

Improving Outcomes In Cardiac Arrest Management: Strategies For Collaboration Between Paramedic, Emergency, And Pharmacy Technicians

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Abstract

Despite ongoing advances in resuscitation science, cardiac arrest survival rates remain suboptimal. Response to cardiac arrest is affected by several factors, including data collection, research infrastructure, public and professional training and education, program evaluation, accountability, and civic and community leadership. Collaboration strategies between different disciplines, including paramedic, emergency, and pharmacy technicians, are needed to reduce the public burden of cardiac arrest. A more cohesive and coordinated approach is required to enhance public education, training, and advocacy across all communities and healthcare settings. Sustained support for continuing basic, clinical, and translational research related to cardiac arrest is necessary to generate more effective treatment protocols and care paradigms based on evidence.

Keywords: Cardiac arrest, management, collaboration strategies, paramedic, emergency technician, and pharmacist.

Introduction

Despite ongoing advances in resuscitation science, cardiac arrest survival rates remain suboptimal for both in-hospital and out-of-hospital settings. There are major gaps that exist in the delivery of optimal clinical care for individuals with cardiac arrest (Cheng et al., 2018). Cardiac arrest is a severe malfunction or cessation of the electrical and mechanical activity of

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the heart, resulting in almost instantaneous loss of consciousness and collapse (Wong et al., 2014). Each year, cardiac arrest strikes more than half a million people and contributes to avoidable death and disability. Following a cardiac arrest, each minute without treatment decreases the likelihood of survival with good neurologic and functional outcomes (Fang et al., 2020). Thus, the consequences of delayed action can have profound and avoidable effects for individuals, families, and communities.

Conservative estimates identify cardiac arrest as the third leading cause of death in the United States, following cancer and heart disease (Taniguchi et al., 2012). In 2013, approximately 395,000 people suffered a cardiac arrest in community settings (Kupchik & Bridges, 2015). In hospital settings, annual cardiac arrests incidence is approximately 200,000 (Fang et al., 2020). Approximately 12,500 children experience cardiac arrest on annual basis. In general, cardiac arrest survival rates remain low and vary widely between communities and hospitals (Andersen et al., 2019).

Promoting advances in cardiac arrest outcomes require collaboration between many disciplines. Paramedic, emergency, and pharmacy technicians can provide basic life support treatments for persons at risk of cardiac arrest (Andersen et al., 2019). Additionally, within systems of care, continuous quality improvement initiatives based on existing guidelines can lead to more proactive and responsive care models, contributing to higher quality care and better outcomes (Taniguchi et al., 2012). Collaboration strategies between different disciplines are needed to reduce the public burden of cardiac arrest. It is critical to focus efforts on training and implementation issues to optimize outcomes and evaluate effectiveness of proposed strategies (Blom et al., 2014).

Surviving cardiac arrest also depends on the provision of high-quality care by first responders, EMS personnel, and hospital providers (Edelson et al., 2008). These individuals must be adequately educated and properly trained to deliver the best possible care in team environments (Lim, 2015). Although it is possible to assess the quality of care provided by EMS or hospital systems on a broad level, it can be more difficult to distinguish which specific aspects of care, or which combination of factors, directly improve the health of patients (Chan et al., 2014). Even so, promising strategies have emerged that could be more widely adopted to reduce the public health burden of cardiac arrest (Sasson et al., 2010).

Over time, numerous organizations and institutions have supported valuable activities to advance cardiac arrest treatment, leading to critical progress within the resuscitation field (Lim, 2015). Yet there remains no united advocacy presence to raise the visibility of cardiac arrest for policy makers and the public (McNally et al., 2011). To develop shared strategies, identify and support new leaders and advocates, and maximize the impact of limited resources within the resuscitation field, formal and sustained collaboration is essential that can ultimately lead to higher cardiac arrest survival rates (Kupchik & Bridges, 2015).

The aim of this systematic review is to highlight how to improve healthcare outcomes in cardiac arrest management and various strategies for collaboration between paramedic, emergency, and pharmacy technicians in getting improved cardiac arrest outcomes.

Methodology

The design of a systematic review is applied to be familiar with and synthesize the international evidence on cardiac arrest management. This systematic review is a comprehensive protocol-driven review and a synthesis of data from various types of research evidence to summarize gaps in the existing international evidence.

