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Multidisciplinary approaches to managing cardiogenic shock: The role of EMS, paramedics, pharmacists, and health information systems

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***Abstract*---Background:** Cardiogenic shock (CS) is a life-threatening condition that arises from the heart's inability to pump sufficient blood, leading to inadequate perfusion of vital organs. It frequently results from acute coronary syndrome (ACS) and is associated with a high mortality rate despite advances in treatment. Managing CS requires a multidisciplinary approach involving emergency medical services (EMS), paramedics, pharmacists, and health information systems. **Aim:** This article explores the pathophysiology, etiology, and treatment of CS, emphasizing the role of multidisciplinary care teams in improving patient outcomes. **Methods:** The review synthesizes

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current literature on CS management, focusing on the contributions of EMS, paramedics, pharmacists, and health information systems in stabilizing hemodynamics, administering pharmacotherapy, and optimizing long-term care. The analysis also examines clinical trial data, risk scoring models, and the effectiveness of early revascularization therapies. **Results:** Effective CS management hinges on early diagnosis, immediate revascularization, and hemodynamic stabilization through pharmacological agents and mechanical circulatory support (MCS). EMS and paramedics are pivotal in the early detection and transport of CS patients, while pharmacists play a key role in optimizing pharmacotherapy. Health information systems contribute by streamlining communication, data sharing, and decision-making processes. **Conclusion:** A coordinated, multidisciplinary approach, incorporating early intervention and the use of advanced health information systems, is essential for improving survival rates in CS patients. Pharmacists and paramedics are integral to delivering timely care, while health information systems enhance treatment efficiency.

***Keywords*---**cardiogenic shock, acute coronary syndrome, multidisciplinary care, emergency medical services, health information systems, revascularization, pharmacists, paramedics.

Introduction

Cardiogenic shock (CS) represents the most critical manifestation of acute heart failure and is the primary cause of mortality in patients experiencing acute myocardial infarction. CS is defined by reduced cardiac output, hypotension, and inadequate systemic perfusion, leading to dysfunction of vital organs. Beyond the acute cardiac etiology, the current diagnostic criteria for CS include (1) systolic blood pressure below 90 mmHg for more than 30 minutes, despite sufficient fluid resuscitation or the requirement for vasopressor therapy to sustain systolic blood pressure at or above 90 mmHg, and (2) clinical indicators of hypoperfusion, such as altered mental status, cold extremities, oliguria, or elevated blood lactate levels. Diagnosis of CS can be based on clinical observation rather than routinely relying on invasive measurements, such as pulmonary artery wedge pressure or cardiac index using a pulmonary artery catheter [1]. Electrocardiography (ECG) and echocardiography should be conducted immediately after shock detection to evaluate the cause of CS and exclude mechanical complications. Advanced chronic heart failure with low output syndrome may mimic cardiogenic shock clinically, though its progression is typically more gradual, and patients may endure the condition longer due to compensatory adaptations.

Etiology

Acute coronary syndrome (ACS) is the leading cause of CS, accounting for approximately 80% of cases [2]. Other causes include mechanical complications such as ventricular septal rupture, free wall rupture, acute severe mitral regurgitation due to papillary muscle rupture, acute myocarditis, cardiac

tamponade, arrhythmias, cardiomyopathies, high-risk pulmonary embolism, and exacerbation of chronic heart failure or valvular heart disease. Since the majority of CS cases stem from acute myocardial infarction, this review will primarily focus on ACS-related etiologies. CS complicates around 5–10% of cases of ST-elevation myocardial infarction (STEMI) and 2-3% of non-STEMI cases [3,4]. Shock onset generally occurs within the first 24 hours of hospital admission [2,5]. Despite advancements in early revascularization treatments and appropriate medical management, CS frequently results in multiorgan failure and death. Mortality rates for CS remain high, ranging between 35% and 50% [2,6]. Furthermore, as CS patients are often admitted to intensive care units (ICUs) and may have hospital stays lasting from several days to weeks, the condition places a significant burden on healthcare systems.

