WORKSHEET for Evidence-Based Review of Science for Veterinary CPCR

1. Basic Demographics

Worksheet author(s)

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2. Clinical question:

In veterinary CPR teams (P) does leadership training (I) compared with no leadership training (C), improve performance in simulation scenarios (O)?

3. Conflict of interest specific to this question:

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

4. Search strategy (including electronic databases searched):

4a. Databases

-MEDLINE via PUBMED (1950 to May 2009) (performed on August 28th 2010)
1. Leadership training
2. Leadership
3. Cardiopulmonary resuscitation
4. CPR
5. CPCR
6. CPR simulation
7. CPR simulation performance
8. Veterinary

1 and 3: 39 relevant hits
1 and 4: 1 additional irrelevant hit
1 and 5: no additional relevant hits
1 and 6: no additional relevant hits
2 and 3: no additional relevant hits
2 and 4: no additional relevant hits
1 and 8: no additional relevant hits
2 and 8: no additional relevant hits

4b. Other sources

-GOOGLE SCHOLAR e
No additional relevant hits

-In addition all references of the following relevant article were checked:
(Hunziker Crit Care Med 2010; 38:1086 –1091)

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

Inclusion criteria

Human studies, veterinary studies, in- or out of-hospital arrest

Exclusion criteria

Non-English language, editorials, letters to the editor, abstracts, proceedings

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4d. Number of articles/sources meeting criteria for further review: 13+20 more identified from review of references read

5. Summary of evidence

Evidence Supporting Clinical Question

Good						*(Makinen M et al 2006)E; (Hunziker S et al 2010)E; (Cooper S 2001)E ; (Marsch SC et al 2004)E;*
Fair						*(Hunziker S 2009)E; (Chung SP 2010)E; (Tschan F et al 2006)E*
Poor						*(Hunziker S et al 2011)E**
	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

*Review article

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Evidence Neutral to Clinical question

Good						(DeVita MA et al, 2005)E
Fair						
Poor						
	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

Evidence Opposing Clinical Question

Good						
Fair						
Poor						
	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:

It has been established that in human medicine, hands-on time and time to defibrillation are two performance markers of CPR that have a proven relevance for medical outcome. Research has shown that in case of an untreated ventricular fibrillation, each minute without resuscitation diminishes survival chances by 7% to 10%. Rapid, appropriate intervention by first responders to a cardiopulmonary arrest is part of improving survival rates. To maximize CPR performance, frequent ACLS training using algorithms and simulated scenarios is recommended by the AHA to maintain technical skills for first-responders to cardiac arrest situations. Despite these recommendations, CPR outcomes have remained poor. It may be that in addition to technical skills of individual rescuers, human factors such as teamwork and leadership affect adherence to algorithms and therefore the outcome of CPR.

Results from a literature search addressing the clinical question "In veterinary CPR teams does leadership training compared with no leadership training, improve performance in simulation scenarios?" did not reveal any veterinary studies. A literature search addressing the question in human medicine found studies which established that clearer leadership is associated with more efficient cooperation in the team and also with better task performance. In addition, when leaders adopted a coordinating role by monitoring CPR and communicating effectively instead of participating with hands-on in the emergency, they were more likely to be efficient leaders, and team performance improved.

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Teamwork and leadership training is now included in ACLS course guidelines. Patient simulation has been suggested to be the ideal tool for teaching. Trainees can engage actively in their learning process while doing no harm to their patients. In addition, using high-fidelity human simulators allows in-depth investigation of complex human interactions using precise and reproducible methods and removes variability in the clinical parameters of resuscitation, thus letting researchers study human factors and team interactions without confounding by clinical variability from resuscitation to resuscitation. It remains to be seen, however, if practice using simulation will consistently translate into improved, real-life CPR success in veterinary medicine.

7. Conclusion

Studies investigating the benefits of leadership training in veterinary CPR simulations are lacking. Studies in human medicine indicate that leadership training is beneficial in improving outcome in simulation studies, and that team training may be more important than leadership training. High-fidelity simulators, needed for accurate assessment of CPR skills during training, need to be developed for veterinary studies.

