Economic implications of nesiritide versus dobutamine in the treatment of patients with acutely decompensated congestive heart failure

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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 nesiritide (0.015 microg/kg per minute) for patients emergently hospitalised with symptomatic decompensated heart failure (HF).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised a hypothetical cohort of 1,000 patients emergently hospitalised with symptomatic decompensated HF.

Setting
The setting was secondary care. The economic study was carried out in the USA.

Dates to which data relate
The authors used results from two studies published in 2000 and 2002. The price year was 2001.

Source of effectiveness data
The evidence for the final outcomes was derived from a review and synthesis of two published studies.

Modelling
As neither of the two trials documented charges or resource use, Monte Carlo simulation was used to estimate treatment cost and survival in a hypothetical cohort of 1,000 patients treated with nesiritide or dobutamine.

Outcomes assessed in the review
The outcomes assessed were:

the incidence of cardiac arrest;

the incidence of sustained and non-sustained ventricular tachycardia;

the incidence of ventricular bigeminy;
the incidence of angina pectoris; the incidence of symptomatic hypotension;
the incidence of readmission for HF; and
the incidence of death within 6 months.

Study designs and other criteria for inclusion in the review
The two studies included in the analysis were randomised controlled trials comparing the use of 0.015 microg/kg per minute and 0.030 microg/kg per minute nesiritide and dobutamine.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Patients receiving nesiritide 0.030 microg/kg per minute were excluded from the analysis, as this dose was not used in subsequent trials of nesiritide.

Number of primary studies included
The authors used data from two clinical trials, the Comparative and Prospective Randomised Evaluation of Cardiac Ectopy with Dobutamine and the Nesiritide Therapy (PRECEDENT) trials.

Methods of combining primary studies
A meta-analysis was used to combine the results of both studies. There were 188 patients in total in the nesiritide group and 144 in total in the dobutamine group.

Investigation of differences between primary studies
In the data from the pooled trials, the age and gender distributions were slightly different across the study groups. To avoid a potential source of variation unrelated to study drug, the modelled gender and age distributions were equalised.

Results of the review
The incidence of symptomatic hypotension was 17.1 in the nesiritide group versus 5.7 in the dobutamine group, (p<0.000).

The incidence of readmission for HF was 4.0 in the nesiritide group versus 9.4 in the dobutamine group, (p=0.030).

The incidence of death within 6 months was 16.0 in the nesiritide group versus 25.0 in the dobutamine group, (p=0.030).

There were no statistically significant differences between the two groups in terms of the incidence of cardiac arrest, sustained and non-sustained ventricular tachycardia, ventricular bigeminy, and angina pectoris.

Measure of benefits used in the economic analysis
The measure of benefits used was the remaining years of life.
Direct costs
The direct costs included in the study were those of the hospital. These were for initial admission, drugs and readmission for HF. Professional fees were not included because a hospital perspective was adopted. The cost of initial hospital admission was estimated by statistically matching the characteristics of admissions simulated in the model with records from a national hospital discharge database. From these records, the authors selected those patients with a primary diagnosis of HF. Billed charges were converted to cost by applying the Medicare cost-to-charge ratio, then adjusted to the 2001 level price based on the hospital producer price index. Discounting was irrelevant since all the costs were incurred during 6 months, and was not performed. The study reported the mean costs per patient.

Statistical analysis of costs
The authors provided mean cost values and standard deviations. A multivariate regression analysis was used to explain the cost of an admission as a function of age, gender, presence of specific secondary diagnosis codes, and a random error term reflecting underlying variability in cost for otherwise identical cases.

Indirect Costs
The indirect costs were not included in the analysis.

Currency
US dollars ($).

Sensitivity analysis
A probabilistic sensitivity analysis, using Monte Carlo simulation, was performed.

Estimated benefits used in the economic analysis
The mean remaining years of life was 4.84 (+/- 0.10) per patient in the nesiritide group, compared with 4.30 (+/- 0.15) per patient in the dobutamine group.

Cost results
The cost of a treatment episode was $12,074 (+/- 93) per patient in the nesiritide group, compared with $12,156 (+/-129) per patient in the dobutamine group. Hence, the cost-difference between the two groups was -$83 (+/- 145) per patient.

Synthesis of costs and benefits
The costs and benefits were not combined as nesiritide was found to be both more effective and less costly than dobutamine. The results from 51 Monte Carlo simulations showed a mean increase in survival of +0.53 years (median 0.54; range: 0.21 - 0.84). The mean difference in cost was -$73 (median -$83; range: -310 - 280).

Authors' conclusions
For patients with acutely decompensated heart failure (HF), the relatively high acquisition cost for nesiritide was fully offset by a less resource-intensive initial hospital admission and a lower rate of readmission. Compared with dobutamine, nesiritide appeared to offer a survival advantage that translated into additional years of life.

CRD COMMENTARY - Selection of comparators
Although no explicit justification was given for using dobutamine as the comparator, it would appear to represent current practice in the authors' setting. You should decide if the comparator represents current practice in your own setting.
Validity of estimate of measure of effectiveness
Evidence for the final outcomes was derived from two randomised controlled trials. Both of these trials appear to have been well conducted, with the authors providing relevant details of them. Estimates of effectiveness from these studies were combined using a meta-analysis, and differences between the two groups were appropriately tested using statistical techniques. To account for differences in age and gender distribution between the nesiritide and dobutamine groups, the modelled gender and age distributions were equalised.

Validity of estimate of measure of benefit
The estimation of benefits was modelled using a Monte Carlo simulation, which was appropriate for the study. However, the health benefits were not discounted, even though this was methodologically necessary.

Validity of estimate of costs
All the categories of cost relevant to the perspective adopted appear to have been included in the analysis. However, it remains unclear why the authors did not include professional fees in the economic analysis. The costs and the quantities were not reported separately, which will hamper the generalisability of the results. A statistical analysis of the costs was performed, with a regression analysis being conducted to explain the costs as a function of underlying variables such as age and gender. All the costs were converted to 2001 prices based on the hospital producer price index. Discounting was unnecessary since all the costs were incurred during 6 months. Medicare charges were used to proxy prices.

Other issues
The authors did not make appropriate comparisons of their findings with those from other studies. In addition, the issue of generalisability to other settings was not addressed. The authors do not appear to have presented their results selectively, and their conclusions reflected the scope of the analysis. The authors reported a limitation of their study, in that the magnitude of added longevity was speculative because of the fragile health status of many patients with HF.

Implications of the study
Based on the results of their study, the authors appear to recommend the use of nesiritide over dobutamine.

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Other publications of related interest

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