Pathophysiology

Cardiogenic shock is primarily triggered by severe left ventricular dysfunction. This systolic impairment leads to a reduction in cardiac output and stroke volume, causing hypotension and inadequate tissue perfusion. In ACS, reduced coronary artery perfusion pressure can exacerbate myocardial ischemia. Compensatory mechanisms activate in response to low systolic blood pressure, causing systemic vasoconstriction, which worsens end-organ hypoperfusion. Activation of the hypothalamic-pituitary-adrenal (HPA) axis results in elevated circulating catecholamines and cortisol levels. Although catecholamines enhance myocardial contractility and peripheral circulation, they also increase myocardial and systemic oxygen demand and can promote arrhythmias. Hypotension and systemic hypoperfusion additionally trigger an inflammatory response, elevating cytokine levels, such as interleukins and tumor necrosis factor α. This systemic inflammatory response is believed to contribute to the self-perpetuating cycle in CS, where compensatory mechanisms aimed at preserving homeostasis further intensify hypoperfusion [3]. Beyond ischemia-induced myocardial injury, myocardial changes following revascularization and reperfusion may also influence the disease cascade. The pathophysiology of CS is highly intricate, and the extent of myocardial infarction does not always correspond with CS development. For example, left ventricular ejection fraction (LVEF) may be only moderately reduced in some CS patients, while severe impairment of myocardial contractility does not always lead to CS [3].

Treatment

Survival rates in cardiogenic shock (CS) have significantly improved over the past few decades, largely due to advancements in early revascularization therapy, which remains the cornerstone of treatment in CS cases caused by acute coronary syndrome (ACS). Urgent revascularization, whether through percutaneous coronary intervention (PCI) or, less frequently, coronary artery bypass grafting (CABG), is advised for all ACS patients presenting with CS, regardless of the time elapsed since symptom onset [1, 7, 8]. Ongoing randomized trials are investigating whether complete revascularization via multivessel PCI or targeting only the culprit coronary lesion yields better outcomes [9]. For cases involving mechanical complications, immediate surgical intervention is imperative.

Irrespective of the CS etiology, standard treatment approaches include fluid resuscitation to achieve euvolemia and alleviate hypoperfusion, provided there are no signs of fluid overload. The efficacy of inotropes and vasopressors in CS remains debated. While these agents help stabilize hemodynamics, they simultaneously increase myocardial oxygen consumption and may induce arrhythmias. Being vasoconstrictive, they can also impair microcirculation, potentially worsening tissue hypoperfusion. Nonetheless, in clinical settings, inotropes and vasopressors are often required to enhance cardiac function and maintain adequate blood pressure. The consensus suggests limiting their use to the shortest duration and lowest effective dose. A target mean arterial pressure of 65–70 mmHg is recommended. First-line inotropes, such as dobutamine and levosimendan, are preferred for enhancing cardiac contractility. Although dobutamine, a beta-adrenergic, elevates myocardial oxygen demand and may induce arrhythmias, levosimendan, a calcium sensitizer and inodilator, lacks these side effects. Phosphodiesterase-3 (PDE-3) inhibitors like milrinone and enoximone can also be used to improve cardiac function. Epinephrine should be limited to resuscitation scenarios due to its association with early mortality [10, 11]. When vasopressors are necessary, norepinephrine is considered superior to dopamine in treating CS [1, 12]. Given the limited evidence on the benefits of these agents, treatment recommendations are often based on clinical experience.

If fluid resuscitation, vasoactive drugs, and reperfusion therapy—when applicable—fail to improve the patient's condition, mechanical circulatory support (MCS) is recommended to enhance hemodynamics, maintain sufficient perfusion pressure, and prevent multiorgan failure. The intra-aortic balloon pump (IABP), a widely used MCS device, improves coronary perfusion during diastole while reducing end-systolic pressure and afterload. However, findings from the IABP-SHOCK II trial showed no significant difference in 30-day or 12-month mortality between patients treated with or without IABP [13], suggesting that IABP should not be routinely used. It may, however, serve as temporary support while awaiting surgical intervention, such as CABG or mechanical repair. More advanced devices, including left ventricular assist devices (LVAD) and extracorporeal membrane oxygenation (ECMO) or extracorporeal life support (ECLS), are indicated in cases of refractory CS. These MCS devices can serve as bridges to recovery, surgical treatment, or cardiac transplantation. Given the high risk of complications such as bleeding, infections, inflammation, and thrombotic events, as well as limb ischemia associated with ECMO, appropriate patient selection and the timing of MCS are critical.

