Fall 12-4-2023

Cardio-Pulmonary Resuscitation without the Pulmonary? A Benchmark Project

Fernando A. Rios
University of Texas at Tyler, frios@patriots.uttyler.edu

Cardio-Pulmonary Resuscitation without the Pulmonary? A Benchmark Project.

A Paper Submitted in Partial Fulfillment of the Requirements

For NURS 5382: Capstone

In the School of Nursing

The University of Texas at Tyler

by

Fernando Rios

December 4, 2023

Contents

Acknowledgments

Executive Summary

Implementation and Benchmark Project

1. Rationale for the Project
2. Literature Synthesis
3. Project Stakeholders
4. Implementation Plan
5. Timetable/Flowchart
6. Data Collection Methods
7. Evaluation
8. Cost/Benefit Analysis
9. Discussion of Results

Conclusions/Recommendations

References

Appendices

Acknowledgments

I would like to express my deepest appreciation to all my professors in this program. I'm extremely grateful for Dr. Greer. Dr. Greer assisted me greatly, she had tremendous patience, understanding, support and worked with me to assure that I understood this project and frequent encouragement. I would like to thank my family, friends and work for helping reach my nursing goals. Thank you for my fellow students and colleagues that have helped me and supported me.

Executive Summary

Cardiac Arrest occurs outside of the hospital setting more than you think. Per the *MyCares.net* database, 15% of OHCA happened in a public setting in 2020. Even if you are a trained healthcare professional, it may not be accessible at times in these situations due to different factors such as equipment availability, trained assistance, etc... Having an alternative option to conventional mouth-to-mouth rescue breath CPR would encourage trained and untrained bystanders to perform life-saving interventions to patients until local EMS responders can arrive. The covid pandemic affected everyone inside and outside the medical world. The general population got a real insight into how certain diseases are transmitted easily, can be prevented, and treated. The question must be asked, in out-of-hospital cardiac arrest patients (P), is chest-compression-only CPR (I) non-inferior to standard rescue breath CPR (C) in survival rate and neurological outcome (O) 3 months (T) after the cardiac event? My benchmark project focuses on improving the outcome of OHCA patients and providing bystanders with every opportunity to assist.

Cardiopulmonary resuscitation (CPR) performed before arrival of the ambulance is one of the strongest predictors of survival. This treatment is commonly performed by a layperson on scene of an OHCA situation and many people might have limited training and little experience of this kind of stressful situation. Nevertheless, their interventions can be lifesaving and which method of CPR can be forever life altering for the patient and their family members. I currently work in a high-acuity emergency department and have cared for multiple OHCA patients throughout my nursing career. In some situations, I have noticed that CPR was not started by bystanders, including family members, due to unknown reasons, significantly affecting the patient's outcome. I hope to achieve community-wide education on the efficacy of an alternative

way of CPR that bystanders can perform on OHCA patients to improve patient outcomes with my change project. Data from state-wide and local statistics will show Leadership the prevalence of OHCA and how it affects our community. Data found in the *CARES* registry shows that during the pandemic period, the public had increased delays to the initiation of CPR for OHCA and reduced survival. The American Heart Association, over the last decade, has put priority on educating the public about hands-only CPR being just as effective as conventional CPR and far superior to no interventions performed by bystanders in OHCA. Bringing to light the data that shows chest compression-only CPR is non-inferior to traditional CPR, making it an appropriate alternative for trained and untrained lay people to perform and encouraging the community to take charge of these situations and improve their outcomes from OHCA

Rationale for the Project

The American Heart Association, over the last decade, has put priority on educating the public about hands-only CPR being just as effective as conventional CPR and far superior to no interventions performed by bystanders in OHCA. Bringing to light the data that shows chest compression-only CPR is non-inferior to traditional CPR , making it an appropriate alternative for trained and untrained citizens to perform and encouraging the community to take charge in cardiac arrest situations. I have noticed that CPR was not started by bystanders, including family members, due to unknown reasons, significantly affecting the patient's outcome. I hope to achieve community-wide education on the efficacy of an alternative way of CPR that bystanders can perform on OHCA patients without performing rescue breaths and concern with disease transmission.

