

Double external defibrillation in the emergency department: A rapid review of the literature

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Abstract

Context: In the context of refractory cardiac arrest, dual external defibrillation (DED) has been attracting growing interest in recent years. Unlike traditional defibrillation, DED uses two defibrillators, either simultaneously or sequentially, to deliver shocks. This approach aims to maximize the likelihood of restoring a normal heart rhythm when conventional techniques fail. Although several studies have looked at DED in prehospital settings, there is a notable lack of data on its use in a hospital setting, particularly in the emergency department.

Objective: To synthesize current knowledge on the use of DED in hospital settings, focusing on reported practices and issues related to its implementation.

Methodology: A rapid review of the literature was conducted in accordance with the methodological recommendations of the Cochrane Rapid Review Methods Group (Garritty et al., 2024). The PubMed, MEDLINE, EMBASE, CINAHL et Cochrane Library databases were consulted.

Results: The initial search identified 356 articles published between 2004 and 2024. A total of 15 articles were selected, detailing 18 case reports. Analysis of the cases

highlighted the potential benefits, limitations, and risks associated with the use of DED in hospital settings.

Conclusion: DED is a technique generally used as a last resort, after traditional methods have failed. To date, the limited robustness of the available studies does not allow its effectiveness to be established in comparison with simple defibrillation. Randomized controlled trials are therefore necessary to confirm its effectiveness. For future practice, the uniqueness of clinical cases must be considered and a risk-benefit analysis must be undertaken by healthcare teams during prolonged resuscitation. Standardization of procedures will also be essential to ensure optimal use of DED.

Keywords: Refractory cardiac arrest, dual defibrillation, emergency, resuscitation

Introduction

In cases of cardiac arrest, many patients do not manage to achieve a return of spontaneous circulation (ROSC). In fact, an observational study conducted in Sweden involving 82,000 people who suffered cardiac arrest in a prehospital setting documented the number of defibrillations required to restore a viable rhythm. The results show that 45% of people in cardiac arrest remain in ventricular fibrillation or ventricular tachycardia after three attempts at defibrillation (Holmén et al., 2017). This phenomenon is referred to as refractory cardiac arrest, a lack of response to resuscitation maneuvers after three shocks administered at two-minute intervals

(van Diepen et al., 2024). Thus, despite treatment in accordance with recommendations for advanced cardiovascular life support (ACLS), ROSC is often a major challenge.

Since prolonging resuscitation maneuvers is associated with a decrease in the probability of survival, rapid ROSC is a priority for maximizing the chances of survival and functional recovery (Holmén et al., 2017; Okubo et al., 2024). In this context, a working group including the Canadian Cardiovascular Society, the Canadian Cardiovascular Critical Care Society, and the Canadian Association of Interventional Cardiology has proposed a clinical practice update to incorporate strategies that may improve survival in people who have experienced refractory cardiac arrest (van Diepen et al., 2024). Among the pharmacological and non-pharmacological interventions proposed, dual external defibrillation (DED) stands out as a promising intervention. Unlike traditional single-device defibrillation, DED uses two defibrillators simultaneously or sequentially to deliver electrical shocks. This approach aims to maximize the likelihood of restoring a normal heart rhythm when traditional defibrillation fails (Deakin et al., 2020).

However, although several studies have explored the use of DED in a prehospital setting (Cheskes et al., 2024; Delorenzo et al., 2019; Ross et al., 2016), data on its application in hospitals, particularly in emergency departments, remain limited. Furthermore, it is important to remember that, in hospital settings, resuscitation maneuvers are guided by Advanced Cardiac Life Support (ACLS) algorithms, which do not yet include DED, as the scientific literature on the subject remains limited (Sood and Kumar, 2024). In the absence of guidelines on DED for refractory cardiac arrests in hospital settings, its use is often based on the clinical judgment of healthcare professionals, which can lead to variability in practices and raise safety issues.

A synthesis of the knowledge is necessary to consolidate the data currently available, however limited they may be, and to obtain an overview of DED use practices in the hospital setting, with emphasis on reported practices and implementation issues. This knowledge synthesis is also vital to support the adoption of practices based on the most recent recommendations, to ensure optimal management of patients experiencing cardiac arrest in the emergency department.