Patients with CS are best managed in an intensive cardiac care unit, where continuous invasive blood pressure monitoring, electrocardiography (ECG), and frequent echocardiography are essential for optimizing hemodynamics. The use of a pulmonary artery catheter may also be considered. Mechanical ventilation—either invasive or non-invasive—is typically required to ensure adequate oxygenation. Acute kidney injury (AKI) is a common complication in CS and is associated with increased mortality [14]. Early correction of hypovolemia and hemodynamic optimization are crucial in preventing AKI, although excessive fluid loading should be avoided. Once the patient is stabilized, diuretics can be

introduced to mitigate fluid overload, and renal replacement therapy may be necessary in some cases.

Prognosis

Cardiogenic shock (CS) continues to be associated with alarmingly high mortality rates, with the majority of deaths occurring within the first few days or weeks following onset. However, patients who survive the early phase of CS generally experience long-term survival rates similar to those of acute coronary syndrome (ACS) patients without CS [15]. Long-term prognostic medications for coronary artery disease, such as beta-blockers and renin–angiotensin–aldosterone system inhibitors, should only be initiated after the patient has fully recovered from CS and is clinically stable. The key to improving prognosis is the rapid identification of CS patients to initiate prompt treatment and prevent multiorgan failure. Early revascularization remains the foundation of treatment for CS. Ongoing clinical trials, such as DanShock (ClinicalTrials.gov, NCT01633502), aim to determine the optimal revascularization strategy for patients with multivessel disease and to assess the role of mechanical circulatory support (MCS) in CS management [9].

The recently developed CardShock risk score (AUC: 0.85, 95% CI: 0.80–0.90, $P < 0.001$) provides a valuable tool for stratifying CS patients based on seven common clinical variables, which can be evaluated at the time of diagnosis [2]. Patients are categorized into low (scores 0–3), intermediate (scores 4–5), and high (scores 6–9) risk groups, with corresponding in-hospital mortality rates of 9%, 36%, and 77%, respectively. The CardShock risk score offers early prediction of in-hospital mortality and can guide clinical decision-making by identifying patients at higher risk of adverse outcomes.

Prevention of Cardiogenic Shock

Preventing cardiogenic shock (CS) is challenging, but certain measures can reduce its risk, particularly by addressing the underlying causes, such as acute coronary syndrome (ACS) and heart failure. While CS itself may not always be preventable, the following strategies can significantly lower its likelihood:

1. **Early Detection and Treatment of Acute Coronary Syndrome (ACS)**
    - **Prompt Revascularization**: Early treatment of ACS through percutaneous coronary intervention (PCI) or thrombolytic therapy can prevent the progression to CS by restoring blood flow to the heart before significant damage occurs.
    - **Medication**: Antiplatelets, anticoagulants, statins, beta-blockers, and ACE inhibitors help manage ACS and reduce the risk of myocardial infarction and subsequent CS.
2. **Management of Chronic Heart Failure**
    - **Optimizing Medical Therapy**: For patients with chronic heart failure, medications such as ACE inhibitors, ARBs, beta-blockers, and diuretics help manage the condition and reduce the likelihood of acute decompensation that could lead to CS.

- **Lifestyle Modifications**: Smoking cessation, regular exercise, a heart-healthy diet, and managing comorbid conditions like hypertension and diabetes can lower the risk of heart failure exacerbations and ACS.

3. Risk Factor Management

- **Control of Hypertension and Diabetes**: Proper management of high blood pressure and diabetes can prevent both heart failure and myocardial infarction, reducing the risk of CS.
- **Lipid Control**: Using statins or other lipid-lowering therapies to manage high cholesterol levels helps prevent coronary artery disease and myocardial infarction, which can lead to CS.

4. Monitoring High-Risk Patients

- Patients with a history of myocardial infarction, heart failure, or those undergoing high-risk procedures should be closely monitored for early signs of cardiac dysfunction to prevent progression to CS.