Literature Synthesis

Out-of-hospital cardiac arrest (OHCA) has an impact on everyone. Current education still emphasizes conventional rescue breath cardiopulmonary resuscitation (CPR) in OHCA situations. The PICOT for this Benchmark project will compare two different variations of CPR and their efficacy in impacting patient survival rates and neurological outcomes. Initial literature searches revealed three level one evidence studies (Bielski et al., 2023; Sun et al., 2023; & Zhang et al. 2019) with 12 out of 13 studies (Bielski et al., 2023; Fukuda et al., 2019; Grunau et al., 2018; Javaudin et al., 2021; Kitamura et al., 2018; Kiyohara et al., 2022; Riva et al., 2019; Rössler et al., 2020; Sun et al., 2023; Thomas & Prescott, 2018; Ueyama et al., 2018; & Yoshimoto et al., 2023) supporting chest compression-only CPR being superior or having no significant difference in outcome on survival rates and neurological outcomes after OHCA. On the contrary, Zhang et al., (2019) showed that conventional CPR is superior in the pediatric

population which has a more likelihood of respiratory disorder related cardiac arrest than other populations.

The Cerebral Performance Category score (CPC) was used in 10 out 12 studies (see Appendix A), which is a valid and reliable criterion-referenced tool used during OHCA events. Scores range from *1* to *5* for neurological outcome. A CPC score of 1 indicates good cerebral performance and a score of 5 is classified as brain death. Following OHCA or arrest in general, researchers look for a score of 1 or 2 for classification as a sign of good neurological outcome (Ajam et al., 2011).

Project Stakeholders

Stakeholders in this project include healthcare providers, ems and local BLS educators, public media, and community members. Having an effective alternative to conventional rescue breath CPR would encourage by untrained bystanders' response and has been shown in multiple studies that chest compression-only CPR is more likely to have knowledge retention than conventional CPR and would be more effective.

Implementation Plan

This Benchmark project is designed as a prospective observational study to compare chest-compression only CPR and conventional rescue breath CPR in out of hospital cardiac arrest using secondary data analysis from a hospital database located in a large metropolitan city. This project will help identify an appropriate alternative variation of cardiopulmonary resuscitation (CPR) that can be performed by bystanders over a 3-month period. The participants for this project will be patients who experienced an out of hospital cardiac arrest (OHCA). All age groups will be included. The primary outcome analyzed is 30-day survival rate and

secondary outcome will be the 30-day neurological outcome using the Cerebral Performance Category Score. The Cerebral Performance Category (CPC) score is widely used in research and quality assurance to assess neurologic outcome following cardiac arrest (Ajam et al., 2011). For this proposed study a CPC of 1-2 will be deemed as neurologically favorable as shown in other studies (Kitamura et al., 2016; Perkins et al., 2015).

First Step

Week 1-2: Request for and obtain administrative/stakeholders' approval for project.

Week 2-3: Submit IRB application.

Second Step

Week 4-7: Gather data from patients records on the number of OHCA patients and their 30-day survival rate and obtain cerebral performance score (neurological outcome).

Week 8-9: Analyze findings and prepare written report.

Third Step

Week 10-12: Provide educational material, and update established protocols for OHCA events.

Week 13-15: Disseminate results to providers and implement change in protocol.

Timetable/Flowchart

The timetable for my benchmark project is 12 weeks. It will begin with seeking approval from administration and IRB within 2 weeks. The following step will be completed over 5 weeks gathering data regarding OHCA patients and analyzing the findings. Step 3 will be over 5 weeks

to provided education and dissemination of findings. This benchmark project should be completed over 12 weeks to review one calendar years' worth of data between 2020 and 2021.

Data Collection Methods

The data will be collected between 2020 and 2021 from a local database upon administrative approval. The data on out of hospital cardiopulmonary arrest will be gathered by the emergency medical service and local fire departments from their observation and chart reviews with no patient identifiers abiding to HIPPA laws. Data includes sex, age, type of bystander-initiated CPR, return of spontaneous circulation, 30-day survival rate and 30-day neurological status after OHCA. All survivors will be followed up for 30 days after OHCA and were placed in two categories, Chest-compression only CPR and Conventional Rescue Breath CPR.

Evaluation

The primary outcome of this project is the 30-day survival rate after OHCA. Secondary outcome is assessing the patients 30-day neurological outcomes using Cerebral Performance Category ranging from category 1, good performance; category 2, moderate disability; category 3, severe cerebral disability; category 4, coma/vegetative state; and category 5, death/brain death. Here, 30-day survival with favorable neurological outcome was defined as CPC 1 or 2. Time periods will be from calendar year 2020 till the end of 2021 calendar year.

Cost/Benefit Analysis

The cost of this project will be the employee hours needed to analyze one years' worth of OHCA data for the timeline of two weeks. Two to Three Nurses will need to be contracted temporarily to ensure that all data can be reviewed for inclusion criteria appropriately.

Total hours will be capped at 270 hours over a 5-day workweek over a two-week period. The cost is estimated to be $5,800. An additional cost will be the dissemination to local first responders to include printed materials, education and updating established protocols would cost an estimated $2,500.

