The cost-effectiveness of organ preservation methods in renal transplantation: US projections based on the machine preservation trial

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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 machine perfusion versus cold storage for organ preservation, with both standard- and expanded-criteria donor kidney transplants. The authors concluded that machine perfusion was preferable to cold storage, from the perspective of the third-party or private payer. On the whole, the study was well conducted. The data sources were not extensively described, but the authors’ conclusions appear to be robust.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study examined the cost-effectiveness of machine perfusion versus cold storage for organ preservation in both standard- and expanded-criteria donor kidney transplants.

Interventions
Machine perfusion was compared with cold storage for kidney preservation.

Location/setting
USA/tertiary care (transplant centre).

Methods
Analytical approach:
The analysis was based on a decision analytic model, with a one-year time horizon. The authors stated that the perspective of the health care payer was adopted.

Effectiveness data:
The clinical evidence came from various published sources that appear to have been selected without a literature review. Most of the evidence came from the European Machine Preservation Trial (MPT), a prospective, randomised, controlled trial (RCT) that compared the impact of the preservation method on the clinical outcomes, over one year after the transplant. The details of the other sources were not given. The key clinical endpoint was the success rate (a functioning kidney) at one year.

Monetary benefit and utility valuations:
Not considered.

Measure of benefit:
The graft survival rate at one year after transplantation was the benefit measure.

Cost data:
The economic analysis included the costs of transplantation (for the two approaches and the two sets of criteria), graft failure, and dialysis. These costs were presented as totals for each category. The economic data were derived from Medicare and private-payer data sources. Reimbursements rather than costs were used and a clear description of the method used to determine the private-payer costs was provided. All costs were in US dollars ($) and the price year was not explicitly reported.
Analysis of uncertainty:
A deterministic sensitivity analysis was undertaken on the model inputs, using published ranges of values. The sensitivity of the results to changes in delayed graft function and graft failure after one year was also tested.

Results
With expanded-criteria donors, the expected costs were $95,676 with cold storage and $91,871 with machine perfusion. The graft survival rate at one year after transplant was 0.84 with cold storage and 0.87 with machine perfusion. The average cost-effectiveness ratio was $114,530 with cold storage and $106,012 with machine perfusion.

With standard-criteria donors, the expected costs were $92,035 with cold storage and $87,254 with machine perfusion. The graft survival rate at one year after transplant was 0.88 with cold storage and 0.94 with machine perfusion. The average cost-effectiveness ratio was $104,118 with cold storage and $92,561 with machine perfusion.

Machine perfusion was dominant as it was more effective and cheaper for both expanded- and standard-criteria donors.

The sensitivity analysis indicated that these results were robust and the most influential inputs were the standard acquisition cost for kidneys and the cost associated with transplants involving kidneys from expanded-criteria donors. In general, machine perfusion remained more cost-effective than cold storage.

Authors' conclusions
The authors concluded that machine perfusion was preferable to cold storage, with both standard- and expanded-criteria donor kidney transplants, from the perspective of the third-party or private payer.

CRD commentary
Interventions:
The two comparators were appropriately selected as they represented the available interventions for organ preservation.

Effectiveness/benefits:
No literature review was reported and the sources were presumably known to the authors. Most of the evidence was appropriately taken from a RCT, which is usually considered to be a valid source of evidence, given its methodological strengths and rigour. More details on the design and other characteristics of this RCT, and the other sources of data, would have been useful to judge the validity of the clinical data. The benefit measure was specific to the disease and, although relevant, was not comparable with the benefits of other health care interventions.

Costs:
The categories of costs reflected the perspective stated, but a detailed breakdown of cost items was not given, due to the use of Medicare data, which are usually presented as total categories. The unit costs and patterns of resource consumption were not reported and the price year was not stated. These issues limit the possibility of replicating the analysis in other settings and time periods. The cost estimates were treated deterministically. The authors justified the use of reimbursements and private prices rather than costs.

Analysis and results:
The costs and benefits were appropriately reported and were combined using average cost-effectiveness ratios. No incremental analysis was conducted, possibly because machine perfusion was the dominant strategy, but this was not explicitly stated. The issue of uncertainty was only partially investigated in a deterministic analysis. The results were clearly reported and discussed.

Concluding remarks:
On the whole, the study was well conducted. The data sources were not extensively described, but the authors’ conclusions appear to be robust.

Funding
Not stated.