LAYPERSON EDUCATION IN BASIC LIFE SUPPORT: IMPACT OF SHORT COURSES ON EARLY DETECTION OF CARDIOPULMONARY ARREST AND EMERGENCY RESPONSE

Alexander da Silva Borges[1]

Marco Antonio Plautz Chocron[2]

Abstract: Out-of-hospital cardiopulmonary arrest (OCA) is a high-mortality event, and survival critically depends on the immediate intervention of bystanders. The participation of the lay population in basic life support (BLS) actions is therefore essential to increase survival rates. This study will investigate the educational impact of short BLS courses, taught by nurses, academic institutions, and fire departments, on the training of laypeople. The research will adopt a mixed-methods design, integrating a quantitative assessment of knowledge and skills (pre- and post-training) with a qualitative analysis of the psychosocial factors that modulate the willingness to intervene. Variables such as early recognition of CPA, appropriate activation of emergency services, quality of chest compressions (depth, frequency, chest recoil), and correct use of an automated external defibrillator (AED) will be examined. The study will also consider factors such as self-confidence, anxiety, perceived barriers, and motivation. Expected outcomes include validating short courses as an effective tool

1 Specialist nurse in intensive care, seeking opportunities and challenges in the area of pre-hospital nursing, contributing to the development of the profession and promoting quality and safety in urgent and emergency care through the dissemination of knowledge in this area.

2 Master's degree in Health and Technology in the Hospital Environment from the Federal University of the State of Rio de Janeiro - UNIRIO (2015). Specialist in Urgency and Emergency Care, Specialist in Occupational Nursing. Bachelor's degree in Nursing from Estácio de Sá University (2010). Sub-Lieutenant Firefighter - RIO DE JANEIRO MILITARY FIRE DEPARTMENT (2002). Specialist in First Aid (2011); Specialist in Technical Approach to Suicide Attempts (2023), Specialist in Canine Training, all from CBMERJ. Works on the cardiopulmonary resuscitation project through Realistic Simulation, developed by UNIRIO (2017). Member of the Teaching, Research and Extension Group in Health in Emergencies and Disasters - GEPESED / UFRJ (2019). She has experience in the areas of Nursing, pre-hospital care, education of laypeople and healthcare professionals in emergencies, and studies for fire evacuation in hospitals.

for increasing public confidence and competence, expanding community response to emergencies, and strengthening health education policies aimed at reducing cardiac arrest mortality, aligned with international resuscitation guidelines.

Keywords: Basic Life Support, Cardiopulmonary Arrest, Health Education, Laypersons, Cardiopulmonary Resuscitation, Community Intervention.

Introduction

Out-of-hospital cardiac arrest (OHCA) is one of the most significant public health challenges worldwide, accounting for a substantial portion of cardiovascular mortality. Epidemiological data from the United States and other industrialized nations indicate hundreds of thousands of occurrences annually, with survival rates that, despite advances in emergency medicine, remain alarmingly low, frequently below 12% (Rao & Kern, 2018).

The vast majority of these deaths occur suddenly, outside of a hospital setting, where survival is a race against time.

The American Heart Association (AHA) and the International Liaison Committee on Resuscitation (ILCOR) have consolidated the approach to this emergency in the concept of the "Chain of Survival." This chain illustrates a sequence of interdependent and time-sensitive actions that, if initiated promptly, maximize the chance of a favorable neurological outcome. The initial links—immediate recognition of cardiac arrest and activation of emergency services, followed by high-quality cardiopulmonary resuscitation (CPR) and rapid defibrillation—are primarily the responsibility of bystanders present at the scene (American Heart Association, 2025). In fact, the literature is unequivocal: CPR initiated by a bystander can double or even triple the victim's chances of survival (Rao & Kern, 2018).

However, the gap between the ideal and reality is vast. Intervention rates by the general public are insufficient, a multifactorial phenomenon attributed to lack of knowledge, fear of causing

harm, psychological barriers such as anxiety and lack of confidence, and social concerns such as fear of litigation or reluctance to intervene with strangers (Uny et al., 2022). To overcome these barriers, community interventions, particularly Basic Life Support (BLS) education, emerge as the most promising strategy. A recent meta-analysis demonstrated that such interventions are associated with a significant increase in bystander CPR rates (Odds Ratio of 2.26) and overall survival (OR of 1.59) (Simmons et al., 2023).