The investment of resources will research the most efficacious method of CPR to be performed in OHCA for the highest quality outcome that can occur after this unfortunate event having good neurological outcome after event. With a good neurological outcome after OHCA a decrease in length of hospital stay is expected with a fewer use of hospital resources and a smaller burden on the patients family.

Discussion of Results

This project was benchmark due to ethical and HIPPA reasons. I expect to validate my question that if chest compression only CPR provides similar if not superior neurological outcomes and survival rate in OHCA 30 days after sentinel event when compared to conventional CPR.

Conclusions/Recommendations

My conclusions are that Chest compression only CPR is comparable to Conventional rescue breath CPR. Next step for my benchmark project is to expand the data search to include multiple years of data and analyze findings for further validation. Having numerous years of data to compare the variations of CPR will influence healthcare organizations to provide the community and its employees an alternative to rescue breath CPR with equivalent sequel.
Implementation at this time would be unfounded and unethical with only one years of analyzed data but provides with opportunity with continued investigation and research.

References

Ajam, K., Gold, L. S., Beck, S. S., Damon, S., Phelps, R., & Rea, T. D. (2011). Reliability of the Cerebral Performance Category to classify neurological status among survivors of ventricular fibrillation arrest: a cohort study. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine, 19*, 38. https://doi.org/10.1186/1757-7241-19-38

Bielski, K., Smereka, J., Chmielewski, J., Pruc, M., Chirico, F., Gasecka, A., Litvinova, N., Jaguszewski, M. J., Nowak-Starz, G., Rafique, Z., Peacock, F. W., & Szarpak, L. (2023). Meta-analysis of chest compression-only versus conventional cardiopulmonary resuscitation by bystanders for adult with out-of-hospital cardiac arrest. *Cardiology Journal*, *30*(4), 606-613. https://doi.org/10.5603/CJ.a2021.0115. https://doi.org/10.5603/cj.a2021.0115

Fukuda, T., Ohashi-Fukuda, N., Hayashida, K., Kondo, Y., & Kukita, I. (2019). Association of bystander-initiated conventional VS compression-only CPR with neurologic outcome after out-of-hospital cardiac arrest due to drowning. *Chest*, *156*(4), 166-174. https://doi.org/10.1016/j.chest.2019.08.462

Grunau, B., Singer, J., Lee, T., Scheuermeyer, F. X., Straight, R., Schlamp, R., Wand, R., Dick, W. F., Connolly, H., Pennington, S., & Christenson, J. (2018). A local sensitivity analysis of the trial of continuous or interrupted chest compressions during cardiopulmonary resuscitation: Is a local protocol change required? *Cureus 10*(9), e3386. https://doi.org/10.7759/cureus.3386

Javaudin, F., Raiffort, J., Desce, N., Baert, V., Hubert, H., Montassier, E., Le Cornec, C., Lascarrou, J. B., Le Bastard, Q., & on behalf of the GR-RéAC (2021). Neurological

outcome of chest compression-only bystander CPR in asphyxial and non-asphyxial out-of-hospital cardiac arrest: An observational study. *Prehospital Emergency Care, 25*(6), 812-821. https://doi.org/10.1080/10903127.2020.1852354

Kitamura, T., Kiyohara, K., Nishiyama, C., Kiguchi, T., Kobayashi, D., Kawamura, T., & Iwami, T. (May 2018). Chest compression-only versus conventional cardiopulmonary resuscitation for bystander-witnessed out-of-hospital cardiac arrest of medical origin: A propensity score-matched cohort from 143,500 patients. *Resuscitation, 126,* 29-35. https://doi.org/10.1016/j.resuscitation.2018.02.017

Kitamura, T., Kiyohara, K., Sakai, T., Matsuyama, T., Hatakeyama, T., Shimamoto, T., et al. (2016). Public-access defibrillation and out-of-hospital cardiac arrest in Japan. *New England Journal of Medicine, 375*(.),1649-59.

Kiyohara, K., Kitamura, Y., Ayusawa, M., Nitta, M., Iwami, T., Nakata, K., Sobue, T., &; Kitamura, T. (2022). Dissemination of chest compression-only cardiopulmonary resuscitation by bystanders for out-of-hospital cardiac arrest in students: A nationwide investigation in Japan. Journal of Clinical Medicine, 11(4), 928. https://doi.org/10.3390/jcm11040928