Therefore, a knowledge synthesis is needed to consolidate the currently available evidence, albeit limited, and to obtain an overview of DED practices in hospital settings, with a focus on reported applications and implementation challenges. This knowledge synthesis is also critical to support the adoption of practices based on the most recent recommendations, thereby ensuring optimal care for patients experiencing cardiac arrest in the emergency department.

Theoretical foundations of dual external defibrillation

The theoretical aspects of DED have been studied for several decades. Three principles are described in the literature to justify its potential advantages: 1) the amount of energy delivered, 2) the principle of vectors, 3) the slightly asynchronous nature of the shocks (Bell et al., 2018).

First, DED allows a greater amount of energy to be transmitted to the myocardium, thereby creating an electric field that exceeds the threshold required to terminate ventricular arrhythmia (Bell et al., 2018). According to Stiell et al. (2007), increased intracardiac voltage is associated with higher conversion rates of ventricular arrhythmia. This concept is particularly relevant given that the amount of energy delivered to the myocardium can vary depending on a person's body mass index (BMI). In individuals with a higher BMI, successful external defibrillation generally requires a higher level of biphasic energy to achieve the appropriate current at the heart (Aymond et al., 2024).

Second, the principle of vectors states that electrode placement influences the effectiveness of defibrillation (Gerstein et al., 2015). An electrical vector reaching the interventricular septum is associated with a higher defibrillation success rate (Gerstein et al., 2015). Accordingly, two orthogonal energy vectors would increase the dispersion of the electric field across the myocardium and increase the likelihood of depolarization at the interventricular septum. For this reason, it is recommended that the electrodes be placed in the anterolateral and anteroposterior positions. Through this mechanism, DED may improve the effectiveness of ventricular fibrillation conversion compared with single shocks delivering the same amount of energy (Cheskes et al., 2020).

Third, the slightly asynchronous nature of shocks delivered by DED may promote successful conversion by prolonging the duration of electrical current through the myocardium (Gerstein et al., 2015; Johnson et al., 1992). This principle is based on the fact that myocardial cells successively pass through different membrane potential states (depolarization, repolarization, hyperpolarization, or rest). Thus, slight asynchrony helps to prolong the duration of the shock, which maximizes the probability of achieving uniform myocardial depolarization and interrupting the disorganized propagation of ventricular electrical activity (Pourmand et al., 2018).

Objectives

This article aims to meet the following objective:

- To synthesize current knowledge on the use of DED in hospital settings, focusing on reported practices and issues related to its implementation.

Methodology

A rapid review of the literature was conducted in accordance with the methodological recommendations of the Cochrane Rapid Reviews Methods Group (Garritty et al., 2024). A systematic review was not deemed appropriate due to the small number of studies and the wide variability in clinical practices surrounding DED. Thus, the rapid review aims to provide an initial overview of reported practices and implementation issues (Garritty et al., 2024).

The search strategy was developed by two of the article's authors (Author A and Author B), in consultation with a university librarian. The PubMed, MEDLINE (EBSCOhost), EMBASE (Elsevier), Cumulative Index of Nursing and Allied Health Literature (CINAHL; EBSCOhost), and Cochrane Library databases were consulted. The keywords used for the search

included the terms “dual defibrillation,” “dual external defibrillation,” “Dual Simultaneous defibrillation,” “Dual sequential defibrillation,” “Double defibrillation,” “Double sequential defibrillation,” and “Double sequential external defibrillation,” in combination with ‘hospital’ or ‘in-hospital.’ The term “pre-hospital” was excluded using the Boolean operator NOT. An example of the literature search strategy for one of the databases is available in the Appendix. Although the electrophysiological principles of dual defibrillation were explored as early as the 1990s (Johnson et al., 1992; Kerber et al., 1994), these studies were conducted on animal models. As its clinical application in patients has emerged more recently, we considered it relevant to include articles published in the last 20 years, between 2004 and 2024. Finally, Covidence software (Veritas Health Innovation, 2022) was used to collect and sort the articles. This platform was chosen mainly because of its simple interface and user-friendly features.

