

Critical Review Form

Meta-analysis

Chest-compression-only versus standard cardiopulmonary resuscitation:
a meta-analysis, *Lancet* 2010; 376:1552-1557

Objective: “To systematically review existing evidence regarding chest-compression only CPR and compare the findings with standard CPR in a meta-analysis.” (p. 1552)

Methods: Search of MEDLINE and EMBASE between January 1985 and August 2010 using search terms “chest compression only”, “compression alone”, “hands only”, and “bystander CPR”. Additionally, every article’s reference lists were checked. Articles in English and German were accepted.

Eligible studies compared compression only CPR (COCPR) with standard bystander CPR in adult patients with out-of-hospital cardiac arrest and reported survival data. Following [PRISMA](#) the primary analysis was of randomized trials. A secondary analysis evaluated observational trials using the [MOOSE](#) guidelines. Survival to hospital discharge was the primary outcome although data on return of spontaneous circulation (ROSC), 30 day survival, and favorable neurological outcome were also collected.

Heterogeneity was assessed using [I² and Cochrane’s Q](#). Publication was assessed with [Egger’s regression test](#). “Heterogeneity within the primary and secondary meta-analyses was negligible as indicated by an I² of 0% so we report only the results of the [fixed-effects model](#)”. (p. 1554)

Guide	Question	Comments
I	<i>Are the results valid?</i>	
1.	Did the review explicitly address a sensible question?	Yes – does the accumulated (randomized and observational) evidence support COCPR for witnessed cardiac arrest?
2.	Was the search for relevant studies details and exhaustive?	Fairly thorough , although ongoing RCT’s, scientific abstracts and pre-1985 trials were excluded. The authors also neglect to detail who conducted the search, who reviewed the titles, and how discrepancies for inclusion were resolved.

