

WORKSHEET for Evidence-Based Review of Science for Emergency Cardiac Care

Worksheet author(s)

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Clinical question.

In lay providers requiring BLS training (P), does focusing training on high risk populations (I) compared with no such targeting (C) increase outcomes (eg. bystander CPR, survival etc) (O)

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

State if this is a proposed new topic or revision of existing worksheet: New

Conflict of interest specific to this question

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

Search strategy (including electronic databases searched).

- 1) PubMed "cardiopulmonary resuscitation" (MeSH) AND ("Caregivers/ed" OR "Parents/ed" OR "Family/ed") (MeSH) (1950 to November 9, 2009)
- 2) EMBASE using terms Resuscitation AND (Parenting Education OR Patient Education OR Health Education OR Education Program OR "Outcome of Education") AND (Caregiver OR Parent OR Family) (1980 to November 9, 2009)
- 3) AHA End Note Master Library (ver. Mar 24, 2008)
- 4) Cochrane Database for systematic reviews searching for "resuscitation" (to November 9, 2009)
- 5) Central Register of Controlled Trials searching for "basic life support" (to November 9, 2009)
- 6) Review of References from articles
- 7) Forward search using SCOPUS, Google Scholar and Web of Science (searched November 9, 2009)

• State inclusion and exclusion criteria

Studies were excluded if they dealt with:

- Automatic External Defibrillator training exclusively,
- health care provider training
- training not related to cardiopulmonary resuscitation

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

16 studies met criteria for review. Of these, 1 was published in Korean, with no English translation available. Of the remaining 15 studies, 6 were LOE 1 (RCT's), 4 LOE 2, one LOE 3, one LOE4 and 3 LOE5.

Summary of evidence

Evidence Supporting Clinical Question

Good		Cheng (1997) E2 Kliegel (2000) E2 Sigsbee (1990) E4 Swor (2006) E9	Higgins (1989) B, E9		
Fair	Dracup (2000) E4, E5, E7, E9, E10 Moser (1999) E2, E4, E11 Moser (2000) E4- E6, E12			McLauchlan (1992) E4	Swor (2005) B
Poor					Groeneveld (2005) E16 Swor (2004) B
	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 (see below for list)
Italics = Animal studies

E1=attitude towards receiving training

E2=would perform CPR if necessary in general

E2A=would perform mouth-to-mouth ventilation if necessary

E2B=would perform chest compressions if necessary

E3=practice CPR skills since training

E4=anxiety

E5=depression

E6=hostility

E7=psychosocial adjustment to illness

E8=successfully learned CPR at end of course

E9=performed CPR (in real life)

E10=perceived social support

E11=CPR Attitudes Scale (global measurement of anxiety, perceived control, responsibility & sense of burden)

E12=perceived control

E13=AHA Heartsaver Questionnaire Score

E14=CPR Knowledge (Written) and Skills Testing

E15=participation in CPR course

E16=cost-effectiveness

E17=marital satisfaction

Evidence Neutral to Clinical question

Good	Dracup (1994) E1-E3				
Fair	Dracup (1997) E4-E7				
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 (see previous page for list)

Italics = Animal studies

Evidence Opposing Clinical Question

Good					
Fair	Dracup (1986) E4-E5, E13				
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 (see previous page for list)

Italics = Animal studies

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

This question is a very important one, as it attempts to address one of the major factors that determines the outcome of adult out-of-hospital cardiac arrest – whether CPR was performed by a bystander. It is well-known that patients do less well if they suffer cardiac arrest at home (e.g. Herlitz *et al*, *Heart* (2002)-not listed in this worksheet) and that family members are less likely to perform CPR on their relatives than on a complete stranger, even if CPR-trained (e.g. Swor *et al*, *Resuscitation* (2003)-not listed in this worksheet). With this review of the literature, we are attempting to determine if targeting CPR training to high-risk populations (e.g. family members of patients with risk factors for cardiac arrest) will improve this situation.

Although a significant number of studies are reviewed here, very few are directly relevant to answering the question, i.e. looking at targeting CPR training and its effect on outcome.

There are 2 main outcomes to review: 1) rate of bystander CPR or patient outcome, and 2) psychological effects of CPR training course participant (e.g. anxiety).