The identification, selection, and extraction steps were carried out independently by two members of the team (Author A and Author B), who each evaluated all the articles. Initially, the search identified 356 potential articles. The two team members then performed an initial sorting to exclude duplicates and articles that did not meet the inclusion criteria. The articles were reviewed for inclusion based on the eligibility criteria detailed in Table 1.

Two of the authors (Author A and Author B) independently read the titles and abstracts. This initial screening allowed us to exclude 170 duplicates and 131 other articles that did not meet the research objective. The remaining 55 articles were reviewed in their entirety, and any conflicts were resolved by consensus between two of the authors (Author A and Author B). Randomized clinical trials, observational studies, and case reports were eligible, while opinion pieces, editorials, and all other texts without empirical data were systematically excluded. At this stage, 40 articles were excluded. The reasons for exclusion are presented in Figure 1, in a PRISMA flow diagram. The remaining 15 articles were included in the study.

Table 1

Article Eligibility Criteria

Inclusion criteria		Exclusion criteria	
Type of publication	Randomized clinical trials, observational studies, case studies, knowledge syntheses	Type of publication	Opinion pieces, editorials, presentation summaries, other texts without empirical data
Year of publication	2004 to 2024	Context	Any study conducted in a pre-hospital setting
Language	English or French		

Data Extraction

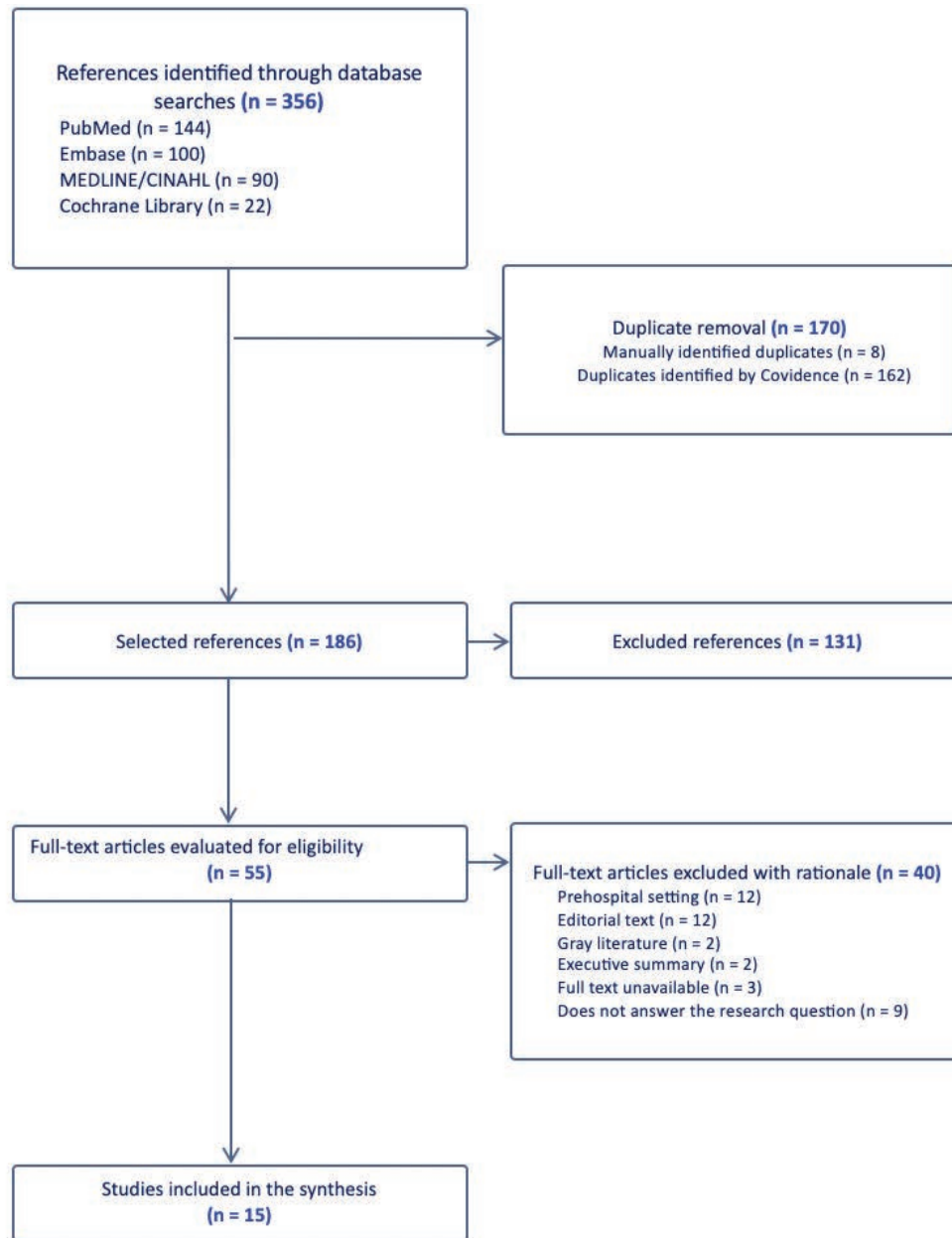
Data extraction was performed by two members of the team (Author A and Author B). A Microsoft Excel spreadsheet was used to extract information from each article. Two independent extractions were performed and then compared to correct any discrepancies or misinterpretations (Author A and Author B). This information included the title of the article, the name of the first author, the year of publication, and all information specific to the case reports. Clinical information extracted included the reason for consultation, the patient’s medical history, the duration of resuscitation, the number of defibrillations, the number of DEDs, the positioning of the electrodes, and the post-resuscitation results. Table 2 summarizes all this data.

