

WORKSHEET for Evidence-Based Review of Science for Veterinary CPR

1. Basic Demographics

Worksheet author(s)

Steven Epstein	Date Submitted for review: 5/7/2011

2. Clinical question:

In dogs and cats that are NOT in cardiac arrest (P), how often does provision of chest compressions (I), lead to harm (eg rib fracture) (O)?

3. Conflict of interest specific to this question:

None

4. Search strategy (including electronic databases searched):

4a. Databases

Pubmed (NLM) (no date restrictions) (performed April 30, 2011)

("cardiopulmonary resuscitation"[MeSH Terms] OR ("cardiopulmonary"[All Fields] AND "resuscitation"[All Fields]) OR "cardiopulmonary resuscitation"[All Fields]) AND ("heart arrest"[MeSH Terms] OR ("heart"[All Fields] AND "arrest"[All Fields]) OR "heart arrest"[All Fields]) OR ("cardiac"[All Fields] AND "arrest"[All Fields]) OR "cardiac arrest"[All Fields]) AND "not"[Title]

2 relevant hits out of 136 total hits

non-arrests

1 additional relevant hit

non-arrest

no additional relevant hits

accuracy dispatcher cardiac arrest

no additional relevant hits

CAB (1910 to Feb 2011) (performed on April 28, 2011)

(1) Harm

(2) Cardiac arrest

(3) Cardiopulmonary resuscitation

(4) Chest compressions

(1) and (2) no relevant hits

(2) and (3) no relevant hits

(1) and (4) no relevant hits

4b. Other sources

Using Google Scholar, the cited by function was used from references obtained in the Pubmed search.

No additional hits

-In addition all references of identified articles and in particular the references of the following relevant review articles were checked:

European Resuscitation Council Guidelines for Resuscitation 2010 Section 2. Adult basic life support and use of automated external defibrillators
Part 5: Adult Basic Life Support 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

No additional relevant hits

The references from the original 3 papers were reviewed and 0 additional relevant papers were identified.

4c. State inclusion and exclusion criteria for choosing studies and list number of studies excluded per criterion

Inclusion criteria

Human and animal studies containing subjects not in cardiac arrest, treated with CPR including chest compressions that have a measure of injury to either the thoracic or abdominal cavities at; necropsy or autopsy, any diagnostic imaging, or healthcare worker reported.

Exclusion criteria

Manikin based studies, not English language, or review articles

4d. Number of articles/sources meeting criteria for further review: 3

Three human clinical studies were identified: (Hallstrom, Cobb, Jonson et al. 2003), (White, Rogers, Bloomingdale et al 2010), and (Haley, Lerner, Pirrallo, et al. 2011)

5. Summary of evidence

Evidence Supporting Clinical Question

Good						
Fair						
Poor						
	1	2	3	4	5	6
Level of evidence (P)						

A = Return of spontaneous circulation C = Survival to hospital discharge E = Other endpoint
 B = Survival of event D = Intact neurological survival *Italics = Non-target species studies*

Evidence Neutral to Clinical question

Good						
Fair						
Poor						
	1	2	3	4	5	6
Level of evidence (P)						

A = Return of spontaneous circulation C = Survival to hospital discharge E = Other endpoint
 B = Survival of event D = Intact neurological survival *Italics = Non-target species studies*

Evidence Opposing Clinical Question

Good						
Fair						<i>Haley 2011 E=rhabdomyolysis</i> <i>White 2010 E=rib fracture</i>
Poor						<i>Hallstrom 2003 E</i>
	1	2	3	4	5	6
Level of evidence (P)						

