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Review article

A systematic review of basic life support training targeted to family members of high-risk cardiac patients☆

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ABSTRACT

Aim: Targeting basic life support (BLS) training to bystanders who are most likely to witness an out of hospital cardiac arrest (OHCA) is an important public health intervention. We performed a systematic review examining the evidence of the effectiveness of providing BLS training to family members of high-risk cardiac patients.
Methods: A search of Ovid MEDLINE, CINAL, EMBASE, Informit, Cochrane Library, Web of Science, Scopus, ERIC and ProQuest Dissertations and Theses Global was conducted. We included all studies training adult family members of high-risk cardiac patients regardless of methods used for cardiopulmonary resuscitation (CPR) or BLS training. Two reviewers independently extracted data and evaluated the quality of evidence using GRADE (Grades of Recommendation, Assessment, Development and Evaluation).
Results: We included 26 of the 1172 studies identified. The majority of studies were non-randomised controlled trials ($n = 18$), of very low to moderate quality. Currently, there is insufficient evidence to indicate a benefit of this intervention for patients; largely because of low numbers of OHCA events and high loss to follow-up. However, the majority of trained individuals were able to competently perform BLS skills, reported a willingness to use these skills and experienced lower anxiety.
Conclusion: Whilst there is no current evidence for improvement in patient outcomes from targeted BLS training for family members, this group are willing and capable to learn these skills. Future research may need to examine longer periods of follow-up using alternate methods (e.g. cardiac arrest registries), and examine the effectiveness of training in the modern era.

Introduction

Out of hospital cardiac arrest (OHCA) affects more than 300,000 people in the US each year[1] and is often fatal. Survival to hospital discharge is less than 10%.[2] The critical initial steps in the treatment of OHCA are: (1) prompt recognition of the condition and activating emergency medical services (EMS), (2) high quality cardiopulmonary resuscitation (CPR), (3) early defibrillation and (4) early advanced care from EMS. This sequence of steps forms the chain of survival with steps one to three known as basic life support (BLS). In the case of OHCA, as distinct from in-hospital cardiac arrest, the first of these steps need to be performed by lay bystanders at the scene.

Unfortunately BLS is not implemented immediately or competently for every OHCA case. In particular, bystander CPR rates in OHCA are low, rarely exceeding 20%.[3] A possible explanation for these low rates is that community CPR and BLS training programmes often attract younger participants who are less likely to be required to use their skills.[4,5] The majority (75%) of OHCAs occur in the home and often witnessed by an older family member, who is unlikely to have had recent, if any, prior BLS training.[6,7]

Given the disparity between those trained in BLS and those most likely to witness a cardiac arrest, it may be more effective to target training to specific populations at high-risk of OHCA. This would include patients with a cardiac history or recent cardiac event. Targeted training of high-risk cardiac groups has been advocated for over three decades[3,4,8,9] and was recommended in a

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systematic review conducted in 2008 broadly examining methods to increase bystander CPR.[3] To date there have been no reviews of this evidence. Therefore, this systematic review aims to examine the evidence of the effectiveness of providing targeted BLS training to family members of high-risk cardiac patients.

Methods

The plan for this review was registered with PROSPERO (CRD42014010297) before commencing the literature search.[10] We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA),[11] in the preparation of this manuscript.

PICO question

Our Population, Intervention, Comparator, Outcome (PICO)[12] question was: "Is targeting family members of high-risk cardiac patients (P) for BLS training (I) compared to no such training or differing training methods (C) effective (O)?"

Eligibility criteria

Participants: We included studies that reported training family members of high-risk cardiac patients or other adults with a close association to the patient. High-risk patients were defined as any person aged over 16 years who is at high-risk of OHCA due to any cardiac aetiology such as coronary heart disease, structural heart disease, life threatening arrhythmias or prior cardiac arrest.

Interventions: All methods of BLS training were included.

Comparison: The intervention was compared to no training or against different methods of training between groups.

Outcomes: The critical outcomes were (1) cardiac arrest survival (2) bystander BLS performance operationally defined as subsequent utilisation of skills by family members for OHCA events. Important outcomes were (1) CPR/BLS skills performance, (2) skills retention, (3) willingness to use BLS skills, (4) anxiety related to BLS training and (5) perceived rates of control post BLS training.

