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CADTH RAPID RESPONSE REPORT:
SUMMARY WITH CRITICAL APPRAISAL

Backboard Use during Cardiopulmonary Resuscitation: A Review of the Clinical Effectiveness and Guidelines

Service Line:	Rapid Response Service
Version:	1.0
Publication Date:	November 6, 2018
Report Length:	11 Pages

CADTH

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Cite As: Backboard use during cardiopulmonary resuscitation. Ottawa: CADTH; 2018 Nov. (CADTH rapid response report: summary with critical appraisal).

Acknowledgments:

ISSN: 1922-8147 (online)

About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

Funding: CADTH receives funding from Canada's federal, provincial, and territorial governments, with the exception of Quebec.

Context and Policy Issues

The estimated incidence of sudden cardiac arrest (SCA) in Canada is approximately 40,000 each year.[1] Immediate initiation of high quality cardiopulmonary resuscitation (CPR) and early defibrillation are keys to survival from SCA.[2] Guidance on proper techniques use during the initial resuscitation of cardiac arrest victim is available in prominent guidelines including those of the American Heart Association.[3] It is recommend that chest compression during CPR should be performed with patients on a hard surface,[4] but the need of placing a backboard between patient and standard hospital bed with foam mattress to improve quality of CPR remains inconclusive.

Backboards are made of wood, plastic or other materials. Many studies using manikins to simulate resuscitations provided mixed evidence on the effectiveness of backboard use.[5] There were studies showed that the use of backboard did not improve chest compression on a manikin placing on a standard hospital bed,[6-8] while the others showed opposing results.[9-11] One simulated study showed that backboard may be needed for CPR when performed on soft mattresses, but may not be needed on relatively firm hospital beds.[12] It is not known how the manikins results can be translated to humans. Thus, there is a need to determine whether or not the use of backboard during in-hospital CPR could provide more effective chest compressions and increase the chance of patient survival.

The aim of this report is to review the clinical effectiveness and evidence-based guidelines on the use of backboard during CPR for patients experiencing cardiac arrest in the hospital setting.

Research Questions

1. What is the clinical effectiveness of the use of a backboard during cardiopulmonary resuscitation for patients experiencing cardiac arrest in the hospital setting?
2. What are the evidence-based guidelines regarding the use of a backboard during cardiopulmonary resuscitation for patients experiencing cardiac arrest in the hospital setting?

Key Findings

No relevant clinical studies were identified. The included guideline recommends that CPR should be performed on a firm surface and states that evidence for the use of backboard is equivocal.

Methods

Literature Search Methods

A limited literature search was conducted on key resources including PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD), Canadian and major international health technology agencies, as well as a focused Internet

search. No filters were applied to limit retrieval by publication type. Where possible, retrieval was limited to the human population. The search was also limited to documents published between January 1, 2008 and October 9, 2018.

Selection Criteria and Methods

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. The final selection of full-text articles was based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Patients experiencing cardiac arrest in the hospital setting
Intervention	CPR with a backboard
Comparator	CPR without a backboard
Outcomes	Effectiveness of chest compressions, safety, harms, guidelines for use
Study Designs	Health technology assessments (HTAs), systematic reviews (SRs), meta-analyses (MAs), randomized controlled trials (RCTs), non-randomized studies, and evidence-based guidelines

Exclusion Criteria

Studies were excluded if they did not satisfy the selection criteria in Table 1 and if they were published prior to 2008.

Critical Appraisal of Individual Studies

The quality of the evidence-based guidelines was assessed using AGREE II instrument.[13] Summary scores were not calculated for the included study; rather, a review of the strengths and limitations were described narratively.

Summary of Evidence

Quantity of Research Available

A total of 194 citations were identified in the literature search. Following screening of titles and abstracts, 192 citations were excluded and 2 potentially relevant reports from the electronic search were retrieved for full-text review. Three potentially relevant publications were retrieved from the grey literature search. Of the five potentially relevant articles, four publications were excluded for various reasons, while one publication of a guideline met the inclusion criteria and were included in this report. Appendix 1 presents the PRISMA flowchart of the study selection.

Summary of Study Characteristics

The characteristics of the identified guideline[14] are summarized and detail is presented in Appendix 2.

Country of Origin

The identified evidence-based guideline (European Resuscitation Council [ERC]) was from the UK and published in 2015.[14]

Overall Objectives

The objective of the guideline was to provide recommendations related to the techniques used during the initial resuscitation of an adult cardiac arrest patient, including basic life support and the use of an automated external defibrillator.[14]

Target Users of the Guidelines

The guideline was targeted to bystander, emergency medical dispatcher, and in-hospital staff who provide CPR and use automated external defibrillators.[14]

Methods Used to Formulate Recommendations

The ERC guidelines are based on the International Liaison Committee on Resuscitation (ILCOR) 2015 Consensus in Science and Treatment Recommendations (CoSTR) for basic life support and automated external defibrillator. In the ERC guidelines, the ILCOR recommendations were supplemented with new evidence not reviewed by ILCOR. Recommendations were drafted by Writing Group Members and then reviewed by the full writing group and national resuscitation councils before a final approval by the ERC board. The guideline did not report on methods used to search for evidence, and did not assess the level of evidence and or strength of recommendation.

