

WORKSHEET for Evidence-Based Review of Science for Emergency Cardiac Care**Worksheet author(s)**

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Clinical question.

The original question was, BLS-007B "In adult and pediatric patients with cardiac arrest (out-of-hospital and in-hospital) and suspected major injury (P), does any different strategy regarding positioning (eg. leaving them in the position they are found) (I) as opposed to standard care (ie. positioning the victim on his or her back) (C), improve outcome (O) (eg. ROSC, survival)?

Is this question addressing an intervention/therapy, prognosis or diagnosis?

This is a question addressing an intervention/therapy.

State if this is a proposed new topic or revision of existing worksheet: This is a revision of the existing two separate worksheets, "What is the sensitivity and specificity of clinical signs for the need of resuscitation in the face-down victim with suspected neck injury?" and "What intervention are safe, effective and feasible when performing CPR in victims with suspected cervical injury? For above, consider over the head position for CPR? body position of victim? Body position of responder?"

Conflict of interest specific to this question

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? No conflict of interest.

Search strategy (including electronic databases searched).

Major databases were searched for heart arrest, cardiac arrest, cardiopulmonary arrest, neck, cervical, injury and trauma. Cochrane reviews databases included Cochrane Central Registry of Controlled Trials, Cochrane Database of Systemic Reviews, Cochrane Methodology Register, Cochrane DSR, ACP Journal Club, DARE, CCTR, CMR, HTA, and NHSEED. The searched hit results are summarized in the table.

Search Results in Major Databases (Date of last search: 07Dec09)

	Ovid/Medline	PubMed	Cochrane	EMBASE	AHA Ref. Lib.
#1 Search "wound and injuries" OR "spinal injuries"	7864	7904	111	25278	621
#2 Search hear arrest OR cardiac arrest OR cardiopulmonary arrest	33229	42454	1577	30735	2618
#3 Search positioning OR repositioning OR patient positioning	28435	27304	1392	32046	12
#4 Search #1 and #2	11	13	0	54	0
#5 Search #1 and #3	44	46	3	250	0
#6 Search #1 and #2 and #3	0	0	0	2	0

All the article abstracts were read carefully and the full texts were obtained when deemed to be closely related to this topic question. Exclusion criteria included abstract only studies, not peer reviewed studies and studies not answering the clinical question. There was no article directly or

indirectly addressing this topic. Since there are no new evidence found, the guidelines adopted at 2005 for resuscitation of traumatic cardiac arrest seem to be right for today. All the cited articles for COSTR 2005 were reviewed.

However, in the process of searching for trauma related articles, it was found that there was an important guidelines/position statement regarding resuscitation of traumatic cardiac arrest published in 2003 in the Journal of American College of Surgeons, by the National Association of EMS Physicians (NAEMSP) and the American College of Surgeons Committee on Trauma (COT), abstract of which is not electronically available (Hopson, 2003, 106). This statement actually suggested to not resuscitate blunt trauma patients with out-of-hospital cardiac arrest (OHCA) or penetrating trauma patients found pulseless, apneic, and with no sign of life, based on the evidence until 1992. Thus, this worksheet, also, included evidence whether the traumatic cardiac arrest patients should be left in the position they are found without repositioning, checking for breath and pulse, and resuscitation. A few new evidence on cervical spine injury were found.

• **State inclusion and exclusion criteria**

Inclusion: Any article which studied or compared outcome (ROSC, survival) of traumatic cardiac arrest as opposed to non-traumatic cardiac arrest when standard cardiopulmonary resuscitation procedures, which involve repositioning of patients, were applied.

• **Number of articles/sources meeting criteria for further review:**

There was no article directly or indirectly addressing the clinical question under the topic.

There was one article somewhat supporting the statement that traumatic cardiac arrest patients should be left as they are found. There were five articles, which showed poor prognosis in resuscitation of traumatic cardiac arrest, and somewhat neutral to the statement. There were eight articles, some of which strongly opposed the statement that traumatic cardiac arrest patients should be left as they are found.

14articles/ studies met criteria for detailed review, from the standpoint whether the traumatic cardiac patients should be left in the position they are found and CPR withheld.

