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Mechanical Chest Compression Devices - A Narrative Review

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Abstract

Introduction & Aim: Sudden cardiac arrest remains a leading cause of mortality, with global survival rates remaining low. High-quality CPR characterized by adequate depth and minimal interruptions, is the cornerstone of survival. Manual CPR quality often declines due to rescuer fatigue and challenging environments. Mechanical chest compression devices (MCCDs) offer a potential solution to ensure consistent quality. This study aims to provide an overview of MCCDs available in the Polish Emergency Medical System, highlighting their advantages, limitations and applications, while evaluating their clinical effectiveness compared to manual CPR.

Material and methods: The study consisted of a descriptive and comparative literature review, focusing on the technical data and clinical evidence (up to 2025) for the AutoPulse, LUCAS, and Corpuls CPR systems used in Poland. Data analysis included RCTS, cohort studies, systematic reviews, and meta-analyses evaluating MCCDs, utilizing PubMed, Scopus, and Google Scholar.

Results: MCCDs ensure high-quality, uninterrupted compressions, particularly in challenging transport or specific scenarios, freeing up personnel for other tasks. Large-scale randomized controlled trials (RCTs) and recent meta-analyses demonstrate that MCCDs provide comparable survival outcomes to high-quality manual CPR, with survival rates ranging from 6.0% to 9.4%. However, MCCDs show a significant advantage in specialized scenarios - prolonged transport, catheterization labs, or as a bridge to advanced therapies like eCPR and extracorporeal life support.

Conclusions: MCCDs are reliable alternatives for specific clinical situations. Although they involve higher costs and different injury patterns, the benefits of maintaining consistent CPR quality in conditions where manual compressions fail are measurable. Current guidelines recommend their use as a viable alternative in specific, difficult circumstances, rather than as a routine replacement for manual CPR.

Keywords: mechanical chest compression devices, CPR quality, Emergency Medical Services, resuscitation guidelines

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1. Introduction

Cardiovascular diseases are responsible for nearly 40% of mortality in Europe among people younger than 75 years. Sudden cardiac arrest (SCA) continues to represent a major clinical and public health challenge, as long-term survival following resuscitation remains markedly low, estimated at only 7.6–10%. [1,2,3]

Although all components of cardiopulmonary resuscitation are important, the early initiation of chest compressions plays a pivotal role in preserving critical perfusion of the myocardium and central nervous system. The ERC 2025 guidelines place strong emphasis on the delivery of high-quality chest compressions, defined by adequate compression depth (at least 5 cm and no more than 6 cm), an appropriate compression rate (100–120 per minute), complete chest recoil, and the avoidance of unnecessary interruptions. [2]

Manual cardiopulmonary resuscitation (CPR) is often performed inadequately due to rescuer fatigue, which begins as early as 2 minutes into the procedure, often without the rescuer realizing the decline in quality. [4] Factors such as insufficient muscle strength or fear of causing injury also play a role. [2,3] These issues are exacerbated in challenging environments, such as during patient transport in a moving ambulance or in resource-limited settings (e.g., in a basic Emergency Medical Team with only two rescuers).

Mechanical chest compression devices (MCCDs) were introduced to overcome these limitations. They are non-invasive circulatory-assist devices that provide uninterrupted, effective chest compressions without fatigue-related variability. However, the current ERC 2025 guidelines do not recommend the routine use of MCCDs as a substitute for high-quality manual cardiopulmonary resuscitation. Nevertheless, they acknowledge that MCCDs can be an appropriate alternative when sustained high-quality manual compressions are impractical or provider safety is at risk, such as during prolonged transport or in difficult terrain and resource-limited environments. [2]

The Polish market includes several advanced mechanical chest compression devices, such as the AutoPulse (ZOLL Medical Corporation), the LUCAS system (Physio-Control/Jolife AB), and the more recently introduced Corpuls CPR (Corpuls).

This review seeks to synthesize the current body of evidence on the effectiveness, safety, and clinical indications of mechanical chest compression devices in contemporary cardiopulmonary resuscitation.

2. Research materials and methods:

The literature review focused on randomized controlled trials, observational cohort studies, systematic reviews, and meta-analyses evaluating mechanical chest compression devices in adult cardiac arrest. Case reports and experimental studies (animal or phantom models) were included only when addressing specific technical or safety aspects. Information was gathered from the current technical specifications provided by manufacturers of devices used on the Polish market. Pediatric studies and non-English publications were excluded.