While CS may not be entirely preventable in all cases, prompt recognition and management of its risk factors, along with timely interventions, can reduce the incidence and improve outcomes.

Role of Pharmacists in Cardiogenic Shock

Pharmacists play a crucial role in the management of cardiogenic shock (CS) by ensuring the safe and effective use of medications, collaborating with the healthcare team, and contributing to patient care. Their responsibilities are multifaceted and span from drug selection and dosing to monitoring and education, especially in critical care settings. Below is a detailed overview of the pharmacist's role in managing CS:

1. Pharmacotherapy Management

- **Medication Selection**: Pharmacists are key in selecting appropriate pharmacological agents for hemodynamic support, such as **vasopressors**, **inotropes**, and agents for revascularization (e.g., **antiplatelets**, **anticoagulants**). They ensure these drugs are chosen based on patient-specific factors, such as comorbidities, renal function, and contraindications.
- **Dosing Optimization**: CS patients often have impaired organ function (e.g., liver, kidney), requiring careful adjustment of drug dosages. Pharmacists calculate accurate doses for **inotropes** (e.g., **dobutamine**, **levosimendan**) and **vasopressors** (e.g., **norepinephrine**, **dopamine**), balancing efficacy with the risk of adverse effects like arrhythmias or tissue hypoperfusion.
- **Drug Interactions**: The polypharmacy often seen in CS patients increases the risk of drug-drug interactions. Pharmacists evaluate the potential for interactions between vasopressors, anticoagulants, and other cardiovascular agents, ensuring safe co-administration.

2. Critical Care Support

- **Hemodynamic Monitoring**: Pharmacists collaborate with physicians and nurses in interpreting clinical data (e.g., **mean arterial pressure**, **cardiac output**, **lactate levels**) to tailor medication regimens that stabilize the patient. They make recommendations on the titration of **inotropic** and

vasopressor therapy to maintain hemodynamic targets while minimizing side effects.

- **Management of Adverse Effects**: Pharmacists monitor for adverse drug reactions, such as **arrhythmias**, **renal dysfunction**, or **hypotension**, which are common in CS treatment. They suggest alternative therapies when adverse effects are detected and assist in mitigating drug toxicity through appropriate monitoring and adjustments.
- **Mechanical Circulatory Support (MCS)**: Pharmacists are involved in the pharmacological management of patients requiring MCS, such as **intra-aortic balloon pumps** (IABP) or **extracorporeal membrane oxygenation** (ECMO). They recommend anticoagulation strategies to prevent thrombotic complications associated with these devices and adjust medication dosages to account for altered drug pharmacokinetics.

3. Multidisciplinary Collaboration

- **Interdisciplinary Communication**: Pharmacists are integral members of the **cardiac intensive care unit (CICU)** team, participating in daily rounds to provide input on medication management. They collaborate with cardiologists, intensivists, nurses, and respiratory therapists to develop individualized treatment plans.
- **Revascularization Therapy**: For patients undergoing **percutaneous coronary intervention (PCI)** or **coronary artery bypass grafting (CABG)**, pharmacists play a vital role in peri-procedural medication management. They ensure appropriate use of **anticoagulants** (e.g., **heparin**, **bivalirudin**) and **antiplatelet therapy** (e.g., **aspirin**, **P2Y12 inhibitors**) to prevent thrombotic events and manage bleeding risks.
- **Post-Shock Care**: Pharmacists help transition patients from acute treatment to long-term therapy. They initiate and adjust **beta-blockers**, **ACE inhibitors**, and **aldosterone antagonists** once the patient has stabilized, ensuring long-term protection against future cardiovascular events.

4. Patient and Caregiver Education

- **Education on Medication Use**: After stabilization, pharmacists provide education to patients and caregivers on the use of life-saving medications. This includes instructions on the correct use of **anticoagulants**, **antiplatelet agents**, and **heart failure medications**, emphasizing adherence to therapy to prevent recurrence of CS.
- **Discharge Counseling**: Pharmacists counsel patients on potential side effects, the importance of medication adherence, and lifestyle modifications (e.g., smoking cessation, diet) to prevent recurrent cardiovascular events. They also educate on the appropriate response to early symptoms of heart failure or recurrent ischemia.