Summary of evidence

Evidence Supporting Clinical Question

Good					
Fair				Lo, 2007 E	
Poor					
	1	2	3	4	5
Level of evidence					

A = Return of spontaneous circulation

B = Survival of event

C = Survival to hospital discharge

D = Intact neurological survival

E = Other endpoint

Italics = Animal studies

Evidence Neutral to Clinical question

Good					Milby 2008E Mithani 2007E
Fair				Alanezi, 2004 E Lin, 2007 E	Connell 2003E
Poor					
	1	2	3	4	5
Level of evidence					

A = Return of spontaneous circulation
B = Survival of event

C = Survival to hospital discharge
D = Intact neurological survival

E = Other endpoint
Italics = Animal studies

Evidence Opposing Clinical Question

Good				David, 2007 E Pickens, 2005 E	Rhee, 2006 E
Fair				Ashour, 2007 E Crewdson, 2007 E Huber-Wagner, 2007 E Lockey, 2006 E Willis, 2006 E	
Poor					
	1	2	3	4	5
Level of evidence					

A = Return of spontaneous circulation
B = Survival of event

C = Survival to hospital discharge
D = Intact neurological survival

E = Other endpoint
Italics = Animal studies

REVIEWER'S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:

The original question was “In adult and pediatric patients with cardiac arrest (out-of-hospital and in-hospital) and suspected major injury (P), does any different strategy regarding positioning (eg. leaving them in the position they are found) (I) as opposed to standard care (ie. positioning the victim on his or her back) (C), improve outcome (O) (eg. ROSC, survival)?”

This question is very specific and can be an enormous concern when a lay bystander, or even a professional rescuer, encountered a trauma victim, who may be in cardiac arrest, on the scene. The literatures were searched widely and extensively but any single article was found, which directly or indirectly addressed this important clinical question, except for a few new data on cervical spine injury. Therefore, the existing consensus on science and treatment recommendations drawn from the extrapolated evidence available at that time, summarized in two separate worksheets, seem to be still valid.

It may be important for this worksheet to identify any data about moving the patient. The central concern with repositioning the patient will be neck/spine injury, which may be complicated with any severe trauma patient. However, effective resuscitation of traumatic cardiac arrest patients will involve repositioning of the patient and the outcome of resuscitation of traumatic cardiac arrest is not satisfactory as in resuscitation of medical patients. There were few literatures supporting the statement that traumatic cardiac arrest patients should be left in the position they are found and not to resuscitate blunt trauma patients with out-of-hospital cardiac arrest (OHCA) or penetrating trauma patients found pulseless, apneic, and with no sign of life. There was one Level4, good study (Rhee, 2006, 1166), which showed that the incidence of cervical spine cord injury is low (0.12 – 1.35%) and that prompt resuscitation and transport are advised. There were one Level4, good study (David, 2007, 2251) and one Level 4, good study (Pickens, 2005, 951), and 5 Level 4, fair studies (Ashour, 2007, 163, Crewdson, 2007,29, Huber-Wagner, 2007, 276, Lockey, 2006, 240, Willis, 2006, 448), which opposed the statement that traumatic cardiac patients should be left in the position they are found. Two Level 4 studies (Huber-Wagner, 2007, 276, Lockey, 2006, 240), which showed that prehospital chest tube insertion was a strong predictor for survival , and prompt manipulation of trauma patients is advocated. There was one Level 4, fair study (Lo, 2007, 62), which somewhat supported the statement, two Level 4 fair studies (Lin 2007, 83, Alanezi 2004, 263), two Level 5 good studies (Mily, 2008, E10, Mithani, 2009, 1293) and one Level 5 fair study (Connell, 2003, 912), which are neutral to the statement.

The overall incidence of cervical spine injury after trauma was 2.4%(LOE 4, Lowery 2001, 12) to 3.7%

(LOE5, meta-analysis Milby, 2008, E10), but increased in patients with craniofacial injuries (LOE5, Mithani, 2009, 1293; LOE 4, Hackl, 2001, 370), a Glasgow Coma Scale score of <8 (LOE 4, Holly, 2002, 285), or both (LOE 4, Demetriades, 2000, 724). A large cohort study (LOE 4, Domeier, 1997, 11) showed that the following features are highly sensitive (94% to 97%) predictors of spinal injury when applied by professional rescuers: mechanism of injury, altered mental status, neurological deficit, evidence of intoxication, spinal pain or tenderness, and distracting injuries (i.e. injuries that distract the victim from awareness of cervical pain). Failure to stabilise an injured spine was associated with an increased risk of secondary neurological injury (LOE 4, Davis, 1993, 342, Reid, 1987, 986). A case—control study of injured patients with and without stabilization showed that the risk of secondary injury may be lower than previously thought (LOE 4, Hauswald, 1998, 214). Fully conscious patients with isolated penetrating trauma and no neurological deficit do not require spinal immobilization (LOE5, Connell 2003, 912). All airway manoeuvres cause spinal movement (LOE 5, Aprahamian, 1984, 584). Studies in human cadavers showed that both chin lift (with or without head tilt) and jaw thrust were associated with similar, substantial movement of the cervical vertebrae (LOE 5, Aprahamian, 1984, 584, Donaldson, 1993, 2020, Hauswald, 1991, 535, Brimacombe, 2000, 1274). Use of manual in-line stabilization (MILS)(LOE 5, Brimacombe, 2000, 1274) or spinal collars (LOE 5, Aprahamian, 1984,584) did not prevent spinal movement. Other studies have shown that application of MILS during airway manoeuvres reduces spinal movement to physiological levels (LOE 5, Majernick, 1986, 417, Lennarson, 2001, 265). Airway manoeuvres can be undertaken more safely with MILS than with collars (LOE 4, Heath, 1994, 843; LOE 5, Gerling, 2000, 293). But a small study of anaesthetized paralysed volunteers showed that use of the jaw thrust with the head maintained in neutral alignment did not improve radiological airway patency (LOE 4, Morikawa, 1961, 265). No studies evaluated CPR on a victim with suspected spinal injuries.

