Amiodarone and rural emergency medical services cardiac arrest patients: a cost analysis

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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 amiodarone (150-mg vial) in a system-wide, rural prehospital treatment protocol for cardiac arrest patients was examined.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients identified by EMS personnel as presenting with a diagnosis of cardiac arrest. Patients designated as inter-hospital transfers were excluded from the analysis if no defibrillation was noted en route to the receiving hospital. From the 189,602 EMS transports in Maine in 1999, 2,189 patients were documented as cardiac arrest patients. Of these 2,189 patients, 160 (7.3%) received lidocaine.

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

Dates to which data relate
The study sample was derived from a retrospective review of EMS records for Maine from 1 January to 31 December 1999. The effectiveness data were derived from two studies published in 1999 and 2002. The price year was not reported.

Source of effectiveness data
The effectiveness data were derived from one published study and another trial presented in abstract form.

Outcomes assessed in the review
The outcomes assessed were:

survival to hospital admission for amiodarone compared with placebo and lidocaine, and the associated absolute risk reduction (ARR) and number needed to treat (NNT); and

survival to hospital discharge for amiodarone compared with placebo, and the associated ARR and NNT.

Study designs and other criteria for inclusion in the review
The published study was a randomised controlled trial. There was no information on the study design used in the trial presented in abstract form.

**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**
Not reported.

**Number of primary studies included**
Two studies (ALIVE and ARREST) were included in the review.

**Methods of combining primary studies**
Not relevant.

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

**Results of the review**
A total of 43.9% of the patients treated with amiodarone survived to hospital admission, compared with 34.5% of those in the placebo group. The ARR was 9.5% (95% confidence interval, CI: 1.0 - 18.1) and the NNT was 10.5 (95% CI: 5.5 - 97.3).

A total of 13.4% of patients treated with amiodarone survived to hospital discharge compared with 13.2% of those in the placebo group. The ARR was 0.2% (95% CI: -5.7 - 6.2) and the NNT was 500 (95% CIs not reported due to the non significant difference between the two groups).

A total of 22.3% of patients treated with amiodarone survived to hospital admission, compared with 10.9% of those in the lidocaine group. The ARR was 11.4% (95% CI: 3.5 - 19.4) and the NNT was 8.8 (95% CI: 5.2 - 28.4).

Based on data reported in the trials, the EMS in Maine would require 3.125 years of system-wide encounters to affect a survival-to-discharge benefit for patients with VF or VT.

**Measure of benefits used in the economic analysis**
No summary benefit measure was used in the economic analysis. This study was, in effect, a cost-consequences analysis.

**Direct costs**
The direct costs included in the analysis were those of the EMS. The cost of amiodarone was estimated via a pharmacy query at each of Maine's five largest hospitals. The responses were averaged to provide a cost estimate for amiodarone supplied to Maine EMS. The cost estimate of lidocaine reflected the current lidocaine cost to Maine EMS. The other costs were for the initiation of an amiodarone treatment protocol for VF or VT. This included the addition of amiodarone to existing licensed EMS vehicles in Maine. This cost was calculated by reviewing EMS records for the
number of EMS vehicles licensed at the paramedic or critical care level. Training and education costs for paramedics were not included in the study investigation given the variability in approach and associated costs. The authors appear to have failed to discount the costs of amiodarone treatment during a 3.125-year time period. The study reported the average and total costs. The dates to which the price data referred were not reported.

**Statistical analysis of costs**
The costs were treated as point estimates (i.e. the data were deterministic).

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

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was performed.

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

**Cost results**
The cost of amiodarone to Maine EMS was $68.84 per 150-mg vial (range: 67.45 - 70.20). The total annual cost for 160 Maine EMS patients receiving two vials of amiodarone per patient was $22,080.80. This compared with a current lidocaine cost acquisition of $1.29 per 100-mg vial, or $206.40 for the 160-patient cohort. Thus, the implementation of an amiodarone protocol would increase system-wide drug utilisation costs by $21,822.4 (10,572.87% per year).

Providing amiodarone stock to 364 EMS vehicles would result in a vehicle drug supply cost of $50,115.52.

The cost of amiodarone in the 3.125 years of system-wide encounters to affect a survival-to-discharge benefit for patients with VF or VT was $68,840.00.

**Synthesis of costs and benefits**
The costs and benefits were not combined.

**Authors' conclusions**
Compared with current treatment strategies, the use of amiodarone in system-wide, rural prehospital treatment protocols for patients with refractory ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT) would require the investment of substantial resources.

**CRD COMMENTARY - Selection of comparators**
A justification was given for using lidocaine as the comparator. It represented one of the current practices in the authors' setting. You should decide if this is a widely used health technology in your own setting.

**Validity of estimate of measure of effectiveness**
The study sample was obtained from a retrospective review of Maine EMS. The study sample was representative of
the study population. The effectiveness estimates were then obtained from two trials, one of which was a randomised controlled trial. For the other trial, it was unclear whether the authors used only the effectiveness data provided in the abstract, or whether they were able to obtain the data from the trial. The results from the review of these two studies were not combined, as one compared amiodarone with lidocaine and the other compared amiodarone with placebo. Further, the studies were not adequately powered to address the more clinically important outcome of hospital discharge for prehospital patients. Although the authors tried to assess the effectiveness of the treatment alternatives, the main focus of the study was the cost analysis.

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

Validity of estimate of costs
All the categories of cost relevant to the perspective adopted seemed to have been included in the study, although some relevant costs were omitted from the analysis. The costs of training and education for Maine's 747 paramedics on the use of amiodarone were not included in the analysis. However, the authors reported that training and education would only entail one hour of education, hence the costs would be minimal. The costs and the quantities were reported separately, which will enhance the generalisability of the authors' results. The unit costs were derived from the authors' setting, but no statistical analysis of the costs was provided. Even though discounting was relevant, as the costs were incurred during 3 years, the costs were not discounted. The price year was not reported, which will hamper future inflation exercises.

Other issues
The authors did not compare their findings with those from other studies. It would appear this was the first study examining the costs of amiodarone in this setting. The issue of generalisability to other settings was not addressed. The authors do not appear to have presented their results selectively. However, their conclusions were based on effectiveness results, which were not found to be statistically significant. The authors reported a number of further limitations to their study. First, the outcomes data for cardiac arrest patients treated by Maine EMS were not available in a form that allowed the outcomes and findings to be adjusted to match accurately those observed in either of the two studies from which the effectiveness data were derived. Second, given the wide disparity in survival rates to hospital discharge between the rural EMS setting and the setting described in the ARREST trial, the time and cost estimates projected in the investigation were likely to represent highly conservative estimates. The authors also reported that there were limitations in the Maine EMS database, as these data were dependent on provider report compliance and accuracy. In addition, the annual variances in Maine EMS lidocaine use would alter the cost projections presented.

Implications of the study
The authors recommended future investigations to evaluate the effect of amiodarone on patient survival, in order to assess the impact of the additional resource expenditure on meaningful patient recovery.

Source of funding
None stated.

Bibliographic details

PubMedID
12109570
Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Amiodarone /administration & dosage; Cost-Benefit Analysis; Emergency Medical Services /economics /methods; Female; Heart Arrest /mortality /prevention & control; Humans; Life Support Care /economics /methods; Maine; Male; Middle Aged; Retrospective Studies; Rural Population; Sensitivity and Specificity; Survival Analysis; Treatment Outcome; Ventricular Fibrillation /drug therapy /mortality

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