Feasibility of building a generic partitioned survival model for oncology: essential components and technical implementation

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Hygstedt K, Magnusson C, **Mickelsson A,** and Carlqvist P
Correspondence: alva.mickelsson@nordicmarketaccess.com
Nordic Market Access, 113 59 Stockholm, Sweden

Background

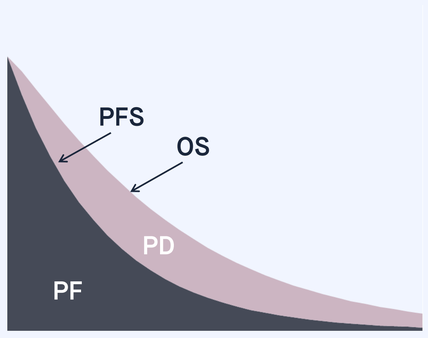
Cancer imposes a growing burden on patients and healthcare systems [1]. While new therapies improve survival, they often come with high costs. To support evidence-based resource allocation, Health Technology Assessments (HTAs) play a vital role in evaluating new treatments. In oncology, economic evaluations often rely on Partitioned Survival Models (PSMs) to estimate long-term outcomes and costs. Increasing collaboration among Nordic HTA bodies through the Joint Nordic HTA-Bodies (JNHB) highlights the need for transparent, easy-to-adapt economic models to improve decision-making.

Aim

The study aimed to determine the essential components and technical implementation needed to build a generic Partitioned Survival Model for oncology and assess its feasibility.

Methods

Figure 1. Model conceptualisation



Abbreviations: PD, progressed disease; PF, progression free; PFS, progression-free survival; OS, overall survival

A targeted literature review identified the essential components for inclusion in the model and best practices for technical implementation. Based on these findings, a PSM was built in Microsoft Excel. To assess the model's generalisability, it was tested on two oncology datasets that differed in healthcare setting and cancer type. Model validation was carried out using the TECH-VER and AdViSHE checklists [2,3].

Results

Nordic HTA guidelines were reviewed to identify requirements and recommendations relevant to develop a PSM.

Table 1. Overview of Nordic HTA guidelines

	Denmark/DMC [4,5]	Finland/HILA [6]	Norway/NoMA [7]	Sweden/TLV [8]
Age-adjusted QALYs and survival to general population	Yes	Not mentioned	Yes	Not mentioned
Discount rate (costs & benefits)	Yes	Yes	Yes	Yes
Half-cycle correction	Optional	When relevant	Not mentioned	Not mentioned
Perspective	Limited societal	Societal	Extended health-service	Societal
Scenario analysis	Optional	Yes	Yes	Not mentioned
Sensitivity analysis	DSA and PSA	DSA and PSA	DSA and PSA	Yes
Software	Excel	Excel or R	Excel	Excel
Data extrapolation	Yes. Details regarding required analysis presented in guidelines	Yes. Details regarding required analysis presented in guidelines	Yes. Details regarding required analysis presented in guidelines	Yes. Details regarding required analysis presented in guidelines.
Time Horizon	Long enough to catch all significant differences in effects and costs	Long enough to catch all significant differences in effects and costs	Long enough to catch all significant differences in effects and costs	Long enough to catch all significant differences in effects and costs.
Effect outcomes	QALYs	QALYs	QALYs & LYs	QALYs