Results

Analysis of the 18 case reports from the 15 studies on DED in the emergency department reveals certain trends, particularly regarding the resuscitation time, age of the patients treated, number of defibrillations, number of double defibrillations, and post-resuscitation outcomes.

First, nine of the 18 case reports (50%) indicated the total resuscitation time, which ranged from 20 minutes (Hwang et al., 2019) to 82 minutes (Bignucolo et al., 2019). The average resuscitation time was approximately 46 minutes, with a standard deviation of just under 23 minutes. This prolonged resuscitation time is often observed in refractory cardiac arrests when traditional defibrillations fail to restore a viable heart rhythm. However, prolonged resuscitation time could be associated with other factors such as response time or underlying pathology. Nevertheless, these data suggest that DED is primarily used in settings where traditional methods have failed. Although the exact timing for the introduction of DED is not documented, there is variability in clinical and decision-making practices regarding the appropriate time to introduce DED. Thus, these data highlight the lack of consensus regarding this intervention.

Second, the patients treated were aged between 24 and 69. The average age was 49, with a standard deviation of 11.9 years. It appears that DED is used in people of different age groups, but mainly in middle-aged people and rarely in elderly people. It is difficult to identify a trend in the factors influencing the use of DED, but some study results suggest that the decision to continue prolonged resuscitation or to intensify interventions may be influenced by considerations related to the potential for recovery. For example, Bignucolo et al. (2019) performed resuscitation maneuvers for 82 minutes on a 24-year-old. In addition, they attempted DED seven times and triple external defibrillation twice (Bignucolo et al., 2019). In comparison, the case report by Hajjar et al. (2018) indicates that the healthcare team stopped resuscitation efforts after 25 minutes and a single attempt at DED on a 69-year-old with a history of hypertension and coronary artery disease (Hajjar et al., 2018). These cases illustrate not only the variability in practices surrounding the use of DED, but also the complexity of clinical decisions in the context of refractory cardiac arrest. These cases also highlight the lack of guidelines to support healthcare teams in the use of this intervention.