Perkins, G. D., Jacobs, I. G., Nadkarni, V. M., Berg, R. A., Bhanji, F., Biarent, D., Bossaert, L. L., Brett, S. J., Chamberlain, D., de Caen, A. R., Deakin, C. D., Finn, J. C., Gräsner, J. T., Hazinski, M. F., Iwami, T., Koster, R. W., Lim, S. H., Huei-Ming Ma, M., McNally, B. F., Morley, P. T., … Utstein Collaborators (2015). Cardiac arrest and cardiopulmonary resuscitation outcome reports: update of the Utstein Resuscitation Registry Templates for Out-of-Hospital Cardiac Arrest: A statement for healthcare professionals from a task force of the International Liaison Committee on Resuscitation (American Heart

Association, European Resuscitation Council, Australian and New Zealand Council on Resuscitation, Heart and Stroke Foundation of Canada, InterAmerican Heart Foundation, Resuscitation Council of Southern Africa, Resuscitation Council of Asia); and the American Heart Association Emergency Cardiovascular Care Committee and the Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation. *Circulation, 132*(13), 1286-1300. https://doi.org/10.1161/CIR.0000000000000144

Riva, G., Ringh, M., Jonsson, M., Svensson, L., Herlitz, J., Claesson, A., Djärv, T., Nordberg, P., Forsberg, S., Rubertsson, S., Nord, A., Rosenqvist, M., & Hollenberg, J. (2019). Survival in out-of-hospital cardiac arrest after standard cardiopulmonary resuscitation or chest compressions only before arrival of Emergency Medical Services. *Circulation, 139*(23), 2600-2609. https://doi.org/10.1161/circulationaha.118.038179

Rössler, B., Goschin, J., Maleczek, M., Piringer, F., Thell, R., Mittlböck, M., & Schebesta, K. (2020). Providing the best chest compression quality: Standard CPR versus chest compressions only in a bystander resuscitation model. *PLOS ONE, 15*(2). https://doi.org/10.1371/journal.pone.0228702

Sun, M., Zhu, A., & Tang, Y. (2023). Continuous compression with asynchronous ventilation improves CPR prognosis? A meta-analysis from human and animal studies. *The American Journal of Emergency Medicine, 64*, 26-36. https://doi.org/10.1016/j.ajem.2022.11.003

Thomas, G. M., & Prescott, J. T. (2018). Comparison of continuous versus interrupted chest compressions during CPR in a rural community. *Kansas Journal of Medicine, 11*(4), 110-113. https://doi.org/10.17161/kjm.v11i4.8708

Ueyama, H., Homma, Y., Shimizu, H., Inoue, T., & Funakoshi, H. (2018). Abstract 204: Conventional vs. compression-only cardiopulmonary resuscitation for geriatric out-of-hospital cardiac arrest. *Circulation, 138*(Suppl 2). https://doi.org/10.1161/circ.138.suppl_2.204

Yoshimoto, H., Fukui, K., Nishimoto, Y., Kuboyama, K., Oishi, Y., Sekine, K., & Hiraide, A. (2023). Annual improvement trends in resuscitation outcome of patients defibrillated by laypersons after out-of-hospital cardiac arrests and compression-only resuscitation of laypersons. *Resuscitation, 183*, 109672. https://doi.org/10.1016/j.resuscitation.2022.12.010

Zhang, X. M., Zhang, W. W., Wang, C. H., Tao, W. Y., Dou, Q. L., & Yang, Y. Z. (2019). Chest-compression-only versus conventional cardiopulmonary resuscitation by bystanders for children with out-of-hospital cardiac arrest: A systematic review and meta-analysis. *Resuscitation, 134*, 81-90. https://doi.org/10.1016/j.resuscitation.2018.10.032

Appendix A

NURS 5382 Capstone Evidence Table

PICOT Question: In out-of-hospital cardiac arrest patients (P), is chest-compression-only CPR (I) non-inferior to standard rescue breath CPR (C) in survival rate and neurological outcome (O) 3 months (T) after the cardiac event?
PICOT Question Type (Circle): **Intervention** Etiology Diagnosis or Diagnostic Test Prognosis/Prediction Meaning

References

1. Bielski, K., Smereka, J., Chmielewski, J., Pruc, M., Chirico, F., Gasecka, A., Litvinova, N., Jaguszewski, M. J., Nowak-Starz, G., Rafique, Z., Peacock, F. W., & Szarpak, L. (2023). Meta-analysis of chest compression-only versus conventional cardiopulmonary resuscitation by bystanders for adult with out-of-hospital cardiac arrest. *Cardiology Journal*, *30*(4), 606-613. https://doi.org/10.5603/CJ.a2021.0115. https://doi.org/10.5603/cj.a2021.0115

2. Fukuda, T., Ohashi-Fukuda, N., Hayashida, K., Kondo, Y., & Kukita, I. (2019). Association of bystander-initiated conventional VS compression-only CPR with neurologic outcome after out-of-hospital cardiac arrest due to drowning. *Chest*, *156*(4), 166-174. https://doi.org/10.1016/j.chest.2019.08.462