5. Research and Evidence-Based Practice

- **Clinical Trials and Guidelines**: Pharmacists stay up to date with ongoing clinical trials and emerging evidence in the treatment of CS, such as studies on the use of **levosimendan**, **mechanical circulatory support**, or optimal **antithrombotic therapy**. They incorporate evidence-based recommendations into patient care and help develop institutional protocols for the management of CS.

- **Pharmacovigilance**: Pharmacists contribute to drug safety monitoring programs by reporting adverse drug reactions and participating in quality improvement initiatives aimed at optimizing medication use in critically ill CS patients.

Role of Paramedics and EMS

Paramedics and Emergency Medical Services (EMS) play a critical role in the initial management and stabilization of patients experiencing cardiogenic shock (CS), as well as other critical emergencies. Their involvement begins at the pre-hospital level, where rapid assessment, prompt intervention, and swift transportation to appropriate medical facilities are essential to improving patient outcomes. Paramedics are trained to recognize the early signs of cardiogenic shock, such as hypotension, altered mental status, and signs of inadequate perfusion, and initiate life-saving treatments in the field. Early identification of CS is pivotal, as it allows paramedics to activate hospital-based cardiac care teams and expedite interventions like percutaneous coronary intervention (PCI) or other reperfusion therapies.

In the pre-hospital environment, paramedics and EMS are responsible for initiating treatment to stabilize hemodynamics, such as the administration of oxygen, intravenous fluids, and, when appropriate, inotropic or vasopressor support. While paramedics may not administer advanced medications used in hospital settings, they are skilled in managing airway patency, supporting ventilation, and establishing intravenous or intraosseous access, which prepares the patient for advanced cardiac care upon arrival at the hospital. Electrocardiogram (ECG) monitoring is another critical function performed by paramedics, as it enables early identification of ischemic changes, arrhythmias, or other abnormalities that can guide immediate treatment decisions. Transmission of ECGs to receiving hospitals allows emergency departments and cardiac units to prepare for urgent interventions, reducing time to reperfusion and improving survival rates.

Moreover, paramedics are trained to manage patients who may require mechanical circulatory support (MCS) devices, such as intra-aortic balloon pumps (IABP), during transport, in collaboration with hospital-based critical care teams. Effective communication between paramedics and the receiving hospital is vital for the seamless transfer of critically ill patients, ensuring continuity of care from the pre-hospital setting to the intensive care unit (ICU). Furthermore, paramedics play a role in providing emotional support and communication to patients and their families during such critical and stressful events, demonstrating a holistic approach to emergency care. In summary, paramedics and EMS personnel are integral to the chain of survival in cardiogenic shock, bridging the gap between pre-hospital care and definitive medical treatment. Their ability to quickly assess, stabilize, and transport patients to appropriate facilities plays a significant role in improving outcomes for individuals suffering from this life-threatening condition.

Importance of Health Informatics in Cardiogenic Shock

Health information systems (HIS) are pivotal in enhancing future responses and management of cardiogenic shock (CS) by facilitating real-time data access, improving decision-making, and enabling efficient patient care coordination. Through the integration of electronic health records (EHRs), clinical decision support systems (CDSS), and telemedicine technologies, HIS allows healthcare providers to rapidly access patient histories, medication records, and diagnostic results, which are crucial for timely intervention in CS cases. Advanced HIS tools can alert clinicians to critical changes in patient conditions, streamline communication across multidisciplinary teams, and support the identification of patients at high risk for CS through predictive analytics. These systems also play a critical role in monitoring patient outcomes and identifying patterns in treatment efficacy, thereby informing evidence-based protocols for future care. Furthermore, HIS contributes to the collection of large-scale data for research, enabling the development of new therapeutic strategies and personalized treatment plans. As health information systems evolve, their capacity to improve care delivery, optimize resource allocation, and reduce response times in emergencies like cardiogenic shock will continue to advance the quality of cardiac care and patient survival rates.