This study utilizes a descriptive and comparative literature review methodology. The analysis focuses on the characteristics, functionality, and implementation of mechanical chest compression devices currently available in the Polish emergency medical system as of 2025. The primary devices selected for detailed analysis were the AutoPulse, LUCAS, and Corpuls CPR.

2.1. Data Analysis

The following aspects were analyzed to provide a comprehensive overview of the subject:

- Mechanism of action (piston vs. load-distributing band).
- Current technical specifications,
- Compliance with contemporary guidelines (rate and depth of compressions).
- Usability in specific conditions, such as patient transport and highly specialized procedures
- Associated risks and quality factors influencing cardiopulmonary resuscitation (CPR).
- Clinical efficacy based on major RCTs (LINC, PARAMEDIC, CIRC).

3. Device Overview

All selected devices aim to provide continuous, effective chest compressions, but they differ in mechanism and technical specifications. In Poland, MCCDs represent two main philosophies: piston-driven compression and load-distributing bands (LDB). The AutoPulse employs a load-distributing band, primarily relying on mechanisms described by the chest pump concept to potentially increase intrathoracic pressure uniformly. The LUCAS and Corpuls CPR systems use a piston mechanism based on the heart pump theory, sometimes incorporating active decompression features. [5,6]. Key technical parameters of devices currently available in Poland (specifications as of early 2025) are presented in the table below. [7,8,9]

Table 1. Key Technical Parameters

Feature	**LUCAS 3.1 (Stryker)**	**AutoPulse (ZOLL)**	**Corpuls CPR (GS)**
Compression Mechanism	Piston with suction cup	Load-distributing band	Piston (modular arm)
Compression Depth	Fixed: 53 ± 2 mm	Adaptive	Adjustable: 20–60 mm
Compression Rate	102 ± 2 /min	~80 /min (automatic, patient-adaptive)	Adjustable: 80–120 /min
Radiolucency	High (polymer backplate)	Low (motor/control board)	Very high (carbon arm)

Battery Life	~45 min (per battery)	~30 min (per battery)	~90 min (per battery)
Weight	~8.0 kg	~10.6 kg	~5.5 kg (arm only)

3.1 Factors Affecting Quality During CPR

Person Performing Chest Compressions

The level of training should influence both the quality of chest compressions and the incidence of complications. However, study results in this area are highly variable, and most indicate no significant differences in CPR performance despite differences in the level of qualification. [10]

Compression Site

Chest compressions generate an intrathoracic pressure gradient and direct cardiac compression, thereby increasing cardiac output and coronary blood flow. Incorrect hand or device placement—either too high or too low—reduces CPR quality and is associated with an increased number of patient injuries. Compression applied to the upper portion of the sternum increases the risk of rib and clavicle fractures, which may subsequently result in damage to major vessels near the heart. More caudal compression increases the risk of intra-abdominal injuries. Lateral hand placement may lead to rib fractures and direct lung injuries. These errors account for approximately 20% of all rib injuries during manual CPR and are described by researchers as potentially avoidable rib fractures. [11]

It has been demonstrated that a position in which a right-handed rescuer kneels on the patient’s right side and uses their dominant hand to maintain contact with the sternum is more beneficial, associated with improved effectiveness, and reduces the risk of injury. This is due to the fact that the hypothenar eminence transmits force more effectively, and such body positioning facilitates proper hand placement on the lower part of the sternum. [12] However, it is not always possible to adopt a comfortable position for resuscitation.

Compression Depth

There is a close relationship between increasing compression force (and depth) and increased blood flow, within certain limits. As manual chest compressions generate, at best, only 20–30% of normal cardiac output, adequate compression depth is crucial. [13] However, it is known that most compressions are too shallow, primarily due to rapid rescuer fatigue. [13, 14, 15] Not only force but also the firmness of the surface on which the patient lies is important [16]. Delivering compressions of consistent depth constitutes the basic principle of mechanical compression devices. However, manikin studies have raised doubts as to whether this consistency is truly achieved. [17]

Shallow compressions significantly reduce the effectiveness of resuscitation but decrease the risk of injury, whereas increasing compression force results in the opposite effect. To date, an ideal balance between effectiveness and injury risk during chest compressions has not been established.