Rate of Bystander CPR/Patient Outcome

Some studies ask BLS course participants whether they would be willing to perform CPR if required (Dracup, 1994, 116; Cheng, 1997, 273; Kliegel, 2000, 147), and generally show that people *say* they are more willing to perform CPR on a relative than a stranger *before* training, but this difference disappears after training. However, Swor (2006, 596) looked at whether CPR was performed in *real-life* cardiac arrest situations, and found that bystanders who were family members were less likely to perform CPR, but if CPR-trained, family members performed CPR at the same rate as strangers who were CPR trained. Therefore, it seems as though CPR training improves the relative/stranger discrepancy with CPR performance rates that is consistently found. In addition, when comparing pediatric cardiology centres that consistently taught CPR to parents of high-risk children vs. those centres that did not, an improvement in CPR performance and patient outcome is seen (Higgins, 1989, 1102).

However, computer-driven cost-effectiveness studies (Groeneweld 2005, 58; Swor 2004, 420; Swor, 2005, 7) show that, although it is possible to show an improvement in survival or QALY with a targeted BLS training approach, and it is a relatively efficient way to do so (vs. widespread AED availability, for example) this may not be a feasible way to improve these measures. For example, Swor (2005, 7) showed that we would need to improve the rate of CPR performance to 75% for private-residence cardiac arrests in order to see an improvement in survival. This seems unfeasible, given that the current rate of bystander CPR for cardiac arrests at home is approximately 28% (Herlitz *et al*, *Heart* (2002)-not listed in this worksheet).

Psychological Effects of CPR Training on Participant

Several well-designed randomized controlled trials by Dracup and Moser reveal that BLS training in high-risk populations has the ability to teach these people CPR (e.g. Dracup, 1986, 1757). In addition, they looked at the psychological effects of this training. The results are somewhat conflicting: In Dracup (2000, 3289), the investigators found that there were positive psychological effects over time (decreased anxiety and increased adjustment to illness) by participating in a CPR class with a social support group. Moser (2000, 270) also found decreased anxiety over time in BLS trained family members. However, Dracup (1986, 1757) found more anxiety in the patients of family members who were given BLS training. In Dracup (1997, 1434), the increased anxiety found in family members who had taken CPR training was mitigated by adding a social support intervention. Finally, McLaughlan (1992, 7) found no difference in anxiety in BLS trained family members over time.

Overall, it seems as though CPR training in family members of high risk patients may improve the rate of bystander CPR seen when the bystanders are relatives of the victims, but it doesn't improve it to beyond the levels seen by strangers. However, it may not be feasible to train the numbers of people potentially required to take CPR in order to effect an improvement in survival. In addition, there is very conflicting data on the potential effects (either positive or negative) on psychological adjustment in relatives of high-risk patients who take CPR training.

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Citation List

Cheng Y-C, Hu S-C, Yen D, Kao W-F, Lee C-H. Targeted mass CPR training for families of cardiac patients – experience in Taipei City. *Tzu Chi Med J* (1997) 9: 273-278.

LOE 2 Supporting Study. This study looked at the attitudinal differences between participants of a mass CPR training program who had high-risk family members and those who didn't. There were no differences found with respect to willingness to perform CPR, when asked after taking the course. But there was a high rate of willingness to provide CPR, and a targeted approach to attracting people to take CPR training was successful.

Dracup K, Guzy PM, Taylor SE, Barry J. Cardiopulmonary resuscitation (CPR) training. Consequences for family members of high-risk cardiac patients. *Arch Intern Med* (1986) Sep;146(9):1757-61.

LOE1 Opposing Study. Although an RCT and high LOE, it doesn't actually answer the question since it doesn't compare the effects of CPR training between high-risk and low-risk populations. The control group comes from high-risk family members also. The main findings of this study were: no significant differences in anxiety or depression in subjects after CPR training. There was a trend, however, to increased anxiety & depression over time after CPR training, and decreased anxiety & depression over time in family members who did not receive CPR training. In addition, the family members who received CPR training demonstrated higher scores than the control group on CPR knowledge portion of AHA Heartsaver Quiz.

Dracup K, Moser DK, Guzy PM, Taylor SE, Marsden C. Is cardiopulmonary resuscitation training deleterious for family members of cardiac patients? *Am J Pub Health* (1994) Jan;84(1):116-8.