Figure 1*PRISMA Flowchart*

Third, of the 18 cases identified, 15 (83.3%) specified the number of standard defibrillation attempts made. Among these 15 cases, a significant proportion of patients underwent several defibrillation attempts before DED was considered. To this end, one-third of cases received seven or more defibrillation attempts before DED was considered (Choi & Noh, 2021; El Tawil et al., 2017; Hajjar et al., 2018; Lybeck et al., 2015; Mohamed et al., 2023). In addition, Choi & Noh (2021) report a total of 14 standard defibrillation attempts on a 31-year-old patient before DED was attempted. Once again, these data highlight the lack of decision-making criteria guiding healthcare teams regarding DED. These results also raise questions about the potential benefits of earlier introduction of DED in the context of refractory cardiac arrest.

Fourth, the number of attempted DED is indicated for 16 of the 18 (88.9%) cases. The number of attempts ranges from 1 to 9, with an average of 2.5 and a standard deviation of 2.1. This statistic shows that a single attempt at dual defibrillation is not necessarily sufficient to restore a viable heart rhythm and that multiple attempts are often necessary. Overall, only one-third of cases were successful in achieving ROSC with a single DED attempt (Frye et al., 2018; Lybeck et al., 2015; Mohamed et al., 2023; Nazir et al., 2016; Sena et al., 2016).

Finally, as evidenced by the variable “return of spontaneous circulation (ROSC),” post-resuscitation results suggest that DED could offer an interesting alternative in cases of refractory cardiac arrest. Of the 18 cases reported, 14 (78%) resulted in medical discharge without neurological sequelae after cardiac arrest

(Bell et al., 2018; Bergin et al., 2024; Bignucolo et al., 2019; Choi & Noh, 2021; El Tawil et al., 2017; Fender et al., 2013; Hwang et al., 2019; Lin et al., 2022; Lybeck et al., 2015; Mohamed et al., 2023; Nazir et al., 2016; Sena et al., 2016; Zuluaga et al., 2019). However, it should be noted that neurological, cardiac, and functional recovery remains uncertain, as shown in the “Clinical Outcomes” column of Table 2.

Discussion

The objective of this rapid review of the literature was to synthesize current knowledge on the use of DED in hospital settings, focusing on reported practices and issues related to its implementation.

In summary, the results of this rapid review show that DED appears to be used more frequently in middle-aged individuals. These results are consistent with a systematic review and meta-analysis on the use of DED in prehospital settings, where the average age of cases in which DED was used was around 60 years (Li et al., 2022). Furthermore, the duration of resuscitation and the number of defibrillation attempts seem to reflect a more aggressive clinical approach when the potential for recovery after cardiac arrest is perceived as more favorable. However, this finding should be interpreted with caution due to the small number of case reports and the level of evidence available.

Although the medical history of patients was not consistently reported across case reports, overweight or obesity was noted in