Conclusion

Cardiogenic shock (CS) remains a formidable clinical challenge, with mortality rates still alarmingly high despite technological advancements and improved treatment protocols. The complexity of CS demands a multifaceted approach, where early diagnosis and timely intervention are pivotal to improving patient outcomes. Central to this process are multidisciplinary teams, including EMS personnel, paramedics, pharmacists, and the integration of health information systems. Each discipline brings a unique contribution that collectively enhances patient care, from initial diagnosis to long-term management. Early intervention, particularly rapid revascularization in ACS-related CS cases, is critical in preventing irreversible organ damage and reducing mortality. EMS teams and paramedics are at the forefront of this effort, ensuring that patients receive immediate care during transport to specialized cardiac centers. Their ability to stabilize patients using non-invasive diagnostic tools and provide initial pharmacological support can significantly impact survival rates. Moreover, their role in facilitating early diagnosis through electrocardiograms (ECGs) and swift communication with hospital teams is invaluable. Pharmacists, often underappreciated in critical care settings, play a vital role in the precise management of pharmacotherapy for CS patients. They optimize medication regimens, adjust dosages according to the patient’s clinical status, and prevent potentially harmful drug interactions. Given the complexity of CS, where patients frequently experience organ dysfunction, the pharmacist's role in monitoring drug efficacy and minimizing adverse effects is crucial for stabilizing patients. Health information systems have revolutionized the management of complex conditions like CS. By ensuring real-time access to patient data, treatment protocols, and clinical decision support tools, these systems enhance coordination between care teams and streamline the entire treatment process. The ability to integrate data from various healthcare providers, combined with the use of risk stratification

tools such as the CardShock score, enables personalized and timely interventions. In conclusion, managing cardiogenic shock requires a comprehensive and collaborative approach. The integration of EMS, paramedics, pharmacists, and health information systems significantly improves patient outcomes by ensuring timely, accurate, and coordinated care. Future efforts should focus on strengthening these multidisciplinary approaches to continue improving survival and reducing the long-term burden of CS.

References

1. Thiele, H, EM Ohman, S Desch et al. 2015. Management of cardiogenic shock. *Eur. Heart J.* **36**: 1223–1230.
2. Harjola, VP, J Lassus, A Sionis et al. 2015. Clinical picture and risk prediction of short-term mortality in cardiogenic shock. *Eur. J. Heart Fail.* **17**: 501–509.
3. Reynolds, HR, and JS Hochman. 2008. Cardiogenic shock: current concepts and improving outcomes. *Circulation* **117**: 686–697.
4. Abbott, JD, HN Ahmed, HA Vlachos et al. 2007. Comparison of outcome in patients with ST-elevation versus non-ST-elevation acute myocardial infarction treated with percutaneous coronary intervention (from the National Heart, Lung, and Blood Institute Dynamic Registry). *Am. J. Cardiol.* **100**: 190–195.
5. Buerke, M, H Lemm, S Dietz, and K Werdan. 2011. Pathophysiology, diagnosis, and treatment of infarction-related cardiogenic shock. *Herz* **36**: 73–83.
6. Thiele, H, U Zeymer, FJ Neumann et al. 2013. Intra-aortic balloon counterpulsation in acute myocardial infarction complicated by cardiogenic shock (IABP-SHOCK II): final 12 month results of a randomised, open-label trial. *Lancet* **382**: 1638–1645.
7. Hochman, JS, LA Sleeper, JG Webb et al. 2006. Early revascularization and long-term survival in cardiogenic shock complicating acute myocardial infarction. *JAMA* **295**: 2511–2515.
8. Mebazaa, A, H Tolppanen, C Mueller et al. 2016. Acute heart failure and cardiogenic shock: a multidisciplinary practical guidance. *Intensive Care Med.* **42**: 147–163.
9. Thiele, H, S Desch, JJ Piek et al. 2016. Multivessel versus culprit lesion only percutaneous revascularization plus potential staged revascularization in patients with acute myocardial infarction complicated by cardiogenic shock: design and rationale of CULPRIT-SHOCK trial. *Am. Heart J.* **172**: 160–169.
10. Tarvasmaki, T, J Lassus, M Varpula et al. 2016. Current real-life use of vasopressors and inotropes in cardiogenic shock - adrenaline use is associated with excess organ injury and mortality. *Crit. Care* **20**: 208.
11. Ponikowski, P, AA Voors, SD Anker et al. 2016. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. *Eur. J. Heart Fail.* **18**: 891–975.
12. De Backer, D, P Biston, J Devriendt et al. 2010. Comparison of dopamine and norepinephrine in the treatment of shock. *N. Engl. J. Med.* **362**: 779–789.

