Utility of blood cultures in community-acquired pneumonia requiring hospitalization: influence of antibiotic treatment before admission
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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 study evaluated the use of microbiological blood cultures for the diagnosis of patients hospitalised for moderate community-acquired pneumonia (CAP). The comparator was no microbiological blood cultures for the diagnosis of patients hospitalised for moderate CAP, and who had received an antibiotic prior to admission.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients aged over 15, with moderate CAP, hospitalised in the respiratory unit of the Centre Hospitalier Universitaire Sud from 1 March 1994 to 28 February 1995.

Setting
The setting was secondary care. The economic study was carried out in the Centre Hospitalier Universitaire, in Amiens, France.

Dates to which data relate
The effectiveness and resource use data were collected between 1 March 1994 and 28 February 1995. The price year was 1995.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
Cost data were collected prospectively alongside the effectiveness data from the same patient sample.

Study sample
No power calculations to determine the sample size required to test the study hypothesis were reported. A total of 53 patients hospitalised for CAP were included in the study: 33 men and 20 women. The sample comprised all patients over 15 years old who were hospitalised with moderate CAP during the study period. The mean age was 55.7 +/- 18 years (range: 18 - 85 years).
The patients were divided into two groups. Group 1 comprised 30 patients who had not received antibiotic treatment prior to admission, whilst group 2 comprised 23 patients who had been treated with antibiotics.

The authors reported that the most frequent underlying diseases were chronic obstructive pulmonary disease (COPD) (32%), congestive heart failure, and alcoholism (13.2%). The authors also stated that there was no significant difference in frequency of co-existing illnesses between the groups. In relation to the inclusion/exclusion criteria, it was reported that pneumonia was defined as any acute septic episode with respiratory symptoms and a new progressive infiltrate on chest x-rays. Community acquired infection was defined as an infection occurring before or within 48 hours after admission in patients who had not been hospitalised during the proceeding two weeks. Moderate CAP was defined as an infection requiring hospitalisation in a respiratory unit but not in an intensive care unit.

The authors reported that patients with a clinical history suggestive of aspiration, a severe pneumonia requiring an intensive care unit, an immunosuppressive illness, or who were being treated with immunosuppressive drugs, were excluded from the study.

**Study design**
The evaluation used a prospective observational study design, and was carried out in a single centre, the Centre Hospitalier Universitaire Sud, in Amiens, France. The duration of follow-up was 15 days after hospitalisation. The patients were not randomised to blood cultures or no blood cultures. The study did not include a comparator group of patients who did not have blood cultures.

**Analysis of effectiveness**
All patients included in the study were included in the reported analysis, which suggests an intention to treat analysis. The primary outcomes used in the economic analysis were: the number of blood cultures, the number of blood cultures per patient, the number of patients with bacteraemia, and the number of positive blood cultures. An explicit comparator group was not reported.

**Effectiveness results**
The results were as follows:

- number of blood cultures:
  - group 1 = 74, group 2 = 62;

- blood cultures per patient:
  - group 1 = 2.5 +/- 1.1, group 2 = 2.7 +/- 1.1;

- number of patients with bacteraemia:
  - group 1 = 5, group 2 = 0;

- positive blood cultures:
  - group 1 = 8, group 2 = 0.

**Clinical conclusions**
The authors concluded that the results of microbiological blood cultures did not influence hospital antibiotic treatment for patients with moderate CAP. The authors also concluded that the results showed a reduced clinical utility of blood cultures in patients hospitalised for moderate CAP, and who had received an antibiotic treatment prior to admission.
Measure of benefits used in the economic analysis
The health benefit was proxied by the number of negative blood cultures.

Direct costs
The only costs reported by the authors were the cost of blood culture. The authors did not report all quantities and costs separately. The resource use data were estimated from data collected prospectively on the study patients. The source of the price data was not reported. The price year was 1995. Discounting was not undertaken because of the short time frame of the study. The authors stated that the cost of a negative set of blood cultures was Ffr 211.2, rising to Ffr 246.4 when a germ was isolated. When an antibiogram was performed for a positive blood culture set, the cost was Ffr 316.8.

Statistical analysis of costs
Costs of the two patient groups included in the study were compared using the student's t-test. The results were expressed as a mean +/- SD. A p-value of <0.05 was considered significant. There was no statistical comparison of the use of blood cultures (intervention) to no blood cultures (comparator).

Indirect Costs
No indirect costs were included in the analysis.

Currency
French francs (Ffr). No currency conversions were reported.

Sensitivity analysis
No sensitivity analysis was performed.

Estimated benefits used in the economic analysis
The number of negative blood cultures was 66 in group 1 and 62 in group 2.

Cost results
The total cost of blood cultures over a 15-day study period was Ffr 16,262.4 for group 1 and Ffr 13,164.8 for group 2. The costs included the costs of additional test for positive blood cultures, but did not include the costs of other diagnostic tests that were used, the costs of hospital treatment during the hospital admission or the costs of treatment prior to admission or post discharge from hospital.

Synthesis of costs and benefits
The authors report that the cost of negative blood cultures corresponded to the cost that could be saved if blood cultures were abandoned. The cost of negative blood cultures was Ffr 13,939.2 in group 1, and Ffr 13,164.8 in group 2. The cost of negative blood cultures per patient was Ffr 464.6 +/- Ffr 244.3 in group 1 and Ffr 569.3 +/- Ffr 233.4 in group 2.

Authors' conclusions
The authors concluded that their results showed a reduced clinical usefulness and extremely low cost-benefit of blood cultures in patients hospitalised for moderate CAP and treated with antibiotics before admission.

CRD COMMENTARY - Selection of comparators
A justification was given for the choice of comparator used, namely that there was limited evidence to support the use of blood cultures in patients admitted to hospital with moderate CAP, and who had been treated with antibiotics. You,
as a user of this database, should decide if this is a widely used health technology in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis was based on a prospective, observational study carried out in a single centre. The authors reported the study aim as the assessment of the influence of antibiotics prior to hospital admission and the clinical utility and cost-benefit of blood cultures on admission to hospital. This would require a comparison between patients who did and did not have blood cultures, but the study did not include a control group of patients who did not have blood cultures. This meant that it was not possible to assess the consequences of not using blood cultures and the validity of the estimate of effectiveness cannot be evaluated. The study sample was representative of the study population.

**Validity of estimate of measure of benefit**
The authors used a measure of effectiveness to proxy health benefit. The measure of effectiveness used did not include the impact of blood cultures on mortality and morbidity and is, therefore, of limited use in assessing the relative cost effectiveness of the intervention.

**Validity of estimate of costs**
The authors did not report the perspective adopted in the study. Only the costs of blood cultures and additional tests for positive blood cultures were reported. The authors did not report the costs of associated treatment that might have been affected by the alternative methods of diagnosis and adverse events arising from misdiagnosis. Costs and quantities were not reported separately. A statistical analysis of costs and quantities was undertaken for the intervention groups. No sensitivity analysis was performed. No currency conversions were reported and discounting was not undertaken because of the short time frame of the study.

**Other issues**
The authors made appropriate comparisons of their findings with those from other studies, but did not fully address the issue of generalisability to other settings. The main limitation reported by the authors in relation to the study was the limited amount of available data. The authors' conclusions could not be supported by the data collected because of the omission of a comparator group.

**Implications of the study**
The authors conclude that their results show a reduced clinical usefulness and extremely low cost-benefit of blood cultures in patients hospitalised for moderate CAP and treated with antibiotics before admission. The authors consequently propose that the use of blood culture should be abandoned in patients who have received antibiotic therapy prior to hospitalisation.

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