Table 2

Summary of Studies Included in the Review of Syntheses

Study	Title	Case report summaries	Clinical outcomes
Bell, 2018 (Canada)	Make it two: A case report of dual sequential external defibrillation	53-year-old male. CPR duration: 23 minutes. 4 single defibrillations. Received 2 DEDs initiated after 18 min of resuscitation. Electrodes were placed in anterolateral and anteroposterior positions for biphasic defibrillation at 400J.	A stenosis of the left anterior descending artery (LAD) was corrected. Despite a second cardiac arrest 24 hours after his arrival at the hospital and ventilator-associated pneumonia during his hospitalization, he was medically discharged 14 days after his arrival at the emergency department, without any neurological sequelae.
Bergin, 2024 (New Zealand)	A case report of successful dual external defibrillation in cardiac arrest	45-year-old male. CPR duration: 32 minutes. 5 single defibrillations. Received 2 DEDs. The electrodes were placed in the anterolateral position, twice, for a biphasic defibrillation at 400J.	Absence of neurological sequelae at 6 and 12 months post cardiac arrest.
Bignucolo, 2019 (Canada)	Triple-sequential defibrillation for refractory ventricular fibrillation in a 24-year-old male out of hospital cardiac arrest	24-year-old male. CPR duration: 82 minutes. More than 4 simple defibrillations, unspecified. Received 7 DED and 3 triple defibrillations. The electrodes were placed in anterolateral and anteroposterior positions for biphasic defibrillation at 400J and 600J during attempts of triple defibrillations.	Medical discharge after 16 days in hospital, without neurological sequelae.
Choi, 2021 (South Korea)	Successful defibrillation using double sequence defibrillation	35-year-old male. CPR duration: unknown. 5 single defibrillations. Received 3 DEDs. Electrodes were placed in anterolateral and anteroposterior positions, for biphasic defibrillation at 400J.	Cerebral Performance Score = 4 (coma or vegetative state).
		38-year-old male. CPR duration: unknown. Number of single defibrillations: unknown. Received 3 DEDs. Electrodes were placed in anterolateral and anteroposterior positions, for biphasic defibrillation at 400J.	Stenosis of the left anterior descending artery (LAD) was corrected. Medical discharge was obtained after 8 days of hospitalization. The patient was discharged without neurological sequelae.
		31-year-old male. CPR duration: unknown. 14 single defibrillations. Received 4 DEDs. Electrodes were placed in anterolateral and anteroposterior positions, for biphasic defibrillation at 400J.	Cerebral Performance Score = 4 (coma or vegetative state).
El Tawil, 2017 (Lebanon)	Double sequential defibrillation for refractory ventricular fibrillation	54-year-old male. CPR duration: 61 min. 7 single defibrillations. Received 3 DEDs. Electrode position unspecified, for biphasic defibrillation at 400J.	Medically discharged the next day with no neurological sequelae
Fender, 2013 (USA)	Dual defibrillation for refractory ventricular fibrillation in a patient with a left ventricular assist device	Male, age unknown. CPR duration: unknown. 1 single defibrillation. Received 2 DEDs. Electrodes were placed in anterolateral and anteroposterior positions, for biphasic defibrillation at 400J.	The patient underwent ablation of the ventricular ectopic focus and remained free of subsequent ventricular fibrillation.

continued...

Study	Title	Case report summaries	Clinical outcomes
Frye, 2018 (USA)	Beyond advanced cardiac life support: Dual-sequential defibrillation for refractory ventricular fibrillation after witnessed cardiac arrest in the emergency department	56-year-old male. CPR duration: unknown. 3 single defibrillations. Received 1 DED. Electrodes were placed in anterolateral and anteroposterior positions, for biphasic defibrillation at 400J.	Despite extracorporeal membrane oxygenation (ECMO), cardiac function did not improve. The patient was not a candidate for heart transplantation. The family chose not to pursue treatment. Death was confirmed 17 days after arrival at the emergency department.
Hajjar, 2018 (Lebanon)	Dual defibrillation in patients with refractory ventricular fibrillation	69-year-old male. CPR duration: 47 min total (including prehospital). 8 single defibrillations. Received 1 DED. Electrodes were placed in anterolateral and anteroposterior positions, for biphasic defibrillation at 400J.	Pulseless electrical activity despite resuscitation.
Hwang, 2019 (USA)	A case of refractory ventricular fibrillation successfully treated with low dose esmolol	51-year-old male. CPR duration: approx. 20 min. 4 single defibrillations. Received 5 DEDs. Electrode position unspecified, for biphasic defibrillation.	ROSC following administration of a 500 mcg IV bolus dose of esmolol. Medically discharged after 6 days. Ejection fraction estimated at 40–45% and no neurological sequelae.
Li, 2022 (China)	Combination of multidisciplinary therapies successfully treated refractory ventricular arrhythmia in a STEMI patient: Case report and literature review	65-year-old male. CPR duration: unknown. 5 single defibrillations. Received 2 DEDs. Electrodes were placed in anterolateral and anteroposterior positions, for biphasic defibrillation at 400J.	Extracorporeal membrane oxygenation (ECMO) and coronary angiography, where two stents were placed in the left anterior descending artery (LAD) and the circumflex artery (CX). Medical discharge obtained 13 days after arrival in the emergency department. Ejection fraction was estimated at 73% at discharge.
Lybeck, 2015 (USA)	Double sequential defibrillation for refractory ventricular fibrillation: A case report	40-year-old-male. CPR duration: 40 minutes. 7 single defibrillations. Received 1 DED. The electrodes were placed in anterolateral and anteroposterior positions, for monophasic defibrillation at 360J and biphasic defibrillation at 200J.	Hypothermia was initiated swiftly. The patient developed rhabdomyolysis, renal failure and pneumonia while in intensive care. After 16 days, the patient was medically discharged, with no neurological sequelae.
Mohamed, 2023 (United Arab Emirates)	Keep shocking: Double sequential defibrillation for refractory ventricular fibrillation	54-year-old male. CPR duration: unknown. 11 single defibrillations. Received 1 DED. Electrodes were placed in anterolateral and anteroposterior positions, for biphasic defibrillation at 400J.	Medically discharged after 5 days in hospital, without neurological sequelae.
Nazir, 2016 (USA)	Why Stop at 360J for Refractory Ventricular Fibrillation?	55-year-old male. CPR duration: unknown. 3 single defibrillations. Received 1 DED. Electrode position unspecified, for monophasic defibrillation at 720J.	Medically discharged after 7 days in hospital, without neurological sequelae.
Sena, 2016 (USA)	Refractory ventricular fibrillation successfully cardioverted with dual sequential defibrillation	56-year-old male. CPR duration: unknown. 4 single defibrillations. Received 1 DED. Electrodes were placed in anterolateral and anteroposterior positions, for biphasic defibrillation at 600J.	A 100% occlusion of the left anterior descending artery (LAD) was corrected by the placement of 3 stents. Medical discharge was obtained after 7 days of hospitalization.
Zuluaga, 2019 (USA)	A case series of double sequential defibrillation for refractory ventricular fibrillation	52-year-old male. CPR duration: 80 min. Unknown number of single defibrillations. Unknown number of DEDs. Electrode position unknown. 56-year-old male. CPR duration: 55 min. Unknown number of single defibrillations. Unknown number of DEDs. Electrode position unknown.	Medical discharge obtained 17 days after admission, with no neurological sequelae. Medical discharge obtained 13 days after admission, with no neurological sequelae.

