

Paramedic – Evidence Based Medicine (P-EBP) Program

Paramedic CAT (Critically Appraised Topic) Worksheet

Title: *The effectiveness of mechanical CPR in a prehospital setting.*

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Clinical Scenario:

A 30-year-old male collapsed outside of a sporting event and was found by a first aider to be in Cardiac Arrest. The patient was 30 minutes away from the nearest hospital. Paramedics arrived on scene and took over resuscitation attempts and applied a mechanical CPR device (LUCAS Device). Is mechanical CPR more effective than manual CPR?

PICO (Population – Intervention – Comparison – Outcome) Question:

Is CPR performed with a mechanical device more effective than manual CPR in adult (non-traumatic) patients who are in cardiac arrest in the prehospital setting and does it increase survival rates?

Search Strategy:

((cardiac arrest OR CPR OR “cardiopulmonary resuscitation” OR ventricular fibrillation OR ventricular tachycardia OR

Search Outcome:

605 Articles Found



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Relevant Papers:

AUTHOR, DATE	POPULATION: SAMPLE CHARACTERISTICS	DESIGN (LOE)	OUTCOMES	RESULTS	STRENGTHS/ WEAKNESSES
Chiang, 2022	38,829, Adult out of hospital cardiac arrests	Systematic Review	1, Survival to hospital admissions 2, Survival to hospital discharge 3, Survival to discharge with favorable neurological outcome	1, Statistically significant; OR=1,23 [1,04-1,47] with CI of 95%; p=0,02 2, Not statistically significant; OR=0,87 [0,71-1,06] with CI of 95%; p=0,17 3, Not statistically significant; OR=0,82 [0,64-1,07] with CI of 95%; p=0,14	- No Biases - Meta analysis - Proper search protocols / - Heterogeneity
Liu, 2019	28,844, Adult out of hospital cardiac arrests	Systematic Review	1, ROSC 2, Survival to hospital admissions 3, Survival to hospital discharge 4, Survival to 30 days	1, Not statistically significant; OR=1 [0,89-1,13] with CI of 95%; p=0,98 2, Not statistically significant; OR=0,86 [0,65-1,15] with CI of 95%; p=0,32 3, Not statistically significant; OR=0,92 [0,73-1,17] with CI of 95%; p=0,50 4, Same as #3	- Meta Analyses - Randomization - Various locals, wide range / - Heterogeneity - No blind method
Zhu, 2019	104,715 Adult out of hospital cardiac arrests	Meta Analysis	1, ROSC 2, Survival to hospital admission 3, Survival to hospital discharge	1, Not statistically significant; [RCT: OR = 1,12, 95% CI (0,80, 1,39), P = 0,31; CH: OR = 1,08, 95% CI (0,85, 1,36), P = 0,54]. 2, Not statistically significant; [RCT: OR = 0,95, 95% CI (0,75, 1,20), P = 0,64; CH: OR = 0,98, 95% CI (0,79, 1,20), P = 0,82]. 3, Not statistically significant; RCT: OR = 0,88, 95% CI (0,64, 1,20), P = 0,41; cohort study: OR = 0,68, 95% CI (0,34, 1,37), P = 0,28]	- Meta analysis - Large data pool / - Heterogeneity - Requirements for blind test not met

Comments:

These studies do not include the logistical benefits of utilizing mechanical CPR devices such as freeing up hands for paramedics to do other things or single/small team responder. Also, these studies do not indicate transport time.

Consider:

Due to time delay in applying a mechanical CPR device, manual CPR must be performed first and only applied if time provides, as these studies have not shown improved results.

Clinical Bottom Line:

At this time, there is no statistical evidence that mechanical CPR devices improve patient outcomes. However, there is no evidence that it is detrimental, and the use of a mechanical CPR device could have situational benefits.



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References:

1. Chiang, C.-Y.; Lim, K.-C.; Lai, P.C.; Tsai, T.-Y.; Huang, Y.T.; Tsai, M.-J. Comparison between Prehospital Mechanical Cardiopulmonary Resuscitation (CPR) Devices and Manual CPR for Out-of-Hospital Cardiac Arrest: A Systematic Review, Meta-Analysis, and Trial Sequential Analysis. *J. Clin. Med.* 2022, 11, 1448. <https://doi.org/10.3390/jcm11051448>
2. Liu, Mao MD, PhDa,b; Shuai, Zhuang MMb; Ai, Jiao MMb; Tang, Kai MMb; Liu, Hui MMA,b; Zheng, Jiankang MMA,b; Gou, Junqi MMb; Lv, Zhan MD, PhDa,b, Mechanical chest compression with LUCAS device does not improve clinical outcome in out-of-hospital cardiac arrest patients, *Medicine*: November 2019 - Volume 98 - Issue 44 - p e17550 doi: 10.1097/MD.00000000000017550
3. Zhu, N., Chen, Q., Jiang, Z. et al. A meta-analysis of the resuscitative effects of mechanical and manual chest compression in out-of-hospital cardiac arrest patients. *Crit Care* 23, 100 (2019). <https://doi.org/10.1186/s13054-019-2389-6>