3. Grunau, B., Singer, J., Lee, T., Scheuermeyer, F. X., Straight, R., Schlamp, R., Wand, R., Dick, W. F., Connolly, H., Pennington, S., & Christenson, J. (2018). A local sensitivity analysis of the trial of continuous or interrupted chest compressions during cardiopulmonary resuscitation: Is a local protocol change required? *Cureus 10*(9), e3386. https://doi.org/10.7759/cureus.3386

4. Javaudin, F., Raiffort, J., Desce, N., Baert, V., Hubert, H., Montassier, E., Le Cornec, C., Lascarrou, J. B., Le Bastard, Q., & on behalf of the GR-RéAC (2021). Neurological outcome of chest compression-only bystander CPR in asphyxial and non-

asphyxial out-of-hospital cardiac arrest: An observational study. *Prehospital Emergency Care, 25*(6), 812-821. https://doi.org/10.1080/10903127.2020.1852354

5. Kitamura, T., Kiyohara, K., Nishiyama, C., Kiguchi, T., Kobayashi, D., Kawamura, T., & Iwami, T. (May 2018). Chest compression-only versus conventional cardiopulmonary resuscitation for bystander-witnessed out-of-hospital cardiac arrest of medical origin: A propensity score-matched cohort from 143,500 patients. *Resuscitation, 126*, 29-35. https://doi.org/10.1016/j.resuscitation.2018.02.017

6. Kiyohara, K., Kitamura, Y., Ayusawa, M., Nitta, M., Iwami, T., Nakata, K., Sobue, T., & Kitamura, T. (2022). Dissemination of chest compression-only cardiopulmonary resuscitation by bystanders for out-of-hospital cardiac arrest in students: A nationwide investigation in Japan. Journal of Clinical Medicine, 11(4), 928. https://doi.org/10.3390/jcm11040928

7. Riva, G., Ringh, M., Jonsson, M., Svensson, L., Herlitz, J., Claesson, A., Djärv, T., Nordberg, P., Forsberg, S., Rubertsson, S., Nord, A., Rosenqvist, M., & Hollenberg, J. (2019). Survival in out-of-hospital cardiac arrest after standard cardiopulmonary resuscitation or chest compressions only before arrival of Emergency Medical Services. Circulation, 139(23), 2600–2609. https://doi.org/10.1161/circulationaha.118.038179

8. Rössler, B., Goschin, J., Maleczek, M., Piringer, F., Thell, R., Mittlböck, M., & Schebesta, K. (2020). Providing the best chest compression quality: Standard CPR versus chest compressions only in a bystander resuscitation model. *PLOS ONE, 15*(2). https://doi.org/10.1371/journal.pone.0228702

9. Sun, M., Zhu, A., & Tang, Y. (2023). Continuous compression with asynchronous ventilation improves CPR prognosis? A meta-analysis from human and animal studies. *The American Journal of Emergency Medicine, 64*, 26-36. https://doi.org/10.1016/j.ajem.2022.11.003

10. Thomas, G. M., & Prescott, J. T. (2018). Comparison of continuous versus interrupted chest compressions during CPR in a rural community. *Kansas Journal of Medicine, 11*(4), 110-113. https://doi.org/10.17161/kjm.v11i4.8708

11. Ueyama, H., Homma, Y., Shimizu, H., Inoue, T., & Funakoshi, H. (2018). Abstract 204: Conventional vs. compression-only cardiopulmonary resuscitation for geriatric out-of-hospital cardiac arrest. *Circulation, 138*(Suppl_2). https://doi.org/10.1161/circ.138.suppl_2.204

12. Yoshimoto, H., Fukui, K., Nishimoto, Y., Kuboyama, K., Oishi, Y., Sekine, K., & Hiraide, A. (2023). Annual improvement trends in resuscitation outcome of patients defibrillated by laypersons after out-of-hospital cardiac arrests and compression-only resuscitation of laypersons. *Resuscitation, 183*, 109672. https://doi.org/10.1016/j.resuscitation.2022.12.010

13. Zhang, X. M., Zhang, W. W., Wang, C. H., Tao, W. Y., Dou, Q. L., & Yang, Y. Z. (2019). Chest-compression-only versus conventional cardiopulmonary resuscitation by bystanders for children with out-of-hospital cardiac arrest: A systematic review and meta-analysis. *Resuscitation, 134*, 81-90. https://doi.org/10.1016/j.resuscitation.2018.10.032