8. Acknowledgement

None

9. Citation list

Cooper S. Developing leaders for advanced life support: evaluation of a training programme. Resuscitation 2001 49:33-38.

This study is likely the first that tests the benefits of leadership training on improving CPR skills in people. The researcher evaluated the effectiveness of a leadership development seminar introduced into the Resuscitation Council (UK) Advanced Life Support (ALS) Provider course by making observational assessments of leadership performance during cardiac arrest scenarios before and after a leadership seminar. Two groups of doctors, nurses and technicians were trained in the same ALS course. They were then randomized to receive a 75 minute leadership course using lecture, videos and discussion, or attend a question and answer session with the instructors. For the observational assessment of leadership skills an adapted and reworded version of the Leadership Behaviour Description Questionnaire (Initiating Structure)-LBDQ (Form X11) was used which specifically measures the degree of structure built within a team, a style of leadership which is essential in emergency situations. Five nurses observed the performance and completed the questionnaires. Personality scores using the Myers Briggs Type Indicator were also calculated. The conclusion was that the leadership training programme significantly improved candidate's leadership performance in the training situation.

Marsch SC, Müller C, Marquardt K, Conrad G, Tschan F, Hunziker PR. Human factors affect the quality of cardiopulmonary resuscitation in simulated cardiac arrests. Resuscitation. 2004 Jan;60(1):51-56

The aim of this prospective study was to determine whether and how human factors affect the quality of cardiopulmonary resuscitation. Sixteen teams, each consisting of three health-care workers (physicians and nurses attending a international ICU conference), were studied in a patient simulator. A scenario of witnessed cardiac arrest due to ventricular fibrillation was used. Ventricular fibrillation could be converted into sinus rhythm by two countershocks administered during the first 2 min or by two countershocks administered during the first 5 min provided that uninterrupted basic life support was started in under 60 seconds. Teams were rated to be successful if ventricular fibrillation was converted into sinus rhythm. A technical and a behavioral rating were performed using criteria defined prior to the workshop. Behavioral rating included leadership, task distribution, information transfer, and conflicts. All data analysis was made post-hoc using videotapes recorded during the simulation. Only six out of 16 teams were successful. Compared with successful teams, teams that failed exhibited significantly less leadership behavior and explicit task distribution. All teams shared among them sufficient theoretical knowledge to successfully treat the simulated cardiac arrest. In a scenario of simulated witnessed cardiac arrest almost two thirds of teams composed of qualified health-care workers failed to provide basic life support and/or defibrillation within an appropriate time window. Absence of leadership behavior and absence of explicit task distribution were associated with poor team performance. Failure to translate theoretical knowledge into effective team activity appears to be a major problem.

DeVita MA, Schaefer J, Lutz J, Wang J, Dongilli T. Improving medical emergency team (MET) performance using a novel curriculum and a computerized human patient simulator. Qual Saf Health Care 2005;14:326–331

This prospective study attempted to address the problem of lack of training in coordination of team resources in ACLS training. Having a team leader assign tasks as the crisis develops may detract from the team leader's focus on treating the patient. The authors hypothesized that a focus on organizational strategies using predetermined (but not preassigned) roles would help organize diverse members into a more coordinated MET team. Organization did not depend on the ''team leader'' assigning tasks. Coordination of team resources may improve the ability of teams to deliver needed treatments reliably and rapidly. Their objective was to use a human simulation training educational environment to develop multidisciplinary team skills and improve medical emergency team

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(MET) performance, and they hypothesized that increased performance of organizational tasks would correlate with simulated patient outcome.

