Estudio de costo-efectividad de ceftriaxona y cefotaxima en el tratamiento de neumonía adquirida en la comunidad [Cost-effectiveness study of ceftriaxone and cefotaxime for the treatment of community acquired pneumonia]

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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
The health technologies under study were two drugs for the treatment of moderate to severe community acquired pneumonia (CAP): ceftriaxone (1g intravenously every 24 hours for 7 days) and cefotaxime (1g intravenously every 8 hours for 7 days).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients suffering from moderate to severe CAP, aged 18 or over with risk factors for mortality and complications that required hospitalisation (according to the American Thoracic Society).

Setting
The setting was a hospital. The economic study was conducted in five hospitals of the Istituto Mexicano de Seguridad, Mexico.

Dates to which data relate
Effectiveness and resource use data were gathered between winter 1994 and spring 1995. The price year was 1999.

Source of effectiveness data
The effectiveness evidence was derived from a single study.

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
A sample of 110 patients was included in the study. 56 patients (mean age: 57.2 (+/- 13.9) years, 54% men) were randomly assigned to the ceftriaxone group and 54 (mean age: 57.8 (+/- 10.0) years, 50% men) to the cefotaxime group. No power calculations were performed to identify the sample size. No patient refused to participate or was excluded from the study.
Study design
The study was a randomised controlled trial performed in five Mexican hospitals. The same protocol was applied in all the hospitals. The follow-up was 7 days from the beginning of the treatment. Three patients in the cefotaxime group withdrew from the study because of resistance to the eradication of the bacterium. The randomisation was based on sealed envelopes.

Analysis of effectiveness
Three effectiveness criteria were considered: clinical efficacy, bacteriological efficacy and therapeutic efficacy. Clinical efficacy was satisfied if patients achieved a decrease in temperature of 1.7 degrees Celsius after 7 days of treatment or if they returned to a normal temperature, if the leukocyte count was reduced by 15% or if it returned to normal levels (4,000-10,000 cells/mm³), and if patients presented normal cardiac and respiratory frequency. Bacteriologic efficacy was achieved when the eradication of the bacterium was obtained after 4 or 7 days of treatment. Therapeutic efficacy was achieved when both clinical efficacy and bacteriological efficacy were obtained. Therapeutic improvement was achieved when the patient attained one or more of the clinical requirements plus bacteriological efficacy. Therapeutic failure was considered when the patient failed to achieve two or more of the clinical requirements and did not obtain bacteriological efficacy. The length of hospital stay and occurrence of adverse effects were also assessed. Patients in the two groups were shown to be comparable in terms of demographic and clinical characteristics and there were no statistically significant differences between the two groups.

Effectiveness results
No statistically significant differences between the two groups were found for clinical efficacy.

As regards bacteriological efficacy, 100% of patients in the ceftriaxone group achieved eradication versus 90% in the cefotaxime group, (p=0.096). Thirteen patients in the ceftriaxone group and 21 patients in the cefotaxime group were not evaluable.

Therapeutic efficacy was achieved in 55 (98%) patients of the ceftriaxone group versus 45 (83%) in the cefotaxime group, (p=0.0091). One patient in the ceftriaxone group and 9 patients in the cefotaxime group were not evaluated. The median length of hospital stay was 8 days in the ceftriaxone group and 9 days in the cefotaxime group. Five patients (9%) in the ceftriaxone group and 3 patients (6%) in the cefotaxime group had adverse effects.

Clinical conclusions
Ceftriaxone was more effective in bacterium eradication (not significantly) and in terms of therapeutic results (significantly) compared to cefotaxime.

Measure of benefits used in the economic analysis
The measure of benefits used was the number of patients cured, namely the number of patients who achieved therapeutic efficacy.

Direct costs
The median total cost per patient for each treatment was calculated. The resources used and unit costs were reported separately. Direct costs included the cost of purchasing, preparation and administration of the two drugs under study and those of concurrent medications (antibiotics), the cost of hospitalisation, the cost of hospital staff and equipment and the cost of chest X-rays. The prices of the medications were obtained from the Instituto Federal del Consumidor, while inpatient costs and cost of the hospital staff were obtained from actual data for each hospital. The price year was 1999. No discount rate was applied given the short time horizon of the study (1 week).

Statistical analysis of costs
No statistical analysis of costs was performed.
Indirect Costs
Indirect costs were not included.

Currency
Mexican pesos (pesos).

Sensitivity analysis
A one-way sensitivity analysis was performed by changing the therapeutic efficacy of cefotaxime from 83% (base case) to 100%.

Estimated benefits used in the economic analysis
Fifty-five (98%) patients from the ceftriaxone group versus 45 (83%) in the cefotaxime group were cured, (p=0.0091).

Cost results
The median total cost per patient in the ceftriaxone group was Pesos 19,111.15 versus Pesos 24,348.40 in the cefotaxime group.

Synthesis of costs and benefits
An average cost-effectiveness analysis was carried out to combine costs and benefits. An incremental analysis was also performed. The average cost per patient cured in the ceftriaxone group was Pesos 19,458.62 and Pesos 29,218.08 in the cefotaxime group. Ceftriaxone was both more effective and less costly than cefotaxime (dominant). It was calculated that the use of ceftriaxone would lead to savings of Pesos 35,170.79 per additional patient cured. Even assigning a 100% therapeutic efficacy to cefotaxime, the average cost per patient cured for ceftriaxone remained lower than that for cefotaxime.

Authors’ conclusions
Ceftriaxone should be the treatment recommended for patients suffering from moderate to severe CAP, being more effective and less costly than cefotaxime. The use of ceftriaxone would lead to savings to the Mexican health system.

CRD COMMENTARY - Selection of comparators
The choice of the comparators was implicitly justified, given that they are treatments commonly used for CAP. You, as a user of this database, should consider whether they represent widely used technologies in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness measures were derived from a randomised controlled trial. Appropriate statistical analyses were performed in order to compare the characteristics of the two groups under study and to compare the effectiveness results. The choice of the clinical measures of efficacy appears to have been appropriate and comprehensive. These issues tend to enhance the internal validity of the analysis. However, sample size calculations were not carried out and some patients were not evaluable.

Validity of estimate of costs
All the relevant medical direct costs were included in the analysis. Indirect and intangible costs were not included because the majority of patients were out of work. Resource use data were derived from actual data and were reported separately from unit costs. However, costs were likely to be typical of the Mexican setting and no statistical analyses were carried out.
Other issues
No sensitivity analyses on costs were performed, limiting the generalisability of the results. However, the authors compared the unit costs for staff and hospital equipment with other US and UK studies, finding similar values.

The authors’ conclusions were appropriately based on an incremental cost-effectiveness analysis.

Implications of the study
The use of ceftriaxone instead than cefotaxime would lead to savings for the Mexican health system.

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