Pharmacoeconomics of piperacillin/tazobactam and imipenem/cilastatin in the treatment of patients with intra-abdominal infections

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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.

Health technology
Antibiotic therapy for the treatment of intra-abdominal infections, in particular piperacillin/tazobactam and imipenem/cilastatin.

Type of intervention
Treatment

Economic study type
Cost-effectiveness analysis.

Study population
Patients with symptoms of perforated or gangrenous appendicitis.

Setting
Practice setting was the hospital. The study was carried out in Los Angeles, USA.

Dates to which data relate
The prices of the antibiotic treatment were based on 1994 prices. No other dates were specified to which the data for effectiveness analysis and resources used related.

Source of effectiveness data
Single study

Link between effectiveness and cost data
Costing was done on the same patient sample as used in the effectiveness study. Costing was undertaken prospectively.

Study sample
A total of 92 patients were assessable for the clinical trial (45 in the piperacillin/tazobactam group, and 47 in the imipenem/cilastatin group). Power calculations were reported (sample size only provided 25% statistical power).

Study design
The study was based on a randomized controlled trial single centre study. Patients were followed up for approximately 2 weeks to 1 months following discharge. No information was provided on any loss to follow-up.
Analysis of effectiveness
The basis for analysis of the clinical study was not stated. Primary health outcomes were based on a number of adverse effects and treatment failures (i.e. resistance of cultured pathogens to the antibiotics). Groups were shown comparable in terms of age, sex, prognostic features.

Effectiveness results
Of the 45 piperacillin/tazobactam patients, 10 were classified as treatment failures. Of the 47 imipenem/cilastatin group there were five treatment failures. No statistical differences in the number of treatment failures were observed (p=0.164). The mean incidence of adverse events was 0.93 and 0.85 for the two groups respectively, but the difference was not statistically significant (p = 0.757).

Measure of benefits used in the economic analysis
Since no statistically significant difference was discovered in the clinical analysis, only costs were examined in the economic analysis.

Direct costs
The viewpoint of the provider organisation was adopted. Acquisition costs of the antibiotics were based on the average wholesale price (personal communication). The cost of supplies used in the preparation and administration of the antibiotics were obtained from published information from another study. Nursing costs and pharmacy technician costs were determined by applying an average time per procedure obtained from published information multiplied by their respective hourly wage rate. The average per diem charges for surgical patients at the institution were used to determine the total charge for the initial hospital days and any re-hospitalised days. Costs and quantities were analysed separately. Drug prices were based on 1994 data. No other date was given.

Statistical analysis of costs
Mean values, standard deviations, median values and p-values were reported for most of the cost items.

Currency
US dollars ($).

Sensitivity analysis
A limited sensitivity analysis of costs was performed. A threshold analysis was performed on the costs per dose of the alternative treatments.

Estimated benefits used in the economic analysis
Not applicable

Cost results
Acquisition cost, IV supplies cost, nursing cost, and pharmacy technician/pharmacist cost were all lower in the piperacillin/tazobactam group (p=0.001, p=0.012, p=0.012 and p=0.012 respectively). Total mean drug treatment costs were significantly lower in the piperacillin/tazobactam group ($538.83 +/- $385.33) than in the imipenem/cilastatin group ($687.66 +/- $345.37). Total mean hospital-days charge was lower for the imipenem/cilastatin group than for the piperacillin/tazobactam group ($16,150 +/- $5,088.60 vs $18,339.76 +/- $6,090.38). This difference was borderline statistically significant (p = 0.052). Sensitivity analysis showed that only when piperacillin/tazobactam was $2/dose more than imipenem/cilastatin were the total treatment costs for the two groups the same.
Synthesis of costs and benefits
Not applicable

Authors' conclusions
On average, total drug treatment cost was more than $100 per patient in the imipenem/cilastatin group. This was the result of a higher acquisition cost and the more frequent administration. However, the savings in treatment costs seen with the use piperacillin/tazobactam is small in relation to the savings that arise with a reduction in the length of hospitalisation. While the difference in length of hospitalisation was not statistically significant, the sample size only provided 25% statistical power and was not large enough to eliminate the risk of a type II error in the failure rates. The findings suggest that length of hospital stay should be the economic focus of antibiotic therapy rather than direct drug costs.

CRD Commentary
Since the study sample is of insufficient magnitude to detect a statistical difference between the failure rates of the alternative therapies, it is very difficult to determine the validity of the findings. The recognition of the importance of length of hospitalisation rather than the direct acquisition is important. In addition, a number of the authors cost estimates are based on values derived from the literature, but the authors do not explain whether this is an appropriate assumption. Since the authors base their estimates of costs on prices in the USA it is difficult to generalise the results to the UK.

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