A preliminary search is conducted via three databases, including PubMed, MEDLINE, and EMBASE from 2000 to 2021. Search terms used in this systematic review are "cardiac arrest", "management", "collaboration strategies", "paramedic", "emergency technician", and "pharmacists." Furthermore, reference lists of related articles are manually reviewed to extract auxiliary studies to provide a vital interpretive synthesis.

This systematic review is completed by experienced healthcare professionals in different healthcare settings in Saudi Arabia, who have developed a protocol for selection of studies that meet prearranged inclusion and exclusion criteria. The inclusion criteria in this systematic review depend on original studies with data on improving outcomes in cardiac arrest management. Studies are included irrespective of language or publication date. Likewise, the exclusion criteria are case reports, guidelines, reviews, non-peer reviewed papers and editorials.

Data is extracted and integrated across studies searched and assessed for eligibility, including study design, research methodology, strategy and findings. As well, a quality assessment of reviewed studies is performed by using standardized tools, which are appropriate for respective study designs. Furthermore, a critical interpretive synthesis is performed to extract data and draw conclusions.

Literature Review

The international literature associated with cardiac arrest management is extensively searched and reviewed. A preliminary search is conducted via three databases, including PubMed, MEDLINE, and EMBASE from 2000 to 2021. Search terms used in this systematic review are "cardiac arrest", "management", "collaboration strategies", "paramedic", "emergency technician", and "pharmacists." Furthermore, reference lists of related articles are manually reviewed to extract auxiliary studies to provide a vital interpretive synthesis.

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Furthermore, a number of 25 studies meet the eligibility criteria. The study design includes randomized controlled trials and cohort studies. Key intervention components examined are cardiac arrest management, collaboration strategies, and the roles of paramedic, emergency, and pharmacy technicians in getting improved cardiac arrest outcomes. Findings assessed are improved support, collaboration and mutual understanding among different stakeholders of cardiac arrest management.

Findings indicate that collaboration strategies between paramedic, emergency, and pharmacy technicians are effective in getting improved cardiac arrest outcomes. As a result, this can help the entire healthcare system to improve patients' quality of life, get better health outcomes, and increase patient satisfaction. However, cardiac arrest survival rates remain low and vary widely between communities and hospitals, which need further research.

Discussion

Cardiac arrest can strike seemingly healthy individuals of any age, race, ethnicity, or gender at any time in any location, often without warning. In an instant, a person's pulse or blood pressure disappears, leading to a loss of consciousness and collapse, which is followed by death if

treatment is not provided quickly. The risk of irreversible brain and organ injury and major disability increases the longer the delay in restoring a heart rhythm and blood flow (Gräsner et al., 2021). However, if the heart can be restarted shortly after arrest, then it is possible for individuals to make a complete recovery without any long-term effects (Andersen et al., 2019).

Death and disability from cardiac arrest are prominent public health threats (Chan et al., 2014). Conservative estimates identify cardiac arrest as the third leading cause of death in the United States, following cancer and heart disease (Taniguchi et al., 2012). In 2013, approximately 395,000 people suffered a cardiac arrest in community settings (Kupchik & Bridges, 2015). In hospital settings, annual cardiac arrests incidence is approximately 200,000 (Fang et al., 2020). Approximately 12,500 children experience cardiac arrest on annual basis. In general, cardiac arrest survival rates remain low and vary widely between communities and hospitals (Andersen et al., 2019).

Cardiac arrest management

Effective treatments for specific types of cardiac arrest are known and, if more efficiently implemented on a broader basis, could avoid needless deaths and disability each year. Decreasing the time between the onset of cardiac arrest and the first compression is essential (Kupchik & Bridges, 2015). Similarly, timely delivery of electrical shocks or defibrillation can revive heart muscles for specific types of cardiac arrest and significantly increase the likelihood of survival to hospital discharge (Blom et al., 2014). Administered CPR is associated with substantial increases in survival rates and with better neurologic outcomes after cardiac arrest (Lim, 2015). Collaboration strategies between different disciplines can improve outcomes in cardiac arrest management and the quality of delivered care (Wong et al., 2014).

Additionally, functional public health infrastructures and well-organized health system responses can facilitate timely treatments and formal transitions of care to significantly improve survival and neurologic function following cardiac arrest (McNally et al., 2011). Within systems of care, continuous quality improvement initiatives based on process evaluation and observed outcomes can serve as a foundation for the development of more proactive and responsive care models. However, the solution to improving outcomes from cardiac arrest does not end with better implementation of known treatments and therapies (Gräsner et al., 2021). Sustained support for continuing basic, clinical, and translational research is necessary to generate more effective treatment protocols and care paradigms based on evidence (Taniguchi et al., 2012).