Leaning

Leaning on the patient during CPR negatively affects its quality. If a rescuer delivers compressions to a depth consistent with guidelines but leans on the patient between compressions, this may result in deeper compressions than recommended. Similarly, during the installation of mechanical devices, piston compression may significantly exceed acceptable limits, which is associated with an increased number of injuries. [13]

Interruptions in CPR

Chest compressions lead to detectable carotid artery flow within approximately 10 seconds; however, achieving adequate coronary perfusion pressure requires about 90 seconds. This difference results from the distinct effects of chest compressions. Cerebral blood flow is maintained during both compression and decompression phases. The heart, however, is perfused exclusively during diastole, as pressure in the ascending aorta is lower than or equal to right atrial pressure during systole.

Evidence indicates that for more than half of the total duration of CPR, chest compressions are not being delivered. These pauses lead to decreased pressure and blood flow, causing blood pooling in the right heart. Each interruption reduces the likelihood of return of spontaneous circulation (ROSC). [13]

Duration of CPR

During the first few minutes, the compression force decreases significantly imperceptibly to the rescuer. This loss of strength has a major impact on the effectiveness of chest compressions. To prevent a significant decline in compression quality, rescuer rotation within the team every 2 minutes is recommended. [18]

It is difficult to predict how resuscitation duration affects injury risk. Does a smaller number of adequately deep compressions result in fewer injuries, or does fatigue-related improper compression lead to a higher injury rate? Furthermore, prolonged CPR has been shown to decrease the elastic recoil of the chest wall, potentially eliminating the chance of successful resuscitation. [13,15]

Compression Rate

Excessively slow chest compression rates are associated with reduced resuscitation effectiveness; however, data regarding their impact on injury incidence are lacking. [13]

Transport

Continuing resuscitation during ambulance transport presents a significant challenge for the medical team. Inability to maintain proper hand position due to constant movement may lead to a higher incidence of injuries and reduced compression quality. In addition, personnel are significantly exposed to risk during patient transport. [17]

3.2 Clinical Scenarios

In the following section, we explore various clinical scenarios in which mechanical chest compression devices (MCCDs) may be considered. These devices are designed to address challenges faced during manual CPR, especially in situations where continuous and high-quality chest compressions are difficult to achieve. By analyzing these scenarios, we aim to provide a clearer understanding of where and when MCCDs might offer valuable support in resuscitation efforts.

The use of mechanical devices theoretically offers a transportation advantage. Although it has been shown that rescuers performing manual CPR delivered compressions more frequently and with greater depth than the LUCAS device, pauses occurred due to rescuer rotation every 2 minutes. Additionally, a higher proportion of compressions were delivered at incorrect locations, and ambulance speed was reduced for safety reasons, resulting in prolonged transport time to the receiving facility. [17]

Mechanical compression devices also allow for reduced transport time within the hospital setting. One study assessed the time required to transfer a patient from a fifth-floor ward to a catheterization laboratory located on the ground floor. Transport time was reduced from 144 seconds to 111 seconds (LUCAS 2) and 98.5 seconds (AutoPulse). A brief interruption in compressions was required to attach the devices—15 seconds for LUCAS and 23 seconds for AutoPulse. [17]

These devices may also be employed in patients who are transported to hospital after the restoration of circulation but remain hemodynamically unstable. Recurrent ventricular fibrillation has been reported in approximately 20–25% of such patients, and in these circumstances mechanical chest compressions can be promptly initiated. [19]

Several studies have additionally evaluated the effectiveness of cardiopulmonary resuscitation performed during helicopter transport. Under these conditions, the delivery of manual CPR is exceptionally difficult and may, in some situations, be unfeasible. One study demonstrated that, in the group receiving manual resuscitation, return of spontaneous circulation (ROSC) was achieved in 7% of cases, with 2.3% of patients discharged from hospital. In contrast, patients treated with the AutoPulse device achieved ROSC in 30.6% of cases, and 6.1% survived to hospital discharge. Importantly, mechanical CPR (MCPR) can be safely continued during patient hoisting into the helicopter. [20]

A separate study demonstrated that among successfully resuscitated patients, the risk of cardiac arrest re-occurrence during flight remained high. The use of mechanical chest compression devices (MCCDs) was both feasible and safe in helicopter emergency medical services (HEMS). Malfunction of the MCCD was documented in only 0.4% of all primary operations. One malfunction resulted from rough terrain preventing correct device positioning, while the other involved an unexplained failure of the device to initiate chest compressions during in-flight cardiac arrest [21].