Citation: (i.e., author(s), date of publication, & title)	**Conceptual Framework**	**Design/ Method**	**Sample/ Setting**	**Major Variables Studied and Their Definitions**	**Measurement of Major Variables**	**Data Analysis**	**Study Findings**	**Strength of the Evidence (i.e., level of evidence + quality [study strengths and weaknesses])**
Author, Year, Title	**Theoretical basis for study Qualitative Tradition**		**Number, Characteristics, Attrition rate & why?**	**Independent variables (e.g., IV1 = IV2 =)** **Dependent variables (e.g., DV =)** **Do not need to put IV & DV in Legend**	**What scales were used to measure the outcome variables (e.g., name of scale, author, reliability info [e.g., Cronbach alphas])**	**What stats were used to answer the clinical question (i.e., all stats do not need to be put into the table)**	**Statistical findings or qualitative findings (i.e., for every statistical test you have in the data analysis column, you should have a finding)**	• **Strengths and limitations of the study** • **Risk or harm if study intervention or findings implemented** • **Feasibility of use in your practice** • **Remember: level of evidence (See PICOT handout) + quality of evidence = strength of evidence & confidence to act** • **Use the USPSTF grading schema http://www.ahrq.gov/clinic/3rduspstf/ratings.htm**
1. Bielski et al., (2021). Meta-analysis of chest compression-only versus conventional cardiopulmonary resuscitation by bystanders for adults with out-of-hospital cardiac arrest	Compare standard CPR with rescue breaths to chest compression-only CPR and resuscitation outcomes	Meta-Analysis and Systemic review	220,945 OHCA patients in 3 randomized and 12 unrandomized control trials.	IV 1: Standard CPR (sCPR) (30:2) and IV 2: continuous chest compressions without rescue breaths (CCC). DV: resuscitation outcomes.	Resuscitation outcomes	30-day mortality and survival to hospital discharge Return of spontaneous circulation (ROSC) and survival to hospital admission	95% CI: 0.93–1.16 No significant differences in the resuscitation outcomes between the use of standard cardiopulmonary resuscitation and chest compression only.	LOE- One Strength is that randomized and non-randomized trials with a total participants being over 220,000. Weakness is the risk of bias. I recommend it is chest compression-only CPR is an appropriate alternative for out-of-hospital cardiac arrest. Quality of Evidence is Good.
2. Fukuda et al. (2019). Association of bystander-initiated conventional VS compression-only CPR	The aim of this study is to examine the effect of bystander-initiated conventional (with rescue breathing)	Chort Study	Full Cohort 5121 in Japan between 2013 and 2016	IV 1: Conventional CPR IV 2: compression only cpr	Glasgow-Pittsburgh Cerebral Performance Category score of 1 or 2.	One month neurologically favorable survival and one month	(7.5% vs. 6.6%; risk ratio [RR], 1.15; 95% confidence interval [CI], 0.82-1.60; and (10.5% vs. 8.6%; RR, 1.21; 95%CI	LOE is four, Strength of study is that over 5,000 participants were involved and in addition to one month survival rate, outcome is measured in neurological favorable. Risk of implementation is basing decision on only level 4 evidence and Currently not feasible to apply to practice at this time.

with neurologic outcome after out-of-hospital cardiac arrest due to drowning. Chest, 156(4).	versus compression-only (without rescue breathing) cardiopulmonary resuscitation (CPR) in OHCA due to drowning			DV1 : Glasgow-Pittsburgh Cerebral Performance Category score of 1 or 2. DV 2: one-month overall survival	and one-month overall survival	overall survival		USPSTF quality of evidence is fair.
3. Grunau et al., (2018). A local sensitivity analysis of the trial of continuous or interrupted chest compressions during cardiopulmonary resuscitation: Is a local protocol change required? *Cureus 10*(9): e3386	compared two CPR strategies for out-of-hospital cardiac arrest (OHCA)	N/A	Randomized controlled trial	3769 patients	IV1 - Continuous chest compressions IV 2- Interrupted chest compressions DV- favorable neurological outcome	modified Rankin scale ≤ 3 risk difference 0.42%; 95% CI - 1.58, 2.41	Our comparisons suggest that CCC may be the preferred strategy in our region and is likely not to result in worse outcomes. Based on the original study and our regional analysis, we found no compelling reasons to change our regional strategy from CCC to ICC. Resuscitation needs, and dedicated policies and procedure.	1. LOE - two 2. Strengths is a Randomized controlled trial. 3. The Weakness is the number of patients in the study. My recommendation is that this study can help clinicians get a preview of the efficacy of RCTs to continue finding results supporting CCC.
4. Javaudin et al., (2021). Neurological outcome of chest compression-only bystander	compare CO-CPR versus S-CPR in adult OHCA from medical etiologies and assess	Observational Study	8541 subjects included for all medical cause of death	IV 1: Standard CPR IV 2: chest compression-only cpr	30 day neurological outcome	Cerebral performance category 1 or 2	bystander-initiated CO-CPR had an adjusted relative risk (aRR) of 1.04; 95% CI [0.79-1.38] of having a good neurological outcome at 30 days for all medical causes	LOE is a four, Strengths are over 8,000 participants, risk of implementing is patient mortality. Not feasible to act on this study alone, need more research. USPSTF quality of evidence is Fair.

