Decision-makers require estimates of decision uncertainty as well as expected net benefits of interventions. Recent guidance from the National Institute for Clinical Excellence (NICE) recommends probabilistic sensitivity analysis (PSA) as the appropriate way to quantify decision uncertainty. This requirement may be difficult in computationally expensive models, particularly those employing patient-level simulation (PLS). This paper discusses the importance of considering decision uncertainty, the appropriateness of PSA, and the use of PLS in NICE appraisals.

A review of published appraisals identified cases in which the model structure employed PLS. Each case was examined to see if decision uncertainty was estimated, whether PLS was necessary, and whether alternative modelling approaches were available.

One out of six case studies estimated decision uncertainty. Reasons for choosing PLS included: treatment switching; sampling from patient characteristics; dependence on elements of patient histories. Alternative approaches were demonstrated in two areas: the use of semi-Markov cohort model structure; and the use of emulators to eliminate the need for 2-level simulation.

Stochastic treatment switching and sampling baseline patient characteristics do not inform adoption decisions. Modelling patient histories is a function of the software used, and does not necessitate PLS. Where there is a non-linear relationship between patient variability and model outputs PLS is appropriate but not necessary. Where models become computationally expensive, PSA is possible using more computing power, emulators or a mathematical linear approximation. Models must provide credible estimates of net benefit and decision uncertainty. Failure to estimate decision uncertainty must be justified in terms of this dual requirement.