Estimating cost-effectiveness of mass cardiopulmonary resuscitation training strategies to improve survival from cardiac arrest in private locations

Swor R, Compton S

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 programme for cardiopulmonary resuscitation (CPR) training was examined.

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised the general population.

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

Dates to which data relate
The effectiveness data were derived from studies published between 1998 and 2004. Surveillance data gathered from 1997 to 1999 were also used. The dates to which the resource use data and costs related were not reported.

Source of effectiveness data
The effectiveness evidence was derived from a synthesis of completed studies and authors' assumptions.

Modelling
The authors stated that a model of cardiac arrest was developed. However, no details of the model were reported.

Outcomes assessed in the review
The outcomes estimated from the literature were:

- the size of the population,
- the annual number of cardiac arrests witnessed,
- the number of potential witnesses per arrest,
- the proportion of an age group that would witness an arrest,
the proportion of an age group in traditional CPR courses, and

the number of traditional CPR course attendees to be trained per cardiac arrest.

**Study designs and other criteria for inclusion in the review**

It would appear that the primary studies were identified selectively. Some data were derived from the US Census, while other data came from published studies. Data on cardiac arrest were estimated for a single suburban zip code in southeastern Michigan from 1997 to 1999.

**Sources searched to identify primary studies**

Not stated.

**Criteria used to ensure the validity of primary studies**

Not stated.

**Methods used to judge relevance and validity, and for extracting data**

Not stated.

**Number of primary studies included**

Three primary studies and a database provided the evidence.

**Methods of combining primary studies**

The primary studies were not combined.

**Investigation of differences between primary studies**

Not stated.

**Results of the review**

The results are presented for adult witnesses aged 50 years or younger versus those older than 50 years:

- the populations of adult witnesses were 23,879 and 8,733, respectively;
- the annual numbers of cardiac arrests witnessed were 7.3 and 14.6, respectively;
- the numbers of potential witnesses per arrest were 3,271 and 598, respectively;
- the proportions of an age group that would witness an arrest were 0.03% and 0.17%, respectively;
- the proportions of individuals in traditional CPR courses were 93.2% and 6.8%, respectively; and
- the numbers of traditional CPR course attendees to be trained per cardiac arrest were 3,510 and 8,896, respectively.

**Methods used to derive estimates of effectiveness**

The authors made some assumptions that were used in the model.

**Estimates of effectiveness and key assumptions**
It was assumed that:

the community was a closed system;

there would be one bystander per cardiac arrest;

if a bystander was trained in CPR, he or she would perform CPR;

cardiac arrests would be evenly distributed in the population; and

CPR training for a proportion of the population would incrementally increase CPR provision by the same rate.

Measure of benefits used in the economic analysis
The summary benefit measure was the number of lives saved. The number of cases of CPR needed to be provided to yield one additional survivor and the number of CPR trainees to save one life were also reported.

Direct costs
Discounting was not relevant since short-term costs were estimated. The unit costs were not presented separately from the quantities of resources used. The economic evaluation considered only the cost of CPR training, which included CPR instructors, costs to attendees for books, and other miscellaneous supplies. The cost/resource boundary of the study was not reported. The source of the resource use data was not reported, whereas the costs came from local payments. The price year was not reported.

Statistical analysis of costs
The costs were treated deterministically.

Indirect Costs
The indirect costs were not included.

Currency
US dollars ($).

Sensitivity analysis
A sensitivity analysis was carried out to examine the impact of changing the proportion of elders in CPR training programmes (6.8% base-case) on the model outputs and cost-effectiveness ratios. The authors chose alternative values of 15, 25 and 50%.

Estimated benefits used in the economic analysis
The estimated lives saved were not reported. With the current programme, CPR would have to be provided to 7.14 patients to yield one additional survivor. In addition, the number of CPR trainees needed to save one life would be 25,060 among individuals aged 50 years or younger and 62,803 among those aged older than 50 years. If the training programme was 100% targeted at individuals older than 50 years of age, the number of CPR trainees needed to save one life would fall to 4,271. The number of CPR trainees needed to save one life increased as the proportion of elders in the CPR programme decreased.

Cost results
The cost of CPR training was $12.50 per student.
Synthesis of costs and benefits
Average cost-effectiveness ratios were calculated to combine the costs and benefits of the two programmes.

With the current programme (non-targeted), the average cost of CPR training per life saved in home cardiac arrest was $313,244 for individuals aged 50 years or younger and $785,040 for individuals older than 50 years. If the training programme was 100% targeted at individuals older than 50 years of age, the cost per life saved would decrease to $53,383.

The sensitivity analysis showed that the cost-effectiveness of the programme examined in the study improved when the proportion of elders in the CPR training programmes increased.

Authors’ conclusions
Current training in cardiopulmonary resuscitation (CPR) was not a cost-effective intervention for home cardiac arrest. A CPR programme targeted at people older than 50 years of age could, potentially, be more cost-effective.

CRD COMMENTARY - Selection of comparators
The authors justified the choice of the comparators, stating that a non-targeted CPR training programme represents the current standard of care in the USA. 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 data derived from the literature and authors’ assumptions. It would appear that a systematic review of the literature was not undertaken to identify the primary studies. Much of the data came from official statistics. The design and characteristics of the other studies were not described. Only one of the key assumptions was varied in the sensitivity analysis. The authors noted that the use of extensive assumptions represents a limitation to the validity of their analysis. It was also noted that important predictors of arrest survival, such as patient age and initial cardiac rhythm, were not varied in the sensitivity analysis.

Validity of estimate of measure of benefit
The summary benefit measure was the number of lives saved. This is partially comparable with the benefits of other health care interventions. However, no details of the methods used to obtain this measure of benefit from the model were provided. Discounting was not applied, owing to the short time horizon of the analysis.

Validity of estimate of costs
The perspective adopted in the study was unclear only training costs were included in the economic evaluation. The inclusion of cost-savings associated with the reduced morbidity or mortality due to the intervention would have been interesting. The unit costs were not reported separately from the quantities of resources used. Similarly, the price year was not reported, which limits the possibility of replicating and reflating the results of the analysis in other settings. The source of the data was unclear.

Other issues
The authors did not make extensive comparisons of their findings with those from other studies. They also did not address the issue of the generalisability of the study results to other settings. Limited sensitivity analyses were carried out. The authors mentioned the use of a model, but no details were provided. The study referred to the general public and this was reflected in the authors’ conclusions.

Implications of the study
The study results did not support the implementation of the current CPR programme. The authors stressed that further research should be carried out to estimate the impact of CPR training on survival of home cardiac arrest.
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Other publications of related interest


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