Additional pilot investigations, including the Asia CPR Pilot Trial, have demonstrated a compression quality of 85.2% with mechanical devices compared with 80.1% during manual CPR, underscoring their reliability, particularly during prolonged resuscitation efforts. [22]

The use of mechanical chest compression devices in obese patients may offer substantial support during resuscitation; however, their applicability is constrained by anatomical and technical factors, such as body habitus and the inclination of the anterior chest wall. For piston-driven systems, these limitations include maximum allowable sternum heights of 303 or 340 mm and chest widths of 449 or 480 mm. [23]

By contrast, load-distributing band devices, such as the AutoPulse, are subject to different restrictions, including a maximum chest circumference of 130 cm, a chest width of 380 mm, and a body weight limit of 136 kg. Despite these constraints, existing literature suggests a theoretical advantage of band-based systems in obese patients, attributable to a more uniform, circumferential distribution of compressive forces during chest compressions. [23]

The issue of resuscitation in obese patients did not appear to be a major limitation, as available studies indicate that approximately 2.3% of patients could not be accommodated between the device's support arms. Additionally, about 1.2% of patients were too small to allow effective chest compression using the piston mechanism. Overall, the device appears to be applicable in the majority of adult cardiac arrest cases, potentially exceeding 95%. [13]

The LUCAS device is engineered to maintain consistent blood flow at optimal perfusion pressure to vital organs. Its clinical utility extends significantly beyond pre-hospital sudden cardiac arrest scenarios, proving instrumental during highly specialized medical procedures. [24,25]

Furthermore, clinical case reports demonstrate the successful implementation of MCCDs as a crucial bridge to advanced therapies, such as extracorporeal membrane oxygenation (ECMO), particularly in the stabilization and management of patients presenting with deep hypothermia. [26]

As an example, there is the CHEER trial protocol, developed for selected patients with refractory in-hospital and out-of-hospital cardiac arrest at The Alfred Hospital, including mechanical CPR, rapid intra-arrest therapeutic hypothermia, percutaneous cannulation for veno-arterial ECMO, and subsequent coronary angiography for suspected occlusion. The protocol proved feasible, with 92% of eligible patients receiving ECMO and achieving return of spontaneous circulation in 96%, resulting in survival to hospital discharge with full neurological recovery for 54% of patients. [27]

Comparative analyses and phantom studies demonstrate significant technical differences in the clinical application of mechanical chest compression devices during invasive cardiology procedures. The Corpuls CPR system utilizes a carbon-fiber modular arm design that provides high radiolucency, allowing extensive visualization of coronary vessels during angiographic imaging. In contrast, the AutoPulse system incorporates a load-distributing band (LDB) mechanism combined with a backboard, which may limit radiolucency in certain projections. The LUCAS 3.1 system employs a piston-driven mechanism and requires precise centering of the compression piston to avoid interference with coronary angiography. [28]

The LUCAS system has been reported to be applicable during high-specialty cardiological interventions, including percutaneous coronary intervention (PCI) and coronary angiography. Owing to its predominantly radiolucent construction, except for the upper electronic module, most angiographic projections remain accessible, except for the anteroposterior view. [28]

Clinical observations from the University Hospital of Zurich describe the use of the LUCAS 2 device during coronary angioplasty in patients who experienced sudden cardiac arrest in the catheterization laboratory. In such settings, manual cardiopulmonary resuscitation is difficult to perform concurrently with ongoing PCI. In the reported cases, mechanical chest compressions enabled the continuation of invasive procedures during prolonged resuscitation efforts. Moreover, it eliminates staff exposure to X-ray radiation and reduces the surgical team's physical fatigue. [24]

Among patients experiencing CA in the catheterization lab, those treated with mechanical chest compressions demonstrated a significantly higher rate of favorable neurological outcome at discharge (25%) compared to those treated with manual chest compressions (10%).

Furthermore, long-term survival remains positive for patients successfully discharged from the hospital [29].

