Critical Review Form

Therapy

Chest Compression-Only CPR by Lay Rescuers and Survival From Out-of-Hospital Cardiac Arrest, *JAMA* 2010; 304:1447-1454

Objective: **To evaluate "whether intentional, widespread public endorsement of COCPR (compression-only CPR) for adult sudden cardiac arrest would be associated with an increased likelihood that lay rescuers would perform CPR and an increased likelihood of survival to hospital discharge compared with no bystander CPR and conventional CPR." (p. 1448)**

Methods: **Prospective observational cohort in Arizona from January 2005 through December 2009 and involving 90 EMS agencies across the state serving 80% of the state's population in the final year. The Save Hearts in Arizona Registry and Education (SHARE) program was established and prospective data collection entered into an utstein-style database was exempt from HIPA because cardiac arrest survival was deemed a major public health problem in Arizona.**

Inclusion criteria included adults (>18 years old) with out-of-hospital cardiac arrest of presumed cardiac origin that was not witnessed by EMS personnel. Exclusion criteria included arrest secondary to trauma, drowning, drug overdose, or asphyxia or obvious signs of death or DNR orders or CPR performed by bystanders with medical training, or arrests occurring in medical facilities.

The SHARE program launched an aggressive educational campaign training 3000 people hands-on COCPR and exposing an additional 500,000 via a media blitz (see box below)

Data elements collected included gender, age, arrest location, presence of bystander witness, presumed etiology of arrest, EMS response interval, initial pre-hospital ECG rhythm, whether bystander CPR was performed, type of bystander CPR, type of EMS protocol, therapeutic hypothermia, survival to hospital discharge and neurologic status using the Cerebral Performance category. EMS crews received extra training in how to ascertain and code type of bystander CPR. The primary outcome was survival to hospital discharge determined by review of hospital records and Arizona Department of Health Services Office of Vital Statistics. Secondary outcome measures included frequency and type of bystander CPR. *A priori* subgroup analyses planned were patients with a witnessed collapse and patients with a shockable rhythm on EMS arrival.

Multivariable logistic regression analysis was used to assess the association of CPR type with survival adjusted for age, gender, witnessed arrest, shockable, rhythm, bystander CPR type, arrest location, EMS response interval, EMS provision of minimally interrupted cardiac resuscitation versus conventional BLS/ACLS, use of post-arrest therapeutic hypothermia, and year.

Box. Intervention: Chest Compression–Only Cardiopulmonary Resuscitation Campaign in Arizona

Web site (http://www.azshare.gov)

Brief online video training

In-person, free training in many settings and locations throughout the state (primarily sponsored by fire departments)

Free training kits sent to schools (n=1816) in Arizona with 6th through 12th grades (students were encouraged to teach family members)

Public service announcements made by the governor and local sports celebrities

Inserts mailed in utility bills

Tables set up at health and safety fairs by Boy Scouts, fire departments, schools, etc

Newspaper articles and editorials

Training video looped on public-access cable channels

Summer youth classes taught by youth corps volunteers

Local radio spots and interviews

Special features on local and national television

Frequent e-mail updates distributed to stakeholders

Guide		Comments
I.	**Are the results valid?**	
A.	**Did experimental and control groups begin the study with a similar prognosis (answer the questions posed below)?**	

1.	Were patients randomized?	This was a prospective observational cohort so patients were not randomized. "However, because the decision to perform conventional CPR, COCPR or no CPR was at the discretion of the bystanders, it would be impossible to randomize this intervention. We believe a large statewide prospective, observational design was the best methodology to evaluate this important issue. It is possible the outcome differences we found were associated with unknown confounders rather than the type of bystander CPR." (p.1453)
2.	Was randomization concealed (blinded)?	There was no randomization, hence no blinding.
3.	Were patients analyzed in the groups to which they were randomized?	No randomization so intention-to-treat analysis meaningless for this manuscript.
4.	Were patients in the treatment and control groups similar with respect to known prognostic factors?	As demonstrated in Table 1 (p. 1450), no significant differences were noted between COCPR, CPR, and no CPR groups in age or gender. Among the no CPR group less patients had witnessed arrest (41% vs. 58% for conventional CPR and 50% for COCPR) or a shockable rhythm (28% vs. 45% vs. 43%).
B.	**Did experimental and control groups retain a similar prognosis after the study started (answer the questions posed below)?**	
1.	Were patients aware of group allocation?	Patients were in cardiac arrest at the time of resuscitation so patient-blinding at the time of intervention was not necessary. Whether patients were aware of their EMS resuscitation after recovery is not stated.
2.	Were clinicians aware of group allocation?	No blinding of clinicians is stated.
3.	Were outcome assessors aware of group allocation?	No blinding of outcome assessors is stated.