In this context, short courses focused on practical and simplified training are proposed as a scalable and cost-effective approach to disseminate these vital skills (Al Jadidi & Al Jufaili, 2023). This article proposes an in-depth study to investigate the impact of these courses on the ability of laypeople to execute the initial links in the survival chain, analyzing not only the acquisition and retention of skills, but also the psychosocial factors that determine the crucial transition from knowledge to action.

Literature Review

Epidemiology and Outcomes of Out-of-Hospital Cardiac Arrest

Out-of-hospital cardiac arrest is a common and devastating event. Large-scale epidemiological studies, such as those by Chugh et al. (2008) and Zheng et al. (2001), estimated the annual incidence of sudden cardiac death in the US to be between 180,000 and 450,000 cases (Chugh et al., 2008; Zheng et al., 2001). In the UK, the numbers are equally significant, with approximately 60,000 occurrences annually (Hawkes et al., 2017). Survival rates vary drastically between different regions, ranging from less than 2% to more than 25%, a variation largely explained by differences in the organization of emergency systems and, fundamentally, in community engagement (Hawkes et al., 2017).

More recent studies confirm this variability, with 30-day survival rates ranging from 10.6% to 22.1% in a 10-year analysis in Austria (Schwaiger et al., 2025).

Basic Life Support Education Strategies and Skills Retention

The teaching methodology in Basic Life Support (BLS) has evolved significantly. Hands-on training is universally recognized as superior to purely theoretical instruction. The introduction of simulation, especially with high-fidelity mannequins that provide real-time feedback on the quality of compressions (depth, frequency, and chest recoil), has been shown to improve skill acquisition (Herrero-Izquierdo et al., 2025; Faghihi et al., 2024). Sahu and Lata (2010) highlight that simulation allows practice in a safe environment, replicating crisis scenarios and improving team performance (Sahu & Lata, 2010).

The delivery format has also diversified, with the emergence of blended learning models, which combine online modules with in-person practical sessions. This approach proves to be no less effective than traditional training and offers greater flexibility and scalability (Lim et al., 2022). However, a persistent challenge is the rapid deterioration of CPR skills after training. Studies such as that of Aqel et al. (2014) show a significant loss of knowledge and skills within the first 3 to 6 months, underscoring the critical need for periodic retraining programs to maintain competence (Aqel & Ahmad, 2014). Short and frequent refresher courses have proven effective in combating this decline (Al Jadidi & Al Jufaili, 2023).

Psychosocial Factors and Barriers to Intervention

A layperson's decision to intervene in an emergency is a complex psychological process. Self-confidence is one of the strongest predictors of willingness to perform CPR (Jaskiewicz et al., 2022). Fear of causing further harm, uncertainty in the diagnosis of cardiac arrest, and situational anxiety are prominent psychological barriers. Additionally, social factors, such as fear of litigation, perceived risk to personal safety (especially in certain urban contexts), and reluctance to have physical contact with a stranger, also inhibit action (Uny et al., 2022).

Studies in socioeconomically disadvantaged communities reveal that, although the willingness to learn CPR is not lower, the confidence to act is often lower, and barriers such as lack of community cohesion and fear of violence are more acute (Uny et al., 2022). The "Intention-Focused" paradigm, proposed by Panchal et al. and explored by Jaskiewicz et al. (2022), emphasizes that training programs should go beyond technique, explicitly addressing these psychological barriers to increase the likelihood of intervention (Jaskiewicz et al., 2022).

Public Policies and Community Implementation

Recognizing the importance of mass training, many governments have implemented public health policies to promote BLS education. The most widespread strategy is legislation that makes CPR training mandatory for high school graduation. In the US, more than 40 states have already adopted such laws (CPR in Schools Legislation Map, 2025). This approach has the potential to train millions of young people each year, creating a generation of potential first responders. Studies on the implementation of these laws, such as that of Vetter et al. (2022), highlight the importance of providing adequate resources to schools, especially in low-income communities, to ensure the effectiveness of the training (Vetter et al., 2022).

Targeted community programs, such as those described by Ebunlomo et al. (2021), which offer free, bilingual training in high-risk neighborhoods, have also proven viable and effective (Ebunlomo et al., 2021).

Methodology

To robustly and holistically investigate the impact of BLS courses, a mixed-methods research design with a longitudinal component will be adopted.

Study Design and Population

The study will follow a quasi-experimental pre-post-test design with an intervention group. The sample will consist of lay adult participants (>18 years old), without formal BLS training in the last five years, recruited from diverse community settings (businesses, neighborhood associations, community centers) to ensure socioeconomic and demographic representativeness.[1].