Summary of Critical Appraisal

The summary of the quality assessment for the ERC guideline[14] is described here and is presented in Appendix 3.

The ERC guideline[14] was explicit in terms of scope, purpose, and clarity of presentation, but not clear for other components such as stakeholder involvement, rigour of development, applicability and editorial independence. For stakeholder involvement, the guideline did not report if the views and preferences of the target population were sought. For rigour of development, the guideline did not used systematic methods to search for evidence, was not explicit in terms of criteria for selecting evidence, and did not described the strengths and limitations of the body of evidence. In terms of applicability, the guideline did not provide advice or tools on how to implement recommendations, and did not state if costs were considered in their recommendations. For editorial independence, it was unclear if the view of the funding body had any influence in the content of the guideline.

Summary of Findings

Clinical effectiveness

No clinical effectiveness studies relevant to the use of backboard during cardiopulmonary resuscitation for patients experiencing cardiac arrest in the hospital setting were identified.

Guidelines

The detailed recommendations of the included guideline are presented in Appendix 4.

The ERC guideline recommends that CPR should be performed on a firm surface.[14] It states that the evidence for the use of backboard is equivocal,[14] but does not disprove its

use during CPR. If it is used, the guideline suggests that backboard placement should not interrupt CPR or dislodge intravenous lines or other tubes.

Limitations

No relevant literature for the clinical effectiveness of the use of a backboard during CPR for patients experiencing cardiac arrest in the hospital setting was identified. Most studies on backboard use in the literature were manikin studies, in which simulated resuscitations were performed on manikins to measure compression depth. Only one relevant guideline that mentioned the use of backboard during CPR was identified. However, the guideline did not explicitly support or refute the use of backboard during CPR. Instead, it suggests that CPR should be performed on a firm surface. Level of evidence and strength of recommendation were not provided.

Conclusions and Implications for Decision or Policy Making

No evidence that supports or refutes the effectiveness of backboard use during CPR for hospital patients undergoing resuscitations was identified. Much of the research about the performance of CPR on various support surfaces including backboards has been performed on manikins,[5] and it is unclear how the results could be translated to the CPR performed on humans. As in the previous CADTH report published in 2008,[15] this report did not find any information regarding the use of backboard during CPR performing on SCA patients in a hospital setting. More research is needed in order to reduce uncertainty.

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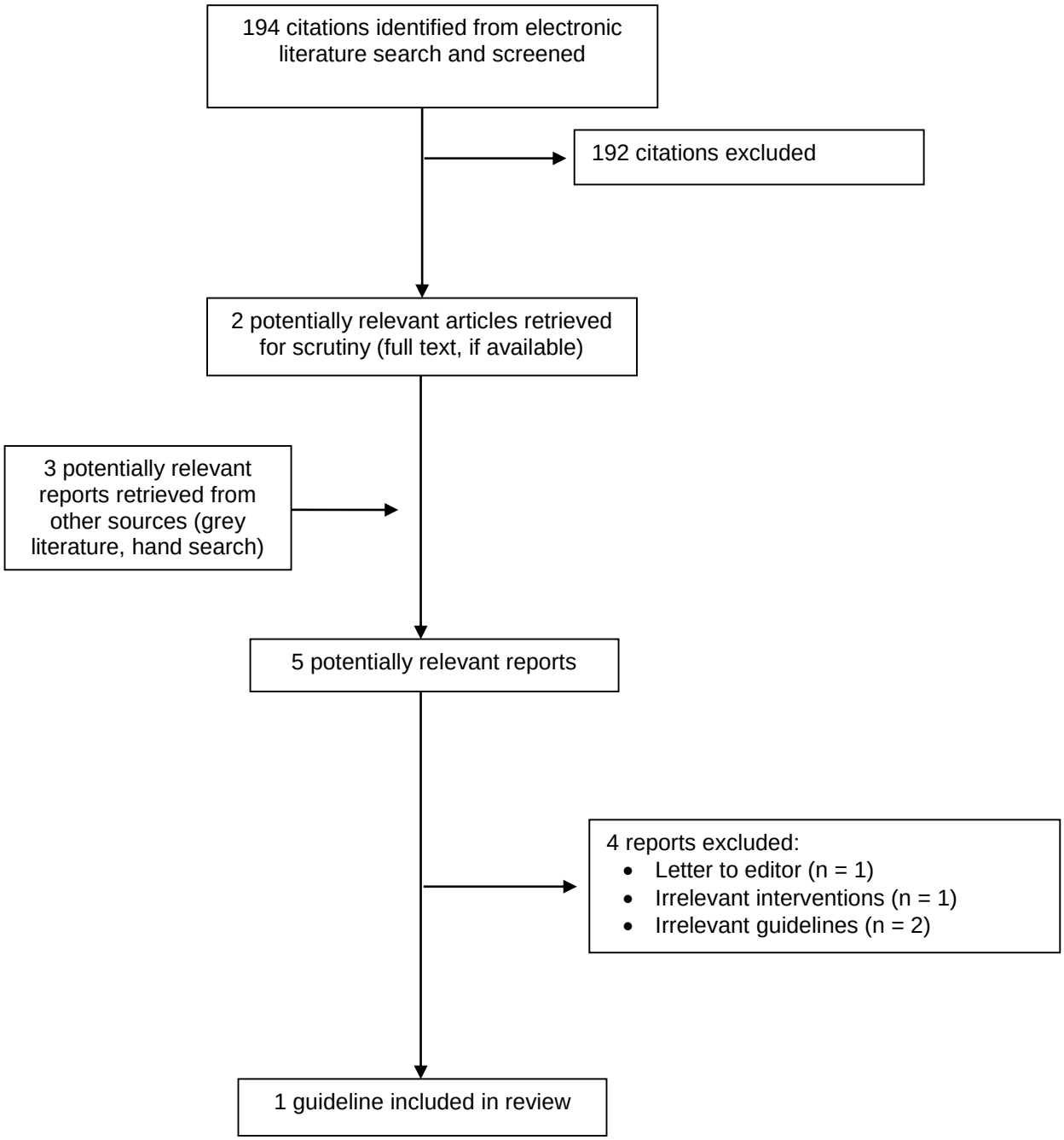
Appendix 1: Selection of Included Studies