3.3 Safety Profile and Complications

Mechanical CPR is associated with a significantly higher incidence of thoracic trauma. One of the studies demonstrates up to a 6-fold higher risk of CPR-related injuries (adjusted odds ratio - 6.2) and internal bleeding (odds ratio - 5.9) compared to manual compression. [30]

MCCDs add approximately 14–15% more patients with rib fractures than manual CPR. In multicenter trials, 77.7% of LUCAS patients sustained at least one rib fracture, compared to 63.9% in manual cases. Interestingly, the median number of fractures was slightly lower in the mechanical group (6 vs. 7). [13] Evidence regarding the sternum remains mixed. Some observational studies suggest LUCAS may increase the incidence of sternal fractures, while other datasets show rates comparable to manual chest compressions (e.g., 58.3% for LUCAS vs. 54.2% for manual). [31]

Autopsy studies indicate that the load-distributing band of the AutoPulse system reduces the risk of anterior chest wall injuries but at the expense of an increased incidence of posterior chest wall injuries (posterior ribs and vertebrae), along with rare injuries to the skin and abdominal organs. [32]

Studies report a 5–10% increase in liver lacerations and splenic ruptures. In piston-based systems (such as LUCAS), liver injuries occur in up to 9.7% of patients, compared to only 2.4% with manual CPR. [33]

3.4. Results of Randomized Controlled Trials & Other Studies

Current research, including multiple pilot studies, indicates no significant statistical difference in early survival or Return of Spontaneous Circulation (ROSC) between mechanical and manual CPR. Although specific trials have observed a higher ROSC rate in LUCAS-treated patients (31% vs. 26% in manual groups), broader clinical conclusions suggest that mechanical systems are not superior to high-quality manual compressions in either in-hospital or out-of-hospital settings. [13]

LINC Trial (LUCAS): In a large-scale, multicenter randomized clinical trial (LINC) involving 2,589 patients with out-of-hospital cardiac arrest (OHCA), the use of mechanical chest compressions (LUCAS system) integrated with defibrillation during ongoing compressions failed to demonstrate superiority over guideline-adherent manual CPR. The primary endpoint of 4-hour survival was nearly identical between groups, reaching 23.6% in the mechanical CPR cohort and 23.7% in the manual CPR cohort. Long-term outcomes remained consistent across both arms; at the 6-month follow-up, survival with favorable neurological function (Cerebral Performance Category score 1 or 2) was 8.3% with mechanical CPR compared to 7.8% with manual CPR. [34]

The PARAMEDIC Trial, a large-scale cluster-randomized trial involving 4,471 patients, provided further evidence regarding the routine use of MCCDs. The study found no significant difference in 30-day survival between the LUCAS group (6.3%) and the manual CPR group (7.0%). [35]

CIRC Trial (AutoPulse):

The goal of the study was to determine whether using a mechanical device (iA-CPR) is better, worse, or equivalent to high-quality manual CPR for saving lives.

Researchers tracked adults with cardiac arrests in the US and Europe over nearly two years. After starting with manual CPR, patients were randomly assigned to either continue by hand or switch to the machine. The team monitored the quality of compressions electronically and followed every patient until they either left the hospital or died.

In the results, manual CPR (M-CPR) showed slightly higher raw numbers than mechanical CPR (iA-CPR) across all stages. For sustained ROSC and ER admission, the rates were 32.3% (689 patients) for manual versus 28.6% (600 patients) for mechanical. The 24-hour survival rate followed a similar pattern at 25.0% (532 patients) for manual compared to 21.8% (456 patients) for mechanical. Finally, the survival to hospital discharge was 11.0% (233 patients) for the manual group and 9.4% (196 patients) for the mechanical group. [36]

4. Discussion

Despite their logistical and operational advantages, large randomized controlled trials, including LINC, PARAMEDIC, and CIRC, have not consistently demonstrated a survival benefit of MCCDs over high-quality manual CPR in terms of hospital discharge. However, MCCDs could be secure by providing continuous compressions for most of the resuscitation time, and reducing interruptions - factors particularly important during prolonged resuscitation patient transport in moving ambulances or during evacuation at sporting events. The slight reductions in survival observed in some trials were attributed primarily to delays during device deployment, emphasizing the need for thorough team training and protocol optimization to minimize "hands-off" time (chest compression hazardous pauses). [34,35,36]

In fact, MCCDs act as a "third member," freeing personnel to focus on advanced life support (ALS) tasks, including airway management, vascular access, and identification of reversible causes (4H/4T). They are especially useful in the Polish EMS context, MCCDs might be vital for basic teams with only two rescuers ("P" teams).