13. Thiele, H, U Zeymer, FJ Neumann et al. 2012. Intraaortic balloon support for myocardial infarction with cardiogenic shock. *N. Engl. J. Med.* **367**: 1287–1296.
14. Marenzi, G, E Assanelli, J Campodonico et al. 2010. Acute kidney injury in ST-segment elevation acute myocardial infarction complicated by cardiogenic shock at admission. *Crit. Care Med.* **38**: 438–444.
15. Singh, M, J White, D Hasdai et al. 2007. Long-term outcome and its predictors among patients with ST-segment elevation myocardial infarction complicated by shock: insights from the GUSTO-I trial. *J. Am. Coll. Cardiol.* **50**: 1752–1758.

النهج المتعددة التخصصات لإدارة الصدمة القلبية: دور خدمات الطوارئ، المسعفين، الصيادلة، وأنظمة المعلومات الصحية

الملخص:

الخلفية :الصدمة القلبية هي حالة تهدد الحياة تنشأ من عدم قدرة القلب على ضخ كمية كافية من الدم، مما يؤدي إلى نقص التروية للأعضاء الحيوية. وغالبًا ما تكون نتيجة لمتلازمة الشريان التاجي الحاد وترتبط بمعدل وفيات مرتفع على الرغم من التقدم في العلاج. إدارة الصدمة القلبية تتطلب نهجًا متعدد التخصصات يشمل خدمات الطوارئ الطبية، والمسعفين، والصيادلة، وأنظمة المعلومات الصحية.

الهدف :تستعرض هذه المقالة الفسيولوجيا المرضية، والأسباب، والعلاج للصدمة القلبية، مع التركيز على دور فرق الرعاية متعددة التخصصات في تحسين نتائج المرضى.

الطرق :يستعرض هذا البحث الأدبيات الحالية حول إدارة الصدمة القلبية، مع التركيز على مساهمات خدمات الطوارئ الطبية، والمسعفين، والصيادلة، وأنظمة المعلومات الصحية في استقرار الديناميكا الدموية، وإدارة العلاج الدوائي، وتحسين الرعاية طويلة الأمد. كما يقوم التحليل بمراجعة بيانات التجارب السريرية، ونماذج تقييم المخاطر، وفعالية العلاجات المبكرة لإعادة التوعية.

النتائج :يعتمد إدارة الصدمة القلبية الفعالة على التشخيص المبكر، وإعادة التوعية الفورية، واستقرار الديناميكا الدموية من خلال العوامل الدوائية والدعم الميكانيكي للدورة الدموية. خدمات الطوارئ الطبية والمسعفون لهم دور محوري في الكشف المبكر ونقل المرضى المصابين بالصدمة القلبية، بينما يلعب الصيادلة دورًا رئيسيًا في تحسين العلاج الدوائي. تسهم أنظمة المعلومات الصحية من خلال تبسيط التواصل، ومشاركة البيانات، وعمليات اتخاذ القرار.

الاستنتاج :نهج منسق ومتعدد التخصصات، يشمل التدخل المبكر واستخدام أنظمة المعلومات الصحية المتقدمة، هو أمر أساسي لتحسين معدلات البقاء على قيد الحياة للمرضى المصابين بالصدمة القلبية. الصيادلة والمسعفون لا غنى عنهم لتقديم الرعاية في الوقت المناسب، بينما تعزز أنظمة المعلومات الصحية كفاءة العلاج.

الكلمات المفتاحية :الصدمة القلبية، متلازمة الشريان التاجي الحاد، الرعاية متعددة التخصصات، خدمات الطوارئ الطبية، أنظمة المعلومات الصحية، إعادة التوعية، الصيادلة، المسعفون