Recent advancements in available cardiac treatments (e.g., percutaneous coronary interventions, emergency cardiopulmonary bypass, cardiac revascularization, and post-resuscitation care algorithms) have also demonstrated favorable impacts on cardiac arrest outcomes (National Institute of Health, 2021). New drug combinations that target reperfusion injury may prevent cardiovascular and neurologic decline that occurs in many patients after resuscitation. Efforts to personalize medicine and improve prognostication are also leading to new models of care and reshaping discussions with patients and their families (Fang et al., 2020).

In fact, meaningful change in cardiac arrest practice, policy, and prioritization is possible, despite many social, political, and practical challenges (McNally et al., 2011). Response to cardiac arrest is affected by several factors, including data collection, research infrastructure, public and professional training and education, program evaluation, accountability, and civic and community leadership (Edelson et al., 2008). Leveraging existing and developing capabilities could strengthen the system of response to cardiac arrest, raise public awareness

and stimulate action that is needed to advance the resuscitation field as a whole and preserve the length and quality of life for individuals who experience a cardiac arrest (Chan et al., 2014).

Improving cardiac arrest quality of care requires a comprehensive set of collaboration strategies, programs and actions. Ideally, these should be embedded in a system of care that plans and prepares for improving cardiac arrest management, prevents cardiac arrest when avoidable, delivers high-quality, guideline-based resuscitation, and continuously evaluates and improves itself within a culture of person-centered care (Neumar et al., 2015).

Collaboration Strategies

Cardiac arrest is a treatable medical event that requires immediate action to save a life. Regardless of the outcome, individuals who experience a cardiac arrest encounter many care providers, including by paramedic, emergency, and pharmacy technicians. These healthcare providers administer essential and interdependent treatments along a continuum of care that may vary in quality and effectiveness (Kupchik & Bridges, 2015). Given the range of negative effects that cardiac arrest can have on the length and quality of a person's life, intensive efforts are needed in order to expand the use of evidence-based practices and to optimize the delivery of known, effective treatments, which can increase likelihood of survival (Gräsner et al., 2021).

In the long term, a reexamination of the current understanding of the causes, diagnosis, and treatment of cardiac arrest are necessary to generate new knowledge that can be used to enable high-quality care across the continuum of care and overcome the longstanding plateau in cardiac arrest survival rates. Additionally, a more cohesive and coordinated approach is required to enhance public education, training, and advocacy across all communities and settings (Neumar et al., 2015).

Improving outcomes from cardiac arrest requires high-quality care. Studies of both in- and out-of-hospital cardiac arrest show that there is a gap between what the guidelines say and what actually happens in clinical practice (Lim, 2015). The aims of high-quality care defined by the Institute of Medicine are that care has to be safe, effective, patient-centered, timely, efficient and equitable (Fang et al., 2020). To achieve these aims, cardiac arrest care requires interventions at an international, national, local, team and individual rescuer level (Andersen et al., 2019).

Effective management for cardiac arrest is widely available and could reduce deaths and disability if they were more efficiently implemented. Within systems of care, continuous quality improvement initiatives based on existing guidelines have led to more proactive and responsive care models that fit local needs and resources, contributing to higher quality care and better outcomes (McNally et al., 2011). Administered CPR is associated with increased survival rates and better neurologic outcomes following cardiac arrest (Sasson et al., 2010). Public education campaigns encourage discussions about the importance of being prepared to respond to a cardiac arrest, and advances in basic, clinical, and translational research could lead to new discoveries in cardiac arrest etiology and pathophysiology, facilitating innovative technologies, new research models, and the widespread adoption of new therapies (Gräsner et al., 2021).