One rationale for implementing MCCDs in HEMS is to ensure compliance with flight transport regulations, including the requirement that all crew members have latched seatbelts during ongoing chest compressions in flight. Additionally, as the incidence of contagious diseases such as COVID-19 increases, MCCDs can enhance provider safety while maintaining high-quality CPR at a safe distance from the patient both on scene and during transport. Equipping HEMS with MCCDs may be particularly beneficial for non-trauma patients, who may derive greater benefit than trauma patients.

The delivery of manual cardiopulmonary resuscitation in catheterization laboratories is particularly challenging because of restricted working space and exposure to ionizing radiation, especially during prolonged, refractory cardiac arrest. Mechanical chest compression devices represent a potential alternative in this setting; however, their clinical effectiveness and practical utility continue to be evaluated. Moreover, arterial cannulation frequently precludes reliable blood pressure assessment, resulting in limited high-quality evidence regarding the hemodynamic effects of mechanical chest compressions.

The potential application of mechanical compression devices in military medicine also warrants consideration. Battlefield conditions often involve delayed access to advanced medical care, limited personnel resources, and harsh environmental conditions. In such contexts, mechanical chest compression devices may mitigate these challenges and enhance the feasibility and effectiveness of life-saving interventions.

Finally, the use of mechanical chest compression devices is associated with a distinct and increased risk of resuscitation-related injuries. Although these complications are generally regarded as acceptable in the context of life-saving treatment, they underscore the need for vigilant post-resuscitation surveillance. Clinicians should incorporate early diagnostic imaging, such as extended focused assessment with sonography for trauma (eFAST), into post-resuscitation protocols to exclude potentially life-threatening conditions, including internal hemorrhage, even in patients with initially stable vital signs.

Limitations of this study primarily stem from the methodology adopted for the literature review and from the current state of scientific knowledge regarding mechanical chest compression devices (MCCDs) up to 2025. The work constitutes a descriptive and comparative literature review, meaning it relies on secondary data and does not generate new, primary clinical data.

The analysis covered three main devices available on the Polish market, which differ in their mechanism of action (piston vs. load-distributing band). These technical differences make it difficult to generalize conclusions for all MCCD models.
The review includes literature up to 2025, and the dynamic development of medical technology and the publication of new research may quickly render some of the presented information outdated.

Future research on mechanical chest compression devices (MCCDs) should address the substantive and operational gaps identified in the article's general topic. It is necessary to investigate the long-term neurological outcomes of patients who survived sudden cardiac arrest thanks to the use of MCCDs, which is a crucial, ultimate measure of resuscitation success.
A thorough evaluation of significant implementation costs is warranted. Future studies should conduct an in-depth cost-effectiveness analysis of using MCCDs in various emergency medical system models (e.g., basic vs. specialist teams in Poland). Although injuries are acceptable in

the context of saving a life, an increase in specific internal injuries (e.g., spleen ruptures, liver lacerations) has been noted. Engineering and clinical research should aim to minimize these complications further. Research should focus on how best to integrate MCCD data with medical information systems to optimize patient care and safety.

5. Conclusions

Modern mechanical chest compression devices have undergone a significant evolution in the 21st century, becoming miniaturized, ergonomic, and highly effective tools that could be widely used in emergency medicine. Their key advantage lies in ensuring consistent and reproducible compression quality that remains independent of rescuer fatigue—a factor that often compromises the efficacy of manual cardiopulmonary resuscitation. Although implementing these devices involves substantial initial and operational costs, their use provides measurable clinical and logistical benefits, particularly in challenging environments such as air medical transport, in scenarios with limited rescuers, or during invasive procedures.

According to the latest guidelines, MCCDs are not considered a routine replacement for manual chest compressions, but rather a reliable and essential alternative in specific clinical situations. They are indispensable during prolonged transport, in cardiac catheterization laboratories, and as a vital bridge to eCPR. While large-scale clinical trials show comparable survival rates to manual CPR, the qualitative benefits—consistency and enhanced safety for both staff and patients—remain significant and measurable. In light of current recommendations, mechanical compression serves as a practical solution whenever maintaining high-quality manual chest compressions is difficult or impossible.

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Not applicable.

Data availability statement

Not applicable.

Conflict of interest

The authors declare no conflict of interest in relation to this study.

Declaration of Generative AI and AI-Assisted Technologies

During the preparation of this work, the authors used ChatGPT (OpenAI) to improve grammar and language clarity. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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