4.	Was follow-up complete?	Patients excluded for missing data included 42/2942 from the no CPR group, 9/675 from the conventional CPR group and 9/858 from the COCPR group (Figure, p. 1449). Neurologic outcome data was lost on 98/315 survivors.
II.	**What are the results (answer the questions posed below)?**	
1.	How large was the treatment effect?	• The majority of arrests occurred in men (66.8%) with mean age 65.3 years and 45.1% of cases were witnessed with bystander CPR in 34.3% (15% conventional CPR, 19% COCPR) • The rate of bystander CPR increased between 2005 (28.2%) and 2009 (39.3%) with **the proportion of COCPR also increasing from 19.6% to 75.9% during the same interval**. • Overall, survival was 7.1% but **increased from 3.7% in 2005 to 9.8% in 2009** (p <0.001 for trend). • Logistic regression demonstrated that COCPR was associated with improved survival vs. no CPR (OR 1.59, 95% CI 1.18-2.13, NNT=27) or conventional CPR (OR 1.60, 95% CI 1.08-2.35, NNT=26) • Other variables independently associated with improved survival on LR were: witnessed arrest (OR 4.26), initial EMS rhythm VF/VT (OR 5.16), age <80, shorter EMS response time, cardiac arrest in a public location (OR 1.48), provision of TH (OR

		3.59) and female gender (OR 1.42). • GEE random effects logistic regression produced the same model with identical OR's indicating no clustering effect on survival. • Neurologic outcomes were available for 217/315 survivors: 4.2% had CPL score 1 or 2 (good outcome) including 3% with no CPR, 5.2% with conventional CPR and 7.6% with COLPR. • **For non-cardiac arrests, 60% had COCPR, but survival was the same regardless of CPR type**: 3% no CPR, 4.6% conventional CPR, 3.6% COCPR. • Few children received COCPR (<1 year, 9.1%; 1-12 years 6.0%; >12 years 42.9%)
2.	How precise was the estimate of the treatment effect?	See 95% CI above
III.	**How can I apply the results to patient care (answer the questions posed below)?**	
1.	Were the study patients similar to my patient?	Yes – adults with presumed cardiac arrest from heterogeneous pre-hospital settings.
2.	Were all clinically important outcomes considered?	Yes, mortality and functional neurological recovery.
3.	Are the likely treatment benefits worth the potential harm and costs?	Yes, if a biologically plausible alteration in CPR can simultaneously reduce bystander angst and increase cardiac arrest patient survival without any apparent downsides then the CPR paradigm should shift to breathless CPR by bystanders immediately.

Limitations

1) **Not randomized – but probably impossible to randomize.**
2) **Uncertain whether the improved survival that was observed can be attributed to CPR changes or the SHARE advertising blitz which could have improved other aspects of bystander CPR care, EMS responsiveness, or outcome awareness by investigators and inpatient hospital teams. For example, the Hawthorne effect may have altered EMS providers' performance in the cardiac arrest scenario since they recognized that the spotlight was on them in that situation.**

Bottom Line

An organized media campaign can significantly increase the rates of bystander CPR in conjunction with a change to more appealing COCPR for hygiene conscious citizens who do not warmly embrace mouth-to-mouth resuscitation. Increasing the rates of bystander CPR, primarily via increased COCPR, corresponds with a significant increase in cardiac arrest survival (26 patients have to receive COCPR for one to survive who would not otherwise have survived if they received conventional CPR) and neurologically good outcomes – without adversely affecting respiratory arrest victims or pediatric arrest victims. These findings support a change towards COCPR for bystander-witnessed cardiac arrest in adults.