Educational Intervention

The intervention will consist of a 4-hour BLS (Basic Life Support) course, structured based on the 2025 AHA/ILCOR (American Heart Association, 2025) guidelines. The course will be taught by certified instructors and divided into:

- Theoretical Module (1 hour): Covering the pathophysiology of cardiac arrest, the chain of survival, and the steps of basic life support (BLS).
- Practical Module (3 hours): Intensive training in small groups using high-fidelity CPR mannequins with real-time audiovisual feedback. Simulated scenarios will include recognizing cardiac arrest, activating emergency services, performing high-quality chest compressions, and applying a training AED.

Data Collection and Analysis

Assessments will take place at three points in time: T0 (baseline, before the course), T1 (immediately after the course), and T2 (six months after the course).

1 This project was submitted to the Research Ethics Committee of the Faculty of Human and Social Sciences at the University of Brasília.

Table 1. Instruments for statistical data collection and analysis.

Domain Evaluated	Instrument / Metric	Collection Moments	Statistical Analysis
Theoretical Knowledge	Validated questionnaire (20 multiple-choice questions)	T0, T1, T2	Repeated measures ANOVA
Practical Skills	Simulated scenario with high-fidelity mannequin.	T0, T1, T2	Paired t-tests / Wilcoxon
Quality Metrics	Average depth, frequency, compression fraction, time to impact	T1, T2	Analysis of variance
Self-confidence	5-point Likert scale (self-assessment of confidence)	T0, T1, T2	Repeated measures ANOVA
Psychosocial Factors	Semi-structured interviews and focus groups	T2	Thematic content analysis

Qualitative Analysis:Interviews and focus groups in T2 will explore in depth participants' perceptions of barriers and facilitators to action, the usefulness of the training, and their residual confidence, seeking to understand the "why" behind the quantitative data.

Expected Results

Based on the reviewed literature, it is anticipated that the study will confirm and quantify several hypotheses:

Significant Improvement in Knowledge and Skills

A sharp and statistically significant increase ($p < 0.05$) is expected in knowledge scores and practical skills performance from T0 to T1. The quality of compressions, measured objectively, should reach the standards recommended by the guidelines in the immediate post-course assessment.

Increased Self-Confidence and Willingness to Act

A substantial increase in reported self-confidence levels is projected for each step of BLS between T0 and T1. Qualitative analysis should corroborate this finding, with participants expressing greater readiness to intervene after practical training demystified the procedure and reduced performance anxiety.

Partial Decline, but Functional Retention of Skills

At the six-month assessment (T2), a statistically significant decline in skills is expected compared to T1, consistent with the literature on retention (Aqel & Ahmad, 2014). However, scores at T2 are expected to remain significantly higher than at baseline (T0), indicating that participants retain a level of functional competence that would still be beneficial in a real emergency.

Identification of Residual Barriers

Qualitative analysis will likely reveal that, even after training, some psychological (e.g., fear of a negative outcome, panic) and social (e.g., concern about the scene, presence of multiple spectators) barriers persist as concerns, informing areas for focus in future training programs.

Discussion

The expected results of this study have the potential to generate important implications for public health practice and policy. By validating the effectiveness of a short-duration, high-intensity training model, the study will provide an evidence-based argument for its widespread adoption by companies, schools, and community organizations. The demonstration that such an intervention not

only teaches technique but also boosts self-confidence reinforces the need to focus on practical and simulation components in course design.

Data on skill decline over six months will contribute to the formulation of evidence-based recommendations on the ideal frequency for refresher courses. Instead of a single model, reinforcement "dosing" strategies, such as short videos or brief practical sessions, could be considered to maintain community readiness.

Furthermore, in-depth exploration of residual psychosocial barriers can lead to innovations in the training curriculum. For example, including discussions on stress management in emergencies or simulating socially complex scenarios (e.g., a victim in a crowded public place) can better prepare laypersons for real-world challenges.

Conclusion

Training laypersons in Basic Life Support is a cornerstone of the strategy to combat the high mortality rate of out-of-hospital cardiac arrest. This study aims to provide a rigorous and multifaceted evaluation of the effectiveness of short-duration courses, a promising intervention model due to its scalability and feasibility.

By measuring not only "what" laypeople learn, but "if" and "why" they feel prepared to act, the research seeks to generate actionable insights to optimize training programs, inform public policy, and ultimately strengthen the chain of survival. The ultimate goal is to transform passive bystanders into active first responders, increasing the chances that every citizen can one day save a life.

