Use of a treatment protocol in the management of community-acquired lower respiratory tract infection

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
A protocol for prescribing antimicrobials was compared with empirical treatment (normal hospital practice) for the treatment of community-acquired lower respiratory tract infection (LRTI).

Type of intervention
Diagnosis and treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised adult patients admitted with a primary diagnosis of LRTI to the medical wards of Antrim Area Hospital. The diagnosis was made on clinical grounds. The authors reported that the patients’ characteristics were similar in relation to the living arrangements prior to admission, age, gender, mean onset time for disease progression, and disease severity. No further inclusion and exclusion criteria were reported.

Setting
The setting was secondary care. The economic study was carried out in Antrim Area Hospital, Northern Ireland.

Dates to which data relate
The effectiveness and resource use data were collected between December 1994 and February 1996. The price year was 1996.

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

Link between effectiveness and cost data
The costing was performed prospectively using the same patient sample as that used in the effectiveness study.

Study sample
No power calculations were performed to determine the sample size. A total of 227 adult patients were recruited to the trial and included in the final analysis. The control group, which received the empirical treatment, comprised 112 patients who were recruited between December 1994 and February 1995. All of these patients had a primary diagnosis of LRTI and were admitted to the Antrim Area Hospital from December 1994 to February 1995. The intervention group, which was treated using the antimicrobial-prescribing protocol, comprised 115 patients who were recruited...
between December 1995 and February 1996. All of these patients had a primary diagnosis of LRTI, and were consecutively admitted to the Antrim Area Hospital from December 1995 to February 1996.

**Study design**

The study was a prospective, controlled clinical trial carried out at a single centre, the Antrim Area Hospital in Northern Ireland. All of the patients were followed over the duration of their complete hospital stay. The patients in the protocol group were also followed-up at 28 days to ensure that early discharge from hospital did not have a detrimental effect on their clinical outcome. No loss to follow-up was reported.

**Analysis of effectiveness**

All of the patients included in the study were accounted for in the analysis. The primary outcome measures were the duration of treatment in hospital (days), the length of hospital stay (days), the duration of i.v. antimicrobial treatment, and the treatment failure rate.

The authors reported that the two groups of patients were comparable. There was no significant difference in relation to the patients’ living arrangements prior to hospital admission, their age, gender, mean onset of days of illness before admission, and disease severity.

A wide range of laboratory tests was conducted for the control and protocol patients. A higher proportion of patients had a sputum culture ordered in the protocol group (98.3%, 113 patients) than in the control group (54.5%, 61 patients), (p>0.05). The authors did not report whether these values were adjusted.

**Effectiveness results**

The study reported the geometric mean of the primary outcome measures for both the control and protocol groups. The mean length of stay in hospital was 9.2 days (range: 8.5 - 10.0) in the control group and 4.5 days (range: 4.0 - 5.1) in the protocol group. This produced a control-to-protocol ratio of 2.04 (95% confidence interval, CI: 1.75 - 2.34; p<0.001).

The mean duration of i.v. antimicrobial treatment was 5.7 days (range: 5.2 - 6.2) in the control group and 2.1 days (range: 1.8 - 2.6) in the protocol group. This produced a control-to-protocol ratio of 2.71 (95% CI: 2.20 - 3.22; p<0.001).

The mean duration of treatment in hospital was 8.8 days (range: 8.2 - 9.4) in the control group and 4.5 days (range: 4.0 - 5.0) in the protocol group. This produced a control-to-protocol ratio of 1.96 (95% CI: 1.69 - 2.25; p<0.001).

The treatment failure rate was 31.3% (35 patients) in the control group and 7.8% (9 patients) in the protocol group, (p<0.001).

**Clinical conclusions**

The authors reported that the results demonstrated that the antimicrobial-prescribing protocol had a statistically significant impact in relation to the clinical outcome measures. The patients treated with the protocol had a significant reduction in the duration of hospital treatment, the length of hospital stay, and the duration of i.v. therapy. They also had a statistically significantly reduced chance of treatment failure when compared with the control group.

**Measure of benefits used in the economic analysis**

No summary measure of health benefit was used in the economic analysis, and the outcomes were left disaggregated. The analysis should therefore be considered as a cost-consequences analysis.

