped. The most plausible model was chosen.

Bayesian Simultaneous Spline Model of RCT and Long-Term Data

This method was based on the method described by Bach et al.\(^1\) A Bayesian simultaneous model was formulated and fitted to both datasets. The methods that directly used external data appeared to perform better. However, the Bayesian model appeared to underestimate the error as a high proportion of probabilities were not matched with the RCT data.\(^3\) Sensitivity analyses can be used to address this to some extent in other models. However, presenting and making sense of numerous models for multiple approaches makes the results less transparent and harder to interpret.

RESULTS

The extrapolated survival curves were compared with the results of the included RCTs and with survival data from the general population. These results were compared with those from the RCTs to determine if the extrapolated survival curves were realistic. The results from the most plausible models are shown for the graph (as 95% CrI). Only the results from the most plausible models are shown for the graph (as 95% CrI).

DISCUSSION

The extrapolated survival curves were compared with the results of the included RCTs and with survival data from the general population. These results were compared with those from the RCTs to determine if the extrapolated survival curves were realistic. The results from the most plausible models are shown for the graph (as 95% CrI). Only the results from the most plausible models are shown for the graph (as 95% CrI).

CONCLUSIONS

The results from this study support the direct use of external data to extrapolate survival curves even when the external data may not be exactly matched with the RCT data.

The study demonstrated the value of including all sources of error within a single model. The methods that directly used external data included errors for the choice of distribution and the uncertainty of the treatment effect after follow-up. Sensitivity analyses can be used to address this to some extent in other models. However, presenting and making sense of numerous models for multiple approaches makes the results less transparent and harder to interpret.

The methods described in this study are based on the Jackson et al.\(^4\) approach, which includes model smoothing, using HR distributions and distribution for the time to HR of 1, can be implemented in a health economic model.

REFERENCES


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