Thus, standard resuscitation, which requires repositioning of the patient most of the time, is recommended in trauma-related cardiac arrest as well as in non-trauma related OHCA or in-hospital cardiac arrest, in adult or pediatric patients.

Acknowledgements:

Citation List

Alanezi K, Alanzi F, Faidi S et al. Survival rates for adult trauma patients who require cardiopulmonary resuscitation. CJEM 2004;6:263-5. OBJECTIVES: To determine survival rates in adult trauma patients requiring cardiopulmonary resuscitation (CPR).

Level 4, neutral, no control, fair study.

Ashour A, Cameron P, Bernard S, et al. Could bystander first-aid prevent trauma deaths at the scene of injury? Emerg Med Australas 2007;19:163-8. OBJECTIVE: To identify potentially preventable prehospital deaths following traumatic cardiac arrest.

Level 4, opposing, no control, fair study.

Connell RA, Graham CA, Munro PT. Is spinal immobilization necessary for all patients sustaining isolated penetrating trauma? Injury, Int J Care Injured 2003;34:912-914.

Level 5, neutral, retrospective, large cohort study.

Crewdson K, Lockey D, Davies G. Outcome from paediatric cardiac arrest associated with trauma. Resuscitation 2007;75:29-34.

Level 4, opposing, fair (no control, retrospective)

David J-S, Gueugniaud P-Y, Riou R, et al. Does the prognosis of cardiac arrest differ in trauma patients? Critical Care Med 2007;35:2251-2255.

Level 4, not randomized, opposing, good study.

Huber-Wagner S, Lefering R, Qvick M, et al. Outcome in 757 severely injured patients with traumatic cardiorespiratory arrest. Resuscitation 2007;75:276-285.

Level 4, opposing, no control, fair study .

Hopson LR, Hirsh E, Delgado J et al. Guidelines for withholding or termination of resuscitation in prehospital traumatic cardiopulmonary arrest: Joint Position Statement of the National Association of EMS Physicians and the American College of Surgeons Committee on Trauma. J Am Coll Surg 2003;196:106-112.

Lin Y-R, Wu H-P, Huang C-Y, et al. Significant factors in predicting sustained ROSC in paediatric patients with traumatic out-of-hospital cardiac arrest admitted to the emergency department. Resuscitation 2007;74:83-89.

Level 4, neutral, fair study.

Lo CJ, Chang WL. Management of pulseless and apneic trauma patients: are aggressive measures justified? Am Surg 2007;73:62-66.

Level 4, supporting, no control, fair study.

Lockey D, Crewdson K, Davies G. Traumatic cardiac arrest: Who are the survivors? Ann Emerg Med 2006;48:240-244.

Level 4, opposing, no control, fair study.

Milby AH, Halpern CH, Guo W, Stein SC. Prevalence of cervical spinal injury in trauma. Neurosurg Focus 2008;25(5):E10.

Level 5, Meta-analysis, neutral, good study.

Mithani SK, St-Hilaire H, Brooke BS, Smith IM, Bluebond-Langner R, Rodriguez ED. Predictable Patterns of Intracranial and Cervical Spine Injury in Craniomaxillofacial Trauma: Analysis of 4786 Patients. *Plast Reconstr Surg* 2009;123:1293-1301.

Level 5, large cohort, retrospective, neutral, good study

Pickens JJ, Copass MK, Bulger EM. Trauma Patients Receiving CPR: Predictors of Survival. *J Trauma*. 2005;58:951-958.

Level 4, opposing, no control, good study.

Rhee P, Kuncir EJ, Johnson L, Brown C, Velmahos G, Martin M, Wang D, Salim A, Douc J, Kennedy S, Demetriades D. Cervical Spine Injury is Highly Dependent on the Mechanism of Injury Following Blunt and Penetrating Assault. *J Trauma* 2006;61:1166-1170.

Level5, large cohort, retrospective study

Willis CD, Cameron PA, Bernard SA, et al. *Injury* 2006;37:448-54.

Level 4, opposing, no control, fair study.