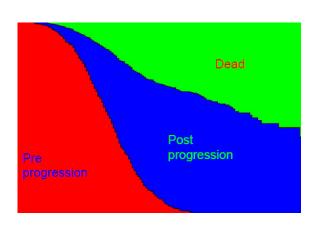
Survival analysis in decision modeling The DARTH Workgroup

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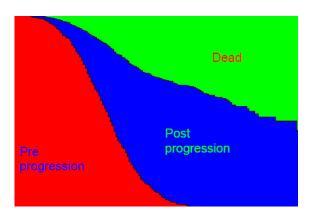
Partitioned survival models

- Form of a decision model that:
 - Considers evidence of (usually) OS and PFS
 - allocates the cohort across pre-progression, post-progression, death
- ▶ PFS and OS are modeled independently



Partitioned survival models

- Mechanics:
 - Remain pre-progression: p(PFS)
 - ▶ Remain dead: 1 p(OS)
 - Progressed: p(OS) p(PFS)
- Implicit assumption: risk of dying is only a function of time



Less problematic with less censoring

Partitioned survival models - the updside

- Intuitively appealing
- ► Easy to communicate
- Easy to construct
- ► In-sync with what is commonly reported in RCTs
- Can be constructed using aggregate / graphic based data
- In-sync with methods of cross-over
- PSMs work great for cases where the whole cohort is observed until event of interest (unlikely in the vast majority of the cases)

Partitioned survival models - the downside

- OS and PFS are falsely assumed independent
- Cohort cannot transition back to a healthier state.
- 3-state PSM cannot distinguish the origin of the cohort moving to the dead state (progresed -> death vs preprogession -> death)
- In the presence of censoring:
 - Projected trajectory of state occupancy after end of follow up only informed by the observed trajectory
 - Poor performance when trends in the within trial period may not continue in the extrapolation period

Partitioned survival models - the criticism

Woods et al 2017 (DSU 19)

NICE DSU TECHNICAL SUPPORT DOCUMENT 19:

PARTITIONED SURVIVAL ANALYSIS FOR DECISION MODELLING IN

HEALTH CARE: A CRITICAL REVIEW

REPORT BY THE DECISION SUPPORT UNIT

2 June 2017

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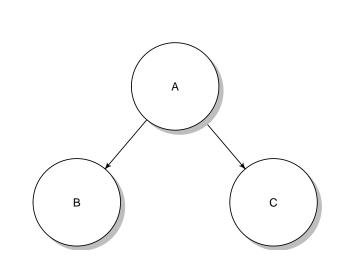
² School of Health and Related Research, University of Sheffield, UK

Estimation of Survival Probabilities for Use in Cost-effectiveness Analyses: A Comparison of a Multi-state Modeling Survival Analysis Approach with Partitioned Survival and Markov Decision-Analytic Modeling

Claire Williams, MSc, James D. Lewsey, PhD, Daniel F. Mackay, PhD, Andrew H. Briggs, DPhil

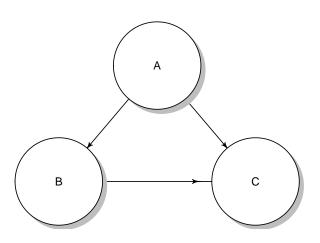
Competing Risks

- Underlying assumption in survival analysis:
 - ▶ If we could follow censored individuals long enough they would experience the event of interest.
- Event B (progression) affecs population size at risk for the competing event C



Multistate modeling

- ► Extended form of competing risks
- ► Multivariate survival analysis



Multistate modeling

- Extended form of competing risks
- ► Multivariate survival analysis
- Can incorporate:
 - Transition specific covariates
 - Recurrent events
- Can work with
 - ► Patient-level data (best)
 - ▶ Digitized / interval censored data (...not best)