LOE1 Neutral Study. Although an RCT and high LOE, it doesn't actually answer the question since it doesn't compare the effects of CPR training between high-risk and low-risk populations. The control group comes from high-risk family members also. The only reported comparison done between treatment and control groups is 6 month test scores, which shows that family members who did not practice CPR in the 6 months following the course performed at the same level as the control group, who received no CPR training at all. The study also showed a positive effect that CPR training had on potential willingness to perform CPR in the future.

Dracup K, Moser DK, Taylor SE, Guzy PM. The psychological consequences of cardiopulmonary resuscitation training for family members of patients at risk for sudden death. *Am J Public Health* (1997) Sep;87(9):1434-9.

LOE1 Neutral Study. Although an RCT and high LOE, it doesn't actually answer the question since it doesn't compare the effects of CPR training between high-risk and low-risk populations. The control group comes from high-risk family members also. However, there are some interesting conclusions related to potential negative effect of CPR training on psychological adjustment of family members of high-risk patients if CPR training is performed alone without any social support put into place.

Dracup K, Moser DK, Doering LV, Guzy PM, Juarbe T. A controlled trial of cardiopulmonary resuscitation training for ethnically diverse parents of infants at high risk for cardiopulmonary arrest. *Crit Care Med* (2000) Sep;28(9):3289-95.

LOE1 Supporting Study. This study doesn't actually answer the question since it doesn't compare the effects of CPR training between high-risk and low-risk populations. The control group comes from high-risk family members also. The main conclusions of this study were: over time, there was a positive effect of receiving CPR training plus social support on psychosocial adjustment to the infant's illness, there was a greater decrease in anxiety in the control group over time. 13 infants were resuscitated after discharge (all successfully). None occurred in control group, so unable to draw conclusions on effect of CPR training on willingness to perform CPR afterwards.

Groeneveld PW, Owens DK. Cost-effectiveness of training unselected laypersons in cardiopulmonary resuscitation and defibrillation. *Am J Med* (2005) Jan;118(1):58-67.

LOE5 Supporting Study. This is a computer model-driven cost-effectiveness study looking at various strategies at increasing the efficiency of CPR (and AED) training on laypeople. It determined that one of the most cost-effective strategies was to target the CPR providers to people who have a higher risk of encountering a patient requiring CPR. Overall, it demonstrated that mass CPR training programs are not very efficient, but that improving the effectiveness of bystander CPR would have a large effect on the outcome, more so than other variables that were tested (for example purchasing of home AED's).

Higgins SS, Hardy CE, Higashino SM. Should parents of children with congenital heart disease and life-threatening dysrhythmias be taught cardiopulmonary resuscitation? *Pediatrics* (1989) Dec;84(6):1102-4.

LOE3 Supporting Study. This study was a retrospective study looking at pediatric cardiology centres' rates of teaching/recommending CPR training to parents of children with cardiac disease. The numbers are very small (only complete data from 20 centres, 12 which taught CPR and 8 which did not). Comparison of the survival rate from cardiac arrests at home between 2 groups revealed significant improvement in survival rate (and rate of CPR attempt during the event) from centres where parents were taught CPR. In fact, from the centres where CPR wasn't taught, there were no attempts at CPR and none survived.

Kliegel A, Scheinecker W, Sterz F, Eisenburger P, Holzer M, Laggner AN. The attitudes of cardiac arrest survivors and their family members towards CPR courses. *Resuscitation* (2000) Oct;47(2):147-54.

LOE2 Supporting Study. This study compared attitudes of high-risk (previous cardiac arrest survivors) and low-risk (general visitors to hospital) participants in a CPR training course. The study found that, before participating in the CPR course, high-risk participants are more willing to perform CPR on someone than low-risk participants. After taking the course, the willingness to perform CPR was similar in both groups, except on a family member, where high-risk participants were more likely to help.

McLauchlan CA, Ward A, Murphy NM, Griffith MJ, Skinner DV, Camm AJ. Resuscitation training for cardiac patients and their relatives--its effect on anxiety. *Resuscitation* (1992) Aug-Sep;24(1):7-11.

LOE4 Supporting Study. This study doesn't actually answer the question since all participants are high-risk. It assessed change in level of anxiety before and 3 months after CPR training and found no significant difference overall. They used 3 ways to measure anxiety and 1 measurement showed significant improvement in anxiety over 3 months in family members. Since this is not a controlled study, we have no

way of knowing whether the lack of change (or perhaps decrease) in anxiety is simply due to the passage of time.

