Cost-effectiveness of linezolid versus vancomycin in mechanical ventilation-associated nosocomial pneumonia caused by methicillin-resistant Staphylococcus aureus

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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 use of linezolid (LIN), an oxazolidinone-class antimicrobial agent, for the treatment of mechanical ventilation-associated nosocomial pneumonia caused by methicillin-resistant Staphylococcus aureus (VAP-MRSA). LIN was given at a dosage of 600 mg every 12 hours.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised a hypothetical cohort of patients with nosocomial VAP-MRSA.

Setting
The setting was a hospital. The economic study was carried out in Brazil.

Dates to which data relate
The effectiveness data were derived from a study published in 2004. The period during which the resource use data were gathered was not reported. The price year was 2004.

Source of effectiveness data
The effectiveness evidence was derived from a synthesis of completed studies.

Modelling
A simple decision model was used to assess the expected costs of the two treatment strategies in a hypothetical cohort of patients with VAP-MRSA. The patients could receive either VAN or LIN and then could be cured or die. A short time horizon was used.

Outcomes assessed in the review
The outcomes estimated were the cure rates with LIN and VAN.

Study designs and other criteria for inclusion in the review
The evidence came from a published meta-analysis of double-blind, randomised clinical trials. The clinical trials
enrolled a total of 1,019 patients with nosocomial pneumonia, including 160 with identified MRSA and 91 with VAP-MRSA.

**Sources searched to identify primary studies**
Not stated.

**Criteria used to ensure the validity of primary studies**
The validity of the estimates was ensured by the use of clinical trials.

**Methods used to judge relevance and validity, and for extracting data**
Not stated.

**Number of primary studies included**
The evidence was derived from a single study, which was a meta-analysis of two trials.

**Methods of combining primary studies**
A meta-analysis was carried out to pool the primary estimates.

**Investigation of differences between primary studies**
Not stated.

**Results of the review**
The cure rate for all patients with nosocomial pneumonia was 59% with LIN and 35.5% with VAN. For patients with VAP-MRSA, the cure rate was 62.2% with LIN and 21.2% with VAN (these values were used in the decision model). All these differences were statistically significant.

**Measure of benefits used in the economic analysis**
The summary benefit measure used was the cure rate. This was derived directly from the effectiveness analysis.

**Direct costs**
The perspective adopted in the study was not stated, but it might have been that of the Brazilian health system. The cost analysis included the costs of LIN, VAN (either brand-name or generic), discarded syringes with needle, sterile water for injection, saline solution for infusion, the device for infusion and the infusion pump. The authors stated that the cost of in-hospital stay was not considered because length of stay was equivalent between the groups. The unit costs were presented separately from the quantities of resources used. The list of materials (with prices) used for the administration of each drug was obtained by interviews with nurse teams from a reference institution in Sao Paulo (Instituto do Coracao do Hospital das Clinicas da Faculdade de Medicina da Universidade de Sao Paulo). The duration of both treatments was standardised to 11 days, based on a published study. Drug dosages were those presented in the literature and recommended by manufacturers. Discounting was not relevant since the costs were incurred during a short timeframe. The price year was 2004.

**Statistical analysis of costs**
The costs were treated deterministically.
Indirect Costs
The indirect costs were not considered in the analysis.

Currency
Brazilian real (R$).

Sensitivity analysis
Sensitivity analyses were not performed.

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

Cost results
The estimated costs were R$4,829.66 with LIN, R$2,805.11 with brand-name VAN and R$2,390.85 with generic VAN.

Synthesis of costs and benefits
Average cost-effectiveness ratios (i.e. the cost per cured patient) were calculated to combine the costs and benefits of the alternative strategies. In a hypothetical cohort of 100 patients, the average cost-effectiveness ratio was R$7,764.72 with LIN, R$13,231.65 with brand-name VAN and R$11,277.59 with generic VAN.

Authors' conclusions
Despite higher acquisition costs in comparison with vancomycin (VAN), linezolid (LIN) was a cost-effective treatment for mechanical ventilation-associated nosocomial pneumonia caused by methicillin-resistant Staphylococcus aureus (VAP-MRSA) in Brazil. The cost per cured patient was lower for LIN than for both brand-name and generic VAN, owing to the higher efficacy of LIN.

CRD COMMENTARY - Selection of comparators
The selection of the comparator was appropriate as the authors stated that VAN was the treatment of choice for VAP-MRSA. Standard dosages were used. You should decide whether this is a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness evidence came from a published meta-analysis of two clinical trials. Details of the approach used to pool the primary estimates were not reported. The use of double-blind, randomised clinical trials enhances the robustness of the primary data. The issue of homogeneity of the primary studies was not addressed. In general, there was limited information on the source of the effectiveness data.

Validity of estimate of measure of benefit
The summary benefit measure was specific to the disease considered in the study. It is not comparable with the benefits of other health care interventions. The impact of treatment on quality of life was not addressed.

Validity of estimate of costs
The perspective adopted in the cost analysis was unclear. Only some direct medical costs were included in the analysis, and the exclusion of the inpatient costs was justified. However, no justification was provided for the exclusion of other costs, such as treatment and monitoring costs. The unit costs were presented separately from the quantities of resources.
used, which enhances the possibility of replicating the analysis in other settings. The source of the data was reported for most items. Statistical analyses of the costs were not carried out and the cost estimates were specific to the study setting. The price year was reported, which aids reflation exercises in other time periods.

**Other issues**
The authors reported the results of other studies that evaluated the efficacy and costs of LIN over VAN in other settings. However, the issue of the generalisability of the study results to other settings was not addressed. In addition, sensitivity analyses were not carried out, which limits the external validity of the study. The issue of uncertainty around the base-case values was generally not addressed, and this appears to have been the main limitation of the study. The analysis referred to hospitalised patients with VAP-MRSA and this was reflected in the authors' conclusions.

**Implications of the study**
The study results supported the use of LIN for the treatment of patients with nosocomial VAP-MRSA.

**Source of funding**
None stated.

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**Other publications of related interest**


**Indexing Status**
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**MeSH**
Acetamides /economics /therapeutic use; Anti-Bacterial Agents /economics /therapeutic use; Cost-Benefit Analysis; Cross Infection /drug therapy /economics /etiology; Drug Costs; Humans; Linezolid; Methicillin Resistance /drug effects; Oxazolidinones /economics /therapeutic use; Pneumonia, Staphylococcal /drug therapy /microbiology; Respiration, Artificial /adverse effects; Staphylococcus aureus /drug effects; Vancomycin /economics /therapeutic use

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