Note. CPR = cardiopulmonary resuscitation; CX = circumflex artery; DED = dual external defibrillation; ECMO = extracorporeal membrane oxygenation; LAD = left anterior descending artery.

five of the ten cases where such information was available (Bell CR et al., 2018; Bergin et al., 2024; Hwang et al., 2019; Nazir et al., 2016; Sena et al., 2016). Given that external defibrillation generally requires a higher level of biphasic energy in people with a higher BMI (Zhang et al., 2002), we believe that overweight and obesity should be carefully considered during resuscitation to ensure that adequate current reaches the myocardium.

The results of this review demonstrate variable and heterogeneous use of DED in hospital settings. In the absence of a standardized protocol, its application appears to be based on ad hoc clinical decisions when traditional resuscitation methods fail. To this end, the average resuscitation time of more than 45 minutes suggests that DED is generally used during prolonged resuscitation and after the administration of numerous single defibrillations. However, given that the chances of survival for a person who has suffered an in-hospital cardiac arrest are less than 1% after more than 39 minutes of resuscitation (Okubo et al., 2024), we believe that the late use of DED could potentially mask its benefits.

Finally, since current evidence is insufficient to determine the actual effectiveness of DED compared with standard defibrillation, guidelines recommend first ensuring optimal electrode placement before considering DED (van Diepen et al., 2024). This recommendation is supported by evidence that an electrical vector aligned with the interventricular septum is associated with a higher defibrillation success rate (Gerstein et al., 2015). For instance, in the anterolateral position, electrodes should be placed to anatomically encompass the heart: one below the right clavicle, adjacent to the upper right sternal border, and the other along the left mid-axillary line, near the cardiac apex. In addition, ensuring adequate contact between the electrode and the skin is essential to optimize energy delivery (van Diepen et al., 2024).