Moser DK, Dracup K, Doering LV. Effect of cardiopulmonary resuscitation training for parents of high-risk neonates on perceived anxiety, control, and burden. *Heart Lung* (1999) Sep-Oct;28(5):326-33.

LOE1 Supporting Study. Although an RCT and high LOE, it doesn't actually answer the question since it doesn't compare the effects of CPR training between high-risk and low-risk populations. The control group comes from high-risk family members also. The main findings were that there was an improvement in CPR Attitudes Scale scores in all subjects over time. In addition, significantly fewer family members who had not received CPR training would be willing to perform CPR on their infant if necessary. Finally, levels of anxiety about performing CPR decreased over time in subjects who had received CPR training but did not decrease in those subjects who did not.

Moser DK, Dracup K. Impact of cardiopulmonary resuscitation training on perceived control in spouses of recovering cardiac patients. *Res Nurs Health* (2000) Aug;23(4):270-8.

LOE1 Supporting Study. This is a substudy of Dracup (1997). Although an RCT and high LOE, it doesn't actually answer the question since it doesn't compare the effects of CPR training between high-risk and low-risk populations. The control group comes from high-risk family members also. The main findings are that levels of anxiety, depression and hostility are correlated with levels of perceived control, i.e. subjects have lower levels of these 3 variables if have higher levels of perceived control. It was also found that having received CPR training significantly improved levels of perceived control in subjects.

Sigsbee M, Geden EA. Effects of anxiety on family members of patients with cardiac disease learning cardiopulmonary resuscitation. *Heart Lung* (1990) Nov;19(6):662-5.

LOE2 Supporting Study. This study compared effects on anxiety and performance between high-risk (family members of cardiac patients) and low-risk (individuals attending a HeartSaver program who did not have relatives with cardiac disease) participants in the AHA HeartSaver program. It revealed that anxiety levels were significantly higher before participation in high-risk participants, and that the levels of anxiety decreased significantly in this group after participation. The low-risk participants did not demonstrate any change in level of anxiety after taking the course. However, the levels of performance on the MCQ test and CPR skill demonstration were not significantly different between high-and low-risk participants, which would make this study neutral to the question, in this respect.

Swor R, Compton S. Estimating cost-effectiveness of mass cardiopulmonary resuscitation training strategies to improve survival from cardiac arrest in private locations. *Prehosp Emerg Care* (2004) Oct-Dec;8(4):420-3.

LOE5 Supporting Study. This is a computer model-driven cost-effectiveness study which estimated the number of people who would need to be CPR trained in order to save a life. In an untargeted approach, it would take over 25 000 people to take CPR training in order to save 1 life. If a targeted approach were used (where people over the age of 50 were trained in higher proportions than in the general population) then that number drops significantly.

Swor R, Fahoome G, Compton S. Potential impact of a targeted cardiopulmonary resuscitation program for older adults on survival from private-residence cardiac arrest. *Acad Emerg Med* (2005) Jan;12(1):7-12.

LOE5 Opposing Study. This is a computer model-driven cost-effectiveness study that looked at the effect of improving CPR training so that more trained witnesses will actually perform CPR would have on survival from cardiac arrest in a private residence. It was determined that we would need to see an improvement to the level of 75% performance to see a statistically significant increase in survival. This effect would be similar to increasing the number of bystanders who are CPR trained to 70%. Although the study supports an effect on survival, it seems not feasible given the numbers.

Swor R, Khan I, Domeier R, Honeycutt L, Chu K, Compton S. CPR training and CPR performance: do CPR-trained bystanders perform CPR? *Acad Emerg Med* (2006) Jun;13(6):596-601.

LOE2 Supporting Study. This observational study interviewed bystanders of cardiac arrest events and attempted to analyze factors that predicted performance of CPR by these bystanders. Univariate analysis showed that bystanders being family members of victim made CPR performance LESS likely, but multivariate analysis looking at bystanders who were CPR trained showed that being a family member conferred neither a positive nor a negative effect on the rate of bystander CPR. Therefore, this study showed that family members having CPR training improved the rate at which they performed CPR in real life to equal the rate at which strangers do.