A = Return of spontaneous circulation
B = Survival of event

C = Survival to hospital discharge
D = Intact neurological survival

E = Other endpoint
Italics = Non-target species studies

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

There are only three studies that look at whether bystander chest compressions in patients not in cardiac arrest do harm. This was not the main objective in one paper (Hallstrom 2003), but it was reported. In this study no serious adverse sequelae were noted by attending EMS personnel or by telephone interview. Whether injury occurred from bystander chest compressions in patients not in cardiac arrest was a primary objective in the other two papers available. The largest study (White 2010) included 247 people who had chest compressions that were not in cardiac arrest and were examined by a physician and had a medical record. Of these rib fractures were noted in only 4 of 247 patients (1.6%) that were possibly or probably attributed to the chest compressions. One of 247 patients (0.4%) had tracheal bleeding possibly resulting from the chest compressions. Additionally 29 of 247 patients (11.7%) experienced chest pain or discomfort as a probable or possible consequence of chest compressions. One smaller retrospective study (Haley 2011) had medical records available for 72 patients in whom chest compressions had been performed, but the patient deemed not to be in cardiac arrest. Of these, only 1 patient (1.4%) had a possible injury, which was rhabdomyolysis. No rib fractures were noted in this study.

With serious adverse effects occurring in less than 2% of patients not in cardiac arrest that receive chest compressions, and the potential benefits of early chest compressions in patients in cardiac arrest, chest compressions should be provided to dogs and cats if there is any doubt as to whether cardiac arrest has occurred or not.

7. Conclusion

CONSENSUS ON SCIENCE: Two prospective and one retrospective [clinical](#) cohort studies [in humans](#) (LOE 6) document a less than 2% occurrence of serious adverse effects (rib fracture or tracheal bleeding) from chest compressions being performed on patients not in cardiac arrest. Minor adverse effects (chest pain or discomfort) occurred 11.7% of the time in one study. [The benefit of early provision of chest compression thus overcomes the risk of injury to subjects not in cardiac arrest based on human data. Veterinary data is lacking.](#)

8. Acknowledgement

none

9. Citation list

Haley, K B, Lerner, E B, Pirralo, R G, et al. (2011). The frequency and consequences of cardiopulmonary resuscitation performed by bystanders on patients who are not in cardiac arrest. *Prehospital Emergency Care*, 15(2), 282-7.

BACKGROUND: The American Heart Association encourages trained and untrained bystanders to perform, at a minimum, chest compressions on anyone who suddenly collapses. It is possible that people who are not in cardiac arrest may receive bystander cardiopulmonary resuscitation (CPR), from which the potential for injury is unknown.

OBJECTIVES: To determine the number of victims who received bystander CPR but were not in cardiac arrest and to identify any injuries resulting from receiving bystander CPR.

METHODS: Retrospective review of patient care records from a countywide emergency medical services (EMS) database. All patients treated by EMS between March 2003 and February 2009 who received bystander CPR were queried. Victims who were determined not to be in cardiac arrest upon EMS personnel assessment were identified as likely not in cardiac arrest. Hospital medical records for transported patients were reviewed for injuries possibly related to CPR. Patient demographics were collected and descriptive statistics were used for analysis.

RESULTS: Six hundred seventy-two incidents of bystander CPR occurred, with 77 (11.5%) cases not being identified as cardiac arrests by EMS. Twenty-three percent of the patients were less than 19 years of age. Emergency medical services arrived in less than 6 minutes for 68% of patients. Seventy-two patients were evaluable for injury; of those, 53% were admitted to the intensive care unit. One patient (1.4%) had an injury that was documented in the medical record as possibly CPR-related: rhabdomyolysis.

CONCLUSIONS: Bystanders provide CPR for patients who are not in cardiac arrest at a relatively low frequency. Short-duration bystander CPR caused injury in less than 2% of victims. Our results suggest that the benefits of bystander CPR for adults who suddenly collapse outweigh the risk of injury for those not in cardiac arrest.

LOE 6 Fair (opposing)

72 patients available for evaluation of injury that had CPR performed when not in cardiac arrest. Only 1 patient had an injury that was possibly related to the chest compressions. This was a notation in the record of rhabdomyolysis with no explanation of the link between chest compressions and the rhabdomyolysis. The data abstraction was supported by the Medical College of Wisconsin EMS Hometown Heroes Fund.

Hallstrom, A P, Cobb, L A, Johnson, E, et al. (2003). Dispatcher assisted CPR: implementation and potential benefit. A 12-year study. *Resuscitation*, 57(2), 123-9.

