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# Using multi-state modelling to facilitate informed personalised treatment planning in Follicular Lymphoma

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## **Abstract:**

Follicular lymphoma is an incurable haematological cancer that tends to follow a remitting relapsing course; with treatment options ranging from “watch and wait” (active monitoring), chemotherapy, and radiotherapy. The treatment decision is typically dependent upon patient characteristics and disease stage. Using routine data collected by the Haematological Malignancy Research Network ([www.hmrn.org](http://www.hmrn.org)), we are undertaking research into improving understanding of the treatment pathways and the impact of these decisions not only on the patient, but also on the cost to the healthcare provider. The aim is to facilitate informed decision making by providing a personalised prognostic tool that identifies a suitable treatment option at each stage of the treatment pathway, as part of a shared decision-making process between patient and clinician.

Multi-state modelling provides an appropriate toolkit for this work, owing to its ability to predict the movement of a person through a discrete state-space captured by individual-level characteristics. This work details implementation considerations of the modelling stage, including the design of the state-diagram, the fitting of transition-specific hazard functions, and the use of Discrete Event Simulation to provide estimated transition probabilities. Other considerations include how to present the results of a complex model into a deployable clinical tool.

**Key words:** Multi-state modelling; Follicular lymphoma; personalised treatment.