Ten courses were delivered to 138 clinically experienced individuals who were ACLS trained (69 critical care nurses, 48 physicians, and 21 respiratory therapists). Each course had four components: (1) a web based presentation and pretest before the course; (2) a brief reinforcing didactic session on the day of the course; (3) three of five different simulated scenarios; each followed by (4) debriefing and analysis with the team. Three of five simulator scenarios were used; scenario selection and order was random. Trainees did not repeat any scenario or role during the training. Participants were video recorded to assist debriefing. Debriefing focused on reinforcing organizational aspects of team performance: assuming designated roles independently, completing goals (tasks) assigned to each role, and directed communication. Simulator ''survival'' depended on supporting oxygenation, ventilation, circulation within 60 seconds, and delivering the definitive treatment within 3 minutes. Simulated survival (following predetermined criteria for death) increased from 0% to 89%. The initial team task completion rate was 10–45% and rose to 80–95% during the third session. The conclusion was that training multidisciplinary teams to organize using simulation technology is feasible. They did not compare this method of training to leadership training.

Tschan F, Semmer NK, Gautschi D, et al. Leading to Recovery: Group performance and coordinative activities in medical emergency driven groups. Hum Performance 2006; 19:277–304

In this prospective study, the differential influence of directive leadership and structuring inquiry on the group's performance in ad hoc emergency driven medical teams performing a cardiovascular resuscitation was studied in a simulator setting. Three phases are distinguished: nurses only (first responder; Phase 1), resident present (coming onto scene; Phase 2), and senior doctor present (last one to arrive; Phase 3). Their hypothesis was that directive leadership and structuring inquiry by the "appropriate" role incumbent will enhance performance, and directive leadership will positively affect performance in each phase. This study showed that with teams of changing compositions, performance was influenced by human factors, as differences in leadership and structuring inquiry partly explained differences in performance. Also, senior physicians who entered the room later in the crisis supported group performance best by asking questions that brought potential problems to the attention of the leading junior doctors rather than by making directive statements. Although they did not specifically evaluate success in resuscitation with leadership training, their results underscore the importance of behavior that is in accordance with specific role and time requirements and support the call for integrating human factor aspects in team training.

Mäkinen M, Aune S, Niemi-Murola L, Herlitz J, Varpula T, Nurmi J, Axelsson AB, Thorén AB, Castrén M; for the ECCE Study Group. Assessment of CPR-D skills of nurses in Göteborg, Sweden and Espoo, Finland: teaching leadership makes a difference. Resuscitation. 2007 Feb;72(2):264-9.

This was a prospective study comparing 2 groups of nurses from different hospitals who were tested on cardiopulmonary resuscitation-defibrillation (CPR-D) simulators in a ventricular fibrillation arrest model. One group had been routinely trained on the use of AED and they were expected to be leaders in CPR situations. That group had significantly improved simulator success as well as improved non-technical responses attributed to leadership training using a ventricular fibrillation model. The purpose of this study was to develop a method to assess the resuscitation skills of nurses and to facilitate construction of an educational program. Assessment of CPR-D skills with an objective structured clinical examination (OSCE) was used to statistically compare the 2 groups. The mean score of AED- trained nurses was statistically better, and they were all able to perform defibrillation, compared to only 49% of the untrained nurses. Significant differences between the skills of the nurses working in the two groups were found in non-technical skills, giving an alarm, setting the lower defibrillation electrode accurately and using the correct CPR-D technique. It was concluded that defining and teaching leadership seems to improve resuscitation performance.

Hunziker S, Tschan F, Semmer NK, Zobrist R, Spychiger M, Breuer M, Hunziker, PR, Marsch SC. Hands-on time during cardiopulmonary resuscitation is affected by the process of teambuilding: a prospective randomised simulator-based trial. BMC Emerg Med. 2009 Feb 14;9:3.