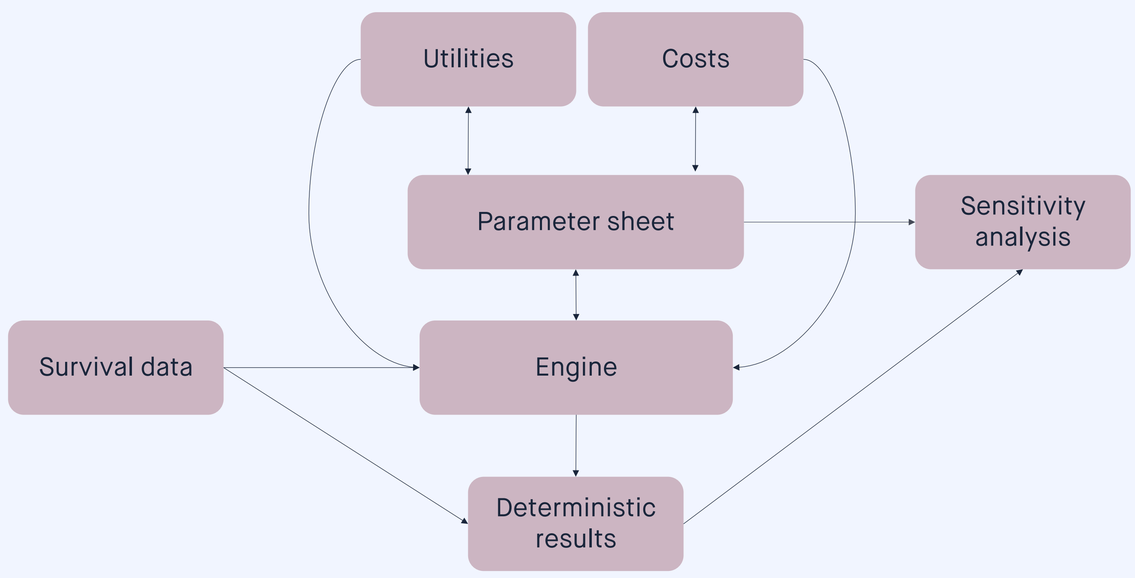
To ensure that the PSM could be adapted to the requirements of each Nordic HTA body, key model components were identified (**Table 2**). These components were incorporated in a modular way, allowing for their inclusion or exclusion facilitating an efficient adaptation.

Table 2. Key components included in a generic PSM

Component	Description
Costs parameters	Healthcare and societal costs, including costs associated with treatment, monitoring, adverse events, palliative care, municipal services, patient and caregiver time, transport and productivity loss.
Model outcomes	Total incremental costs, QALYs & LYs, ICERs and Net Monetary Benefits (undiscounted, discounted, and half-cycle corrected), budget impact.
Survival analysis	KM curves for PFS, OS and TTD. Possibility to extrapolate with parametric function according to NICE TSD. Mean and median estimated for each extrapolation and AIC/BIC ranking.
Scenario analysis	To show other relevant, country-specific or clinically plausible scenarios.
Sensitivity analyses	DSA (including Tornado diagram) and PSA (including cost-effectiveness plane, cost-effectiveness acceptability curve, and ICER convergence plot)
Utilities	Treatment dependent and independent utilities and general population utilities, divided by men and women.

Other inputs that should be modifiable include cohort starting age, cycle length, discount rates for costs and benefits, gender distribution, patient body surface area, patient weight, retirement age, time horizon and background mortality. **Figure 2** presents the model structure, which illustrates how components interact through a centralised parameter sheet, enabling easy adaptation to Nordic national settings and requirements.

Figure 2. Flow chart of the model structure



Discussion and conclusion

The aim of this study was to determine the essential components and technical implementation needed to build a generic PSM for oncology, and to assess its feasibility. By incorporating all required, recommended, and optional components from the Nordic guidelines together with best health economic practices identified through a targeted literature review, the study demonstrates the feasibility of developing a flexible PSM adaptable to various cancer types, treatments, and healthcare settings.

The model demonstrated its adaptability by functioning as expected when changing clinical datasets and country setting, without requiring structural modifications. Several specific components contributed to the model's ease of use and adaptability. These included standardised, generic naming conventions, the ability to add or remove rows within each sheet, different cell types, and the ability to choose what parameters should be included in the model in a flexible settings sheet.

This work provides a useful modelling framework in oncology with the potential to streamline HTA processes for oncology by promoting greater transparency and standardisation, supporting joint evaluations across the Nordics.

References

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