**Direct costs**
The costs and quantities were not reported separately. The authors reported three direct hospital costs: the total antimicrobial cost, the total laboratory cost, and the bed cost. All the costs were calculated for the total stay in the hospital. The source of unit costs was not reported. The resources used were collected prospectively using a data collection form. Discounting was not carried out due to the short timeframe of the analysis. The price year was 1996.

**Statistical analysis of costs**
The authors reported that the cost differences between the control and protocol groups were analysed using Student's t-test. The health care costs were normalised using a logarithmic transformation to base 10. This was also used to the CIs for the mean values. The results were reported to be statistically significant at a p-value of less than 0.05.

**Indirect Costs**
No indirect costs were included in the analysis.

**Currency**
UK pounds sterling (\(\£\)). No conversion rate was reported. The price year was 1996.

**Sensitivity analysis**
No sensitivity analysis was reported.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
The total cost of health care was 2,024 (range: 1,878 - 2,220) in the control group, compared with 1,020 (range: 933 - 1,175) in the protocol group. The control-to-protocol ratio was 1.98 (95% CI: 1.70 - 2.30; p<0.001).

**Synthesis of costs and benefits**
No synthesis of costs and benefits was conducted. No incremental analysis was reported.

**Authors' conclusions**
The authors concluded that the antimicrobial-prescribing protocol had a statistically significant impact in terms of the clinical measures, when compared with the control group. The results showed that patients treated using the antimicrobial-prescribing protocol had significant reductions in the length of hospital stay, the duration of i.v. therapy, and the duration of hospital treatment. Further, the authors' reported that the use of the protocol resulted in a significant reduction in health care costs. In addition, the protocol was a central factor in the streamlining of antimicrobial therapy for community-acquired LRTI, and led to a more cost-effective treatment of the patients.

**CRD COMMENTARY - Selection of comparators**
The choice of the comparator, i.e. empirical treatment, was justified on the grounds that it represented current practice. You should decide if this is a widely used approach in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis was based on a prospective, controlled clinical trial that was carried out at a single centre. This appears to have been appropriate for the study question. The study sample was representative of the study population, and the two groups of patients were shown to be comparable at analysis. The authors performed appropriate statistical analyses to
take into account potential biases and group differences.

**Validity of estimate of measure of benefit**
The authors did not derive a summary measure of health benefit. The analysis should therefore be categorised as a cost-consequences study.

**Validity of estimate of costs**
All the categories of cost relevant to the perspective adopted, i.e. the hospital, were included in the analysis. Some of the costs, such as the cost of adverse reactions, were excluded from the analysis. These were unlikely to have affected the authors’ conclusions given that the clinical and economic impact of the protocol were statistically significant. The authors did not report the costs and quantities separately. The authors performed a statistical analysis of the quantities and prices, but did not conduct a sensitivity analysis. A logarithmic transformation was used to normalise the cost data because these types of data are generally skewed. This was an inappropriate approach to take because it was unclear how you interpret the transformed cost data. The authors did not report any currency conversions. Discounting was not undertaken because of the short timeframe of the study. The price year was reported.

**Other issues**
The authors made appropriate comparisons of their findings with those from other studies. The omission of a sensitivity analysis meant that the authors’ did not address the issue of generalisability to other settings. The authors did not report any limitations to their study.

**Implications of the study**
The authors concluded that the protocol had a statistically significant impact on both the clinical and economic measures. The authors stated that this was because the protocol led to significant reductions in the length of hospital stay, the duration of i.v. therapy, the duration of hospital treatment, and the costs of health care. Thus, it led to a more cost-effective treatment of those patients with community-acquired LRTI. The authors also reported that the study led to the algorithm being placed on the hospital intranet. The website algorithm has facilitated the decision-making process on the need to hospitalise patients with LRTI, by automatically scoring the severity of LRTI in response to questions posed on screen, and by continuing work on the development of guidelines.

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**MeSH**
Aged; Anti-Bacterial Agents /administration & dosage /economics /therapeutic use; Clinical Protocols; Community-Acquired Infections /drug therapy /economics; Cost of Illness; Data Collection; Female; Hospitalization; Humans; Longevity; Male; Middle Aged; Northern Ireland; Respiratory Tract Infections /drug therapy /economics; Treatment Outcome