Cost-effectiveness of lanthanum carbonate in the treatment of hyperphosphatemia in chronic kidney disease before and during dialysis

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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 assessed the cost-effectiveness of the non-calcium-based phosphate binder lanthanum carbonate, as a second-line treatment for hyperphosphataemia, after the failure of calcium-based binders, for patients with chronic kidney disease who had or had not started dialysis. Lanthanum carbonate improved patients' health and was cost-effective, for the UK NHS, irrespective of dialysis status. The methods were valid and the uncertainty was considered. The authors' conclusions seem robust, but dependent on the future dialysis costs.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
This study assessed the cost-effectiveness of the non-calcium-based phosphate binder lanthanum carbonate, as a second-line treatment for hyperphosphataemia, after the failure of calcium-based binders, for patients with chronic kidney disease who had or had not started dialysis.

Interventions
Lanthanum carbonate was compared against calcium-based binders, as second-line treatment after a calcium-based binder.

Location/setting
UK/secondary care.

Methods
Analytical approach:
The analysis was based on a standard decision tree, followed by a Markov model, with a lifetime horizon. The authors stated that it was carried out from the perspective of the UK NHS.

Effectiveness data:
The clinical inputs were from a selection of published studies, with some assumptions by two UK clinical experts. The main inputs related to drug efficacy and were from two randomised trials; one of 57 patients who had not started dialysis and were treated with lanthanum carbonate and the other of patients on dialysis who were treated with lanthanum carbonate (n=123) or calcium-based binders (n=257). Other data were from published epidemiological studies. The baseline expected survival was from long-term observational data. The adverse effects of the drugs (mainly vomiting) were from the two clinical trials.

Monetary benefit and utility valuations:
The utility values were from a recent systematic review of health conditions in patients on or before dialysis. The utility decrements for vomiting were from a published study.

Measure of benefit:
Life-years and quality-adjusted life-years (QALYs) were the summary benefit measures. A 3.5% annual discount rate was applied.
Cost data:
The economic analysis included the costs of the drugs and dialysis. Most of the resource consumption estimates were from the two clinical trials. The drug costs were from the British National Formulary and the dialysis costs were a weighted average of the UK estimates for haemodialysis and peritoneal dialysis. The costs of dialysis in added life-years were not included in the base case. All costs were in UK pounds sterling (£) and were discounted at an annual rate of 3.5%. The price year was 2009.

Analysis of uncertainty:
A probabilistic sensitivity analysis was carried out to assess the uncertainty, using recommended probability distributions for each type of input. Credible intervals around the model outcomes were calculated. The dialysis costs in added life-years were included in a scenario analysis and other scenarios were analysed.

Results
In patients who had not started dialysis, lanthanum carbonate led to a gain of 69.4 life-years or 44.1 QALYs, and saved £339 over a calcium-based binder. Lanthanum carbonate was dominant, as it was more effective and less expensive. At a willingness-to-pay threshold of £30,000 per QALY, the net monetary benefit was £1,700, suggesting that lanthanum carbonate was highly cost-effective.

In patients on dialysis, lanthanum carbonate led to a gain of 91.9 life-years or 55.8 QALYs, at an additional cost of £386. The incremental cost per life-year gained with lanthanum carbonate over a calcium-based binder was £4,200 and the incremental cost per QALY gained was £6,900. The net monetary benefit was £1,300.

The base-case results were stable in most scenarios, but when future dialysis costs were included, the incremental cost per QALY gained rose to £48,600 for patients before dialysis and £63,000 for patients on dialysis. When the mortality on dialysis was varied, the incremental cost per QALY gained rose to £22,300 for patients on dialysis.

Authors’ conclusions
The authors concluded that second-line treatment with lanthanum carbonate improved patients’ health and was cost-effective, from the perspective of the UK NHS, irrespective of dialysis status.

CRD commentary
Interventions:
The selection of the comparators was appropriate, as calcium-based binders, such as calcium carbonate and calcium acetate, were the first-line options for the treatment of hyperphosphataemia in the UK and in many other countries.

Effectiveness/benefits:
No systematic search was reported to identify the relevant sources of evidence. Two clinical trials were selected as the main sources for the efficacy data and trials generally are valid sources, but there were few patients who had not started dialysis and they were pooled with dialysis patients who had similar characteristics. Few details of these two trials were provided. The epidemiological data were from large databases and observational studies, but it was unclear if these studies were conducted in the UK. Extensive sensitivity analysis was conducted on the clinical parameters. Both benefit measures were appropriate for capturing the impact of the disease on the patients’ health. Life-years and QALYs allow comparisons with the benefits of other health care interventions. The utility values were from published sources, but the methods used to elicit them were not given.

Costs:
The categories of costs were representative of the NHS perspective as stated. The sources were appropriate for the UK setting and the resource quantities were generally from the clinical trials or UK guidelines. A key assumption was the exclusion of future dialysis costs, in the base case, and these appear to have been the main driver of the cost-effectiveness results. The unit costs and resource quantities were not presented separately. The costs were varied stochastically in the probabilistic sensitivity analysis. The price year was reported, allowing reflation exercises.

Analysis and results:
The results were extensively presented. An incremental approach was used to assess uncertainty in deterministic and probabilistic sensitivity analyses; the results were clearly illustrated and discussed. The authors stated that conservative
assumptions against lanthanum carbonate were made, where there was uncertainty. They stated that this was the first study analysing the cost-effectiveness of lanthanum carbonate in patients who had not started dialysis. The transferability of the results was not discussed and the findings may be specific to the UK or settings with similar epidemiology and prices.

Concluding remarks:
The methods were valid and various areas of uncertainty were considered. The authors’ conclusions appear to be robust, but dependent on the future dialysis costs.

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