Community Engagement

The urgent nature of cardiac arrest and the risks of mortality and disability without immediate response imply a societal obligation of healthcare providers to be prepared and willing to deliver basic life support. Communities can foster a culture of action by promoting awareness of cardiac arrest symptoms, early activation of emergency medical systems, easy access to CPR and AED training, and active engagement in response to cardiac arrest (Blom et al., 2014). Communities can also cultivate community engagement through public advocacy, local awareness events and campaigns, and leadership opportunities that create a platform for dialogue within the community (Kupchik & Bridges, 2015). In the event of a medical emergency, it can help to understand who's at the scene and what their roles are. Understanding the responsibilities of each individual can help us appreciate the collective effort needed to provide immediate care and support to someone experiencing a medical emergency (Wong et al., 2014)

A paramedic is a trained medical professional who is often the first to arrive at the scene of an emergency, such as someone experiencing a cardiac arrest. Their primary role is to assess the patient's condition and provide appropriate medical care, which may include administering medication or performing life-saving procedures such as CPR (Chan et al., 2014). In the case of a cardiac arrest, a paramedic's primary goal is to restore the patient's heartbeat and breathing as quickly as possible, as this can significantly increase their chances of survival (Edelson et al., 2008). They may also need to transport the patient to the hospital for further treatment and monitoring (Taniguchi et al., 2012). Paramedics can provide advanced life support for patients with cardiac arrest (Andersen et al., 2019).

Emergency medical technicians are the first-line health care providers, who provide medical care and transportation for patients in emergency situations (Kupchik & Bridges, 2015). Emergency medical technicians are trained to provide basic life support, such as administering oxygen, bandaging wounds, and performing CPR (Taniguchi et al., 2012). They also have the skills to manage medical emergencies like cardiac arrests, seizures, and allergic reactions (Sasson et al., 2010). Emergency medical technicians work as part of a team alongside paramedics and other healthcare professionals, such as pharmacy technicians to provide the best possible care for patients in an emergency situation (Neumar et al., 2015).

An effort to standardize training and performance-evaluation measures for cardiac arrest treatment would promote a more rapid and uniform adoption and assessment of high-quality care. It is recommended to establish a standardized set of protocols and training curriculums to improve system capabilities and promote delivery of high-performance CPR (Fang et al., 2020). Likewise, all health care systems, including individual hospitals, should adopt continuous quality improvement programs for cardiac arrest, tracking system performance, highlighting accountability, and ensuring that personnel are trained to respond competently to cardiac arrest to improve its related outcomes (Neumar et al., 2015).

Conclusion

Despite ongoing advances in resuscitation science, cardiac arrest survival rates remain suboptimal for both in-hospital and out-of-hospital settings. Death and disability from cardiac arrest are prominent public health threats. Conservative estimates identify cardiac arrest as the third leading cause of death in the United States, following cancer and heart disease. Within systems of care, continuous quality improvement initiatives based on process evaluation and observed outcomes can serve as a foundation for the development of more proactive and responsive care models and strategies.

Promoting advances in cardiac arrest outcomes require collaboration between many disciplines. Paramedic, emergency, and pharmacy technicians can provide basic life support treatments for persons at risk of cardiac arrest. Collaboration strategies between different disciplines are needed to reduce the public burden of cardiac arrest. It is critical to focus efforts on training and implementation issues to optimize outcomes and evaluate effectiveness of proposed strategies. Surviving cardiac arrest also depends on the provision of high-quality care by first responders. These individuals must be adequately educated and properly trained to deliver the best possible care in team environments.

To develop shared strategies, identify and support new leaders and advocates, and maximize the impact of limited resources within the resuscitation field, formal and sustained collaboration is essential that can ultimately lead to higher cardiac arrest survival rates. Response to cardiac arrest is affected by several factors, including data collection, research infrastructure, public and professional training and education, program evaluation, accountability, and civic and community leadership. In the long term, a reexamination of the current understanding of the causes, diagnosis, and treatment of cardiac arrest are necessary to generate new knowledge in order to enable high-quality care across the continuum of care and overcome cardiac arrest survival rates. Additionally, a more cohesive and coordinated approach is required to enhance public education, training, and advocacy across all communities and healthcare settings.

Communities can foster a culture of action by promoting awareness of cardiac arrest symptoms, early activation of emergency medical systems, easy access to CPR and AED training, and active engagement in response to cardiac arrest. An effort to standardize training and performance-evaluation measures for cardiac arrest treatment would promote a more rapid and uniform adoption and assessment of high-quality care. It is recommended to establish a standardized set of protocols and training curriculums to improve system capabilities and promote delivery of high-performance CPR. Likewise, all health care systems, including individual hospitals, should adopt continuous quality improvement programs for cardiac arrest, tracking system performance, highlighting accountability, and ensuring that personnel are trained to respond competently to cardiac arrest to improve its related outcomes. Sustained support for continuing basic, clinical, and translational research related to cardiac arrest is necessary to generate more effective treatment protocols and care paradigms based on evidence.

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