Finally, some prehospital studies have nevertheless shown a higher survival rate at hospital discharge among patients who received DED compared with standard defibrillation (Cheskes et al., 2022, 2024). Accordingly, guidelines recommend that DED should be considered for adults who have suffered cardiac arrest and whose pulseless ventricular arrhythmia persists after three consecutive shocks. In line with prior studies, DED should be performed by a single operator activating the defibrillators in sequence. This DED strategy, which consists of sequential rather than simultaneous defibrillation, creates a short delay before the second defibrillator shocks, which promotes successful conversion by prolonging the duration of electrical current through the myocardium (Gerstein et al., 2015; Johnson et al., 1992). This slightly asynchronous approach is also recommended to avoid potential damage to the defibrillator. Although the risk of damage is estimated to be below 0.5%, instances of equipment damage have been documented during simultaneous DED (Drennan et al., 2022).

Strengths and Limitations of the Study

The main strengths of this rapid review lie in the methodological rigor applied throughout the process. It was conducted in accordance with the recommendations for rapid literature reviews, ensuring a structured and reliable approach (Garritty et

al., 2024). The identification, selection, and extraction of studies were carried out independently by two members of the research team, reducing the risk of selection bias and interpretation bias. These steps are also well described, ensuring the reproducibility of this study. Finally, the inclusion of several databases broadened the scope of the review and ensured a more comprehensive coverage of relevant publications.

Despite these strengths, several limitations must be acknowledged. First, many of the included case reports presented significant gaps in essential clinical information, such as age, medical history, duration of resuscitation, prehospital interventions, or complementary therapies used (e.g., number of single defibrillations, doses of epinephrine or amiodarone administered, etc.). Because these variables strongly influence resuscitation outcomes, the ability to assess the actual effectiveness of DED remains limited.

Second, case reports are low-level evidence studies, as they may be biased toward positive results (Clemency et al., 2019). In fact, case reports with positive outcomes are more likely to be published, while cases where DED has failed are less likely to be reported or submitted for publication (Clemency et al., 2019). This imbalance may result in an overestimation of the actual effectiveness of DED. In fact, we believe that there is an inverse relationship between the effectiveness of DED and the level of evidence in studies. To support this claim, the 18 case reports presented in this literature review showed a survival rate with no neurological sequelae of 78%. In comparison, a retrospective prehospital cohort study showed favorable neurological outcomes in only 6% of cases that received DED in the context of refractory cardiac arrest (Ross et al., 2016). In summary, while this review highlights promising findings, the small number and limited quality of available studies warrant cautious interpretation. Larger-scale studies or randomized clinical trials are needed to accurately assess the true efficacy of DED.

Conclusion

This rapid review found that DED is generally used as a last resort, after traditional resuscitation strategies have failed. However, the lack of standardization in DED practices leads to significant variability in its clinical application, as well as a prolonged delay before its use. This raises questions about the potential benefits of earlier use.

To date, although it is currently impossible to measure the actual effectiveness of DED and generalize the results of current studies, it is important to recognize the relevance of this intervention during prolonged resuscitation. After a thorough analysis of the risks and benefits, healthcare teams could consider DED for adults who have suffered cardiac arrest and remain in ventricular fibrillation or pulseless ventricular tachycardia after three consecutive defibrillations (van Diepen et al., 2024).

For future practice, randomized controlled trials will be needed to confirm the effectiveness of DED. In addition, standardized implementation protocols will be essential to ensure consistent and optimal application in clinical settings.

Implications for emergency nursing practice

Emergency nurses play a key role in identifying clinical situations where DED may be considered. Their ability to anticipate the subsequent steps in resuscitation and quickly prepare the necessary equipment can help reduce the time to intervention. A thorough understanding of the electrophysiological principles underlying DED, as discussed above, is also essential. This understanding ensures proper electrode placement and optimal application of the intervention with both defibrillators. Finally, as DED is increasingly used in emergency situations, this article highlights the importance of training nursing staff to reduce clinical hesitation and ensure effective management in cases of refractory cardiac arrest.

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Author Contributions – CRediT Statement

The first two authors contributed equally to the design/conduct of the knowledge synthesis, the analysis of results, and the writing of this article.

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