CPR in asphyxial and non-asphyxial out-of-hospital cardiac arrest: An observational study. Prehospital Emergency care, 25(6), 812–821.	neurologic outcome in asphyxial and non-asphyxial causes.			DV: 30 day neurological outcome				
5. Kitamura et al., (2018). Chest compression-only versus conventional cardiopulmonary resuscitation for bystander-witnessed out-of-hospital cardiac arrest of medical origin: A propensity score-matched cohort from 143,500 patients. Resuscitation, 126, 29-35.	Find optimal type of CPR to be performed by bystanders	Cohort Study	143,500 patients between January 2005 and December 2014.	IV 1: CCCPR IV 2: CCRB DV: one month survival with favorable neurological outcome using cerebral performance category 1 or 2.	Cerebral Performance Category 1 or 2	one month survival with favorable neurological outcome using cerebral performance category 1 or 2	the CCCPR group also showed a more favorable neurological outcome than the CCRB group (7.2% [2894/40,096] vs. 6.5% [2610/40,096], adjusted OR 1.14, 95% CI	LOE is four, strength is the number of participants, but weakness is only being a LOE four. Not feasible to implemented based on this study. USPSTF quality of evidence is Fair.

6. Kiyohara et al., (2022). Dissemination of chest compression-only cardiopulmonary resuscitation by bystanders for out-of-hospital cardiac arrest in students: A nationwide investigation in Japan. Journal of Clinical Medicine, 11(4), 928.	Determine the association between two types of bystander-CPRs (i.e., chest compression-only CPR [CCCPR] and conventional CPR with rescue breathing [CCRB]) and survival after OHCA.	Cohort study	287 students Between April 2008 and December 2017.	IV 1: CCCPR IV 2: CCRB DV :	30-day survival and a favorable neurological outcome after OHCA.	CPC 1 or 2	In the multivariable analysis, there was no significant difference in the outcome between CCCPR and CCRB (adjusted OR: 1.23; 95% CI: 0.67–2.28)	LOE is a four, weakness is limited participants and uncontrollable variables due to cohort study. Not feasible to implement in practice. USPSTF quality of evidence is Poor.
7. Riva et al. (2019). Survival in out-of-hospital cardiac arrest after standard cardiopulmonary resuscitation or chest compressions only before arrival of emergency	To describe changes in the rate and type of CPR performed before the arrival of emergency medical services (EMS) during Three consecutive guideline periods in correlation to 30-day survival	Cohort study.	30445 patients	DV- 1-month survival IV 1- Compression-only CPR IV 2- Standard CPR IV 3- NO CPR	1 month survival	CPC 1 or 2	95% CI, 1.8–2.3) there was an almost a 2-fold higher rate of CPR before EMS arrival and a concomitant 6-	1. LOE - two. 2. Strengths – this is a nationwide study. Results could be used to continue community-wide education on Chest-compression-only CPR

medical services								
8. Rössler et al., (2020). Providing the best chest compression quality: Standard CPR versus chest compressions only in a bystander resuscitation model. *PLOS ONE, 15*(2).	Cs are more correctly delivered in a flowchart-assisted standard resuscitation algorithm than in a CC-only algorithm.	Manikin Study	84 laypersons	IV 1: Standard resusucitation IV 2: VV	The relative number of correct CCs (the fraction of the total number of CCs achieving 5-6cm) and the level of exhaustion after BLS did not significantly differ between the groups.	The primary endpoint consisted of the total number of CCs that achieved the correct depth of 5-6cm,	The total number of correct CCs did not significantly differ between the CC-only group and the standard group (63 [±81] vs. 79 [±86]; p = 0.394; 95% CI of difference: 21–53).	LOE is Four, Weans is limited participants, in a controlled manikin environment. Not feasible to implement. USPSTF quality of evidence is Fair.
9. Sun et al., (2023). Continuous compression with asynchronous ventilation improves CPR prognosis? A meta-analysis from human and animal studies. The American Journal of *Emergency Medicine, 64*, 26–36.	compare the outcomes between continuous chest compressions CPR with asynchronous ventilation (CCC-CPR) and interrupted chest compressions CPR with synchronous ventilation (ICC-CPR) in cardiac arrest	Meta-Analysis	Eight human studies and Twelve Animal Trials with 28,454 humans and 259 animals	IV 1: CCC-CPR IV 2: ICC-CPR DV: Survival to discharge	survival to hospital discharge, 1-month survival ,and good neurological outcome	Jadad Scale and Newcastle-Ottawa Scale	There were no significant differences in ROSC (odd ratios [OR] 1.07; 95% confidence interval [CI]: 0.86–1.32; P = 0.55), survival to hospital discharge (OR 1.04; 95%CI 0.77–1.42; P = 0.79), 1-month survival (OR 1.07; 95%CI 0.84–1.36; P = 0.57), and good neurological outcome (OR 0.92; 95%CI 0.84–1.01, P = 0.09) between CCC-CPR and ICC-CPR in human studies. In animal trials, CCC-CPR had significantly higher rate of ROSC (OR = 1.81; 95% CI: 0.94–3.49; P = 0.07), survival at 4 h (OR 2.57; 95% CI: 1.16–5.72; P = 0.02) and MAP (mean	LOE is One, Strengths is the number of human participants and being a meta-analysis. Could be feasible to implemented based on LOE one. USPSTF quality of evidence is good.