3.	Were the primary studies of high methodological quality?	“The quality of these trials was high; all trials reported outcomes in an intention-to-treat analysis, had few missing data, and had a low rate of intervention cross-over’s.” (p. 1554). However, the authors neglect to use a validated instrument or describe risk of bias as advocated by PRISMA (p. W-74). They also do not report who conducted quality assessments or whether quality assessments were reproducible.																																																																	
4.	Were the assessments of the included studies reproducible?	Uncertain since the authors do not report the assessment process.																																																																	
II. What are the results?																																																																			
1.	What are the overall results of the study?	<ul style="list-style-type: none"> 10 trials were identified: 3 RCT’s and 7 observational trials <table border="1" data-bbox="630 768 1485 1409"> <thead> <tr> <th></th> <th>Study design</th> <th>Patients receiving chest-compression-only CPR</th> <th>Patients receiving standard CPR</th> <th>Primary outcome</th> </tr> </thead> <tbody> <tr> <td colspan="5">Randomised trials*</td> </tr> <tr> <td>Hallstrom et al (2000)²⁴</td> <td>Randomised</td> <td>240</td> <td>278</td> <td>Survival to hospital discharge</td> </tr> <tr> <td>Rea et al (2010)²⁵</td> <td>Randomised</td> <td>978</td> <td>956</td> <td>Survival to hospital discharge</td> </tr> <tr> <td>Svensson et al (2010)²⁶</td> <td>Randomised</td> <td>282</td> <td>297</td> <td>30-day survival†</td> </tr> <tr> <td colspan="5">Observational cohort studies‡</td> </tr> <tr> <td>Bohm et al (2007)⁷</td> <td>Retrospective</td> <td>1145</td> <td>8209</td> <td>Admission to hospital; 30-day survival</td> </tr> <tr> <td>Iwami et al (2007)⁸</td> <td>Prospective</td> <td>544</td> <td>783</td> <td>Favourable neurological outcome 1 year after cardiac arrest</td> </tr> <tr> <td>Olasveengen et al (2008)⁶</td> <td>Retrospective</td> <td>145</td> <td>281</td> <td>Survival to hospital discharge</td> </tr> <tr> <td>Ong et al (2008)²⁰</td> <td>Prospective</td> <td>154</td> <td>287</td> <td>Survival to hospital discharge</td> </tr> <tr> <td>SOS-KANTO Study Group (2007)²²</td> <td>Prospective</td> <td>439</td> <td>712</td> <td>Favourable neurological outcome 30 days after cardiac arrest</td> </tr> <tr> <td>Van Hooyweghen et al (1993)²¹</td> <td>Retrospective</td> <td>263</td> <td>443</td> <td>Awake 14 days after CPR</td> </tr> <tr> <td>Waalewijn et al (2001)²³</td> <td>Prospective</td> <td>41</td> <td>437</td> <td>Admission to hospital; survival to hospital discharge</td> </tr> </tbody> </table> <ul style="list-style-type: none"> The meta-analysis of the three randomized trials demonstrated a significantly increased chance of survival with COCPR (RR 1.22, 95%, CI 1.01-1.46, p=0.04, NNT=41) None of the individual observational trials showed a survival advantage and different outcomes were reported so 30-day survival, 1-week survival, and awake after 14 days were used in place of survival to hospital discharge for 4 studies. Meta-analysis of observational trials did not show a survival benefit or change in ROSC. 		Study design	Patients receiving chest-compression-only CPR	Patients receiving standard CPR	Primary outcome	Randomised trials*					Hallstrom et al (2000) ²⁴	Randomised	240	278	Survival to hospital discharge	Rea et al (2010) ²⁵	Randomised	978	956	Survival to hospital discharge	Svensson et al (2010) ²⁶	Randomised	282	297	30-day survival†	Observational cohort studies‡					Bohm et al (2007) ⁷	Retrospective	1145	8209	Admission to hospital; 30-day survival	Iwami et al (2007) ⁸	Prospective	544	783	Favourable neurological outcome 1 year after cardiac arrest	Olasveengen et al (2008) ⁶	Retrospective	145	281	Survival to hospital discharge	Ong et al (2008) ²⁰	Prospective	154	287	Survival to hospital discharge	SOS-KANTO Study Group (2007) ²²	Prospective	439	712	Favourable neurological outcome 30 days after cardiac arrest	Van Hooyweghen et al (1993) ²¹	Retrospective	263	443	Awake 14 days after CPR	Waalewijn et al (2001) ²³	Prospective	41	437	Admission to hospital; survival to hospital discharge
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2.	How precise are the results?	See 95% CI above
3.	Were the results similar from study to study?	Yes. “Heterogeneity within the primary and secondary meta-analyses was negligible, as indicated by an I^2 of 0% so we report only the results of the fixed effects model”. (p. 1554) The effect size and distributions are grossly similar in Fig. 2, 3 and 4.
III.	<i>Will the results help me in caring for my patients?</i>	
1.	How can I best interpret the results to apply them to the care of my patients?	EMS dispatchers should instruct bystanders to focus on COCPR.
2.	Were all patient important outcomes considered?	No. Although the authors collected data on neurological outcomes, they did not report these outcomes. Furthermore, they did not report on potential harms or relevant exclusion criteria from the trials.
3.	Are the benefits worth the costs and potential risks?	Yes. “The incidence of cardiac arrest is 0.5 cases per 1000 people per year in the USA and Canada. Extrapolation of this number to include the USA, Canada, and the European Union (combined population of about 850 million) with an absolute increase in survival of 2% as recorded in our meta-analysis (e.g., from 10% to 12%, which is equivalent to 20% relative increase), an additional 8000 lives could be saved per year ”. (p. 1555)

Limitations

- 1) No details on [publication bias](#).
- 2) No details on [quality assessment](#).
- 3) No assessment of important subsets (cardiac vs. non-cardiac, bystander witness, post-resuscitation TH)
- 4) No assessment of potential harms.
- 5) No report on [neurological outcomes](#).

Bottom Line

The benefit of COCPR by bystanders is largest in adult patients with sudden cardiac arrest. Recent minimally interrupted CPR recommendations by the American Heart Association are appropriate and EMS dispatchers should instruct bystanders unfamiliar with CPR to perform COCPR. The

evidence suggests that doing so will simultaneously increase bystander acceptability/compliance and improve cardiac arrest victim survival.

