Economic evaluation of doripenem for the treatment of nosocomial pneumonia in the US: discrete event simulation

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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 doripenem compared with imipenem for the treatment of nosocomial (hospital-acquired) pneumonia, particularly when associated with ventilator use. The authors concluded that doripenem was clinically and economically superior to imipenem from the perspective of the US payer. The methods were valid and the study presentation was satisfactory. The authors’ conclusions appear to be robust.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study examined the cost-effectiveness of doripenem for the treatment of nosocomial pneumonia, particularly when associated with ventilator use.

Interventions
Intravenous doripenem was compared against imipenem. Intravenous doripenem was given at a dosage of 500mg every eight hours, while imipenem was given intravenously at 500mg every six hours or 1g every eight hours.

Location/setting
USA/hospital.

Methods
Analytical approach:
The analysis was based on a discrete event simulation model with a follow-up of 35 to 49 days. The authors stated that the analysis was carried out from the perspective of a comprehensive US payer.

Effectiveness data:
The clinical data were from selected sources, and some details were reported. Most of the evidence was from two open-label, multi-centre, phase III, non-inferiority trials that compared doripenem with imipenem or other antibiotics. The two trials included almost 1,000 patients. The key clinical endpoints were the relapse and death rates.

Monetary benefit and utility valuations:
Not considered.

Measure of benefit:
A number of clinical outcomes were considered; the rates of relapse, death, and seizures, and emerging Pseudomonas aeruginosa resistance.

Cost data:
The economic analysis included the costs of initial antibiotic, of any subsequent therapy, of hospitalisation, and related to seizures. Most of the resource use data were from clinical trials. The unit costs were based on average wholesale prices. Other costs were from published literature. All costs were in US dollars ($) and the price year was 2007.

Analysis of uncertainty:
Several one-way sensitivity analyses were carried out to examine the effects of changes in the key model inputs.
Results
The total costs per patient were $39,237 (range 38,497 to 40,092) with doripenem and $46,339 (range 45,511 to 47,309) with imipenem. The main reason for the lower costs was the reduction in hospital length of stay (by 2.9 days). In comparison with imipenem, doripenem had similar relapse and death rates, but prevented 10 seizures, 19 occurrences of emerging *Pseudomonas aeruginosa* resistance, and 27 incidents of *Pseudomonas aeruginosa* transmission, in a sample of 1,000 patients.

Doripenem was the dominant strategy as it was more effective and less expensive than imipenem.

In the sensitivity analysis, the savings associated with doripenem ranged from $4,800 to $12,000.

Authors' conclusions
The authors concluded that doripenem was clinically and economically superior to imipenem from the perspective of the US payer.

CRD commentary
Interventions:
The authors stated that imipenem was chosen as a comparator because it belonged to the drug class of antipseudomonal carbapenems, which were recommended, as initial empiric therapy for nosocomial pneumonia, by the American Thoracic Society and the Infectious Diseases Society of America.

Effectiveness/benefits:
A selective approach appears to have been used to identify the data sources. Phase III trials are generally valid sources of evidence, given the strengths of their design. The authors also used patient-level data from these trials and this should produce reliable results. The baseline characteristics of the patients in the trials were reported, but other details were not. The benefit measures were disease-specific and might not be easily compared with the benefits of other health care interventions.

Costs:
The cost categories were appropriate for the economic viewpoint. The key details of the unit costs and resource quantities were reported, enhancing the transparency of the analysis. It should be possible to inflate the results for other time periods as the price year was reported. The economic analysis appears to have been satisfactorily carried out, except that the sources of hospital costs were not clearly reported.

Analysis and results:
The results were clearly reported and the costs and benefits were combined in an incremental analysis, which showed the superior profile of one treatment. The issue of uncertainty was implicitly assessed in the discrete event model that simulated individual patients in several trials. One-way sensitivity analyses were also conducted. The follow-up was appropriately chosen to reflect the period during which the outcomes might occur. The authors acknowledged some limitations of their analysis, such as the use of clinical data from countries other than the USA, and the exclusion of some factors that might influence disease transmission, such as the hospital environment, size, and infection control.

Concluding remarks:
The methods were valid and the study presentation was satisfactory. The authors’ conclusions appear to be robust.

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Bibliographic details