Cost-Effectiveness of Dynamic Contrast Enhanced Computed Tomography in the Characterisation of Solitary Pulmonary Nodules – The SPUtNIk Trial

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Context

When a small nodule is detected on a lung scan (solitary pulmonary nodules, SPNs), imaging tests are used to establish its malignancy.

Problem

Current clinical pathways in the UK recommend the use of Positron Emission Tomography/Computed Tomography (PET/CT), but this test is costly and not available nationwide.

Evidence

Studies proved that Dynamic Contrast-Enhanced Computed Tomography (DCE-CT) could be more cost-effective in diagnosing SPNs than PET/CT, but their design and scope were suboptimal.

Aim

This research aimed to strengthen the evidence base by comparing the cost-effectiveness of PET/CT, DCE-CT and their combination (DCE-CT&PET/CT).

Why was this research important?

Given the NHS scarce resources, this research usefully shed light on which imaging strategy provides the best value for money in correctly diagnosing SPNs.

Methods

Decision tree
To model the patients' clinical pathways following the imaging test.

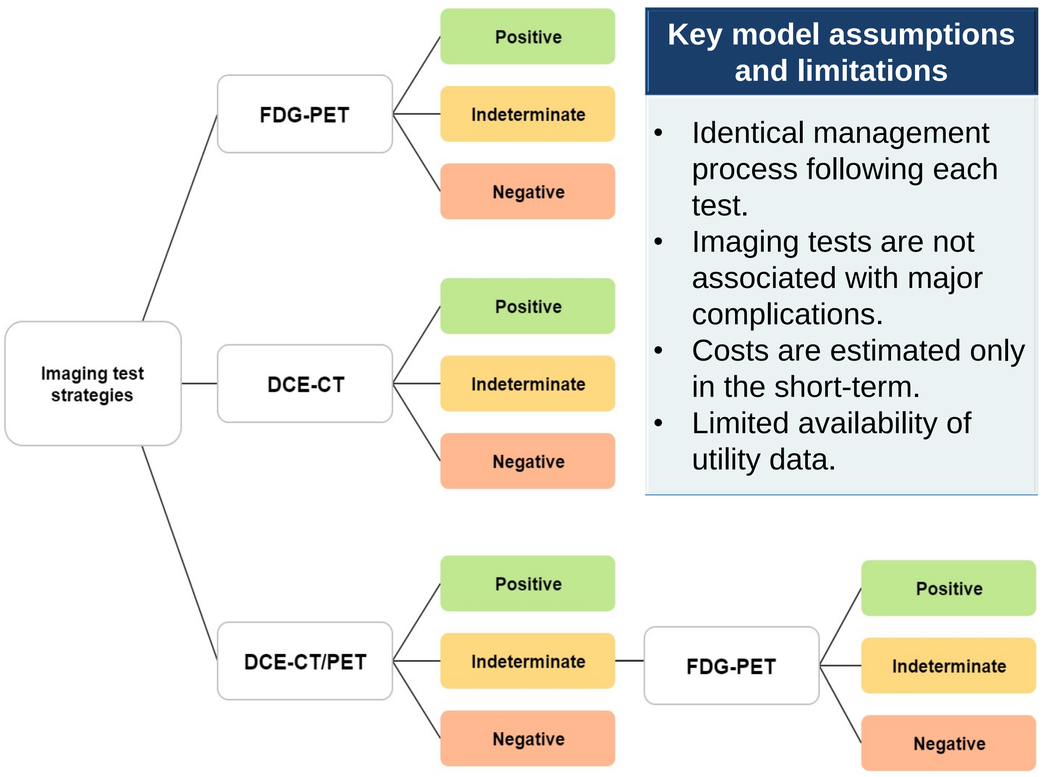
Incremental cost-effectiveness ratios (ICERs)
To compare the imaging strategies in terms of joint outcomes.

Cost-effectiveness acceptability curves
To investigate how uncertainty in the parameters influences the results against different NHS willingness-to-pay (WTP) thresholds.

Model parameters

Short term	Long term	Joint outcomes
• Costs • Correctly managed cases • Malignancy treated/missed • Malignancies with delayed or no treatment • Benign nodules treated • Operative deaths (benign)	• Life expectancy • Quality-adjusted life years	• Cost per malignant case treated • Cost per correctly managed case