Types of studies: We included published original research articles or conference abstracts on randomised and non-randomised interventional studies and observational studies. There were no publication date or language restrictions imposed. Commentary, editorial papers, reviews and animal studies were excluded.

Information sources

Searches for relevant publications were conducted in the following databases from their earliest record until 15th July 2015: Ovid MEDLINE (1946-), CINAHL (1937-), EMBASE (1966-), Informit, Cochrane Library, Web of Science (1990-), Scopus (1960-), ERIC (1966-) and ProQuest Dissertations and Theses Global. Key word and MeSh terms included 'cardiopulmonary resuscitation', 'basic life support', 'resuscitation/ed [Education]', 'death, sudden' and 'family/ed [Education]' (full search strategy see http://www.crd.york.ac.uk/PROSPEROFILES/10297_STRATEGY_20140519.pdf).[10]

Study selection

Titles and abstracts were screened against the inclusion criteria by one reviewer (SC) to identify eligible studies for inclusion. Full text articles and included abstracts were then fully appraised by two authors (SC and JB) independently; with consensus reached on discordant selections. In cases where there were research studies with multiple publication of research results we used the more recent or complete publication. Reference lists of included studies were visually scanned for additional papers not found through the search strategy.

Data extraction

One reviewer (SC) independently extracted data using a pre-piloted data extraction form based on minimum requirements recommended in the Cochrane Handbook for Systematic Reviews.[13] A second reviewer (JB) independently extracted data utilising the same form on a random sample of studies. Major categories on the data extraction form included: author(s), title, publication year, study location and design, response rates, number of participants (families and patients), type of BLS training and identification and adjustment for confounders. Data extraction for these studies was then cross checked. The primary author was contacted in four instances due to missing data, the need for additional data or for clarification.

Assessment of risk of bias

Risk of bias at a study level for both randomised controlled (RCT) trials and non-randomised controlled trials (non-RCTs) was assessed using the 'Cochrane Collaborations' tool for assessing risk of bias.[13] Risk of bias at the outcome level was then conducted using the GRADE (Grades of Recommendation, Assessment, Development and Evaluation) system.[14] The GRADE approach judges the quality of evidence (from low quality to high quality), at an outcome level. The quality of evidence can be downgraded or upgraded. An example where evidence would be downgraded is in instances where there is a lack of blinding. Where a large effect size is seen evidence may be upgraded.[15] Outcomes are pre-specified and categorised as "critical" or "important" outcomes. Discrepancies or disagreements regarding data extraction or quality assessment were resolved through consultation with a third author (JF).

Results

Study selection

After the initial search, 1169 studies were identified from the search strategy (Fig. 1). Three studies[16–18] were identified from the reference list search of included studies. Once duplicates were removed 807 studies remained for title and abstract screening. Of these, 34 studies were reviewed and a further eight were excluded, leaving 26 studies for inclusion. Reasons studies were excluded following full text review were: duplicate publication of research results ($n = 1$), outcomes reported for patients only and not family members ($n = 4$), or outcomes solely focussed on recruitment strategies of the target population ($n = 3$).

Study characteristics

Of the 26 included studies, eight were RCTs and 18 were observational studies, including three conference abstracts[19–21] (Tables 1 and 2). Only one study was an international multicentre clinical randomised controlled trial, for which there were three publications examining different outcomes.[16,22,23] Nine studies were multicentre studies conducted in the USA[21,24–30] and Italy.[31] The remaining studies were single centre studies conducted in the USA,[32,33] China,[20,34,35] Austria,[36–38] Korea,[39] Pakistan,[40] United Kingdom,[41] and Greece.[19] Finally, two studies recruited patients from Washington, USA via a cardiac arrest surveillance system that identified all pre-hospital cardiac arrests.[17,42] One study conducted a secondary analysis from randomised controlled trial data.[30]

In most studies, target populations for BLS training were family members of heart disease patients[16,19,20,22–31,33,34,36,40] or cardiac