							difference [MD] 0.79, 95% CI: 0.04–1.53; P = 0.04), even though no significant differences in ROSC time, arterial potential of hydrogen (pH) and partial tension of carbon dioxide (PaCO2).	
10. Thomas et al. (2018). Comparison of continuous versus interrupted chest compressions during CPR in a rural community	Traditional CPR (30:2 compressions to ventilations) was compared with continuous chest compressions, CCC (also termed Cardiocerebral Resuscitation, CCR) in a rural community	Cohort Analysis	There were 580HCA patients in the six-year study period (June 2008 - May 2014).	IV 1: Traditional CPR IV 2: Continuous chest compressions DV 1: Survival at one month DV 2: Survival at six months	Primary outcomes were survival at one and six months	CPC 1 or 2	CCC had a more favorable outcome for patients in a rural environment with OHCA than traditional CPR related to Survival after discharge	LOE- Two The weakness is the number of patients in the study. Not feasible and needs to continue with more cohort studies to support the use of chest compression-only CPR. USPSTF quality of evidence is poor.
11. Yoshimoto et al., (2023). Annual improvement trends in resuscitation outcome of	This study aims to investigate the effect of compression-only cardiopulmonary	Cohort Study	11,402 patients between 2005 and 2019.	IV 1: Compression - only CPR IV 2: Conventional CPR	Survival with a good neurological outcome	Neurological outcome 1 month	By inverse probability weighting, compression-only CPR was superior to conventional CPR for the favorable outcomes (P < 0.001).	LOE is four, strengths is 11,402 participants over one decade. Feasible to implement in further research using this study. USPSTF quality of evidence is Good.

patients defibrillated by laypersons after out-of-hospital cardiac arrests and compression-only resuscitation of laypersons. Resuscitation, 183.	resuscitation (CPR) with conventional CPR in patients who were defibrillated by laypersons.			DV:				
12. Zhang et al. (2019). Chest-compression-only versus conventional cardiopulmonary resuscitation by bystanders for children with out-of-hospital cardiac arrest: A systematic review and meta-analysis	To summarize the current evidence and compare the outcomes after CC-CPR with those after conventional CPR by bystanders in children with out-of-hospital cardiac arrest.	Systemic Review/ Meta-Analysis	14,427 pediatric participants	IV 1- CCCPR IV 2- Conventional CPR DV 1- 30-day survival after hospital discharge	30-day survival Survival after discharge	CPC 1 or 2	conventional CPR for out-of-hospital cardiac arrest may have better outcomes than those who receive CC-CPR.	LOE- One Strengths are systemic review. The weakness is that only five studies met the criteria for assessment. Unfeasible due to the limited quantity of studies. The conclusion is that more research is needed for pediatric OHCA. The recommendation is to request more studies to confirm the results USPTF quality of evidence is good.

Legend:

LOE- Level of evidence, standard CPR (S-CPR) with mouth-to-mouth ventilations, chest compression-only CPR (CO-CPR), Compression-only CPR [CCCPR], conventional CPR with rescue breathing [CCRB]), OHCA- out of hospital cardiac arrest, CPC-cerebral performance category, CC- chest compression only, continuous chest compressions CPR with asynchronous ventilation (CCC-CPR), interrupted chest compressions CPR with synchronous ventilation (ICC-CPR).

Appendix B

Project Flowchart

Appendix C

Instrument (Include permissions at the bottom of your instrument or copyright information)