References

Al Jadidi, H., & Al Jufaili, M. (2023). Effectiveness of a Short Refresher Course on the Retention of Cardiopulmonary Resuscitation-Related Psychomotor Skills (REF-CPR). Oman Medical Journal, 38(3), e509.

American Heart Association. (2025). 2025 International Consensus on Cardiopulmonary Resuscitation and ECC Science with Treatment Recommendations. Circulation.

Aqel, A. A., & Ahmad, M. M. (2014). High□fidelity simulation effects on CPR knowledge, skills, acquisition, and retention in nursing students. Worldviews on Evidence□Based Nursing, 11(6), 394-400.

Chugh, S. S., Reinier, K., Teodorescu, C., Evanado, A., Kehr, E., Al Samara, M., … & Jui, J. (2008). Epidemiology of sudden cardiac death: clinical and research implications. Progress in cardiovascular diseases, 51(3), 213-228.

CPR in Schools Legislation Map. American Heart Association. Accessed December 4, 2025.

Dong, X., Zhang, L., Wang, Z., & Zheng, Z. (2024). Implementation of basic life support education for the lay public in China: barriers, enablers, and possible solutions. Frontiers in Public Health, 12, 1390819.

Ebunlomo, E. O., et al. (2021). Save a life: implementation and evaluation of a community-focused CPR education program in Houston, Texas. Health Education & Behavior, 48(4), 449-455.

Faghihi, A., et al. (2024). A comparison between the effects of simulation of basic CPR and workshop training on the knowledge and skills of nurses. BMC medical education, 24(1), 1-8.

Hawkes, C., Booth, S., Ji, C., Brace-McDonnell, S. J., Whittington, A., Mapstone, J., … & Perkins, G. D. (2017). Epidemiology and outcomes from out-of-hospital cardiac arrests in England. Resuscitation, 110, 133-140.

Herrero-Izquierdo, L., et al. (2025). Effectiveness of high-fidelity clinical simulation in CPR training. Nurse Education in Practice.

Hoops, K., et al. (2025). Demand for cardiopulmonary resuscitation and bleeding control training. Frontiers in Public Health.

Jaskiewicz, F., Kowalewski, D., Kaniecka, E., Kozlowski, R., Marczak, M., & Timler, D. (2022).

Factors Influencing Self-Confidence and Willingness to Perform Cardiopulmonary Resuscitation among Working Adults—A Quasi-Experimental Study in a Training Environment. International Journal of Environmental Research and Public Health, 19(14), 8334.

Lim, X. M. A., et al. (2022). The Effectiveness of Technology-Based Cardiopulmonary Resuscitation Training on Laypeople's Skills and Knowledge: Systematic Review. Journal of Medical Internet Research, 24(12), e36423.

Rao, P., & Kern, K. B. (2018). Improving Community Survival Rates from Out-of-Hospital Cardiac Arrest. Current Cardiology Reviews, 14(2), 79–84.

Rodgers, D. L., et al. (2009). The effect of high-fidelity simulation on educational outcomes in an advanced cardiovascular life support course. Simulation in Healthcare, 4(4), 200-206.

Sahu, S., & Lata, I. (2010). Simulation in resuscitation teaching and training, an evidence based practice review. Journal of emergencies, trauma, and shock, 3(4), 378.

Schwaiger, D. et al. (2025). A 10-year analysis of survival and neurological outcomes. Resuscitation.

Simmons, K. M., McIsaac, S. M., & Ohle, R. (2023). Impact of community-based interventions on out-of-hospital cardiac arrest outcomes: a systematic review and meta-analysis. Scientific reports, 13(1), 10231.

Uny, I., Angus, K., Duncan, E., & Dobbie, F. (2022). Barriers and facilitators to delivering bystander cardiopulmonary resuscitation in deprived communities: a systematic review. Perspectives in Public Health, 143(1), 43–53.

Vetter, V. L., et al. (2022). Impact of State Laws on Cardiopulmonary Resuscitation Training in US High Schools. Journal of the American College of Cardiology, 79(19), 1947-1957.

Yu, Y., et al. (2020). Assessment of Community Interventions for Bystander Cardiopulmonary Resuscitation in Out-of-Hospital Cardiac Arrest: A Systematic Review and Meta-analysis. JAMA Network Open, 3(7), e2010921.

Zheng, Z. J., Croft, J. B., Giles, W. H., & Mensah, G. A. (2001). Sudden cardiac death in the United

States, 1989 to 1998. Circulation, 104(18), 2158-2163.

Zipes, D. P., & Wellens, H. J. (1998). Sudden cardiac death. Circulation, 98(21), 2334-2351.