PROBABILISTIC ANALYSIS AND COMPUTATIONALLY EXPENSIVE
MODELS: NECESSARY AND REQUIRED?

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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.