Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
This study examined the cost-effectiveness of multimodal computed tomography (CT) to identify those eligible for endovascular therapy in non-haemorrhagic patients with acute stroke. The authors concluded that multimodal CT was cost-effective for patients who could be eligible for intra-arterial procedures, but non-contrast CT with angiography might be preferred for patients with severe stroke over a lifetime. The cost-effectiveness framework was conventional and the authors’ conclusions appear to be valid, but more studies are needed to corroborate their findings.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined the cost-effectiveness of multimodal computed tomography (CT) to identify those suitable for endovascular therapy, in non-haemorrhagic patients with acute stroke, who presented within three hours of the onset of symptoms.

Interventions
The two strategies were non-contrast CT followed by conventional cerebral angiography versus multimodal CT, which included non-contrast and contrast CT, CT angiography, and perfusion CT. Patients who were eligible in each group received intravenous tissue plasminogen activator (tPA). Those who did not show benefits within one hour and those who were ineligible for tPA could undergo intra-arterial procedures if no clinical contraindication was found and an intraluminal thrombus was detected by the initial screening procedures. The intra-arterial procedures were endovascular thrombolysis, thrombectomy, or both.

Location/setting
USA/hospital.

Methods
Analytical approach:
The analysis was based on a Markov model with a lifetime horizon and a three-month horizon was also considered. The authors stated that it was carried out from the perspective of the payer.

Effectiveness data:
The clinical data were from a selection of relevant clinical trials, a meta-analysis, cohort studies, and other studies. The authors used their judgement to select the most appropriate estimates from the available evidence, without combining data. The key input was the accuracy of CT, defined as its sensitivity and specificity.

Monetary benefit and utility valuations:
The utility values were from a published study.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and they were discounted at an annual rate of 3%.

Cost data:
The economic analysis included the costs of angiography, multimodal CT, hospitalisation for stroke, intravenous tPA,
intra-arterial procedures, and long-term care for minor or major stroke. These costs were from published sources including Medicare. They were in US dollars ($), the price year was 2008, and a 3% annual discount rate was applied.

Analysis of uncertainty:
A one-way sensitivity analysis was undertaken for all the inputs for the model, using pre-specified ranges of values. A multivariate probabilistic analysis was performed using predetermined distributions for the costs, probabilities, and utilities. In an alternative model, a population of patients with severe stroke was considered.

Results
The expected lifetime costs were $225,287 with non-contrast CT and $223,229 with multimodal CT. The QALYs were 6.663 with non-contrast CT and 6.671 with multimodal CT. Multimodal CT was dominant as it was more effective and less expensive. The influential inputs were the sensitivity and specificity of CT angiography and the efficacy of the intra-arterial procedures. Varying these inputs made the multimodal strategy no longer dominant, but still cost-effective.

Multimodal CT was the preferred strategy in 95% of simulations at a willingness-to-pay threshold of zero; in 90.1% of simulations at a threshold of $50,000 per QALY; and in 84% of simulations at a threshold of $100,000 per QALY.

It resulted in higher QALYs (0.004) and lower costs (-$1,716) at three months and the results of the three-month model were robust. Multimodal CT had a 99.7% of being cost-effective at a willingness-to-pay of zero and 100% at a threshold of $100,000 per QALY.

In the population of patients with severe stroke, multimodal CT was dominant in the short-term, but non-contrast CT was dominant in the lifetime model; these results were less stable and depended on the baseline assumptions.

Authors’ conclusions
The authors concluded that multimodal CT was a cost-effective screening tool for patients presenting with an acute stroke, but non-contrast CT might be preferred in patients with more severe stroke over a lifetime. Future models should incorporate new data with longer follow-up for stroke patients.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear. The authors stated that multimodal CT was the proposed intervention, while non-contrast CT with angiography was the usual practice.

Effectiveness/benefits:
The authors provided little information on the criteria used to select the data sources and limited details of their methods were given. The design was reported for a few studies, which included a meta-analysis and clinical trials, which generally have good internal validity. More details would have allowed a more extensive assessment of the quality of the evidence. The base case assumptions were extensively tested in the sensitivity analysis. QALYs were an appropriate benefit measure, given the impact of the disease on both survival and quality of life. The derivation of utility values was not reported in detail.

Costs:
The analysis of costs was consistent with the perspective of the payer; only the direct medical costs were analysed. The authors stated that the costs that were common to both strategies were not considered and only the additional costs were included. Hospitalisations were from a commonly used US source (Medicare), but the authors did not provide a clear description of the published studies used for the other costs. No information on the resource consumption was given. The price year and discounting were clearly presented. Alternative assumptions on the costs were considered in the sensitivity analyses.

Analysis and results:
An appropriate incremental approach was used to synthesise the costs and benefits of the two diagnostic strategies and the projected costs and benefits were clearly reported. The uncertainty was satisfactorily investigated using both a deterministic and a probabilistic approach; the results were presented and discussed. Alternative scenarios were
presented and different time horizons were considered. The results might not be generalisable to settings with different costs or resource use. The authors stated that a limitation of their analysis was that only one acute event was allowed in the model.

**Concluding remarks:**
The cost-effectiveness framework was conventional and the authors’ conclusions appear to be valid, but more studies are needed to corroborate the findings.

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