Appendix 2: Characteristics of Included Studies

Table 2: Characteristics of Included Guidelines

First Author, Society/Group Name, Publication Year, Country, Funding	Intended Users/ Target Population	Intervention and Practice Considered	Major Outcomes Considered	Evidence Collection, Selection and Synthesis	Recommendations Development and Evaluation	Guideline Validation
European Resuscitation Council (ERC), Perkins et al., 2015[14] 2015 Europe Funding : not reported	Intended users: bystander, emergency medical dispatcher and in-hospital staff who provide CPR and automated external defibrillator Target population: Adult with cardiac arrest	Techniques used during initial resuscitation of an adult with cardiac arrest including basic life support (i.e., airway, breathing and circulation support without the use of equipment other than a protective device) and the use of an automated external defibrillator	Survival	Based on the International Liaison Committee on Resuscitation (ILCOR) 2015 Consensus in Science and Treatment Recommendations (CoSTR) for basic life support and automated external defibrillator. In the ERC guidelines, the ILCOR recommendations were supplemented with new evidence not reviewed by ILCOR.	Recommendations were drafted by Writing Groups Members and then reviewed by the full writing group and national resuscitation councils before a final approval by the ERC board.	The guideline was peer-reviewed

Appendix 3: Quality Assessment of Included Studies

Table 3: Quality Assessment of Guidelines

AGREE II checklist[13]	ERC, Perkins et al., 2015[14]
Scope and purpose	
1. Objectives and target patients population were explicit	Yes
2. The health question covered by the guidelines is specifically described	Yes
3. The population to whom the guidelines is meant to apply is specifically described	Yes
Stakeholder involvement	
4. The guideline development group includes individuals from all relevant professional groups	Yes
5. The views and preferences of the target population have been sought	Not clear
6. The target users of the guideline are clearly defined	Yes
Rigour of development	
7. Systematic methods were used to search for evidence	No
8. The criteria for selecting the evidence are clearly described	No
9. The strengths and limitations of the body of evidence are clearly described	No
10. The methods of formulating the recommendations are clearly described	Yes
11. The health benefits, side effects, and risks have been considered in formulating the recommendations	Yes
12. There is an explicit link between the recommendations and the supporting evidence	Yes
13. The guideline has been externally reviewed by experts prior to its publication	Yes
14. A procedure for updating the guideline is provided	Yes
Clarity of presentation	
15. The recommendations are specific and unambiguous	Yes
16. The different options for management of the condition or health issue are clearly presented	Yes
17. Key recommendations are easily identified	Yes
Applicability	
18. The guideline describes facilitators and barriers to its application	Yes
19. The guidelines provides advice and/or tools on how the recommendations can be put into practice	Not clear
20. The potential resource (cost) implications of applying the recommendations have been considered	No
21. The guideline presents monitoring and/or auditing criteria	Yes
Editorial independence	
22. The views of the funding body have not influenced the content of the guideline	Not clear
23. Competing interests of guideline development group members have been recorded and addressed	Yes

Appendix 4: Main Study Findings and Author's Conclusions

Table 4: Summary of Findings of Included Guidelines

Recommendations
European Resuscitation Council Guidelines for Resuscitation 2015, Perkins et al., 2015[14]
CPR should be performed on a firm surface whenever possible. Air-filled mattresses should be routinely deflated during CPR. The evidence for the use of backboards is equivocal. If a back-board is used, take care to avoid interrupting CPR and dislodging intravenous lines or other tubes during board placement. (p.89)[14]