The aim of this prospective randomised study was to explore and quantify the effects of adhoc team-building on the adherence to the algorithms of CPR among general practitioners and hospital physicians. To unmask team-building the performance of preformed teams, i.e. teams that had undergone their process of team-building prior to the onset of a cardiac arrest, with that of teams that had to form ad-hoc during the cardiac arrest were compared. Fifty teams consisting of three general practitioners each and 50 teams consisting of three hospital physicians each, were randomised to two different versions of a simulated witnessed cardiac arrest: the arrest occurred either in the presence of only one physician while the remaining two physicians were summoned to help ("ad-hoc"), or it occurred in the presence of all three physicians ("preformed"). All scenarios were videotaped and performance was analysed post-hoc by two independent observers. Compared to preformed teams, ad-hoc forming teams had less hands-on time during the first 180 seconds of the arrest, delayed their first defibrillation, and made less leadership statements. The conclusion was that hands-on

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time and time to defibrillation are negatively affected by shortcomings in the process of ad-hoc team-building and particularly deficits in leadership. Team-building has thus to be regarded as an additional task imposed on teams forming ad-hoc during CPR. All physicians should be aware that early structuring of the own team is a prerequisite for timely and effective execution of CPR.

Hunziker S, Buhlmann C, Tschan F, et al. Brief leadership instructions improve cardiopulmonary resuscitation in a high-fidelity simulation: A randomized controlled trial. Crit Care Med 2010 38:1086-1091

This is a randomized controlled study that assessed the influence and sustained effect of technical vs. leadership instructions on the medical performance of medical students in a high-fidelity simulated CPR. During a baseline visit, medical students participated in a video-taped simulated witnessed cardiac arrest. Participants were thereafter randomized to receive instructions focusing either on correct positions of arms and shoulders (technical instruction group) or on leadership and communication to enhance team coordination (leadership instruction group). A follow-up simulation was conducted after 4 months. The hypothesis was that short instructions have a sustained effect after a 4-month duration but that leadership instruction is superior in terms of team performance and will result in better medical performance of CPR compared to technical instructions. The leadership group started earlier with ventilation and chest compressions and was more vocal with instructions and decisions. Correct arm position decreased in leadership group after 4 months. Leadership instruction resulted in better team performance and showed better overall results with regard to outcome relevant measures such as beginning of CPR, hands-on time, and appropriate chest compression rate. Conversely, technical-instructed groups showed more correct arm positions. This study indicates that in addition to teaching technical algorithms, rescuers may benefit from instructions concerning the importance of leadership during CPR. We found that teams with leadership instruction had more leadership utterances and started CPR earlier, resulting in a significantly longer uninterrupted hands-on time during the first 3 minutes of the cardiac arrest.

Chung SP, Cho J, Park YS, et al. Effects of script-based role play in cardiopulmonary resuscitation team training. Emerg Med J 2011 Aug;28(8):690-694

The purpose of this prospective randomised controlled trial was to compare the cardiopulmonary resuscitation (CPR) team dynamics and performance between a conventional simulation training group and a script-based training group. Fourteen teams, each consisting of five members, were recruited. The conventional group received training using a didactic lecture and simulation with debriefing. The script group received training using a resuscitation script, which consisted of good leadership verbal instructions to use as an adjunct for leadership training of resuscitation teams. They suggested that it may be more effective to teach using a specific script such as 'Tap the patient's shoulder and ask "are you all right?"' rather than to instruct students to 'check unconscious patients for a response'. The team activity was evaluated with checklists both before and after 1 week of training. The videotaped simulated resuscitation events were compared in terms of team dynamics and performance aspects. Both groups showed significantly higher leadership scores after training. However, there were no significant improvements in performance scores in either group after training. There were no differences in the score improvement after training between the two groups in dynamics, performance and total scores. The conclusion was that script-based CPR team training resulted in improvements in team dynamics scores compared with conventional simulation training.

Hunziker S, Johansson AC, Tschan F, et al. Teamwork and leadership in cardiopulmonary resuscitation. J Am Coll Cardiol 2011;57:2381–2388

This review article describes the state of the science linking team interactions to the performance of CPR using high-fidelity human simulator studies. They illustrate how detailed, real-time analysis of the complex interplay between team members, their communication, and the role of leadership and team hierarchy can shed light on fundamental aspects of group interaction that materially affect the performance of resuscitative teams.

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