Model simplified structure

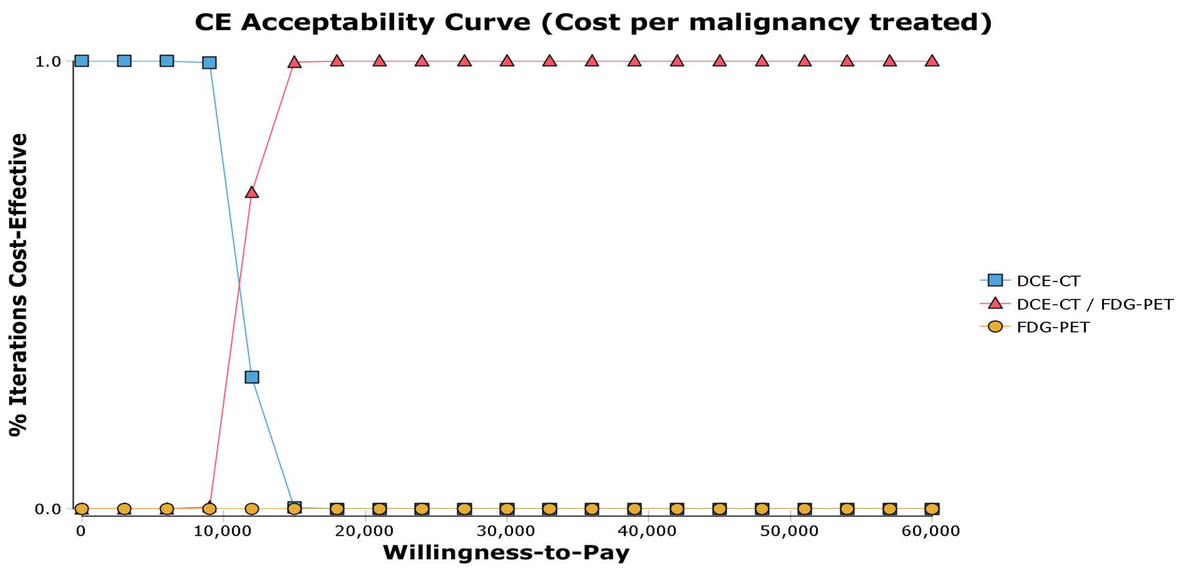


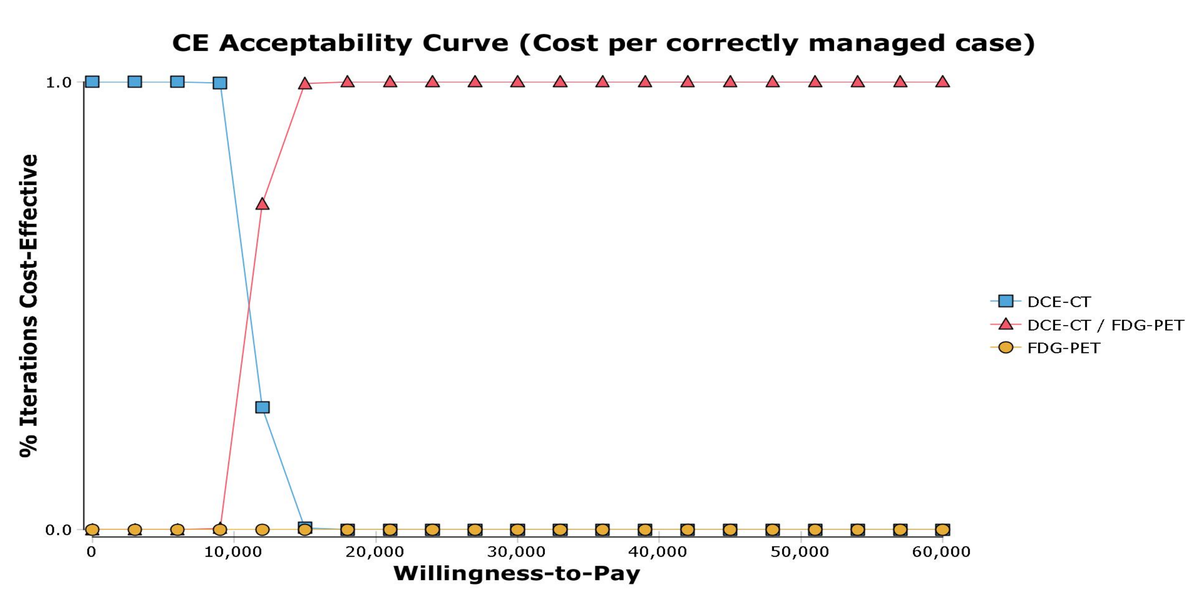
Key model assumptions and limitations

- Identical management process following each test.
- Imaging tests are not associated with major complications.
- Costs are estimated only in the short-term.
- Limited availability of utility data.

Cost-effectiveness results and acceptability curves

Strategy	Cost £	Incr. Cost £	Effectiveness %	Incr. Effectiveness %	ICER £
Per malignancy treated					
DCE-CT	3,305	-	40.1	-	-
DCE-CT&PET/CT	4,058	753	46.7	6.61	11,395
Per correctly managed case					
DCE-CT	3,305	-	77.8	-	
DCE-CT&PET/CT	4,058	753	84.4	6.65	11,323





Key findings and implications for practice

DCE-CT was the least expensive strategy and, together with DCE-CT&PET/CT, extendedly dominated PET/CT in terms of cost-effectiveness.

With WTP thresholds below £9,000 per correctly treated malignancy and £11,395 per correctly managed case, DCE-CT was the most cost-effective strategy.

For WTP thresholds over £15,500 per correctly treated malignancy and £16,000 per correctly managed case, the combined DCE-CT&PET/CT strategy became the most cost-effective.

Sensitivity analyses showed that the model parameters with the highest impact on incremental costs and incremental correctly managed cases are the prevalence of malignancy and the sensitivity of PET/CT.

Overall, the combined strategy DCE-CT&PET/CT can improve outcomes for a minimal additional cost compared with current practice (i.e. PET/CT).

Therefore, using DCE-CT as first test of a combined strategy should be seen favourably.

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