OBJECTIVES:

Our objectives are to describe details of the dispatcher assisted cardiopulmonary resuscitation (CPR) instruction program we implemented during a 12 years study and to provide estimates of the potential number

The Veterinary School 7/9/11 12:27 AM

Comment [1]: You may also want to expand on studies on injuries associated with chest compression to truly arrested patients, as we do not have a PICO question on compression associated injuries. It seems that these studies (often human necropsy studies) show more severe injury than the injuries sustained in the non-arrest studies you identified.

of out-of-hospital cardiac arrests that might benefit from such instruction based on data from the last 77 months.

METHODS: Basic data were obtained for all episodes of out-of-hospital cardiac arrest in the city of Seattle, as well as all emergency medical services (EMS) dispatches for suspected cardiac arrest. In addition to EMS run reports, data sources included audio tapes of dispatches, and interviews of callers. These data were used in a potential benefit analysis.

RESULTS: Over a period of 77 months, 54% (3320/6130) of cardiac arrests received advanced cardiac life support (ACLS) by Seattle Fire Department emergency medical technicians (EMTs) and paramedics. We estimated that 29.9% (994/3320) of cardiac arrests in Seattle treated by EMS could have theoretically benefited from dispatcher assisted CPR. No serious adverse consequences of a dispatcher assisted CPR program were observed. Failure to identify a cardiac arrest by dispatchers was largely attributed to deviation from a well-defined protocol. However, non-arrests identified, initially as arrests appeared to be unavoidable.

CONCLUSIONS:

In the city of Seattle, some 29.9% of all out-of-hospital cardiac arrest victims who received ACLS had the potential to benefit from dispatcher assisted CPR.

LOE 6 Poor (opposing)

71 patients had chest compressions and were not in cardiac arrest. No serious adverse sequelae attributed to the CPR in these non-cardiac arrest cases were described on the EMS reports or during telephone interviews with the recipients of CPR instructions.

No statement about funding

White, L, Rogers, J, Bloomingdale, M, et al. (2010). Dispatcher-assisted cardiopulmonary resuscitation: risks for patients not in cardiac arrest. *Circulation*, 121(1), 91-7.

BACKGROUND: Dispatcher-assisted cardiopulmonary resuscitation (CPR) instructions can increase bystander CPR and thereby increase the rate of survival from cardiac arrest. The risk of bystander CPR for patients not in arrest is uncertain and has implications for how assertive dispatch is in instructing CPR. We determined the frequency of dispatcher-assisted CPR for patients not in arrest and the frequency and severity of injury related to chest compressions.

METHODS AND RESULTS: The investigation was a prospective cohort study of adult patients not in cardiac arrest for whom dispatchers provided CPR instructions in King County, Washington, between June 1, 2004, and January 31, 2007. The study focused on those who received chest compressions. Information was collected through review of the audio and written dispatch report, written emergency medical services report, hospital record, and telephone survey. Of the 1700 patients for whom dispatcher CPR instructions were initiated, 55% (938 of 1700) were in arrest, 45% (762 of 1700) were not in arrest, and 18% (313 of 1700) were not in arrest and received bystander chest compressions. Of the 247 not in arrest who received chest compressions and had complete outcome ascertainment, 12% (29 of 247) experienced discomfort, and 2% (6 of 247) sustained injuries likely or possibly caused by bystander CPR. Only 2% (5 of 247) suffered a fracture, and no patients suffered visceral organ injury.

CONCLUSIONS: In this prospective study, the frequency of serious injury related to dispatcher-assisted bystander CPR among nonarrest patients was low. When coupled with the established benefits of bystander CPR among those with arrest, these results support an assertive program of dispatcher-assisted CPR.

LOE 6 Fair (opposing)

Of 247 people not in arrest who received chest compressions and had complete outcome ascertainment, 12% (29 of 247) experienced discomfort, and 2% (6 of 247) sustained injuries likely or possibly caused by bystander CPR. Only 2% (5 of 247) suffered a fracture, and no patients suffered visceral organ injury.

No statement about funding

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