A computer-assisted management program for antibiotics and other antiinfective agents


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
Using a computerised antiinfectives-management program to improve the quality of care by employing decision-support logic to assist physicians in the prescribing of antiinfective agents.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients admitted to the intensive care unit of a community hospital.

Setting
Hospital. The economic study was carried out in Utah, USA.

Dates to which data relate
The data relating to the pre-intervention period were collected during the period July 1992 to June 1994, whilst data for the intervention period were from the period July 1994 to June 1995. The price year was 1995.

Source of effectiveness data
The evidence for the final outcomes 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
No power calculations were reported. A total of 545 patients were admitted to the ICU during the intervention period, of whom 398 received antiinfective agents. Forty-nine percent of the patients in the intervention group (n=195) did not always receive the regimen suggested by the program. On the other hand, 766 of the 1,136 patients admitted in the control period received such agents.

Study design
The study was a nonrandomised trial with historical controls carried out in a single centre. The duration of follow-up was not clearly reported.
Analysis of effectiveness
The analysis was based on intention-to-treat and the primary health outcomes used in the analysis being the number of adverse events caused by antiinfective agents, number of days of excessive antibiotic dosage, and mortality. A regression model was used to investigate the differences in costs and outcomes between strategies after controlling for differences in age, sex, severity of illness, medical service, and mortality.

Effectiveness results
Overall, 28 cases of adverse events were caused by antiinfective agents in the pre-intervention period (2 years), and 4 cases in the intervention period (1 year). The corresponding mortality figure was 22% for both periods, while the average number of days of excessive antiinfective dose was 5.9 (pre-intervention) and 2.7 (intervention), (P<0.002). After adjusting for differences in patient characteristics between groups the figures for number of days of excessive antiinfective dose changed to 5.4 (95% CI: 4.5 - 6.4) in the pre-intervention period and 1.4 (95% CI: 0 - 2.7) and 3.6 (95% CI: 2.0 - 5.1) in the intervention period for "computer regimen followed" and "computer regiment overriden" respectively.

Clinical conclusions
The designed program showed a dramatic improvement in clinical outcomes in the management of infectious diseases.

Measure of benefits used in the economic analysis
The number of days of excessive antiinfective dosage avoided was used as the benefit measure. These were reported after adjusting for patient characteristics using a regression model.

Direct costs
Only the length of hospital and ICU stay and number of microbiology cultures were reported separately from costs. These included costs related to hospitalization and drug acquisition costs (no further details provided). The costs were reflated to 1995 figures by using the medical component of the US consumer price index. The perspective adopted in the cost analysis was not specified.

Statistical analysis of costs
After adjusting for differences in patient characteristics between groups, the costs were analysed by using a linear regression model. In addition, 95% confidence intervals were reported for the cost figures.

Indirect Costs
Not considered.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was reported.

Estimated benefits used in the economic analysis
Relative to the pre-intervention period, a total of 4 days of excessive antiinfective dosage would be avoided if the computer regimen were always followed. Within the intervention period, following the computer regimen would save 2.2 days relative to overriding the computer regimen.
Cost results
The total cost of hospitalization was $26,315 (95% CI: 20,393 - 32,237) for the intervention group patients who always received the computer regimen, $44,865 (95% CI: 38,564 - 51,166) for those not always receiving the computer regimen, and $35,283 (95% CI: 31,448 - 39,118) in the pre-intervention period. The p value for the comparison between the first and last figures was <0.005 (overall p<0.001).

Synthesis of costs and benefits
A synthesis was not performed since the computerized antiinfectives-management program was considered as the dominant strategy.

Authors’ conclusions
A computerized antiinfectives-management program can improve the quality of patient care and reduce costs.

CRD COMMENTARY - Selection of comparators
The reason for the choice of comparator was clear.

Validity of estimate of measure of benefit
The validity of the estimate of measure of benefit might be affected by problems related to selection bias and the comparability or otherwise of the study groups (for those who were given the suggested computer regimen always and those who were not), and also, given the non-concurrent control, due to changes in practice patterns over time. Despite the fact that the authors adjusted for patient characteristics known to affect the outcomes, lack of randomization in the allocation process may have affected the validity of the results. Overall adjusted results were not presented for the intervention group.

Validity of estimate of costs
Many quantities of resource use were not reported separately from the costs. Moreover, no adequate details of the methods of cost estimation were reported. Finally, the human and physical capital costs (computer network) seem to have been omitted from the analysis.

Other issues
The conclusions reached by the authors may not be fully justified given the uncertainty in the data. The authors stated that the study findings may not be generalisable, given that the study was based on computerized medical-information systems already in operation at the institution before the intervention started. No adequate comparisons with other studies were presented. Overall, given the lack of randomisation and sensitivity analysis the results may need to be treated with some caution.

Implications of the study
Although providing useful insights, after controlling for important additional factors affecting patient outcomes, the present findings require further studies to determine the cost-effectiveness of computer-assisted management programs for antibiotics and other antiinfective agents.

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Bibliographic details